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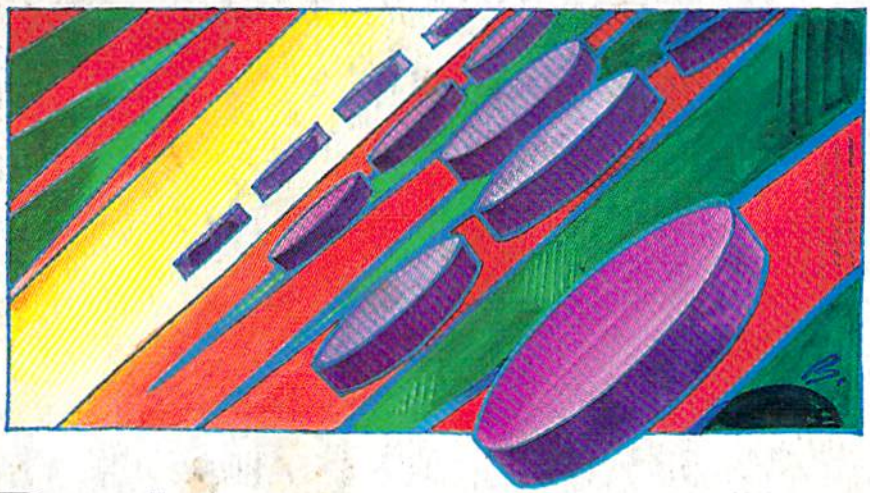

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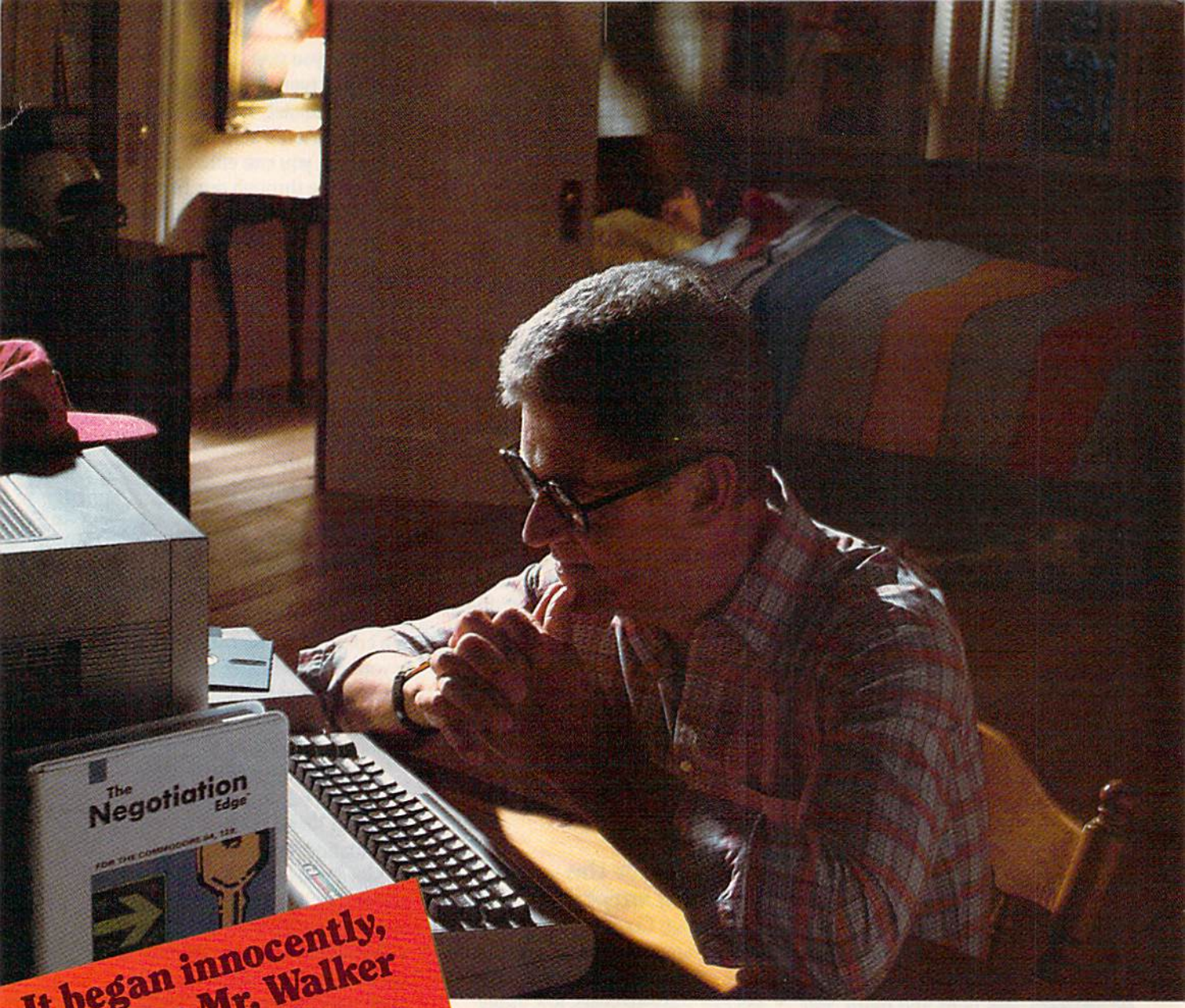

It began innocently, but soon Mr. Walker was running his entire career on little Bobby's Commodore.

Mr. Walker had never used a computer when he read about Info Designs' Negotiation Edge.™ He'd been meaning to ask for a raise and was looking for an "Edge."

That night, as Bobby slept, Mr. Walker's career turned. "Hey, Info Designs software makes Commodore® a terrific business computer."

The Edge line is people-insight software that's easy-to-use and only costs $79.95.*

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The ISS accounting modules are powerful, easy-to-use, and easy-to-learn. They include every business feature.

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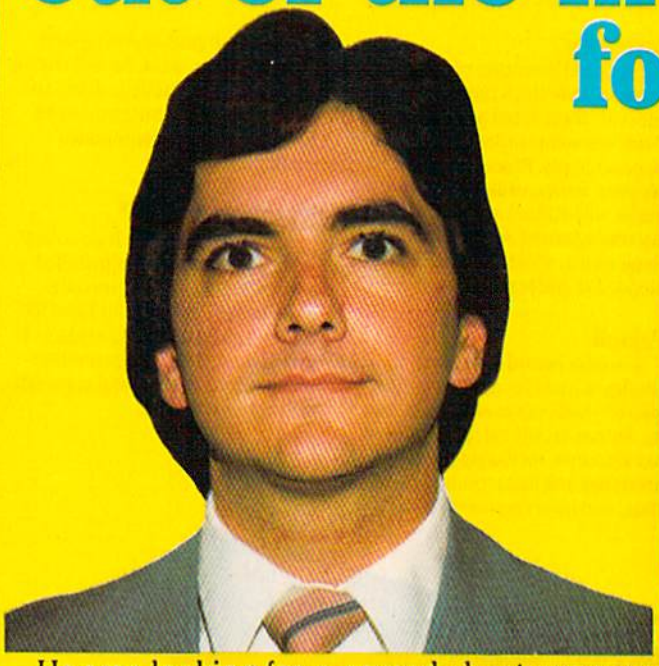
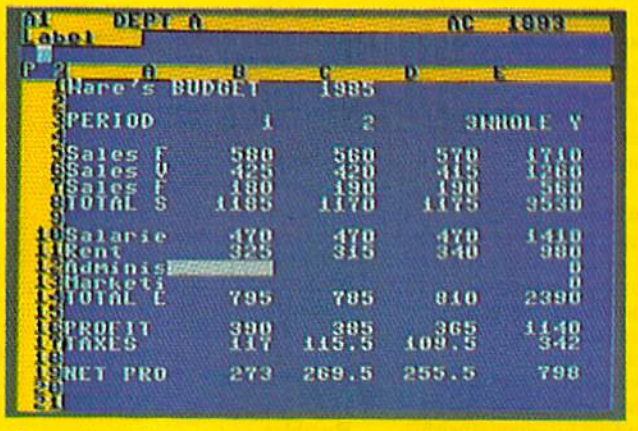
"Calc Result cut 10 years out of the mortgage time for my house",

says Tony Muscarella.





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21				

Tony is a CPA, and works in Windsor Locks, CT. Tony bought his Calc Result two years ago. He was looking for a spread sheet program for the Commodore and found Calc Result.

"I think Calc Result is the best spread sheet on the market. It is very easy to use and logically built up. I have found the capacity I need in the program, and you can understand I have some demands, as I am an accountant. I did not believe that a homecomputer equipped with Calc Result could be so powerful.

I use the program for business as well as at home. The most frequent business use is loan amortization. With Calc Result it is a lot faster to see the status of a loan, and also how a change in the amortization will affect the payment time.

Calc Result showed me how a slight increase of 10—20 dollars per month on the house amortization could cut 10 years out of the amortization period for my house. Incredible!

Calc Result is a program that is very easy to use, and very powerful. I can really recommend it."

If you want some more information about Calc Result or any of Handic's products for Commodore 64, send in the coupon or call.
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*=General, **V**=VIC-20, **64**=Commodore 64, **+4**=Plus/4, **16**=Commodore 16, **128**=Commodore 128

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editor's notes

Richard Mansfield, Senior Editor, prepared this month's Editor's Notes.
—Robert Lock, Editor-In-Chief

Like many of you, we've been Commodore-watchers for years now. We saw them gradually push to the head of the home computer manufacturing pack. Lately, though, there have been some mixed signals. Commodore has a phenomenal computer, the Amiga, but a decidedly obscure marketing strategy for it. Commodore's debut of the new 128 was also delayed and somehow confused. What's ahead for this company that, only a year ago, was the darling of the consumer and the leading force in personal computing?

Are we seeing simply the early strains of a company trying to reorient itself, to absorb new management styles? Is this temporary confusion the result of a leap to a new level of technological excellence? Is the Amiga so far beyond previous machines that Commodore doesn't yet know its identity and, thus, cannot yet position it or give it the right image?

The long-planned shipment of the Commodore 128 was delayed for months because, among other things, someone in the company didn't get FCC approval early enough. Now Commodore is faced with the difficult project of introducing virtually simultaneously two quite dissimilar machines to the public. Marketing campaigns will overlap. A large percentage of the potential buyers for these machines are not very familiar with computers, and it will likely be difficult for many of them to differentiate between the two competing models.

Another destabilizing factor—probably related to the radically advanced technology inside the Amiga—is the number of last-minute changes being made to the Amiga's operating system. Currently, Commodore is telling authors and developers that every available Amiga (the rumor is that there are perhaps 50 of them) is being taken around by staffers and demonstrated to dealers. There are no extra machines for research, books, or publications. Sources report that the available machines are not identical, that the operating system is still being reworked. We have heard of several iterations: code name Amiga Exec #24 through what is expected to be the final version, Exec #30 (or version 3.0). For example, in August at one Midwestern dealership, two machines were demonstrated. One was an Exec #27 and one an Exec #28. Software which ran on one of the versions would not run on the other.

These various versions have created problems for software houses trying to support the computer. One major manufacturer tells us that every time they have a group of programs ready, a new Exec comes along and the software has to be modified.

There also seems to be an Amiga identity crisis. It has been decided that the Commodore name and company logo will not appear anywhere on the Amiga or its peripherals. Commodore's official comment on this was that they wanted the new machine to stand on its own. This probably means that Commodore is concerned that its name—so long associated with home computing—would prevent the business community from taking the Amiga seriously. In a related move, Commodore has used the carefully chosen phrase "in-home users" to describe home computer users. This is similar to the way used car dealers like to refer to their wares as "previously owned vehicles." Presumably, the idea of home computing is so discredited that Commodore wants to distance itself both from the phrase *home computer* as well as *Commodore*, its own name.

On the bright side, the demonstration of the popular IBM PC program *Lotus 1-2-3* on the Amiga at the July press conference was one of the most promising and surprising announcements Commodore could have made about its new machine: the Amiga appeared able to run the huge software library available to the PC. PC-compatibility is perhaps the single strongest selling point today for any consumer computer. And the Amiga already had several strong selling points of its own: exceptional graphics, high speed, impressive audio and digitization capabilities, and co-processing among them.

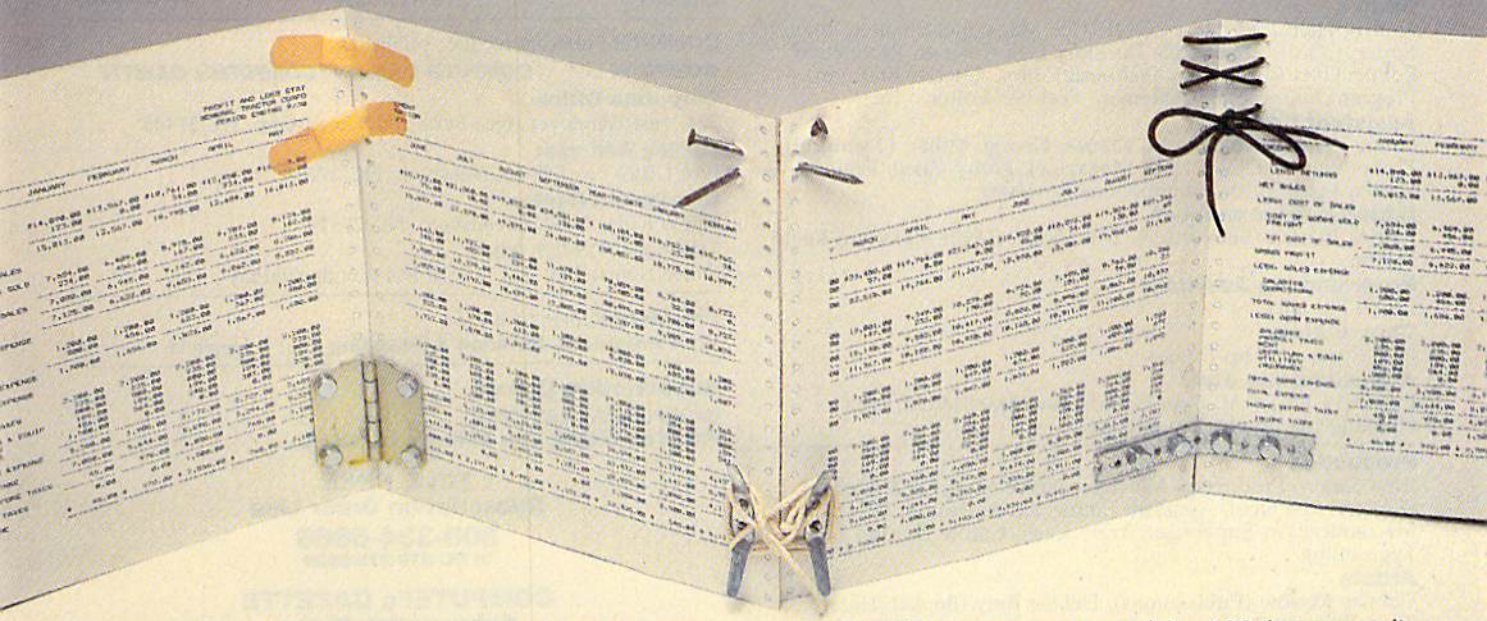
Also, early sales of the Commodore 128 seem strong. Commodore seems to be having more success signing up dealers for the Amiga than was first predicted. And, perhaps most important of all, Commodore does have in the Amiga one of the finest personal computers ever built.

