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Great New Release! Scenery Disk \# 11

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[^0]Everyone has to take science courses in high school. The big problem for me started with chemistry class. A barrage of elements, minerals, and chemicals, each with strange, cryptic abbreviations. Then came the bizarre chains that represent the various molecular structures: If we add $\mathrm{H}_{2}$ here, will oxidation take place? If so, how is the carbon chain affected? Draw the new chain. You may recall the strange little diagrams that looked like many strings of pearls after several hours in a clothes dryer.

It was then that I began to suspect the Great Scheme. All of this information was too abstract, too far removed from the real world I thought I was beginning to understand through history, English, geography, even math. Well contrived, I thought, but not clever enough. People who had little or no talent for self-expression-writing, music, and art, for example-had long ago invented a secret society for the institution of bogus scientific systems and subsystems which has continued to expand and codify over the decades and centuries.

The culmination of my experience with that chemistry class was a drawing I made in answer to a fi-nal-exam question requiring one of those molecular chain contrivances. I drew a picture of bacon and eggs.

Freshman year, college. Required: Chemistry 101, with a twohour lab every Friday. In the labs, I remember pouring combinations of oddly colored solutions together to make an even stranger-colored one with, maybe, some smoke rising. On paper, the string of pearls became even more convoluted. My Great Scheme suspicions were now zealous convictions.

While I held these beliefs closely over the years, I never shared them until many years later. My wife is very strong in the sciences and had taken a lot of chem-
istry and related courses in college. She was, by then, a clinical dietitian. One day after work, she was discussing how a certain hospital patient required this and that, but no potassium-and an IV solution because of electrolyte imbalance. I let loose. The restraining walls that had held my pet theory for so many years erupted. I accused her of propagating the confounding conspiracy, the Great Scheme. She laughed, hard. But I knew her to be an honest woman-and this added to my confusion.

In January 1983, intrigued by a new mass-market product-the personal computer-I splurged and purchased a Commodore 64 for $\$ 400$. Computers fascinated me. After learning to program, I was hooked.

The following Thanksgiving, having been at COMPUTE! since the previous spring, I returned home with my wife for the holidays. Sitting around the table, some curious family members asked me questions about how these new computers worked. As the questions and answers became more complex, I heard myself explaining things about serial and parallel data transfer, raster interrupts, data storage, binary math, and electron guns used with RGB monitors. Electron guns? The great revelation. I had become a co-conspirator with my wife and old chemistry teachers. I was now part of the Great Scheme.

Welcome to the wonderful world of science.


Lance Elko
Senior Editor

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#### Abstract

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## Plain Vanilla Reviews

Let's discuss your software reviews. They are much too vanilla. What is sorely needed is a rating system that will rate software in several categories, including a warning if the product's copy-protection scheme will rattle the disk drive head.

Robert Nellist Brockport, NY

We've heard this complaint off and on over the past five years, and we addressed it way back in the July 1984 issue. We haven't stated our position on software reviews in recent years, so since it remains the same, here's how we addressed it four years ago in the July 1984 "Editor's Notes."
"A number of readers have asked why we don't 'grade' our reviews or 'degrade' some products. Essentially, any product we review is, in our opinion, of merit. We feel that it's only worth your time and space in GAZETTE to review products that are well designed. The market is flooded with products, and we'd rather tell you about the good ones.
"While the grading of products may be helpful to some readers, it is often unfair to the product. If you've ever read reviews of records you really like, only to see a thumbs down or a poor grade, you probably wondered if the critic heard the same thing you did. The goal of quantifying a product with a letter or number grade is to be objective, yet it's often subjective and arbitrary. If we took a poll of our staff, we'd have a number of different answers."

To augment this position, it remains true that our staff and outside reviewers have varying opinions on software products. If there's a general consensus among our staff that a product is not good, we'll pass on it (regardless of who published it). Whether a good product should get a B or an A- is eternally debatable.

Our reviewers are sensitive to products that are abusive to the disk drive. And many have made notes to that effect in a number of reviews in the past year.

## WordStar for CP/M

I've just read the excellent article in the March 1988 issue entitled, "Super CP/M Software for the 128, Part 1: Writer's Toolbox," by Clifton Karnes. I have always wanted to purchase WordStar, but I didn't think I could afford its hefty price tag. Your article got me to thinking. If I could purchase WordStar 2.26 from PDSC at $\$ 39.95$, I could then upgrade to WordStar 4.0 for $\$ 89$.

Then I saw an article in FOGHORN that said WordStar 4.0 was now available to all registered $C P / M$ users for $\$ 89$. I couldn't believe that this word processor was available to 128 users for less than $\$ 100$. I thought your readers might like to know about the new version of WordStar and its new low price.

> John L. Gordon
> Chadds Ford, PA

When MicroPro first released the $C P / M$ version of WordStar 4.0, it was available only as an upgrade for owners of previous versions. As you stated in your letter, it's now available to any $C P / M$ user at a bar-gain-basement price of $\$ 89$. You can order WordStar 4.0 from MicroPro at (800) 2275609, extension 761.

## SpeedScript Copyright

What is the present copyright status of SpeedScript? A couple of our user group members say they have seen a notice releasing the program to public domain.

James C. Ladd
San Antonio, TX
We have not released SpeedScript to the public domain, nor do we have plans to do so. While we own the copyright to SpeedScript, we do grant permission for user groups (or any individuals or organizations) to provide disk copies of Speed-Script-or any of our programs-to individuals who own a copy of the issue in which the corresponding article was printed. Version 2.0 of SpeedScript is in the January 1984 GAZETTE; version 3.0 is in the March 1985 COMPUTE!; and version 3.2 is in the May 1987 GAZETTE. Each of these issues contains full documentation.

## Copying GAZETTE Disks

I would like to know how to copy my COMPUTE!'s Gazette disks. Are they write-protected? If so, why?

Peter J. Cotton<br>Waukesha, WI

The GAZETTE Disk is write-protected as a result of a damaging incident several years ago. A program on a 1985 disk, which was not write-protected, included a feature which reformatted the current disk in the drive. A number of subscribers loaded the disk menu, then pressed a key to load the program, which itself contained a menu. After pressing a number corresponding to the menu selection which reformatted the disk, they lost everything. We had a large number of re-turns-and a lot of phone calls. We decided at that time to write-protect the disk as a safeguard for both ourselves and subscribers. In retrospect, we're glad we did. Since that incident, we've published dozens of programs that are designed to write to disk. When those programs are published on disk, we include a message screen to remind the user that disk is write-protected.

While the disk is write-protected, it is not copy-protected. Any GAZETTE program can be saved from memory directly to a blank, formatted disk. Over the years, we've published a number of copy programs that can help with this. The most recent is "Disk Rapid Transit" (December 1987) which is easily the fastest copier program we've published. In general, copy programs are available-with varying quality-in the public domain and in user group libraries.

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Do you have a question or a problem? Have you discovered something that could help other Commodore users? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s Gazette, P.O. Box 5406, Greensboro, NC 27403. We regret that, due to the volume of mail received, we cannot respond individually to programming questions.

## Stop Scrolling

I adapted the algorithm for scrambling the random numbers $1-1000$ in the March 1988 "Gazette Feedback" column to pick random numbers in the range 1-48 for the New York state lotto.

One minor problem presents itself. The column of numbers scrolls out of sight before the program reaches the 48 th number. Could you print an addition to this program that would print the numbers in four or more columns across the screen?

> Robert G. Farricy
> Syracuse, NY

A variety of solutions present themselves. If you're using a 128, you can press the NO SCROLL key to freeze the screen. Press it again to unfreeze it. On the Plus/4 and 16, use CTRL-S to freeze and CTRL-Q to unfreeze.

On the 64, you can build your own print-freezing routine. If you want to check for a keypress between lines 60 and 70, add these lines:

## 65 GET AS: IF AS=""" THEN 70 66 GET AS: IF AS<>"" THEN 66

In line 65 , the program checks for a keypress. If the user didn't press a key, the program jumps forward to line 70. At line 66, it waits for another keypress and doesn't break out of the loop until the user hits a key. Note that both lines use two double quotation marks with nothing between them. This is a null string, a string that contains no characters.

A quicker way to freeze the screen is to press the RUN/STOP key. When you want the program to continue, type CONT.

If you'd prefer to see all 48 numbers on the screen at the same time, you can print them in columns. Just add a comma after the variable name in the PRINT statement. Substitute PRINT X(I), (with a comma) for PRINT I,X(I) and you'll see 12 lines of four columns.

## Doctor, Doctor

I have recently purchased a 1581 disk drive. I can't get my directory organizers and disk cataloger programs to work with it. I guess this is because there are twice as many tracks, which makes programs for the 1541 incompatible with the 1581. Can you help?

Seth Meashey Woodbridge, VA
A disk operating system (DOS) stores information in two sections: the directory and the rest of the disk. DOS designers can make disk access slightly faster if the directory is located on the middle track. A 1541 disk puts the directory on track 18 because there are a total of 35 tracks. When a program is found in the directory, the drive's read/write head will move a maximum of 17 tracks to track 1 or track 35.

A 1581 disk has 80 tracks, and the directory is located on track 40 (the middle of the disk). If you happen to have a disk doctor or directory organizer program for the 1541, it probably expects to find the directory on track 18. The programmer assumed the directory would always live on track 18.

Two suggestions come to mind: Either modify the program to look for the directory on 40 instead of 18 , or write to the company that released the original program and ask them if they are working on a new version for the 1581 drive.

## The Best Language?

I was wondering which language the creators of commercial games use-machine language or BASIC or some other language I don't know about? I was also wondering if a person like me could learn how to create games like the ones on the market today.

> Craig Cassata Orland Park, IL

Although some smaller software companies sell programs written in BASIC, most commercial software for the 64 and 128 is written in machine language (ML) because it doesn't use up much memory and it's very fast. On computers such as the IBM PC or Amiga, C language is popular because it's almost as fast as ML and it's fairly portable, meaning that you can write a program for the PC and then "port" it over to the Amiga or another computer. Pascal,

Modula-2, Forth, and various other languages are also used for commercial development.

Some software companies assign an entire program to one programmer, but, on complicated projects, the work is sometimes split up between people who specialize in sprites, sound, and other aspects of a project. Some companies use expensiveand very fast-minicomputers to develop Commodore software (imagine a $\$ 20,000$ computer running an emulator that makes it act like a $\$ 200$ Commodore 64). Infocom has its own language for writing adventure games, the Zork Interactive Language (ZIL). After creating a game and the generic packaging and documentation, they can quickly compile it into several dozen versions for different computers. The resulting program is machine language, but it wasn't written directly in ML.

Some companies write all of their programs in-house, but others hire freelance programmers. Still others will evaluate software and buy it if they like what they see. If you're interested in freelance programming, write to various software companies and ask for their Author's Guidelines. Another avenue is writing for GAZETTE. Many of our programs are written by readers like yourself.

## Vexed by Hex

My printer has many capabilities that I have been unable to use, as I am unable to give the proper commands with the information I have available. The user's manual gives commands such as this:
CHRS(\&HE) Set enlarged characters
CHR\$(\&H4E) Select pica characters
CHR $\$(\& H 51)$ Select condensed characters
Is there any cross-referencing information available for translating these codes to the 64 ?

Paul Offutt
Louisville, KY
Some computers, but not the 64, use the \&H prefix to mark hexadecimal (base 16) numbers. You'll have to translate the hex values into decimal. Just remember that the hex numerals $A-F$ correspond to the decimal values $10-15$ and that the second number from the right is the sixteens' place (not the tens' place).

The three CHR\$ codes you listed translate into $\operatorname{CHR\$ (14),~CHR\$ (4^{*}16+14)\text {,}}$ and $\operatorname{CHR} \$\left(5^{*} 16+1\right)$-or 14,78 , and 81 .

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CHR\$(78) and CHR\$(81) are the ASCII values of the letters n and q . If you send these characters to the printer, it will just print an n or a q . It's likely that you'll need to send an Escape code, a CHR\$(27), first. Try this: OPEN 4,4,7: PRINT\#4, CHRS(27);" $N$ ": CLOSE 4. If your interface automatically translates from Commodore ASCII to true ASCII, you may need to experiment with using uppercase or lowercase for the letters like n and q .

## Commas Instead of Periods

I have a question concerning the keypad and the 128 . When inputting a program with numerous DATA statements, I have found it easier to use the numeric keypad. Is there some way to redefine the decimal point to a comma? If so, I wouldn't have to reach across to hit the comma key.

## Donald Hebert

 APO, NYThe 128 uses five lookup tables to translate keyscan codes to ASCII values (for more information, see the entry at location 830 in Mapping the 128 from COMPUTE! Books). The five tables correspond to the five keyboard maps: plain (unshifted), SHIFT, Commodore, CONTROL, and ALT. The default location for normal, unshifted keys is 64128 . The first thing to do is copy the table from ROM down to RAM. Line 20 does this in the program below. The period (decimal point) on the numeric keypad has a keyscan code of 82. A period is ASCII 46. We want to change it to a comma, which is ASCII 44. Line 30 modifies that character in the table. Then, in line 40, the pointer for the unshifted keys is moved to point to the brand new table at 6912. When you press the period on the numeric keypad, you'll get a comma instead. See the next letter for another idea.

```
BQ 10 RAM=6912: ROM=64128
XP 2\emptyset FORJ=\emptysetTO88: POKERAM +J, P
    EEK(ROM+J): NEXT
AG 30 POKE RAM+82,44
CR 40 HI = INT(RAM/256): POKE
    {SPACE}836,RAM-HI*256: P
    OKE 831,HI
```


## DATA and Commas

Many BASIC programs have an extensive DATA section. It would be easier for 128 users if a one-handed entry feature could be incorporated into "The Automatic Proofreader." I'd suggest that one of the function keys be reassigned to a comma (F1, maybe?). I don't have a machine language assembler/disassembler, and my ML is a little rusty, but the change should only be a few lines.

Charles F. Oller
Warwick, RI
You don't need ML. You can do everything in BASIC 7.0. Look up the two commands

KEY and AUTO in your System Guide. If you want F1 to print a comma and F7 to print DATA, type these two lines:
KEY1,","
KEY7,"DATA"
If the DATA statements are numbered by tens, use the AUTO command to put the 128 into autonumbering mode. Type a line, press RETURN or ENTER, and the next line number will appear. Press F7 for DATA and F1 to print the commas between numbers.

## Using "Countdown Timer"

I am trying to write a BASIC program that will determine typing speed. I'd like to use "Countdown Timer" from the April GAZETTE, but when it's running I can't type on the keyboard. How can I use the Countdown Timer to stop all keyboard entry after one or five minutes?

Steven Schulte Long Beach, CA
From your description, it sounds like you're attempting to build your program around the five-line demonstration program included in the article. This demo displays the current internal clock reading as it counts down from one minute. Near the end of the article is a description of how to incorporate the Countdown Timer into your own BASIC programs.

To do this, you'll need to include the lines from Program 1 (for the 64) or 2 (for the 128) in your program. These lines POKE the ML routine into memory. Start up Countdown timer with SYS 679 on the 64 or SYS 3072 on the 128. Next, set the internal clock using the reserved variable TI\$ (either TI\$="000100'" or TIS="000500").

Follow this with your typing input routine. Include a line near the end of the routine to check the timer. If it has wrapped around from "000000" to " 235959 " or something lower, the time is up and you can rate and display the user's typing speed. Otherwise, loop back to the beginning of the typing input routine.

Note that we didn't suggest that you look for exactly zero ("000000") on the timer each time through the loop. If you did this, chances are you'd miss it since the input routine may take longer than a second to execute.

## Locating the Hi-Res Screen

I have a question regarding location 53272 , which is used to select base addresses for bitmap mode on the Commodore 64. Most references I've seen will POKE 53272,29 (binary 00011101) to put the graphics screen at $\$ 2000$ (8192) and color memory at $\$ 0400$ (1024). The low nybble of this number is 13 in decimal. Shouldn't the low nybble
be 8 ? POKEing a 29 in 53272 would seem to put the bitmap at $13^{*} 1024$ (13312). Could you explain what they're doing here?

Wayne Dooley Winchester, VA

Locations 53248-53294 are registers in the VIC-II chip, which is responsible for the 64's video display. The VIC chip can address only 16 K of memory at a time. Data for anything shown on the screen must be located within this 16 K of memory. Any of the four 16 K blocks ( $0-16383$, 16384-32767, 32768-49151, 4915265535) can be chosen for video memory. Location 56576 (bits 0-1) determines which 16 K video bank the VIC chip addresses.

The VIC chip register at 53272 does several different things. In text mode, it contains the offset address within the current video bank for the character set in the low nybble and the address for the text screen in the high nybble. The character set is 2 K in length, so the low nybble (in bits 1-3) must hold an even number from 0 to 14 , representing a 2 K offset (since the number is always even, bit 0 is unused). Similarly, the text screen is 1 K in length. So, bits 4-7 hold a number from 0 to 15 , representing a 1 K offset.

In normal bitmap mode, bits 4-7 still point to the offset address for the text screen. But in this case, the text screen provides color data for the graphics screen. As for the low nybble (bits $0-3$ ) in this mode, only bit 3 is significant. It provides the 8 K offset for the bitmap screen from the beginning of VIC memory. If this bit contains a 0 , the offset is 0 K , and if it contains a 1 , the offset is 8 K (8192).

Now, to consider your example. POKEing a 29 (binary 00011101) into 53272 sets bit 3. Assuming the VIC-II chip is in video bank $0(0-16381)$, the bitmap screen is positioned at 8192 because bit 3 is turned on. The other bits in the low nybble are ignored. You could get the same result by POKEing a 24 (binary 00011000 ) into 53272.

Color memory for this hi-res screen is at 1024. A value of 1 is stored in the high nybble of 53272 , and $1 \times 1024=1024$.

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# Commodore-Ready Printers: A New Generation Much More-For Less 

Tom Netsel, Assistant Features Editor

Sales of more than seven million 64s and 128 s have had a major impact on the printer market. The result: Printer manufacturers now offer 64 and 128 owners a wide choice of Commodore-ready printers that are filled with features undreamed of just a few years ago.

After a disk drive, a printer is the most popular computer peripheral bought by home computer users. About 65-70 percent of the people who buy a computer for personal use also buy a printer, according to Rick Lamb, product manager for Okidata, a major printer manufacturer.

For Commodore owners, there are more than 100 different printers on the market, made by 20 different companies, all listing for less than $\$ 500$. Virtually any of them can be connected to a 64 or 128 with a separate printer interface. But it's not always a simple matter to achieve compatibility among printer, interface, computer, and software.

## Uniquely Commodore

At one time, only a Commodore printer would connect directly to Commodore's unique serial port. There wasn't much of a choice, and special features were limited. Anyone who wanted underlining, multiple pitches, subscripts and superscripts, or a choice of type styles had to buy a printer with a standard Centronics parallel port. Then a separate interface was still needed to connect the printer to the 64 or 128.

As the base of Commodore owners grew, however, more and more manufacturers began offering ready-to-use printers packed with a full range of features. Now 64 and 128 owners have a wide choice of

Commodore-ready daisywheel, dotmatrix, and thermal-transfer printers to handle their black-and-white and color printing needs. (See the accompanying buyer's guide for details about Commodore-compatible printers.)

Last year, Okidata introduced a universally compatible dot-matrix printer featuring both a Commodore serial and a Centronics parallel interface. The Okidata 180 is compatible with every major personal computer. If, for example, you buy an Amiga or IBM PC, you don't have to buy another printer or interface.

## Determine Your Needs

Dot-matrix and thermal printers are the most popular choices among Commodore owners. Key ingredients to their popularity are versatility and low cost. Cost alone, however, should not be the deciding factor in choosing a printer. If a bargain printer doesn't meet your printing requirements, it isn't much of a bargain.
"Too many times the printerpurchase decision is dependent upon how much money is left over in discretionary income," Lamb says. "The buyer has $\$ 120$ left, so he buys a $\$ 120$ printer. Often there is some buyer remorse. After he lives with the print quality for a while, he realizes he needs something better."

Ask yourself what you want the printer to do. Decide how you plan to use the printer; then pick the one that has the features you need. If you primarily want to print graphics, you have different needs from those of the person who works with spreadsheets and needs a printer with 136 columns.

## Daisywheels

If you write business reports, term papers, or other important correspondence requiring a professional look, a daisywheel printer offers the sharpest type. Your papers will look as though they've been typed on a quality typewriter, but you'll have to wait for them. Daisywheels are notoriously slow. Most daisywheels priced for the home market operate at speeds in the $10-20 \mathrm{cps}$ (characters per second) range. That's fast for a human typist, but the daisywheel is the tortoise of the printer world.

The printing element of a daisywheel is a flat metal wheel that has approximately 90 spokes. It's about three inches in diameter, and gets its name from the fact that it looks something like a daisy. At the end of each spoke or "petal" is a bossed letter, number, or punctuation mark. As the wheel spins, the characters are pressed against a ribbon, which transfers ink onto the paper. You can buy additional printwheels if you want to change to a different style of type or a different font. Since its basic printing element is a fixed alphanumeric character, the daisywheel cannot print graphics.

If you're looking for quality type, and you don't need speed or
graphics-printing capabilities, then a daisywheel may suit your requirements. Blue Chip, Brother, and Silver Reed each sell Commodore-ready units. The Silver Reed EXP 420 and the Brother HR-10/C offer a choice of pitches in the $10-15 \mathrm{cpi}$ (characters per inch) range. Their top speed is 12 cps , while the Blue Chip D $20 / 10$ is a little faster, at 20 cps .

## Paper Handling

The method used for feeding paper in and out of a printer varies between models. Friction-feed printers move paper around the platen somewhat the way a typewriter does, while tractor-feed printers engage the holes at the edge of fanfold paper. Tractor feeds are usually more reliable when it comes to handling long printouts on continuous or fanfold paper. Many printers offer both methods, but tractors are often sold as options.

Some models, such as the Seikosha SP-1000VC, have an automatic loading feature for single sheets of paper: When the paper is inserted behind the platen, the printer automatically advances it to the proper starting position. This feature can speed up long printing jobs. The NX-1000C from Star Micronics America comes in two Commodore-ready models. Each employs a unique paper-parking feature that allows users to feed single-sheet paper into the printer without removing tractor-fed paper.

## Dot-Matrix Printers

If the daisywheel is the tortoise of the printer world, then the dotmatrix printer is the hare. This versatile machine offers speed plus the ability to produce complex graphic printouts. Instead of printing with preformed characters, dot-matrix printers use a row of vertical pins that strike the paper through an inked ribbon.

Dot-matrix printers generally fall into one of three printhead configurations: $9-\mathrm{pin}, 18$-pin, or $24-\mathrm{pin}$. Printers with 24 pins offer letterquality type, as opposed to the near-letter-quality (NLQ) mode found on 9 -pin printers. Their ability to print out letter-quality correspondence at 100 cps makes 24 -pin printers popular in an office environment. Their relatively high cost, however, has limited consumer interest.


The Okidata 180 is compatible with every major personal computer.

Printheads with nine pins are the standard with the Commodoreready models. A vertical column of nine pins prints across a page in both directions in draft mode, at speeds ranging from 100 to 180 cps . This process is considerably slower in NLQ mode.

An early drawback to dotmatrix printers was print quality. The printheads formed characters in a $5 \times 7$ or $8 \times 8$ matrix. There was often considerable space between the dots, making the letters look porous and ill-defined. Upgrades in printer electronics and printheads, however, have improved print quality tremendously

Most printers now have several print modes. Draft mode is usually the fastest, but produces a rougher, fainter type. NLQ, or correspondence mode, takes longer to print, but it produces a more polished print quality.

NLQ is achieved in a variety of ways. Spaces between the horizontal dots of a letter can be filled in by printing the same column of dots twice while the printhead is traveling at half-speed across the page. This is sometimes called emphasized type. Spaces between vertical dots can be eliminated by making a second pass over the line after moving the printhead or paper half a dot vertically.

NLQ printing uses these multistrike techniques and special letter shapes to improve print quality. Unfortunately, improvements in one area often force a decline else-
where. A tradeoff for improved print quality is a reduction in printing speed, by $50-300$ percent. Most NLQ printing is done at speeds of 25-30 cps.

Until recently, changing from draft to NLQ mode required changing the printer's DIP switches. This often meant turning the printer around or opening an inside panel to access the switches. Then you had to check the manual for the proper sequence, since DIP switches were seldom marked. Most printers today simplify this chore by providing front panel buttons that allow instant access to frequently used print functions. You can switch from emphasized to double width to italics at the touch of a finger.

Some high-end printers allow the user to change fonts by plugging in ROM cartridges, but multiple fonts are also available on some printers in the Commodore price range. The Star NX-1000C Multi Font printer has four onboard fonts that are selected from the front control panel.

## A Splash of Color

Another Commodore-compatible version of Star's Multi Font is the NX-1000C Rainbow. In addition to the multiple internal fonts, the Rainbow provides seven-color printing capabilities, and prints at 144 cps in draft mode and 36 cps in NLQ mode at 12 cpi. It prints black, red, yellow, blue, orange, green, and violet.
"We believe [the NX-1000C Rainbow] will be a significant factor in the Commodore market," says Brian Kennedy, product manager at Star Micronics. "It's going to be the lowest-priced color impact printer on the market."

The Rainbow can be used as a conventional printer for word processing and similar functions when color is not wanted or needed. "If you want to use it in the monochrome, or black-only mode, that's no problem," Kennedy says. "When you print out a hardcopy, just omit the color commands."

## Barriers to Color

Printer manufacturers expect color to play an important role in the future of all printers. Several obstacles presently stand in the way. The first is the lack of color copiers. While they are available, the cost is prohibitive. A color printout may look great for a business presentation or meeting, but without the ability to make color copies, its value is greatly diminished.

Another obstacle is the lack of software support for color printers. Most printing packages simply do not support color printers. To circumvent this problem, Kennedy says the Rainbow recognizes embedded color commands. For example, if it sees ((C1)) in a letter or memo, the Rainbow recognizes that code and changes accordingly to color number 1.
"If you're typing a report and want a heading in a different color, type in ((C3)) followed by the heading," Kennedy says. "Then type in ((C2)) to change back to blue or black. You can embed these commands in any standard word processing or software package.'

Kennedy notes that the average life of the color ribbons on a dot-matrix printer should be a couple of hundred pages. It can be considerably shorter on other types of color printers.

## Thermal-Transfer Printers

Another Commodore-ready color printer is Okidata's Okimate 20. It uses a different print technology called the thermal-transfer process. Instead of using pins to strike an ink-coated ribbon, the Okimate 20 briefly heats the pins. The heat transfers to a ribbon coated with a


The Star Micronics NX-1000C Multi Font includes four onboard fonts that are selected from the front control panel.
waxlike ink that melts, forming a character on the paper.

The thermal-transfer process has several advantages over the dot-matrix and daisywheel method. One is quietness. The Okimate 20 makes a slight whirring sound, and is practically silent compared to impact printers.

A third obstacle to the expanded use of color in printers is the high price tag-but not so with thermal-transfer printers. The Okimate, with a plug-in Commodore interface, has a suggested retail price of $\$ 268$, while the dot-matrix


The Okimate 20 offers vibrant color and graphics capabilities.

Rainbow (which includes the multiple fonts) lists for $\$ 379$. There are a few other color printers in the $\$ 500-\$ 700$ range, but then prices jump quickly to $\$ 6,000$ and $\$ 7,000$.
"There's a big gap there," says Star's Rick Lamb. "Virtually all the large players are starting to add color to their line of printers, although very few are serial thermaltransfers such as the Okimate 20."

Another advantage to the color thermal-transfer process is its vibrant color. Dot-matrix printers put color to paper with ink, which lacks the high-gloss factor that wax achieves.

Unfortunately, thermal-transfer printers gobble up ribbons rather quickly, and they also require a very smooth paper for best results. A black ribbon may last for 75 pages of text, but expect only 10-15 pages when printing color graphics.

## More Features in the Future

A few years ago, a basic dot-matrix printer cost about $\$ 500$ and offered little in the way of extras. Now you can find models for half that price that are loaded with advanced printing features. There have been modest price increases recently on Japanese-made printers because of the dollar/yen exchange rate, but there are still many exceptional printers available at attractive prices for Commodore users.
"The number-1 thing to remain competitive," says Star's Brian Kennedy, "is to introduce
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As manufacturers battle for a greater share of the printer market, printer buyers are reaping the advantages. And most manufacturers say this trend will continue.

As the prices of $24-$ pin machines come down, Kennedy believes they are going to force 9-pin machines out of the marketplace. "I think that over the next two or three years, 24 -wire printers are going to come down so much in price that only the real down and dirty printers-in terms of price-are going to be 9 -wires," he says.

Epson and NEC already have introduced 24-pin printers selling for $\$ 499$. Breaking the $\$ 500$ price barrier was a major step, and Kennedy expects to see them selling for $\$ 399$ in a couple of years. In order to compete, 9 -pin printers will have to sell for $\$ 299$ and less. The 24-pin printers will be the standard for home users, and 9 -pins will be bargain-basement items.

## Looking to Lasers

On the other side of the coin, laser printers have come down in price so

quickly that they are overtaking the high-end 24 -pin market. Lasers print spectacular graphics and produce text at near-typeset quality. They are quiet and fast. Instead of being rated at characters per second, lasers are rated at pages per minute. Most of today's models crank out eight to ten pages per minute.

The street price for a HewlettPackard LaserJet Plus is around $\$ 1,500$. That's only a couple of hundred dollars more than a $300-400$ cps 24 -pin printer. When people consider what an extra $\$ 200$ can buy, most will lean toward the laser.

It may be a few years before the average 64 owner buys a laser printer, but the marketing battles in the high-end business environment ultimately filter down to benefit the home-computer user. Most industry representatives say these advances in technology and reductions in price will be passed on to the Commodore market.
"We have plans to support the Commodore for years because of its installed base," says Okidata's Rick Lamb. "There's still one heck of a lot of them out there."

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# A Buyer's Guide to Commodore-Ready Printers 

Mickey McLean

There is a good selection of printers designed to work specifically with the Commodore 64 and 128-with no separate interface required. This buyer's guide represents a comprehensive list and description of all those available. Included are categories describing speed, pitch, buffer, paper feed, graphics capability, warranty, and price. Be sure to see the previous article, "Commodore-Ready Printers: A New Generation," for more details.

## Explanations of Terms

The following list contains definitions of terms used in the buyer's guide.
Compatibility. Because of Commodore's unique serial-data communications format, printers with standard serial or parallel connections will not work with a 64 or 128 without first being connected to a separate interface. All printers in this buyer's guide work directly with Commodore computers and do not require a separate interface. As noted in the buyer's guide, some of these printers are compatible with other formats as well.

Printer type. There are three types of print technology available for Commodore computers: daisywheel, dot matrix, and thermal transfer. Daisywheel printers form characters by striking the paper through an inked ribbon with a small wheel whose spokes have letters and numbers at their tips. Dotmatrix printers also use impact, but employ a printhead that contains either tiny wires or pins that form characters or graphics. A printer with thermal-transfer capabilities uses heat to melt a waxlike ink onto
the paper.
Speed. In this category, users can determine how fast a printer prints. Most printers offer users a range of speeds measured in characters per second (cps). The slower modes can provide near-letter-quality printing (like a typewriter), whereas the faster modes produce rougher or fainter type in what is usually referred to as draft mode. Some printer speeds vary depending on the type of font used such as pica or elite.
Pitch. The pitch determines how many characters can fit on a line and is measured in either characters per inch (cpi) or characters per line (cpl). If larger- or smaller-than-normal characters are being printed, the pitch can vary.
Buffer. This is amount of text the printer can store while it is operating, allowing the computer to perform other work. Add-on buffers can be purchased to increase the printer's memory capacity.
Paper feed. The two basic feed types are friction and tractor. Friction-feed printers grip the paper and move it around the platen like a typewriter,
while tractor-feed printers grab the holes at the edge of the paper with teeth at either side of the platen. Many printer manufacturers offer single-sheet feeders and additional tractors as optional equipment.
Graphics capability. Because of the limited number of characters on a daisywheel, printers with daisywheel technology cannot usually produce Commodore graphics characters. Dot-matrix and thermaltransfer printers do not have these limitations and therefore have the capability to print graphics.

## Manufacturer Names and Addresses

Blue Chip Electronics

7505 W. Boston Ave. Chandler, AZ 85226
Brother International 8 Corporate Pl.
Piscataway, NJ 08854
Commodore Business Machines 1200 Wilson Dr.
West Chester, PA 19380
Okidata
532 Fellowship Rd.
Mt. Laurel, NJ 08054
Seikosha America
1111 Macarthur Blvd.
Mahwah, NJ 07430
Silver Reed America
19600 S. Vermont Ave.
Torrance, CA 90502
Star Micronics
200 Park Ave., Suite 2310
Pan Am Bldg.
New York, NY 10166

| Name | Manufacturer | Compatibility | Printer type | $\begin{aligned} & \text { Speed } \\ & \text { (cps) } \end{aligned}$ | $\begin{aligned} & \text { Phach } \\ & (C p)^{\prime} \end{aligned}$ | Butfer | Paper feed | Graphics Capsbility | Warranty | Price | Comments |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| D12/10 | Blue Chip Electronics | Commodore interface included | Daisywheel | 12 | 10 | 2 K | Friction, tractor optional | No | 6 months | \$269 | Cornes with Flieetwiter III word processor |
| D 20/10 | Bue Chip Electronics | Built in Commodore and Centonics interfaces | Daisywheel | 20 | 10 | 2K | Friction, tractor optional | No | 6 months | \$279 | Comes with Fieetwiter III word processor |
| M 120 NLO | Bue Chip Electronics | Commodore interface included, optional IBM/compatible cable | Dot matrix | 25-120 | 10 | 2 K | Friction and tractor | Yes | 6 months | \$299 | Comes with Fleetwriter III word processor |
| HR-10/C | Brother International | Commodore serial, parallel | Daisywheel | 12 | 10-15 | 2 K | Friction and tractor | No | 1 year for parts, 90 days for labor | \$349 | Optional keyboard converts printer into electric typewtiter |
| MPS 1250 | Commodore Business Machines | Commodore serial, Centronics parallel | Dot matrix | 24-120 | 5-12 | available | Friction and tractor | Yes | 90 days | \$299.95 |  |
| Owidata 180 | Ondata | Commodore serial, Centronics paralle! | Dot matrix | 30-180 | 17 | 2 K | Friction and pin. tractor optional | Yes | 1 year | \$329 |  |
| Okimate 20 | Okidata | Serial, parallel (Commodore interface with Plug $N$ Print Kit) | Thermal transter | 40-80 | 17 | 8K | Friction and tractor | Yes | 90 days | \$268 | Color printing capabilities |
| 1200 VC | Selosha America | Commodore standard | Dot matrix | 25-120 | 10-15 | 2.3K | Friction and tractor | Yes | 2 years | \$299 | Fonts chosen from front panel |
| SP-1000 VC | Selosha America | Commodore standard | Dot matrix | 20-100 | 10-15 | 1.5K | Friction and tractor | Yes | 2 years | \$270 | Includes lineteed and margin setting |
| SP-180 VC | Selosha America | Commodore standard | Dot matrix | 20-100 | 10-15 | 1.5K | Friction and tractor | Yes | 2 years | \$249 |  |
| EXP 420 | Silver Reed America | Built-in Commodore interface | Daisywheel | 12 | 10-15 | 1 line | Friction; tractor and sheet feed optional | No | 90 days | \$299 |  |
| $N X-10 \mathrm{C}$ | Star Micronics | Commodore serial | Dot matrix | 30-120 | 5-17 | 1 line | Friction and tractor | Yes | 1 year | \$349 |  |
| NX -1000C Multi-Font | Star Micronics | Commodore serial | Dot matrix | 36-144 | 12 | 1 line | Friction, tractor, and single-sheet feed; optional automatic sheet feeder | Yes | 1 year | \$299 |  |
| $N X-1000 C$ <br> Rainbow | Star Micronics | Commodore serial | Dot matrix | 36-144 | 12 | 1 line | Friction, tractor, and single sheet feed; optional automatic sheet feeder | Yes | 1 year | \$379 | Color printing capabilites |



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## Super Snapshot 3.0 and Slideshow Creator

The 64 utility-cartridge war has intensified markedly in the past year. I recently counted at least ten "fast load plus" cartridges on the market. Several, including Super Snapshot, are in their third incarnations. Though one of the most technologically advanced, even a quality product like Super Snapshot needs something special going for it in a crowded market. And this "something special" is a gem of a companion: Slideshow Creator.

Dependent entirely on the cartridge for slide preparation, Slideshow's Projector program does not require Super Snapshot to run. Essentially, Slideshow Creator enables you to turn DOODLE! and/or Koala Paint images into a series of "slides," either in a stand-alone show, or as part of your own BASIC or machine language program. (Demos are included illustrating all possibilities.) All applications should be easily understood by intermediate programmers.

One of Super Snapshot's many fine features is its screen copy (dump) capability, which permits any screen (minus sprites-we are promised these in version 4.0) to be captured on disk as a DOODLE! or Koala file, among other formats. Screen dumps can also be sent in three sizes, and in normal or reverse format to a variety of printers.

Once saved, screens can be modified by their respective programs. Slideshow allows for sequencing any set of DOODLE! or Koala images, specifying their timing, and entry/exit mode (wipes). It also offers a scrolling text overlay option.

Scrolling text (which can be quite long) is either of two sizes, in any of ten fonts, and may be placed anywhere on the screen. (It can appear either in front of or behind the graphic, in a variety of user-specifiable colors.) The show itself can be set either to run once and stop or to repeat infinitely. To display a large number of slides, up to four disk drives of any type may be chained together.

Slideshow Creator is a versatile program. It's highly appropriate for window displays and for both business
and educational presentations. This ability alone is nearly reason enough to purchase a Super Snapshot cartridge (the combination costs less than \$70).

Super Snapshot has many other features going for it as well. With a 32 K ROM and an 8 K RAM, it-uniquely among utility cartridges-permits plugin ROM upgrades. Company policy is to upgrade cartridge ROM for $\$ 20$ plus $\$ 3$ shipping and handling; all you do is send in your old cartridge. (The original Snapshot 64 is not upgradable). It replaces the ROM (you can do it yourself as easily), and includes the current "parameters" disk and documentation, which is quite good.

> Super Snapshot is one of the most technologically advanced cartridges for the 64-and it has a gem of a companion: Slideshow Creator.

Users familiar with version 2.0 should be aware that 3.0 is a significant upgrade. Among the many new features are turbo save and a faster turbo load. (Now, 60 blocks load in 6 seconds instead of 8.5 , and we are promised further improvement in version 4.0.) Version 3.0 includes turbo routines unique to the 1571 drive. (The manual shows how to use these even on the 64). Also, there is sprite collision disabling (several varieties), and an Extended Life function that locks in your attained level in a game. Should a game "death" occur, upon restart, the game resumes at the previously attained level. This is one of several reasons for the on-board 8 K RAM. Indeed, dedicated hacker/ gamers can freeze a program at any point, enter the machine language monitor, modify code, and return to the running program with memory otherwise uncorrupted. This is a capability
unique to Super Snapshot.
One of the features I particularly like is the easily programmable function keys. Cartridges typically offer preprogrammed keys, but this is the only one I've seen that allows you to modify them. And who doesn't want to change one or two? Particularly well-designed is function key loading from an on-screen disk directory, accessible via another function key. (I only wish that a DSAVE command made saving from a directory as simple.)

The cartridge contains so many useful features, I cannot begin to name them all. Two, however, merit special mention: the accessible-through the ML monitor-and user-friendly track-and-sector editor, and the turbo file and disk copy utility. The file copier permits fast copying of selected files from any model disk drive to any other, including the 1581. (Turbo and copy utilities for the 1581 are rare.) The disk copier purportedly copies disks between like drives only. I could not test this copier; my review ROM lacked this feature.

A parameters disk-the latest one from Kracker Jax-is included with Super Snapshot for those relatively few programs the cartridge cannot back up by itself. (According to the publisher, Software Support International, no cartridge can back up all programs.) The disk includes both a nibbler for programs that require one (Kracker Jax identifies them) and a set of disk-based Turbo*25 utilities that permit you to reformat your backups-on the 1541 only-and to load very fast, with or without Super Snapshot.

Every reviewer has a wish-list of desirable features, and I am no exception. I miss a set of BASIC aid utilities, a reset button available during system crash, and an OLD command to recover a lost BASIC program. On the other hand, a complete disk wedge is always available, even at snapshot time. This wedge, turbo load and/or save, and the programmed function keys may be turned on or off at any time. I would also appreciate a turbo Scratch and Validate to go with the fast Format, Load, and Save (maybe in 4.0?).

There's a lot of power in these two packages. Both are well-designed and packed with useful features. Software Support International (formerly Com-


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## Kung-Fu Master

Data East is becoming a major source of games centering on Eastern martial arts. After my initial disappointment with the action and graphics found in two other Data East products-Karate Champ and Kid Niki-I was beginning to think that there was nothing of interest to be found in this genre.

It was with pleasant surprise that I discovered Kung-Fu Master.

In this newest offering from Data East, you'll find realistic action, cunningly designed enemies that include stylized dragons and snakes, dwarfs, henchmen, guardians, killer bees, and jars and exploding globes raining from the sky. You would be well advised to

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buy a high-quality joystick. You'll need it because the action is so frantic you'll find yourself trying to wrench the joystick in four directions at once. (You can also play with keyboard joystick emulation.)

When the game begins, you'll see a demonstration game. Press any key to see the options screen. You have the option of playing against an opponent (actually you'll just trade off control of the central character) or of playing alone.

Next, select your level of play. There are five floors in the wizard's temple, where you have come to rescue a maiden, and the five levels of difficulty correspond to these floors. The level of difficulty represents the number of enemies coming after you.

The third option is whether to play the game with the selected options or to return to change the options already mentioned. Once again, press RETURN to continue. When you are on the level you want, you can begin play after a

> Buy a high-quality joystick. You'll need it because the action is so frantic.

loss by pressing RETURN four times. You'll probably lose often at first, so this procedure will quickly become a part of the game's rhythm.

In the first frame of the first level, jars and globes fall from the sky. They can be destroyed in midair. If they reach the ground, they burst to reveal dragons and snakes. Some globes float a moment and then explode into clouds of deadly shards.

You cannot kill the snakes, but they can kill you, so you should leap over them. Attacking a dragon is very dangerous. They breathe flames, which you must avoid. Squat and kick for best results. Move quickly, because the dragons disappear after the flames go out.

Henchmen approach you individually and in groups. They appear to be unarmed, but they can destroy you if they get their hands on you. Shrug off their life-draining grip by rapidly turning from side to side. It will save your life, but you'll earn no points for such a maneuver. You can keep tabs on your strength, and the enemy's strength as well, by watching the bar displays at the top of the screen.

To earn points, you must kick or punch the enemy. This concept is deceptively simple. The fact is that, just as in real martial arts, you must develop a sense of space around yourself. When a henchman (or any one of the dozen or
so other threatening obstacles) enters that space, you must react instantly. If the enemy is too close or too far away, your aggression will have no effect.


You can select kicking or punching by pressing the space bar. You can kick or punch on any of three levels: standing, squatting, or leaping. For example, you can leap over or squat-kick dwarfs. If one grabs your legs, switch the joystick rapidly from side to side until the dwarf falls off the surface of the earth.

Generally, you'll earn more points for defeating someone with a punch or a jumping kick than with a standing or squatting kick. Points, however, will be a secondary consideration to survival until you become very good at this game.

Guardians are the most resilient characters in this game, and they are armed. Somehow you have to avoid being stabbed by flying knives or destroyed by bats as you kick or punch the guardian repeatedly.

You must battle your way to the stairs at the end of the corridor before the timer counts from 2000 to 0 . The stairs lead you to the next floor, where you will be given additional time and energy. You begin with three lives, but you can earn extra ones for each 40,000 points scored. To earn points rapidly, concentrate on killing dragons, floating globes, and bats.

The pause feature is most wel-come- especially in a game so frenzied as this one. Another impressive feature is the ability to move in both directions. Many action games allow you to move right to left or left to right, but steadfastly refuse to move in the opposite direction (Kid Niki and Bazooka Bill are two examples). Kung-Fu Master can move away from or toward the objective, which makes the game just a little more realistic.

If you want fast, unrelenting action (and particularly if you have been disappointed by other oriental combat offerings), Kung-Fu Master is the martial arts game you've been waiting for.
-Robert Bixby

## Data East <br> 470 Needles Dr. <br> San Jose, CA 95112 <br> $\$ 19.95$

## Tetris

It arrived during the first week of the Olympics. It was a simple-looking game in a red-and-yellow box. I looked it over excitedly thinking, "Aha! Here's a chance for at least someone to get even with the Soviets!"

So I thought.
Coutesy of Spectrum Holobyte, Tetris is the first game to arrive in the United States from the U.S.S.R. This intriguing and deceptive game was invented by a young Soviet researcher currently working at the Computer Centre (Academy Soft) of the U.S.S.R. Academy of Scientists in Moscow. The original programmer was an 18-yearold student of Computer Informatics at Moscow University. It was developed through the joint efforts of Academy Soft (Moscow), Andromeda Software (London), and Spectrum HoloByte (U.S.A.).

The concept is relatively straightforward. You're presented with an attractive picture overlaid by a tall black window in the center of the screen. This window is a "pit" into which descend six shapes composed of four tiny squares. The six shapes include a bar, a $T$-shape, an $L$-shape, a rectangle, and two zigzags. Your objective is to maneuver these shapes, rotating and aligning them, to create a solid row of multicolored blocks across the bottom of the pit. When such a row is created, it disappears from the screen and you accumulate points. Misaligned pieces, however, stack up until they reach the top of the pit, and then the game is over.

As rows disappear, the rate at which pieces fall increases. At faster speeds, you score more points per row. Being quick at Tetris means faster scoring, boosting your point value per row, and keeping the pit clear for room to maneuver.

Tetris is played solely with a joystick. The instructions are short, consisting of only two pages of large print. In just a few minutes, you'll get the idea of how to play. Developing strategy takes a few more sessions. Mastering Tetris is another story altogether.

Choose your level of play at the outset from nine available levels. I've found that, in terms of effective scoring, starting at a medium level is actually more advantageous than starting at the lowest. While one shape is falling, the next shape to descend is previewed in a corner of the screen. Seeing this next shape is extremely helpful in planning where to put the piece currently tumbling down the pit.

Musical accompaniment while you play is optional, and the program will automatically rank your score for up to 15 games. Unfortunately, the game will not save scores from session to session.

Is Tetris fun? I found it addictive on the order of Pac Man. There's a strong pull to try to stay in the game longer, a competitive desire to build up your score. Yet Tetris is mentally more challenging than Pac Man. You're trying to beat time, but that's not all. Fitting those puzzle pieces together takes as much mental dexterity as physical. The game is both fascinating and unpredictable. I've played over 15 games in a row and have never noticed the shapes falling in a discernible pattern.

There's less tension in Tetris than in arcade-style games and less mental exertion than in adventure games. That makes it all the easier to while away a couple hours juggling the little tiles of color.

## Is Tetris fun? Yes, addictive on <br> the order of Pac Man-yet mentally more challenging.

I have only one real criticism of Tetris: Why weren't the details of the onscreen presentation done better? This is the second game from Spectrum I've seen that has not used the 64 to its potential. The outside package is misleading. It features four screen shots taken from IBM PCs. (Tetris is also available for the IBM PC, Amiga, and Atari ST.) The 64 version has only one background scene-and it isn't of the variety shown on the box. And while the drawing is quite beautiful and well-executed, it uses none of the 64's vibrant colors. Also, the musical background could be more sophisticated. Here again, the 64 is not used to its potential.

Other features listed on the package aren't available on the 64 version. Different starting heights and different statistic and help screens appear in versions for other machines, but it's not clear why they're excluded from the 64 version. It may be due to lack of memory, why couldn't disk space be used to store different screens which could be retrieved at random intervals, perhaps linked to the level of play?

This, of course, is the fine detailing which would simply make a good program more complete and impressive. The game itself is well-designed, challenging, and fun. That, more than anything, is what matters.

That and my next score.
-David and Robin Minnick
Spectrum Holobyte
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Skyfox II:
The Cygnus Conflict
Legends and apocryphal stories abound in computer lore. One very popular story is that the Apple II became a success because of VisiCalc, the first computer spreadsheet. Maybe, but I've often felt great numbers were sold because of a game called Skyfox.

Whatever the truth may be, Skyfox was eventually released for other computers, and now Electronic Arts has chosen the 64 for the debut of Skyfox II. A product of Dynamix-the wonderful folks who brought you Arctic Fox-Skyfox II is worthy of the name, owing only a little to its predecessor.


You may remember that the original game took place in the air above a far planet and that your targets in the various missions were aircraft, tanks, or both. Convincing explosions, good sound effects, and the impression of rapid flight were features that made the original a standout. These features have been carried into the new release-in spades.

Your mission now encompasses the preservation of an entire galaxy against the invading Xenomorphs, but all action will occur in the blackness of space. After selecting one of ten missions and the skill level at which you wish to fight, you'll find yourself sitting in the cockpit of a highly advanced-well, for lack of a better name-space plane.

On your windscreen, a digital countdown begins. At 0 , a metal door slides open, and you are rocketed into space, powered by nuclear batteries. Your armament includes neutron disruptors (lasers), photon pulse bombs, and antimatter mines.

The control console, reading from left to right, displays the number of photons, a target identifier, number of mines, a scan monitor, shield and damage indicators, and the energy level. Just below this, a long bar indicates the range of radar scanning. It will also alert you as to enemy craft in your neighborhood.

On the windscreen, a circle and an arrow form a Heads Up Display. The
arrow points the direction to the nearest target and changes color depending on the target's range. When using the neutron disruptors, the circle functions as a gunsight and must be centered on the target.

The scan monitor shows your ship and its relative attitude. Enemy craft are white dots, and the nearest space station is a flashing red dot. You'll need to know this when it's time for repairs or reloading of weapons, because there is little future in trying to dock with an enemy ship.

## The name of the game is

speed. . . .

Once you've docked with a Federation space station, you'll want to use the Repair command to fix damaged systems. A schematic of your space plane appears on the screen with damaged sections indicated by a yellow or red color. Repair is as simple as moving the cursor (now a screwdriver) to the damaged section and pressing the fire button. This process takes time, and attacks are still taking place. You'll want to be ready to go as soon as you can,
perhaps with only partial repairs.
As with the original, the name of the game is speed. This time, instead of soft and friendly clouds rushing by, you'll find yourself in a field of meteors. No matter what direction you choose, the meteors are always rushing toward you (perhaps because you're going faster than they are). I think the field must be a couple of million miles across.

At any rate, they must be avoided or blasted out of the way, for too many hits will eventually destroy your shields. Subsequent hits will lead to a fiery death. Personally, I think the meteors are overdone, a case of too much of a good thing. By avoiding them, however, you'll become very aware of the smoothness of screen scrolling as you whip your craft around in what really feels like 3-D space.

When your mission ends, you'll see a graphic depicting your ship as either crashed or returned home to cheering crowds. If you wish, you can see the evaluation of your mission. You are presented with a list of accomplished objectives, enemy craft and bases destroyed, and a final point score for the entire mission. Then it's on to the next mission.

In selecting a mission, you highlight the one you wish to try. You have the option of seeing a description of the mission. Take it, or go back and try another.

You also have the option, at this point, of checking out the specifications of the Skyfox II. There is little point to this, since you can't do anything about them, but leafing through the specs does give you three beautiful views of your space plane. They are worth looking at more than once.

The graphics of Skyfox II are excellent, the sound good, and the documentation average. Fortunately, there is not a great deal of the latter. Because some missions require navigation, a star map of the Cygnus system is included, but for reasons not made clear, it's printed in dark blue on darker blue. Luckily, the same map can be called up on the Heads Up Display, where it is much easier to read.

It is also worth noting that Skyfox II requires so much memory that it will probably not run until you've disconnected your printer, second disk drive, and any other peripherals except your monitor.

Summing up, I think the original Skyfox is difficult to beat, but Skyfox II certainly matches it in speed and slambang action.
-Ervin Bobo

## Electronic Arts

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## Leonard Morris

Puzzle lovers of all ages will find this Commodore 128 game both challenging and entertaining. There are four game variations and nine skill levels so every member of the family can enjoy playing. A joystick is required.
"Square Logix," is a quartet of logic games that will exercise your prob-lem-solving ability and amuse you. Each of the four games offers its own special logic test and, since each one has nine difficulty levels, players from the beginner to the advanced puzzler can share in the fun. You may start playing Square Logix just for the challenge, but Square Logix quickly can become addicting.

Each of the games in Square Logix involves shifting blocks in a 6 $\times 6$ grid until they form a specified predetermined pattern. The number of blocks you'll need to move to solve a puzzle is three times the level number selected. At level 1, for example, three blocks need to be moved; at level 2 , six blocks; and so on. It's a good idea to start at level 1 to get a feel for each of the four games and then advance to the more difficult levels.

## Getting Started

Square Logix consists of three programs: Two are written in machine language and one in BASIC. To enter Program 1 (SQRS.OP), you'll need to use " 128 MLX," the machine language entry program found elsewhere in this issue. When you run 128 MLX, you'll be asked for the starting and ending

"Square Logix," a four-in-one game, offers a challenge for every member of the family.
addresses of the data you'll be entering. Here are the values to use for SQRS.OP:

## Starting address: 0B00 <br> Ending address: 0BE7

Follow the 128 MLX instructions carefully and be sure to save a copy of the data with the filename SQRS .OP before you leave 128 MLX.

Program 2 (SQRS.SPR), is also written in machine language, so you'll need to enter it with 128 MLX, too. Again, when you run 128 MLX, you'll be asked for the starting and ending addresses of the data you'll be entering. Here are the values to use for SQRS.SPR:
Starting address: OEOO
Ending address:

As with Program 1, follow the 128 MLX instructions carefully and be sure to save a copy of the data with the filename SQRS.SPR before leaving 128 MLX.

Since Program 3 (SQUARE) is written entirely in BASIC, simply type it in and save a copy on the same disk as SQRS.OP and SQRS .SPR. Now, make sure your 128 is set up for 40 columns and your joystick is plugged into port 1. Type RUN to get started.

## Four Games

When you first run Square Logix, you'll see the main screen with the four game variations displayed. After choosing which of the games you want to play, you'll be given the chance to select a difficulty level of 1-9.

After choosing the difficulty level, you'll see the game screen, with the puzzle block in the upper left corner, a timer on the right side of the display, and a running total of the number of turns you've taken just below the timer. From the game screen, you can press $Q$ to quit or * to see a solution to the puzzle (we'll discuss the solution option a little later).

When you successfully complete a game, the difficulty level and the game's number will be displayed at the bottom of the screen, and a colorful display will highlight the entire display. You'll then be prompted to press the fire button to start another game.


Let's take a look at each of Square Logix's four games.

Game 1: Shifts. This is the easiest of the four games and the best one with which to start. As the name suggests, you use the joystick to shift columns and rows of blocks until you produce the winning pattern. An arrow inside the array indicates the direction in which the row or column will be shifted. Any block that's shifted off the array will wrap around to its opposite end.

To shift blocks, press the fire button. The arrow can be moved horizontally or vertically by moving the joystick in the corresponding direction. Don't forget that the whole row or column moves, not just one block.

Game 2: Shuffle. This is played in much the same way as Shifts, except that the pattern you must match has a definite order, identified by letters and numbers on the blocks. This makes Shuffle somewhat more difficult than Shifts.

Game 3: Rotate 1. This game is more challenging. You must generate the desired pattern by rotating a group of four blocks-indicated on the screen by a large outlined square-either clockwise or counterclockwise. The direction of rotation is controlled by holding the fire button down and moving the joystick right for clockwise or left for counterclockwise.

To move the outlined group either horizontally or vertically, move the joystick in that direction. It may take several games of play to unlock the secret of Rotate 1, but when you do, you'll be ready for Rotate 2.

Game 4: Rotate 2. This is the the most difficult game of the four. This variation uses the same logic as Rotate 1, but a group of nine blocks, instead of four, is rotated.

## The Solution

If you decide you need a little help to solve the game you're playing, you'll need to use the asterisk (*) key. Pressing this allows you to see the solution to the game. The computer displays only the solution, however; it doesn't actually solve the game for you. After the computer shows you the solution, you can continue your game by pressing any key.
See program listings on page 69.
 less than 4 K of memory. When MLX asks for a starting address and ending address, respond with the values indicated:
Starting address: 0801 Ending address: 1688
Be sure to save a copy to disk or tape after you've finished typing.

## The Big Serve

When you're ready to play, plug in two joysticks. Although Arcade Volleyball is a machine language program, it can be loaded, saved, and run just like a BASIC program. To start the game, load the program and type RUN.

In the center of the court, you'll
see the volleyball net. One player controls the side to the left of the net; the other player controls the side to the right. Above the court, you'll see the status line. Here you'll find a two-digit score for each player. The player with joystick 1 controls the yellow and green jumping heads on the left side of the screen; the player with joystick 2 controls the purple and red heads on the right.

For the first point, it's a redhead's serve. Position him under the floating volleyball and press the fire button to serve. You have three chances to get the ball over the net. If you fail, you'll lose the serve.

> How do you play volleyball without hands? Use your head, of course. You and an opponent each control two mutant heads in this fast-paced and rather unusual version of America's favorite beach sport. An optional practice mode is included. For the Commodore 64. Joystick(s) required.


#### Abstract

lose nor gain speed. If you jump to


 hit the ball, the ball will speed up. You are free to bounce the ball off the ceiling and the wall behind you. If you hit the ball with the left side of your head, the ball will tend to go to the left. If you hit the ball with the right side of your head, it will go right. If you hit the ball with the top of your head, the ball will continue on with the same horizontal velocity. As in real volleyball, you can receive points only during your serve. However, Arcade Volleyball differs from real volleyball in several ways. First, the court is entirely surrounded by walls; there is no need toThe joystick controls are easy to learn. You can run either left or right by moving the joystick in the appropriate direction. To jump, press the fire button. The players in Arcade Volleyball are gifted; they can move left and right while in the air. You control both of your players at the same time-there's no need to switch back and forth. In time, you'll grow accustomed to the synchronized movement.

## Use Your Head

You can hit the ball while you're on the ground or in the air. If you hit the ball while you're standing on the ground, the ball will neither
side. Either way, the ball's velocity decreases. If the ball goes over the net, hits the opponent's wall, and bounces back to your side, you'll have three more chances to get the ball over the net.

If the ball hits the side of the net, it rebounds at full velocity. Don't lose your composure, though. You may still have a chance to score.

If the ball hits the floor on your side of the court, you'll lose your serve-or a point, if your opponent was serving. You must also be sure to keep the ball from going under the net. This is considered to be the same as hitting the floor.


It's heads up in this fast-moving volleyball game for one or two players.

## Warm-Up

If you'd like to warm up with a computer opponent, you can make a special one-player version of Arcade Volleyball. To do so, follow these steps:

- Load the program
- Type POKE 2065,1
- Save the program with a new name
- Type RUN

You won't find the computer opponent especially challenging, but the one-player mode is a good way to learn how to serve and return the ball.

## Playing Tips

The key to the game is learning the angles. Watch the ball carefully as you play. If you jump to hit the ball, it will speed up and the angles will change. The players' horizontal movement is limited-try to anticipate which head the ball will come to. Be sure to use the walls and nets to your advantage. Careful use of these obstacles is the best way to confuse your opponent.
See program listing on page 75 .

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## Fred D'Ignazio <br> Contributing Editor

A reader wrote me recently to confess that he once remarked " 8 K of RAM was all the memory anyone would ever need."

Don't laugh! Many of us oldtimers are guilty of making the same statement.

I remember when I was getting my first computer ... I told the dealer that I needed 64 K of memory because I was a writer and would be writing long chapters for books. The dealer finally gave me what I wanted, but he warned me that I was being extravagant. "You know, 16 K would work just fine for your documents now,-and 32 K would last you forever."

## Attack of the Terabytes

Last week a friend of mine, Dr. Gerri Sinclair, sent me some E-mail. "I am so frustrated," she wrote. "Now that computers are starting to plug into CD-ROM 'libraries' and are processing digital sounds, photographs, and full-motion video, a million bytes of memory just doesn't cut the mustard!"

I wrote back to Gerri asking what she thought would cut the mustard. Her reply: "Sixteen million bytes, minimum, for main storage, and another 80-160 megabytes on hard disk. And this is just the start. Soon we'll need gigabytes and terabytes, and even that might not be enough."

Terabytes? It sounds like an invasion of Japanese snapping turtles.

## Have Mercy!

Computers make us lazy. Didn't you know? After all, they're supposed to be labor-saving devices. And the labor they're supposed to save is mental labor. So when we use computers, we think less, and we get lazy.

Simple, eh? Except it's not true.

Anyone who uses computers intensively will stare blearily at you and swear that computers aren't making them work less. In fact, they're working harder-much harder.

It's true. Think about it. Human bosses are just that-human. They work a full day; then they quit and go home. Even when they're at the office, they're not hanging over you every minute, tapping their fingers, waiting for you to keep working. But computers-oh my! Once you turn them on, their little crystal clocks rev up to a million beats a second, and they're ready for you to work. You can put in a solid eighthour day, and the computer won't even be winded. It's ready for more work. So you take the computer home and try to appease it by working another four hours.

Does this satisfy the beast? Not by a long shot. It sits there with its little cursor blinking, like a perky puppy waiting for more play.

Every day we push ourselves a little harder, trying to keep up with our computers. But it's a losing battle. So, computer manufacturers, hear my cry: Please make a computer that, after a lengthy session, flashes "Good work! I can see you'd like to keep going, but I'm pooped! How about a break? After all, tomorrow's another day."

## Desktop Foods

By now, we've all heard of desktop publishing. It's so popular that it has spawned a lot of other terms, all beginning with the word desktop. There are desktop presentations, desktop communications, and even desktop videos.

Have you wondered where this desktop mania will end? Can you imagine the computer designers who spend all their waking moments "on the desktop," who see the world as a giant desktop, and who are forever dreaming up new desktop applications?

We're already doing our work at the desktop. Maybe in the near future the desktop can go with us and become a part of all our daily activities. For example, imagine what "desktop eating" would be like. When we get hungry, we'll just click on a little icon of a refrigerator. The refrigerator door will open, and we'll click on pictures of soda pop, candy bars, and sandwiches, to "select" our snack. Then the pictures will pop open and display the number of calories consumed, and the vitamins (if any) we're getting. Productivity consultants will recommend desktop eating to corporate management because it will replace costly coffee breaks and lunch hours, since workers will be able to do their eating at the desktop.

## Beware of Computer Mouth!

During a busy day at the desktop, we have all experienced that awful sensation known as "computer mouth"-a sour taste that arises from trying to find a pesky program bug or from struggling to make our printer ignore the formatting glitches. When computer mouth strikes, you should hightail it to the restroom and whip out a toothbrush. But, if you have "desktop toothbrushing" installed as a DA (Desk Accessory), you just click on the little icon of the toothbrush. Instantly you see a picture of a little person (that's you) actively brushing, and smiling a great big smile with gleaming, pearly whites.

And at the end of a long, grueling day on the desktop, what could be nicer than taking your computer home, resting it on your lap in the living room, and taking in some desktop movies? Demi Moore may not look the same, but it sure beats renting a video or going to the theater. After all, when you're hungry, you just press RESTORE and order up a round of desktop Cokes and a tub of desktop popcorn.

Todd Heimarck<br>Contributing Editor

On the subject of software piracy in this column ("The Software Police," March 1988), many GAZETTE readers responded very passionately on both sides of the issue. Herewith, their comments.

## To Pirate . . .

When I read your article on piracy, I almost died of laughter. I have over 300 games and around 100 more other programs. Five of them I bought; the rest are pirated. The pirated programs include GEOS, Print Shop, Newsroom, Project Stealth Fighter, Elite, and Fast Hack'em. I'm just a high school student, and I cannot afford to buy a $\$ 40$ program. I have to dig deep in my pocket just to pitch out $\$ 3$ for your magazine. I have over $\$ 2,000$ in software; it's crazy to spend that much on software. You say I could always get public domain software. What a joke; PD programs are not worth a dime. They're the programs kids write and put up on a BBS. If they were any good, they would write to a software company or a magazine.

Because of copy-protection, I have wanted to learn how to crack. I have become a much better programmer. I've mastered BASIC, ML, and Pascal. If I had decided to follow the "law," I never would have been interested in programming.
-DL, Nebraska
I have a complete 128 system and about $\$ 2,500$ worth of software. I have purchased four or five titles. For us hourly workers, there's just no other way to be able to enjoy computing at all.

> -Anonymous, Alabama

Being a software pirate myself, I felt compelled to write. You're absolutely right, of course; piracy is thievery. Since most pirates are like
me, honest enough to return a lost wallet, why do we do it? I have a few theories. First, I think a lot of us use it as a means to exercise the larcenous part of our nature, a chance to do something wrong, to thumb one's nose at a faceless authority. Second, it's a challenge. It's a game with few rules, fewer reliable guidelines, and only one way of winning: obtaining a working copy. There's a definite kick to seeing a copy fire up for the first time. Third, it's an ego trip. Witness the bragging opening graphics on many of the cracked games going around. Finally, having a huge software library is usually regarded as quite a status symbol. Note that I didn't mention that it's an easy way to obtain programs. Most avid pirates have hundreds of disks, more than they can ever use.

Maybe the only answer is to forbid copying for any reason. I believe the typical pirate uses one of the many nibblers and parameter copiers to make his copies. Banning nibblers would certainly cut down on your ad revenue. One of the better nibblers was advertised on the same page as your article.

> -Anonymous, Ohio

To think that people will pay money when they can get something for nothing is way off. Face it, it's easy and it's free. If software companies can't come up with good copy-protection, that's their problem. Morals are a thing of convenience and are best abandoned altogether.

$$
-C E, \text { Texas }
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## . . . Or Not to Pirate?

It is unfortunate that most home computer users are not aware of the bargains in excellent commercial software available to them. Programs that cost tens of thousands of dollars to produce are available for a few dollars, because of the large market for them. If piracy could be eliminated, the increased market
would reduce the cost even more.
-BW, Michigan
I am writing to say that the article is the most sensible statement I've read on the subject. I salute you for calling piracy exactly what it is-stealing-and, more importantly, for saying in print that it is immoral, not just illegal. This is an ethical issue, and it is right in front of many youngsters. How can we expect them to understand piracy is wrong when we don't tell them so, or (worse) when our example doesn't show them so? How many of us adults use pirated software (myself included)? To say nobody is hurt is foolish. There is no such thing as a free lunch. Somebody has to pay, sometime, somehow. Thanks for saying what you did.

> -JDJ, Pennsylvania

I have the ability to copy virtually any type of software, including some of the most highly protected. I back up my own programs, which I believe we all have a right to do. I don't believe copiers and protection strippers should be used to furnish everyone in town with a copy, however. Piracy not only grates against my moral attitude but, as you pointed out, it is illegal.

> -RF, Kansas

I would like to clarify one point you made. Making a copy is not per se an infringement of copyright. The copyright law of 1976, which went into effect in 1978, unintentionally made it illegal to load a program into a computer, because the definition of copying included the copying of software from disk to memory. The law was amended in 1980. In addition to making it legal to load (copy) a legally obtained program into your computer, the amendment allows the making of an archival copy (as you noted). It also allows the revising of software, if it is necessary to do so to use it on
your computer.
I agree with all you say. If someone has the intelligence and ability to write a worthwhile program, he or she is entitled to make a profit from it. The better the program, the more the profit should be.
$-E P V$, Illinois
About five or six years ago, I bought my first computer, a VIC-20. I soon realized that I could make copies of cassette games with a dual cassette stereo. So I did, and gave all my best games to friends and sold them to kids from school, charging \$3 and a blank tape. Then I went even further. I actually ran an ad in the local newspaper that offered two or three VIC games on one cassette for $\$ 5-\$ 10$. I made over $\$ 900$ in three days! To a 15 -year-old, that's a lot of money. Now the tables are turned. I am a programmer, developing real estate applications for a small company. I get paid each week for the programs I write. I can imagine what it would be like to have a percentage of my pay taken away because of pirates. Now I realize what harm I was doing.

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-M X, \text { Florida }
$$

## Software Companies: The Real Pirates?

I do not agree with piracy. However, I do have a copy program for protected software and I am planning to update (Electronic Arts is driving me crazy). Why do I want to copy software if I'm against piracy? You mentioned it in your article: archival purposes. I've got three kids who are real sticky-fingered threats to software, but I'm not about to ban them from the computer. They range from 4 to 13 years old. What I want are backup copies.
$-D C$, Texas
You seemed to miss an important point about copying-why it's done. Clearly, software is copied illegally so that one can avoid paying for it. And you forgot to mention that the term "piracy" can also apply to software pricing. If every program were $\$ 9.95$, then almost nobody would be copying programs illegally (except really poor people, who probably don't have computers in the first place).
-JBM, North Carolina

I purchased my 64 several years ago, along with a few games my children requested. This introduced me to the use of disk errors as protection. My disk drive was unmercifully beaten to a premature death by this form of protection. This forced me to learn how to crack games, to remove the errors and lengthen my drive's life. I wrote letters to all the major software companies, explaining that their protection schemes were beating my drive to death. I got one response. They said they couldn't help my problem and that their foremost concern was to protect their programs. I got fed up with the fact that software companies don't care about users and started to learn more and more. I put up a BBS that turned out to be one of the biggest and best in the country. I am now a major pirate and will continue to be one with the same conscience that the software companies have about knocking equipment out of alignment and costing us money in repairs. I would not be a pirate today if it were not for the software companies and their irresponsible attitude toward the users. I can honestly say there are no programs reviewed in GAZETTE I don't already have.

$$
-R A F, \text { New Jersey }
$$

Recently, I downloaded a 128 database. It seemed like a very good program. The drawback was that it would only handle 20 records. I was able to run it, test it, and judge if I wanted it. If I decided to buy the database, there was an address. For $\$ 49.95$, I could purchase the fullscale program with no limits on records, plus manuals, plus updates, plus support. Software publishers should consider selling a test disk at cost and then waiting for orders.

- RH, Illinois

Your holier-than-thou attitude concerning piracy irritates me more than pirating does you. I have not pirated in the past because it might be illegal and I once thought it was immoral. However, now I have my doubts as to whether pirating from a pirate is immoral. The pirates I'm talking about are the software companies who sell software with bugs or the ones who misrepresent their products in advertising and packag-
ing. And those reviews in your magazine-if you told the truth about some of these products, you would not have the advertisers; therefore, you couldn't bring us those "hard-hitting" reviews.
-JJT, West Virginia
What about the poor user who wastes hundreds of dollars on software that doesn't live up to the hype of the ads? Software that crashes with one keypress, word processors with fewer features than a typewriter, and databases that make you long for $3 \times 5$ index cards-that's what makes people copy software. I know several people who have pirated software. They always bought the program if they enjoyed it. If not, the disk was promptly formatted.
-JS, Maryland

## On the Chin

What kind of hypocrites are you? Why do you criticize the pirates when you sell them the tools to ply their trade?
-CES, Vermont
If you want to stop piracy, the only way to do it is to stop selling nibblers. To stop selling nibblers, you have to stop advertising them like the greedy, money-sucking scum you are! Sure, there's always a need for backup copies, but can't the rich software companies afford to pack two of the same disk in a software package? I'm sick and tired of hearing only one side of this controver-sy-the side spoken by the huge monopolies. If you have any guts, you'll print this letter.
-AE, New Jersey

## Reprint Piracy?

I thought the March "Horizons" column was very well written and made some good points about the illegality and immorality of copying software. I liked it so much, I was going to make some photocopies and pass them along; maybe even copy it onto a local BBS. Then the irony hit me. If I copied your article, even though my motives were pure, wouldn't that also be piracy?

$$
-K L, \text { Alabama }
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Written permission for reprinting is required. We may charge a reprint fee, although we often do not.

Each month, COMPUTE!'s Gazette tackles some questions commonly asked by Commodore users. If you have a question you'd like to see answered here, send it to this column, c/o COMPUTE!'s Gazette, P.O. Box 5406, Greensboro, NC 27403.


- I have a Commodore 128 and have recently begun using its $\mathrm{CP} / \mathrm{M}$ capabilities. In the documentation for various programs, I have repeatedly come across the term overlay. I am baffled by this term. What is an overlay, and how do you find them within programs? For example, my terminal program says to use the phone library overlay to change the numbers. There is no file that comes up when the DIR command is used that says anything about being an overlay file. I am stumped. A. Neglecting to define a term which may be unfamiliar to the reader is a common pitfall in explanatory writing; we know, because it happens to us all the time. In this case, the author of your terminal program's manual assumed you were familiar with a term that was quite common a few years ago but is seen less often now.

Until very recently, programmers were severely cramped by the amounts of random access memory (RAM) available in personal computers. RAM is the part of the computer where a program is temporarily stored when loaded from disk or tape. As long as the computer remains powered up, RAM retains the information loaded into it. The more RAM available in a computer, the larger the programs it can run. In addition, most programs that let you create or process information-such as word processors, spreadsheets, database managers, and so on-also use RAM as a temporary workspace to
hold your information until you save it on disk or tape.

Because RAM is so useful, the power of a computer is often defined in terms of how much RAM it has. The more RAM, the more power.

CP/M (Control Program/Microcomputers) is an operating system that's been around since the late 1970s. (An operating system is a master control program that's always active while the computer is switched on; it takes care of numerous housekeeping tasks that allow the computer to run other programs for you.) Because CP/M was designed in the 1970s, its power is limited by the hardware that was available then. To be specific, it was designed to run on the Z 80 microprocessor chip, which can't directly access more than 64 K of RAM at a time ( $1 \mathrm{~K}=1024$ bytes, roughly equivalent to 1024 characters).

The Commodore 128, in addition to having a microprocessor chip that's compatible with the Commodore 64, also has a Z80 chip. That's why this multipurpose computer can run CP/M and programs written for $\mathrm{CP} / \mathrm{M}$. But even though the Commodore 128 contains 128 K of RAM, its Z80 chip is still limited to directly addressing only 64 K of that memory, just like any other Z80.

Although 64 K was considered a lot of memory in the late 1970s, it just isn't enough to run some large programs. For instance, your terminal program evidently needs more than 64 K . To get around this limitation, the programmer resorted to a technique that was common in the days when computers had only 64 K or less memory: overlays. Overlays allow a program to be much larger than the amount of memory available in the computer.

An overlay is a section of a program that normally isn't loaded into memory along with the main
part of the program. Instead, it's loaded into memory only when needed. The main program is written to fit in memory with a little room to spare. Whenever necessary, it then loads the overlay into this spare memory to perform a certain function. A program may have several overlays waiting on disk. As each overlay loads, it replaces the previous one in memory.

Overlays usually perform some auxiliary function that isn't central to the main program. That way, you don't have to wait for them to load from disk any more often than necessary. In some cases, though, a large overlay may also replace the main program in memory, requiring you to rerun the main program after using the overlay.

Overlays are less common now that personal computers routinely come with anywhere from 512 K of RAM to four megabytes (one megabyte equals 1024 K ). Still, overlays will probably be around as long as programmers keep writing memo-ry-hungry programs.

Generally, a program automatically loads the appropriate overlay when you select the function it performs. Some programs, however, require you to load the overlay yourself. It sounds like your terminal program expects this. There should be an overlay file on the disk, and it should be a program file, most likely shorter than the terminal program.

Check your manual again for any instructions on loading overlays or any explanation of the files on the disk. If you draw another blank, it's possible the overlay was inadvertently left off the disk or the instructions were omitted from the manual. Your best bet would be to contact the software publisher.

## E. William Huffman

To get the most from geoPaint, you need a chart showing the maximum possible sizes for a document, a normal-edit window, a pixel-edit window, and an album page. This month's column shows you how to construct just such a chart.

GeoPaint is undoubtedly one of the most-used GEOS applications, but it's sometimes difficult to get your bearings when creating a document. What size, for example, is the pixel-edit window when compared with an entire document page? When you fill the normal-edit window with a pattern, how much of a page will be used? The geoPaint reference chart described in this column will help solve all these problems. Making a chart like this is also an excellent way to get acquainted with some of geoPaint's editing features.

## Making the Chart

First, boot GEOS and load geoPaint, telling the program you're going to create a new file with the name SCALES. Now, take just a moment to look at the accompanying reference chart. The chart has an outline with pixel scales along its top border and down the left side. Inside this area are scaled representations of a normal editing window, an album page, and a pixel editing window.

Start things off by outlining the document. You may want to experiment with both normal- and pixeledit modes for drawing the outline. Be sure your pencil is drawing at the extreme edge of the normal-edit window to get a true size for the page. Because single pixel-width lines are very thin, you might try using a double pixel line, but for accuracy, measure to the outer one. The GEOS Manual explains moving windows around to make all outside edges available.

Next, draw a short line of three pixels at ten pixel intervals along the left and the top edges. You'll need to do this in pixel-edit mode. Use the ruler or tape measure to check the scale markings or count. Make slightly longer marks every 50 pixels and still longer ones every 100. Examine the accompanying chart for guidelines. If you're ambitious, you might want to place
scales along the right and bottom edges of the document, too.

With the text-edit feature, place the appropriate numbers along the top and left sides of the chart. When you've finished this step, save this file (you may find a chart with just these measurements on it useful). Now, bring SCALES back to the screen and rename it CHART. Next, we'll add the normal-


This chart makes it easy to navigate geoPaint.
edit window, the album page, and the pixel-edit window to the chart.

## Adding the Windows

Discovering the largest possible album can be time consuming. You need to make long horizontal and vertical scales and to experiment by placing them on an album page. Experimentation determined that the maximum size of the page is $250 \times$ 85 pixels, but it's impossible to place a graphic of this size in the album because of limitations in the selection process. The practical limit for album pictures is about $216 \times 65$ pixels.

Now draw the normal-edit window using a rectangle of $262 \times$ 143 pixels. Please note that, although you can fill this window with a graphic, if you do, you won't be able to rotate it. Text or any graphic larger than 125 -pixels long horizontally probably can't be rotated to a vertical position because of the selection limitation and the more narrow window dimension.

You may find the caption "LEFT EDGE LEFT WINDOWS" a challenge to create. It's rotated in two segments and requires several
moves before everything is aligned correctly. Each move is in eightpixel jumps, so this can be a timeconsuming process.

After you've created the document, including all captions, print a hard copy and save the file to disk. Now you can visualize exactly what portion of your picture is displayed in the editing windows, an album page, or the entire document. Larger drawings are no problem, except for album pages. Segments drawn in pixel- or normal-edit modes can be rearranged to make larger pictures.

## The Grid

Bring the SCALES file into geoPaint and rename it GRID (leave SCALES on the files disk for future use, however). Now extend all the ten-pixel marks across the document both horizontally and vertically. Save the completed document to the files disk and print it. Next, make several copies on a copy machine to use in making large pictures.

Layout and trace a drawing onto a copy of the grid. Then load GRID into geoPaint, and, with the editing pencil, make marks at all in-
tersections in pixel-edit mode. You'll need to make identification marks near key intersections so they can be seen in the pixel-edit window. With enough intersections marked, proceed to outlining the small portion of your drawing in the pixel window and watch your creation come to life in the small window to the left of the status box. When you're satisfied, erase all the unwanted grid pixels and move to an adjacent area to continue your artwork. When you've finished, you'll have mastered an important new technique.

A complicated graphic can be laid out on a hard copy of your GRID or, if you don't relish erasing all those grid lines, on a hard copy of SCALES. When the master layout is finished, simply load the appropriate geoPaint file and use corresponding reference points on the master to position graphics and text on the screen. Be sure to rename the new document and to erase all the unwanted grid or reference lines, numbers, and so on, before saving and printing.

## Modifications and Corrections

- "Easy Load" (February) has a slight bug that prevents it from working correctly. It adds graphics characters to the end of the program names in the disk's directory instead of appending ,8: or $, 8,1$. This problem makes the converted files nearly impossible to load. First, to correct the bug in Easy Load, change lines 180 and 190 as follows:

```
KB 180 IFCHOICE=1THENOPEN15,8,15,
    "R: "+AS+"{SHIFT-SPACE}{D}8
    @=:"+AS:CLOSE15
RG 190 IECHOICE \(=2\) THENOPEN \(15,8,15\), "R: "+A\$+"\{SHIFT-SPACE\}\{D\}8 \{D \(\} 1=: n+\) AS:CLOSE15
```

Then, to correct the filenames with graphics characters in them, type in and run the following program:
QQ 18 PRINT"\{CLR\}\{RVS\}\{5 SPACES\}E ASY LOAD DIRECTORY CORRECTO R\{6 SPACES\}"
DE 20 PRINT:PRINT:PRINT" \{3 SPACES\}PLACE THE DISK TO BE CORRECTED IN"
MM 36 PRINT: PRINTTAB (11) "DRIVE $g$ \{SPACE\}OF UNIT 8."

QR 40 PRINT" 3 DOWN\}"TAB (6)"\{RVS \} PRESS ANY KEY TO CONTINUE (SPACE\}"
RX 50 GETK $\$$ :IFK $\$=$ ""THEN 50
FE 60 OPEN $1,8,8, " \$ \varnothing ":$ OPEN $15,8,15$ : PRINT" (CLR\}"
FP 78 GET\#1,AS,AS:REM LOCATION BY TES
RQ 80 GET\#1,AS,AS:REM LINK BYTES
KG 9 g $S=S T:$ IFS $\langle>$ OTHENCLOSE1: GOTO1 50: REM CHECK FOR END OF FIL E
KE 100 GET\#1,LOS,HI $: C \$=" n:$ REM LO W BYTE, HI BYTE OF THE LINE NUMBER
FH 110 LO=ASC (LOS + CHRS ( $\theta)$ ): HI =ASC ( $\mathrm{HIS}+\mathrm{CHR} \$(\varnothing)$ ) : LN $=\mathrm{LO}+\mathrm{HI}$ * 256 : LN $\$=$ MID $\$(S T R S(L N), 2)$
DR $12 g$ PRINTLNS + " ";:REM PRINT TH E LINE NUMBER
BB 136 GET $\ddagger 1, B \$: I F$ B $\$=" n$ THEN PRI NT CHRS (13);:GOTO170:REM F ILENAME
ED 146 PRINT BS;:C $\$=C \$+B \$$ :GOTO13 $\theta$
BM 150 INPUT 15 , EN, EMS, ET, ES:CLOS E15: IFEN<>@THENPRINTEN;EMS ;ET;ES
MX 160 END
PE $170 \mathrm{I}=1: \mathrm{J}=\mathrm{LEN}(\mathrm{C} \$)$
EA $180 \mathrm{IF}(\mathrm{MIDS}(\mathrm{C} \$, \mathrm{I}, 1)<>\operatorname{CHR} \$(34))$ AND ( I <>J) THENI $=\mathrm{I}+1$ : GOTO18g
JA $190 \operatorname{IF}(\operatorname{MIDS}(C \$, J, 1)\langle>C H R \$(34))$

```
            AND (I <>J) THENJ=J-1: GOTO190
DS 200 IF I=J THEN8@
XS 210 J=J-4:IFMIDS(CS,J,4)=" {D}
            8@"THEN24g
DC 22g J=J=1:IFMIDS(CS,J,5)=" {D}
            8{D}1"THEN25|
ME 230 GOTO80
GR 240 I=I +1:DS=MIDS(CS,I,J-I):PR
    INT#15,"RG:"+D$+"
        {SHIFT-SPACE}{D}8@="+D$+"
        {SPACE}{D$8@":GOTÖ80
AK 250 I=I+1:DS=MID S (CS,I,J-I):PR
    INT#15,"R0:"+D$+"
    {SHIFT-SPACE}{D}8{D}1="+DS
    +" {D}8{D}1":GOTO8@
```

You will be prompted to place the disk containing the corrupted filenames into drive 0 of unit 8 (a 1541 as it comes from the factory is drive 0 of unit 8 ). Place the disk to be corrected into the drive and press any key. All the filenames that were corrupted by Easy Load will be corrected. Filenames that weren't corrupted by Easy Load are not affected by the correction program, so don't worry if you place the wrong disk in the drive.

So you can code circles around the pros, eh? Well, here's your chance to prove it. It's the GEOS Programming Contest. And all it takes to win is a Commodore and your skill at programming under GEOS to win in any four categories and walk away with all kinds of prizes.

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6Judging will be performed by the staff of Compute!'s Gazette Magazine. The decisions of the judges are final in all respects. This includes decisions regarding creativity, similarity among entries and general suitability.

7 Entries become the property of Berkeley - Softworks, which reserves the right to adapt, use or publish all entries received. Entries may become part of a "shareware" library to be distributed by Berkeley Softworks, Compute!'s Gazette and Quantum Computer Services. As part of each

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1. Applications are identified by the GEOS Application File Type, are entered from and exit to the deskTop and conform to the GEOS user interface. 2. Desk Accessories are defined as programs which are less complex than applications, are identified by the GEOS Desk Accessory File Type, may be entered and pop-up within any application and upon exiting return the application to its prior state.

## Categories

ENTERTAINMENT - Includes entertainment and games. For example, a Chess game (Applications Division) or a trivia game (Desk Accessories Division). EDUCATION - Primarily educational and instructional. For example, a world geography program (Applications Division) or a flash card program (Desk Accessories Division).
PRODUCTIVITY - Designs that improve personal productivity. Examples include an "outline processor" (Applications Division) or a scientific or financial calculator (Desk Accessories Division).
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## Official Rules

1.Employees of Berkeley Softworks, Quantum. Computer Services, Laser Direct, Compute!'s Gazette Magazine, their advertising and promotional agencies and their immediate families are not eligible to enter the contest.
2. Each entry must be your original work, . previously unpublished in any form. All those programs accepted will be required to affirm this in writing.
3. Contestants may enter multiple categories, but 2. may only submit one entry per category per division (e.g. one entry in the Entertainment category Applications Division, and one entry in the Entertainment Desk Accessonies Division).
Regardless of the number of categories you enter, you will only be cligible to win one prize. Deadline for entries is August 31. 1988. Mail
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satisfied users to address and a "user fee" amount for

8.Entries may be written in any programming - language but must be a GEOS based program supporting the GEOS file structure and be executable from the GEOS deskTop or a GEOS application. Whichever language is chosen, the code must be a self-standing program that can be run by someone who does not own the language. We must be able to legally distribute the program without incurring licensing fees or any other obligations to the maker of the language.

9Entries must be submitted on $5.25^{\prime \prime}$ floppy - disks in 1541/1571 format. The following should be clearly marked on both the printout and the disk:
A. Contestant's name, address and phone number. B. Category and division for the entry. C. Intended use for the program.


Entries must be accompanied by a
description which explains how program and what it does. program and what it does.
11. This contest is void where prohibited by law. responsibility of the winners local taxes are the sole responsibility of the winners.

## General Conditions

- Entries will be judged on creativity, originality, interface consistency with other GEOS programs and error-free quality of the code.
Make sure your mailer will protect your disk from damage. Affix sufficient first class postage. Mail your printout, disk and official entry blank to the above address in time to reach Compute!'s Gazette Magazine address in time to reach Compute." SG
before the August 31,1988 , deadline.
- Winners will be announced by October, 1988.

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# Ramdisk 64 

Bruce Thompson

This short machine language utility creates a ramdisk in the 64 's "hidden" memory, allowing you to load and save programs instantaneously-and it provides over 20K of storage.

BASIC programmers rarely tap the great expanses of memory in the Commodore 64. For instance, both BASIC and Kernal ROM (Read Only Memory) have an $8 \mathrm{~K} c h u n k$ of RAM (Random Access Memory) beneath them. "Ramdisk 64 " lets you use this RAM (along with the 4 K block of free memory at location 49152) for temporary storage of BASIC programs. No longer will loads and saves depend on the speed of your tape or disk drive. With Ramdisk 64, you'll have instant access to as many programs as you can fit in 20 K of RAM.

## Installing the Ramdisk

Since Ramdisk 64 is written in machine language, you'll need to enter it with "MLX," the machine language entry program printed elsewhere in this issue. When you load and run MLX, respond to the address prompts with the following values:
Starting address: 0801
Ending address: 0A50
After you've typed in the program, save a copy to disk or tape before leaving MLX. Even though it's written in machine language, Ramdisk 64 loads and runs like a normal BASIC program. Thus, to install the ramdisk, simply load the program, type RUN, and press RETURN. When the cursor reappears, type NEW and press RETURN. The ramdisk is now active and ready for use.

## RAM Power

The ramdisk you've installed operates much like a disk or tape drive. It assumes a device number of 2 (a disk drive is normally device 8 ; a
tape drive is device 1). So, to save a BASIC program to the ramdisk, use the command SAVE"filename",2 where filename is any string of 16 or fewer characters.

Once you've stored a number of programs in the ramdisk, enter LOAD" $\$$ ", 2 to produce a twocolumn directory of all the files currently in the ramdisk. This directory does not destroy the program that's in memory. At the end of the directory, you'll see a BYTES FREE message telling you how much memory is left in the ramdisk for additional programs. If you attempt to save a program that is longer than the space that remains, the save aborts with an OUT OF MEMORY error, and your BASIC program remains intact.

When you wish to reload a file from the ramdisk into the BASIC work area, type LOAD" filename", 2 and press RETURN. If there is an appropriately named file in the ramdisk, it loads into memory (much as it would from tape or disk). To conserve memory, the program is erased from the ramdisk. For this reason, when you're finished working on a program you've taken from the ramdisk, be sure to resave it (either to the ramdisk, or to tape or disk) before loading another program. If you wish to delete a file from the ramdisk, just load it into memory.

Ramdisk 64 shares traits of both the disk and tape drive. For instance, if you're using tape for program storage, entering LOAD " C " will load the first program on the tape whose filename starts with the letter $C$. This technique works just fine with Ramdisk 64 (for example, LOAD" $C^{\prime \prime}, 2$ loads the first program
in the ramdisk that begins with the letter C.)