Commodore is a different company than it was when Jack Tramiel ran the show. Jack's running Atari now, and the new Atari ST computer has been shipping for some time, in spite of that company's problems. And it shipped about when Tramiel said it would. While not everyone agreed with Tramiel's corporate philosophy, he did have a can-do spirit that propelled Commodore and the entire home computer industry for several years. In some ways, Commodore's new management has a hard act to follow.

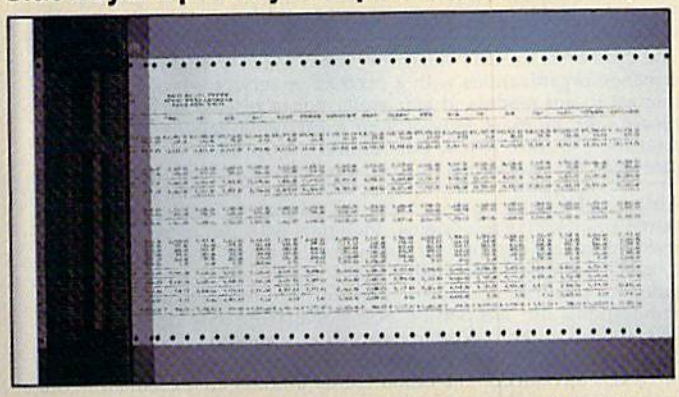
Richard Mansfield

Senior Editor

SIDEWAYS... A NEW PROGRAM THAT SOLVES AN OLD PROBLEM.



Sideways. It prints your spreadsheet sideways.



The problem with spreadsheets is they get printed the wrong way. You still have lots of stapling and taping to look forward to before your printout is ready. Now, with SIDEWAYS, you can print a spreadsheet report that's wider than your printer paper – vertically, all at one time, on one continuous page.

SIDEWAYS rotates your spreadsheet 90 degrees as it prints out, causing your hard copy to print sideways. Nothing you create with today's most popular spreadsheet programs* is too wide for SIDEWAYS.

And, because you're no longer confined to the width of your printer paper, you have complete control over line spacing; left, top and bottom margins; character spacing; and you can choose from a wide variety of type sizes.

Now, get rid of that stapler and tape for good – go SIDEWAYS. Available now at your favorite dealer for only $29.95.**

***COMPATIBILITY:** Sideways works with any C-64 or C-128 spreadsheet program that can create text file information (ASCII) on a disk, or interfaces with a word processor. SIDEWAYS also works with these spreadsheet programs: Better Working Spreadsheet, Calc Now, Cal-Kit, Creative Calc, Multiplan, Practicalc, Syncalc, and Trio. Timeworks's SWIFTCALC already includes SIDEWAYS.

For Commodore 64 and 128 Computers.***

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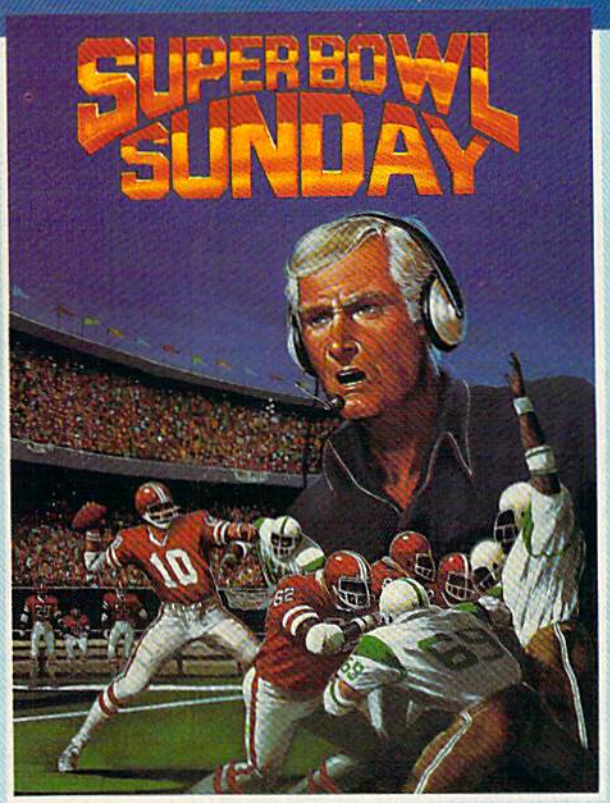

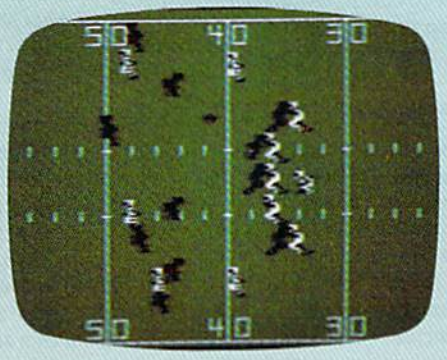

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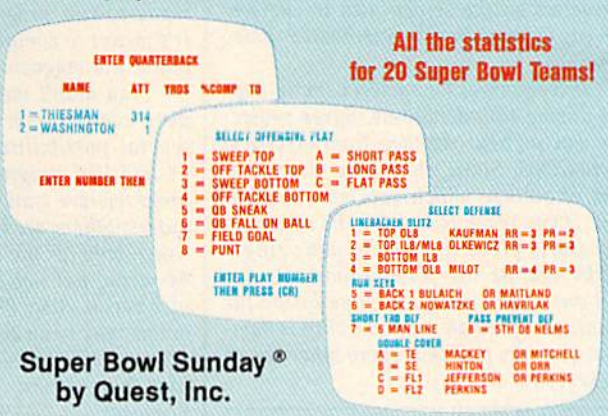

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Dangers To A Computer

Does it hurt the computer if a person types on the keyboard when the computer isn't on?

Maurice Maglalang

No. Ordinary typing can never hurt the keyboard. However, since the keys are basically just electrical switches, they can wear out, although it would take years of heavy use.

The electronic components of a computer can be harmed by two things: overheating and power surges. Overheating is not usually a problem; here at COMPUTE! there are several 64s (and other computers) that have run eight hours a day, five days a week for over a year. But if you're using a computer for long periods in 90-degree weather, overheating would be possible and you might consider buying a fan to dissipate the heat. The video chip seems to be more sensitive to heat; if the characters on the screen turn to rubbish, the cause may be an overheated video chip.

Power surges (or spikes) usually happen during thunderstorms. Surge protectors can prevent damage from electrical fluctuations. Static electricity is another form of voltage which can lead to problems. If you reach to turn on the computer and static electricity from your finger sparks against the joystick port, it may ruin one of the interface chips inside the computer. When an interface chip is damaged, you may find that every other key on the keyboard doesn't work.

Resaving A Program

"Bug-Swatter" listed a change for line 14 of the game "Balloon Blitz." How do I go about making the change without resaving the entire program?

Ann Collins

If you want a correct copy of that program, you'll have to resave it. You don't have to retype *the program though. Load it from tape or disk, type the correct line 14 (if there's already a line 14 in the program, it will be automatically replaced by the line you enter) and press RETURN. And then save to tape or disk. Disk drive owners should know that you can't have two files with the same name on the same disk. You can save the corrected copy of the program to a different disk, scratch the old version (***OPEN 15,8,15, "S0:*programname*"***) before saving the new version, or save the new version with a new filename.*

Documentation For The GAZETTE DISK

My father recently purchased a GAZETTE DISK subscription for me. Two days ago I purchased a magazine to compare it to the disk and was disappointed. I found that a couple of programs weren't on the disk.

Daniel Grandshaw

When you first load the menu program from the GAZETTE DISK, *a message appears on the screen, noting that you should see the corresponding issue of the* GAZETTE *for the documentation, the instructions for running the programs. Because we publish many type-in programs each month, we offer the* DISK *to magazine readers who don't have the time or inclination to type for hours. The* DISK*'s purpose is to provide ready-to-run programs from each issue. It's meant to complement, rather than replace, the magazine.*

You didn't mention which programs were missing from the DISK, *but there are several possibilities. Currently, we offer 64 and VIC programs on the* DISK. *Some programs are translated for several computers; others are not. So a program published only for the 64 will be listed on the 64 menu, but not on the VIC menu (and vice versa). Also, Plus/4, 16, and 128 programs may be in the magazine but not on the* DISK. *Finally, short example programs, like those found regularly in "Gazette Feedback" or "BASIC Magic," are not included. Short programs like these are designed to teach or illustrate a programming technique. With rare exceptions, all 64 or VIC programs listed in the back of the magazine are on the* DISK.

The Meaning Of Numbers

I have a question about DATA statements. I've been unable to find any information that tells me how the numbers are determined. Are they ASCII values or CHR$ values or something else?

M. L. Avery

The significance of numbers inside DATA statements is determined by context.

If you overheard someone say "48," the question might have been "How old are you?" or "What's four dozen?" or even "What's the decimal op code for branch on minus?" Knowing the answer is 48 doesn't necessarily tell you what the 48 means. It depends on the context.

You can sometimes make a good guess with partial information, however. If you see a 3–1 sports score in the newspaper, it may be a baseball score if it's summertime, or a hockey score in the winter. If the score is 111–102 (in winter), it's not a hockey or football score, but basketball.

When a program has DATA lines containing numbers between 0 and 255, and there's a READ followed by POKE inside a loop, it's putting numbers into memory. If the numbers include 169, 160, 162, 133, 141, and 145, chances are good that it's a machine language program. A lot of 255s or zeros may signal sprite shapes or custom characters. If most numbers are between 65 and 90, it may be a message—these are the ASCII (or CHR$) values for the letters A–Z. (ASC and CHR$ are complementary functions; ASC translates a character into its ASCII number, and CHR$ makes an ASCII number into its corresponding character.)

The numbers may be something else if they're not being POKEd into memory—a series of prices, people's ages, or sports scores—depending on what the program is supposed to do.

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Now that your programs load so quickly, doesn't it seem that "TurboTape" itself takes a long time to load? Try this:

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2. Enter NEW
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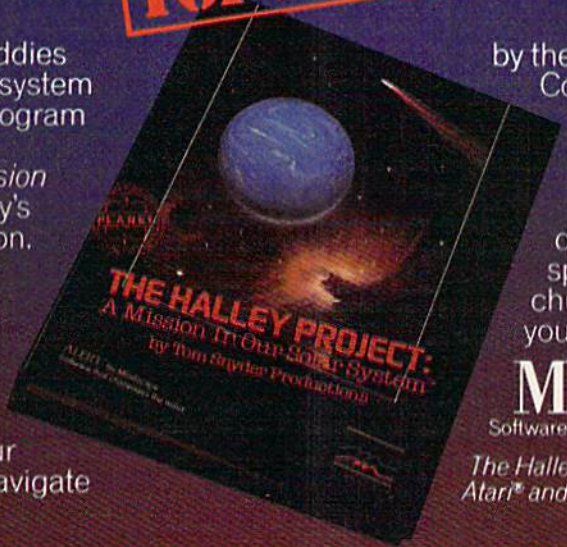

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4. Enter TSAVE "TURBO/64" ,2049,3462

The Turbosaved version of TurboTape will load a lot faster.

Helen Roth

Thanks for the helpful tip.

Spacing On Commodore Printers

How can I get my 1526 to double space program listings? I tried using a secondary address of 6, but can't seem to get it to work.

Playford Ramsey

On the odd-numbered Commodore printers (1525, 801, and 803), you can print double-spaced listings by opening a file with a number larger than 127. **OPEN 130,4: CMD130: LIST** *is how it would look. But this trick doesn't work on the even-numbered printers (1526 and 802). These printers give you more control over spacing.*

Although the manual says the 1526 advances paper in increments of 1/144 inch, our tests showed that the 1526, like the 802, uses 1/216 inch. It may be that some older 1526s worked at 1/144 inch.

When you turn it on, the normal spacing of a 1526 or 802 is 36/216 (which equals 1/6 when you factor it out), so there are 6 lines per inch. You can change the spacing by sending a CHR$ value between 0 and 127 to the printer over a channel that's been opened with a secondary address of 6:

```
OPEN 1,4,6: PRINT#1, CHR$(72):
  CLOSE 1
```

By sending character 72, you're telling the printer to space the lines at 72/216—double spaced at three lines per inch. A CHR$(108) should set the spacing at 1/2 inch. As you reduce the number below 36, the lines get closer and closer until they touch. This could be useful for printing a picture made up of the Commodore graphics characters.

A CHR$(0) means no spacing—in other words, the paper doesn't advance at all and the lines overstrike each other. This is how most hi-res programs for the 1526 work, because you can print more than one redefined character on a single line when there's no paper advance.

To get better print quality, print a CHR$(2) to channel 6, print the line, print a CHR$(34) to channel 6, reprint the line, and so on, alternating between 2 and 34 and printing each line twice. The spacing of 2/216 inch on reprinted lines fills in the area between the dots, giving the characters a more solid look. It's also possible to adjust the line spacing of the 1526 and MPS-802 to add subscripts and superscripts.

Limits On String Length

When I try to assign 255 characters, the maximum length, to a string variable, I always receive a STRING TOO LONG error. Other 64 and Plus/4 users here on Okinawa seem to think it is because I use a portable television versus an 80-column monitor. Is this possible?

Charles M. Kent

The computer doesn't know whether you have a TV or monitor; the type of display you're using never affects the way the computer works. Your 64 outputs a TV-compatible signal, and never inputs any information from the cable. Buying a monitor wouldn't affect the way the computer handles strings.

While it's true that string variables can hold up to 255 characters, the size of the input buffer controls how many characters you can initially assign to a string variable. The input buffer is a section of memory that temporarily holds characters after you press RETURN.

*The equals sign is one way of assigning a value to a variable (***20 A$="THIS IS A STRING"***, for example). Here's where we run into the limit. A program line typed into a 64 can be up to two screen lines long. After you press RETURN, the characters you typed are temporarily stashed in the input buffer and then the line is added to the program in memory. This limits you to a maximum of 80 characters per line. The line number, variable name, and equals sign take up a few spaces, which means the maximum string length in a program line is a little less than 80.*

Another way to assign a value is via the INPUT statement. But INPUT also has the limit of two screen lines, again because of the size of the input buffer. You can't input more than 80 characters (88 characters on a VIC, Plus/4, or 16). In 128 mode, the Commodore 128 accepts up to 160 characters in program lines or INPUT.

If you want longer strings, you'll have to concatenate them. Say you have two variables, A$ and B$, and they each contain 65 characters, you could add a line that glues them together: **C$ = A$ + B$**. *There will be 130 characters in the new variable C$. Or you could use GET:*

```
10 B$=""
20 GET A$:IF A$="" THEN 20
30 IF A$<>CHR$(13) THEN B$=B$+A$:
   GOTO 20
```

Weighing Words

I am writing a version of Hangman, but I need to find out how many letters are in the word. How do I do that?

Mike Craig

The LENgth function tells you the number of letters or characters in a word or string variable. Here are some examples you can try:

```
A$ = "SOME WORDS":PRINT LEN(A$)
K = LEN("TEST"): PRINT K
W$ = "COMPUTER": FOR J=1 TO
  LEN(W$): PRINT MID$(W$,J,1):NEXT
C$ = "CENTERED": PRINT
  TAB(20-LEN(C$)/2);C$
```

For more about LEN, see "BASIC Magic" elsewhere in this issue.

For Best Results, Randomize

I do a lot of programming, mostly adventure games, on my 64. I have a problem with random numbers—the computer picks the same ones every time. I need to know why. The players have the same statistics in every game.

Shane Peterson

Random numbers aren't truly random, because computers have to operate logically. The RND(1) function takes a seed number and scrambles it to come up with a new number (which becomes the seed value for the next random number).

When you turn on a VIC, 64, or other Commodore computer, the first seed is read from ROM. Since it's always the same, the sequence of random numbers is always the same. Some computers have a RANDOMIZE command, to scramble the first seed value.

For the equivalent of RANDOMIZE, use this line at the beginning of your program: **10 X=RND(-TI/37)**. *A negative number in parentheses puts a definite value into the seed, but TI changes every 1/60 second, so the first seed number will vary according to how long the computer has been turned on. The values from RND(1) won't follow a definite pattern if you include this randomizing equation. Dividing by 37 isn't really necessary. You could use RND(-TI), but dividing by a prime number gives you better odds of getting a floating point fraction in the seed value, which means a wider variety of on and off bits.*

Adding Flash To Messages

To give some of my games a little extra, I would like to know how to program a flashing "WARNING" message on my 64.

Michael Ratzlaff

You could flash a message in BASIC by alternately printing in normal and reverse mode again and again. But the program would have to stop while the message blinked. When the program continued, the flashing would stop.

Here's a machine language solution for the 64. The following program will flash any message that is printed in black on the screen. Other colors will print normally.

```
10 FORA=828TO914:READB:POKEA,B
   :C=C+B:NEXT:IFC<>8545THENPR
   INT"DATA ERROR":STOP
15 POKE6,0:SYS828:POKE53281,1:
   POKE53280,1:PRINT"{CLR}
```

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```
    {3 DOWN}{15 RIGHT}{BLK}WARN
    ING!"
20  DATA 120,169,81,141,20,3,16
    9,3,141,21
30  DATA 3,169,0,141,147,3,141,
    148,3,88
40  DATA 96,206,148,3,16,58,169
    ,10,141,148
50  DATA 3,169,0,133,2,133,4,16
    9,4,133
60  DATA 3,169,216,133,5,162,4,
    160,0,177
70  DATA 4,41,15,197,6,208,9,17
    7,2,41
80  DATA 127,13,147,3,145,2,200
    ,208,236,230
90  DATA 3,230,5,202,208,227,17
    3,147,3,73
100 DATA 128,141,147,3,76,49,2
    34
```

If you want a different color to flash, POKE its color code (0 for black, up to 15 for light gray) into location 6. The speed of the flashing can be adjusted by POKEing location 855 with a number from 0–255. SYS 828 enables the flashing messages. To stop the flashing, tap RUN/STOP-RESTORE.

Telecommunications: How Costly?

I am 12 years old and I'm thinking of buying a modem. My mom thinks the phone bill will be super large if I call bulletin boards or my friends. Could you give me some information on long distance calling to CompuServe or Playnet? Also, we live in Wisconsin and my friend knows of an excellent bulletin board in Michigan and one in Minnesota.

Shane Lardinois

Besides the cost of the modem, there are a few more charges you (and your mom) should consider. Almost all Commodore and Commodore-compatible modems include terminal software, so that's not a factor unless you want to buy a more powerful telecommunications program sometime in the future.

There are two types of telecommunications services. Information services (CompuServe, Dow Jones, Delphi, The Source, Playnet, People Link, Viewtron, and The Electronic University, to name a few) generally have dozens of phone lines and work on large mainframe computers or minicomputers. Bulletin boards are smaller operations with a single phone line and a microcomputer.

Most modems come with a password and a free hour or two on CompuServe and other information services. If you choose to join an information service, you pay hourly charges for connect time. The current price for CompuServe is $6 per hour (if you have a 300-baud modem and call after 6 p.m.). If you live in a medium to large city, there shouldn't be any extra cost for long-distance. CompuServe has hundreds of local numbers you can call, in cities all over the U.S. They charge 25 cents per hour for time spent on their phone network. Other services can be accessed through Tymnet or Telenet, for which you would be charged an additional fee ($2 per hour is common). If you live in a rural area, you'll have to make a long-distance call to the nearest CompuServe, Tymnet, or Telenet number.

So, if you call CompuServe through a local number every night for a month and stay on for two hours each night, your long-distance phone bill won't increase a penny, but you'll get a bill for about $375 of connect time from CompuServe. If you call them once a month for an hour, you'll be charged $6.25.

The costs for calling an out-of-state bulletin board system (BBS) are just the opposite. There may be an initial membership fee to join the BBS, but you don't generally pay for connect time. You do have to pay the phone company for long-distance calls, though. If you make ten hours of calls to Duluth one month, you'll be charged the same rate whether you're telecommunicating on a BBS or talking to your cousin.

Many BBS's have no membership fee. They may be run by a computer store, a user group, or someone who just likes operating a bulletin board. If you get onto a free BBS in your city, you won't pay anything extra. A free BBS doesn't charge for membership, and the phone company doesn't charge for local calls. It's like calling a friend in town—there's no charge.

Absolute And Relocating Loads

When you **LOAD"filename",8,1**, how does the computer know where to store the program in memory? How is **LOAD"filename",8,1** different from **LOAD"filename",8**?

Paul Brown

*When you load with **,8,1**, the 1 tells the computer to load the program back into the area of memory it originally came from. These absolute loads are used most often for machine language because many ML programs won't work if they're not loaded into the correct part of memory.*

The first two bytes in the disk program file indicate the memory location where the program should be loaded. That information is used by the computer when it's transferring the program to memory in an absolute load. Most of the time it's a good idea to type NEW after an absolute load, especially if you're going to be using the ML program in conjunction with BASIC. NEW resets some pointers, and prevents OUT OF MEMORY errors that sometimes occur after you load an ML program and try to add or change a line of BASIC.

*A relocating load (**LOAD "program name",8**) is used mostly for BASIC programs. The program is put into the beginning of BASIC memory regardless of where it was saved from. Relocating loads are valuable because you can move up the start of BASIC to protect a section of memory for a hi-res screen, custom characters, or sprites. If you use a relocating load on a machine language program and then LIST, you'll often see a screen full of strange line numbers and bizarre BASIC statements. The computer tries to list the machine language as BASIC and fails. To list an ML program, you need a special program called a disassembler.*

The Opposite Of LOG

What formula can I use to figure out an antilogarithm?

Paul Amedee

*The opposite of LOG is EXP, an abbreviation for EXPonentiate. Like LOG, you follow it with a number inside parentheses. **PRINT LOG(20)** returns a value of 2.99573227. To turn that number back into 20, type **PRINT EXP(2.99573227)**.*

*Both LOG and EXP are based on "natural" logarithms. To find a logarithm in base 10, use the formula **PRINT LOG(X)/LOG(10)**, where X is a positive number. If you put the number 20 in that statement, you'll find the logarithm of 20 in base 10 is 1.30103. To change that number back to 20, you don't need EXP, you can enter **PRINT 10 ↑ 1.30103**.*

Saving Data In Sequential Files

Could you please explain what a sequential disk file is, and how to create one?

David Bayer

A sequential file provides a way of keeping information separate from the program that uses it. This allows you to create general-purpose programs that can act on different sets of information. Instead of writing one program to keep track of a stamp collection and a second program to list a collection of rare books, you could write (or buy) a general inventory program that stores data in sequential files. One file would contain notes about stamps, and another would have the data about the books. A single program could handle two or more different files. Sequential files are like DATA statements because you start reading at the beginning and continue until you reach the end.

To create a sequential disk file, first open it for writing, then write one or more pieces of information to it, and close it. If you don't close it when you're done, some of the information will be lost. Reading the file is much the same: Open it for reading, read the information back, and then close it.

Here's a short program that creates a sequential file:

```
10 PRINT "TYPE THREE NAMES"
20 INPUT A$,B$,C$
30 OPEN 1,8,2, "NAMES,S,W"
40 PRINT#1,A$: PRINT#1,B$:
```

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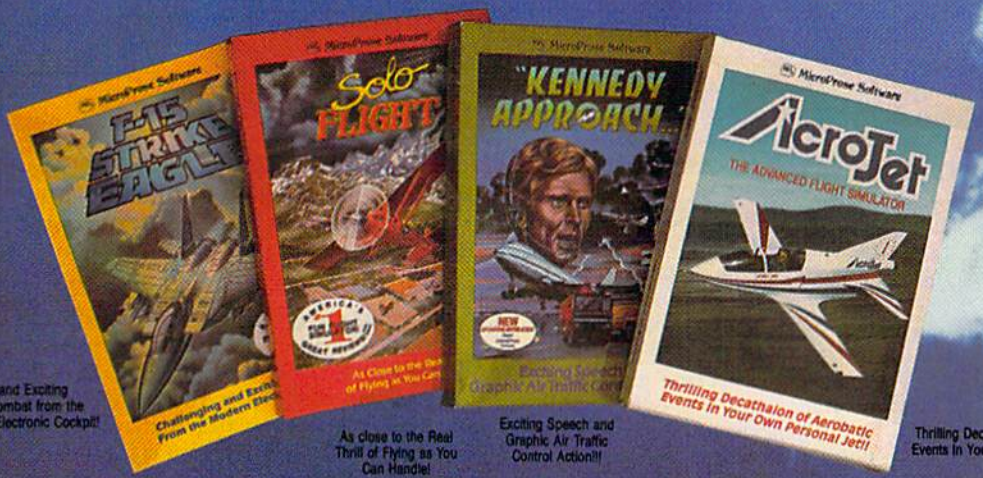

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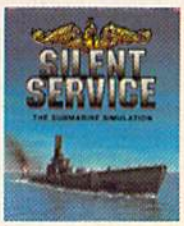

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```
PRINT#1,C$
50 CLOSE 1
```

The three numbers after the OPEN statement in line 30 are the logical file number, the device number, and channel. The file number can be any number that's not already being used by a peripheral. If you had previously opened a file to the printer with OPEN 1,4 (file 1, device 4), you couldn't use logical file number 1 for opening the disk file. The logical file number is important because it's the number used later when you're reading from and writing to a file.

The second number after OPEN is the device number (a single disk drive is device 8). The third number is the channel to be used. There are 16 disk channels, numbered 0–15, but 0 and 1 are used for loading and saving and 15 is the command channel, which leaves channels 2–14 for sequential files. It doesn't matter which channel you pick, as long as it's not being used by another disk file. You can open more than one disk file, but they must have different logical file numbers and different channel numbers.

The ",S,W" after the filename means the file will be sequential (S) and you'll be writing (W) to it. Note the five commas in line 30; they're all necessary to separate the various parts of the OPEN command.

When the file is open, the red light on the front of the drive will turn on and stay on until the file is closed. In line 40, PRINT# writes information to the file. It must be followed by the logical file number, a comma, and the information. If line 30 had been OPEN 5,8,3, line 40 would have used PRINT#5 instead of PRINT#1. Line 50 closes the file. CLOSE is followed by the logical file number.

Here's a program to read the file NAMES created above:

```
10 OPEN 5,8,4,"NAMES,S,R"
20 INPUT#5,A$,B$,C$
30 PRINT A$:PRINT B$:PRINT C$
40 CLOSE 5
```

Since we're reading the file, there's an R, rather than a W, at the end of the OPEN statement in line 10. We're using logical file 5 and channel 4, although we could have used 1 and 2 as in the first program. INPUT# reads information from the file. Like PRINT#, it's followed by the logical file number and a comma. GET# is similar to INPUT#, but it reads a single character at a time.

The programs have similar structures: They both INPUT from one source and PRINT to another. The first used INPUT/PRINT# to read the keyboard and write to a file, while the second used INPUT#/PRINT to read from the file and write to the screen.