With disk, this process is known as pattern matching and requires an asterisk (*). The ramdisk also recognizes this convention when loading files. For example, just as with disk, LOAD" ${ }^{\text {file }}{ }^{* \prime \prime}, 2$ loads the first file that begins with the letters file. In contrast, LOAD"**", 2 always loads the first entry in the ramdisk directory. With disk, this is true only when no other program has been loaded yet. If a program has been loaded, LOAD "*", 8 fetches the most recently accessed program.

As a convenience, Ramdisk 64 allows you to save multiple versions of a program using the same filename. This prevents you from accidently overwriting a program in the ramdisk. To recall a version of a program, simply load the program repeatedly until your most recent copy is in memory. Be sure to save other versions to disk or to the ramdisk if you wish to keep them.

## How It Works

The Ramdisk 64 driver routine resides at the bottom of the BASIC text area. This allows utilities like "MetaBASIC" to operate undisturbed.

When it is run, Ramdisk 64 immediately protects itself from BASIC by adjusting the start-ofBASIC pointers upwards. Next, it stores the current ERROR handler vector at 768 , redirects the vector to its own error handler, and exits to BASIC.

Henceforth, whenever a BASIC error occurs, the program checks for an ILLEGAL DEVICE NUMBER error. If this error took place, it assumes the user is attempting to access the ramdisk. The program then looks for a correct filename and loads or saves the specified program to the ramdisk workspace. Ramdisk storage extents from location \$A000 to \$FFFF, excluding the area from \$D000 to \$DFFF.

On the 64, certain device numbers other than 2 will trigger the ILLEGAL DEVICE NUMBER error ( 0,3 , and so on). These can also be used for ramdisk access. For example, both LOAD" $\$$ ", 0 and LOAD" $\$$ ", 3 produce a ramdisk directory listing.
See program listing on page 77.

## Big Screen Converter

Robert Bixby
This companion program to "Big Screen," (a powerful $640 \times$ 400-pixel drawing program for the 64, published in the March 1988 issue) makes ordinary DOODLE! files-and BASIC 7.0 graphics screens-compatible with Big Screen.
"Big Screen," published in the March 1988 issue of COMPUTE!'s Gazette, lets you create hi-res drawings on a virtual graphics screen that is $640 \times 400$ pixels-four times the usual screen size. With "Big Screen Converter," you can load graphics created with DOODLE! into Big Screen and handle them as you would other Big Screen files. Thus you'll be able to perform the kind of detail work allowed by Big Screen on your DOODLE! files.

Big Screen Converter is written in machine language for maximum speed. To enter it, you must use "MLX," the machine language entry program found elsewhere in this issue. When you run MLX, you are asked for the starting and ending addresses of the data you'll be entering. Here are the values to use with Big Screen Converter:

[^3]Follow the MLX instructions carefully, and be sure to save a copy of the Big Screen Converter data before exiting MLX. Although written in machine language, Big Screen Converter can be loaded and run just like a BASIC program.

## Converting DOODLE! Files

To convert a file, first load and run Big Screen Converter. The program asks you for a filename. Place a disk
containing a DOODLE! file in your disk drive. Type the name of the DOODLE! file and press RETURN. Remember to add the DD prefix which precedes all DOODLE! filenames. (For example, if you save a hi-res picture as LANDSCAPE with DOODLE!, the file will appear in the directory as DDLANDSCAPE.) Be sure that you type a valid file-name-if the program is unable to find your file, you'll have to load the program and run it again to ensure an accurate conversion.

Once you've entered the DOODLE! filename, Big Screen Converter switches to the hi-res screen and begins the conversion process. You'll actually see the first part of the picture load and expand until the limits of the normal hi-res screen have been reached ( $320 \times$ 200 pixels). The screen border color flashes red and white during the conversion. When the process ends, the text screen reappears.

At this point, follow the instructions in the March GAZETTE to load and run Big Screen. Your DOODLE! file will be displayed on the graphics screen in an enlarged form-four times bigger than before. Using Big Screen's various modes and commands, you can now work on this expanded image. When you've finished, be sure to save a copy of it to disk.

## Converting 128 Graphics

Big Screen Converter handles not only DOODLE! files; it also converts graphics screens saved from BASIC 7.0. Hi-res screens on the 128 are generally saved with the command BSAVE. For instance, the following statement saves the contents of the hi-res screen at 7168 to disk as the file "HR PICTURE":

## BSAVE "HR PICTURE",B0,P7168 TO P16384

Once it is saved, you can convert HR PICTURE to Big Screen format by first switching to 64 mode. Next, load and run Big Screen Converter. At the filename prompt, enter "HR PICTURE". When the conversion is complete, load and run Big Screen and save a copy of the enlarged image to disk.

## How It Works

After you've specified a filename (DOODLE! or BASIC 7.0 graphics screen), Big Screen Converter reads a byte of graphics data from the file and expands it to encompass four bytes. These four bytes are displayed on the 64's graphics screen beginning at 8192 before another byte is read from the disk. The normal graphics screen represents the first quadrant of Big Screen's $640 \times$ 400 -pixel canvas. The rest of the converted graphics data (the three remaining quadrants) is stored in 8000 -byte areas beginning at 16384, 24576, and 32768. Big Screen Converter itself occupies a little more than 800 bytes of memory in the BASIC text area.
See program listing on page 75 .

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# Pointer 

Charles Prince

This clever utility allows you to use a joystick-controlled, mouselike pointer in your own BASIC programs. A demo is included to help you get the most from this program. For the 64 with joystick.
"Pointer" is a short machine language utility that displays an onscreen arrow you can maneuver around your 64's display with a joystick. With Pointer installed, you can program your joystick to create "point-and-shoot" applications like those used in the popular GEOS operating system. "Finder," Program 2, demonstrates how to locate the arrow's position on the screen so you can use Pointer to its best advantage.

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

## Starting address: CF00 Ending address: CFF7

Follow the MLX instructions carefully and be sure to save a copy of the Pointer data before you leave MLX.

## Using Pointer in Your Own Programs

There are two ways to use Pointer in a program. First, you can wait for the fire button to be pushed. This can be done in two ways:
100 WAIT 56320,16,16
or
100 IF (PEEK(56320)AND16) $=16$ THEN 100
Both options will freeze execution of the BASIC program until the fire button is pressed. The program

## Customizing Pointer

There are several ways to customize Pointer for your preferences. You can change the color of the pointer simply by typing

## POKE 53294,n

where $n$ is the number of the desired color. Values for colors are the following:

| $0=$ Black | $=$ Orange |
| :--- | :--- |
| $1=$ White | $9=$ Brown |
| $2=$ Red | $10=$ Light Red |
| $3=$ Cyan | $11=$ Dark Gray |
| $4=$ Purple | $12=$ Medium Gray |
| $5=$ Green | $13=$ Light Green |
| $6=$ Blue | $14=$ Light Blue |
| 7 | $=$ Yellow | $15=$ Light Gray

To change what the pointer looks like, you can use any sprite. (Please note, however, that sprites that are eight pixels by eight pixels or smaller work best. If you use anything larger, you won't be able to select anything in the bottommost row or the rightmost column.) Either you can place the data for the new sprite in locations 704-766erasing the data for the original sprite-or you can store the data for the new sprite somewhere else (such as the cassette buffer) and change the data pointer by entering POKE 2047, $b$, where $b$ is the number of the block in which you stored the data.

If the picture for the new sprite has a size other than four pixels by four pixels, you'll need to change two registers in the routine with the following POKES:

## POKE 53101,251-YW

POKE 53146,88-XW
$Y W$ is the height of the sprite, and $X W$ is its width (both measured in pixels). For example, for a sprite with a width of six pixels and a height of eight pixels, you'd enter:
POKE 53101,243
POKE 53146,82
 (1) 2

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2. You can submit multiple entries provided that all entries fit on a single diskette.
3. Entries must be accompanied by the official entry form you'll find inside the BeckerBASIC package. Xerox or reproductions of the entry form are not acceptable.
4. You must make sure that your entry is received by Abacus no later than August 31, 1988.
5. We'll announce the winning entries by October $31,1988$.

Complete rules are on the official entry form inside the BeckerBASIC package.

## Finder

Finder, Program 2, is designed to demonstrate how to use Pointer and to help you determine where things are on the screen. Since Finder is written entirely in BASIC, simply type it in, save a copy to disk, and type RUN.

You'll see the pointer on the screen and, in the upper left corner, the $x$ and $y$ coordinates followed by the screen position. To find the position of a point on the screen, use the joystick to move to any location, press the space bar to erase the position information, and press the fire button on the joystick. Pressing $Q$ at any time will return you to BASIC.

## Program Notes

When using Pointer, there are a few restrictions to note:

- Your BASIC program cannot use sprite number 7 , since that is the one used by the machine language routine for the pointer.
- The BASIC program cannot store anything in locations 704-766, except to change the appearance of the pointer.
- Anything that is stored in locations 52992-53232 will affect the machine language routine already there and probably result in a crash.
- If your BASIC program uses WAIT $56320,16,16$ to test for the fire button, you won't be able to use the RUN/STOP key during that wait.

Pointer works by wedging itself into the computer's hardware interrupt. The hardware interrupt is that part of the operating system that performs various housekeeping functions 60 times per second. By changing the interrupt vector (locations 788-789) to point at the new routine, the computer reads the joystick and moves the pointer accordingly every $1 / 60$ second, regardless of what else is going on. This gives BASIC programmers more memory to work with, since they no longer need to include routines in their programs to read the joystick, check to see if the sprite has gone off the screen, and so on. Pointer, running in the background, takes care of all these details.
See program listings on page 74 .

# Graphics Wedge 

Phillip A. Gilley

> View any hi-res picture on your screen with this powerful machine language graphics utility for the Commodore 64. Six different formats are supported.

One of the most impressive features of the Commodore 64 is its bitmapped graphics. Beautiful pictures can be created with a variety of graphics programs, including DOODLE!, KoalaPainter, and Cadpak.

Unfortunately, it can be difficult to display the pictures you've made. To display a picture file created with KoalaPainter, for instance, you must load and run the KoalaPainter program and then load the picture. From within KoalaPainter, you can load only KoalaPainter pictures. To load a picture of another format, you must leave KoalaPainter and run the appropriate program. "Graphics Wedge" is the solution to this problem.

Graphics Wedge is a short machine language program that allows you to view picture files quickly and easily-even pictures created by different graphics programs. Graphics Wedge can display files created with Blazing Paddles, Cadpak, DOODLE!, KoalaPainter, Micro Illustrator, and the Screen Magik area of The Print Shop-the only time you'll need to load a graphics program is when you draw your pictures.

Graphics Wedge is especially handy for those who have many public domain pictures, but don't have the graphics programs needed to display them.

## Getting Started

Since Graphics Wedge is written in machine language, you'll need to enter it with the "MLX" machine language entry program found elsewhere in this issue. When you run MLX, you'll be asked for the starting and ending addresses of the
data you'll be entering. For Graphics Wedge, use the following values:
$\begin{array}{ll}\text { Starting address: } & 0801 \\ \text { Ending address: } & \text { 0B28 }\end{array}$
Follow the MLX instructions carefully, and be sure to save a copy of the Graphics Wedge data before you leave MLX.

## Easy Display

To use Graphics Wedge, load and run it just like a BASIC program. Graphics Wedge places itself in a safe area of memory and returns you to the READY prompt.

Viewing picture files is easy. First, type LOAD "filename" 8,1 (tape users should type LOAD "filename", 1,1 ). The picture loads into memory. Now type a period and press RETURN. You'll see a list of the file formats that Graphics Wedge supports. Press the letter that corresponds to the format of the picture. The picture will appear on the screen.

While the picture is being displayed, you can change the border and background color. The f1 and f 2 keys cycle through the border colors (f1 cycles forward; f 2 cycles backward). The f3 and f4 keys cycle through the background colors. (Note: Changing the background color while in multicolor mode can produce strange results.) When you are finished viewing the picture, press a key.

You can now load and display another file. If you're not sure what format a picture is in, try one. If it fails, load the picture again and try another format.
See program listing on page 77.

# The Great Communicator 

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Editing characters is easy with this powerful, feature-packed program.

# Excelfont 80 <br> Super Character Editor for the 128 

Daihung Do

With this well-designed and powerful utility, you can easily create your own custom 80-column character sets for the 128, using an amazing maximum of 15 pixel rows for each character. An 80-column monitor and disk drive are required.

The Commodore 128 's 80 -column video is a remarkable improvement over the 64's 40 -column display, but unfortunately, the 80 -column screen doesn't have its own character set-it borrows the 64's. The 64's characters, though fine in 40 columns, don't do justice to the 128's 80 -column resolution. "Excelfont $80^{\prime \prime}$ solves this problem by allowing you to creatively design any number of attractive character sets to suit your preferences.

One special feature of Excelfont 80 is that it allows you to edit the full 15 rows of the 80 -column set. Imagine a large 15 -row character set for titling and a smaller one for normal text. With Excelfont 80, you can create just the right look for any program on which you're working. Although Excelfont 80 is partially written in machine language, you don't need to know machine language in order to use it.

## Getting Started

Excelfont consists of six programs. Three of these programs are written in BASIC, and three in machine language. Program 1, EXCEL.LDR, loads the other programs into memory and sets up the screen. Since Program 1 is written in BASIC, simply type it in and save a copy to disk with the name EXCEL.LDR.

Program 2 does most of the work, scanning the keyboard and calling the correct machine language routines. Program 2 is written in BASIC, so type it in and save a copy to disk with the filename EXCEL .BAS.

Program 3 is the main machine language program, the one that actually manipulates characters and accesses the 80 -column video chip. Enter this program with " 128 MLX," the machine language entry program found elsewhere in this issue. When
you run 128 MLX, you'll be asked for the starting and ending addresses of the data you're entering. For Program 3, use the following:
$\begin{array}{ll}\text { Starting address: } & 0 \mathrm{C} 00 \\ \text { Ending address: } & 0 \mathrm{FCF}\end{array}$
When you've finished entering the Program 3 data, save it with the filename EXCEL.OBJ. Be sure to use this name, because Program 1 looks for a file with this name on disk.

Program 4 is also a machine language program, so again, use 128 MLX to enter it. Respond to the prompts with the values indicated:
Starting address: 1300
Ending address: 135F
When you've finished entering the Program 4 data, save it with the filename EXCEL.OBJ1. It's important that you use the name EXCEL .OBJ1, because this is the filename that Program 1 uses to load this file.

Program 5 is a BASIC program that merges the two character sets into one. Simply type it in and save a copy to disk with the filename EXCEL.UTL.

Program 6 is a machine language program that enables you to
load and install a character set for use in your own programs. Use 128 MLX to type in this program. When you run 128 MLX, you'll be asked for the beginning and ending addresses of the data you're entering. The values for Program 6 are as follows:

## Starting address: 0C00 <br> Ending address: 0C2F

When you've finished entering the data, be sure to save a copy with the filename EXCEL.OBJ2. Be sure to save the data with this filename because this is the name Program 5 will expect.

## Up and Running

In order for Excelfont 80 to work, all six files must be on the same disk in the disk drive, and your 128 must be in 80 -column mode. When everything is set, type
RUN"EXCEL.LDR"
followed by RETURN, to run the program.

This program loads the other three programs into memory and executes Program 2, EXCEL.BAS. (The last two programs, Programs 5 and 6, are used separately.) On the main screen you'll see a characterediting window with an enlarged version of the character currently being edited, a window that displays the entire character set, a help window, a status window, and a prompt window.

When you first start the program, you'll be asked whether you want to edit the uppercase/graphics (character set 0 ) or the lower-/uppercase character set (character set 1). Excelfont 80 allows you to edit one character set at a time. Later, the two separate character sets can be merged into one. The second prompt asks for the number of character rows you'll be using for the character. This question affects the number of rows that are reversed, mirrored, or flipped when the appropriate options-to be discussed later-are selected.

You'll notice that there are two cursors on the screen: One is in the character-editing window, and the other one is in the character-selecting window. To move the cursor in the character-editing window, use a joystick in port 2 . To move the cursor in the character-selecting window, use the cursor keys. When you press the fire button, the corre-
sponding pixel under the cursor is set or cleared, depending on its previous state: If it was set, then it will be cleared, and vice versa. To continuously set or clear pixels, hold down the fire button and move the cursor around. You'll notice that the corresponding character in the character-selecting window is altered with each change you make to the expanded character in the character-editing window. When you move the character-selecting cursor, the pattern in the characterediting window changes to the character that is under the cursor in the selecting window.

## Editing Characters

Excelfont has several features that allow you to edit and manipulate the character in the editing window or even the whole character set. Here's a brief description of each one.

HELP. Pressing this key displays a Help menu in the Help window. Press HELP again to see the next Help menu. There are a total of three of them, so pressing HELP three times returns you to the first menu.
R. Rotates your character clockwise. This feature only rotates the upper $8 \times 8$ grid. It will operate regardless of the number of character rows. This feature is handy if, for example, you want to make a ship point in a different direction, or if you want to create a sideways character set. If you want to rotate the bottom $8 \times 8$ grid, just scroll the character eight times vertically to move the bottom eight rows to the top, rotate the character, and then scroll it back so that the character is back where it started, except for the rotated bottom rows.

SHIFT-R. This command is like R, but it rotates your character counterclockwise instead of clockwise.

CONTROL-9. Reverses the character. All pixels that have been set are cleared and all cleared pixels are set. If you press this twice, you'll have the same character you started with.
F. Flips the character vertically. This is the same as pressing $R$ twice, but it saves a keystroke.
M. This command mirrors your character horizontally. This feature allows you to make mirrored character sets. Pressing this
key twice returns to the character with which you started.

SHIFT-CLEAR/HOME. Clears the character so you can begin afresh. Be careful with this option, however; you may have to edit the whole character over if you press this accidentally.
N. Restores the ROM character image. If you've made a mistake trying to enhance a ROM character, press this to get it back. Please note that this restores the ROM character, not your previous character.
E. Pressing this key enlarges (or expands) the character vertically. This feature is particularly useful if you're making a 15 -row character set. It makes two rows for every one row that was in the original pattern. Be careful not to press this twice, because it will ruin your character, leaving you no way to get it back. This feature destroys the last eight rows of the original character.
C. This command is the opposite of E , above. It shrinks the character. If you press E and then this key, you'll have your original character pattern.
Commodore-9. Copies the first two rows, reverses them, and then writes them to the bottom two rows, effectively making a reverse character set for your new character set. This feature can be quite a timesaver.
T. Use this command to try your new character set. If you specified any number of character rows except 8 or 16 , you'll be prompted to enter the number of displayed character rows, 8 or 16 . You're asked this because Excelfont can only display either an 8 - or a 16 row character set. After you've answered the prompt, the main screen is replaced by a nearly blank one. You can type and try out your font as much as you wish. Press the ALT key to return to the main screen.
O. Stashes your character in a buffer so you can recall it later. If you're about to make a big change in your character, stash it here first in case you make a mistake.

SHIFT-O. Recalls the character from the buffer. If you press this key before you've saved something to the buffer with the above feature, you'll get a random pattern.

SHIFT-N. Restores the ROM character set. Please note that this will erase your whole character set, replacing it with the one in ROM.

You'll be asked if you really want to do this before the ROM character set is restored.
Q. Allows you to quit the character set and edit another one.

HOME. Homes the editing cursor to the top of the characterediting window.

Cursor keys. Allow you to move the character-selecting cursor.

Joystick (in port 2). Allows you to move the editing cursor.

Joystick fire button. Sets or clears pixels in the editing window.
Y. Scrolls up in the cursor's column.
G. Scrolls left in the cursor's column.
H. Scrolls right in the cursor's column.
B. Scrolls down in the cursor's column.
8. Scrolls the whole character up.
4. Scrolls the whole character left.
6. Scrolls the whole character right.
2. Scrolls the whole character down. Scrolling affects the entire column or row. The number of rows it affects will always be either 8 or 16 .
D. Displays the disk directory.
S. Saves the character set. Note that the character set is saved with a starting address of 8192 and an ending address of 12288. You can merge character sets after they have been saved by using EXCEL.UTL, Program 5.
L. Loads a saved character set. The loaded character set must have been created and saved from Excelfont in order for it to load correctly. When you load a character set, the one that was in memory will be replaced by the new one, so save the old one if you'll need it later. If you attempt to load a character set created with another character editor, the results are unpredictable.
@. Allows you to enter a DOS command through the command channel. See your disk drive manual for more information. It's possible to scratch and rename files, and format, initialize, and validate disks with this option.
$W$. This command toggles wrapping on the scrolling features.
P. Toggles between whole and part rows. If you're in whole mode, mirroring, reversing, or flipping af-
fects the character up to the row that you entered as the maximum number of displayed character rows (specified when you first ran the program). If you're in part mode, the mirroring, reversing, and flipping only affect the rows from the top of the character to the row that the cursor is on.

## Program Notes

Excelfont's machine language routines do most of the program's work, such as manipulating characters, accessing the 80 -column video chip, and moving memory. The BASIC program is essentially a shell. It reads the keyboard, calls the appropriate routines, prints the screen, loads and saves files, and performs screen tricks with the help of the ML program.

You may be interested in the way the program manages to make the screen fade in and fade out. This effect is created by decrementing (to fade out) or incrementing (to fade in) VDC registers 22 and 23. To change a register, use the following command in bank 15:
SYS 52684,value, registernumber
Register 22 controls a character's horizontal size. Bits 0-3 control how many horizontal pixels of a character are displayed. This affects all the characters on the screen, so by decrementing this value slowly, you can make the screen fade out. By incrementing the register after you've changed the screen, you create a fade-in effect.

Register 23 controls the character's vertical size. The fading effect that you want determines which register to change. If you want characters to slowly disappear by losing columns, use register 22. If you want them to fade in or out vertically, use register 23.

The curtain effects are created by incrementing or decrementing register 34 or 35 . Register 34 controls the left-most blanked column; register 35 , the right-most blanked column. The left-most visible column on many monitors is 0 , and the right-most column is 96 . You may have noticed that there are three different curtain effects you can create. A curtain can move from the left side of the screen to the right, or vice versa; or a curtain can come in from both sides to meet in
the center. You don't have to use a curtain effect; you can blank out the screen while you're setting up another one so that it will pop into view. Note that when you blank a screen or column, it turns black because the electron gun in your monitor is turned off.

## Installing a Character Set

To use a character set in your program, you need Programs 5 and 6, EXCEL.UTL and EXCEL.OBJ2, respectively.

If you plan to use just one character set, decide which one-that is, either uppercase/graphics or lowercase/uppercase. If you want the leftover character set to be the default ROM character set, boot up Excelfont and select which ROM character set you want to use and save it to disk. Then follow the instructions below as if you were using two character sets. If you want to use only one, saving disk space and loading time, have your program allocate graphics memory, because that's where the character set will be temporarily stored. Then BLOAD the character set into memory at address 8192. After this, BLOAD Program 6 into memory and SYS 3072. Your character set is installed. You can automate this process by adding the following line to the beginning of your program:

## 10 BLOAD"EXCEL.OBJ2":GRAPHICS 1,1:BLOAD "YOUR CHARACTER SET FILENAME":SYS 3072: GRAPHICS CLR

If you plan to use two character sets, merge them with Program 5; then use the BASIC line above at the beginning of your program to install the character set. Please note, if you reset the computer, or press RUN/STOP-RESTORE, the character set will be erased. If you want the default ROM character set back, just SYS 65378, but be sure that you're in BANK 15.

Excelfont allows you to utilize as many as 15 rows for each character set. To use these large characters in your program, incorporate the following line in your program:
100 WR $=52684$ :BANK 15:FAST:SYS
WR,15,4:SYS WR,6,5:SYS WR,12,6:
SYS WR,15,7:SYS WR,15,9:SYS
WR,16,23:WINDOW 0,0,79,12
See program listings on page 72 .

# Eight Thousand Dragons 

Paul Carlson

Fractal graphics invade your home with this short but stunning graphics program. "Eight Thousand Dragons" is the fastest fractal program you can find for your Commodore 64.

In the last few years, the word fractal has nearly become a household word with personal computer users. A fractal is a curve or surface which has a fractional dimension. While fractals are very important to mathematicians, most people appreciate fractals because of the spectacular graphic effects they make possible. For instance, the Star Trek II "Genesis" sequence was fractal-generated.
"Eight Thousand Dragons" lets you view fractal "dragons," one by one, on your 64's hi-res screen. More than eight thousand dragons are possible.

## Typing It In

Eight Thousand Dragons is a very short program-just over 400 bytes, in fact. Since it's written in machine language, type it in with "MLX," the machine language entry program found elsewhere in this issue. When MLX asks you for a starting and ending address, respond with the values indicated:
$\begin{array}{ll}\text { Starting address: } 0801 \\ \text { Ending address: } & 0998\end{array}$
Enter the data for Eight Thousand Dragons. When you've finished, be sure to save a copy to tape or disk.

Although Eight Thousand Dragons is written entirely in machine language for speed (each dragon is drawn in less than 10 seconds), the program loads and runs


Three examples of the beautiful fractals that are automatically created by "Eight Thousand Dragons."
just like a BASIC program. To start the program, type LOAD "DRAGONS", 8 (for disk) or LOAD"DRAGONS", 1 (for tape). Use the filename you specified when you saved the program from within MLX. After the program has loaded, type RUN.

The first fractal you'll see is the classic fractal dragon. Press a key to see the next dragon. After the first, the parameters for the dragons are generated randomly, and more than eight thousand different screens are possible. Press $Q$ at any time to quit.

## The Fire-Breathing Engine

To achieve the speed of Eight Thousand Dragons, I used a technique I call incremental bitmap addressing. The complete calculation for the bitmap address is done only for the first point plotted. For successive plots, only the change in bitmap address is computed. This is a fast and easy calculation with dragon curves because each point is immediately adjacent to the previous one.

The program is also self-modifying, which means that it changes itself as it runs.

As listed, the program plots orange dragons on a black background. If you'd like different colors, load the program, then type the following lines:
POKE 2442,background color number POKE 2443,foreground color number RUN

The color numbers correspond to those listed in the user's guide that came with your 64.
See program listing on page 72 .

## Larry Cotton

Over the last couple of months we've written a four-function math program to see how RND works. In the process, I hope you've also discovered more about the BASIC language itself.

In order to concentrate on RND, I deliberately glossed over the math programming. This month, we'll take a closer look at computer math.

## The Old Days

In the mid-seventies, I bought an exciting machine-a calculator the size of two videocassettes which could instantly do calculations that machines a year earlier had taken several noisy minutes to do. It was made by APF (who, incidentally, later made an early personal computer called The Imagination Machine). This $\$ 80$ wonder could do only four things-add, subtract, multiply, and divide.

For several years, calculators that did more than that cost as much as a Commodore 64 does now. Things have changed; we now have wonderful computing machines which can do complex mathematical equations in less time than in takes to press and release a key.

All BASIC math operations, simple or complex, can be accomplished in both BASIC modes-immediate and program. In the immediate mode, the computer works just a like a calculator except that we must type the word PRINT (or use a question mark) before the expression and press the RETURN key after it. Here's an example:

## ? $4+5$

If you type this and press RETURN, you'll see the number 9 displayed. This also works with the other three simple math functions:
PRINT 18 - 9
PRINT 3 * 3
PRINT 18 / 2

The asterisk means multiply and the slash means divide. The answer to all these problems, is, of course, 9 . Here are the same problems in program mode:

## 10 PRINT 4+5

20 PRINT 18-9
30 PRINT 3*3
40 PRINT $18 / 2$
If you enter this and run it, you'll see four 9's. The computer performs its calculations and prints only the answers-not the problems.

But suppose you did want to see the problems on the screen as well as the answers. The way to do this is simple: Put the problems (along with the equals sign) inside quotation marks. The computer prints whatever's inside quotation marks.

10 PRINT " $4+5=$ " $4+5$
20 PRINT " $18-9=$ " $18-9$
30 PRINT " $3 * 3=$ " $3 * 3$
40 PRINT " 18 / 2 =" 18/2
All of this has been presented before in various ways, so it should look familiar. Another (and probably the most common) way to perform math functions is to use letters (variables) to represent numbers. Again, in the immediate mode:
$A=4: B=5$ : PRINT $A+B$
$A=18: B=9$ : PRINT $A-B$
$A=3: B=3$ : PRINT A* $B$
$A=18: B=2$ : PRINT A/B
Using variables is a powerful way to do math, but before looking closely at variables, let's try a few more examples which use only numbers.

## Adding and Subtracting

Math performed with computers is the same math done with calculators, or, for that matter, with pencil and paper. Certain conventions have been adopted which are universal. For instance, in most problems, the math operations are performed from left to right. What would you expect the answer to this problem to be?

## PRINT 10-5+4

The answer is 9 . And 9 also would be the answer if the numbers were rearranged:
PRINT 4-5+10
Adding and subtracting are commutative, that is, they can be done in any order. Just be sure that the signs stay with the numbers. To illustrate further:
PRINT $-5+4+10$
Again, the answer is 9. The negative sign stays with the 5 .

## Multiplying and Dividing

Multiplication and division are trickier. In problems which contain only these two operations, the computer will again do the math from left to right. Since this is so, these two lines will not produce the same answer:

## PRINT $12 / 6^{*} 3$

## PRINT 6/12*3

In the first line, the computer first divides the 12 by 6 to get 2 , and then it multiplies the 2 by 3 to get 6 . In the second line the computer first divides the 6 by $12(.5)$ and then multiplies that by 3 to yield 1.5 . Division is not commutative.

## My Dear Aunt Sally

When math problems include combinations of adding, subtracting, multiplying, and division, we mustn't forget My Dear Aunt Sallya memory aid which uses the first letters of the words in the phrase$M D A S$ - to help you remember to Multiply, Divide, Add, Subtractin that order.

Since the internals of the computer are already preprogrammed to think that way, it's up to the programmer to remember that. Here's a problem which demonstrates how My Dear Aunt Sally goes about her work:
PRINT 5+3* $6-2$
Before you type this, try to guess what the answer would be. Now
type the line in and press RETURN. The answer is 21. Why? My Dear Aunt Sally says that the computer will do multiplication and division (there's no division here) to get $5+18-2$ and then addition and subtraction to get 23-2 (and finally 21).

Don't take My Dear Aunt Sally too literally-multiplication does not take precedence over division, nor does addition take precedence over subtraction. But both multiplication and division do take precedence over either addition or subtraction. Consider this example:

## PRINT 10/5*3-1+2

In this case, the division is performed first, followed by the multiplication, the subtraction, and finally the addition.

Most computers and calculators do math in this order without your having to worry about it. Notable exceptions are the Hewlett Packard calculators which use the postfix method of computation. Postfix or RPN (Reverse Polish Notation) calculators perform the operations in the order that they are entered. Calculators that use the infix method of computation need a set of rules, such as My Dear Aunt Sally, to determine the order in which to perform the calculations. Calculators that use the My Dear Aunt Sally rules are called algebraic calculators.

## Gaining Control

To cause the computer to preempt My Dear Aunt Sally requires extra effort:

## PRINT (5+3)*6-2

When parentheses appear in a problem, My Dear Aunt Sally quietly takes a back seat. Parentheses say "Do this first!" In other words, if 5 and 3 must be added together before being multiplied by 6 , we must enclose these numbers in parentheses. The answer to the above problem is 46 .

## The Laws of Averages

Now let's look at a practical use for combining math operations-averaging. The average of two or more numbers is calculated by adding the numbers together and then dividing the total by the number of numbers. Let's say we want the average of 4 and 6 . Suppose we typed:

## PRINT 4+6/2

My Dear Aunt Sally will step in and try to multiply and divide first. Finding nothing to multiply, she'll divide the 6 by the 2 to get 3 . Then she'll add the 3 to the 4 to get 7 . This is definitely not the average of 4 and 6. To get the correct answer you must use parentheses:

## PRINT (4+6)/2

Since parentheses take precedence, the numbers 4 and 6 will be added and their sum divided by 2 (the number of numbers to average) to get a correct average of 5 .

To carry this further, let's write a simple program that averages a series of numbers which are typed into the computer. Let's write this program in a logical order and then add the frills.

To gather user data requires the use of INPUT. Let's start with line 100 and write the lower line numbers later:

## 100 INPUT "FIRST NUMBER";A

Here's where the variables which represent numbers come into play again. Variables consist of one or two letters such as $A B$ or $H Y$, or a combination of one letter and one digit, such as $A 4$ or $T 6$. In the line above, $A$ is the variable.

When the user types a number at the INPUT prompt and presses RETURN, that number immediately goes into the computer's memory and will from then on (at least in this program) be identified as $A$. We've seen this concept many times before. OK, let's get the next number:

## 110 INPUT "SECOND NUMBER";B

Experienced BASIC programmers will immediately recognize that this is not the most efficient way to write an averaging program, but since the thrust here is to learn math concepts, we'll continue. The second memory space we've set aside is called B. Let's add a couple more lines:

## 120 INPUT "THIRD NUMBER";C 130 INPUT "FOURTH NUMBER";D

These four user-input numbers which are now identified as $A, B, C$, and $D$, must be added together and their sum divided by 4. As in our previous example, the letters which now represent numbers must be enclosed in parentheses so they will be added before they're divided by 4 :

140 PRINT "AVERAGE IS" ( $\mathrm{A}+\mathrm{B}+$ C + D)/4
That's the core of the program; it's runnable. But let's neaten it up a bit by adding a lower line number to clear the screen and move the cursor down a little:
90 PRINT "\{CLR\}\{3 DOWN\}"
When the program is listed, line 90 will automatically place itself in front of the previously written lines, and the program will, of course, run in line-number order.

You may want the lines as printed on the screen to be separated and spaced away from the left border. If so, go back to each line (except the first) and add a cursor down and a space just inside each first quotation mark, such as:

## 100 INPUT "\{DOWN\} \{SPACE\}FIRST NUMBER";A

There is a distinction between your doing math on computers and having computers do the math for you. The latter sounds much more interesting, so let's all begin to think of it this way. Next month, we'll investigate more ways computers can do math for you.

COMPUTE!'s Gazette is looking for utilities, games, applications educational programs, and tutorial articles. If you've created a program that you think other readers might enjoy or find useful, send it, on tape or disk to:

> Submissions Reviewer COMPUTE! Publications P.O. Box 5406 Greensboro, NC 27403

Please enclose an SASE if you wish to have the materials returned. Articles are reviewed within four weeks of submission.

## Jim Butterfield <br> Contributing Editor

Unlike BASIC programmers, machine language programmers have to worry about where their programs are placed in memory.

In this column, I often put machine language demonstration programs at decimal 8192 (\$2000). This is an excellent place for programs, but since it is so universally used, other items (programs, variables, arrays, or strings) might write over this part of memory.

## The Cassette Buffer

For quick test programs, the cassette buffer is ideal. A machine language program is unlikely to be disturbed in this area. Memory area \$33C-\$3E8 (decimal 828-1000) is quite safe. The 128 is an excep-tion-the cassette buffer is at \$B00-\$BFF (decimal 2816-3071).

If you assemble (or POKE) a program here, it needs no special handling. If you load a program into this area, you must be careful about pointers. I'll discuss this in more depth later.

## Free Space on the 128

The Commodore 64 has a block of memory not used by the system at \$C000-\$CFFF (decimal 49152-
53247). This whopping 4 K area is a favorite place to put machine language programs. Feel free to use it, but watch out for other utility programs which like to nest in the same space.

The Commodore 128 has a lot of free space at low addresses. The $\$ 1300-\$ 17 \mathrm{FF}$ block can also be considered spare. Other chunks can be claimed if you know your system. For example, the RS-232 code uses the $\$$ C00-\$DFF area. If you know that you won't be communicating with an RS-232 device, help yourself. Other areas become available if you don't use sprites, if you
have few programmed keys, or if you never use DOS commands such as SCRATCH or DLOAD. If you plan to load a machine language program to any of these areas, check the "Pointers" section of this article.

## Asking for Memory

One way to get memory is to ask BASIC to give up some of its working space. This workspace holds BASIC code and variables, arrays, and strings. On the 128 , it holds code only.

It's best to do this before BASIC starts creating variables; otherwise, you may be asking for space that's already in use. After such an allocation, a CLR (clear) command allows the BASIC program to adjust to its new space.

Usurping memory space from the top of BASIC is the least complicated method. Most machines have a "top of BASIC" pointer. On the 64, this pointer is located at $\$ 37$. Move this pointer down (then type CLR) and BASIC will give up the space.

The 128 has a special situation. Since variables, arrays, and strings are kept in Bank 1, you may help yourself to the space above BASIC without worrying about changing pointers. To simplify programming, you'll want your program to stay below $\$ 4000$.

Memory space taken from the top of BASIC gives you a fairly permanent area for a program. Even if you load other BASIC programs, you'll keep the space you have taken unless you give it back. Only a complete reset changes everything back to its original state.

Space can be taken from the bottom of the BASIC area, but this is more complex. There are sometimes valid reasons for doing this on the 128 , but it's best to avoid if possible.

If you plan to load a machine language program into an allocated area, check "Pointers," below.

A nearly ideal way to site a machine language program is to tack it onto the end of a BASIC program. The two parts-BASIC and machine language-can be loaded and saved as a unit-there's no need to worry about pointers.

Here's how to do it: After the ML program is placed somewhere above the end of the BASIC program, move up the pointer that marks the end of BASIC. On most machines, that's the Start-ofVariables pointer (\$2D and \$2E on the 64). On the 128, there's a special End-of-BASIC pointer at $\$ 1210$. Once everything is in place and the pointer has been moved, type CLR and then save the program. From this point on, a single load brings in the two parts, BASIC and ML. Once the programs have been united, you must not change the BASIC program.

This system becomes difficult if the start-of-BASIC pointer has been changed. The program will be relocated as it loads (into the wrong place).

## Pointers

If you load a machine language program using a BASIC direct command, you'll create a minor problem that may crash your system.

The LOAD command changes BASIC pointers around. That's OK when you load a BASIC program; the pointers do the right thing. But it's wrong when you load ML. To correct the problem, type NEW immediately following the LOAD command. If you have a 128 , you can type BLOAD instead of LOAD and the pointers will be undisturbed.

If you arrange for a program to load the machine language segment, the pointers will not be disturbed. Unless your computer has a BLOAD command, you'll have to learn some new coding tricks to make it all work, but at least you won't need to worry about pointers.

# A Guide to Commodore User Groups 

## Part 2

Mickey McLean

This annual GAZETTE feature provides an up-to-date list of user groups across the U.S., throughout Canada, and around the world. Last month, Part 1 listed user groups in states $A$ through $M$ (Alabama-Montana). This month, our list includes user groups in the remaining states (Nebraska-Wyoming) and from outside the U.S. (including APO addresses). Groups are listed in order according to zip code.

If your group does not appear in this list and you wish to be included, send your club name, address, and, if appropriate, your bulletin board service telephone number to:

## User Group Update <br> COMPUTE! Publications <br> P.O. Box 5406 <br> Greensboro, NC 27403

Your group will then be listed in our monthly "User Group Update" column.

When writing to a user group for information, please remember to include with your request a stamped, self-addressed envelope.