POKEs To BASIC

While listing a program I was writing, I saw this at the end of the program:

```
7453 ";C$
57341 >INPUT#ANDGOSUB>
  READ>ONFNINPUT#STEP-)/
65535 π
55+>ON<"
5%%!
```

The computer also put a few Qs into the program. When I printed it out, I got something that doesn't quite match what was on the screen. What caused the mess on the screen and why did it appear differently on the printer?

Jeff Jordan

In looking over your program listing, we noticed a couple of lines that POKE to screen memory:

```
175 POKE1024+X+80*Y,81
190 POKE1024+X+40*Y,32
```

This is a fairly common way of moving a character around the screen; X is the column number (0–39) and Y is the row (0–24). The first POKE should put screen code 81—a solid circle, or ball—into screen memory. The other erases it, replacing it with a space, screen code 32.

Line 190 is correct, but line 175 should multiply Y by 40, not 80. Instead of keeping the POKEs within screen memory (1024–2023), the program POKEs in the range 1024–2983.

When you POKE to the screen, you're not putting characters directly on the screen, you're putting numbers into screen memory for the video chip to see a few millionths of a second later. Screen memory is followed by the beginning of BASIC memory, so line 175 has put some stray POKEs directly into the BASIC program. While 81 is the screen code for a ball, it's also the ASCII value of the letter Q, which explains why some lines were corrupted by this letter.

In addition, 81s have been POKEd into line numbers or line links, sending the listing to sections of memory which have no connection with your BASIC program.

Whenever you're writing a program that uses POKEs, it's a good idea to save a copy to tape or disk before you run it. If a program destroys itself with POKEs, at least you can recover the most recent version.

The printed copy varies slightly from the screen listing because there are ASCII control codes that do different things when sent to the screen or printer. To the screen, CHR$(159) means change the cursor color to cyan, but your printer doesn't have color, so CHR$(159) may do something else (or nothing at all) when sent to a printer.

A Customized Cursor

I own a 64 and would like to know how to change the cursor to an underline.

Lennie Mewes

It's easy to think of the cursor as a flashing object which can be moved around the screen, but there isn't really a separate cursor character. The 64 uses two memory locations (211 and 214) to keep track of the cursor position. Whichever character is at that location seems to blink because the 64 is alternately displaying the regular and reverse shapes of that character. So to change the cursor to an underline, you have to redefine all of the reverse characters to look like underlined characters. When the cursor blinks by alternating between normal and reverse characters, it will look like a blinking underline because the shapes of reversed characters have been altered. Here's a program to do that:

```
10 POKE55,0:POKE56,56:CLR:POKE
   56334,0:POKE1,51
20 FORA=0TO1023:POKEA+14336,PE
   EK(A+53248):POKEA+15360,PEE
   K(A+53248):NEXT
30 FORA=15367TOA+1023STEP8:POK
   EA,255:NEXT
40 POKE1,55:POKE56334,1:POKE53
   272,30
```

After about 30 seconds, the time it takes to POKE the character shapes into memory, the cursor changes to an underline. The new character set begins at 14336 (the top of BASIC has been moved down, to protect the characters from interference by variables). And reverse characters are gone. Instead, if you type CTRL-9 (RVS ON), the letters will appear underlined.

Changing The Timing

I've noticed that **POKE 56325,255**, which slows down the cursor, makes BASIC programs speed up considerably. Is this true for most programs and how does it work?

James W. Fish

That memory location is associated with the clock that controls IRQ interrupts. POKEing a high number there makes the computer wait longer between interrupts, so they occur less frequently. What this means is that the keyboard is scanned less often, the cursor blinks more slowly, and the jiffy clock slows down.

An empty FOR-NEXT loop counting to 10,000 normally takes about 11 seconds. If you **POKE56325,255** *and repeat the loop, the jiffy clock (***PRINT TI$***) will say that only about three seconds have passed. But that's only because the POKE slowed down the clock, like running a one-minute mile because you used a very slow watch. If you timed the loop with a stopwatch or with the computer's Time Of Day (TOD) clock, which is independent of the jiffy clock, you'd find that 10,000 times through the loop still takes about 11 seconds.*

An RS-232 Bug?

I have tried to change line 60020 of "Memo Writer" (May 1984) to make it

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work with my printer hooked up to an RS-232 interface. I changed the device number to two, selected the baud rate, etc., but I get a RETURN WITHOUT GOSUB error in line 60140. Why do I get this error message?

Keith D. Sohm

The error message is not a bug, it's related to the way RS-232 communications are handled on Commodore computers. If you're writing a BASIC program for a modem, printer, or other peripheral connected to the RS-232 port, put the OPEN statement at the beginning of the program, before any variables are defined. (The RS-232 "user" port is on the far left as you're leaning over the computer looking at the back.)

The user port is most often used for connecting a modem, although some parallel interfaces plug into it. RS-232 peripherals are always treated as device two. Most printers and interfaces go into the serial port, not the user port.

When you OPEN a channel to device two, the computer creates two buffers of 256 bytes each, one for sending, another for receiving. The buffers occupy the highest 512 bytes of BASIC memory. Printing FRE(0) before and after opening the RS-232 channel will demonstrate that memory has been reduced by 512 bytes.

After the buffers are created, the computer has to move down the pointer to the top of memory, so dynamic strings won't interfere with communications. The operating system also executes a CLR, which clears all variables, unDIMensions arrays, and clears the stack. The stack contains information about GOSUBs and FOR-NEXT loops, all of which is erased.

Because opening the RS-232 channel in the middle of a subroutine clears the stack, it makes the computer "forget" that it's in a subroutine. If you OPEN the channel to device two at the very beginning of the program, you won't get the error message.

Aligning Columns On A Printer

While working on a program, I found that the TAB command doesn't work properly on my printer. Do you have a solution?

Daniel K. Ward

Yes. Don't use the TAB when you're sending data to the printer.

When you're printing to the screen, you can move to specific areas with screen formatting codes like commas, semicolons, cursor controls (up, down, left, right), as well as the BASIC commands TAB and SPC. Some of these are not available for Commodore printers or they just don't work as you would expect: the cursor controls, TAB, and the comma. You can use SPC and semicolons when printing.

Your printer does have a built-in TAB function. Use CHR$(16) followed by ASCII numbers in the range CHR$(48) for zero to CHR$(57) for the number nine. You can also move around with the SPC function. Here's an example:

```
10 OPEN4,4
20 PRINT#4,"HERE ARE FIVE SPAC
   ES";SPC(5);"IN THE LINE"
30 PRINT#4,"{P}40TAB TO POSITI
   ON 40"
40 PRINT#4,CHR$(16);CHR$(52);C
   HR$(48);"TAB TO 40 THE HARD
    WAY"
50 PRINT#4:CLOSE4
```

In line 30, the curly brackets around the letter P mean you should type CTRL-P (not SHIFT-P or Commodore-P). If you're in quote mode, as you should be, the screen will show a reversed letter P. Lines 30 and 40 do the same thing, since CTRL-P is CHR$(16), the character "4" is CHR$(52), and "0" is CHR$(48).

Easier Disk Commands

Every time I think I know everything the "DOS Wedge" does, I read about another command or feature I was unaware of. Is there a definitive and complete listing of all the features? If so, how can I get it?

Frank Puleo, Jr.

Once you've loaded the DOS Wedge program (found on the Test/Demo disk included with the 1541 disk drive) into memory and enabled it (using the short loader program on the disk), disk commands are much easier to access. Here's a complete list of commands we know are in the Wedge:

/ or **Commodore-Z** ***programname****—loads a BASIC program from disk.*

↑ or **Commodore-S** ***programname****—loads and runs a BASIC program from disk.*

% ***programname****—loads a machine language program from disk. The equivalent of LOAD "programname",8,1.*

← ***programname****—saves a BASIC program.*

@, **>**, *or* **Commodore-E***—reads the error channel and prints the results. If there are no errors, you'll see 00 OK 00 00. Any one of these three characters can be used at the beginning of the following commands:*

@$0 *or* **>$0** *or* **Commodore-E $0***—prints directory of disk without disturbing the program in memory.*

@#9*—changes default device number for the wedge to 9 if you have two drives, one of which has been changed to device 9.*

@Q *(quit)—turns off the wedge.*

@S0:*programname—scratches a program.*

@R0:*newname***=0:***oldname—renames a program.*

@I0*—initializes a disk.*

@N0:*diskname,id—formats (news) a disk.*

@V0*—validates a disk.*

@C0:*copyname***=0:***originalname—makes a copy of a file on the same disk, under another name.*

@UJ*—resets the drive, as if it were turned off and then on.*

Finding An End Of File Marker

I'm trying to master the art of writing sequential files to a disk. With an Apple, you can use the ONERR command to detect the end of a file. What's Commodore's trick?

Vicki Hayden

There are a few methods you can use to find out how many items are in a sequential file. If you know ahead of time exactly how many records there will be, write it into the program. For example, there are 12 months in a year, so a program that stores information about average monthly rainfall would loop 12 times when reading or writing the information to the file.

But many files contain a variable amount of information. There are two ways for writing the length into the file. If your file contains 53 records, write a 53 to the beginning of the file. Later, when you open it for reading, you would include a line like **INPUT#1,N**. *The variable N, representing the length of the file, would then be available for DIMension statements or FOR-NEXT loops. The second technique is to use a certain phrase or number to mark the last record. You would write the file to disk and, before closing it,* **PRINT#1, "LAST RECORD."** *In reading the file, use an IF-THEN statement to test for "LAST RECORD". In a file containing numeric data, mark the end of the file with a number like −1 or 500000 (or something not in the range of numbers the program is handling).*

There is also a way to detect the end of a sequential file, the STATUS variable, which can be abbreviated ST. If bit six of ST is on (a value of 64), you've reached the end of the file. If it's off, there's more to read in the file. Here's a short program that reads through an ASCII file and prints the contents on the screen:

```
10 OPEN1,8,2,"0:FILENAME,S,R"
20 GET#1,A$:PRINTA$;
30 IF64ANDST=0THEN20
40 CLOSE1
```

Note line 30, where the number 64 is ANDed with ST. If the result is zero, the sixth bit is off, meaning you haven't yet reached the end of the file. In this case, you can't use STAND64, because the embedded TANgent function causes a syntax error.

Corrections

The Buyer's Guide To Printers (July) incorrectly stated that the Juki 6000 has a 90-day warranty. The printer comes with a one-year warranty.

The suggested retail price of *Donald Duck's Playground* (October) was listed incorrectly. The price is $24.95.

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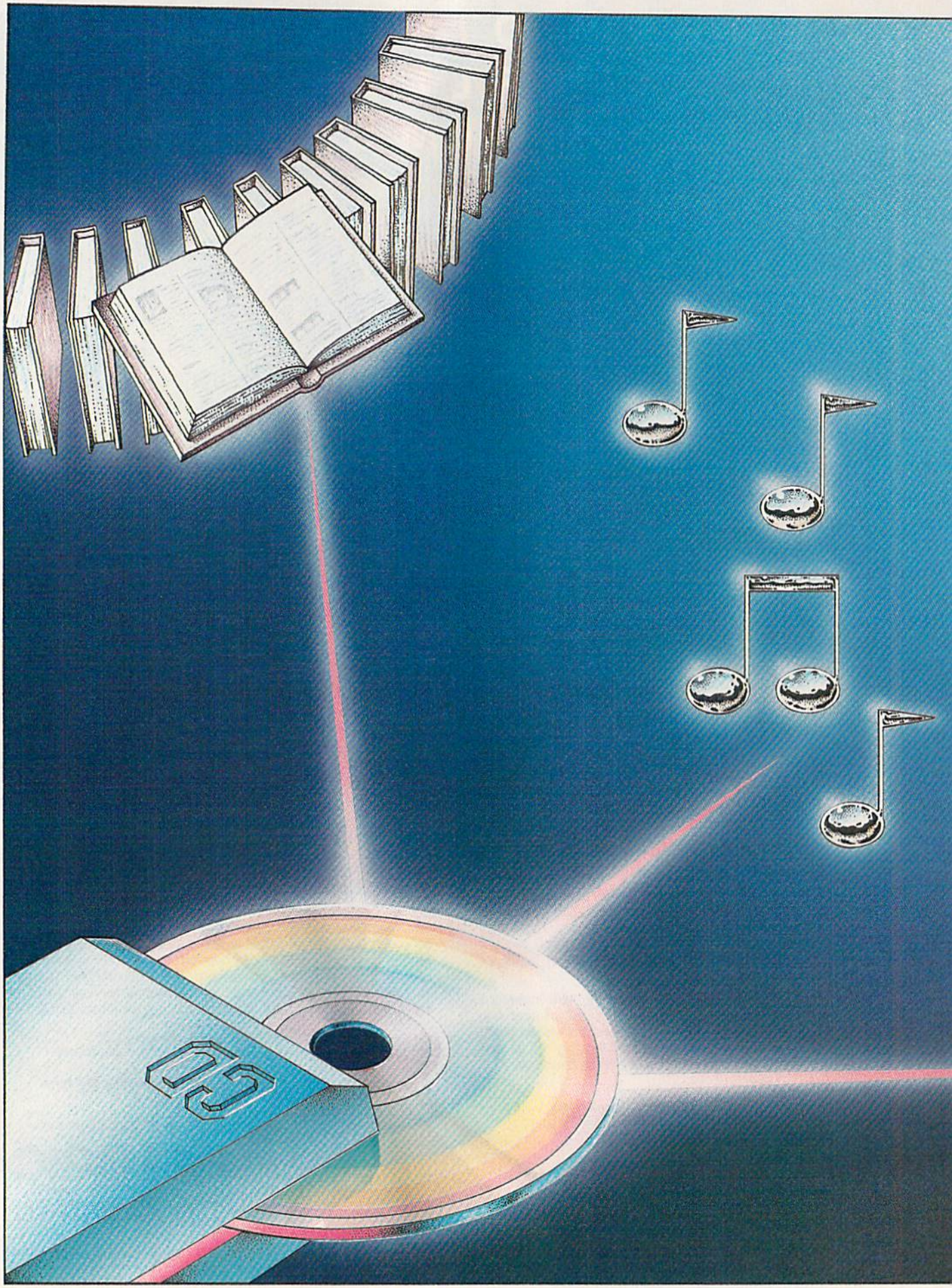


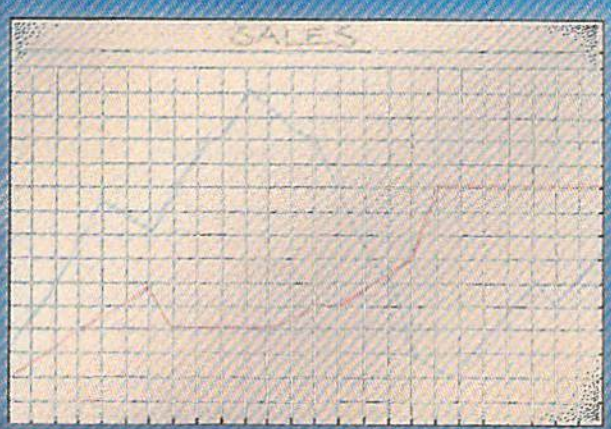
CD-ROMs: *The Ultimate Database*

Kathy Yakal, Feature Writer

Compact disc (CD) players have been a boon to the home audio industry, offering impeccable sound quality in affordable stereo systems. Now it's possible to interface slightly modified CD audio players with home computers to store data. The potential is phenomenal.