## NEBRASKA

Pathfinder Commodore User Group, P.O. Box 683, Fremont, NE 68025
Greater Omaha Commodore Users Group, P.O. Box 241155 , Omaha, NE 68124
Mid-Nebraska Users of Commodore (MUC), 1920 N. Huston Ave., Grand Island, NE 68803 Platte Valley Computer Users Group (PVCUG), 1625 North St., Gering, NE 69341

## NEVADA

SOG Commodore User Group, c/o Video Tonite, 1111 N. Nellis, Las Vegas, NV 89110
Silver State Computer Users Group, P.O. Box 81075, Las Vegas, NV 89180

## NEW HAMPSHIRE

Manchester Commodore Users Group, P.O. Box 402, Merrimack, NH 03054
Commodore Help And Information Network (CHAIN Gang), P.O. Box 1155, Laconia, NH 03247
Commodore Users Group, 53 Page Rd., Bow, NH 03301
Monadnock Users Group (MUG) for Commodore Owners, 135 Liberty Ln., Keene, NH 03431

## NEW JERSEY

Data Exchange-Beneficial Users Group 64/128 (DE-BUG 64/128), 213 Burns Way, Fanwood, NJ 07023

Info-64, P.O. Box BC, Paterson, NJ 07509
Hillsdale Commodore 64 Users Club, 32 Esplanade Lake Dr., Hillsdale, NJ 07642
Gold Crown Commodore Club, 517 Center Pl., Teaneck, NJ 07666
Commodore 64 Beginners Group, 680 Leigh Terrace, Westwood, NJ 07675
Garden State Commodore User's Group Inc., 89 Stratford Rd., Tinton Falls, NJ 07724
L \& L Commodore 64 User Group, 1 Longstreet Rd., Manalapan, NJ 07726
Commodore User Group of Central New Jersey, 112 Old Bridge Rd., Matawan, NJ 07747
South Jersey C-64 Users Group, 507 N. Dudley Ave., Ventnor, NJ 08406
Bordentown Area Commodore Users Group, P.O. Box 381, Bordentown, NJ 08505

Commodore Computer Collection Club, 72 Pine Dr., Roosevelt, NJ 08555
Commodore Users Group of Ocean County, 981 Cedar Grove Rd., Toms River, NJ 08753
Commodore E. Brunswick Users Group (CEBUG), 9 Kings Rd., E. Brunswick, NJ 08816
Somerset Users Group, 49 Marcy St., Somerset, NJ 08873

## NEW MEXICO

New Mexico Commodore User's Group, P.O. Box 37127, Albuquerque, NM 87176
64-X, 501 Camino Sin Nombre, Santa Fe, NM 87501

Los Alamos Commodore Users Group, 4125-D Sycamore Dr., Los Alamos, NM 87544
Taos Area Commodore User's Group, P.O. Box 5089, Taos, NM 87571
The Southern New Mexico Commodore User's Group, P.O. Box 4437, Uni. Park Brch., Las Cruces, NM 88003

## NEW YORK

Kids Computer News, 2714 University Ave., \#1B, Kingsbridge Heights, NY 10468-3424
Bronx Users Group (BUG-64), P.O. Box 523 , Bronx, NY 10475
Folklife Terminal Club, Box 555-R, Co-op City Station, Bronx, NY 10475
For Your Computer Only, 35 Belleview Ave., Ossining, NY 10562
St. Francis College Microcomputer Users' Group, Microcomputer Center, 180 Remsen St. Brooklyn, NY 11201
The Computer Freaks, 84 Sterling Pl., Brooklyn, NY 11217
Brooklyn Commodore User's Group, 1735 E 13th St., Apt.7N, Brooklyn, NY 11229-1950
Commodore Users Group of Greater New York, 190-25 Woodhull Ave., Hollis, NY 11423
Commodore Long Island Club, Inc., 2949 Roxbury Rd., Oceanside, NY 11572
Elite Commodore Users Group, 151 DuBois Ave., Sea Cliff, NY 11579
Brentwood 64/128 Computer Club, Pub. Lib., 2nd Ave. \& 4th St., Brentwood, NY 11717
MI-Comm User Group, 26 Azalea Rd., Levittown, NY 11756
Amiga-64 User Group, P.O. Box 280, Lindenhurst, NY 11757
Club 64, 174 Maple Ave., Patchogue, NY 11772
LIVICS Commodore Users Group, 15 Hastings Dr., Stony Brook, NY 11790
Ridge C-64 Users Group, 94 Ridge Rd., Ridge, NY 11961
Mohawk Valley Computer User Group, R.D. \#2, Box 177, Johnstown, NY 12095
Tri City Commodore User's Group (TCCUG), P.O. Box 12742 , Albany, NY 12212-2742

Hudson Valley Commodore Club, P.O. Box 2190 , Kingston, NY 12401
Orange County Commodore Users Group (OCCUG), 7 Cottage Ave., Newburgh, NY 12550
Commodore 64 User Group of Orange County, 74 Cardinal Dr., Poughkeepsie, NY 12601
Frontier Computer Users, R.F.D. \#1, Box 352A, Chazy, NY 12921 (BBS\# 518-846-8803)
Malone Commodore User Group (MALCUG), 27 Bentley Ave., Malone, NY 12953 (BBS\# 518 -483-1035)

Morrisonville Commodore Users Group, 61 E . Main St., Morrisonville, NY 12962
Oswego Commodore User Group, 424 Mahar Hall, State University College, Oswego, NY 13126
Central New York Commodore Users Group (CNYCUG), 6887 Peck Rd., Syracuse, NY 13209
The Commodore Computer Club of Syracuse, P.O. Box 2232, Syracuse, NY 13220

Utica Commodore User Group, 1801 Storrs Ave. Utica, NY 13501
Commodore Users Group of Massena (COMA), 7 Water St., Massena, NY 13662
Leatherstocking Computer User's Club, P.O. Box 1284, Oneonta, NY 13820
Triple Cities Commodore Society, 1713 Castle Gardens Rd., Vestal, NY 13850
Commodore Buffalo User Group (COMBUG), P.O. Box 1005, Tonawanda, NY 14151-1005

The Rainbow International C-64 Users' Group, 3 Expressway Village, Niagara Falls, NY 14304
The Niagara Falls Commodore Club, 2405 Willow Ave., Niagara Falls, NY 14305
The Lost Boys (TLB), 20 Mountain Rise, Fairport, NY 14450
Geneva Commodore Users Group, 84 Pleasant St., Geneva, NY 14456
Commodore Users Group of Rochester (CUGOR), P.O. Box 23463, Rochester, NY 14692
Finger Lakes Area Komputer Experts (FLAKES), 86 West Lake Rd., Hammondsport, NY 14840

## NORTH CAROLINA

Foothills User Group, 1012 Jesse Tr., Mount Airy, NC 27030
Sanlee Commodore Club, 5822 Blue Jay Dr., Sanford, NC 27330
Triad Commodore Users Group, P.O. Box 10833, Greensboro, NC 27404 (BBS\# 919-288:0372)
Carolina Commodore Computer Club, P.O. Box 2664, Raleigh, NC 27602-2664
Lincolnton Commodore Users Group, Rt. 3, Box 351, Lincolnton, NC 28092
Salisbury Compute, Rt. 1, Box 349B, Salisbury, NC 28144
Cleveland/Gaston Commodore User's Group (CGCUG), 2048 McBrayer Springs Rd., Shelby, NC 28150
Wilmington Commodore Users Group, 2104 Wisteria Dr., Wilmington, NC 28401
Down East Commodore Users Group, P.O. Box 1255, Havelock, NC 28532
Greater Onslow Commodore User Group, P.O. Box 7171, 910 Winchester Rd., Jacksonville, NC 28540
Unifour Commodore Users Group, P.O. Box 9324, Hickory, NC 28603-9324
Asheville-Buncombe User Group (A-BUG), P.O. Box 15578, Asheville, NC 28813

## NORTH DAKOTA

Central Dakota Commodore Club, P.O. Box 1584, Bismarck, ND 58502-1584

## OHIO

The Commodore User Group, Inc. (TCUG), P.O. Box 63, Brice, OH 43109
Central Ohio Commodore Users Group, P.O. Box 28229, Columbus, OH 43228-0229
Marion Ohio Commodore User Group (MOCUG), 775 Wolfinger Rd., Marion, OH 43302
South Toledo Commodore Computer Club, P.O. Box 6086, Toledo, OH 43614
Commodore Computer Club of Toledo (CCCT), P.O. Box 8909 , Toledo, OH 43623

Basic Bits Commodore Group, P.O. Box 447, N. Ridgeville, OH 44039
Northeast Ohio Commodore User Group, P.O. Box 718, Mentor, OH 44061-0015
C128 Network, 321 Kensington, Vermilion, OH 44089
Commodore Preference Users Connection (CPU Connection), P.O. Box 42032, Brook Park, OH 44142
Cuyahoga Falls Commodore Club, P.O. Box 3025, Cuyahoga Falls, OH 44223
Akron Area Commodore User Group (AACUG), P.O. Box 685, Akron, OH 44309

TRUMCUG, P.O. Box 8632, Warren, OH 44484
C-128/64 Amateur Computer Club, P.O. Box 1180, Youngstown, OH 44501
Commodore Users Group, 29425 Bettler Rd., Box 175, Dennison, OH 44621

Canton/Akron/Massillon Users Group (CAMUG), P.O. Box 2423, North Canton, OH 44720 Mid-Ohio Commodore User's Club, R.D. \#2, Box 10A, Cassell Rd., Butler, OH 44822
Commodore Erie Bay Users Group (CEBUG), P.O. Box 1461, Sandusky, OH 44870

Cincinnati Commodore Computer Club, Box 450, Owensville, OH 45160
Southwestern Ohio Commodore Users Group (SWOCUG), P.O. Box 46644, Cincinnati, OH 45246
Dayton Area Commodore Users Group (DACUG), 2040 Turnbull Rd., Dayton, OH 45431
PMUG, P.O. Box 31744, Dayton, OH 45431
Hancock User's Group (HUG), P.O. Box 1651, Findlay OH 45839-1651

## OKLAHOMA

Commodore User's Group of Lawton, P.O. Box 3392, Lawton, OK 73502
Commodore Users of Bartlesville, 1704 S. Osage, Bartlesville, OK 74003
Stillwater Computer Society, 3124 N. Lincoln, Stillwater, OK 74075
Tulsa Area Commodore Users Group (TACUG), P.O. Box 691842, Tulsa, OK 74169-1842

Muskogee Commodore Users Group (MCUG), 2429 Georgia, Muskogee, OK 74403

## OREGON

Commodore East County (CEC), 2424 S.E. Evans Ave., Troutdale, OR 97060-2328
United States Commodore Users Group, P.O. Box 2310, Roseburg, OR 97470
Caveman Commodore Computer Club (CCCC), 5863 Lower River Rd., Grants Pass, OR 97526

## PENNSYEVANIA

Beaver County Area Commodore User's Group (BCACUG), P.O. Box 412, New Brighton, PA 15066
A-K 64 User Group, 1762 Fairmont St., New Kensington, PA 15068
Bettis Commodore Users Group, 592 Arbor Lane, Pittsburgh, PA 15236
Pittsburgh Commodore Group (PCG), P.O. Box 16126, Green Tree, PA 15242
Westmoreland Computer Users Club (Commodore Section), P.O. Box 3051, Greensburg, PA 15601
Butler Commodore 64 User Group, P.O. Box 2408, Butler, PA 16001
Castle Commodore Computer Club, P.O. Box 961, New Castle, PA 16103
North Coast Commodore Users Group Erie, P.O. Box 6117, Erie, PA 16512-6117
PCUC, C. Rhoads, Milton Hershey SchoolRidgeway, P.O. Box 830, Hershey, PA 17033. 0830
Blue Juniata Commodore Users Group, 18 Ridge Rd., Lewistown, PA 17044
Huntingdon County Hackers, P.O. Box 132, Mill Creek, PA 17060
Southern York County Commodore Users Group, 5E Lark Circle, York, PA 17404
White Rose Commodore Users Group, 760 Fireside Rd., York, PA 17404
West Branch Commodore Users Group, P.O. Box 995, Williamsport, PA 17703
CenPUG for Commodore, R.D. \#4, Box 99A, Jersey Shore, PA 17740
Susquehanna Valley User Group, P.O. Box 90 , Hummels Wharf, PA 17831
Lehigh Valley Commodore User Group, 2228 Baker Drive, Allentown, PA 18102
Ingersol Rand Computer Users Group (IRCUG), R.D. \#1, Box 173, Sayre, PA 18840

Lower Bucks Users Group, P.O. Box 397, Croydon, PA 19020-0959
Environmental Protection Agency (EPA) Commodore Users Group, Edward H. Cohen, 1712 Aidenn Lair Rd., Dresher, PA 19025 (Note: Open to all federal government employees and their families.)
Horsham Amiga/64, 20-A Lumber Jack Circle, Horsham, PA 19044
Commodore Users Group, Philadelphia Area Computer Society, P.O. Box 57096, Philadelphia, PA 19111-7096
Main Line Commodore Users Group (MLCUG), 1046 General Allen Lane, West Chester, PA 19382

Worldwide Commodore Users Group (International Headquarters), P.O. Box 337 , Blue Bell, PA 19422
Upper Buxmont CBM Users Group, 1206 Cowpath Rd., Hatfield, PA 19440
Plymouth-Whitemarsh Commodore Users Group, 4029 Woodruff Rd., Lafayette Hill, PA 19444
Commodore Colony, 303 Old Airport Rd., Douglassville, PA 19518
Commodore Users of Berks (CUB), 810 Sledge Ave., West Lawn, PA 19609

## RHODE ISLAND

No listings.

## SOUTH CAROLINA

Commodore Computer Club of Columbia, P.O. Box 5691, Columbia, SC 29250
BIBS, S.P.O. S89, Charleston, SC 29424

## SOUTH DAKOTA

Aberdeen Commodore Club, 115 Church Dr., Aberdeen, SD 57401
Port 64, P.O. Box 1191, Rapid City, SD 57709 (BBS\# 605-348-9443)

## TENNESSEE

CHIP, 4952, Shihmen Dr., Antioch, TN 37013
Commodore Association of the Southeast (CASE), P.O. Box 2745, Clarksville, TN 37042 2745
Nashville Commodore User Group, P.O. Box 121282, Nashville, TN 37212 (BBS\# 615-8338642)

Commodore Computer Club, P.O. Box 96, Estill Springs, TN 37330
Howard S. Bacon, KC4CIQ, 213 Holly Ave., South Pittsburg, TN 37380-1313
Memphis-East Commodore Organization (MECO), 6870 Sauterne Cove, Memphis, TN 38115
Commodore PC-10/MS-DOS Users Group, 3318 Keystone Ave., Memphis, TN 38128
Raleigh-Bartlett Hackers CUG, James Patrick, 3457 Gatewood Dr., Memphis, TN 38134
Memphis Commodore Users Club, P.O. Box 34095, Bartlett, TN 38134-0095
Old Hickory Commodore Users Group, 542 Lambuth Blvd., Jackson, TN 38301

## TEXAS

PD Users of Texas, 135 Maytrail, McKinney, TX 75069
Society of Computer Owners and PET Enthusiasts (SCOPE), P.O. Box 3095, Richardson, TX 75083
128 Users of Dallas/Ft. Worth, P.O. Box 28277 , Dallas, TX 75228-0277 (BBS\# 214-328-7261)
Longview Computer Users Group, P.O. Box 9284, Longview, TX 75608
Mid-Cities Commodore Club, P.O. Box 1578, Bedford, TX 76095
Commodore Languages and Operations Group (C/LOG), Rt. 1, Box 158, Groesbeck, TX 76642
East Texas Commodore User Group, 2200 Montgomery Park Blvd., No. 616, Conroe, TX 77304
Commodore Houston User Group (CHUG), P.O. Box 612, Tomball, TX 77375 (BBS\# 713-4702484)

The Willis Commodore Users Group, 8 Forest Trails, Willis, TX 77378
Tri-County Commodore Users Association (TCCUA), 557 Lakeview Circle, New Braunfels, TX 78130
Commodore Users of San Antonio, P.O. Box 380732, San Antonio, TX 78280
Commodore User Group of Austin, P.O. Box 49138, Austin, TX 78765
Top of Texas Commodore (TOTCOM), Box 2851, Pampa, TX 79066-2851
Commodore Users of Texas (CUT), 7007 Memphis Ave., Lubbock, TX 79413

## UTAF

Cache Valley Commodore Users Group, 315 W. 400 S., Smithfield, UT 84335
Moab Commodore User's Group, 860 S. Antiquity Ln., Moab, UT 84532
Payson Area Commodore Users Group (PAC), P.O. Box 525, Salem, UT 84653

Southern Utah Commodore Hobbyists, 528 N. Blue Sky Dr., Cedar City, UT 84720

## VERMONT

Champlain Valley Commodore Users Group, 6 Mayfair St., South Burlington, VT 05403

## VIRGINIA

Arlington Victims Commodore Computer Club 9206 Annhurst St., Fairfax, VA 22031
Capitol Area Commodore Enthusiasts (CACE) 607 Abbotts Lane, Falls Church, VA 22046
Washington Area Commodore User Group, P.O Box 684, Springfield, VA 22150-0684
Dale City Commodore Users Group, Inc., P.O Box 2265, Dale City, VA 22193-0265
Fredericksburg Commodore Club, P.O. Box 8438, Fredericksburg, VA 22404-8438
Shenandoah Valley Commodore Users Group Mountain Falls Rte., Box 77FF, Winchester, VA 22601
The Richmond Area Commodore Enthusiasts (TRACE), 2920 Pinehurst Rd., Richmond, VA 23228
South Richmond Commodore User Group 11101 Cranbeck Ct., Richmond, VA 23235
Peninsula Commodore Users Group, P.O. Box L, Hampton, VA 23666
Portsmouth Commodore Users Group (PCUG) P.O. Box 6561, Portsmouth, VA 23703

Southside Virginia Commodore Users Group 315 Lakeview Ave., Colonial Heights, VA 23834
Commodore Users of Franklin, 1201 N. High St. Franklin, VA 23851
Henry County Commodore Computer Club, Rt. 9, Box 61, Martinsville, VA 24112
Lynchburg User Group, Rt. 2, Box 180, Lynchburg, VA 24501

## WASHINGTON

64 E/T, 127-182 Pl. SW, Bothell, WA 98012
The Covington Commodore Connection, 26243 172 SE, Kent, WA 98042
NW Commodore User Group, 2565 Dexter N, \#203, Seattle, WA 98109
PSACE, 1313 5th Ave. W, Seattle, WA 98119-3410
UW Commodore User Group, P.O. Box 75029 , Seattle, WA 98125
Arlington Commodore Users' Group, 4416-126th Place NE, Marysville, WA 98270
Club 64, 6735 Tracyton Blvd. NW, Bremerton, WA 98310
World Wide User Group, P.O. Box 98682 , Tacoma, WA 98498
Commodore Users of Grays Harbor, 1111 Fordney, Aberdeen, WA 98520
Lewis County Commodore Users Group, 803 Euclid Way, Centralia, WA 98531
Longview Commodore Users Group, 626 26th Ave., Longview, WA 98632
North Forty Commodore User Group, 2903 Florida St., Longview, WA 98632
Tri-City Commodore Computer Club (TC CUBED), P.O. Box 224, Richland, WA 99352
Blue Mountain Commodore Users, 550 S. 2nd Ave., Walla Walla, WA 99362-3149

## WEST VIRGINIA

Bluefield User Group 20/64 (BUG), P.O. Box 1190, Bluefield, WV 24701
Kanawha Valley Commodore Computer Club, P.O. Box 252, Dunbar, WV 25064

Commodore Home User's Group (CHUG), 81 Lynwood Ave., Wheeling, WV 26003
Mid-Ohio Valley Commodore Club, Inc. (MOVCC), P.O. Box 2222, Parkersburg, WV 26101-2222
Northern West Virginia C-64 Club, 228 Grand St., Morgantown, WV 26505

## WISCONSIN

Wisconsin Association of Vic/Commodore Enthusiasts (WAVE), 840 Park Manor Ct., Cedarburg, WI 53012
Lakeshore Commodore Computer Club, 1738 N . 27th Pl., Sheboygan, WI 53081
Commodore Hobbyists Involved In Personal Systems (CHIPS), P.O. Box 1006, West Bend, WI 53095
715 Commodore Users Group, 1052 S. Fork Dr., River Falls, WI 54022
Kewaunee \& Brown County Computer Club (KB Triple C), E4125 Krok, Kewaunce, WI 54216
COMM-BAY64, P.O. Box 1152, Green Bay, WI 54305

Price County Computer User Group, Rt. 2, Box 532, Phillips, WI 54555
Western Wisconsin La Crosse Area Commodore Users Group, 1545 Loomis St., La Crosse, WI 54603
Menomonie Area Commodore Users Group, 510 12th St., Menomonie, WI 54701
Eau Claire Area CBM 64 User Group, 1527 W Mead St., Eau Claire, WI 54703
Fond du Lac Area Commodore Users Club, P.O. Box 1432, Fond du Lac, WI 54936-1432

## WYOMING

Cheyenne Association of Computer Enthusiasts (CACE), P.O. Box 1733, Cheyenne, WY 82003

## Outside the U.S.

## APO

Commodore Computer Users Group Heidelberg, Robert H. Jacquot, P’O. Box 232, Gen. Del., APO NY 09102, Tel. 06223-5614 (West Germany)
Stuttgart Local Users Group, c/o Don Rimestad, HHC VII Corps, Box 228, APO NY 09107-0007 (West Germany)
Commodore Base User's Group (C-BUG), Attn: Computer Club Recreation Center/SSRR, RAF Chicksands, APO NY 09193 (Shefford Beds. England SG17 5PZ)
U.S. Naval Station Guantanamo Bay Cuba Computer Users Group, 0SC Mark Merkling, FTG Box 605, FPO New York, NY 09593

## AUSTRALIA

Commodore Computer Users Group (QLD) Inc. P.O. Box 274, Springwood Qld. 4127, Brisbane, Australia
Commodore Computer Users Group (Townsville), 9 Bryant St., Cranbrook, Townsville 4814, Qld., Australia
Commodore User Group (ACT), P.O. Box 599, Belconnen, ACT, Australia 2616
Hedland Commodore Computer Group, David Warren, P.O. Box 2551, South Hedland 6722, Western Australia
Melbourne Commodore Computer Club Inc. P.O. Box 177, Box Hill, Victoria 3128, Australia South Australian Commodore Computer Users Group, P.O. Box 427, North Adelaide, SA 5006, Australia

## BELGIUM

L'Amiral Club $\mathrm{C}=64$ \& Amiga, c/o Alain Trinteler, P.O. Box 41, B-1090, Brussels, Belgium

## BRAZIL

Brasilian General Computers by Piagesoft, Flavio Joao Piagentini, Rua Heitor de Moraes 856 Pacaembu, Sao Paulo-SP-Cep01237-Brasil
Commodore Grupos de Usuarios, Carlos A. Silva, Rua Gen. Roca 176, Apt. 501, 20521 Rio de Janeiro RJ, Brasil
Commodore Users Group Porto Alegre, Ferreira de Abreu 91/3, 90040 Porto Alegre RS, Brasil
Curitiba Commodore Club, R. Ver. Garcia R. Velho 33, Apto. 41-Barro Cabral, 80030 Curitiba-PR-Brasil

## CANADA

## British Columbia

Castlegar Commodore Computer Club, R.R. 1 , Site 37, Comp. 7, Castlegar, British Columbia, Canada V1N 3H7
Chilliwack Commodore Computer Club, P.O. Box 413, Sardis, British Columbia, Canada V2R 1A7
Commodore 64 Soft Swap, 4635210 St., Langley, British Columbia, Canada V3A-2L. 3
C64 International Users Group, 1544 West 59th Ave., Vancouver, British Columbia, Canada V6P 1Z2
Juan de Fuca C64/128 Users' Group, P.O. Box 7188, Depot 4, Victoria, British Columbia, Canada V9B 4Z3
Port Coquitlam Computer Club, 1752 Renton Way, Port Coquitlam, British Columbia, Canada V3B 2R7
Powell River Commodore User Group (PRCUG), 4858 Fernwood Ave., Powell River, British Columbia, Canada V8A 3L8
Prince George Commodore User's Association (PGCUA), 1491-17th Ave., Prince George, B.C. Canada V2L 3Z2

Universal Commodore Users Group, 1518 Myrtle Victoria, British Columbia, Canada V8R 2 Ž8

## Manitoba

Commodore Concepts Users Group (CCUG), Box 783, Steinbach, Manitoba, Canada R0A 2A0

## New Brunswick

The FORCE, P.O. Box 2203 MPO, Saint John, New Brunswick, Canada E2L 3V1
Moncton Users Group, Box 2984, STN A, Moncton, New Brunswick, Canada E1C 8T8

## Ontario

Barrie User Group, P.O. Box 22224, Barrie, Ontario, Canada L4M 5R3
Brampton User's Group (BUG), P.O. Box 384, Brampton, Ontario, Canada L6V 2L3
Hamilton Commodore Users' Group, 201 Millen Rd., Stoney Creek, Ontario, Canada L8E 2G6
Midland Commodore Users Group, c/o W. E. McKibbon, R.R. \#3, Penétang, Ontario, Canada LOK 1P0
Ottawa Home Computing Club, P.O. Box 4164 , Station C, Ottawa, Ontario, Canada K1Y 4P3
Sarnia Commodore User Group, 1276 Giffel Rd. Sarnia, Ontario, Canada N7S 3 K 7
The Sault Commodore Computer Club, 7 Chaumier Pl., Sault Ste. Marie, Ontario, Canada P6A 6P3
3-D Commodore 64 User Group, c/o Jonathan St. Clair, 10 Queen St., Branchton, Ontario, Canada N0B 1 LO
Ultima 64 Computer Club, c/o Centre des Jeunes, 20 Ste.-Anne St., Sudbury, Ontario, Canada P3C 5N4

## Quebec

CICN Commodore Group, P.O. Box 564, Septlles, P. Quebec, Canada G4R 4X7
Club Commodore Champlain, P.O. Box 522, Boucherville, Quebec, Canada J4B 6Y2
C-64 Users Group of Canada, Snowdon, P.O. Box 1205, Montreal, Quebec, Canada H3X 3 Y3 (BBS\# 514-739-3446)
L'Association de Micro Informatique de l'Estrie (L'AMIE), P.O. Box 1627, Sherbrooke, Quebec, Canada J1H 5M4

## Yukon

64s North of 60, P.O. Box 5438, Whitehorse, Yukon, Canada Y1A 5H4

## COLOMBIA

Club Commodore Colombia, c/o Jorge Bonilla Avenida Caracas No. 52-79 Of. 401, P.O. Box 36621, Bogota, Colombia, South America
ComSoft Commodore User Group, D.F. Cardenas, Apartado Aereo 9872, Cali, Colombia, South America

## COSTA RICA

Club Commodore de Tibas, Marvin Vega, P.O. Box 516, Tibas, San Jose, Costa Rica

## DENMARK

MIDTJYDSK Computer Klub (M.C.K.), Jegstrupvej 86, 8800 Viborg, Denmark

## DOMINICAN REPUBLIC

RD-C-64 Users Group, David Braverman, Centro Ed, de Bonao, Ave. Jose Marti, Bonao, Dominican Republic

## ENGLAND

Rolls Royce International Computer Users Group, Tom Lomax, 17 Greystoke Drive, Bilborough, Nottingham, Nottinghamshire, England NG8 4HW

## FINLAND

Commodore Micro Amateurs, P.O. Box 852, SF00101 Helsinki, Finland
User's Club of PTT, c/o Matti Pohtola, Teletutkimuslaitoksen, Mikrotietokonekerho, Kiviaidankatu 2 F, 00210 Helsinki 21, Finland

## INDIA

Commodore Users Group, c/o S. Ram Gopal, 1 B, 19th D Main Rd., Rajajinagar First Block, Bangalore 560 010, India

## ITALY

Commodore 64 Computer Users Group of Rome, c/o Pluchinotta Via di S. Agnese 22, 00198 Rome, Italy

## MEXICO

Bose Commodore Users Group, Lic. Oscar E. Saenz Salinas, Av. Francisco I. Madero con, Oriente 3 \#1001, Cd. Rio Bravo, Tam., Mexico
Club Commodore de Juarez, Calle del Manantial \#1448, Ciudad Juarez, Chihuahua, Mexico 32500
Club Commodore del Sureste, Carlos M. Diaz Escoffie, Col. G. Gineres 25 X 14192 A, 97070 Merida Yucatan, Mexico
Club Herra*Tec C64, Alain Bojmal, Vicente Suarez 25, 06100 Mexico, D.F.
Commodore Users of Puerto Vallarta, APDO 86 CP 48300, Puerto Vallarta, Jalisco, Mexico
Golden Chips Users Group, Ibsen 67 \#2, Mexico D.F., Mexico 11560

Grupo Commodore del Suereste, Barcazas \#115, Fracc: Jose Colomo, 86100 Villahermosa, Tabasco, Mexico

## THE NETHERLANDS

Comiac-Software User Group, Jarrod Bernadina, Kortenaerstraat 12, 2712 KJ Zietermeer, The Netherlands

## NETHERLANDS ANTILLES

Commodore 64 User Group, Ludwin Statie, Caracasbaaiweg \#94, Curacao, Netherlands Antilles

## NEW ZEALAND

Hokitika Commodore Computer Users Group, 185 Sewell St., Hokitika, New Zealand
N.Z. Commodore User's Group (Wellington) Inc., P.O. Box 2828 , Wellington, New Zealand

## PAKISTAN

Computer Users of Pakistan, 882/14, Federal B' Area, Karachi-38, Pakistan

## PUERTO RICO

East Commodore User's Club, c/o Nelson Jimenez Marquez, Jardines Judelly Edif. 4, Apt. 36, Las Piedras, Puerto Rico

## SAUDI ARABIA

Commodore League of Riyadh (CLR), P.O. Box 16216, Riyadh 11464, Saudi Arabia

## REPUBLIC OF SINGAPORE

The Commodore User Club, Bedok Central P.O. Box 693, Singapore 9146, Republic of Singapore

## SPAIN

Costa Blanca Computer Club, c/o Ed Kelly, Montebello 25, La Nucia-Alicante, Spain 03530

## SWEDEN

Commodore-Klubben, Lars Persson, Box 18158 , 20032 Malmo, Sweden
Computer Club Sweden, Hans Engstrom, P.O. Box 7040, S-103 86 Stockholm, Sweden

## SWITZERLAND

Computer Anwender Club, Postfach 29, 8042 Zurich, Switzerland

## WEST GERMANY

International Commodore Owners Network (ICON), 55 Westfallen Strasse, Apt. 2, 6200 Wiesbaden, West Germany

## WEST INDIES

Commodore Computer Club, Jim Lynch, PO. Box 318, St. Johns, Antigua, West Indies

# Jericho 

Robert Bixby

"Jericho" adds a new twist to the venerable line of breakout games. There are no walls here-you have to keep the ball on the screen no matter which way it bounces. For the 64. Joystick required.

Bad news! Jericho, the super moth, has broken into your competitor's kilt factory. You've got to pitch in and help. But you know there's only one thing to do-keep that moth in the warehouse until he's eaten every scrap of cloth.
"Jericho" is a variation of the popular breakout-style game, where you try to keep a ball bouncing inbounds until all the bricks on the screen are gone. In Jericho, the ball is a moth, and the bricks are colorful pieces of cloth.

## Getting Started

Jericho is written in machine language. Type it in with "MLX," the machine language entry program found elsewhere in this issue. When MLX prompts you for starting and ending addresses, respond with the following values:

## Starting address: 0801 <br> Ending address: 0E78

Enter the data for Jericho. Be sure to save a copy to tape or disk before exiting MLX.

When you're ready to play Jericho, load and run the program. Although Jericho is written in machine language, it can be loaded, saved, and run like a BASIC program.

## First Game

Plug a joystick into port 2. When you type RUN, you'll see the game's demo mode, which is very much like the game itself. In the center of the screen is the cloth that is used to make the kilts. Jericho the moth flaps around, soaring from place to place, until he bumps into cloth. He then eats a section and moves on.


Try to make the moth eat as much of the colorful kilt as possible in this clever takeoff on the classic Breakout game.

Since moths are so flighty, Jericho is as likely to fly right out the window as he is to stay in the building. In the demo mode, all four edges of the screen are walled off. This keeps Jericho in.

Press the fire button to begin the game. The walls disappear. You now have control of two large paddles. These paddles can be moved around all sides of the screen. Use them to bounce Jericho back into the kilt factory whenever he strays.

Joystick control is easy. Press the stick forward to move the paddles clockwise and pull back to move them counterclockwise.

Sooner or later, no matter how careful you are, Jericho will slip away. Press the fire button to bring him back. This can be done ten times. When Jericho escapes for the final time, press RETURN to begin a new game.

Your current score and number of lives are displayed in the upper left corner of the screen.
See program listing on page 78 .

# 3-D Bar Grapher for the 128 

Jon Atkinson

Transform ordinary numbers into bold, multicolored threedimensional graphs with this useful application for the 128. You can keep track of your expenses, earnings, or just about anything else you might imagine. A color monitor is suggested.

Before the computer age, plotting graphs was a time-consuming chore that had to be done by hand. With "3-D Bar Grapher," however, graphing spreadsheets is fun and easy. Using multicolor and 3dimensional charts, 3-D Grapher enables you to see where your money is going, to gauge how your investments are doing, to plot as many as 20 years of statistics incorporating as many as 20 different items, and much more. You can save graphs to disk, or by using a printer and a screen dump program (such as The Print Shop by Brøderbund), you can make a printout.

## Getting Started

Since 3-D Bar Grapher is written entirely in BASIC, simply set your 128 for 40 columns, type the program in, save a copy to disk, and type RUN. 3-D Bar Grapher begins by asking you the first of several questions. Pressing RETURN at a prompt enters the default response. This is useful if you're trying the program for the first time, or if you're not sure what to enter. The first two prompts involve looking at previously saved graphs. For now, choose N for these prompts. (We'll discuss saving graphs later on.).

Now you begin to input the actual values for your 3-D graph.

First, enter the title of the graph. This can be as long as 40 characters and is displayed at the top of your graph. The next prompt asks what you want displayed at the sides of your graph. This is called the value representation and is a label for the graph's height or the $z$ dimension. Common values are dollars, millions, or number of units sold.

Next, 3-D Bar Grapher asks for the beginning and ending year. The year span must be in the range $0-20$. For example, for a graph for this decade, enter 80 for the beginning year and 88 for the ending year. These values are displayed on the $x$ length of the graph. If the same year is chosen for starting and ending values, the computer asks for the beginning and ending month, a number in the range 1-12. The ending month is normally calculated 12 months ahead, but can be changed by entering the number of the ending month (for example, 8 for August). Next you're asked for the number, within the range $1-20$, of items to graph. In graphing a home budget, for example, you might have monthly payments on a house or a car, travel expenses, medical bills, entertainment expenses, and miscellaneous, for a total of five items. These values are represented on the $y$ length of the graph.


Just one example of the colorful 3-D graphs you can create with this versatile program.

The next two prompts ask for the graphing range. The minimum and maximum values are 0 and 99,999 , respectively. If one million or any other number greater than 99,999 is needed, all you have to do is enter the value as millions or billions and use $0-100$ for the graphing range.

## Impact Colors

Now the three multicolors have to be entered using values in the range $1-15$. The defaults are 15 -light blue, 4 -cyan, and 7-dark blue. To make your graph more pleasing to the eye and to strengthen the 3-D illusion, three shades of a single color are recommended.

Recommended Color Combinations

| shade | color 1 | color 2 | color 3 |
| :--- | :---: | :---: | :---: |
| blue | 15 | 4 | 7 |
| red | 9 | 11 | 10 |
| gray | 13 | 16 | 12 |
| green | 14 | 6 | 2 |

After the colors have been chosen, each value must be entered at a prompt. The total number of values can be calculated by multiplying the number of years or months by the number of items. There are no default values for this part of the program. If you press RETURN without entering any data, the program assumes you've entered a 0 . When you've finished with the values, item keys may be entered. These are optional, but they make a more readable and attractive chart. For an expense graph, for example, you might have the following keys ${ }^{\prime}$ values: ITEM $1=$ HOUSE, ITEM $2=$ CAR, ITEM $3=$ TRAVEL, and ITEM $4=$ MEDICAL. You can also place a comment in the key area.

You can have a border drawn around the screen after the graph has been completed by answering yes to the next prompt. The border can give a printout a more polished look. Finally, you're asked if fast mode is to be turned on. Fast mode cuts the drawing time of the graph in half, but the screen will be
blanked during the process. It's important to run the program in slow mode until you're sure you've eliminated any typing errors, because you can't see error messages while in fast mode.

## Finished Product

Now the graph will be drawn on a 3-D chart, starting with the ending year or month in the top corner. The starting year or month is located near the bottom of the screen and the endirg year or month further up, near mid-screen. The bar's length, width, and height depend on the number of items, the number of years or months, and the value of that particular cell.

After the graph has been completely plotted, press any key to return to text mode. Here you have three options: Save the graph, plot another graph, or exit to BASIC. If you choose $Y$ to save the graph, you're prompted for the filename of the graph. Note that each graph takes a space of 33 blocks on the disk, so be sure to have enough
room on a disk before attempting to save anything. After you've saved the graph, you return to the beginning of the program to construct another graph.

## Loading Graphs

The first prompt in 3-D Bar Grapher loads graphs from disk. After selecting this option, you can display a directory before entering a filename and your color choices. The graph is then displayed until any key is pressed. Unfortunately, you can't add to the data from an old graph. If you have a graph with expenses from January to May, for example, when June comes along, you won't be able to add the June data. The only solution is to reenter all your old data and then the new information.

Each graph resides in memory locations 8192-16383, so hi-res dumps can be made with The Print Shop. Load your graph using get screen from the Screen Magic section of The Print Shop.
See program listing on page 70.


## Square Logix

See instructions in article on page 30 before typing in．

## Program 1：SQRS．OP


 ØB10：A $A \emptyset E 8 E 8 A \emptyset A \emptyset A \emptyset E 8$ FB


 0B30：E6 Ag DC Aø E6 Aø E6 Ag AF ØB38：E6 AØ E6 Aø E6 Ag E6 Ag F8 ØB4日：E6 Aの E6 AØ E6 AØ E6 AØ $\emptyset 1$ ØB48：E6 A $\emptyset$ A $\emptyset$ A $\emptyset$ DC $A \emptyset A \emptyset A \emptyset 63$日B50：Ag Ag E6 E6 E6 AØ DC Ag 3E日B58：E6 A 9 E6 Ag E6 Ag E6 E6 5F日B60：E6 AØ E8 E6 DC Ag DC Ag 61 ØB68：E6 Ag DC Ag Ag Ag DC Ag A1日B79：DC Ag Ag Ag E6 E6 E6 Ag 7C
 のB8日：E6 AØ E6 Aø E6 AØ DC Ag 2D ØB88：E6 AØ E6 AØ E6 AØ E6 AØ 49日B90：E6 Ag E6 Ag E6 Ag E6 Ag 51 ØB98：E6 AØ AØ AØ AØ AØ E6 AØ 5E曰BAØ：Aの Aの E6 E8 E6 Aの Aの E6 7C ఏBA8：E8 A $\emptyset$ E6 E8 E6 Ag E6 Ag EE
 ØBB8：E6 AØ E6 E8 DC AØ E6 AØ AD 0BC $0: E 6$ E8 E6 A 0 E6 E8 E6 Ag B4 ØBC $8: 2 \theta \quad 2 \theta \quad 2 \theta \quad 2 \theta \quad 2 \theta \quad 2 \theta \quad 2 \theta \quad 2 \theta \quad D E$




## Program 2：SQRS．SPR



日E18： $0 \varnothing 67 \quad 30 \quad 90 \quad 97 \quad 90 \quad 90 \quad 9753$























 ØEE $0: F 8$ 1F FF F8 बF FF F8 0641









 ØF 38： 62 8 80 g 62 FF FF FE g 95






$\begin{array}{lllllllll}\text { 日F 7月：} \\ \text { 日8 } & 10 & 20 & 98 & 92 & 12 & \text { Ag } & 54 & 16\end{array}$


## Program 3：Square

QD 1 REM COPYRIGHT 1988 COMPUT E！PUBLICATIONS，INC．－A LL RIGHTS RESERVED
BA 2 PRINT＂\｛CLR\}\{3 SPACES\}COPY RIGHT 1988 COMPUTE！PUB．，
INC．＂：PRINTTAB（11）＂ALL R IGHTS RESERVED＂
QG 3 BLOAD＂SQRS．SPR＂，$B \emptyset, P 3584$
BH 4 REM＊＊＊ESTABLISH VARIBLE S＊＊＊
QF $5 A=\emptyset: A A=\emptyset: A X=\emptyset: B=\emptyset: D 1=-1: G$ $=\emptyset: G 1=\emptyset: H=\emptyset: J=\emptyset: J 1=\emptyset: J 2=\emptyset$ $: J 3=\emptyset: J V=\emptyset: K=\emptyset: L=\emptyset: L 1=-1:$ $L V=\emptyset: M=\varnothing: M 1=\varnothing: N=\emptyset: O=\varnothing: O X=$ $\emptyset: O Y=\emptyset: P=\emptyset: R 1=-1: S D=\varnothing: T=\emptyset$ $: U 1=-1: U U=\sigma: V=\sigma: W=\sigma: W W=\sigma$
$\mathrm{XK} 6 \mathrm{WZ}=\emptyset: X=\varnothing: X \mathrm{X}=\varnothing: \mathrm{XX}=\varnothing: \mathrm{YX}=\varnothing: \mathrm{Y}$ $=\varnothing: Y Y=\varnothing: Z=\varnothing: Z Z=\varnothing: C O S="\{8\}$ \｛GRN\} \{CYN \} \{BLU\} \{RED\} $\{2\}^{\prime \prime}$ ： FORT $=1 \mathrm{TO} 6: \mathrm{CS}(\mathrm{T})=\mathrm{MIDS}(\mathrm{COS}$ ， T，1）：NEXT：YS＝＂＂
SM 7 P ＝＂$\{$ RVS \}@@@@@\{OFF\}": FOR $T=\emptyset T O 5: \operatorname{READC}(T): N E X T: I I=4$ 9176：DIMAS $(6,6), X(999), J($ 999），K（999）
AP 8 FORT＝ØTO3：POKE53287＋T，1：P OKE $53291+\mathrm{T}, \varnothing$ ：SPRITET $+1, \varnothing$ ： SPRITET +5 ，$\varnothing$ ：NEXT
QA $9 \mathrm{WZ}=\emptyset: V=\sigma: Y X=\emptyset: J 1=1: J 2=1: J$ $3=4: A X=17:$ COLOR $0,2:$ COLOR 4 ，1：COLOR 6,2
RS 10 ？WINDOWø $, 0,39,24,1:$ PRINTT AB（9）＂\｛RVS \} \{BLU\} \｛4 SPACES \} SQUARE LOGIX \｛5 SPACES \} \{DOWN \}"
EH 11 PRINT＂\｛RVS\}\{1\}SHIFTS \｛OFF\}\{3 SPACES\} \{RVS\} SHUF FLE \｛OFF \} \{2 SPACES \}\{RVS \}R OTATE 1 \｛OEF $\}\{2$ SPACES $\}$ \｛RVS\}ROTATE 2 \｛DOWN\}"
AX 12 PRINT＂ 22 SPACES \}\{BLK\}"P\$ ＂$\{3$ SPACES $\}\{R V S\}\{8\} A B C D E$ F \｛OFF \} \{4 SPACES \} \{RVS \}
（BLK\}@@\{8\}@@@@\{OFF\} \｛3 SPACES \} $\{$ RVS $\}\{B L K\} @ @$ \｛8\}@@巴"
AK 13 PRINT＂$\{2$ SPACES $\}\{G R N\}$＂PS ＂\｛3 SPACES\} \{RVS\}GHIJKL \｛OFE \} 4 SPACES \} \{RVS \} \｛BLK\}@@\{GRN\}@@@@\{OFF\} \｛3 SPACES \} \{RVS\}\{BLK\}@@e \｛GRN\}@@@"
EG 14 PRINT＂ 2 SPACES \}\{CYN\}"P\$ ＂$\{3$ SPACES $\}\{R V S\} M N O P Q R$ \｛OFE\} \{4 SPACES\} "P\$" \｛3 SPACES \} \{RVS \} \{BLK\}@@@ \｛CYN\}@@@"
BH 15 PRINT＂\｛2 SPACES\}\{BLU\}"PS ＂$\{3$ SPACES $\}$ \｛RVS $\}$ STUVWX \｛OFF \} 4 SPACES \} "P\$" \｛3 SPACES\}"p\$"
ES 16 PRINT＂ 22 SPACES \}\{RED\}"PS ＂$\{3$ SPACES $\}\{R V S\} Y Z 1234$ \｛OFF\} \{4 SPACES\}"PS" \｛3 SPACES\}"PS"
ER 17 PRINT＂$\{2$ SPACES $\}\{2\}^{\prime P}$＂＂ \｛3 SPACES $\}$ \｛RVS \}56789 \｛BLK\} \{OFF\} \{4 SPACES \} $\{2\}$ ＂PS＂\｛3 SPACES\}"PS"
QJ 18 PRINT＂\｛DOWN\} \{BLK\} \｛2 SPACES \} \{RVS\}GAME 1 \｛OFE \} \{3 SPACES \} \{RVS\}GAME $2\{O F F\}\{4$ SPACES $\}$ \｛RVS \}GA ME $3\{O F E\}\{3$ SPACES $\}\{R V S\}$ GAME $4^{\prime \prime}: \mathrm{J} 1=1: \mathrm{UU}=15$ ：SLOW： GOSUB 26
KK 19 REM＊＊＊\｛2 SPACES $\}$ MAKE SE LECTION $\{2 \text { SPACES }\}^{\star * *}$

## BEFORE TYPING

Before typing in programs，please refer to＂How to Type In COMPUTE！＇s GAZEITE Programs，＂ elsewhere in this issue．

GP 20 WINDOW5，14，39，14，1：PRINT ＂\｛BLU\}PICK GAME. . . . 12 \｛SPACE\} $34^{\prime \prime \prime}$ ；：GOSUB23：WZ $=$ $\theta: \mathrm{Gl}=\mathrm{J} 1:$ GOSUB 35
$X S 21 B=G 1-2: A X=15: J 1=1: J 3=9: Z$ $=7-\mathrm{Gl}: \mathrm{ZZ}=\mathrm{Z}+1: \mathrm{UU}=17: \mathrm{GOSUB}$ 26 ：SLOW
JX 22 WINDOWø，16，39，16，1：PRINT ＂$\{B L U\} L E V E L$ OF PLAY \｛BLK\}
 ：GOSUB 26 ：GOSUB 23 ： $\mathrm{LV}=\mathrm{J} 1: \mathrm{F}$ AST：GOTO27
CF 23 JV＝JOY（1）：IFJV＝gTHEN23：E LSE IFJV $=7$ THENJ1 $=\mathrm{J} 1-1-$（ J 1 ＝J2）：GOSUB 26 ：GOTO23
RJ 24 IFJV $=3$ THENJI $=\mathrm{J} 1+1+(\mathrm{Jl}=\mathrm{J} 3$ ）：GOSUB 26：GOTO 23：ELSEIFJ V＞127THENSOUND1，406，1：RE TURN
DD 25 GOTO23
DG $26 \mathrm{XU}=\mathrm{AX}+2$＊J1：SOUND1，J1＊1 10 0,10 ：WINDOW $\varnothing, U U, 39, \cup U, 1$ ： PRINTTAB（XU）＂\｛RED\}个";:RE TURN
DS $27 \mathrm{~J}=$ RND（ -TI ）：M1＝ ： $\mathrm{IFGI}<3 \mathrm{TH}$ ENZZ $=6$
SD 28 REM＊＊＊\｛2 SPACES $\}$ RANDOML Y MIX BLOCKS $\{2 \text { SPACES }\}^{* *}$
DX 29 DO：Ml＝Ml＋1：J＝INT（RND（1）＊ Z ？Z ）： $\mathrm{K}=\mathrm{INT}$（RND（1）＊ ZZ ）：GOS UB33：SOUND2，8øøø，1：ONG1G OSUB $30,30,31,31:$ LOOPUNTI LMI $=\mathrm{LV} * 3: J=2: K=2: W Z=1: G O$ SUB35：TIS＝＂のøøøøg＂：GOTO5 $\emptyset$
CG 3 X $=$ INT（RND $(1) * 4+1)$ ：GOSUB 3 2：GOSUB71：RETURN
$\mathrm{KX} 31 \mathrm{X}=\mathrm{INT}(\operatorname{RND}(1) \star 2): \mathrm{X}(\mathrm{M} 1)=-($ $X=\varnothing)$ ：GOSUB 33：GOSUB82：RET URN
MK $32 X(M 1)=X+2+(X>2) * 4$ ：RETURN EE $33 \mathrm{~J}(\mathrm{ML})=\mathrm{J}: \mathrm{K}(\mathrm{M1})=\mathrm{K}:$ RETURN
PM 34 REM＊＊＊ 22 SPACES $\}$ PRINT B LOCKS TO SCREEN \｛2 SPACES ${ }^{*} * *$
HH 35 FAST：WINDOW0，$\varnothing, 39,24, W Z:$ $A A=\emptyset: F O R Y=\emptyset$ TO $5: F O R X=\emptyset$ TO5 ： I FWZ $=1$ THEN 42
BE 36 AA $=\mathrm{AA}+1$ ：IFG1 $\left\langle 2\right.$ THENAAS $={ }^{\prime \prime}$ ＂：GOTO 39
CQ 37 IFAA $<27$ THENAA $S=$ CHRS $(64+A$ A）：GOTO 39 ：ELSEIFAA $<36 \mathrm{THE}$ NAAS $=$ CHR $\$(22+A A)$
SE 38 IFAA $=36$ THENAS $(X, Y)="$ \｛RVS\} \{BLK\} \{2 SPACES\}\{M\} \｛DOWN\}\{3 LEFT\} \{2 SPACES\} \｛M\}\{DOWN\}\{3 LEFT\}$\{2 \mathrm{P}\}$＠＂ ：GOTO 41
HM $39, \mathrm{ZZS}={ }^{\prime}$ \｛M\}\{DOWN\}\{3 LEFT\} $\{2$ SPACES \}$\{M\}\{D O W N\}$ $\{3$ LEFT $\} \leqslant 2$ P\}@\{OFE $\}^{\prime \prime}$
SX 40 AS $(\mathrm{X}, \mathrm{Y})="\{\mathrm{RVS}\} "+\mathrm{C} \$$（INT（ $A A-1) / 6)+1)+A A S+Z Z S$
GX 41 BS $(X, Y)=A S(X, Y): \operatorname{NEXTX}, Y:$ SLOW：RETURN
EQ 42 SYSII，$\varnothing, Y^{\star} 3, X^{\star} 3$ ：PRINTAS（ $X, Y) ;: S O U N D 1,1 \varnothing \sigma \theta \varnothing, 1:$ NEX $T X, Y$
DJ 43 WINDOW18， $0,20,24:$ PRINT＂ \｛OFE\} \{BLK\}\{*\}\{RVS\}
\｛2 SPACES \} \{RIGHT\}
\｛2 SPACES $\}$ \｛RIGHT \}
（2 SPACES $)^{\prime \prime}$ ；：FORT＝1TO5： P

RINT＂\｛＊\}\{2 SPACES\}
\｛RIGHT\} \{2 SPACES\} \{RIGHT\} \｛2 SPACES\}";: NEXT
GQ 44 WINDOWø，18，21，22：PRINT＂ \｛RVS\} \&*\}\{2 RIGHT\}\{OFF\}
\｛＊$\}\{2$ RIGHT $\left.\}\}^{\star}\right\}\{2$ RIGHT $\}$ \｛＊$\}\{2$ RIGHT $\}$ \｛＊$\}\{2$ RIGHT $\}$ \｛＊${ }^{*}\{2$ RIGHT\}M\{RVS\}
（2 SPACES ${ }^{\prime \prime}$ ：$\overline{\text { FORT }}=1 \mathrm{TO} 2: \mathrm{PR}$ INT＂\｛RVS\}\{21 SPACES\}":NE XT：WINDOW $0,0,39,24$
GK 45 IFGl＝3THENOX＝24：OY＝52：SD $=5:$ ELSEIFG1 $=4$ THENOX $=36: 0$ $\mathrm{Y}=64: \mathrm{SD}=6$
HQ 46 SLOW：RETURN
GG 47 REM $* \star \star$ MARKERS $* \star \star$
BQ 48 MOVSPRX，J＊ $24+24, K * 24+50$ ： POKE53269， $2 \uparrow(\mathrm{X}-1)$ ：SOUND1 ，4060，1：RETURN
GR 49 SPRITESD， $1,1,0,1,1: M O V S P$ RSD，J＊ $24+0 \mathrm{X}, \mathrm{K} * 24+0 \mathrm{Y}$ ：SOUN D1，（J $+\mathrm{K} * 5+1$ ）＊1000， $1:$ RETU RN
BE 50 SLOW：GOSUB101：IFG1＜3THEN X＝1：GOSUB47：GOTO 52 ：ELSEG OSUB49：GOTO52
BJ $51 \mathrm{Ml}=\mathrm{Ml}+1: \mathrm{J}(\mathrm{Ml})=\mathrm{J}: \mathrm{K}(\mathrm{Ml})=\mathrm{K}$ ： $\operatorname{IFGl}<3$ THENX $(M 1)=X+2+(X>2$ ）＊ $4: \operatorname{ELSEX}(\mathrm{Ml})=-(\mathrm{X}=\mathrm{\theta})$
AS 52 GOSUB116：IFV＝1THEN96
QH 53 GETK\＄：IFK $\$=$＂Q＂THENFORI $=1$ TO8：SPRITEI， $0:$ NEXT：PRINT ＂\｛CLR\}": COLORの, 1:COLOR5, 14：COLOR4，14：END：ELSEIFK \＄＝＂＊＂THENGOSUB118
JD 54 REM＊＊＊JOYSTICK CONTROL S＊＊＊
JF 55 JV＝JOY（1）：IFJV＝øTHEN52：E LSEIFG1＞2THEN58
BC 56 IFJV＝1THENX＝1：GOT062：ELS EIEJV＝3THENX＝2：GOTO64：EL SEIFJV $=5$ THENX $=3:$ GOT066： E LSEIFJV＝7THENX＝4： GOT068： ELSEIFJV＝128THENGOSUB71： GOSUB86：GOTO51
HG 57 GOTO52
FG 58 IFJV $=1$ THENK $=K-1-(K=\varnothing)$ ：$G 0$ TO61：ELSEIFJV＝3THENJ $=\mathrm{J}+1$ $+(\mathrm{J}=\mathrm{Z}):$ ：GOTO61：ELSEIFJV $=5$ THENK $=\mathrm{K}+1+(\mathrm{K}=\mathrm{Z})$ ： GOTO 61 ： E LSEIFJV＝7THENJ $=\mathrm{J}-1-(\mathrm{J}=\varnothing)$ ：GOTO 61
HK 59 IFG1＞2AND（JV＝1310RJV $=135$ ）THENYX $=Y X+1$ ：GOSUB81：GOS UB80：GOT051
RG 60 GOTO52
PS 61 GOSUB49：GOTO52
EA $62 \mathrm{Ul}=\mathrm{Ul}+1: \mathrm{Rl}=-1: \mathrm{Dl}=-1: \mathrm{L} 1=-$ 1： IFU1 $>$ ©THENK $=K-1-(K=\varnothing)$
FM 63 GOTO69
GE $64 \mathrm{Rl}=\mathrm{Rl}+1: \mathrm{Ul}=-1: \mathrm{Ll}=-$ Sl： $\mathrm{Dl}=$ 1： IFR1＞ $\operatorname{CTHENJ}=J+1+(J=5)$
PP 65 GOTO69
CD $66 \mathrm{D}=\mathrm{D} 1+1: \mathrm{Ll}=-1: \mathrm{Ul}=-1: \mathrm{Rl}=-$ 1： IFD1 $>$ GTHENK $=K+1+(K=5)$
BP 67 GOTO69
BJ $68 \mathrm{~L} 1=\mathrm{L} 1+1: \mathrm{Ul}=-1: \mathrm{Rl}=-1: \mathrm{D} 1=-$ 1： IFL $1>$ GTHENJ $=\mathrm{J}-1-(\mathrm{J}=\varnothing)$
DC 69 GOSUB48：GOTO55
XH 76 REM＊＊＊SHIFT AND ROTATE ROUTINES＊＊＊
CD 71 ONXGOTO 72，74，76，78
KJ 72 AS＝AS $(\mathrm{J}, 8): \mathrm{FORT}=\varnothing \mathrm{TO4:AS( }$ $\mathrm{J}, \mathrm{T})=\mathrm{AS}(\mathrm{J}, \mathrm{T}+1):$ NEXT：AS（ J ，5）$=$ AS： IFWZ $=0$ THENRETURN
QC 73 FORT＝5TO日STEP－1：SYSII，日， $T \star 3, J \star 3: \operatorname{PRINTAS}(J, T): N E X$ T：RETURN
JS $74 \mathrm{~A}=\mathrm{AS}(5, \mathrm{~K}): \mathrm{FORT}=5 \mathrm{TO} 1 \mathrm{STEP}$ $-1: A S(T, K)=A S(T-1, K): N E X$ $\mathrm{T}: \mathrm{A} \$(\theta, \mathrm{~K})=\mathrm{A} \$: \mathrm{IFWZ}=\varnothing$ THENR ETURN
GB 75 FORT $=0$ TO5：SYSII，$\varnothing, K * 3, T *$

3：PRINTAS（T，K）：NEXT：RETU RN
RB 76 A $\$=A S(\mathrm{~J}, 5):$ FORT $=5 \mathrm{TO}$ ISTEP $-1: A S(\mathrm{~J}, \mathrm{~T})=A S(\mathrm{~J}, \mathrm{~T}-1):$ NEX T：AS $(\mathrm{J}, \varnothing)=\mathrm{A} \$:$ IFWZ $=\varnothing$ THENR ETURN
AE 77 FORT＝ØTO5：SYSII，$\quad, \mathrm{T}^{*} 3$ ，J＊ 3：PRINTAS（J，T）：NEXT：RETU RN
KJ 78 AS $=\mathrm{A} \$(\varnothing, \mathrm{~K}): F O R T=\emptyset T 04: \mathrm{A} \$($ $\mathrm{T}, \mathrm{K})=\mathrm{A} S(\mathrm{~T}+1, \mathrm{~K}): \operatorname{NEXT}: \mathrm{AS}(5$ ，K）$=A S:$ IFWZ $=\varnothing$ THENRETURN
BK 79 FORT＝5TO日STEP－1：SYSII，$\varnothing$ ， $K * 3, T * 3: \operatorname{PRINTA}(T, K): N E X$ T：RETURN
CR 80 SOUND1，$(\mathrm{X}+1) * 2006,1$ ：GOSU B92：GOSUB115：RETURN
JR 81 IFJV $=135$ THENX $=1$ ：ELSEX＝
SD $82 \mathrm{~L}=\mathrm{J}+1: 0=\mathrm{K}+1:$ IFG1 $=4$ THEN 86 ：ELSEIEX＝1THEN84
JP 83 A $\$=A \$(J, K): A \$(J, K)=A \$(J$, 0）：AS $(\mathrm{J}, 0)=A \$(\mathrm{~L}, 0): A \$(\mathrm{~L}$, $0)=A \$(L, K): A \$(L, K)=A \$: G O$ T085

EA 84 A $\$=A S(J, K): A S(J, K)=A S(L$, $K): A S(L, K)=A S(L, O): A S(L$, $0)=A \$(J, 0): A S(J, 0)=A S$
EJ 85 IFWZ $=0$ THENRETURN：ELSEEOR $\mathrm{H}=\mathrm{KTOK}+\mathrm{B}: \mathrm{FORG}=\mathrm{JTOJ}+\mathrm{B}: \mathrm{SYS}$ II，$\varnothing, H * 3, G * 3$ ：PRINTAS（ $G, H$ ）：NEXTG，H：RETURN
CB $86 \mathrm{M}=\mathrm{J}+2: \mathrm{P}=\mathrm{K}+2$ ： IEX $=1$ THEN89
RC 87 AS $=A \$(\mathrm{~J}, \mathrm{~K}): \mathrm{A} S(\mathrm{~J}, \mathrm{~K})=\mathrm{A} S(\mathrm{~J}$, $0): A S(J, O)=A \$(J, P): A S(J$, $\mathrm{P})=\mathrm{A} S(\mathrm{~L}, \mathrm{P}): \mathrm{A} S(\mathrm{~L}, \mathrm{P})=\mathrm{A} \$(\mathrm{M}$, P）
SH 88 A $(M, P)=A S(M, O): A S(M, O)=$ AS $(M, K): A S(M, K)=A S(L, K):$ AS（L，K）＝AS：GOTO85
MH $89 \mathrm{~A} \$=\mathrm{A}(\mathrm{J}, \mathrm{K}): \mathrm{A} \$(\mathrm{~J}, \mathrm{~K})=\mathrm{A} \$(\mathrm{~L}$, $K): A S(L, K)=A S(M, K): A S(M$, $K)=A S(M, 0): A S(M, O)=A S(M$, P）
EB 96 A $(M, P)=A \$(L, P): A S(L, P)=$ AS $(J, P): A S(J, P)=A S(J, 0):$ AS $(\mathrm{J}, \mathrm{O})=\mathrm{A}$ S：GOTO85
KK 91 REM＊＊＊CHECK FOR WIN＊＊ ＊
CD $92 \mathrm{~V}=1$ ： $\mathrm{FORXX}=\emptyset \mathrm{TO}$ ： $\mathrm{FORYY}=\varnothing$ TO 5
QQ 93 IFAS $(X X, Y Y)<>B \$(X X, Y Y) T H$ $\mathrm{ENV}=\varnothing: \mathrm{YY}=5: \mathrm{XX}=5$ ：GOTO 94
SE 94 NEXTYY，XX：RETURN
BQ 95 REM $* * *$ YES，COMPLETED． \｛SPACE\}NEW GAME ***
RK 96 WINDOW0，22，39，24，1：PRINT ＂\｛WHT\}YOU HAVE COMPLETE \｛SPACE\}GAME"G1"AT LEVEL" LV＂
AE 97 PRINT＂\｛4 SPACES\}\{RVS\} \｛2 SPACES\}PRESS \｛2 SPACES \}FIRE\{2 SPACES $\}$ BUTTON\｛2 SPACES\}TO
\｛2 SPACES $\}$ START \｛OFF\}";: $\mathrm{A}=0$ ：
EF 98 JV＝JOY（1）：IFJV＞127THENGO TO8
XJ $99 A=A+1+(A=5) * 6: \operatorname{COLORG}, C(A$ ）：$W=W+1+(W>206) * 2 \sigma \theta:$ SOUN D1，W＊30日 300 ，2：GOTO98
FD 100 REM＊＊＊PRINT TITLE AND PATTERN＊＊＊
EQ 101 WINDOW $23,0,39,24,1:$ IFG1 $=1$ THENPRINT＂$\{$ RVS $\}$（BLK $\}$ \｛SPACE\}S H I F T S \｛2 DOWN \}"
RP 162 IFGl＝2THENPRINT＂$\{$ RVS $\}$ \｛BLK\} S HUFELE \｛2 DOwn \}"
CR 163 IFGl＝3THENPRINT＂\｛RVS\} \｛BLK\} R O T A TE 1 \｛2 DOWN \}":SD=5

GP 104 IFGl $=4$ THENPRIN1＂$\{$ RVS $\}$
（BLK\} R O T A TE 2 （2 DOWN\}": SD=6
AP 105 PRINT＂PATTERN TO MATCH＂ ：WINDOW26，5，39，24：1FG1＝ 2THEN107
QA 186 FORR＝1TO6：PRINTCS（R）＂ \｛RVS\}"PS:NEXT: GOTOI11
FE 167 AK $=\varnothing$ ：FORAA $=1$ T06：PRINT： F ORBB $=0$ TO $: ~ A K=A K+1$
FS 108 IFAK＜27THENPRINT＂\｛RVS\}" CS（AA）CHRS（ $64+$ AK）；：GOTO 110：ELSEIFAK＝36THENPRIN T＂\｛RVS\}\{BLK\} ";:GOTO11の
SF 109 PRINT＂\｛RVS\}"CS (AA)CHRS ( $22+A K$ ）；
KH 110 NEXTBB，AA：GOTO111
FK 111 WINDOW0， $8,39,24$
AA 112 REM $\star \star \star \star$ COMPUTER SOLVES ＊＊＊
KP 113 SYSII，0，22，0：PRINT＂ \｛OFF\}\{RED\}HIT \{RVS\}Q
\｛OFF\} TO QUIT. \{RVS\}*
\｛OFF\} FOR COMPUTER SOLU TION，\｛PUR\}THEN PRESS A Ny KEy to resume your g AME．＂
KK 114 WINDOW0， $0,39,24$
KJ 115 SYSII， $0,17,24$ ：PRINT＂ \｛OFF\}\{BLK\}TURN \#"YX+1" （2 SPACES\}": RETURN
RB 116 SYSII， $0,13,26$ ：PRINT＂ 83$\}$ TIMER＂
HQ 117 PRINTTAB（25）＂$\{$ RVS $\}\{B L U\}$ ＂LEFTS（TIS，2）＂：＂MIDS（TI \＄，3，2）＂：＂RIGHT\＄（TI\＄，2）： RETURN
FE 118 IFGl＞2THEN125
XH 119 WW＝1：W＝M1：DO： $\mathrm{X}=\mathrm{X}(\mathrm{W})$ ：GOS UB121：W＝W－1：LOOPUNT ILWく 1：GETKEYYS：FAST
RB $12 \varnothing \mathrm{WW}=-1: \mathrm{W}=1: \mathrm{DO}: \mathrm{X}=\mathrm{X}(\mathrm{W})+2+($ $\mathrm{X}(\mathrm{W})>2) * 4$ ：GOSUB121：W＝W + 1：LOOPUNTILW＞M1：SLOW：RE TURN
GP $121 \mathrm{~J}=\mathrm{J}(\mathrm{W}): \mathrm{K}=\mathrm{K}(\mathrm{W}): S D=\mathrm{X}-1$
BS 122 GOSUB48：IFWW＞日THENGOSUB 124
MB 123 GOSUB71：RETURN
SA 124 SLEEP1：SOUND $2,4000,1$ ：RE TURN
BS $125 \mathrm{WW}=1$ ：FORW＝M1TOISTEP－1： X $=X(W):$ GOSUB127：NEXT：GET KEYYS：FAST
BK 126 WW＝－1：FORW＝1TOM1：X＝－（X） W）$=\varnothing$ ）：GOSUB127：NEXT：SLO W：RETURN
BJ $127 \mathrm{~J}=\mathrm{J}(\mathrm{W}): \mathrm{K}=\mathrm{K}(\mathrm{W}): \mathrm{SD}=\mathrm{Gl}+2: \mathrm{G}$ OSUB49：IFWW $>$ OTHENGOSUB1 24
BH 128 GOSUB82：RETURN
MG 129 DATA16，6，4，7，3，16

## 3－D Bar Grapher for the 128

Article on page 67.
HE 10 REM COPYRIGHT 1988 COMPU TE！PUBLICATIONS，INC．－ ALL RIGHTS RESERVED
MQ 20 PRINT＂$\{C L R\}\{3$ SPACES $\} C O P$ YRIGHT 1988 COMPUTE！PUB ．，INC．＂：PRINTTAB（11）＂AL L RIGHTS RESERVED＂：SLEEP 3
XB 36 DIMV1 $(441), V(21,21): G R A P$ HIC3，1
EX 40 GRAPHIC $0,1:$ COLOR $\varnothing, 16:$ COL OR4，7：PRINT＂\｛BLK\}
\｛12 SPACES \} 3-D BAR GRAPH ER＂
HE 50 PRINT＂$\{2$ DOWN $\}\{B L K\}\{R V S\}$ LOAD A GRAPH FROM DISK？ \｛SPACE\} $(\mathrm{Y} / \mathrm{N})$＂
DQ $6 \emptyset$ INPUT＂$\{2$ SPACES $\} N$ \｛3 LEFT\}"; LG\$: IFLG\$="Y"T HEN67g
GG 70 PRINT＂$\{$ RVS \}VIEW PREVIOUS GRAPH IN MEMORY？（ $\mathrm{Y} / \mathrm{N}$ ）＂
ED 80 INPUT＂$\{2$ SPACES $\} N$
\｛3 LEFT\}";V\$:IFV\$="Y"THE NGOSUB71g
QA $9 \varnothing$ PRINT＂\｛RVS\}ENTER TITLE 0 F GRAPH（ $\varnothing-4 \varnothing$ CHARACTERS ）＂
MR 100 INPUTT $\$$ ：IFLEN $(T \$)>39 \mathrm{THE}$ NPRINT：TS＝＂＂：GOTO1g
SP 110 PRINT＂ 1 RVS\} ENTER VALUE \｛SPACE\}REPRESENTATION g－15 CHARS．）＂
EB 120 INPUTRS：IFLEN（RS）$>15 \mathrm{THE}$ NPRINT＂$\{2$ UP\}":RS="":GO TO120
CS 130 PRINT＂$\{$ RVS $\}$ ENTER STARTI NG YEAR $\{21$ SPACES $\} 2$ DIG IT REPRESENTATION）
GF 140 INPUTSY：IFSY＝बTHENPRINT ＂\｛2 UP\}": GOTO14
JF 150 PRINT＂（RVS\}ENTER ENDING YEAR $(\Omega-2 \emptyset$ YEAR SPAN）
FH 160 INPUT＂ 55 SPACES $\}$
\｛5 LEFT\}"; EY: IFEY <SYTHE $N E Y=E Y+1 \sigma \sigma$
DA 176 IFEY＞SY +2 GTHENPRINT＂ \｛2 UP\}": GOTO16
BQ 180 IFEY $=$ SYTHENGOSUB 720
KP 199 PRINT＂$\{$ RVS $\} E N T E R$ NUMBER OF ITEMS TO GRAPH（1－2『）
CS 200 INPUT＂$\{5$ SPACES $\}$
\｛5 LEFT $\}$ \｛2 SPACES $\} 5$ \｛3 LEFT\}"; IT: IFIT<lORIT ＞2のTHENPRINT＂\｛2 UP\}":GO TO2g
PP 210 PRINT＂$\{$ RVS \}GRAPH FROM ( 0－99999）＂
RH 22g INPUT＂ 55 SPACES $\}$
\｛5 LEFT $\}$ \｛2 SPACES $\}$
\｛5 SPACES $\}\{8 \text { LEFT }\}^{\prime \prime} ; S: I$ FS＞99999THENPRINT＂
\｛2 UP\}":GOTO22
DX 236 PRINT＂$\{$ RVS $\}$ TO $\{9$ SPACES $\}$ （8－99999）＂
DD 246 INPUTE：IFE＜＝SORE＞99999T HENPRINT＂\｛2 UP\}":GOTO24 $g$
XA 250 GOSUB 820
RD 260 PRINT＂\｛RVS\}ENTER VALUES ＂：TMS＝＂YEAR＂：IFEL＝1THEN TMS＝＂MONTH＂
MP 270 FORA＝1TOEY－SY＋1－FL：FORB ＝1TOIT
MQ 286 PRINTTMS；A＂，ITEM＂B；：INP $\operatorname{UTV}(A, B): \operatorname{IFV}(A, B)<\operatorname{SORV}($ $A, B)>$ ETHENPRINT $^{\prime \prime}\{2 \text { UP }\}^{\prime \prime}$ ：GOTO280
GG 290 NEXTB，A
HJ $3 \emptyset \emptyset$ PRINT＂$\{$ RVS $\}$ ENTER KEY（ $\varnothing$ -46 CHARACTERS）＂
KC $31 \varnothing$ INPUTK $\$$ ：IFLEN $(K \$)>40 \mathrm{THE}$ NPRINT：K\＄＝＂＂：GOTO3 $\varnothing \sigma$
CC 32 白 BD $=$＂＂：INPUT＂\｛RVS\} BORDE R？$(\mathrm{Y} / \mathrm{N})$ \｛OFF\} $\{2$ SPACES $\}$ N\｛3 LEFT\}";BDS
QX 330 INPUT＂$\{$ RVS \}FAST? $(\mathrm{Y} / \mathrm{N})$ \｛OFE $\}$ \｛ 2 SPACES\}N
\｛3 LEFT\}";FS:IFFS="Y"TH ENFAST
DQ $340 \mathrm{Tl}=12:$ GOSUB $870: S L=I N T(4$ $9 /(E Y-S Y+1-F L)): S I=I N T($ 49／IT）
RK 350 DRAW3，79，18T079，82TO79－
（EY－SY＋1－FL）＊SL， $82+(E Y-$ SY $+1-\mathrm{FL}$ ）＊SLTO $79-(E Y-S Y+$ $1-\mathrm{FL}) * S L, 18+(E Y-S Y+1-F L$
 $8+1$ T ${ }^{\text {S S ITO }} 79+\mathrm{IT}$＊SI， $82+\mathrm{IT}$ ＊SITO79，82： $\mathrm{B}=\varnothing$
HJ 360 FORA $=18+(E Y-S Y+1-F L) * S L$ TO82 $+(E Y-S Y+1-F L) * S L S T E$ P8：DRAW3，79－（EY－SY＋1－FL ）＊SL，ATO $79,18+8$＊BTO $79+\mathrm{I}$ $T * S I, 18+8 * B+I T * S I: B=B+1$ ：NEXT
JG $370 \mathrm{SP}=\mathrm{INT}(49 /(\mathrm{EY}-\mathrm{SY}+1-\mathrm{FL}))$ $: Y=19+(E Y-S Y+1-F L) * S L: D$ ＝79－（EY－SY＋1－FL）＊SL：FOR $\mathrm{A}=\mathrm{DTO} 9$ STEPSP：DRAW3，A， Y TOA， $\mathrm{Y}+63: \mathrm{Y}=\mathrm{Y}-\mathrm{SP}:$ NEXT
RD $389 \mathrm{SK}=\mathrm{INT}(49 / \mathrm{IT}): \mathrm{Y}=18: \mathrm{D}=79$ $: \mathrm{L}=\mathrm{Y}: \mathrm{M}=\mathrm{D}: \mathrm{FORA}=\mathrm{DTO} 99+\mathrm{T}$＊ SKSTEPSK：DRAW3，A，YTOA，Y ＋64：Y＝Y＋SK：NEXT
$A D 390 \quad S E=E / 8: Y=16: 0=50: Q=-1: C$ OLOR 3，2：FORA $=$ ØTOESTEPSE ：N1S＝STRS（INT（A））＋＂＝＂：N $M \$=S T R S(\operatorname{INT}(A)): N 2 \$="="$ ＋RIGHTS（NMS，LEN（NMS）－1） ：X＝8－LEN（N1\＄）－1：CHAR3，X ，Y，N1\＄
FF 400 CHAR $3,33, Y, N 2 S: Y=Y-1: I F$ $X<O T H E N P=X: O=X$
HA 416 IFQ＜LEN（N2\＄）THENR $=$ LEN（N 2\＄）： $\mathrm{Q}=\mathrm{R}$
AP 420 NEXT
GG 430 SC＝$(4 \theta-$ LEN（T $\$)) / 2:$ COLOR 3，5：CHAR 3，SC，1，T\＄，1
DC 440 COLOR $3,8: Y=8: F O R A=1 \mathrm{TOLE}$ $N(R S): R 2 \$=M I D S(R S, A, 1):$ CHAR 3，P，Y，R2S，1：CHAR 3，R $+33, Y, R 2 S, 1: Y=Y+1: N E X T$
PS 450 COLOR 3,9 ：IFFL $=1$ THENCHAR 3，21，22，Y1\＄：CHAR 3，31， 17 ，Y2\＄：CHAR 3，27，22，＂MONTH S＂：GOTO480
AF 460 Y1 $\$=$ STRS（SY）：Y $2 \$=$ STR（E Y）：IFEY $>99$ THENY $2 \$=$ STRS（ EY－10 0 ）
KQ 470 CHAR3， $20,22, \mathrm{Y} 1 \$:$ CHAR3， 3 $1,17, \mathrm{Y} 2 \mathrm{~S}:$ CHAR $3,27,22$ ，＂Y EARS＂
CK 480 COLOR $3,10:$ I $2 \$=S T R S(I T):$ CHAR 3，7，17，＂1＂：CHAR 3， 16 ，22，I $2 \$:$ CHAR3，7，22，＂ITE MS＂
PJ $49 \emptyset$ SC $=(4 \emptyset-$ LEN $(K \$)) / 2:$ COLOR 3，11：CHAR 3，SC，24，K\＄：COL OR3，C3
GE 500 IFBD $\$=$＂Y＂THENCOLOR 3，8：B OX3，0， $0,159,199:$ COLOR 3 ， C3
MC $51 \emptyset \mathrm{X} 2=80: Y 2=81+\mathrm{SP}: X 3=\mathrm{X} 2: Y 3$ $=Y 2: Y 4=81+S K: Y 5=Y 4: F O R A$ $=E Y-S Y+1-F L T O 1 S T E P-1: F O$ $\mathrm{RC}=1 \mathrm{TOIT}: \mathrm{VI}(\mathrm{C})=\mathrm{V}(\mathrm{A}, \mathrm{C}): \mathrm{N}$ EXTC：FORB＝1TOIT： $\mathrm{X}=\mathrm{X} 2-\mathrm{SP}$ $: Y=Y 2: F=(E-S) / 64: G=\emptyset: H=$ $\mathrm{X}+\mathrm{SK}-1: \mathrm{I}=\mathrm{Y}+\mathrm{SK}-1$
RQ 520 DRAW3，X，YTOX + SK $-1, Y+S K-$ 1： $\mathrm{Y}=\mathrm{Y}-1: \mathrm{G}=\mathrm{G}+\mathrm{F}: \mathrm{IFG}>=\mathrm{V} 1$（ B ）THEN $530:$ ELSE $52 \theta$
KR $530 \mathrm{~J}=\mathrm{X}: \mathrm{K}=\mathrm{Y}: \mathrm{DRAW} 1, \mathrm{H}, \mathrm{ITOH}, \mathrm{Y}+$ $S K: X=X 2+S K-2: Y=Y 4: G=\emptyset: H$ $=\mathrm{X}: \mathrm{I}=\mathrm{Y}$
DQ 540 DRAW1，$X, Y T O X-S P+2, Y+S P-$ 2： $\mathrm{Y}=\mathrm{Y}-1: \mathrm{G}=\mathrm{G}+\mathrm{F}: \mathrm{IFG}>=\mathrm{V} 1$（ B ）THEN55 6 ：ELSE54 $\sigma$
CP 550 DRAW $3, \mathrm{H}, \mathrm{ITOH}, \mathrm{Y}+1: \mathrm{X}=\mathrm{J}: \mathrm{Y}=$ $K: G=g: L=X+S P-1: M=Y-S P+1$
BA 560 DRAW $2, \mathrm{X}, \mathrm{YTOX}+\mathrm{SP}-1, \mathrm{Y}-\mathrm{SP}+$ $1 \mathrm{TOX}+\mathrm{SP}-1, \mathrm{Y}-\mathrm{SP}+2 \mathrm{TOX}, \mathrm{Y}+1$ $: \mathrm{X}=\mathrm{X}+1: \mathrm{Y}=\mathrm{Y}+1: \mathrm{G}=\mathrm{G}+1:$ IFG $>$ $=\mathrm{SK}-1$ THEN $57 \emptyset:$ ELSE56 0
GP 576 DRAW2， $\mathrm{X}, \mathrm{YTOX}+\mathrm{SP}-1, \mathrm{Y}-\mathrm{SP}+$ 1：DRAW1，J，KTOL ，MTOX＋SP－

1， $\mathrm{Y}-\mathrm{SP}+1: \mathrm{X} 2=\mathrm{X} 2+\mathrm{SK}: \mathrm{Y} 2=\mathrm{Y} 2$ ＋SK：Y4 $=\mathrm{Y} 4+\mathrm{SK}: \mathrm{NEXTB}: \mathrm{X} 2=\mathrm{X}$ 3－SP：Y2 $=Y 3+S P: Y 4=Y 5+S P$ ： $\mathrm{X} 3=\mathrm{X} 2: \mathrm{Y} 3=\mathrm{Y} 2: Y 5=\mathrm{Y} 4:$ NEXTA
QR 580 SLOW：COLOR 4，1：POKE 2 68 ，$\sigma$ ：GETKEYAS：GRAPHIC $\varnothing, 1:$ CO LORØ， 16 ：COLOR4， 7
DJ 590 PRINT＂ 22 DOWN \} \{BLK\}
\｛RVS\}SAVE GRAPH TO DISK $(\mathrm{Y} / \mathrm{N} / \mathrm{Q}) ?\{\mathrm{OFF}\}$ \｛RVS\} \｛OFE\}\{LEFT\}";
CH 6øØ GETKEYBS
MS 610 IFB $\$=$＂Y＂THENPRINT＂YES
\｛RVS\} \{OFE\}":SLEEPI:GOT 065
BS $62 \emptyset$ IFB $\$=" N$＂THENPRINT＂$N O$
\｛RVS\} \{OFF\}":SLEEP1:GOT 040
CP $63 \sigma$ IFB $\$=$＂Q＂THENEND
KP 640 GOTO 60 0
QX 650 GOSUB88
DD 660 FAST：BSAVE（SGS），B 0, P819 2TOP16383：SLOW：GOTO 900
HK 670 GOSUB88 6 ：GOSUB82 $\varnothing$
HF 68 Ø DOPEN\＃1，（SGS）：IFDS $\langle>$ ØTH ENGOSUB81 0 ：CLOSE1：GOTO6 70 ：ELSECLOSE1
KA 690 Tl＝1：GOSUB 870 ：FAST：BLOA D（SG§），B $\emptyset$, P8192：SLOW
JC $7 \emptyset 0$ GRAPHIC 3：POKE 208 ， $0:$ GETK EYB\＄：GOTO4 $\sigma$
PG 710 GRAPHIC3：COLOR $0,1:$ COLOR 4，1：POKE $2 \sigma 8, \sigma$ ：GETKEYBS： GRAPH IC 9 ：COLOR $\varnothing, 16$ ：COLO R4，7：RETURN
AE $72 \emptyset$ INPUT＂ 2 RVS $\}$ STARTING MON TH？$(1-12)\{O F F\}$
\｛2 SPACES\}1\{3 LEET\}";M1 ：IEMI＜1ORM1＞12THENPRINT ＂$(2$ UP\}": GOTO $72 \emptyset$
XH 730 M2 $=(\mathrm{ML}+12)-13:$ IFM $2=\emptyset \mathrm{THE}$ NM2 $=12$
BP 740 PRINT＂$\{$ RVS $\}$ ENDING MONTH ？（1－12）\｛OFF\} $\{2$ SPACES \} ＂M2；：INPUT＂ 55 LEET\}";M3 ：IFM 3 ＜1ORM 3 ＞1 2 THENPRINT ＂\｛2 UP\}": GOTO 740
QB 750 M ＝＂JANF EBMARAPRMAYJUNJ ULAUGSEPOCTNOVDEC＂：Y1S＝ MIDS（MS，MI＊3－2，3）：Y2\＄＝M IDS（MS，M3＊3－2，3）：SY＝ø：E $\mathrm{Y}=(12-\mathrm{M} 1)-(12-\mathrm{M} 3)+1:$ IFE $\mathrm{Y}<=\emptyset$ THENE $\mathrm{Y}=\mathrm{EY}+12$
SQ $760 \mathrm{FL}=1$ ：RETURN
SJ 776 PRINT＂\｛DOWN\} \{RVS\}NEED T O SEE THE DIRECTORY FIR ST？（Y／N）＂
QQ 786 INPUT＂$\{2$ SPACES $\} Y$
\｛3 LEET\}";DS: IFDS="N"TH ENRETURN：ELSEIFDS＜＞＂Y＂T HEN776：ELSEPRINT＂ （CLR\}"
FH 790 DIRECTORY：IFDS＜＞日THENGO SUB810：GOTO79
BM 80ø GETKEYAS：PRINT＂\｛CLR\}":R ETURN
DR 810 PRINT＂\｛DOWN\} "DS \$: GETKEY AS：PRINT＂$\{C L R$ \}": RETURN
XH $82 \sigma$ PRINT＂$\{$ RVS \}ENTER THREE \｛SPACE\}COLORS"
PB 830 INPUT＂COLOR $1\{2$ SPACES\} $15\{4$ LEFT $\}$＂；C $1:$ IFCl $<10 \mathrm{R}$ C $1>16$ THENPRINT＂$\{2 \text { UP }\}^{\prime \prime}$ ： GOTO83ø
MJ 840 INPUT＂COLOR $2\{2$ SPACES $\}$ 4\｛3 LEFT\}";C2:IFC2<1ORC 2＞16THENPRINT＂ 2 UP\}":G OTO 849
QK 850 INPUT＂COLOR $3\{2$ SPACES \} 7 \｛3 LEFT\}";C3: IFC3 <lORC $3>16$ THENPRINT＂$\{2 \mathrm{UP}\}^{\prime \prime}: \mathrm{G}$ OTO 850
MR 860 RETURN
SQ 876 COLOR $0,1:$ COLOR 4，T1：COLO

R1，C1：COLOR2，C2：COLOR3， C3：GRAPHIC 3,1 ：RETURN
EP 88ø GOSUB770：PRINT＂\｛RVS\}ENT ER NAME OF GRAPH（ $1-16$ \｛SPACE\}CHRS)"
GM 890 INPUTSGS：IFLEN（SG\＄）＜1OR LEN（SGS）＞16THENPRINT＂ \｛2 UP\}": GOTO89』: ELSERET URN
KG 900 IFDS＜＞0THENGOSUB810：GOT 0650：ELSE46

## Eight Thousand Dragons

See instructions in article on page 59 before typing in．

0801：बB 08 01 00 9E $32 \quad 30 \quad 36$ 0D ஏ809：31 98 日8 98 AD 8A 99 8D E8 6811：2の D6 A9 61 A2 68 9D B1 CC 6819：09 6A CA D® F9 A9 FF 8D 9A 6821：बF D4 A9 8छ 8D 12 D4 8D 17 0829：18 D4 Aø $6 \emptyset$ AD 8B 69 日A 46 9831：ØA GA GA GD 8A 9999 g6 86 0839：84 99 g6 65 99 90669974 6841： 6067 C8 D6 F1 A9 ø6 A2 12 0849： 0 F 9D 93 69 CA D 9 FA A9 84 6851：18 8D 18 D $\varnothing$ AD 11 D 69 3D 6859：20 8D 11 Dø A9 $0 \varnothing 85$ FB 60 6861：A2 $2 \varnothing 86$ FC Aの 0091 FB 8 F 6869：C8 D $\varnothing$ FB E6 FC CA Dø F4 A9
 6879：Cg FF D 0 F8 A9 6085 FD 6B 0881：A9 8485 FE A9 6485 FB ØE 0889：A9 3485 FC A6 06 A9 80 D4 8891：91 FB A 00 A2 0018 BD 80 6899：95 69 7D A3 99 7D A4 69 31
 98A9：C8 E8 Eの ØE D® E8 9829 D9 98B1： 87 A8 B9 8С 99 8D C 69877 98B9： $\mathrm{B9} 9 \mathrm{8D} 99$ 8D C1 98 4C FF CA 08C1：FF E6 FD A5 FD 2967 AA F2 08C9：Dの 6D A5 FB 18690885 F5 の8D1：FB A5 FC 69 g6 85 FC 4 C DB 08D9：42 99 E6 FE A5 FD 290798 68E1：AA A5 FE 2967 D 810 E6 A5 व8E9：FC A5 FB $18 \quad 693985 \mathrm{FB}$ 1A 08F1：98 62 E6 FC 4C 42 g9 E6 DB Ø8F9：FB FG $\mathrm{F7}$ 4C 42 99 C6 FD C9 6901：A5 FD 29 97 AA C9 97 D® 56 9909：38 A5 FB 38 E9 9885 FB 1A 6911：A5 FC E9 0685 FC 4 C 42 6D 6919：69 C6 FE A5 FD 2987 AA E8 6921：A5 FE $29 \quad 67$ C9 87 D 61677 6929：C6 FC A5 FB 38 E9 3985 B3 0931：FB B6 0E C6 FC 4C $42 \quad 0942$ 9939：A5 FB 38 E9 6185 FB 9699 6941：F2 A 90 B1 FB 1D B2 99 D2 6949：91 FB EE B1 69 A2 GE BD C8 6951：A3 б9 C9 92 D 6 ØB A9 96 D6 9959：9D A3 69 FE A2 99 CA D6 D3 6961：EE AD A3 69 D6 83 4C 93 1A 6969：08 20 E4 FF C9 60 F6 F9 4E 0971：C9 51 F6 12 A＠ 62 AD 1B 7F 0979：D4 $296199 \begin{array}{llllll}94 & 99 & \text { C8 C8 } & 15\end{array}$
 9989：E5 0608 C 208 DB 08 FF 7 B


## Excelfont 80

See instructions in article on page 56 before typing in．

## Program 1：EXCEL．LDR

HE 16 REM COPYRIGHT 1988 COMPU TE！PUBLICATIONS，INC．－ ALL RIGHTS RESERVED
PD 26 GRAPH IC 1，1：GRAPHIC $\emptyset, 1:$ FA

ST：POKE2606，8：POKE2607， 2 4：GRAPH IC5，1：SYS 52684，8， 12：SYS52684，24，28：SYS526 84，96，34：COLOR6，15
XF $3 \varnothing$ PRINT＂\｛WHT\} （5 $^{\circ}$ DOWN\}"TAB ( 10）＂$\left\{\begin{array}{c}\text { \} } \\ \text { CCCCCCCCCCCCCCCC }\end{array}\right.$ $\mathbf{~ C C C C C C C C C C C C C C C C C C C C C C}$ CCCCCCCCCCCCCCCC $\{5$ \}
EQ 46 FORI $=$. TO2：PRINTTAB（16）＂B ＂TAB（69）＂B＂：NEXT
CQ 50 PRINTTAB（ $\overline{1} \sigma$ ）＂B＂TAB（34）＂E XCELFONT 80 ＂TAB（69）＂B＂
QS 60 PRINTTAB（ 10 ）＂$\underline{\text {＂}}$＂TAB $(6 \overline{9})$＂$\underline{B}$
DD 76 PRINTTAB（16）＂B＂TAB（26）＂（ C） 1988 COMPUT̄E！PUB．，I NC．＂TAB（69）＂B＂
 LL RIGHTS RESERVED＂TAB（6 9）＂B＂
RQ 90 PRINTTAB（10）＂B＂TAB（69）＂B
KR 100 FORI $=. \operatorname{TO2}: \operatorname{PRINTTAB(10)}$
B＂TAB（69）＂B＂：NEXT
MQ 116 PRINTTAB（ $1 \bar{\emptyset}$ ）＂$\{z\} \operatorname{CCCCCCC}$
 CCCCCCCCCCCCCCCCCCCCCCC CCCCC $\{X\}$＂：SYS52684，．．， 34
KA $12 \emptyset$ CHAR1， 33,16 ，＂LOADING \｛2 SPACES $\}$ ML．．．＂：BLOAD＂ EXCEL．OBJ＂：BLOAD＂EXCEL． OBJI＂
JR $13 \emptyset$ CHAR1，33，16，＂SETTING \｛2 SPACES\}UP...": GOSUB1 50
JA 140 CHAR1，28，16，＂$\{$ WHT $\}$ LOADI NG MAIN PROGRAM．．．＂：CLR ：RUN＂EXCEL．BAS＂
FH 150 POKE26日6，．：POKE2607，16： PRINT＂\｛CLR\}"
MR 160 PRINTTAB（34）＂$\{\mathrm{B}\}\{$（WHT $\}$ EX CELFONT $89^{\prime \prime}$
QS $17 \varnothing$ PRINT＂\｛CYN\}\{3 SPACES\} （B） 12345678 ＂CHRS（130）＂ \｛2 SPACES\}\{YEL\} \{A\}CCCCC
 $\mathbf{\text { ccccccccccccccccccccccc }}$ ccccccccccccc $\{5\}$
EB $180 \overline{\text { FORI }=1 T O 4: P R I N T "\{C Y N\} " S ~}$ TR $\$(I)$＂$\{\mathrm{M}\}$＂SPC（8）＂$\{\mathrm{G}\}$ \｛YEL\}B"SPC (64)"B": NEXT
BC 190 PRINT＂$\{C Y N\} 5\left\{\mathrm{M}^{\circ}{ }^{\circ} \mathrm{SPC}(8)\right.$ ＂$\{\mathrm{G}\}$ \｛YEL\} $\{\mathrm{Z}\} \mathrm{CCCCCCCCC}$ $\mathbf{~ C C C C C C C C C C C C D C C C C C C C C ~}$ $\mathbf{~ C C C C C C C C C C C C C C C C C C C C C C C ~}$ CCCCCCCC $\{x\}$
AJ 206 PRINT＂\｛CYN\} 6 \｛M\}"SPC (8) ＂$\{\mathrm{G}\}\{$ WHT \} \{A\}CCCCCCCCCC CCCCCccccccccecchelp ME Nuccceccecceccecceccccc cccccccess？＂
MC 210 FORI＝7TO9：PRINT＂\｛CYN\}"S TRS（I）＂\｛M\}"SPC (8)"\{G\} （WHT\} ${ }^{\text {B＂SPC（64）＂B＂：NEXT }}$
DM 226 FORI $=\overline{1} \emptyset T O 16:$ PRI $\bar{N} T "\{C Y N\}$ \｛LEFT\}"STR\$(I)"\{M\}"SPC(
8）＂\｛G\} \{WHT\}B"SPC (64)"B ＂：NEXT
JR 236 PRINT＂\｛CYN\}\{3 SPACES\} \｛8 T \} \{ 2 SPACES $\}\{W H T\}\{Z\}$
 $\mathbf{~ C C C C C C C C C C C C C C C C C C C C C C C ~}$ CCCCCCCCCCCCCCCCCC $\{x\}^{\prime \prime}$
JR 240 PRINT＂$\{6\}\left\{\begin{array}{c}\text { \} } \\ \text { CCCCCCCCCC } \\ \hline\end{array}\right.$ \｛S \} \{PUR\}\{A\}CCCCCCCCCCC $\operatorname{cccccccccccc} \overline{\operatorname{ccccccccccc}}$ $\mathbf{~ c c c c c c c c c c c c c c c c c c c c c}$ CCCCCCC\｛S\}"
KG $25 \emptyset$ PRINT＂$\{6\}$ B WRAP \｛2 SPACES\}ON B \{PUR\}B"S PC（64）＂B＂
SB 260 PRINT＂$\{\overline{6}\}$ B $\{3$ SPACES \}WHO

LE\｛2 SPACES\} B \{PUR\}B"SP C（64）＂B＂
MH 278 PRINT＂$\{6\}$ B SIZE \｛5 SPACES\}B \{PUR\}B"SPC( 64）＂B＂
JJ 280 PRINT＂ $\mathbf{~} 6$ 6\} CHRSET
\｛3 SPACES\}B \{PUR\}B"SPC( 64）＂B＂\｛53 SPACES $\}$＂
AF 290 PRINT＂$\{6\}\{z\} \operatorname{CCCCCCCCC}$ \｛X\} \{PUR\} $\{2\}$ CCCCCCCCCCC
 © $\operatorname{ccccccccccccccccccccc}$ CCCCCCC $₹ \times\}$＂；
SP 300 POKE2606，8：POKE2607，24： SYS 4864 ：RETURN