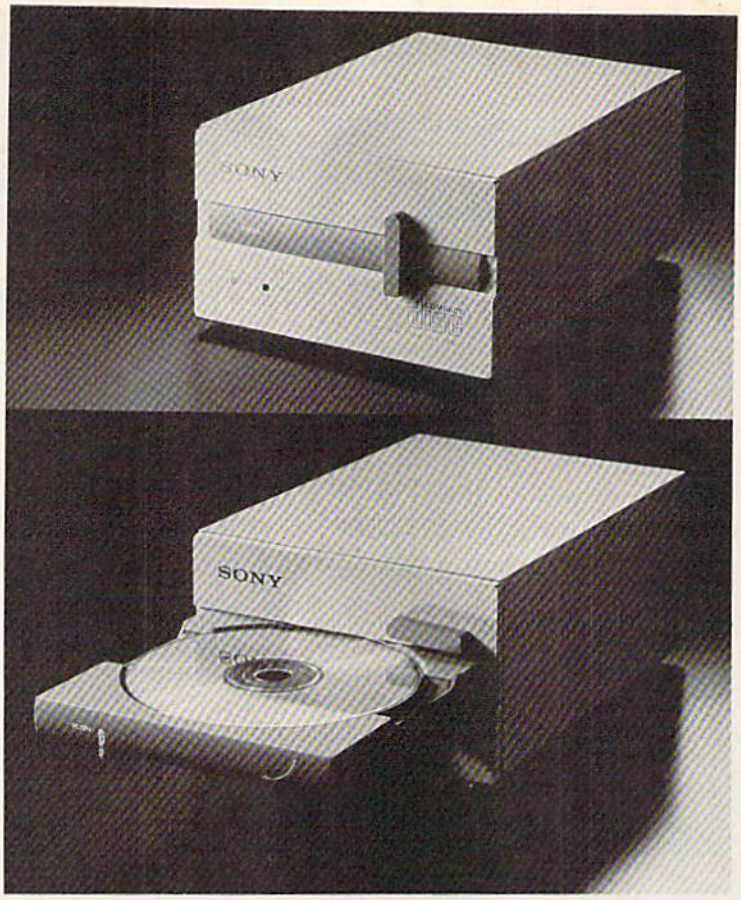
It's probably happened to everyone who owns a stereo. You have a favorite song on an album that you play over and over again, until one day it starts skipping. Perhaps your younger sister decided that the LP would be a good Frisbee, and scratched the vinyl grooves. Or, you've played the album 600 times and the diamond stylus has been slowly gouging a deeper trench in the record. Whatever the cause, the inevitable wear and tear on your conventional album has taken its toll.

Compact disc (CD) players, using miniature lasers and tough aluminum and plastic exteriors, are solving those problems. The sound quality of music from an audio CD is markedly



better than what can be produced on a conventional stereo system. And a CD is affordable—multi-featured units can cost up to $2000, but you can buy one with the same sound quality and fewer extras for less than $300.

The technology responsible for this remarkable audio improvement is now moving into the world of computers in the form of CD-ROMs—*Compact Disc-Read Only Memory*. Using the digital storage system and laser-optical reading mechanisms found in audio CDs, the CD-ROMs can store music, graphics, text—virtually any kind of information. When linked to a computer, these new mass storage devices are expected by some to produce major changes in many computer applications.



Sony's new CD-ROM player, the CDU-1, with a 4.7-inch compact disc.

The heart of a compact disc—whether audio or the new CD-ROM—is the powerful optical-digital technology that drives it. A miniature, low-powered laser inside the player "reads" microscopic pits on rigid plastic discs that are coated with a mirror-like finish. Nothing but light touches the disk surface, so there's no wear. The hisses, pops, and other distortions found on record albums are absent.

The advantages of using this same method to store computer data are obvious. Your 1541 disk drive has a read/write head that makes contact with a disk every time you read, load, or save something. With heavy enough use, some areas on floppy disks can eventually wear thin.

That isn't the case with optical technology. In a CD, the laser beam shines on a 4.7-inch rigid disc. The light is reflected back from the pits to a *beam splitter*, which sends the digital information to an *optical sensor*, and then to a microprocessor for decoding into audio signals. In the case of CD-ROMs, the digital data doesn't have to be limited to audio signals, but can be controlled by the computer in digital form for text and graphics as well.

Just as your 1541 drive is a *random access* device, so is a CD. That is, they both find information anywhere on the disk in a few moments without having to search for it sequentially. A CD spins at approximately 300 rpm, about the same speed of the 1541 disk drive. But the access time for a CD is incredibly fast when compared to your 1541 drive. One 4.7-inch CD holds about 550 megabytes, equal to more than 3,000 floppy disks on a 1541. The time required to call up any information on the CD disc averages out to about one second, more than mildly impressive considering the storage capacity of the CD.

The reporter was a bit skeptical. Frank Farrell, president of Grolier Electronic Publishing, was demonstrating the indexing powers of his company's new software, the Academic American Encyclopedia, *the first encyclopedia ever put on a compact disc.*

"Look up IBM," the reporter suggested.

Farrell explained that there might be a few entries there, though a smaller company might not be referenced. Before he had time to finish that sentence, the answer came up. Thirty-three entries under IBM. *There were the expected ones, like* Dow Jones *and* Fortune 500, *but then a curious one appeared:* fountain. *So Farrell called up the article.*

It seems that there is an electronically operated fountain in front of IBM corporate headquarters in Armonk, New York. Designed by a Japanese artist, it is dedicated to the wedding of technology and the arts.

"If you were looking for examples of the wedding of technology and the arts, how would you do it?" asks Farrell. "That kind of information is not indexed anywhere."

Grolier's encyclopedia, the first software produced for a CD-ROM, contains the entire 21-volume (nine million words) *Academic American Encyclopedia*. That so much data can be stored on something so small is amazing in itself, but the real marvel lies in the software's search capabilities.

The encyclopedia's electronic index, almost as large as the encyclopedia itself, was developed by Activenture Corporation (founded by Gary Kildall, inventor of the CP/M operating system). Compiled on a VAX minicomputer, it can cross-reference every unique phrase in the encyclopedia. So, as in the example above, it makes connections between thousands of seemingly unrelated items.

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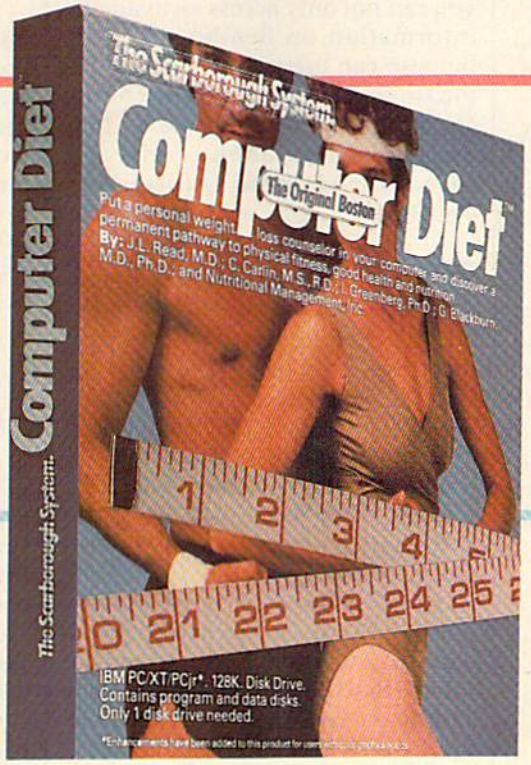
This is not a crash diet, or fad diet. Written by a team of Boston-based physicians, psychologists and nutritional specialists, the program incorporates a database of 90% of all foods Americans eat — and you can add your personal favorites.

"This program is flexible enough to take into account all your devilish delights..."
—The New York Daily News

"...not only is it thorough in its dietary approach... It catalogs your moods, habits, personality — along with your height, weight and eating patterns..."
—USA Today

Working with all this information, The Original Boston Computer Diet tailors a balanced diet to your specific tastes and helps you change bad habits — something no book can do.

You can even choose one of three computer counselors, each with a distinct personality, to guide you through the plan and provide you with the support you need to stick to a diet.



"At each daily session, you are expected to report your eating habits to the counselor, who responds with guidance and a reading assignment in an excellent manual."
— PC Magazine

"While the program is outstanding, the counselors are the feature that really makes OBCD a superior product."
— InCider Magazine

When you reach your weight goal, you and your counselor develop a maintenance diet to help you keep weight off permanently. And it's easy because The Original Boston Computer Diet helps you build a new attitude toward weight control — a totally positive attitude that will help you look better and feel better for the rest of your life.

Available for:
IBM PC/XT/PCjr,
Apple IIe/IIc,
Commodore 64/128

The Scarborough System.

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well we can find the information within that material, how good its indexing system is," says Activenture's Tom Rolander. "What we have here, by connecting the computer with the CD-ROM, is the ultimate indexing tool. We'll know every reference there is to everything that's in the database."

There are two ways to search for information with this new tool. Let's say you're a college student doing a paper on the Oedipal theme in literature. If you looked it up in the printed encyclopedia, you would find three references: *Oedipus*, *Oedipus Rex*, and *Oedipal Complex*.

You could do the same thing on a CD-ROM. Load the software (which takes just a few seconds), then call up the appropriate *O* volume to search for Oedipal. By looking at the list of articles included, you would discover the same thing.

But you could also enter *Oedipus* and ask for a list of every article that contains that word. You would find that Thomas Hardy used the theme for his first critically acclaimed novel. That Jean Cocteau used it for one of his major plays. And so on.

That kind of research capability has astounding implications for education. "I've watched people wending their way through this mass of man's knowledge, and it's always this constant, 'Gee, I didn't know that,' " says Farrell. "You can spontaneously go off on these information quests, and it's the dynamics of that that makes us excited."

Grolier's software ($199) will run on any manufacturer's CD-ROM—as soon as one is available. At this writing, no manufacturer has produced one for the retail market, though Hitachi, Sony, and Philips have announced that they will provide them for the OEM (Original Equipment Manufacturer) market. What this means is that they'll sell them to companies—like Commodore or Atari—that will market them under their own brand names. At last summer's Consumer Electronics Show, Atari demonstrated a CD-ROM player which will be compatible with its new 520 ST. Anticipated cost is around $500.

Converting databases of information—like encyclopedias—was the natural first application for CD-ROMs. Activenture's Rolander believes that existing *online* databases will also be some of the first targets since they're already machine-readable.

"Anything you open up to look for something is a prime candidate for CD-ROM and that is an awful lot of printed material—encyclopedias, chemical abstracts, Library of Congress card catalogs, realtors' listings, airline guides—...anything where you're going to look for information," he says.

And the next logical step after text-only applications is graphics. Frank Farrell thinks that in the next year we'll start to see relatively simple graphics—line drawings, schematics, diagrammatic representations, maps, and so on. High-resolution graphics will follow.

And within two years, he believes, we may be close to the convergence of audio and text. Using a CD-ROM and a personal computer, you can not only access all available information on Beethoven's life, but also can listen to excerpts of his music in beautiful stereophonic sound. "This is what we're ultimately excited about: two- and three-dimensional information exchanges."

This technology is truly a giant step, but, naturally there are still a few hitches. The compact discs we have now can only be written to once, then read many times. The digital pits on the surface of a CD are burned into the plastic during the manufacturing process. They're permanent, as are the analog grooves of a record. Once a program is stored there, it's impossible to modify. A disk in your 1541 can be written to, read, and rewritten literally thousands of times since the read/write head is simply rearranging magnetized bits on the disk's surface. Optical technology has not yet reached a level which will allow that.

The error rate for a CD player designed for music is about one in every 100,000 bytes of data. "That's fine for music, but for CD-ROM applications, we do not believe it's acceptable," says Rolander. If you were looking for the word *regatta* in a paragraph and the media told you there was no *regatta* there, or it said there was a *regatta* in this paragraph and there was no *regatta* in that paragraph, then your confidence in that media would go way down. "CD-ROMs have, in hardware, error-correction to compensate," adds Rolander.

The first CD-ROMs available to consumers will only be able to read computer data. So, if you already have an audio CD player, you'll have to buy a different machine to interface with your computer. However, manufacturers are working on units that will both play music and run computer programs.