## Program 2：EXCEL．BAS．

BS 10 TRAP1ø20：BANK15：MAS＝＂ \｛UP\}\{RIGHT\} \{DOWN\} \{LEET\}D SLYGHB 8462 WPRR\｛RVS $\}$ FM \｛CLR\}N OON $\left\{\right.$ HOME QTEC（A ${ }^{\prime \prime}$ ：SYS $2 \overline{4} 8 \overline{1} 2,, 9,$, CHRS（1）
RJ 26 FORI $=$ ．TO48：SYS 3072,34 ， I ： SYS $3072,35,96-I: N E X T$
JR 30 SYS $3072,12,6: S Y S 3072,13$ ， 6：SYS $3672,26,16:$ POKE 2666 ，$\sigma:$ POKE $2607,16:$ COLOR6，1： SLEEP1
QP 40 FORI $=$. TO48： SYS $3072,34,48$ －I：SYS $3 \varnothing 72,35,48+\mathrm{I}$ ：NEXT
RJ 50 FORI $=1$ TO8： $\operatorname{READX}(\mathrm{I}), Y(\mathrm{I}):$ NEXT
KR 60 IFPA＜＞．THENSYS 3114, PA／25 6，PAAND 255,7 ：SYS $3114, \mathrm{CA}$ 256，CAAND255，141
JC 76 WINDOW14， $26,77,23,1$ ：PRIN TCHR（142）＂\｛WHT\}(U)PPERC ASE OR（L）OWERCASE？＂：GET KEYAS：IFAS＝＂U＂THENCC＝．：I ＝208：ELSEIFAS＝＂L＂THENCC＝ $1: \mathrm{I}=216$ ：ELSE7 $\varnothing$
GB $8 \varnothing$ INPUT＂\＃OF EDITING ROWS（ 1－16）＂；R：R＝R－1：IFR＜．ORR＞ 15THEN8ø
CJ 90 WINDOW1，20，10，23：CHAR1，7 3，CHRS（153）＋STRS（CC）
ER 106 IFR＜10THENA $="$＂：ELSEAS ＝＂＂
SB 110 A $\$=A \$+S T R \$(R): C H A R 1,5,2$ ，AS
PA 120 BANK14：SYS 3899, I：BANK15 ：SYS 3784
BR $130 \mathrm{CX}=.: \mathrm{CY}=.: S Y \mathrm{~S} 3254,48, \varnothing$ ： SYS 3289 ：$X=,: Y=.: P A=4259$ ：SYS $3114,16,174,181: C A=$ 4270：SYS $3114,16,163,59$ ： $\mathrm{AH}=48: \mathrm{AL}=.: \mathrm{W}=1$
BK 140 SYS 3158, AH，AL：SYS 3289
RF 150 WINDOW14，26，77，23，1
DC $160 \mathrm{~J}=\mathrm{JOY}(2):$ IFJ $=$ ．THENB $=$. ：$G$ OTO268
RG 179 IFJ $>127$ THEN23 ${ }^{\circ}$
HD $180 \mathrm{~B}=$ ．
BK 190 SYS $3114, \mathrm{PA} / 256$, PAAND 255 ，15： $\mathrm{X}=\mathrm{X}+\mathrm{X}(\mathrm{J}): \mathrm{Y}=\mathrm{Y}+\mathrm{Y}(\mathrm{J})$
ED 200 IF $(X<$.$) OR（ X>7$ ）THENX $=X-X$ （J）
HC $21 \emptyset$ IF $(\mathrm{Y}<) .\mathrm{OR}(\mathrm{Y}>15)$ THENY $=\mathrm{Y}-$ $\mathrm{Y}(\mathrm{J})$
MP 220 PA $=\mathrm{Y} * 86+\mathrm{X}+4259: S Y S 3114$ ， PA／256，PAAND255，59：GOTO 260
CX $230 \mathrm{~J}=\mathrm{JAND} 15:$ IFB＝1THEN25
PA $240 \mathrm{~B}=1$ ：SYS 3125 ，（PA－4996）／2 56，（PA－4096）AND255：RREG ，，S：IFS $>32$ THENS $=.:$ ELSES $=1$
JD 250 SYS $3220,8-X, Y, S: S Y S 3158$ ，AH，AL：SYS $3254, A H, A L: S Y$ S3289：IFJ＝．THEN260：ELSE GOTO19ø
KK 260 GETAS：A＝INSTR（MAS，AS）：I

FA＝．THEN160
BS 270 IFA 55 THEN 306
JR $280 \mathrm{~A}=\mathrm{A}-4$ ：ONAGOTO $350,380,40$日，42の，43 $0,440,450,460,4$ $70,480,490,500,520,540$ ， $550,560,570,580,600,610$ ，630，640，650，660，670，68 0，690，780
SQ $290 \mathrm{~A}=\mathrm{A}-28$ ：ONAGOTO 790，80 80
DE $300 \quad A=A * 2-1: C X=C X+X(A): C Y=C$ $\mathrm{Y}+\mathrm{Y}(\mathrm{A}): S Y S 3114, \mathrm{CA} / 256, \mathrm{C}$ AAND 255， 141
PG 310 IF $(C X<$.$) OR (C X>63)$ THENCX $=C X-X(A)$
QB $32 \sigma$ IF（CY＜．）OR $(C Y>3)$ THENCY $=$ $C Y-Y(A)$
JM $330 C A=C Y * 80+C X+427 \theta$ ：SYS 312 5，$(C A-4096) / 256,(C A-469$ 6）AND $255:$ RREG，，$C: A D=122$ $88+C$＊ $16: A L=A D A N D 255: A H=$ AD／256
AQ 340 SYS 3254，AH，AL：SYS 3289：S YS $3114, C A / 256$, CAAND 255 ， 181：GOTO160
RJ 35 Ø POKE 2606,8 ：POKE 2607，24： PRINT＂$\{$ WHT \} \{ 2 HOME $\}$
\｛CLR\}":FORI =8TO.STEP-1: SYS 3072,23, I：FORD $=$ ，TO99 ：NEXT：NEXT：SYS $3 \boxed{72,12,8}$ ：SYS $3072,13,0:$ SYS 3072,2 ＠，24：SYS 3 Ø72，23，8：DIREC TORY
PD 360 PRINT＂\｛RVS\}PRESS ANY K EY TO CONTINUE＂：GETKEYA \＄：FORI＝8TO．STEP－1：SYS3 $\sigma$ 72，23，I：FORD $=$ ．TO99：NEXT ：NEXT：SYS $3072,34,96: F O R$ D＝．TO99：NEXT
JP 376 SYS $3072,12,0: S Y S 3072,13$ ，日：SYS $3072,20,16:$ POKE 26 06， 0 ：POKE2607，16：SYS307 $2,34,:$ FORI $=$. TO8：FORD $=$ ． TO99：NEXT：SYS 3＠72，23，I： NEXT：GOTO16
KS 380 SYS 3744 ：WINDOW14，20，77， 23，1：INPUT＂$\{$ WHT \} SAVE FI LENAME＂；FS：IFES＝＂＂THEN1 50
SQ 390 BSAVE（FS），P8192TOP12288 ：GOTO15
PG $40 \theta$ WINDOW14， $20,77,23,1:$ INP UT＂$\{W H T\}$ LOAD FILENAME＂； FS：IFE\＄＝＂＂THEN150
JJ 410 BLOAD（ES），P8192：SYS 3784 ：SYS 3254, AH，AL：SYS 3289 ： GOTO15 1
BE 420 SYS $3568, \mathrm{~W}, \mathrm{X}:$ GOTO14 $\varnothing$
SJ 430 SYS $3443, W, Y: G O T O 14 \theta$
PP 440 SYS $3419, W, Y: G O T O 14 \theta$
XM 450 SYS 359 ，W，X：GOTO14』
RR 460 SYS $367 \emptyset$ ，W，R：GOTO14 $\varnothing$
MJ 478 SYS 3612 ，W：GOTO14 9
KS 480 SYS 3641 ，W：GOTO14 $\varnothing$
RR 490 SYS $3711, W, R: G O T O 140$
CB $50 \sigma \mathrm{~W}=\mathrm{XOR}(\mathrm{W}, 1)$ ：WINDOW1， 20,1 $0,23:$ IFW $=1$ THENW $\$="\{6\} 0$ N＂：ELS EW $\$="\{6\} O F F "$
PP 510 CHARI，6，，W\＄：GOTO160
PB $52 \theta \quad \mathrm{P}=\mathrm{XOR}(\mathrm{P}, 1)$ ：WINDOW1， $2 \theta, 1$ 0,23 ：IFP＝1THENP $\$=$＂$<6 \$ \mathrm{PA}$ RT＂：ELSEPS＝＂\｛6\＄WHOLE＂
HX 530 CHAR 1，3，1，P $\$$ ：GOTO160
DG 540 SYS 3486：GOTO14 0
PB 55 SYS 3527：GOTO14 6
QP 560 GOSUB 590 ：SYS 3406 ，T：GOTO 148
GQ 570 GOSUB590：SYS 3196 ：SYS 338 9，T：GOTO148
DJ 580 GOSUB590：SYS 3196 ：SYS 346 7．T：GOTO140
QB 590 IFP＝1THENT＝Y：RETURN：ELS ET $=$ R：RETURN

DB 60 6 SYS 3136：GOTO14
SQ 610 WINDOW14，20，77，23，1：PRI NT＂ARE YOU SURE？＂：GETKE YAS：IFAS＝＂N＂ORAS〈＞＂Y＂TH EN150
AC 620 BANK14：SYS $3890,208+C C * 8$ ：BANK15：SYS 3784：S YS 3254 ，AH，AL：GOTO140
RX 63＠GOSUB59ø：SYS 3196 ：SYS 382 Ø，T：SYS 32 ø8：GOTO140
ER 640 SYS $3949:$ GOTO160
JJ 650 SYS 3961：GOTO14
BP $660 \mathrm{RA}=(2 \sigma 8+\mathrm{CC} * 8) * 256+(\mathrm{C} * 8)$ ：BANK14：FORI＝．TO7：POKE2 $816+\mathrm{I}, \mathrm{PEEK}(\mathrm{RA}+\mathrm{I}):$ NEXT： F ORI＝8TO15：POKE $2816+\mathrm{I}$ ，．： NEXT：BANK15：GOTO148
EG 670 SYS 3114, PA／256，PAAND 255 ，15： $\mathrm{X}=.: \mathrm{Y}=.: \mathrm{PA}=4259: \mathrm{SYS}$ 3114，PA／256，PAAND 255,59 ：GOTO160
SQ 680 WINDOW14，20，77，23，1：PRI NT＂$\{$ WHT $\}$ QUIT CHARACTER \｛SPACE\}SET": PRINT"ARE Y OU SURE？＂：GETKEYAS：IFAS ＝＂N＂ORAS〈＞＂Y＂THEN150：EL SEGOTO6
GA 690 IFR＝7ORR $=15 \mathrm{THENV}=\mathrm{R}$ ：$G O T O$ 710
AF 700 WINDOWI $4,20,77,23,1$ ：INP UT＂$\{$ WHT \} \# CHARACTER ROW S USED FOR ACTUAL DISPL AY $(8 / 16)$＂；V：V＝V－1：IFVく＞ 7ANDV＜＞15THEN7Ø 7
QS 710 FORI $=8 \mathrm{TO}$ ．STEP－1：SYS 3672 ，23，I ：FORD $=$ ．TO99：NEXT：N EXT：SYS $3672,34,96$
EP $72 \sigma$ IFV＝15THENSYS $3672,4,15$ ： SYS $3072,5,6:$ SYS $3072,6,1$ 2：SYS $3672,7,15:$ SYS 3972 ， 9，15：WINDOW0， $0,79,11: S Y$ S3＠72，11，15：ELSEPRINT＂ \｛2 HOME \}"
AQ 730 POKE2606，8：POKE2607，24： PRINTCHR\＄（11）＂$\{$ WHT \}
\｛CLR\}";:SYS $3672,12,8: S Y$ S $3072,13,0: S Y S 3672,2 \emptyset, 2$ 4
AC 746 PRINTCHRS（142）TAB（34）＂S AMPLE FONT＂：PRINTTAB（18 ）＂\｛DOWN \} \{CYN\}PRESS ALT \｛SPACE\} TO RETURN TO MAI N SCREEN $\{$ WHT $\}$＂CHRS（14）
AF 750 SYS 3072,34, ：FORI $=$ ．TOV： FORD $=$ ．TO99：NEXT ：SYS 3672 ，23，I：NEXT：SYS 3973 ：FORI $=12$ 畀O113STEP－1：SYS 3672 ，22，I：FORD $=$ ．TO99：NEXT：N EXT：FORD＝．TO99：NEXT
MH 760 IFV $=15 \mathrm{THENSYS} 3072,4,32$ ： SYS $3072,5,224$ ：SYS 3072,6 ，25：SYS $3072,7,29:$ SYS 307 2，9，231：SYS $3672,23,232$ ： SYS $3072,11,7$
PR 770 SYS $3072,12,6: S Y S 3072,13$ ，0：SYS $3072,20,16$ ：POKE 26 06,0 ：POKE 2607,16 ：PRINTC HR\＄（142）：WINDOW14，20，77 ，23，1：FORI $=113 \mathrm{TO} 12 \sigma:$ FOR D＝．TO99：NEXT：SYS 3072,22 ，I：NEXT：GOTO16 6
KM 780 SYS 3997：GOTO140
GD 790 SYS4019：GOTO140
XE $8 \emptyset \emptyset$ WINDOW $14,8,77,17,1: \mathrm{H}=\mathrm{H}+$ 1： $\mathrm{IFH}=4 \mathrm{THENH}=1$
CQ 810 ONHGOTO82 $0,910,970$
PF 820 PRINT＂$\{$ WHT\} \{B\}CHARACTER EDIT FEATURES＂SPC（11）＂ \｛B\}MISC. FEATURES"
CQ 830 PRINT＂$\{3$ SPACES $\}$ R
\｛3 SPACES \}- ROTATE CLOC KWISE＂SPC（12）＂T
\｛3 SPACES $\}$－TYPE／TRY FO NT＂
MK 840 PRINT＂SHFT－R－ROTATE C OUNTERCLOCKWISE
\｛2 SPACES \} CMMD-9 - REV \｛SPACE\}1ST TO 2ND HALE"
XG 850 PRINT＂CTRL－R－REVERSE＂
SPC（21）＂O \｛3 SPACES \}- RE
STORE CHAR＂
SJ 860 PRINT＂ 33 SPACES $\}$
\｛3 SPACES \}- ELIP"SPC(21
）＂SHFT－0－STASH CHAR＂
QA $87 \emptyset$ PRINT＂ 33 SPACES $\} M$
\｛3 SPACES\}- MIRROR"SPC(
19）＂SHFT－N－RESTORE RO M CHAR SET＂
XE 880 PRINT＂$\{3$ SPACES $\} E$
\｛3 SPACES\}- EXPAND CHAR
＂SPC（17）＂Q \｛3 SPACES \}- Q UIT CHAR SET＂
DS 890 PRINT＂$\{3$ SPACES $\} C$
\｛3 SPACES $\}$－COMPACT CHA
R＂：PRINT＂SH－CLR－CLEAR CHARACTER＂
XG 900 PRINT＂$\{3$ SPACES $\} N$
\｛3 SPACES \}- RESTORE ROM CHAR＂；：GOTO16
FS 910 PRINTSPC（23）＂$\{$ WHT $\}\{B\}$ SC ROLLING FEATURES＂
FP 920 PRINTSPC（7）＂SCRL UP＂SPC （32）＂SCRL COL UP＂
BS 930 PRINTSPC（ 10 ）＂$\{6\} 8$＂SPC（4 Ø）＂Y＂：PRINT＂\｛DOWN \}
\｛WHT \} SCRL"SPC (11) "SCRL" SPC（22）＂SCRL＂SPC（11）＂SC RL＂
RA 940 PRINT＂LEFT $\{6\} 4$＂SPC（7） ＂6 \｛WHT\}RIGHT"SPC (21)"R OW \｛2 SPACES \} $\{6\} G^{\prime \prime}$ SPC（7） ＂H \｛WHT\}ROW"
CM 950 PRINTSPC（42）＂LEFT＂SPC（1 1）＂RIGHT＂：PRINTSPC（16）＂ \｛6\}\{DOWN\} 2 ＂SPC（40）＂B＂
XC 960 PRINTSPC（6）＂$\{$ WHT $\}$ SCRL D OWN＂SPC（ 30 ）＂SCRL COL DO WN＂；：GOTO160
QF $97 \emptyset$ PRINT＂$\{$ WHT \} \{B\}DISK COMM ANDS＂SPC（21）＂\｛B\}TOGGLES

EK 980 PRINT＂$\{3$ SPACES $\} D$
\｛3 SPACES $\}$－DIRECTORY＂S PC（16）＂W\｛3 SPACES \} - WRA P ON／OFF＂
HA 990 PRINT＂$\{3$ SPACES $\}$ S
\｛3 SPACES\}- SAVE CHAR S
ET＂SPC（12）＂P \｛3 SPACES \}-
PART／WHOLE CHAR EDIT＂
CH $10 \emptyset \emptyset$ PRINT＂$\{3$ SPACES $\} L$
\｛3 SPACES \} - LOAD CHAR \｛SPACE\}SET": PRINT"
\｛3 SPACES \}@\{3 SPACES \}DOS COMMAND＂：PRINT＂
\｛B\} \{DOWN\} CURSOR FEATUR ES＂
RA $1 \emptyset 1 \emptyset$ PRINT＂HOME $\{2$ SPACES $\}$－ HOME CHAR EDIT CURSOR
＂：PRINT＂CURSOR＂：PRINT＂ KEYS \｛2 SPACES \}- MOVE
\｛SPACE\}CHAR SELECT CUR SOR＂；：GOTO16
RJ 1 g2 $\sigma$ IFAS＝＂\｛STOP\}"THENSTOP
XG 1030 IFDS〈〉．THENPRINTDS $\$:$ RE SUME168
XH $104 \sigma$ DATA．，$-1,1,-1,1, \ldots, 1$, ．，1，$-1,1,-1, \ldots,-1,-1$

## Program 3：EXCEL．OBJ．

 øC 日8：8E Ø1 D6 6曰 8D 日の D6 2C CE日C10：00 D6 10 FB AE 01 D6 6027 ØC18：8E 30 日B AA A9 $12 \quad 20$ Ø日 65

日C20：वC A9 13 AE 30 日B 20 00 E3 9C28：日C $60 \quad 2018$ OC 98 AA A9 A5
 ØC38：A9 1F 20 日C 日C 8A A8 60 ED ØC46：A2 $0^{\circ}$ A9 96 9D 06 日B CA 76 ØC 48：10 FA 60 A2 日F A9 00 9D 1A gC50：10 GB CA 18 FA $68 \quad 2818$ 3F ØC58：ØC AØ Ø0 A9 1F BE 60 ØB 38 ØC60：20 日6 日C C8 C 810 D 8 F5 74
 ØC70：BE 10 日B 20 日の 日C C8 C 0 D1 øC78：18 D8 F5 68 A2 0 FE BD 06 5E

 ØC 90 ：CA 16 F7 $60 \quad 8 \mathrm{E} \quad 31$ ØB AA 11 gC98：38 A9 00 2A CA D 0 FC AE 1C
 ØCA8：3D 60 GB 9D 00 ØB 60 1D A 4 ØCB0： 06 日B 9D 00 日B 60201871 ØCB8：ØC A9 1F Ag 日0 20 ØC ØC D3 øCC0：8A 99 gの 日B A9 1F C8 C 61 ØCC8：10 D 0 F2 6048 8A 4820 9E ØCD $0: 46$ ØC 68 AA 68 2g 56 ØC 46 ØCD8：60 A9 A3 8D 39 ØB A9 øØ 22 8CE 0：8D 3A 日B 8D 3B 9B 8D 3D E6 ØCE8： 6 B AC 3 B 6B B9 60 6B 8D 3B


 9D98：3D GB C 97 Eg 日E EE 3D E6 ØD10：0B EE 39 日B D6 63 EE 3A ED GD18：ØB 4C F2 GC 18 AD 39 GB DE GD20：69 49 8D 39 GB AD 3A GB 15 GD 28：69 G日 8D 3A GB EE 3 B GB E1
 gD38：C0 10 D $\varnothing$ AD 60 A8 A2 0096
 gD48：10 F6 2088 ØC 60 A8 B9 A1 6D 50：00 6B 49 FF 99 g0 日B 88 Cl ØD58：10 F5 68 C9 90 D $\emptyset 64$ 5E 4A
 GD68： 61 60 A9 80 1D 60 gB 9D F4 6D76：00 日B 60 C9 00 D6 64 1E 5F
 9D86： 61 60 A9 61 1D 60 日B 9 D 15


 ØDA＠：ØC A9 Ø1 8D 38 ดB A2 ด6 57 GDA8：A 97 AD 38 GB 5 E Ø日 $\quad$ GB EA ØDB6：90 661910 बB 9910 日B A2

 ØDC8：4B 日C A9 80 8D 38 ØB A2 CE ØDD $0: 60$ A 697 AD 38 GB 1 E 96 FB
 GDEG： $0 B \quad 88 \quad 16$ EF $4 \mathrm{E} \quad 38$ ØB E8 F 5 ØDE8：Eの 10 D $\varnothing$ E5 2088 日C 60 8B
 ØDE 8：ØD AD 30 日B AE 31 ØB 202 C
 gE व8：बB 8E 31 बB $2 \varnothing 9 \mathrm{E}$ ØD AD 67 ØE16：30 日B AE 31 日B $2 \varnothing 73$ gD BC gE18：20 C7 ØD 60 AB A2 ØF 1E E9
 ØE28：90 9B BD 90 9B 99 01 9D 23 ØE30：00 日B D $\emptyset 6128$ CA 10 E7 AD 0E38：60 A8 A2 0E 5E व0 6B $98 \quad 95$
 ØE48：00 日B 69 80 9D 00 0B D0 24 6E50：01 28 CA 10 E7 60 A8 AD 11 ØE58： 00 日B 8D 3 C ØB E8 8E $31 \mathrm{F6}$
日E68：日A E8 EC 31 日B D 0 E4 C6 BA बE76：00 FG 67 AD 3 C 9B 9D FF CD ØE78：6A 60 A9 06 4C 76 ØE A8 E7日E80：BD 00 日B 8D 3C 日B CA BD 17 のE88：00 0B 9D 01 ØB CA 10 F7 C6 gE90：C0 00 F0 97 AD 3C 9B 8D 9D ØE98：00 ØB 60 A9 96 4C 97 ØE 8C बEA0：A9 10 8D 39 ØB A9 20859 F ØEA8：FB A9 60 AA 85 FA A9 3073 ØEB6：2Ø 18 ØC Aの Øø A9 1F $2 \emptyset 73$曰EB8：日C gC 8A 91 FA C8 Dø F5 DA बEC $\emptyset: E 6$ FB CE 39 GB D $\varnothing$ EE $6 \varnothing 96$

ØEC8：A9 2685 FB A9 00 AA 85 5A gED6：FA A9 302018 日C Ag 06 GE GED8：B1 FA AA A9 IF 26 gg gC 62 øEE0：C8 D6 F5 E6 FB A5 FB C9 FA
 GEF0：36 8D 3A 日B A9 38 8D 3B 65 GEF8：GB A9 908 BD 39 日B AD 3A 69日F06：बB AE 39 बB 26 B6 GC AD C8日F08：36 日B 2g 4E gD AD 3B 日B 8D GF10：AE 39 日B 20.56 gC 18 AD F7 ＠F18：39 ØB 69 10 8D 39 ØB 90 BB बF20：gE EE 3B gB EE 3A GB AD 3D
 GF30：FE GE 85 FB A9 2085 FD 98 बF 38：A9 66 85 FA 85 FC Aの 06 EC gF40：B1 FA 91 FC C8 C 068 D 022 0F48：F7 189865 FA 85 FA 9646日F50：02 E6 FB A9 60 91 FC C8 4C gF58：Cg 18 D＠F9 189865 FC 7 F 0E60：85 FC 90 62 E6 FD A5 FD 2B日F68：C9 3g D 0 D2 60 A2 日F BD 28日F70：日6 ØB 9D 20 ØB CA 10 F7 A2 gF78：60 A2 日F BD 2g 日B 9D 60 95 9F80： 6 B CA 10 F7 60206 F CD 88 ØF88：20 E4 FF D6 ØA A5 D3 29 B4 9F96： 68 E6 F5 28 9F CD 60 26 C4 0F98：D2 FF 4C 85 日F A2 07 A 1 B3 बFAg： 0 F BD 90 日B 9918 日B $88 \quad 12$ ØEA8：99 10 ØB 88 CA 10 F2 26 1E のFB $: 88$ 日C 60204 B 日C A2 67 FA 0EB8：AØ 日E B9 00 日B 9D 10 日B DB ØFC $0: 88$ 88 CA 10 F5 2088 日C EC


## Program 4：EXCEL．OBJ1．

1300：A9 06 8D 36 日B 8D 38 6B 1A 1308：8D 3 C बB AE 36 GB BD 54 FD 1310：13 8D 39 GB BD $58 \quad 13$ 8D FD 1318： 3 A 日B A2 $\quad 3 \mathrm{~F}$ 8E 38 日B AD 7 F 1320：3A 日B AE 39 日B AC 3 C 日B 1E 1328：28 2A 日C 18 AD 3A $\mathrm{gB}^{29} \mathrm{Cl}$ 1330：10 AE 39 日B AØ 8D 20 2A 87 1338：वC EE 3C 日B EE 39 वB D 0 9B 1340：03 EE 3A 日B CE 38 GB 1019 1348：D6 EE 36 ดB AE 36 日B E 052 1350：04 90 B8 6ø AE FE 4E 9E 66 1358：00 00 01 01 00 00 00 00 AE

## Program 5：EXCEL．UTL．

XC 10 GRAPHIC5，1：COLOR6，1：PRIN TCHRS（142）CHRS（5）；： $\mathrm{IFT}=$ ． THENT $=1$ ：BLOAD＂EXCEL．OBJ2

HA 26 PRINTSPC（32）＂\｛B\}EXCELFON T UTILITY＂：PRINTSPC（27）＂ （DOWN\}\{YEL\}1) COMBINE CH ARACTER SETS＂：PRINTSPC（2 7）＂2）DIRECTORY＂
CG $3 \emptyset$ GETAS：A＝VAL（AS）：IEA $\langle>1$ IAN DA＜＞2THEN3 $\sigma$
ES 40 ONAGOTO 0 ， 76
QE 50 INPUT＂\｛DOWN\}\{PUR\}EXCELFO NT CHARACTER SET \｛WHT\}1 \｛PUR\} FILENAME";FIS:INPU T＂\｛PUR\}EXCELFONT CHARACT ER SET \｛WHT\}2\{PUR\} FILEN AME＂；F2S：INPUT＂\｛DOWN\}\{6\} MERGED CHARACTER SET FIL ENAME＂； F 3 S
XD 60 BLOAD（E1\＄），P8192：BLOAD（F 2\＄），P12288：BSAVE（F3\＄），P8 192TOP16383：GOTO1б
SC 76 DIRECTORY：PRINT＂\｛DOWN\} \｛RVS\}\{WHT\}PRESS ANY KEY \｛SPACE\}TO CONTINUE": GETK EYAS：GOTOI $\varnothing$

## Program 6：EXCEL．OBJ2．

ØCø日：Aの Ø6 8D Ø0 FF A2 12 A9 72 øCø8：20 $85 \mathrm{FB} 2 \emptyset \mathrm{CC}$ CD E8 A9 2C øC1ஏ： 0685 FA 20 CC CD Aø 96 C9
gC18：B1 EA 20 CA CD C8 D0 F8 A4 ØC 20：E6 FB A5 FB C9 40 D 6 F 61


BEFORE TYPING ．．．

> Before typing in programs，please refer to＂How to Type In COMPUTE！＇s GAZETTE Programs，＇ elsewhere in this issue．

## Pointer

See instructions in article on page 52 before typing in．

## Program 1：Pointer

CE60：78 A9 40 8D 1403 A9 CF F6
 CF10：CF 9D C0 02 CA 10 F7 A9 67 CF18：64 8D ØE D6 8D ØF DØ A9 10 CF2ஏ： 01 8D 2E Dg A9 8Ø 8D 15 F5 CF28：D 8 AD 18 D 029 F 04 A 4 A 97 CF30：18 $69 \quad 63 \quad 85 \mathrm{FC}$ A9 $\mathrm{FF} 85 \quad 93$ CF38：FB Ag 60 A9 0 BB 91 FB 608 F

 CF50：EE 日F D 0 4A B 03 CE 0 CE 27 CF58：D6 4A B6 63 EE GE D6 AD 38 CF60：0F D6 C9 31 D 03 EE GF 87 CE68：Dの AD GF D C9 E7 D 63 9D CE70：CE 日F D® AD 10 D夭 29 80 C6 CF78：D6 1C AD gE Dg C9 17 Dg CA CE80：03 EE 日E D6 AD GE D6 C9 3D CF88：日の D 024 AD 10 D 0998012

 CFAD：AD GE D6 C9 FF D6 08 AD 52
 CFB0：31 EA F6 6060 E 6060645 CFB8： 98 日0 00 08 00 00000021
 CEC8： 00 00 00 00 00 00 00 00 68






## Program 2：Finder

GF 16 REM COPYRIGHT 1988 COMPU TE！PUBLICATIONS，INC．－ ALL RIGHTS RESERVED．
HR $2 \emptyset$ IFA $\langle>1$ THENA $=1$ ：LOAD＂POINT ER＂，8，1
PA 36 SYS 52992
GA 40 DIMC（39）
PD 50 PRINT＂\｛CLR\}";:GOSUB16 0
QR 60 FORI $=\varnothing$ TO 39：C $(I)=$ PEEK（ 162 4＋I）：NEXT
HS 70 WAIT 5632 ， 16,16
JM $80 \times 8=($（PEEK（53262）-255 ＊（PE $\operatorname{EK}(53264)=128))-24) / 8$
CR $98 \quad \mathrm{Y}$ \％$=(\operatorname{PEEK}(53263)-49) / 8$ ：SL $=40$＊$Y$ \％+X \％
FA 100 PRINT＂$\{$ HOME $\}$ \｛RVS \} $X=" ;$ \％ ；＂Y＝＂；$Y$ \％；＂SL＝＂；SL
MP 110 GETAS：IFAS＝＂＂THEN11Ø
XK 128 IFAS＝＂Q＂THENPRINT＂\｛CLR\} ＂：END
DE 136 IFAS＜＞＂＂THEN11 0
KX 140 EORI $=$ бTO 39 ：POKE $1624+$ I，C （I）：NEXT
MX 150 GOTO7 9
HH 160 PRINT＂\｛CLR\}\{9 DOWN\}"TAB （13）＂COPYRIGHT 1988＂
BB $17 \varnothing$ PRINTTAB（7）＂\｛DOWN\} COMPU TE！PUBLICATIONS，INC．＂

## FC 190 RETURN

## Big Screen Converter

## See instructions in article on page 45 before typing in．

0801：बB 08 FF FF 9E 323039 EF 0869：39 $08 \quad 3108$ FF FF 8F 148 F 6811：14 $14 \begin{array}{llllllll}14 & 14 & 14 & 14 & 14 & 14 & 21\end{array}$ 6819：31 $39 \begin{array}{lllllll} & 38 & 38 & 20 & 43 & 4 \mathrm{~F} & 4 \mathrm{D} \\ 9\end{array}$ 6821：50 $55 \begin{array}{llllll}54 & 45 & 21 & 20 & 50 & 55\end{array}$ gD 0829：42 2 E 2C $20494 \mathrm{E} \quad 43$ g0 77 0831：00 00 A9 0085 C6 8D F5 CE 0839：08 8D F6 $08 \quad 20$ 3E 9A $2 \varnothing$ 3E 0841：5C gA 28 F4 gA A2 17 Ag FE 0849：06 1820 F0 FF A9 60 AA C3 0851：A8 BD C6 6A Fg 69 2g D2 5D 6859：FF E8 4C 5208 Aб 602035 0861：CF FF 99 9E 67 C8 C9 9D 72 8869：D6 F5 C 62 D 61 60 A9 8C 9871：14 26 D2 $2 \mathrm{FF} 8898 \mathrm{~A} 2 \mathrm{9E} 78$ 9879：A＠ 87 28 BD FF A9 98 A2 24 0881：08 Aの 06 2ø BA FF $2 \varnothing$ C 96 8889：FF A2 A6 Ag 9686 FC 84 F8 6891：FB A2 $98 \quad 20 \mathrm{C} 6 \mathrm{FF} 2 \varnothing \mathrm{DB} 9 \mathrm{D}$ 0899：08 20 A9 日A 2880 日A 20 C2 88Al：CF FF 26 F7 68 EE 6 E GB 61 08A9：D8 03 EE 6F GB AD 6F 9 BB B 98B1：C9 1F 98 EB AD 6E 日B C9 46
 68C1：Fg DD A9 68 20 C3 FF 20 A7 68C9：CC FF 4C 5C $6 \mathrm{~A} \quad 20$ CF FE FF 98D1：26 B7 FF 29 46 E6 F6 4C 72 08D9：C3 08 20 CF FF EE F5 087 E 98E1：D6 63 EE F6 98 AD F6 6855 68E9：C9 9498 EE AD F5 98 C9 FF
 98F9：A 日 98 8C D7 日A 8C D8 6A A7 6901：8D CE 6A AD CE 6A 3D CF 92 9969：夭A FO 69 BD D9 GA बD D7 42 0911：0A 8D D7 6A E8 E6 64 98 8A 6919：EA AD CE GA 3D CF GA FG B4 6921：09 BD D9 6A GD D8 gA 8D 76 9929：D8 GA E8 EØ 08 98 EA A2 50 6931： 66 A 60 AD D7 6 बA 911969 6939：28 E1 GA 9119 AD D8 $0^{6} 69$
 0949：E1 GA 20 E8 6A EE EF GA 57 6951：AD EF 6A C9 64 B 0616059 6959：A9 08 8D EF 6A EE F6 6A E8
 6969：Fg 25 AD F2 日A C9 ØC D6 82 6971：03 4C 24 6B A5 $1918 \quad 6978$ 0979：38 8519 9ø 92 E6 1A E6 FB 6981：1A A5 1B $186938 \quad 85$ 1B 41 6989：90 62 E6 1C E6 1C 60 A9 15 6991： 06 8D $\mathrm{F} 0^{6}$ GA AD F2 GA C9 DC 6999：ØC D8 062049 日B 4C BC 74
 99A9：Bø 02 C6 1A C6 1A A5 1B 14 99B1：38 E9 $38 \quad 85$ 1B B 602 C6 28 99B9：1C C6 1C EE E1 日A AD Fl 03 99C1：0A C9 14 B6 01 60 A9 60 B5 69C9：8D F1 GA EE F3 GA AD F3 66 99D1：$\sigma_{A}$ C $9 \quad 62$ Fg 25 A5 1918 B4 69D9：69 C6 8519 9б 62 E6 1A 87 69E1：A5 1A $18 \quad 69$ 1E 85 1A A5 C7 99E9：1B 1869 Cg 85 1B $90 \quad 9284$ 99F1：E6 1C A5 1C 1869 1E 85 1D

 0A09：C6 1A 38 A5 1A E9 1E 85 A2 gAll：1A A5 1B 38 E9 Cg 85 1B FA 0A19：B6 62 C6 1C A5 1C 38 E9 98 gA21：1E 85 1C EE F2 gA AD F2 26 GA29：©A C9 GD Fg 0160 A9 61 A3 बA 31： $85 \quad 1 \mathrm{~A} \quad 85$ 1C A9 $40 \quad 85 \quad 19 \quad 73$

ØА 39：A9 48 85 1B 60 A9 $2085 \quad 66$ 0A41：1C 85 1A A9 008519 8D 78 GA49：EF GA 8D Fa 0A 8D F1 0A 0D gA51：8D F3＠A 8D F2＠A A9 98 5E 6A59：85 1B 60 AD 62 DD 9963 7A 9A61：8D 92 DD AD 96 DD 29 FC 1A gA69： 69 g3 8D gø DD A9 15 8D C1 6A71：18 D6 A9 1B 8D 11 D 0 A9 A8 ØA79：80 85 C6 8D 15 Dø 60 A5 F2 ØA81：01 29 FE 8501 AD 02 DD 39 बA89：09 03 8D 62 DD AD 90 DD 38日A91：29 FC $99 \quad 63$ 8D øø DD AD Aø 9A99：18 D8 9998 8D 18 D 0 AD AB ØAA1：11 D $\varnothing 69208 \mathrm{D} \quad 11$ D 66048 ØAA9：A9 8485 FC A9 0085 FB 68 ØAB1：A2 $\emptyset 0$ A9 61 A $9061 \mathrm{FB} 8 \varnothing$ ØAB9：C8 C 0 Ø日 D $\varnothing$ F9 E6 FC E8 BD


 9AD9：C0 30 日C 03 C 30 ØC 03 ED ＠AE1：E6 19 D 682 E6 1A 60 E6 31
 ØAF1： 00 ø日 00 A9 2085 FC A9 5B GAF9：$\varnothing \varnothing 85 \mathrm{FB}$ A8 91 FB C8 D 805 $\quad$ B $61: \mathrm{FB}$ E6 FC A5 FC C9 A 0 B 0 C 9 वB69：04 A9 00 F0 EF 68 C6 1942 øB11：A5 19 C9 FF D 062 C 6 1A AF 0B19：C6 1B A5 1B C9 FF D 062 Bl
 ØB29：85 19 90 02 E6 1A A5 1A 7 F gB31：18 $\begin{array}{lllllllll} & 21 & 21 & 85 & 1 A & A 5 & 1 B & 18 & d F\end{array}$ बB 39：69 F8 85 1B $90 \quad 02$ E6 1C 1B 6B41：A5 1C $18 \quad 692185$ 1C 6082
 gB51：g2 C6 1A A5 1A 38 E9 215 E बB59：85 1A A5 1B 38 E9 F8 85 EF
日B69：E9 2185 1C 60 08 ø0 ø0 32

## Arcade Volleyball

See instructions in article on page 32 before typing in．

 6811：06 A9 7F 8D 6D DC A9 FE 83 9819：8D 90 DC AD 11 D 298065
 8829：81 8D GD DC 60 98 AA 6A 91 6831：A8 AD 8F GA 99 7D GA BD 28 ब839：99 ØA 2D 8C 日A 8D 8С ØA Bø 6841：$A D \quad 8 \mathrm{E}$ GA $\mathrm{FG} \quad 99 \mathrm{BD} 91 \mathrm{gA} 88$ 6849：ØD 8C ØA 8D 8C ØA AD 8D 92 6851：0A 99 7C 日A 60 AD 79 日A B3 6859：18 $69 \quad 32$ 8D 8F ØA A9 Ø0 E6 0861：8D 8E GA AD 7B 日A 8D 8D A4 0869：日A AD 7A 日A 日A 2E 8D 6A 日8 6871：2E 8E GA AD 8D＠A $18 \quad 6986$ 9879：18 8D 8D ØA AD 8E 9A 6976 б881：øø 8D 8E ØA 60 A 910 B9 C6
 0891：60 A9 FF 8D 15 D6 A9 E1 36 9899：8D F8 87 A9 E2 8D F9 8772 g8A1：A9 E3 8D FA 07 A9 E4 8D 17 08A9：FB 87 A9 E7 8D FC 67 A9 45 98B1：日6 8D 78 9A 8D 79 gA 8D C8 98B9：7A 6A 8D 7B 6A 8D 8D 6A 9E 68C1：8D 8E gA 8D 8F gA 8D 90 A6
 98D1：FA 8D 6B ØF 8D 6C ØF 8D EA
 Ø8E1：8D $7 \emptyset 0 \mathrm{GF}$ 8D 71 ØF $8 \mathrm{D} \quad 72 \mathrm{E4}$ g8E9：gF 8D A3 15 8D A4 15 8D 61 88F1：D7 15 8D 5 5E 16 8D $5 \mathrm{5F} 1686$ 98F9：A9 81 8D 3715 8D A2 15 7D 6981：8D D8 15 A9 68 8D B5 0 EF FD 9999：8D B6 ØF 8D B7 बF 8D B9 19
 6919：8C 8D B8 6 F A9 7D 8D BC F7 9921：GF A9 68 8D 6616 A2 3 F GE g929：BD A1 GB 9D 40 38 BD E1 FD 9931： $\mathrm{gB}^{9 D} 88 \quad 38 \mathrm{BD} 21$ gC 9D EB

9939：40 39 BD 61 ØC 9 DD Cø $38 \quad 18$ 9941：BD A1 ØC 9D Ø0 39 BD El 38 6949：ØC 9D $80 \quad 39$ BD A1 9A 9D 92 6951：CØ 39 BD E1 ØA 9D 60 3A E8 6959：BD 21 बB 9D 40 3A $\quad$ BD $61 \quad 95$ 6961： 日B $^{9 D} 88$ 3A CA 10 Cl A9 D7 6969：32 8D 7A 0A 8D 78 0A 8D D7
 6979：56 $08 \quad 26$ 2E 08 A9 78 8D 05 6981：79 ØА А9 1E 8D 7B ØA Ag F8
 6991：78 8D 79 0А А9 6E 8D 7B Bø
 69A1： 68 A9 78 8D 79 ØA A9 $28 \quad 79$
 69B1：28 2E 08 A9 78 8D 79 6A F1 69B9：A9 64 8D 7B gA Aの 03201 C 69Cl：56 $68 \quad 28 \quad 2 \mathrm{E} \quad 88 \quad 2886 \quad 68$ BD 69C9：A9 61 8D 2B D $\varnothing$ A9 948 BD 18 69D1：27 D6 A9 62 8D 28 Dø A9 59 69D9： 67 8D 29 Dø A9 05 8D 2A AB
 69E9：D6 A9 9320 D2 FF A9 8E BB 69F1：20 D2 FF A9 68 2б D2 FF C9 99F9：A9 56 8D F3 65 8D 1B 66 6A91：8D 43 66 8D 6B 66 8D $93 \quad 68$ 9A09：96 A9 Ag 8D BB 66 8D E3 6C 6A11： 06 8D 0 日 678 8D $33 \quad 978 \mathrm{BD} 32$

 0A29：D6 10 20 FA 15 A9 øC Aの 68 GA31：FA 889900 D8 99 FA D8 14 ØA39：99 F4 D9 99 EE DA D6 F1 A2 9A41：A9 1F 26 D2 FF A9 61 8D 59 0A49：F3 D9 8D 1B DA 8D 43 DA 9F 6A51：8D 6B DA 8D 93 DA AD 7C 1B

 gA69：67 16 FG 97 28 D2 FF E8 7A 9A71：4C 68 6A EA $4 C \quad 84$ 日D 0044



 ØA99：FE FD FB F7 EF DF BF 7E A9
 gAA9： 6063 D7 C6 6 D E7 76 1C 8 BA 9AB1： $\mathrm{EF} \quad 78 \quad 1 \mathrm{~B} \quad 6 \mathrm{E} \quad \mathrm{E} 8 \quad 37 \quad 9 \mathrm{E}$ CC 54 ØAB9：2E 7D D $\emptyset 1 D \quad B D \quad D C \quad 3 B \quad D D E 5$ gAC1：DC 35 E3 8 BC 16 7C $\begin{array}{llllllll} & 54 & 17 & 39\end{array}$ ดAC9：9F D8 0 O


 gAE9：80 62 7 CC 60 gB E3 $9817 \begin{array}{lllllll} & 74\end{array}$ 9AF1：9F D8 16 7C $54 \begin{array}{llllllllll} & 35 & \text { E3 } & 8 C & 62\end{array}$ gAF9：3B DD DC 1D BD DC 2E 7D CB 9B01：D 37 9E CC 1B 6E E8 1C 6E
 6B11： 00 B7 00000000000015


 $\begin{array}{llllllllllll}\text { 9B31：F7 } & 38 & 17 & 76 & \text { D8 } & 33 & 79 & \text { EC } & \text { 9F }\end{array}$
 9B41：DC 31 C7 AC 2A $3 \mathrm{E} \quad 68$ 1B 9 CC बB49：F9 $\begin{array}{llllllll} & \text { E8 } & 69 & C 7 & D & 66 & 3 E & 40 \\ 8 F\end{array}$


 9B69：08 86 3E $4809 \mathrm{C7}$ D8 1B $\mathrm{E} \varnothing$ 9B71：F9 E8 2 AA 3E 68 31 C7 AC 2 C
 6B81：74 $33 \quad 79$ EC $17 \begin{array}{llllllll} & 76 & \text { D8 } & 1 \mathrm{E} & \mathrm{FE}\end{array}$ 9B89：F7 38 ØE E7 B 0 Ø3 EB C 014
 9B99：00 00 00 00 00 00 00 00 AF


 GBB9：1E CF $\begin{array}{lllllllll} & \text { G } & 3 \mathrm{~F} & \mathrm{FF} & \mathrm{F} 4 & 3 \mathrm{~F} & \mathrm{C} 7 & 7 \mathrm{~F}\end{array}$ ØBC1：8C वC 1F FC 97 FF F8 $03 \quad 92$ GBC9：FF Fg 01 FF Ed 06 FF 80 C 3



 ดBF1：FE FC बE 日F FC ØE 8F 8C 45 9BE9：1E CF F4 3F FF F4 3F C7 BF ØC $1: 8 \mathrm{C}$ ØC 1F FC 97 FF F8 0343


 ØC 21： 06 7F E 0 g1 FF F8 07 E1 19 ØC29：F8 日F FE FC ØE GF FC 日E E5 ఏC 31：8F 8C 1E CF F4 3F FF F4 8E ØC 39：3F C7 8C ØC 1F FC 97 FF 30




 ØC69：ø日 1F FF 80 1F $87 \mathrm{Eg} \quad 3 \mathrm{~F} \quad 69$
 ØC79：2F F3 $78 \quad 2 \mathrm{~F}$ FF FC 31 E3 62 ØC81：FC 3F F8 30 1F FF Eの 日F D3 ØC89：FF C $0 \quad 07 \mathrm{FF} 80 \quad 01 \mathrm{FF}$＠ 0 BA
 ØC99：00 60 70 日0 00 FF 00 8C 4C
 ØCA9：$\emptyset \emptyset 1 \mathrm{~F}$ FF $8 \emptyset 1 \mathrm{~F} 87 \mathrm{E} \emptyset \quad 3 \mathrm{~F}$ A9 ดCB1： $7 \mathrm{~F} \quad \mathrm{Fg} \quad 3 \mathrm{~F} \quad \mathrm{Fg}$ 7g 31 Fl 7659 ดCB 9： 2 F F3 $78 \quad 2 \mathrm{~F}$ FF FC 31 E3 A2 ØCC1：FC 3 F F8 $3 \emptyset \quad 1 \mathrm{~F}$ FF $\mathrm{E} \emptyset \quad \emptyset \mathrm{F} ~ 14$ ดCC $9: \mathrm{FF} \mathrm{C} \emptyset \quad 97 \mathrm{FF} 8 \emptyset \quad 11 \mathrm{FF}$ ఏ FA

 ØCE1： $97 \mathrm{FE} \quad 601 \mathrm{~F} \mathrm{FF} 801 \mathrm{~F} 87 \mathrm{~F} 6$ ØCE9： E Ø $3 \mathrm{~F} \quad 7 \mathrm{~F}$ Fg $3 \mathrm{~F} \mathrm{Fg} 70 \quad 7111$ 6CF1：F1 $76 \quad 2 \mathrm{~F}$ F3 78 2F FF FC C1 बCF 9： 31 E3 FC 3 F F8 30 1F FF FD ØD＠1：E $\emptyset \quad$ ØF FF C $\emptyset \quad 97 \mathrm{FF} 80 \quad 9195$


 GD 21：AD g§ DC 8D B1 日E AD 61 A8 ØD29：DC 8D Bø ØE A9 g曰 8D 6E E2 ØD 31：$\emptyset F$ 8D 6D ØF AD B $\emptyset$ ØE 29 4A 6D39：10 D 65 A9 91 8D 6D 0F F2 ØD41：AD B1 बE 29 10 DG 05 A9 6A GD49： 01 8D 6E ØF EA AD B1 日E 85
 9D59： 61 8D BC 日E A9 g0 8D BA F2
 ØD69： 98 D $\emptyset 1 \emptyset$ EE B3 ØE A9 Ø1 D6 6D71：8D BC बE A9 ब1 8D BA ØE 9F日D79：4C C5 日E A9 日Ø 8D BC ØE 45 GD81：4C C5 GE 2612 日8 $20 \quad 21 \quad 69$


 GDA1：10 20 DB GD 2086 g8 2063 ØDA9：A5 15 AD 66 16 Fg D4 A9 9 BF
 GDB 9： 11 8D D8 15 8D A2 15 A9 EE ØDC1：$\emptyset \emptyset$ 8D AF ØE $2 \emptyset \quad 73$ 11 CE D5 ØDC9：AF ØE AD AF GE DG E5 A9 39 ØDD1： $0 \emptyset 85$ C6 A5 C6 F 6 FC 4 C C $\emptyset$ GDD 9：92 g8 AD B3 बE 8D 7B gA D7 ØDE1：A9 9B 38 ED 6F ØF 8D 79 E9

 ØDF 9： 98 AD B3 बE $18 \quad 69 \quad 20$ 8D $\quad$ ØF
 ØE 69：2E Ø8 AD B7 日E 8D 7B 日A 17 GE11：A9 9B 38 ED 76 OF 8D 7923 ØE19：ØA A9 ØØ 8D 7A 日A 8D 78 ØD


 ØE 39： 2 E Ø8 AD BA GE gA $1869 \quad 62$ ØE41：E1 8D F8 67 8D F9 67 AD 51 बE 49：BD 日E 18 6D BC बE 8D BD 98 ØE 51： $0 \mathrm{E} \quad 29 \quad 68$ 4A $4 \mathrm{~A} ~ 4 \mathrm{~A} ~ 8 \mathrm{D} ~ \mathrm{BB}$ B6 GE59： 0 E 18 18 6D $\mathrm{F} 8 \quad 97$ 8D F 8 g7 $\quad 27$ ØE 61：AD F8 $\quad 97$ 8D F9 97 AD C 6054 ØE69： 0 E ØA $18 \quad 69 \mathrm{El}$ 8D FA 97 EA ØE71：8D FB $\quad 7 \mathrm{AD}$ BF बE 18 6D E2
日E 81：4A 4A 8D BB 日E 18 6D FA 69

0E89：07 8D FA 07 AD FA 97 8D 51 ØE91：FB 97 AD 6B 日F F® 08 A9 CF 0E99：E5 8D F8 67 8D F9 67 AD AB ØEA1：6C OF F6 08 A9 E6 8D FA 55 gEA9： 67 8D FB 67 EA 60000075

 ØEC1：$\emptyset 0$ 4C D1 14 AD 1198 Dg FE gEC9：F8 AD B $\emptyset$ gE 2964 D 6 GE CD gED1：CE B7 GE A9 01 8D BE GE 69 ØED9：A9 00 8D C $\emptyset$ ØE $6 \varnothing$ AD B $\emptyset 86$ ØEE1：ØE 29 Ø8 D 8 GE EE B7 GE 97 ØEE9：A9 61 8D BE GE A9 61 8D 5F
 ØEF9：60 A9 日6 8D 6F 日F 8D 78 CC GF Ø1：ØF AD 6B GF FØ GA AA BD 33 ØF $99: 46$ ØF 8 DD 6F $\quad$ GF CE 6 CB ØF 4 D
 बF19：40 0F 8D 78 OF CE 6C 日F 6F बF 21：AD 6B 日E D 0 GA AD 6E 日F D2 gF 29：FG 65 A9 28 8D 6B GE AD 9E GF 31：6C GF D $\emptyset$ GA AD 6D GF FG 36 ØF 39： 65 A9 28 8D 6 C 日F $60 \quad 6082$ ØF 41：Øø 04 Ø8 $\begin{array}{llllllll}\text { ØB } & \text { ØE } & 11 & 14 & 17 & 66\end{array}$ gF 49：19 1B 1D 1F $21 \quad 22 \quad 23 \quad 24$ 4C GF51：25 $26 \begin{array}{lllllll}26 & 26 & 26 & 25 & 24 & 23 & \text { E } 3\end{array}$ gF59：22 21 1F 1D 1B 171411 F4

 0F71：日6 日0 A9 日6 8D 71 日F 4C 61
 gF81：21 日F AD B7 日E C9 61 B 8 6F日F89： 65 A9 61 8D B7 ØE AD B7 96 ØF91：ØE C9 21 9ø 65 A9 21 8D F4 0F99：B7 GE EA AD B3 ØE C9 4F 98 ØFA1：B $\emptyset ~ 65 ~ A 9 ~ 4 F ~ 8 D ~ B 3 ~ G E ~ A D ~ 88 ~$ ØFA9：B3 ØE C9 6F 9ø 65 A9 6 F Bg ØFB1：8D B3 日E $60 \quad 60 \quad 60 \quad 608 \mathrm{C}$ D7
 ØFC1：6D B9 日F 8D BB GF AD BC F1 ØFC9： 6 F 6D BA 0 F 8D BC $\mathrm{gF}^{2}$ AD 3E
 gFD9： 21 A9 00 8D A4 15 A9 62 9A GFE1： $8 \mathrm{D} \quad \mathrm{BC}$ 日F $\quad 20 \quad 39$ 11 A9 68 3B GFE9：38 ED B9 ØF 8D B9 GF A9 E2 GFF1： $6 \varnothing$ ED BA GF 8D BA GF 4 C 95 ØFF9： 2010 AD BC 日F C9 9690 FE 1001：1E A9 68 8D A3 15 A9 8F C7 1069：8D BC 日F $20 \quad 3911$ A9 0064 1011：38 ED B9 ØF 8D B9 ØF A9 日C 1019：00 ED BA $\quad$ GF 8D BA $\quad$ OF 4 C BE
 1829：AD BC $\quad$ EF 8D 7B $6 A$ AD B7 21 1631：बF 8D 78 gA AD B8 日F 8D E7
 1641：2E 08 EE 3811 AD 38119 C 1049：4A 4A 4A $29 \quad 0318 \quad 69$ E7 38 1651：8D FC $\quad 67 \quad 6 \boxminus$ AD 3715 D 6 A3 1059：11 AD B5 GF $18 \quad 69 \quad 63$ 8D 日F 1061：B5 GF AD B6 GF 69 g6 8D EC
 1871： 6 F 8D B7 GF AD B8 GF 6D 40 1879：B6 GF 8D B8 日F AD B8 GF A5 1081：C9 A8 98 30 A9 9F 8D B8 63 1089：0F $26 \quad 3911$ A9 $06 \quad 38$ ED 1D 1091：B5 日F 8D B5 日F A9 ø日 ED 6A 1699：B6 GF 8D B6 GF AD BC GF AD 10A1：C9 469098 A9 96 8D A2 D5 18A9：15 4C B2 10 A9 61 8D A2 CD 16B1： 15203815 AD B8 GF C9 F4 10B9： $0 E$ B 619 A9 $9 F$ 8D B8 बF $F 9$ 10C1：20 3911 A9 6038 ED B5 6F 10C9： 6 F 8D B5 बF A9 66 ED B6 5C 16D1：$\sigma F$ 8D B6 GF 60 A9 42 A2 75 10D9：日8 20 E6 10 A2 26 20 E6 B4 19E1：10 26231160 9D 5064 A5 10E9：9D $78 \quad 64$ 9D Ag 64 9D C8 6A 10F1：64 9D FG 64 9D $18 \quad 659 \mathrm{CE}$ 10F9：40 659 D 68959 D 98657 A 1161：9D B8 65 9D EG 65 9D 68 F8 1169： 66 9D $30 \quad 66$ 9D $58 \quad 66$ 9D F3 1111：80 66 9D A8 06 9D D 06681 1119：9D F8 66 9D 2867 9D 4883 1121：07 60 A9 63 A2 26 9D 78 A3

1131：9D 2864 CA 10 FA 606886 1139：EA A9 8F 8D 18 D4 A9 16 7D $\begin{array}{llllllll}1139: E A & A 9 & \text { 1 } \\ \text { 1141：8D } & 65 & \text { D4 } & 13 & \text { D4 A9 } & 64 & 82\end{array}$ 1149：8D 66 D4 A9 5A 8D 14 D4 EE 1151：A9 18 8D 12 D4 A9 158 D 24 1159： 64 D4 A9 18 8D 61 D4 A9 2D 1161： 0 D 8D 日F D4 207311 A9 37 1169：14 8D 64 D4 A9 168 D 1281 1171：D4 60 A2 60 A 69288 D 695 1179：FD CA D8 F8 60 60 A9 98 CE 1181：8D 3715 A9 8 FF 8D 18 D4 2 D 1189：A9 16 8D 65 D4 8D 13 D4 5E 1191：A9 64 8D 66 D4 A9 5A 8D 43 1199：14 D4 A9 18 8D 12 D4 A9 39 11A1：15 8D 64 D4 A9 108 D 9129 11A9：D4 A9 65 8D GF D4 207399 11B1：11 A9 10 8D 64 D4 A9 1878 11B9：8D 12 D4 60 AD BA 日F $^{2} 2967$ 11C1：8g D 1 C AD BC 日F C9 44 Bg 11C9：98 31 C 948 Bg 2 D AD B8 8C 11D1： 0 F C9 $9 \mathrm{AB} 98 \quad 26 \mathrm{C} 982 \mathrm{BO} \quad 6 \mathrm{E}$ 11D9：23 26 7F $11 \begin{array}{ll}4 \mathrm{C} & \text { 日F } \\ 12 & \mathrm{AD} \\ 97\end{array}$ 11E1：BC बF C9 49 90 15 C9 4D AD
 11F1：$\sigma A C 9 \quad 82 \mathrm{~B} 010287 \mathrm{~F} 11 \mathrm{F7}$ 11F9：4C GF 12 60 A9 61 8D A2 5D $\begin{array}{llllllll}1201: 15 & 20 & 38 & 15 & 60 & \text { A9 } 90 & 8 \mathrm{D} & 47\end{array}$ 1269：A2 15 28 38 15 68 A9 60 C8 1211：38 ED B9 GF 8D B9 GF A9 10 1219：08 ED BA gF 8D BA GF 60 D6 1221：FE FE FE FE FE FE FF FF 4C
 1231：01 61 01 61 61 B 0 B5 CE 4 B 1239：E2 F6 F8 FA FF FF 61015 E 1241： $06 \quad 08$ बA $1 \mathrm{E} \quad 324 \mathrm{~B} \quad 50 \quad 99 \mathrm{~F} 5$ 1249：14 50267612 AD BA 日F C2 1251：C9 63 FG 15 C9 94 FG 11 DB 1259：C9 65 F6 GD C9 FD F6 OF C9 1261：C9 FC FG 日B $^{2} 9$ FB Fg 67 9F 1269：60 A9 62 8D BA 0F 60 A9 BD 1271：FE 8D BA 日F 60 AD B6 日F F6 1279：C9 $65 \mathrm{FG} 15 \mathrm{C} 966 \mathrm{FG} 11 \mathrm{8C}$ 1281：C9 67 FG 日D C9 FB FG 6 F 6A 1289：C9 FA Fg gB C9 F9 Fg 07 3F 1291：60 A9 64 8D B6 ØF 60 A9 66
 12A1：FF FF FF FF FF FF FF FF C5 12A9：FF FF FF FF FF FF FF FF CD 12B1：FF 68060060606060 D5

 12C9：FC FD FD FE FE FE FE FF 8D 12DI：FF FF FF FF FF FF FF FF F5 12D9：FF FF 606060606060 FD
 12E9： 01626203606060 AD 2D 12F1：B6 GF 3865 AD B8 $0 \mathrm{~F} \quad 1818$
 1301：59 AD BC 日F 1869 6A 38 7A 1369：ED B7 GE AA Eg g6 98 4A F2 1311：E 014 B $\emptyset 46$ A9 6038 ED D2 1319：B5 बF 8D B5 बF A9 बठ ED F7 1321：B6 GF 8D B6 GF AD B9 GF 35 1329：18 7D 3612 8D B9 GF AD C1 1331：BA GF 7D 21128 D BA $\quad$ ØF 85 1339：AE 6C GF AD B5 GF 38 FD E6 1341：9E 12 8D B5 GF AD B6 日F F3 1349：FD C7 12 8D B6 GF EE A3 EE 1351：15 A9 gg 8D A4 15 26 7F 7E 1359：11 60 AD B6 GF 3065 AD F2 1361：B8 GF 18 6D 78 GF 29 F8 8C 1369：C9 98 D6 $59 \mathrm{AD} \mathrm{BC} \mathrm{日F} 38 \mathrm{FE}$ 1371：E9 1638 ED B7 日E AA EG 24 1379：08 98 4A Eの 14 Bø 46 A9 B4 1381：00 38 ED B5 日F 8D B5 日F F7 1389：A9 68 ED B6 GF 8D B6 日F D8 1391：AD B9 GF 18 7D 3612 8D D6 1399：B9 GF AD BA GF 7D 211284 13A1：8D BA GF AE 6C GF AD B5 BA 13A9： 6 E 38 FD 9E 12 8D B5 OF 50 13B1：AD B6 GF FD C7 12 8D B6 76 13B9： 0 F EE A3 15 A9 60 8D A 4 F5 13C1：15 267 F 1168 AD B6 बF B1


## BEFORE TYPING ．．

Before typing in programs，please refer to＂How to Type In COMPUTE！＇s GAZETTE Programs，＇ elsewhere in this issue．

13D9：BC GF 1869 ØA 38 ED B3 7C 13E1：ØE AA Eの 06 90 4 A E E 1459 13E9：B6 46 A9 0638 ED B5 0 FF 23 13F1：8D B5 日F A9 g0 ED B6 GF FC 13F9：8D B6 日F AD B9 日F 18 7D 99 1401：36 12 8D B9 GF AD BA GF C9 1469：7D $21 \quad 12$ 8D BA gF AE 6B 2E 1411：$\emptyset F ~ A D ~ B 5 ~ G F ~ 38 ~ F D ~ 9 E ~ 12 ~ D C ~$ 1419：8D B5 GF AD B6 日F FD C7 E7 1421：12 8D B6 GF EE A4 15 A9 5B 1429：00 8D A3 15 20 7 F 11 60 FB 1431：AD B6 $6 F \quad 30 \quad 65$ AD B8 $\quad$ GF 25 1439：18 6D 6F 日F 29 F8 C9 99 F8 1441：D6 58 AD BC बF 38 E9 16 AC
 1451：49 EØ 14 B6 45 A9 0038 EC 1459：ED B5 GF 8D B5 日F A9 98 DD 1461：ED B6 GF 8D B6 GF AD B9 EF 1469： $0 \mathrm{~F} \quad 18 \quad 7 \mathrm{D} \quad 36 \quad 12$ 8D B9 $\mathrm{OF}^{18} 7 \mathrm{7B}$ 1471：AD BA GF 7D 2112 8D BA FF 1479：日F AE 6B 日F AD B5 日F 38 CD 1481：FD 9E 12 8D B5 GF AD B6 67 1489：GF FD C7 12 8D B6 日F $^{\text {EF }} 27$ 1491：A4 15 A9 06 8D A3 1520 CB 1499：7F 11 60 AD B6 0 F 30 2 EE 2D 14A1：AD B8 0 GF 29 FC C9 4C D 8 BB 14A9： 25 AD BC $\quad$ GF C9 44 9g 1E F6 $14 \mathrm{Bl}: \mathrm{C} 94 \mathrm{C} \quad \mathrm{B} \emptyset \quad 1 \mathrm{~A} \quad 4 \mathrm{E} \quad \mathrm{B} 6 \quad$ OF $\quad 6 \mathrm{E} \quad 63$ 14B9：B5 0F 20 7F 11 A9 0018 E3 14C1：ED B5 6 FF 8D B5 $\quad$ ØF A9 9046
 14D1：AD 68 DC 29 1F 6914 CD 95
 14E1：E9 66 CD B7 GE FG 1F Bg D8

 14F9：15 EE B7 0E A9 01 8D BE 6B

 1511：29 8 8 BD BB GE AD BC GF GD 1519：38 ED B7 $\mathrm{gE}_{2} 29$ 8Ø 4 D BB 54 1521： $6 E$ D 65 A9 61 8D 6D GF E9 1529：68 AD BC 日F 38 E9 16 CD DA
 1539：D8 15 CD A2 15 D 6320 日B 1541：D9 15 AD A2 15 8D D8 1523 1549：A9 90 8D B9 gF 8D BA $9 F$ C8 1551：8D B5 日F 8D B6 日F 28 C6 63 1559：15 AD 11 日8 FG 16 A9 9857 1561：8D B7 GE A9 G日 8D 6D GF BC 1569：8D 6C GF 8D B6 日E 8D BB F4 1571：बF 8D B7 बF A9 g® 8D A3 7A 1579：15 8D A4 15 AD A2 15 Fb 8A 1581：10 A9 61 8D 3715 A9 8C 65 1589：8D B8 GF A9 7D 8D BC GF CF 1591：60 A9 61 8D 37 15 A9 8C 3D 1599：8D B8 日F A9 14 8D BC 日F 94 15A1： $6 \emptyset$ Ø1 $\emptyset \emptyset$ Øg AD A3 15 C9 2 C 15A9：04 Fg 68 AD A4 15 C 964 FE 15B1：Fg gA 6g A9 G1 $_{1}$ 8D A2 1516 15B9：2g 381560 A9 60 8D A2 B5 $15 \mathrm{C} 1: 1528 \quad 38 \quad 1566$ A9 608 CD 6E 15C9：D7 15 2ø 73 Il CE D7 15 E8 15D1：AD D7 15 Dg F5 606061 AA 15D9：AD A2 15 D® GE EE 5E 1632 15E1：28 FA 15 AD $5 E 16$ C9 GF 46 15E9：Fg 7560 EE 5F 16 20 EA 73 15F1：15 AD 5F 16 C9 OF FG 6733 15F9：6日 A9 65 2g D2 FF A2 gø 3D 16g1：Ag 11828 Fg FF AD 5 E 94 1669：16 C9 $\begin{array}{lllllll} & \text { A } & 98 & 32 & \text { A } 9 & 31 & 26 \\ \text { B7 }\end{array}$ 1611：D2 FF AD 5E 1638 E9 GA Bl 1619：18 69 36 28 D2 FF A2 $68 \quad 8 \mathrm{~F}$ 1621：Ag 241828 FG FF AD 5 FF ED 1629：16 C9 日A 98 22 A9 31 26 57

1631：D2 FF AD 5F 1638 E9 GA El 1639：18 69 30 28 D2 FF 60 A9 D4 1641：36 28 D2 FF AD 5E $16 \quad 6964$ 1649：30 20 D2 FF 4C 1F 16 A9 A4 1651：30 26 D2 FF AD 5F 166978 1659：30 2ø D2 FF 60 øø $0 \varnothing$ A9 AC 1661： 018 8D $6616 \quad 60$ 日6 $41 \begin{array}{llllll}52 & 77\end{array}$ 1669：43 41 | $1671: 4 C$ | 45 | 59 | 42 | 41 | 4 C | 4 C | 90 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 8 |  |  |  |  |  |  |  | 1679：47 $4 \mathrm{FF} \quad 28 \quad 41 \quad 4 \mathrm{D} \quad 49 \begin{array}{llllll}47 & 41 & 94\end{array}$



## Ramdisk 64

## See instructions in article on page 44 before typing in．

9801：0C $08 \quad 2 \mathrm{E} 949 \mathrm{E} \quad 32 \quad 30 \quad 3673$ 8869：38 3 A 60 $\quad 12 \quad 08 \quad 38 \quad 94 \quad 80 \quad 8 \mathrm{E}$ 0811：00 00 00 Aの 08 A9 4 C 9944 0819：2B 00 A9 $0^{\circ} 99$ 2C 9088 AA 8821：88 10 F2 AD $90 \quad 03$ AC 6119 9829： 83 8D 4 C 98 8C $4 \mathrm{D} \quad 68$ A9 7 B 6831：45 A0 08 8D 00 03 8C 01 日C 0839：03 A9 60 8D 08 Ag 8D 61 AC 9841：A0 $4 \mathrm{C} \quad 74$ A4 A5 3A C9 FF 37 6849：F0 66 4C FF FF $4 \mathrm{C} \quad 83 \quad 09 \quad 1 \mathrm{E}$ 0851：E6 99 D6 F6 A4 B7 D6 0447 0859：A2 08 D6 EE AD 0062 C9 01 6861：93 FG EA C9 94 D 1 E3 2041 6869：8F F6 $26 \quad 31 \quad 69 \quad 38$ A5 2D B7 0871： E 5 2B 85 62 A5 2E E5 2 C ED
 9881： B 061 C 818 A5 $94 \quad 65 \quad 62 \mathrm{CE}$日889：A5 $65 \quad 65$ 03 B 065 D9 F5 CD 0891： 08 90 $98 \quad 20 \quad 31 \quad 99$ A2 10 CF 9899：4C 4B 68 A5 B7 C9 11 96 95 98A1：02 A9 10 A8 A9 60 F6 62 DA g8A9：B1 BB C8 C8 $916488 \quad 88$ 5D 98B1：88 16 F5 A4 77 C8 C8 C8 4 E ब8B9：98 $18 \quad 65 \quad 64 \quad 85 \quad 68$ A5 65 A5 08C1：69 $6085 \quad 69$ A9 4C $85 \quad 66 \quad 57$ 08C9：A9 日B 8587 A5 6485 GA E4
 08D9：06 A5 08856491 日A C8 EF 08E1：A5 $6985 \quad 6591$ 0A C8 A9 F7 08E9：00 $91 \quad 64 \quad 88 \quad 16$ FB 263149 68F1： 69 4C 74 A4 FF EF $93 \quad 2079$

 6999：41 4D $44 \quad 49 \quad 534 B \quad 36 \quad 34 \quad 94$
 6919：20 $42595445 \quad 532046$ 3A 6921：52 $4545 \quad 2 \mathrm{E}$ 60 60 06 Aの 19
 6931：A 699 B9 62 日6 AA B9 $25 \quad 78$
 6941：88 10 EF $60 \quad 2874 \quad 69$ A0 25 9949：00 A6 62 D6 67 C6 6310 BB 9951： 63 4C 7A 69 C6 62 B1 06 7F 6959：91 08 A2 62 F6 66 D 0 ØC 28
 6969：A9 Eg 9597 CA CA 16 EC 3A 9971：4C 4A 6978 C6 61 C6 61 AD 6979：68 E6 61 E6 $6158 \quad 68$ 4C 7A 0981：34 GA 26 D2 F5 263109 FC

 0999：B9 F7 68 F6 66 28 D2 FF EC 99A1：C8 D6 F5 A9 90 Ag A0 85 EE ஏ9A9： $06 \quad 84 \quad 67 \quad 20 \quad 7409 \mathrm{~A} 061 \mathrm{CC}$ 99B1：Bl 66 69B9：A5 $6 B$ FG 3A Aб 61 A9 22 Al 69C1：D6 08 Bl 66 Dg 64 A9 22 Eg 69C9：A 0 FF 26 7A 6920 D2 FF 46
 69D9：09 38 28 Fg FF C6 14 Bg 6 D 99E1： 69 Ag $1418 \quad 28$ Fg FF 4 C B5 69E9：Fg 99 A9 $0 D 2 \varnothing$ D2 FF A5 AE

 gAb1：28 D2 FF 88 Dg F8 38 A9 E6

gAll：D6 90 0528 A9 FF 306385 छA19：28 A9 EF E5 67 20 CD BD 1A
 0A29：C8 C $\varnothing$ ØC D 0 F5 203109 FB

 6A 41：Bl $66 \quad 99$ gA 068810 F8 BE


## Graphics Wedge

See instructions in article on page 54 before typing in．

 8811：Ag $56 \quad 84$ FB 86 FC A2 C9 8 EE 8819：A8 3484 FD 86 FE A2 $82 \quad 6 \mathrm{E}$ 0821：A6 00 B1 FB 91 FD C8 D6 5E 8829：F9 E6 FC E6 FE CA D 9 F2 B5 6831：B1 FB 91 FD C8 C $\varnothing$ CC D $\varnothing$ DE 8839：F7 AE $68 \quad 63 \mathrm{AC} \quad 69 \quad 63$ 8E 40 6841：40 C9 8C 41 C 9 A2 $34 \mathrm{~A} \emptyset 6 \mathrm{~B}$ 0849：C9 8E 08 63 8C $69 \quad 0320 \mathrm{Cl}$ 0851：44 A6 4C 7B E3 C9 FF D6 85 0859：87 AD 08 62 C9 2E F0 0364 6861：4C FF FF $20 \quad 73$ ø0 A9 73 FB $0869: \mathrm{A} 日 \quad \mathrm{CB} \quad 2 \emptyset \quad 1 \mathrm{E} A \mathrm{AB} 2 \emptyset \mathrm{E} 4 \mathrm{FF} 4 \mathrm{~A}$ 9871：Fg FB C9 42 D 6 g3 4C 7E FF 6879：C9 C9 43 D8 83 4C BE C9 E6 0881：C9 44 D6 03 4C D7 C9 C9 F6 0889：4B D9 03 4C FC C9 C9 4D 88 9891：D6 63 4C 2D CA C9 50 D 616 6899：03 4C 8C CA 4C 7B E3 A2 37 08A1：Cg Ag 6884 FB 86 FC A2 19 98A9：8ø A $9 \quad 06 \quad 2 \emptyset \quad 53$ CB A2 C4 F7 98B1：A＠ 0684 FB 86 FC A2 D8 A8
 ஏ8C1： $0828 \quad 3 C$ CB A5 6129 FE A4 98C9：85 81 AD 86 BF 8D $21 \mathrm{D} \varnothing \mathrm{El}$ 98D1：AD 7F BF 8D 26 D6 A5 61 F9 68D9： $69 \quad 6185 \quad 614$ 4C E2 CA A2 95 08E1：Cg Ag 0684 FB 86 FC A2 59 68E9：88 A $0020 \quad 53 \mathrm{CB}$ A2 6174 08F1：Aの 08 2ø 2 D CB 4 C DE C9 42 68F9：A2 $\quad 62 \mathrm{Ag} 78 \quad 202 \mathrm{D}$ CB 26 E 4 6901：E4 FF C9 06 Fg F9 C9 8547 6989：D8 66 EE 28 D8 4C DE C9 24 9911：C9 89 D $\varnothing 66$ CE $2 \varnothing$ D $64 C$ C9 6919：DE C9 4C 11 CB A2 7E Ag 30 6921：48 84 FB 86 FC A2 46 Ag EF 6929： 00 2ø 53 CB A2 83 A 98 F6 9931：84 FB 86 FC A2 D8 A6 06 DE
 6941：3C CB AD 1087 8D 21 D （ A A 6949：8D 26 D6 4C E2 CA A2 18 A8 9951：Ag FG 84 FB 86 FC A2 5C $\mathrm{OA}_{\mathrm{A}}$ 6959：A0 002053 CB A2 1C A6 B6 6961：D8 84 FB 86 FC A2 D8 Ag AD 6969： $08 \quad 28 \quad 53 \mathrm{CB}$ A2 $2 \varnothing$ Ag C 642 6971：84 FB 86 FC A2 60 AØ 60 3D 6979：84 FD 86 FE A2 62 A 678 E4 6981：20 3C CB AD DC 18 8D 218 A 6989：D $\varnothing$ AD DD 18 8D 26 D 12 A2 D 6991：1F Ag 00 Bl FB 91 FD C8 61 6999：D6 F9 E6 FC E6 FE CA D6 D8 99A1：F2 B1 FB 91 FD C8 C 64087 69A9：D6 F7 4C E2 CA A2 62 Ag 5F 69B1：86 20 2D CB A9 18 A2 68 A1 69B9：Ag 6684 FD 86 FE A2 0365 69C1：A＠ 0691 FD C8 D6 FB E6 9E 69C9：FE CA D8 F6 91 FD C8 C 6 6E 69D1：E8 D 6 F9 26 E4 FF C9 9688 99D9：Fg F9 C9 85 D 66 EE 2Ø 11 69E1：D6 4C B2 CA C9 89 D 068 8E 99E9：CE $2 \varnothing$ D 04 C 2 CA C9 $86 \quad 25$ 69F1：D8 65 A9 01 4C 95 CA C9 9 B 99F9：8A D 065 A9 18 4C 95 CA 68 6A＠1：4C 11 CB 20 E4 FF C9 06 B5 9A09：Fg F9 C9 85 D 06 EE 2842 6A11：Dg 4C E2 CA C9 89 D 66 C5 gA19：CE 26 Dø 4C E2 CA C9 86 D7 6A21：D6 66 EE 21 D6 4C E2 CA 57
＠A29：C9 8A DG 06 CE 21 D® 4C 28 6A31：E2 CA A9 93 26 D2 FF A9 CD 6A39：97 8D 00 DD A9 15 8D 18 2F 6A41：D6 A9 C8 8D 16 D6 A9 1B 7C 6A49：8D 11 D6 4C 7B E3 8E 66 CF ＠A51：DD 8C 18 D 0 AD 11 D 69 E3 9A59：2g 8D 11 D6 60 8E 60 DD 2B बA61：8C 18 D $\varnothing$ AD 16 D 6910 CC日A69：8D 16 D 6 AD 11 D 06920 BC ØA71：8D 11 D 6684 FD 86 FE D8 gA79：A2 03 A0 06 Bl FB 91 FD 52 GA81：C8 D 6 F9 E6 FC E6 FE CA 28 ØA89：D6 F2 B1 FB 91 FD C8 C6 8F 9A91：E8 D6 E7 $68 \quad 9311$ 8E 4798 6A99：52 $41 \quad 50484943 \quad 53 \quad 28 \quad$ D3 GAAl：57 45444745 gD 2843 Al GAA9：29 $31 \begin{array}{llllllll} & 39 & 38 & 38 & 20 & 43 & 4 \mathrm{~F} & 61\end{array}$ gAB1： $4 \mathrm{D} 5055 \begin{array}{llllll}54 & 45 & 21 & 20 & 50 & \mathrm{AF}\end{array}$ ØAB9：55 42 2E 2 C 20 494 E 4397
 ఏAC9：41 5A 49 4E 4720 50 41 BE ＠ADl： $44444 \mathrm{C} 45 \quad 53$ 日D 112068 gAD9：43 $2 \mathrm{EE} 20 \begin{array}{lllllll} & 43 & 41 & 44 & 50 & 41 & 50\end{array}$ ØAEl：4B ØD 1126442 EE 264462 gAE9： 4 F 4F $44 \quad 4 \mathrm{C} 45$ gD 1112067
 ØAF9： 0 D 11204 D 2E $2 \emptyset 4 \mathrm{D} 4987$ बB61： $43 \quad 52 \quad 4 \mathrm{~F} \quad 20 \quad 494 \mathrm{C} 4 \mathrm{C} 55 \mathrm{~A} 2$ बB69：53 $54 \quad 5241544 \mathrm{~F} 52$ gD CD GB11：11 $26 \quad 50$ 2E 20 50 5249 D4 GB19：4E $54 \quad 2063484 \mathrm{~F} 50 \quad$ gD D1日B21：00 0000600060000037

## Jericho

See instructions in article on page 66 before typing in．
0801： $0 \mathrm{~B} \quad 08 \mathrm{FF} \mathrm{FF} 9 \mathrm{E} 323639 \mathrm{EF}$ 0809：39 $0631 \quad 98 \mathrm{FF}$ FF 8 FF 148 F 0811：14 $14 \begin{array}{llllllll}14 & 14 & 14 & 14 & 14 & 14 & 21\end{array}$ 6819：43 $26 \quad 31 \quad 39 \quad 38 \quad 38 \quad 2843$ B2 6821：4F $4 \mathrm{D} \quad 50555445 \quad 2050$ D3 0829：55 42 4C 2 E 20202000 A2 0831：08 06 20 44 gD 20 C3 GD 67 9839：20 63 08 20 3E 日A 2063 F 2

 0851：20 7F GB $2 \varnothing 18$ gD $2 \varnothing 33$ 1D 0859：बD 20 BC 日A $28 \quad 28$ GE 4C 3A ब861：39 68 AD 06 DC 29 日F C9 39 0869：ØF F6 11 C9 ØD Dø 63 4C F9 6871：91 ØC C9 बE Dの 63 4C 日A 9C 0879：0C 4C 3E 日A A5 C5 C9 40 23 0881：F6 F7 C9 92 D6 63 4C 911 L 0889：बC C9 97 D $\varnothing$ EC 4C GA OC B8 0891：A5 FB 38 E9 2885 FB Bø 19 0899： 62 C6 FC 60 A5 FB 1869 B8 68A1： $2885 \mathrm{FB} 9682 \mathrm{E} 6 \mathrm{FC} 60 \mathrm{B5}$ 68A9：A9 D8 85 FC A9 6085 FB 99 08B1：Ag 00 A9 9791 FB C 8 D 996 08B9：FB E6 FC A5 FC C9 DC 90 D4 08C1：F1 60 A9 9485 FC A9 E6 C2 08C9：85 FB A9 DB Ag 6091 FB B2 08D1：C8 C 6 1C 96 F9 2g 9D 9896 08D9：A5 FC C9 96 96 EC A5 FB 15 08E1：C9 Fl 90 E6 A9 39 8D 4364 08E9：6B 8D 26 64 A6 60 A9 01 41 68F1：99 96 D8 C8 C6 28 98 F8 37 08F9：A9 60 A8 99 g6 D4 C8 D6 43 6901：FA 60 AC BF 62 8C 27 日E D8 6909：AD BC 6285 FB 85 FD AD 59 g911：BD 6285 FC 85 FE Bl FB 8A 6919：C9 A6 D6 67 A9 Eg 91 FB B2 6921：4C 28 ब9 A9 2091 FB AD ©C 6929：AB 62 F6 69 2ø Dø 99 2ø B6 6931：8C 69 4C 3 C 69 69 E4 69 B4 6939：28 8C 69 AD AF 62 D6 3B DC 6941：AD AA 62 D 6 gC 2891082 E 6949：20 AE 99 20 1E＠A 4 C 5B 47 Ø951： 69 2Ø 9D $68 \quad 2 \varnothing \mathrm{AE} 992012$ 6959：2E GA AD AC 92 D® 248 C AD 6961：BE 62 AC 27 GE A9 $26 \quad 91$ C4

969：FD AC BE 62 A9 5191 FB 6F 9971：A5 FB 8D BC 62 A5 FC 8D 61 6979：BD 0260 A9 06 8D AF 6229 6981：4C $28 \quad 69$ A9 06 8D AC 6211 6989：4C 4169 B1 FB C9 $2 \varnothing$ D® 66 9991：05 C9 20 D 61 6б AD AB 3A 9999：62 49 FF 8D AB $62 \mathrm{B1} \mathrm{FB} 9 \mathrm{C}$ 99A1：C9 Ag Dg 08 A9 618 D AF 77 99A9： 02 2ø 44 日B 6Ø B1 FB C9 89 99B1：2の D 65 C9 $2 \varnothing$ D 6160 EB 99B9：AD AA 6249 FF 8D AA 62 AF $09 \mathrm{Cl}: \mathrm{B} 1 \mathrm{FB}$ C9 Ag D 6082044 1A 99C9：日B A9 61 8D AC 6260 C0 B3 99D1： 659067 AD 1B D4 C9 2F 35
 99E1：F8 $6960 \mathrm{C} \varnothing 23 \mathrm{~B} \varnothing 67 \mathrm{AD} 62$ 99E9：1B D4 C9 FC B6 6188 C 623 69F1：FF D6 63 4C F8 6960 AD B7 99F9：ø0 DC 29 10 F0 66 A5 C5 1A gAg1：C9 15 Dg F3 CE 43 日B AD DF
 6A11： 03 4C 07 日B 2083 日A 208 E
 ØA21：65 Bø 69 A5 FB C9 28 Bø 67 6A29：03 4C F8 6960 A5 FC C9 DE 9A31： 07 96 99 A5 FB C9 E8 96 D1 6А 39：03 4C F8 09 60 A9 67 AA F3 GA41：A8 CA D $\emptyset$ FD 88 D 6 FA 6034 gA49：EE 32 GD AD 32 gD C9 93 3A 9A51：B6 6160 A9 06 8D 32 ØD 4C ＠A59：A9 F6 85 FB A9 D8 85 FC 29 ＠A61：A0 00 AD 1B D4 29 0F F6 87 gA69：F9 91 FB C8 Cb 1C 98 F2 75 ØA71：AØ Øб $2 \varnothing$ 9D Ø8 A5 FC C9 4E gA79：DA 90 E7 A5 FB C9 F2 96 F3
 のА89：04 99 C $607 \mathrm{C8} \mathrm{C} 62898$ B8 gA91：F5 A9 6485 FC A9 278546 9A99：FB A2 øø A9 $2 \varnothing$ A 0019164 ఏAAl：FB C8 91 FB 20 9D 08 E8 48 ØAA9：Eの 18 90 EF 60 30 303099 बAB1：30 $30303030303030 \quad C 5$ gAB9： $38 \quad 38 \quad 30$ A9 6485 FC A9 6C gAC1：F6 85 FB A 906 B1 FB C9 C4
 gAD1：1C 90 F2 Ag ø日 20 9D 08 44 gAD9：A5 FC C9 0690 E7 A5 FB 65 GAE1：C9 F1 90 E1 60 A2 0A FE 28 gAE9：AE ØA BD AE ØA C9 3A 96 F6 gAF1： 09 A9 30 9D AE ØA CA 4C 54 ØAF9：E8 ØA BD AE＠A 9D 06 0472

 6B11：E8 4C 69 日B A5 C5 C9 4098 GB19：Fg FA C9 3F FG 63 4C 36 F5 बB21：08 4C E2 FC 9A $1311 \quad 50$ gE बВ 29：52 $45 \begin{array}{llllllll}53 & 53 & 20 & 52 & 45 & 54 & 82\end{array}$ बB $31: 55 \quad 524 \mathrm{E} 2 \mathrm{8}$ ØB39： $4 \mathrm{C} \quad 41 \quad 59 \quad 20 \quad 41 \quad 474149$ E5 GB41：4E $0 \emptyset \quad 06$ AD 1B D4 $29 \quad 07$ DE 6B49：AA BD C7 $9 B 8 D \quad$ BE $6 B$ BD 99 6B51：BF 9B 8D BD ØB A9 98 8D 34 ØB59： 06 D4 8D 61 D4 8D 67 D4 26 ØB61：8D 08 D4 A9 $0^{5}$ 8D 18 D4 29 ØB69：A9 ØF 8D 65 D4 8D gC D4 E3 GB71：A9 FC 8D 06 D4 8D GD D4 79 6B79：A9 15 8D 6B D4 6б AD BE 4E
 ØB89： 03 EE BD ØB AE BD ØB AD 75 gB91： BE 日B 8D 00 D4 $18 \quad 69$ 0A 5 FF gB99：8D 67 D4 8E 61 D4 $90 \quad 0189$ GBAl：E8 8E 98 D4 AD BD GB C9 62 GBA9：1E 9068 A9 10 8D 64 D4 22 ØBB1：8D 日B D4 60 0g C9 51 Dg 8 C

日BC9：A3 CC $23 \quad 86$ F4 30 A2 $00 \quad 5 \mathrm{~F}$ GBD1：A9 30 9D AE 0A E8 EO OE 2B ØBD9：90 F6 60 A5 FB 18692897 gBE1：85 FB 9802 E6 FC A5 FD 60 ØBE9：38 E9 2885 FD B 062 C6 71 GBEl：FE 60 A5 FB 38 E9 $2885 \quad 53$ ØBF9：FB Bø 62 C6 FC A5 FD 1879 ＠C01：69 2885 FD 9062 E 6 FE C1
gC11：4F 94 8D 13 GD AD Cl 07 5E ØC19：8D 14 gD AD BF 978 8D 15 C3 ØC 21：ØD AØ 26 A2 62 B9 28 g4 22 6C29：8D 16 GD BD CØ 67 CA C8 8B ØC31：9D C $\emptyset 67$ AD 16 日D 992844 ØC39： 64 E8 E8 8888 C 8 FF D6 4B ØC41：E4 Aø 66 A9 2885 FB A9 87 ØC 49： 6485 FC A9 E7 85 FD A9 F9 ØC51：07 85 FE A2 0020 DC 日B 9D gC59：A1 FB 8D 16 gD A1 FD 8D CC ØC61：17 GD 26 F3 GB AD 16 GD D3 gC69：81 FB AD 17 GD 81 FD 28 F2
 ØC79：12 6D 8D 28 64 AD 13 GD 1C ØC81：8D $77 \quad 64$ AD 14 gD 8D C 6 4A gC89： 67 AD 15 GD 8D E7 9768 7E gC91：AD 2964 8D 12 gD AD 77 BB ØC99： 64 8D 13 GD AD $98 \quad 67$ 8D B5 ØCA1：14 GD AD E6 67 8D 15 gD D $\varnothing$ ØCA9：A＠ 26 A2 02 B9 C 67807 C gCB1：16 GD BD 2864 CA C8 9D CC ØCB9：28 64 AD 16 GD 99 C $607 \quad 55$ ØCC1：E8 E8 88 88 C0 FF D6 E4 AE
 ØCD1：85 FC A9 4 F 85 FD A9 6491
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# How To Type In COMPUTE['s Gazette Programs 

Each month, COMPUTE!'s Gazette publishes programs for the Commodore 128,64 , Plus $/ 4$, and 16. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then on, erasing what was in memory. So be sure to save a program before you run it. If your computer crashes, you can always reload the program and look for the error.

## Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the GAZETTE, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: \{DOWN \} means to press the cursor down key; $\{5$ SPACES $\}$ means to press the space bar five times.

To indicate that a key should be shifted (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, $\{8 \underline{A}\}$ ), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, $\mathbb{B}$, hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces.

## When You Read:



This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, $\{A\}$ means to press CTRL-A.

## The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as $\{$ LEFT $\}$, and $\{\mathrm{HOME}\}$ in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.