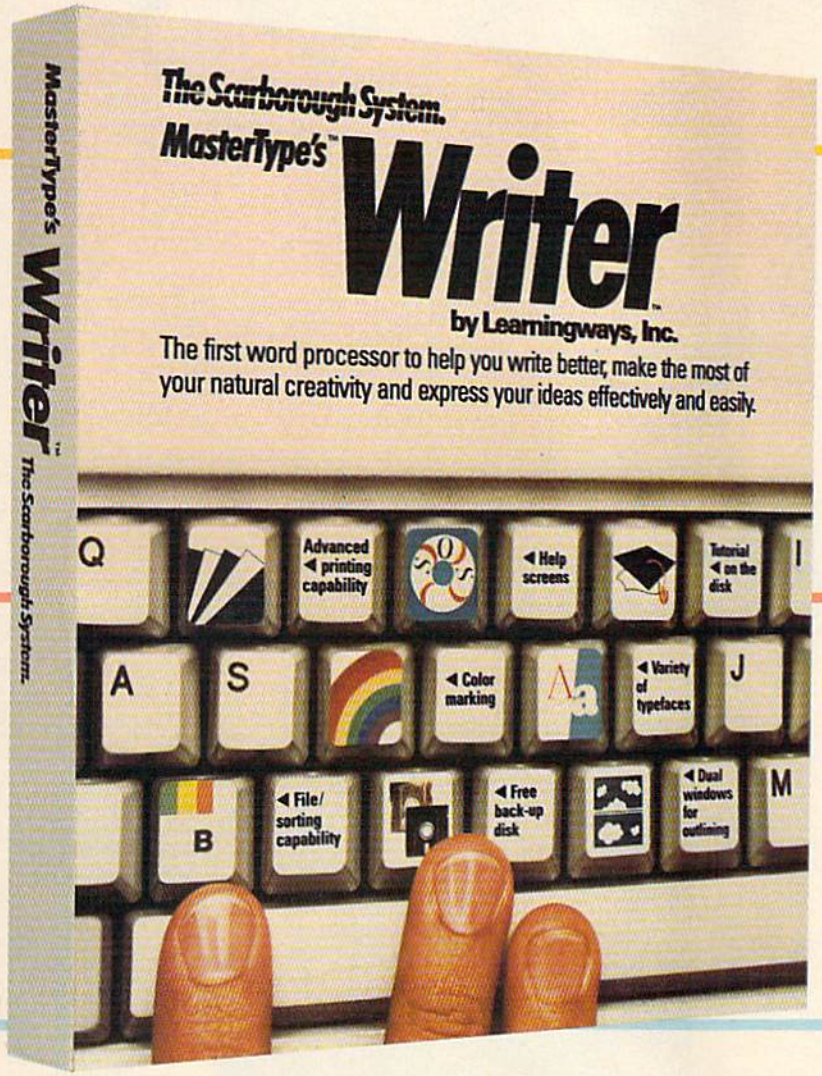
CD-ROMs will have enormous impact on the power of personal computers. We can already see that in the first product offering, Grolier's encyclopedia. Consumers will have access to enormous amounts of data, easier and faster than ever before. Any business that has to use extensive libraries of information will benefit.

Teachers who have been asking for better educational software—programs that truly utilize the computer's processing power and provide new learning and teaching tools—may find that this new combination hardware/software offers much. And videogame designers who have long asked for more memory to make room for bulky high-level languages and better graphics and sound will have plenty to work with (though it will take a long time to write a game that big).

Some people think that CD-ROMs may actually *sell* computers, especially when they can be interfaced to already-powerful machines like the new Amiga computer from Commodore. Frank Farrell watched the reactions of dealers and distributors when he showed his new product at the National Computer Conference (NCC) last July. "They all made the same comment," he says. " *'Thank God we now have for the first time an application that really legitimizes a computer in the home.'*

"It's going to present a highly legitimate, highly valuable, high utility application. That's got to be good for new computer sales."

"...makes turning ideas into text a delight." —Classroom ComputerLearning



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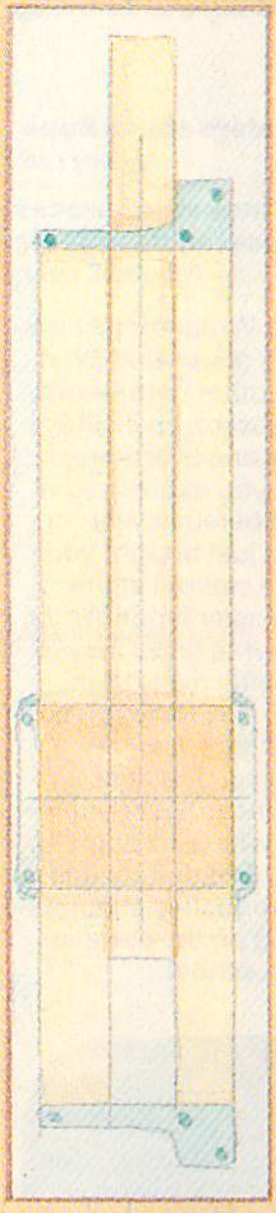

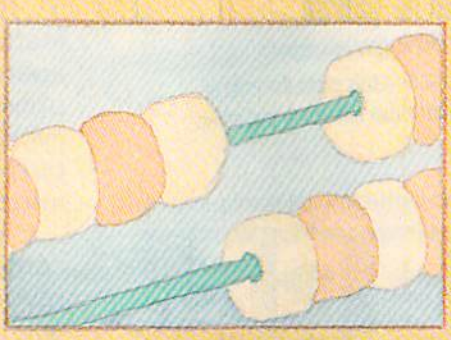

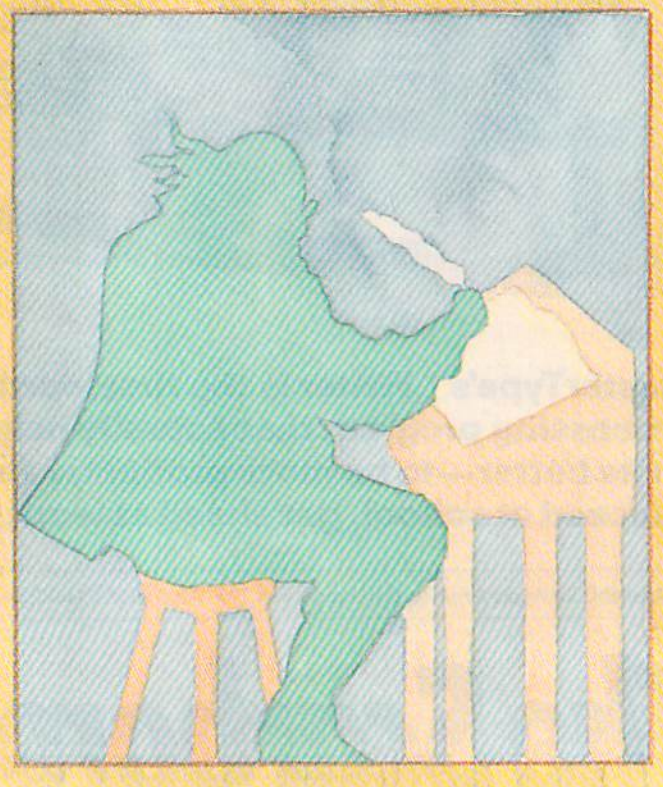

Anatomy Of A SPREADSHEET

Selby Bateman, Features Editor

A two-dimensional electronic grid called the spreadsheet is reshaping the way we work with and think about numerical data. For American business, the changes have been nothing short of revolutionary. Commodore owners have a growing number of these powerful and flexible tools from which to choose.

The birth of the first computer spreadsheet has become something of a legend among those who use this remarkable software which turns your computer into a sophisticated calculation and financial modeling machine.

In 1978, Daniel Bricklin, an M.I.T. graduate enrolled in the Harvard M.B.A. program, wanted some way to escape the tedious, time-consuming chore of filling out paper ledger sheets for assignments in a finance course. Every alteration in the figures naturally meant another sheet of numbers had to be totaled on a calculator and then written down. Mistakes were disastrous—if he incorrectly added two numbers, the whole spreadsheet had to be recalculated. How much easier it would be, Bricklin thought, if there were such a thing as an "electronic blackboard" on which numbers and formulas could be accurately written, erased, and replaced.

Working with a friend, M.I.T. programmer Bob Frankston, Bricklin developed the idea even further, eventually deciding to create a ledger sheet which would work on the new Apple microcomputer. The name of the product became *VisiCalc* (for *Visi*ble *Calc*ulation), and several hundred thousand copies were sold.

Although originally developed to keep track of "what is," *VisiCalc* soon became a tool to examine "what if." Before these new electronic spreadsheets, business managers might have looked at two or three possible budgets before making a decision. With *VisiCalc's* ability to instantly recalculate, businesses could suddenly try 20, 50, or more different scenarios. And for a time, this magical tool was only available for the Apple computer. Some say that *VisiCalc* sold more Apples than any other software product.

There have been many spreadsheets since *VisiCalc*, but all follow, to one extent or another, the simple yet powerful concept pioneered by Bricklin.

Nothing could be simpler. At first glance, a spreadsheet appears to be little more than a grid of rectangular boxes. A line of numbers descends vertically from the top left of the computer screen to the bottom, identifying the *rows* to their right. Letters of the alphabet are usually arranged horizontally across the top of the screen, identifying the *columns* below. The resulting boxes, called *cells*, are labeled by their coordinates, such as *Column A, Row 0*, or simply, *A0*.

Nested within that simple matrix of cells is a powerful generator of mathematical calculations, formulas, and redefinable relationships. Change one number in a calculation or a formula, and the spreadsheet can automatically recalculate all other numbers that are affected. With practice, you can set up and solve just about any calculation, which is especially useful in financial modeling. Businesses can keep track of production and sales figures, set up budgets, and tailor projections.

An electronic spreadsheet is so fast and so flexible that its long-range impact is still being assessed. Computer users unfamiliar with spreadsheets often have trouble understanding what all the excitement is about; those who have taken the plunge appreciate the spreadsheet as a unique mixture of simplicity and power.

In most spreadsheets, only a half-dozen columns and 12–15 rows are visible on the screen at any one time. But the spreadsheet itself can contain thousands of cells. You

Help For Beginners

Many computer users in the home, or in small businesses without heavy accounting needs, want the benefits of a spreadsheet without having to master a complex program. Several new packages, such as Spinnaker's Better Working: Spreadsheet *for the Commodore 64, offer programs which simplify calculation procedures and which contain extensive user aids.*

The screen above, for example, is just one of a variety of HELP screens available in the Spinnaker program. They provide quick reminders of key functions without your leaving the spreadsheet you're working with. One key press puts you back to the worksheet.

Better Working: Spreadsheet *also contains basic word processing and database features, and includes the "Quikstart Card" of command reminders. The program contains 250 rows and 100 columns with more than 30 mathematical functions.*

can move easily and swiftly throughout this electronic grid with just a few keystrokes. And, most importantly, you see the calculations and changes occur instantaneously.

Learning how to take advantage of this power can be a daunting task for many computer users, especially those whose spreadsheet needs are only occasional. The most powerful spreadsheets require the user to virtually *program* the software. You might say a spreadsheet is a programming language that specializes in making calculations. If you spend some time to learn the commands, the results can be amazing. And new packages are becoming available which are easier to use and equally powerful. This is especially true for the Commodore 64.

Templates On Call

One of the ways that spreadsheets can be made more immediately usable, even by those who don't work with a computer everyday, is to include templates, *or ready-made spreadsheet forms, for different applications.* Cal-Kit *from Batteries Included presents a 99-row by 26-column free-form spreadsheet, but also includes 20 prepared templates to help you with home budgeting, installment payments, income tax forms, personal net worth, checkbook balancing, and other common applications.*

The sample screen shown here is a simple Home Budget template which offers the user guidelines from which to work. These preprogrammed worksheets can be particularly helpful for beginners who benefit from seeing examples of forms which they can then use immediately or modify for more specific needs.

Although businesses use spreadsheets mainly for budgeting and finances, they're not limited to working with dollars and cents. Spreadsheets can be helpful in many situations that require moving numbers around.

Let's say you play on a softball team, and you've volunteered to be the team statistician. First, you'd enter the calculations: Batting average is determined by hits divided by at-bats, on-base percentage includes walks, and so on. Once the labels and formulas are set up, you enter the results of each game. All of this could be done with pencil and paper, of course. But you can program a spreadsheet to look at specific situations, like which player hits better in night games or who does best against left-handed pitchers. You figure out the formula and the spreadsheet does all the work.

Spreadsheets can also help in decision-making. Say you're looking for a new car and have narrowed the choice to five or six models. Based on conversations with car dealers, you could calculate the yearly cost from the car's price, the interest rate, and the number of payments. But what if one dealer offers a bigger trade-in allowance, or a lower interest rate? What if one car gets more miles per gallon and you expect to drive 12,000 miles in the next year? How would that change if you drove 15,000 or 20,000?

It's no exaggeration to say that a spreadsheet can turn those "what if" calculations into answers far faster, no matter how quick you are with calculator, pen, and paper. The greater the number of calculations, the more you can appreciate the power of an electronic spreadsheet.

The real strength of a spreadsheet is its capacity to use and maintain formulas for anything from a simple addition problem to a complex series of mathematical or scientific calculations.

A simplified example can be seen in the screen on page 30 from *VizaStar 64*, a powerful integrated spreadsheet-database-graphics program for the Commodore 64.

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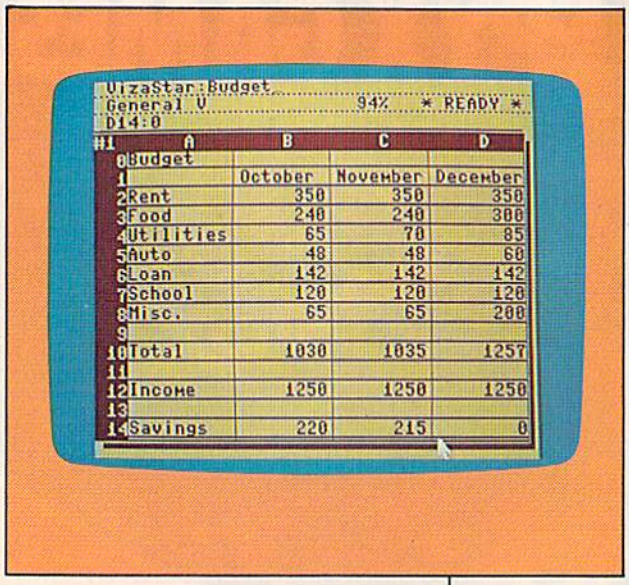

This family budget shows the last three months of the year, with a combination of actual expenses and estimates for a variety of expense categories plus goal totals for savings. Trying several different budget variations with a pocket calculator would take quite a while. However, a spreadsheet can contain embedded formulas which will automatically refigure the amount available for savings, based on how expenses and income vary. The results can be printed out, if needed, for reference. And dozens of different options can be tried in just minutes.