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# The Automatic Proofreader 

Philip I. Nelson

"The Automatic Proofreader" helps you type in program listings for the 128,64 , Plus $/ 4$, and 16 and prevents nearly every kind of typing mistake.

Type in the Proofreader exactly as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, 10 PRINT"THIS IS BASIC" will generate a different checksum than 10 PRINT"THIS ISBA SIC".

A common typing error is transpo-sition-typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the position of each character within the line and thus catches transposition errors.

The Proofreader does not accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line
substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16 , do not perform any GRAPHIC commands while the Proofreader is active. When you perform a command like GRAPHIC 1 , the computer moves everything at the start of BASIC program space-including the Proofreader-to another memory area, causing the Proofreader to crash. The same thing happens if you run any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/ STOP-RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128,64738 for the 64 , and 65526 for the Plus/4 and 16). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, if you're using a 64 and activate the Proofreader after installing the other utility. For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable both programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

## The New Automatic Proofreader

1 10 VEC $=\operatorname{PEEK}(772)+256 * \operatorname{PEEK}(773)$ : $\mathrm{LO}=43: \mathrm{HI}=44$

20 PRINT "AUTOMATIC PROOFREADE R FOR ";:IF VEC=42364 THEN [SPACE]PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI c-2 ${ }^{\prime \prime}$
40 IF VEC $=35158$ THEN GRAPHIC C LR:PRINT "PLUS/4 \& 16"
50 IF VEC $=17165$ THEN LO $=45: \mathrm{HI}=$ 46:GRAPHIC CLR:PRINT" $128^{\prime \prime}$
$60 \mathrm{SA}=(\operatorname{PEEK}(\mathrm{LO})+256 \star \operatorname{PEEK}(\mathrm{HI}))+$ $6: A D R=S A$
76 FOR $J=\varnothing$ TO 166:READ BYT:POK $E$ ADR, $B Y T: A D R=A D R+1: C H K=C H K$ +BYT: NEXT
8 IF CHK $<>26570$ THEN PRINT "* ERROR* CHECK TYPING IN DATA STATEMENTS": END
90 FOR $J=1$ TO 5:READ RF,LF,HF: $\mathrm{RS}=\mathrm{SA}+\mathrm{RF}: \mathrm{HB}=\mathrm{INT}(\mathrm{RS} / 256): \mathrm{LB}=$ RS $-\left(256^{*} \mathrm{HB}\right)$
$100 \mathrm{CHK}=\mathrm{CHK}+\mathrm{RF}+\mathrm{LF}+\mathrm{HF}$ : POKE $\mathrm{SA}+\mathrm{L}$ F,LB: POKE SA+HF, HB:NEXT
110 IF CHK <> 22054 THEN PRINT " *ERROR* RELOAD PROGRAM AND \{SPACE\}CHECK FINAL LINE": EN D
126 POKE SA +149 , PEEK (772) : POKE SA +150 , $\operatorname{PEEK}(773)$
136 IF VEC $=17165$ THEN POKE SA+ 14,22 : POKE SA $+18,23$ : POKESA + 29,224: POKESA $+139,224$
$14 \varnothing$ PRINT CHRS (147); CHRS(17);" PROOFREADER ACTIVE": SYS SA
150 POKE HI, PEEK(HI) +1 : POKE (P $\operatorname{EEK}(L O)+256 * \operatorname{PEEK}(\mathrm{HI}))-1, \varnothing: \mathrm{N}$ EW
160 DATA $120,169,73,141,4,3,16$ 9,3,141,5,3
170 DATA $88,96,165,20,133,167$. $165,21,133,168,169$
180 DATA $0,141,0,255,162,31,18$ $1,199,157,227,3$
190 DATA 2 202, $16,248,169,19,32$, $210,255,169,18,32$
200 DATA $210,255,160,0,132,180$ ,132,176,136,230,180
210 DATA $200,185,0,2,240,46,20$ 1,34,208,8,72
226 DATA $165,176,73,255,133,17$ $6,164,72,201,32,2 ø 8$
230 DATA $7,165,176,208,3,104,2$ ø8,226,104,166,180
240 DATA $24,165,167,121,0,2,13$ 3,167,165,168,165
250 DATA $0,133,168,202,208,239$ , 240, 262,165,167,69
260 DATA $168,72,41,15,168,185$. 211,3,32,210,255
276 DATA $164,74,74,74,74,168,1$ $85,211,3,32,210$
280 DATA $255,162,31,189,227,3$, 149, 199, 2ø2, 16, 248
290 DATA $169,146,32,216,255,76$ ,86,137,65,66,67
3øø DATA $68,69,70,71,72,74,75$, $77,80,81,82,83,88$
$31 \varnothing$ DATA $13,2,7,167,31,32,151$, $116,117,151,128,129,167,136$ .137

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Computel's Gazette

## 

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# MLX Machine Language Entry Program For Commodore 64 and 128 

Ottis R. Cowper

"MLX" is a labor-saving utility that allows almost fail-safe entry of machine language programs. Included are versions for the Commodore 64 and 128.

Type in and save some copies of whichever version of MLX is appropriate for your computer (you'll want to use it to enter future ML programs from COMPUTE!'s GAZETTE). Program 1 is for the Commodore 64, and Program 2 is for the 128 ( 128 MLX can also be used to enter Commodore 64 ML programs for use in 64 mode). When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in hexadecimal-a base 16 numbering system commonly used by ML programmers. Hexadecimal-hex for short-includes the numerals 0-9 and the letters A-F. But don't worryeven if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

## Entering A Listing

Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLXformat listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing. (Commodore 128 users can enter the data from an MLX listing using the built-in monitor if the rightmost column of data is omitted, but we recommend against it. It's much easier to let MLX do the proofreading and error checking for you.)

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

## Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You do not type spaces between the columns; MLX automatically inserts these for you. You do not press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

Only the numerals 0-9 and the letters A-F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, 128 MLX redefines the function keys and + and keys on the numeric keypad so that you can enter data one-handed. (The 64 version incorporates the keypad modification from the March 1986 "BugSwatter" column, lines 485-487.) In either case, the keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figures above show the keypad configurations for each version.

MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that

## 64 MLX Keypad



## 128 MLX Keypad

| A <br> (F1) | B <br> (F3) | C <br> (F5) | D <br> (F7) |
| :---: | :---: | :---: | :---: |


| 7 | 8 | 9 | E <br> $(+)$ |
| :--- | :--- | :--- | :---: |
| 4 | 5 | 6 | F <br> $(-)$ |
| 1 | 2 | 3 | E <br> N <br> T <br> E <br> R |
| 0 |  |  | - |

can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00 , and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

## Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line

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$\begin{array}{ll}20 \% & \text { CLOSEOUTS } \\ 23 . \%\end{array}$ | HOME ACCOUNTANT WAS | NOW |
| :--- | :--- | :--- |
| 74.0 |  |
| $70^{\circ}$ | 24.0 |
| $10 \%$ |  | HOME ACCOUNTANT

EASY SCRIPT
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number prompt.
More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/ DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

## Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

## Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press $S$ or $L$, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save (save only for the 128 version). Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands ( 128 MLX makes use of BLOAD). Disk users should also note that the drive prefix 0 : is automatically added to the filename (line 750 in 64 MLX ), so this should not be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different
name. The 128 version makes up for this by giving you the option of scratching the existing file if you want to reuse a filename.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape, users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT address, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The 128 version also has a CATALOG DISK option so you can view the contents of the disk directory before saving or loading.

The QUIT menu option has the obvious effect-it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the $Q$ option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press $Y$ to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

## The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD "filename", 8 for disk (DLOAD "filename" on the 128) or LOAD "filename" for tape, and then RUN. Such
programs will usually have a starting address of 0801 for the 64 or 1C01 for the 128 . Other programs must be reloaded to specific addresses with a command such as LOAD "filename", 8,1 for disk (BLOAD "filename" on the 128) or LOAD "filename",1,1 for tape, then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

## An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances-use our "Automatic Proofreader" to type the new MLX, and then test your copy thoroughly before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

## Program 1: MLX For Commodore 64

SS $1 \varnothing$ REM VERSION 1.1: LINES 8 $30,95 \emptyset$ MODIFIED, LINES 4 85-487 ADDED
EK 1øø POKE 56,50:CLR:DIM INS, $I, J, A, B, A S, B \$, A(7)$, NS
DM 11ø C4=48:C6=16:C7=7:Z2=2:Z $4=254: Z 5=255: Z 6=256: Z 7=$ 127
CJ $12 \varnothing \mathrm{FA}=\operatorname{PEEK}(45)+\mathrm{Z6}$ * $\operatorname{PEEK}(46)$ : $\mathrm{BS}=\operatorname{PEEK}(55)+Z 6$ *PEEK (56 ): HS="ø123456789ABCDEF"
SB $130 \mathrm{R} \$=\mathrm{CHR} \$(13): \mathrm{L} \$="\{\operatorname{LEFT}\} "$ $: S \$=" \mathrm{n}: \mathrm{D} \$=\operatorname{CHR}(2 \varnothing): Z \$=$ CHRS( $\varnothing$ ): T\$ =" $\{13$ RIGHT $\} "$
CQ $140 \mathrm{SD=54272:FOR} \mathrm{I}=\mathrm{SD}$ TO SD +23:POKE I, ø:NEXT:POKE [SPACE]SD+24,15: POKE 78 8,52
FC 150 PRINT" $\{$ CLR \}"CHRS ( 142 ) CH RS(8): POKE 53280,15: POK E 53281, 15
EJ 160 PRINT TS" [RED] \{RVS\}
(2 SPACES ${ }^{2} 8$ 83
(2 SPACES \} "SPC(28)"
\{2 SPACES \} \{OFF\} \{BLU\} ML X II \{RED\} \{RVS \} (2 SPACES \}"SPC(28)" (12 SPACES\}\{BLU\}"
FR 170 PRINT" $\{3$ DOWN $\}$ \{3 SPACES \} COMPUTEI'S MA CHINE LANGUAGE EDITOR \{3 DOWN\}"
JB $18 \varnothing$ PRINT" ${ }^{\text {\{BLK }\} \text { STARTING ADD }}$

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PACKAGE INCLUDESt Leading Edge Keyboard - Disc Drive $\cdot 10$ Diskettes "12" Computer Monitor *Disc Drive Head Cleaner
-Owners Manual -AC Adapter-1CoK Floppy Drive -Word Pro.
cessor - Spread sheet - Data Base
WITH: 20 MEGABYTE HARD DRIVE
WITH: 10 MEGABYTE HARD DRIVE
WITH: 40 MEGABYTE HARD DRIYE.


RESSE4 ${ }^{\text {n }}$ ；：GOSUB3øø：SA＝A D：GOSUB1ø4ø：IF F THEN18 $\theta$
GF 190 PRINT＂ （BLK $\}$ \｛ 2 SPACES $\}$ EN DING ADDRESSE48＂；：GOSUB 30ø：EA＝AD：GOSUB103ø：IF \｛SPACE］F THEN19ø
KR 2 Øø INPUT＂$\{3$ DOWN $\}$（BLK $\}$ CLEA R WORKSPACE $[\mathrm{Y} / \mathrm{N}]$ R 4 月＂；A \＄：IF LEFTS（AS，1）＜＞＂Y＂TH EN22ø
PG 210 PRINT＂$\{2$ DOWN\}\{BLU\}WORK ING．．．＂；：FORI＝BS TO BS＋ EA－SA +7 ：POKE $1, \varnothing:$ NEXT：$P$ RINT＂DONE＂
DR $22 \varnothing$ PRINTTAB（ $1 \varnothing$ ）＂$\{2$ DOWN $\}$ \｛BLK\} \{RVS\} MLX COMMAND ［SPACE \}MENU (DOWN) E4Z": PRINT T\＄＂$\{$ RVS $\}$（OFF\}NTE R DATA＂
BD 230 PRINT TS＂\｛RVS\}D\{OFF\}ISR LAY DATA＂：PRINT T\＄＂ \｛RVS\}L\{OFF\}OAD FILE"
JS 240 PRINT TS＂$\{$ RVS $\}$ S $\{O F F\}$ AVE FILE＂：PRINT TS＂\｛RVS\}Q \｛OFF\}UIT (2 DOWN\} (BLK)"
JH 250 GET AS：IF AS＝NS THEN256
HK $260 \mathrm{~A}=0$ ：FOR $\mathrm{I}=1$ TO $5: I F \mathrm{~A}=$ MIDS（＂EDLSQ＂，I，1）THEN A $=I: I=5$
FD 270 NEXT：ON A GOTO $20,610,6$ 90，7øø，280：GOSUB1ø6б：GO TO250
EJ $28 \varnothing$ PRINT＂\｛RVS\} QUIT ": INPU T＂\｛DOWN］E4ヨARE YOU SURE ［Y／N］＂；AS：IF LEFTS（AS， 1）＜＞＂Y＂THEN $22 \varnothing$
EM 290 POKE SD＋24，$\varnothing$ ：END
JX $3 \varnothing \varnothing$ INS＝NS：AD＝ø：INPUTINS：IF LEN（INS）＜＞4THENRETURN
KF 310 B \＄$=\mathrm{IN} \$$ ：$G O S U B 32 \varnothing: A D=A: B \$$ $=$ MID $\$$（INS，3）：GOSUB320：A $D=A D * 256+A:$ RETURN
PP $32 \emptyset A=\varnothing: F O R \quad J=1$ TO 2：AS＝MID \＄（BS，J，1）：B＝ASC（AS）－C4＋ （ $A$ §＞＂＠＂）＊C7：$A=A * C 6+B$
JA $33 \varnothing$ IF $B<\emptyset$ OR $B>15$ THEN $A D=$ Ø：$A=-1: J=2$
GX 340 NEXT：RETURN
CH $350 \mathrm{~B}=\operatorname{INT}(\mathrm{A} / \mathrm{C} 6)$ ：PRINT MIDS（ H ， $\mathrm{B}+1,1):: \mathrm{B}=\mathrm{A}-\mathrm{B} * \mathrm{C} 6: \mathrm{PRI}$ NT MIDS（HS，B＋1，1）；：RETU RN
RR 360 A＝INT（AD／Z6）：GOSUB350：A ＝AD－A＊Z6：GOSUB350：PRINT ＂：＂；
BE $370 \mathrm{CK}=\mathrm{INT}(\mathrm{AD} / \mathrm{Z6}): \mathrm{CK}=\mathrm{AD}-\mathrm{Z4}$＊$^{*}$ CK＋Z5＊（CK＞Z7）：GOTO39ø
PX 38 Ø $\mathrm{CK}=\mathrm{CK} \star \mathrm{Z} 2+\mathrm{Z5}$＊（ $\mathrm{CK}>\mathrm{Z7}$ ）+A
JC 39 CK＝CK +Z 5 ＊（CK＞Z5）：RETURN
QS 4øø PRINT＂$\{$ DOWN $\}$ STARTING AT ह4刃＂；：GOSUB3日ぁ：IF IN§＜＞ NS THEN GOSUB1ø3ø：IF F ［SPACE］THEN4øø
EX $41 \varnothing$ RETURN
HD $42 \varnothing$ PRINT＂$\{$ RVS $\}$ ENTER DATA \｛SPACE\}":GOSUB4ø日:IF IN \＄＝NS THEN22ஏ
JK $43 \varnothing$ OPEN3，3：PRINT
SK 440 POKE198， $0:$ GOSUB360：IF F THEN PRINT INS：PRINT＂ \｛UP\} \{5 RIGHT\}";
GC 450 FOR $I=\varnothing$ TO 24 STEP $3: B \$$ $=\mathrm{S} \$:$ FOR J＝1 TO 2：IF F T HEN BS＝MIDS（INS，I＋J，1）
HA 460 PRINT＂$\{$ RVS $\}$＂BSLS；：IF I＜ 24THEN PRINT＂$\{$ OFF $\}$＂；
HD 470 GET AS：IF AS＝NS THEN $47 \varnothing$ FK 480 IF（AS＞＂／＂ANDAS＜＂：＂）OR（A §＞＂＠＂ANDAS＜＂G＂）THEN54ø

3＊$\left(A S=" "^{\prime \prime}\right)-4^{*}(A S=" / ")-5$
＊（AS＝＂J＂）$-6^{*}(A S=" K ")$
 ＂）$-9 \star(A S=" U ")-1 \sigma^{*}(A S=" I$ ＂）-11 ＊（ $\mathrm{A} S=$＂ O ＂$)-12^{*}(\mathrm{~A} \$=$＂ p＂）
$C M 487 \mathrm{~A}=\mathrm{A}-13^{*}(\mathrm{~A}=\mathrm{S}=\mathrm{S})$ ）：IF A THE N AS＝MIDS（＂ABCD123E456F

MP 490 IF $A \$=R S$ AND（ $(I=\varnothing)$ AND（ $J$ $=1$ ）OR F）THEN PRINT B\＄；： $\mathrm{J}=2$ ：NEXT： $\mathrm{I}=24$ ：GOTO55 $\varnothing$
KC 500 IF A $\$=$＂$\{$ HOME $\} "$ THEN PRI NT B\＄：J＝2：NEXT：I＝24：NEX $T: F=\varnothing$ ：GOTO44 $\varnothing$
MX 510 IF（AS＝＂$\{$ RIGHT \}") ANDF TH ENPRINT BSLS；：GOTO54ø
GK 520 IF AS $<>L \$$ AND AS $<>D \$$ OR （ $(\mathrm{I}=\varnothing)$ AND（ $\mathrm{J}=1)$ ）THEN GOS UB166Ø：GOTO47ø
HG $53 \varnothing$ A $=\mathrm{L} \$+\mathrm{S} \$+\mathrm{LS}:$ PRINT B L $L \$$ ； ：$J=2-J: I F ~ J$ THEN PRINT \｛SPACE\}LS;:I=I-3
QS 540 PRINT AS；：NEXT J：PRINT \｛SPACE\}S\$;
PM 550 NEXT I：PRINT：PRINT＂\｛UP\} ［5 RIGHT］＂；：INPUT\＃3，INS ：IF INS＝N $\$$ THEN CLOSE3： GOTO226
QC 560 FOR $\mathrm{I}=1$ TO 25 STEP3： B S $=$ MIDS（INS，I）：GOSUB320：IF I＜25 THEN GOSUB38ø：A（I （3）$=A$
PK 576 NEXT：IF A＜＞CK THEN GOSU B1ø6ø：PRINT＂$\{$ BLK $\}$（RVS） \｛SPACE \}ERROR: REENTER L INE E43＂：F＝1：GOTO44
HJ 580 GOSUB1ø8ø：$B=B S+A D-S A: F O$ R I＝ø TO 7：POKE B＋I，A（I ）：NEXT
QQ 590 AD＝AD＋8：IF AD＞EA THEN C LOSE3：PRINT＂\｛DOWN\} \{BLU\}
＊＊END OF ENTRY＊＊\｛BLK\} \｛2 DOWN\}": GOTO7øø

QA $61 \varnothing$ PRINT＂\｛CLR $\}$（DOWN\} \{RVS \} ［SPACE］DISPLAY DATA＂：G OSUB4日ぁ：IF INS＝NS THEN2 $2 \sigma$
RJ 62ø PRINT＂\｛DOWN\} \{BLU\} PRESS: \｛RVS\}SPACE\{OFF\} TO PAU SE，［RVS\}RETURN\{OFF\} TO BREAKE4 （DOWN \}"
KS 630 GOSUB36ø：B＝BS + AD－SA：FOR $\mathrm{I}=\mathrm{BTO} \quad \mathrm{B}+7: \mathrm{A}=$ PEEK（ I$): \mathrm{GOS}$ UB350：GOSUB38ø：PRINT S $\$$ ；
CC 640 NEXT：PRINT＂${ }^{\text {RVS }}{ }^{\prime \prime}$ ：： $\mathrm{A}=\mathrm{CK}$ ：GOSUB35 ：PRINT
KH $650 \mathrm{~F}=1: \mathrm{AD}=\mathrm{AD}+8: I \mathrm{~F}$ AD＞EA TH ENPRINT＂$\{$ DOWN $\}$（BLU \} ** E ND OF DATA＊＊＂：GOTO22ø
KC 660 GET AS：IF AS＝RS THEN GO SUB1ø8Ø：GOTO22ø
EQ 670 IF $A S=S \$$ THEN $F=F+1$ ：GOS UB1ø8ø
AD 680 ONFGOTO630，660，630
CM 69ø PRINT＂\｛DOWN\} (RVS\} LOAD ［SPACE \}DATA ": OP=1:GOTO 710
PC 760 PRINT＂ \｛DOWN\} \{RVS\} SAVE ［SPACE］FILE＂：OP＝$\varnothing$
RX 710 IN $\$=$ NS：INPUT＂${ }^{\prime 2}$ DOWN $\}$ FILE NAMEK4＂$;$ INS：IF IN $\$=N \$$ \｛ SPACE \} THEN 220
 \｛RVS\}T\{OFF\}APE OR (RVS) D\｛OFF\}ISK: E4g";
FP 730 GET AS：IF AS＝＂T＂THEN PR INT＂T［DOWN ］＂：GOTOB8ø
HO 740 IF AS＜＞＂D＂THEN73

HH 750 PRINT＂D\｛DOWN\}":OPEN15,8 ，15，＂I6：＂：B＝EA－SA：INS＝＂ Ø：＂＋INS：IF OP THEN81ø
SQ $76 \varnothing$ OPEN $1,8,8$ ，IN\＄＋＂，P，W＂：G OSUB860：IF A THEN22ø
FJ $77 \varnothing \mathrm{AH}=\mathrm{INT}(\mathrm{SA} / 256): \mathrm{AL}=\mathrm{SA}-(\mathrm{A}$ H＊256）：PRINT $\ddagger 1$ ，CHRS（AL） ；CHR（ AH ）；
PE 780 FOR $I=\varnothing$ TO B：PRINT $\# 1, \mathrm{CH}$ RS（PEEK（BS +I$)$ ）：：IF ST T HENBøø
FC 790 NEXT：CLOSE1：CLOSE15：GOT 094б
GS 8øØ GOSUB1ø60：PRINT＂\｛DOWN\} \｛BLK］ERROR DURING SAVE： E4g＂：GOSUB86ø：GOTO22ø
MA 810 OPEN $1,8,8$ ，INS $+^{\prime \prime}, P, R^{\prime \prime}: G$ OSUB860：IF A THEN22ø
GE 820 GET\＃1，AS，BS：AD＝ASC（AS＋Z \＄）$+256^{*}$ ASC（ B S +ZS ）$: I F$ AD ＜＞SA THEN $F=1$ ：GOTOB5
RX $83 \varnothing$ FOR $\mathrm{I}=\varnothing$ TO B：GET\＃1，AS：P OKE BS $+I, \operatorname{ASC}(A S+2 \$): I F($ I＜＞B）AND ST THEN $F=2: A D$ ＝I：I＝B
FA 840 NEXT：IF ST＜＞64 THEN $F=3$
FO 850 CLOSE1：CLOSE15：ON ABS（F $>$ ©）+1 GOTO96 $0,97 \varnothing$
SA 860 INPUT $\# 15, A, A S: I F A$ THEN CLOSE1：CLOSE15：GOSUB1ø $60:$ PRINT＂$\{$ RVS $\}$ ERROR：＂A \＄
GQ 870 RETURN
EJ 880 POKE183，PEEK（FA +2 ）：POKE 187，PEEK（FA +3 ）：POKE188， PEEK $(F A+4):$ IFOP $=0$ THEN 92 ■
HJ 89ø SYS 63466：IF（PEEK（783）A ND1）THEN GOSUB1060：PRIN T＂\｛DOWN\} \{RVS\} FILE NOT ［SPACE \}FOUND ": GOTO690
CS 9øø AD＝PEEK（829）$+256 * \operatorname{PEEK}(8$ 3ø）：IF AD＜＞SA THEN F＝1： GOTO97ø
SC 916 A $=\operatorname{PEEK}(831)+256 * \operatorname{PEEK}(83$ 2）$-1: F=F-2^{\star}(A<E A)-3^{*}(A>$ EA）：$A D=A-A D: G O T O 93 \varnothing$
KM $92 \varnothing \mathrm{~A}=\mathrm{SA}: \mathrm{B}=\mathrm{EA}+1$ ：GOSUB1 $\varnothing 1 \varnothing$ ： P OKE78ø， 3 ：SYS 63338
JF $930 \mathrm{~A}=\mathrm{BS}: B=B S+(E A-S A)+1: G O S$ UB1ø1ø：ON OP GOTO950：SY S 63591
AE $94 \varnothing$ GOSUB1ø8ø：PRINT＂\｛BLU\}** SAVE COMPLETED＊＊＂：GOT O22ø
XP 950 POKE147，Ø：SYS 63562：IF

FR 960 GOSUB1ø8ø：PRINT＂$\left\{\right.$ BLU ${ }^{* *}$ LOAD COMPLETED＊＊＂：GOT 0220
DP $97 \varnothing$ GOSUB1ø6ø：PRINT＂$\{$ BLK $\}$ \｛RVS\}ERROR DURING LOAD: \｛DOWN\}E4]": ON F GOSUB98 Ø，99ø，1øøø：GOTO22ø
PP 980 PRINT＂INCORRECT STARTIN G ADDRESS（＂；：GOSUB360： PRINT＂）＂：RETURN
GR 990 PRINT＂LOAD ENDED AT＂；： $A D=S A+A D: G O S U B 360: P R I N T$ D $\$$ ：RETURN
FD $10 ø \varnothing$ PRINT＂TRUNCATED AT END ING ADDRESS＂：RETURN
RX 161Ø AH＝INT $(A / 256): A L=A-(A H$ ＊256）：POKE193，AL：POKE1 94，AH
FF 162 1 AH＝INT（B／256）：AL＝B－（AH ＊256）：POKE1 74，AL：POKE1 75，AH：RETURN
FX $163 \varnothing$ IF AD $<S A$ OR AD＞EA THEN 185 $\varnothing$
HA 1040 IF（AD＞511 AND AD＜4696ø

） OR （AD＞49151 AND AD＜53 248）THEN GOSUB1ø8ø：F＝ø ：RETURN
HC 1050 GOSUB166б：PRINT＂\｛RVS\} ［SPACE］INVALID ADDRESS \｛DOWN\} (BLK\}": F=1:RETU RN
AR 1060 POKE SD＋5，31：POKE SD＋6 ，208：POKE SD，240：POKE \｛SPACE\}SD $+1,4$ ：POKE SD + 4，33
DX 1078 FOR S＝1 TO 100：NEXT：GO Tolø9ø
PF 1 1ø8 $\varnothing$ POKE SD $+5,8:$ POKE SD +6 ， 240：POKE SD，$\varnothing$ ：POKE SD＋ 1，90：POKE SD＋4，17
AC 1690 FOR S＝1 TO 16ø：NEXT：PO KE SD＋4，$:$ POKE SD，$\varnothing: P O$ KE SD $+1, \varnothing$ ：RETURN

## Program 2：MLX For Commodore

 128AE 100 TRAP 960：POKE 4627，128： DIM NL\＄，A（7）
XP $110 \mathrm{Z2}=2: \mathrm{Z4}=254: \mathrm{Z} 5=255: \mathrm{Z} 6=2$ 56：Z7 $=127:$ BS $=256 *$ PEEK（ 4 627）：$E A=6528 \varnothing$
FB 120 BES $=\operatorname{CHR} \$(7):$ RT $\$=\operatorname{CHR} \$(13$ ）： $\mathrm{DL} \$=\mathrm{CHR} \$(20): \mathrm{SP} \$=\mathrm{CHR} \$$ （32）：LFS $=$ CHRS（157）
$\operatorname{KE} 130 \operatorname{DEF} \operatorname{FNHB}(A)=\operatorname{INT}(A / 256)$ ： $\operatorname{DEF} \operatorname{FNLB}(A)=A-\operatorname{FNHB}(A) * 2$ 56： $\operatorname{DEF} \operatorname{FNAD}(A)=\operatorname{PEEK}(A)+$ 256＊PEEK（A＋1）
JB 140 KEY $1, " A ": K E Y \quad 3, " B$＂：KEY 5，＂C＂：KEY 7，＂D＂：VOL 15 ：IF $\operatorname{RGR}(\varnothing)=5$ THEN FAST
FJ $15 \varnothing$ PRINT＂$\{$ CLR $\}$＂CHR $\$(142)$ ；C HRS（8）：COLOR 9，15：COLOR 4，15：COLOR 6，15
GQ 160 PRINT TAB（12）＂$\{$ RED $\}$ ［RVS $\} 2$ SPACES $] 89$ ẻ ［2 SPACES］＂RT\＄；TAB（12）＂ \｛RVS］\｛2 SPACES $\}$ \｛OFF\} （BLU） 128 MLX \｛RED］ \｛RVS\} (2 SPACES)"RTS;TAB （12）＂\｛RVS\}\{13 SPACES \} ［BLU］＂
FE $17 \varnothing$ PRINT＂$\{2$ DOWN \}
\｛ 3 SPACES ）COMPUTE I＇S MA CHINE LANGUAGE EDITOR \｛2 DOWN \}"
DK 180 PRINT＂$\{$ BLK）STARTING ADD RESSE4＂；：GOSUB 260：IF \｛SPACE\}AD THEN SA=AD:EL SE $18 \varnothing$
FH 190 PRINT＂\｛BLK\}\{2 SPACES\}EN DING ADDRESSE4シ＂；：GOSUB 260：IF AD THEN EA＝AD：E LSE 196
MF 200 PRINT＂\｛DOWN\}\{BLK\}CLEAR ［SPACE］WORKSPACE［Y／N］？ E4＂＂：GETKEY AS：IF AS＜＞＂ $\mathrm{Y}^{\prime \prime}$ THEN 22ø
QH $21 \varnothing$ PRINT＂\｛DOWN\}\{BLU\}WORKIN G．．．＂：：BANK ø：FOR A＝BS \｛SPACE\}TO BS $+($ EA－SA $)+7$ ： POKE A，$\varnothing:$ NEXT A：PRINT＂D ONE＂
DC 226 PRINT TAB（1б）＂\｛DOWN\} ［BLK］［RVS］MLX COMMAND ［SPACE\}MENU E4 \｛DOWN $^{\prime \prime}$ ： PRINT TAB（13）＂\｛RVS\}E \｛OFF\}NTER DATA"RTS;TAB ( 13）＂$\{$ RVS $\}$ D $\{O F F\}$ ISPLAY D ATA＂RT\＄；TAB（13）＂\｛RVS\}L （OFF）OAD FILE＂
HB 23ø PRINT TAB（13）＂\｛RVS\}S
\｛OFF\}AVE FILE"RTS;TAB(1 3）＂\｛RVS\}C\{OFF\}ATALOG DI SK＂RT\＄；TAB（13）＂\｛RVS\}Q \｛OFF\}UIT \{DOWN\}\{BLK\}"
AP 240 GETKEY AS：AaINSTR（＂EDLS CQ＂，AS）：ON A GOTO 340，5 $50,640,650,930,940$ ：GOSU В 95ø：GOTO 240
SX 250 PRINT＂STARTING AT＂；：GOS UB 260：IF（AD $\langle>6$ ）OR（ $A S=N$ LS）THEN RETURN：ELSE 250 BG 260 AS＝NLS：INPUT AS：IF LEN（ $\mathrm{A} S$ ）$=4$ THEN $\mathrm{AD}=\mathrm{DEC}(\mathrm{A}$ ）
PP $27 \emptyset$ IF $A D=\emptyset$ THEN BEGIN：IF A \＄＜＞NL\＄THEN 3øø：ELSE RE TURN：BEND
MA $28 \emptyset$ IF AD $\angle S A$ OR AD＞EA THEN ［SPACE］ $3 \varnothing 0$
PM 29ø IF AD＞511 AND AD＜6528ø ［SPACE］THEN PRINT BES；： RETURN
SQ 300 GOSUB 950：PRINT ${ }^{\text {n }}$ \｛RVS\} I NVALID ADDRESS（DOWN\} （BLK）＂：AD＝ø：RETURN
RD $310 \mathrm{CK}=\mathrm{FNHB}(\mathrm{AD}): \mathrm{CK}=\mathrm{AD}-\mathrm{Z} 4 * \mathrm{CK}$ ＋Z5＊（CK＞Z7）：GOTO 33ø
DD 32 の $\mathrm{CK}=\mathrm{CK}$＊ $\mathrm{Z} 2+25$＊$(\mathrm{CK}>\mathrm{Z} 7)+\mathrm{A}$
AH $336 \mathrm{CK}=\mathrm{CK}+\mathrm{Z} 5$＊$(\mathrm{CK}>\mathrm{Z5})$ ：RETURN
QD $34 \emptyset$ PRINT BES；＂$\{$ RVS $\}$ ENTER \｛SPACE］DATA＂：GOSUB 250 ：IF AS＝NLS THEN 22Ø
JA $35 \emptyset$ BANK $\varnothing:$ PRINT：F＝$\varnothing$ ：OPEN 3 ， 3
BR 360 GOSUB $310:$ PRINT HEX $\$(A D$ ）＋＂：＂：：IF F THEN PRINT ［SPACEJL\＄：PRINT＂\｛UP\} （5 RIGHT）＂
QA 37Ø FOR $I=\emptyset$ TO 24 STEP 3：BS ＝SPS：FOR J＝1 TO 2：IF F \｛SPACE ）THEN $\mathrm{B} \$=$ MID $\$(\mathrm{~L} \$$ ， I $+\mathrm{J}, 1$ ）
PS $38 \emptyset$ PRINT＂\｛RVS\}"BS+LFS;:IF ［SPACE］I $<24$ THEN PRINT＂ \｛OFF\}";
RC 390 GETKEY AS：IF（AS＞＂／＂AN D AS＜＂：＂）OR（AS＞＂＠＂AND AS＜＂G＂）THEN $47 \varnothing$
AC 406 IF A $\$=$＂+ ＂THEN $A S=" E ": G$ ото 478
QB $41 \varnothing$ IF $A S="-"$ THEN $A S=" F ": G$ ото 47ø
FB $42 \sigma$ IF AS＝RTS AND（ $(I=\emptyset)$ AN D（ $\mathrm{J}=1$ ）OR F）THEN PRIN
T BS；：J＝2：NEXT：I＝24：GOT － $48 \varnothing$
RD 43ø IF AS＝＂ （HOME）＂THEN PRI NT BS：J＝2：NEXT：I＝24：NEX T：F＝ø：GOTO 36ø
XB 44ø IF（AS＝＂$\{\text { RIGHT }\}^{n}$ ）AND $F$ THEN PRINT BS＋LFS；：GOT － 478
JP 450 IF AS＜＜LLFS AND AS＜＞DLS ［SPACE］OR（ $(\mathrm{I}=\varnothing)$ AND（J
＝1））THEN GOSUB 950：GOT － 390
PS 460 A $\$=L F \$+S P \$+L F S:$ PRINT $B \$$ ＋LFS；：J＝2－J：IF J THEN P RINT LFS；：I＝I－3
GB 470 PRINT AS；：NEXT J：PRINT \｛SPACE］SPS；
HA 480 NEXT I：PRINT：PRINT＂\｛UP\} ［5 RIGHT ${ }^{\prime \prime}$ ；：L $\${ }^{(1)}$
［27 SPACES \}"
DP 490 FOR $I=1$ TO 25 STEP 3：GE T\＃3，AS，BS：IF AS＝SPS THE N I＝25：NEXT：CLOSE 3：GOT － $22 \varnothing$
BA $500 \mathrm{~A} \$=\mathrm{A} \$+\mathrm{B} \$: \mathrm{A}=\mathrm{DEC}(\mathrm{A} \$): \mathrm{MID} \$$ （LS，I，2）$=\mathrm{A} \$: \mathrm{IF}$ I $<25 \mathrm{THE}$ N GOSUB 32ø：A（I／3）＝A：GE T＊3，AS

AR $51 \varnothing$ NEXT I：IF A $\langle>C K$ THEN GO SUB 950：PRINT：PRINT＂
\｛RVS \} ERROR: REENTER LI NE＂：F＝1：GOTO 360
DX $52 \sigma$ PRINT BE $\$: B=B S+A D-S A: F O$ R $\mathrm{I}=\emptyset$ TO 7：POKE $\mathrm{B}+\mathrm{I}, \mathrm{A}$（I ）：NEXT I
XB $53 \varnothing F=\varnothing: A D=A D+8: I F \quad A D<=E A T$ HEN $36 \varnothing$
CA $54 \varnothing$ CLOSE 3：PRINT＂ \｛DOWN \}
［BLU］＊＊END OF ENTRY＊＊ \｛BLK］\｛2 DOWN\}": GOTO 650
MC 550 PRINT BES；＂\｛CLR］\｛DOWN\} ［RVS］DISPLAY DATA＂：GO SUB 250 ：IF AS＝NL $\$$ THEN ［SPACE］ 220
JF 560 BANK Ø：PRINT＂ （DOWN\} \｛BLU\}PRESS: \{RVS\}SPACE ［OFF\} TO PAUSE, \{RVS]RE TURN\｛OFF\} TO BREAKE4』 \｛DOWN\}"
XA $57 \varnothing$ PRINT HEXS（AD）＋＂：＂；：GOS UB $310: B=B S+A D-S A$
DJ 580 FOR $I=B$ TO $B+7: A=$ PEEK（ $I$ ）：PRINT RIGHT \＄（HEX\＄（A）， 2）；SPS；：GOSUB $320:$ NEXT ［SPACE］I
XB 59ø PRINT＂\｛RVS\}";RIGHT\$(HEX \＄（CK），2）
GR $6 \varnothing 0 \mathrm{~F}=1: \mathrm{AD}=\mathrm{AD}+8: I F \quad \mathrm{AD}>\mathrm{EA}$ TH EN PRINT＂\｛BLU\}** END OF DATA＊＊＂：GOTO $22 \varnothing$
EB 610 GET AS：IF AS＝RTS THEN P RINT BES：GOTO 220
QK $62 \varnothing$ IF AS＝SP $\$$ THEN $F=F+1: P R$ INT BES；
XS 630 ON F GOTO $570,610,57 \varnothing$
RF 64ø PRINT BES＂${ }^{\text {（DOWN }}$ \｛RVS ）L OAD DATA＂：OP＝1：GOTO 66 Ø
BP 65 ® PRINT BES＂\｛DOWN\}\{RVS\} S AVE FILE＂： $\mathrm{OP}=\varnothing$
DM $660 \mathrm{~F}=\varnothing: \mathrm{F}$＝$=$ NL $\$:$ INPUT＂FILENA ME［4］＂；F\＄：IF FS＝NLS THE N 22.
RF $67 \varnothing$ PRINT＂${ }^{\text {（DOWN }}$ \｛BLK $\}$（RVS）$T$ \｛OFF\}APE OR \{RVS\}D\{OFF\} ISK： 848 ＂；
SQ 680 GETKEY AS：IF AS＝＂T＂THE N 850：ELSE IF ASく＞＂D＂T HEN 680
SP 690 PRINT＂DISK\｛DOWN］＂：IF OP THEN $76 \varnothing$
 ［SPACE］DS THEN A\＄＝DS\＄：G OTO 740
JH 710 BANK $\varnothing$ ：POKE BS -2 ，FNLB（S A）： POKE BS $-1, \mathrm{FNHB}(\mathrm{SA}): \mathrm{P}$ RINT＂SAVING＂；FS：PRINT
MC $72 \varnothing$ FOR A $=B S-2$ TO BS $+E A-S A$ ： PRINT ${ }^{1} 1, \operatorname{CHR}$（ $\left.\operatorname{PEEK}(A)\right)$ ：： IF ST THEN AS＝＂DISK WRI TE ERROR＂：GOTO 750
GC 730 NEXT A：CLOSE 1：PRINT＂
［BLU］＊＊SAVE COMPLETED （SPACE］WITHOUT ERRORS＊ ＊＂：GOTO 220
RA 740 IF DS $=63$ THEN BEGIN：CLO SE 1：INPUT＂\｛BLK\}REPLACE EXISTING FILE［Y／N］E4 ＂；AS：IF AS＝＂Y＂THEN SCR ATCH（FS）：PRINT：GOTO 7øの ：ELSE PRINT＂（BLK）＂：GOTO 660：BEND
GA 750 CLOSE 1：GOSUB 95ø：PRINT ＂\｛BLK\}\{RVS\} ERROR DURIN G SAVE：E4引＂：PRINT AS：G OTO $22 \varnothing$
FD 766 DOPEN \＃1，（FS＋＂，P＂）：IF DS THEN AS＝DS $\$: F=4$ ：CLOSE ［SPACE］1：GOTO 790

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PX 770 GET\#1,AS,BS:CLOSE 1:AD= ASC (AS) +256 *ASC (BS) : IF \{SPACE\}AD<>SA THEN $\mathrm{F}=1$ : GOTO $79 \varnothing$
KB $78 \emptyset$ PRINT"LOADING "; FS:PRIN $\mathrm{T}: \mathrm{BLOAD}(\mathrm{FS}), \mathrm{B} \varnothing, \mathrm{P}(\mathrm{BS}): \mathrm{AD}$ $=\mathrm{SA}+\mathrm{FNAD}(174)-\mathrm{BS}-1: \mathrm{F}=-2$ * ( $A D<E A)-3^{*}(A D>E A)$

RQ 790 IF $F$ THEN 800:ELSE PRIN T" $\left\{\mathrm{BLU}\right.$ ** $^{*}$ LOAD COMPLETE D WITHOUT ERRORS **":GO TO $22 \varnothing$
ER 80® GOSUB 950:PRINT" [BLK]
[RVS\} ERROR DURING LOAD : E4g": ON F GOSUB 810,8 2の,83б,840:GOTO22б
QJ $81 \varnothing$ PRINT"INCORRECT STARTIN G ADDRESS (";HEXS(AD);" )": RETURN
DP 820 PRINT"LOAD ENDED AT "; H EXS(AD): RETURN
EB 836 PRINT"TRUNCATED AT ENDI NG ADDRESS ("HEX\$(EA)") ": RETURN
FP 846 PRINT"DISK ERROR ";AS:R ETURN
KS 85ø PRINT"TAPE": AD=POINTER( F\$): $\operatorname{BANK} \quad 1: A=\operatorname{PEEK}(A D): A$ $\mathrm{L}=\mathrm{PEEK}(\mathrm{AD}+1)$ : $\mathrm{AH}=\mathrm{PEEK}$ (AD $+2)$
XX 860 BANK 15:SYS DEC("FF68") , $\varnothing, 1: S Y S$ DEC("FFBA"), 1, 1, $\varnothing$ :SYS DEC("FFBD"), A, A L, AH:SYS DEC("FF9ø"), 12 8:IF OP THEN 890
FG $87 \varnothing$ PRINT: $A=S A: B=E A+1$ : GOSUB 920:SYS DEC("E919"), 3: PRINT"SAVING ";FS
$A B 880 \quad A=B S: B=B S+(E A-S A)+1: G O S$ UB 920:SYS DEC("EA18"): PRINT" ${ }^{\text {(DOWN }}$ \{BLU\}** TAP E SAVE COMPLETED **": GO TO $22 \sigma$
CP 890 SYS DEC("E99A"): PRINT: I F PEEK (2816) $=5$ THEN GOS UB 950:PRINT" $\{$ DOWN\}
(BLK] (RVS) FILE NOT FOU ND ": GOTO $22 \varnothing$
GQ $9 \varnothing 0$ PRINT"LOADING $\ldots$ \{DOWN\} " : AD=FNAD (2817) :IF AD<> SA THEN $F=1: G O T O$ 8øø:EL SE AD=FNAD (2819)-1:F=-2 * (AD<EA) -3 * (AD>EA)

JD $91 \varnothing \mathrm{~A}=\mathrm{BS}: \mathrm{B}=\mathrm{BS}+(\mathrm{EA}-\mathrm{SA})+1: \mathrm{GOS}$ UB 920:SYS DEC("E9FB"): IF ST>日 THEN 8øø:ELSE 7 $9 \varnothing$
XB 920 POKE193,FNLB(A):POKE194 , FNHB (A) : POKE 174, FNLB ( B): POKE 175 , FNHB (B) : RET URN
CP 93ø CATALOG:PRINT" [DOWN\} \{BLU\}** PRESS ANY KEY F OR MENU **": GETKEY AS:G OTO 22ø
MM 946 PRINT BES" $\{$ RVS $\}$ QUIT E43"; RTS;"ARE YOU SURE [SPACE][Y/N]?": GETKEY A \$:IF AS<<"Y" THEN 220:E LSE PRINT" $\left\{\right.$ CLR ${ }^{\prime \prime}$ : BANK 1 5: END
JE 950 SOUND 1,5øø,10:RETURN
AF $96 \emptyset$ IF ER=14 AND EL=26ø THE n RESUME $3 \varnothing \boxminus$
MK $97 \varnothing$ IF ER=14 AND EL=5øø THE N RESUME NEXT
KJ 980 IF ER=4 AND EL=78ø THEN $F=4: A \$=D S \$$ : RESUME $8 \varnothing \sigma$
DQ $99 \varnothing$ IF ER=3ø THEN RESUME:EL SE PRINT ERRS(ER);"ERR OR IN LINE"; EL


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