With a calculator, you would subtract expense totals from income to find out what money was left to go toward savings (or any other category you designate). A spreadsheet lets you build formulas which automatically calculate and recalculate the difference between Expense Totals and Income. Another formula would automatically add the totals within the Expense subcategories and place the sums in the monthly total columns. Change any of the variables and the results are instantly refigured in the appropriate cells.

Some people have called an electronic spreadsheet a "numeric word processor." Like a word processor, a spreadsheet lets you move through a document making immediately visible changes. Specified combinations of key commands control where and what kinds of data are entered, how they are defined, and what relationships are established among those entries.

For example, in *VizaStar 64*, you can jump anywhere within the spreadsheet by simply typing f5. A "GO TO:" prompt appears. You then type the desired column and row number to which you wish to refer, such as X249, then press RETURN. Since *VizaStar* lets you include up to 64 columns and one thousand rows (64,000 cells), typing BL999 after a GO TO prompt will immediately put you at the end of the spreadsheet. (BL is the letter combination designating the sixty-fourth column.) Typing A0 following a GO TO prompt returns you to the first cell in the spreadsheet. In *VizaStar* that can also be accomplished by pressing the HOME key twice.

Each spreadsheet handles its features and special functions in a slightly different manner. But, after becoming familiar with one, you'll find that any other spreadsheets you use will contain many similar conventions.

In the past couple of years, the trend has been to integrate spreadsheets with other applications, chiefly word processors, databases, and graphics programs. *VizaStar 64*, marketed in the U.S. by Solid State Software, is such an integrated package, and is called an "information processor" since its functions carry over into several areas.

VizaStar 64 represents one of the more powerful and yet easy to use application programs available for the 64. Like *Lotus 1-2-3*, one of the most popular integrated spreadsheets available for MS-DOS computers like the IBM PC, *VizaStar* uses advanced formula functions, file commands, and execution lists (EXEC List) which go far beyond simple calculation programs. *VizaStar* has been called the *Lotus 1-2-3* for the Commodore 64, and to take full advantage of all of the program's power requires that you spend some time with it.

There are a number of popular spreadsheets for the 64—too many to cover completely in one article. Among them are Cardco's *Calc Now*, Creative Software's *Creative Calc*, Handic Software's *Calc Result Advanced* and *Calc Result Easy*, Synapse/Brøderbund's *SynCalc*, Tri Micro's *Team-Mate*, and the best-selling, powerful *Multiplan* from Microsoft.

Although spreadsheets for the Commodore 64 vary in price and performance, there are some general guidelines to follow when shopping for one:

• **How easily can you move around in the spreadsheet?** The motion of the onscreen cursor, or pointer (sometimes a boldfaced or outlined cell), should be smooth and rapid. There should also be a way to move to any part of the spreadsheet with just a couple of keystrokes.

• **Are the cells adjustable in size, allowing longer numbers and/or text?** Some spreadsheets allow you to change the size of cells, but only one at a time. Others let you alter the sizes of one cell, a range of cells, or the entire spreadsheet.

• **Can you easily edit the material you've entered?** This is crucial in most cases, since correction of errors and the need to make plenty of "what-if" variations is key to the effective use of a spreadsheet.

• **How fast will the spreadsheet calculate and recalculate various groups of data?** If you plan to use a spreadsheet regularly, nothing will cause you more frustration than having to sit while your spreadsheet goes through a time-consuming information sort or recalculation. Obviously, this is not as important if your uses are only occasional or limited in scope. Some spreadsheets are able to give the user many more cells by storing parts of the spreadsheet on disk, then calling up different sections when accessing or saving material. This type of spreadsheet may perform complex calculations more slowly than a program which keeps all of its cells in the computer's memory at once. Spreadsheets that work entirely in memory are quicker, although there are fewer cells

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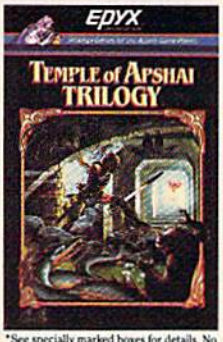

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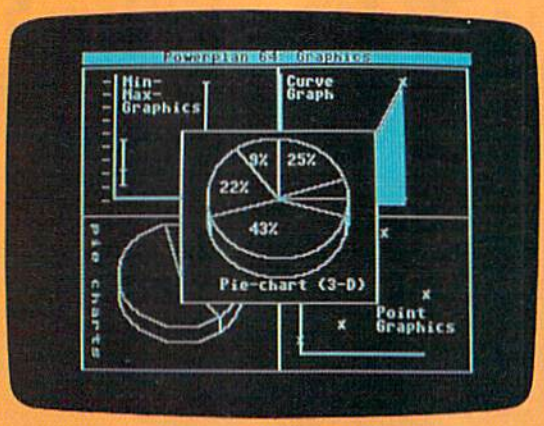

Spreadsheet Graphics

One of the most helpful ways to show the meaning behind spreadsheet figures is through graphic representations—charts and graphs. Some spreadsheets, such as Power Plan-64 *from Abacus Software, let you turn your numbers into bar, line, point, and pie charts and then print them out. This is especially useful for businesses which need to demonstrate financial results and projections quickly and easily.*

The screen here shows a sample of the graphs and charts available with Power Plan-64. *The spreadsheet program itself contains 255 rows and 63 columns.*

with which to work.

• **What are your printing options?** Spreadsheets depend on printouts almost as much as do word processors. Will the spreadsheet work with your printer? Do you have special printing needs, such as oversize paper, tabular requirements, or graphics? Make sure of this before you get the package out of the store.

One product Commodore 64 spreadsheet owners should be aware of is Timeworks' *Sideways*, a program which lets you print an entire spreadsheet vertically on one sheet of paper, at one time. The program reportedly works on all major brands of electronic spreadsheet programs for the 64.

• **Do you need to send spreadsheet information over the telephone?** Some programs let you telecommunicate spreadsheet information to another computer. If this is a consideration, make sure the files created by your spreadsheet are compatible with the files used by the computer at the other end. Many businesses need this feature, but home users are less likely to require this.

• **What are the available calculation functions built into the program?** Most users, especially in the home, require little more than the basic arithmetic functions, plus such features as average, exponentiation, square root, percentage, and logical operators (greater than, less than, etc.) and range functions (maximum, minimum).

• **How many active cells are there?** The needs of a home user may be quite different from those of a business user when it comes to spreadsheets. While a business person may run out of room with a spreadsheet with only 500 cells, this may be plenty of space for you. The available space varies widely among spreadsheets, but most manufacturers do a good job in telling the prospective buyer how big the system can be.

• **Do you need to view different parts of the spreadsheet at the same time?** Some spreadsheets offer *windows* or *split screens*, letting you look at part of one section of the spreadsheet at the same time you view a section of another. This can be particularly important for business uses.

If you can test a spreadsheet before purchase—either at a store or through a friend or user group—by all means do so. As with a word processor, the right spreadsheet can be a valuable and efficient tool; a poorly chosen spreadsheet can be a source of frustration.

Although space does not allow us to list all of the many spreadsheets available for the Commodore 64, the following will help you get started:

Better Working: Spreadsheet *($49.95)*
Spinnaker Software Corporation
One Kendall Square
Cambridge, MA 02139

Calc Now! *($39.95)*
Cardco, Inc.
300 S. Topeka
Wichita, KS 67202

Calc Result Advanced *($79.95)*
Calc Result Easy *($49.95)*
Handic Software, Inc.
400 Paterson Plank Rd.
Carlstadt, NJ 07072

Cal-Kit *($49.95)*
Batteries Included
30 Mural St.
Richmond Hill, Ontario
L4B 1B5 Canada

Creative Calc *($49.94)*
Creative Software
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EduCalc *($49.95)*
EducCalc Template Disk *($19.95)*
Grolier Electronic Publishing
95 Madison Ave.
New York, NY 10016

Kwik-Calc! *($19.95)*
Datamost
19821 Nordhoff St.
Northridge, CA 91324

Multiplan *($195)*
Microsoft
10700 Northup Way
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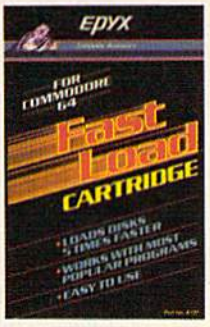

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Getting The Most OUT OF YOUR PRINTER

Charles Brannon, Program Editor

A computer works with abstract information composed of the state of switches, glowing dots on a TV screen, or invisible magnetic entities on tape or disk. A printer bridges this intangible realm, bringing you solid, printed information that the eye can read and the hand can grasp. This article will help you learn how to prevent the common printer problems that stand between fuzzy bits and hardcopy.

The first step in using your printer is setting it up properly. Some printers are simple to attach and use—just plug the cord into the wall socket, and attach a cable between the computer and printer. Even with Commodore-ready printers, you should make sure any optional settings are set correctly. For example, the device number switch, if present, can be set to either 4 or 5 (4 is the most common and recommended setting).

Installing the paper and ribbon can be tricky. Some printers use drop-in ribbon cartridges, others use typewriter ribbon spools. You may need to thread the ribbon manually through the ribbon transport mechanism. Make sure the ribbon is installed between the printhead and the paper. Watch for a metal shield in front of the printhead. The ribbon should be placed between the shield and the printhead. The shield prevents the ribbon from brushing against and smudging the paper.

Paper Particulars

It may take some trial and error to load the paper properly. Friction-feed printers roll the paper through the printer with a typewriter-like *platen*. The paper should be lined up vertically, or printing will be skewed. If you're using pinfeed paper, turn off the friction setting so that the tractor feed mechanism can pull the paper effortlessly past the platen.

When using a tractor feed, adjust the tractors so that they line up with the holes in the side strips, then lock the tractors into place to prevent slippage. Don't allow the horizontal paper tension to get too tight, or the tractors will tend to rip out of the holes.

Be sure that the paper can move easily through the mechanism without binding or jamming. Some printers have an annoying tendency to eat their own paper. The paper emerging from the printer can fold back into the paper feed slot, creating a maddening loop of tightly wound paper. This can damage your printer. A paper separator is often included with a printer to prevent this. You may even want to invest in a printer stand with a shelf for paper and a rack to catch the output.

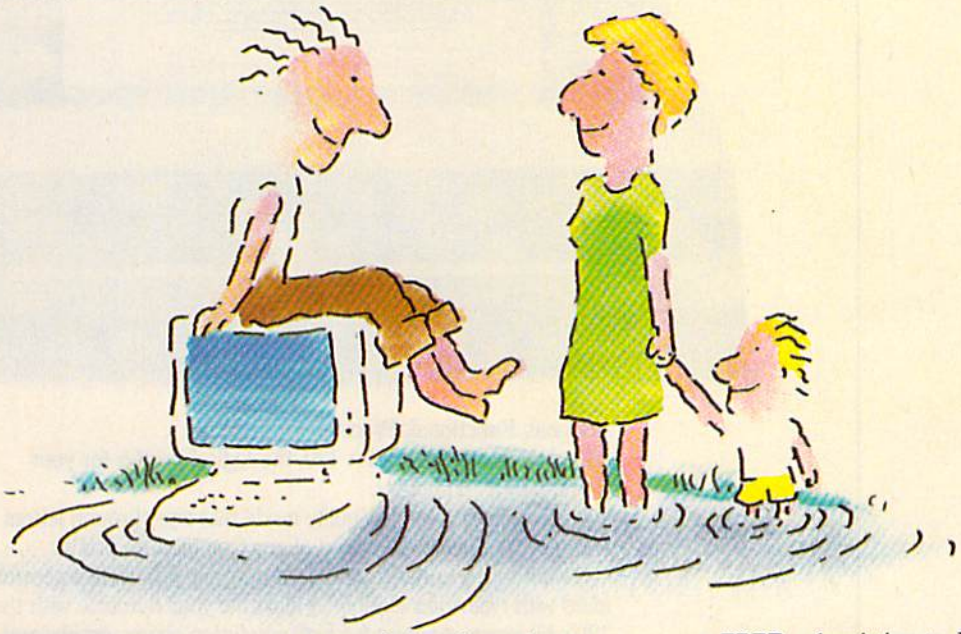
Before even turning on your printer, be sure to remove any packing material. Often a plastic cylinder or foam block is used to protect the printhead track and immobilize the printhead during shipping. Check to see if any shipping screws need to be removed.

Now you've got your printer set up. The ribbon's in place, the shipping screws are removed, paper is installed, and you've plugged the interface or cable into your computer. Let's power on the equipment and give it a workout.

Power On

There are some strange yet necessary rituals observed by Commodore owners. One is the order you turn on your equipment. The literature is conflicting—some manuals say you should turn on your printer first, then your disk drive, then your computer. You may need to wait a few moments after turning on your disk drive and printer before turning on the computer. Other sources have said to turn on the computer first, the printer next, then the drive. Other sources advise you to turn on the printer last.

GET YOUR FEET WET...



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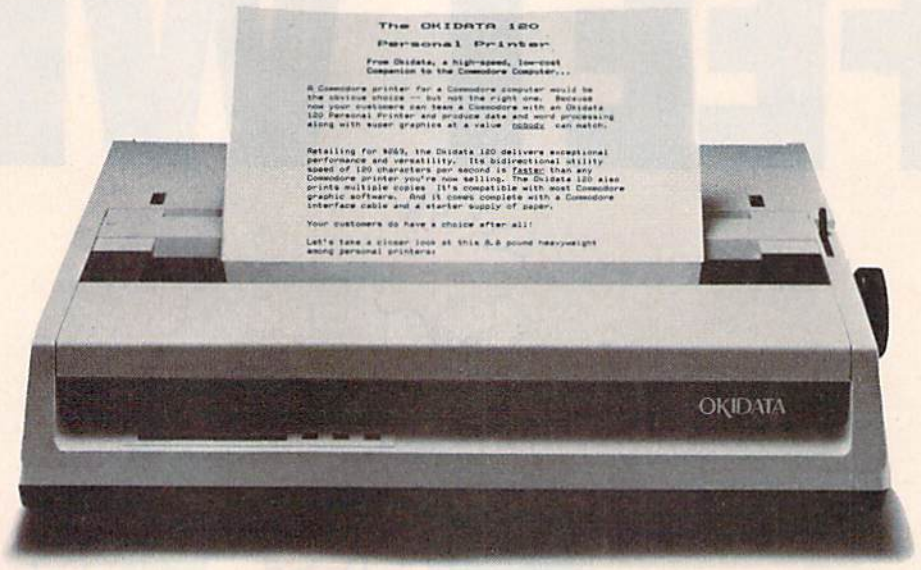
Left Brain.



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It's not consistent. But you may find a particular combination that works best for you. It can't hurt to try.

First, establish that you've got a working connection. Type in the following line (but don't abbreviate PRINT#4 as ?#4; the abbreviation for PRINT# is P shift-R):

```
OPEN 4,4: PRINT#4, "HELLO": CLOSE 4
```

If everything is working so far, you should see the word "HELLO" on your printer. If not, it's time to examine a few things:

• Is your printer set up as device 4? Most are. Sometimes you need to change the device number to 5, usually when you already have one printer attached as device 4. If in doubt, try changing the second 4 to a 5 in the OPEN statement. Check your interface for device number switching. Several Commodore printers let you change the device number with a three-position switch, usually found on the rear of the printer. For most purposes, this should be set to 4.

The T position on some Commodore printers is used to test the printer. When you power on in the T position, your printer will print some text on its own. Check to see that all dots of the characters are printed. A bad printhead will cause gaps in printed characters. An improperly installed ribbon will also be obvious after a self-test. Other printers can be tested by holding down the FORM FEED or LINE FEED button on the printer console while powering on. The self-test proves that the printer is working, but does not show that your computer is talking to the printer.

• Get the obvious out of the way. Don't assume you've plugged in and turned on everything. Check all connections. Make sure there's paper in the printer, and that the paper-empty switch (a thin metal leaf) is closed by the paper. Some printers won't print if the plastic cover is open. The ON LINE light should be lit, as well as the READY light, if your printer has these indications. If you continue to have problems, check the connections again. The most common problems are simple ones.

• Examine the DIP switches if you're using a non-Commodore printer. These tiny switches are found under the paper cover or inside the printer behind a slot. You may have to remove some screws and open your printer to get at these switches. Don't be squeamish—most printers are designed to be opened, if merely to get at those DIP switches. The DIP switch looks like a small box (less than one inch square, and usually red or blue) with tiny white tabs. Each tab slides or flips between positions marked ON and OFF, or 1 and 0 (0 is off).

Each position controls some on/off function of the printer, like linefeed/no linefeed, slashed zero/normal zero, emphasized/draft, italics/normal, 80 characters/132 characters, and select/deselect. The printer manual includes a chart showing the factory settings and a description of each switch's function. Make sure the DIP switch controlling select/deselect is in the *select* position. A deselected printer powers up offline and acts dead until the ON LINE button is pressed. Although most DIP switches are adjusted at the factory to reasonable settings, you'll at least want to know what your options are. These switches let you customize your printer.

• Is your interface powered on? Some interfaces draw power directly from the printer, since such a power line is indicated in the Centronics parallel standard. Not all printers supply power on this line, though, and your interface may not function. Most interfaces have a power light to let you know they're working. Other interfaces plug into the cassette port, drawing power directly from your computer. If your interface can't get power from the printer, you'll need a power adapter that plugs into the cassette port. If you use a cassette port adaptor, make sure it's plugged in correctly (the position of the notch on the adaptor should match the notch in the cassette port).

• If you're still having trouble, your manual may have an additional list of trouble-shooting tips. You don't want to give up before you've done everything reasonable to make your printer work. However, the printer or interface may be broken. Damage may occur during shipping, so check your equipment as soon as you unpack it. It's not very likely, but the serial port on your computer may be malfunctioning or inoperative. Or the cable may have a broken wire. Whatever is wrong, get it fixed before your warranty expires. Printer servicing can be expensive.

Now, let's assume you've got your printer working. You've cleared the biggest obstacle. Printers usually work just fine, but the documentation can be so bad that you don't know where to begin. Common sense can usually serve where the manual fails.

Testing Your Printer

Let's try some more tests in BASIC. When you tried this line:

```
OPEN 4,4: PRINT#4, "HELLO": CLOSE 4
```

did "HELLO" appear in uppercase or lowercase? On a Commodore printer, or a printer with an interface that emulates a Commodore printer, it should have been uppercase. Now try:

```
OPEN 4,4,7: PRINT#4, "HELLO":
  CLOSE 4
```

This should give you a lowercase "hello." If you got uppercase, your interface does not properly convert Commodore ASCII to your printer's true ASCII. This can be a real problem unless you use software that supports true ASCII output (several word processors do).

If the two lines were double-spaced, you're getting an extra linefeed. You should get two words on two different lines, with no blank line in between. If the two lines print on the same line, you're not getting any linefeeds. You can probably set a DIP switch to turn on and off linefeeds. Your interface may have a built-in switch for linefeeds. Alternately, you can try a different secondary address. Replace the 7 in the above example with a 6 or an 8 and try again. We'll explain the secondary address below.

Now try this line:

```
OPEN 4,4: PRINT#4,"SHIFT-A SHIFT-S
  SHIFT-Z SHIFT-X SHIFT-CLR":
  CLOSE 4
```

Type the keys as described above by holding down SHIFT while you press A, S, Z, and X. The "SHIFT-CLR" means to hold down SHIFT and press CLR/HOME (which appears on the screen as a reverse-video heart symbol).

Check your printout. If you're using a Commodore printer, or a

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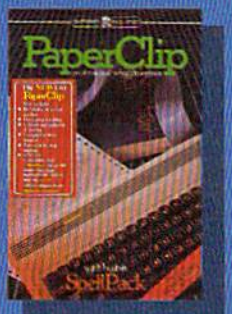

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Commodore graphics emulation interface, you should see the card symbols: spade, heart, diamond, and club—just as they appear on your screen. The clear screen key should also print out as it does on the screen. Instead of the actual shapes, you may see something like "[SHIFT-A][SHIFT-S][SHIFT-Z][SHIFT-X][CLR]" or "[193][211][218][216][147]." You may even see nothing, or just a bunch of strange, twisted boxes.

If you get the numbers in brackets (the ASCII values of the characters), your interface doesn't know what to do with these codes, or is stuck in a mode that always prints characters as numbers in brackets. If nothing prints, then your interface may be inadequate for use with all software. You may get uppercase A, S, X, and Z. It's not a hardware problem, just one of compatibility. For many software packages, you'll have no problem. But some programs will expect the printer to act *exactly* like the 1525 or MPS-801.

Print Power

Before you can talk to the printer, you have to open up a channel for communication, just as you have to dial a phone number before you can talk over the telephone. The OPEN statement has the following format:

OPEN *file number,device number, secondary address*

The *file number* can be any number from 0 to 255. Usually, if you use a file number higher than 127, an extra linefeed will be sent out after every carriage return. Unless you can't figure out any other way to get linefeeds, you'll want to use a file number below 128. The file number is not sent to the printer or interface. It's used to tell the computer where you'd like printing to go, since you can have many files open at once. The file number is used to identify which opened channel to use.

The *device number* for a printer is usually 4, but can range from 4–7, allowing you to use up to four printers simultaneously.

The Secondary Address

The *secondary address* is where the most mischief comes into play. Leaving off the secondary address is usually like using a secondary address of 0. The secondary address is a way of sending a command to the printer, as opposed to actual characters. For example, a secondary address of 7 commands the printer to print all following text in the uppercase/lowercase mode, instead of the uppercase/graphics mode.

Commodore 1525/MPS-801/MPS-803 Secondary Addresses

The 1525, MPS-801, and MPS-803 use just two secondary addresses; they control the printing mode. An interface for non-Commodore printers may emulate these, and support several others.

If you send the letter A and a SHIFTed A via a channel opened with secondary address 0, you'll get an uppercase A and a spade character. With a secondary address of 7, you'll get a lowercase *a* and an uppercase *A*.

0	Print in uppercase/graphics mode (graphics mode)
7	Print in upper/lowercase mode (text mode)

Commodore 1526/MPS-802 Secondary Addresses

The 1526 and MPS-802 use secondary addresses 0 and 7 in the same way as the 1525/801/803, but they have quite a few more features. However, the 1526, renamed as the MPS-802, is not fully compatible with the 1525/801/803 since it was based on an earlier version of a Commodore printer, the 4022, used back in the heyday of the PET/CBM. The 1526/802 is an exception to the usual Commodore printing conventions, and is not always compatible with software written for the 1525/801/803. Here are the secondary addresses (for more about using them, see the printer manual):

0	Print in uppercase/graphics mode
1	Print according to previously set format string
2	Accept a format string
3	Set page length in lines
4	Enable error messages
5	Define the programmable character
6	Set line spacing
7	Print in upper/lowercase mode
9	Cancel error messages
10	Reset the printer

Cardco Card/? Secondary Addresses

We're not specifically endorsing the Cardco Card/?, but many interfaces have used it as a standard, just as many third-party printers emulate the Epson MX-80. Notice how most odd numbered secondary addresses suppress linefeeds. The listing mode spells out cursor controls like SHIFT–CLR/HOME as symbols like [CLR].

The graphics or transparent mode sends all characters to the printer without translating or intercepting any characters. The interface just converts serial to parallel without altering any characters passed. You'll use this mode when sending binary patterns to your printer in graphics mode, or with software that otherwise wouldn't let you use the special features of your printer.

If you add 20 to any of these numbers, the interface is locked into that mode. Other OPEN statements, even with different secondary addresses, will not reset the locked mode. This is quite useful, since you can lock in a mode from BASIC, then use your printer with software that doesn't let you send a secondary address.

0	Print in uppercase/graphics with linefeed
1	Uppercase/graphics with no linefeed
2	Listing mode with linefeed
3	Listing mode without linefeed
4	Graphics or transparent mode with linefeed
5	Graphics or transparent mode without linefeed
6	Listing mode in upper/lowercase with linefeed
7	Print in upper/lowercase with linefeed
8	Upper/lowercase without linefeed

You can have more than one channel open at once. You could have one file open for uppercase/graphics, and another for uppercase/lowercase. Printing the same text to each file will give you different results. Remember that each open file is distinguished by its file number.

There's only so much you can do with secondary addresses. They set an overall environment for printing, but are not used in the middle of printing to change modes. *Control codes* are used instead. These codes are not printable

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characters. They lie outside the normal ASCII range of 32–127. You usually send these codes with the CHR$ function, although they can sometimes be embedded in PRINT statements. Let's try a few.

Double Width Characters

On Commodore printers, CHR$(14) turns on double-width (enhanced) printing mode. Characters are horizontally elongated. This is a good way to emphasize text, as in titles and headlines. Remember that spaces are also printed twice as wide, so you'll need half as many spaces to center double-width text. This line can be used in BASIC to print double-width text:

```
PRINT#4, CHR$(14); "DOUBLE WIDTH
  TEXT"
```

This assumes that you've already opened file #4 to the printer (OPEN 4,4). Usually, you'll OPEN the file once, and leave it open until you're through printing. You usually won't want to OPEN and CLOSE the printer file every time you want to print something.

The special printer control codes are outside the normal printable range. In the ASCII standard code set, these control codes lie in the range of CHR$(0) to CHR$(31), and sometimes from CHR$(128) to CHR$(255). A special code, called ESC (escape), has a value of CHR$(27). Some of these codes can be entered from the keyboard and embedded in text. For example, this line will also print double-wide text. Hold down CTRL and press N to embed the <CTRL-N> within the line. You'll see a reverse-video N. (This trick won't work on the VIC.)

```
PRINT#4,"<CTRL-N>DOUBLE-WIDE
  TEXT"
```

You might prefer to spell out the codes with CHR$, however, since the embedded CTRL codes make your listing hard to read. Also, if you were to LIST your program to the printer (OPEN 4,4:CMD 4:LIST), the embedded CTRL codes could be activated in the middle of your listing, although the same could happen with embedded cursor control statements with some printer interfaces.

If you want to use the CTRL trick, CHR$(1)–CHR$(26) correspond to CTRL-A to CTRL-Z. You can use CTRL-[for the ESC code, CHR$(27).

As long as you're using BASIC, it's very convenient to assign string variables to the printer control values. This saves typing and produces more readable code.

```
10 OPEN 4,4
20 DW$=CHR$(14): OFF$=CHR$(15)
30 PRINT#4, DW$; "DOUBLE WIDTH
   ON"; OFF$; " AND OFF."
```

Switching Between Upper- And Lowercase

You can embed other control codes too. If you want to switch between uppercase/graphics and uppercase/lowercase mode in the middle of printing, use the cursor-up/cursor-down codes. These can be embedded in text as cursor keys or you can use the CHR$ function for readability. After a cursor up (CHR$(145)), all following text will be printed in the uppercase/graphics mode. Shifted alphabetic characters will print out as graphics symbols. To get lowercase, use CHR$(17). These modes are cancelled at the end of a line by a carriage return, CHR$(13). (The CHR$(13) is automatically output at the end of every line, unless you append a semicolon to the end of the PRINT# statement.) If you want to stay in one mode or the other, use a secondary address of either 0 or 7, as discussed above.

You can use reverse-field printing to highlight text. Reverse-field causes the dots that make up the text to switch values. Characters are printed as white characters on a black background. On both the screen and the printer, CHR$(18) turns on reverse-field, and CHR$(146) turns it off. Reverse-field printing is terminated at the end of a line by a CHR$(13).

You can also embed codes to skip to any tab position. Just use CHR$(16) followed by a two-digit tab position. The next character will be printed at the indicated column. For example, to print text at column 23:

```
PRINT#4, CHR$(16); "23TEXT AT
  COLUMN 23."
```

The "23" will not be printed. These characters are used by the CHR$(16) function. The text printing starts at "TEXT AT...".

Graphics Mode

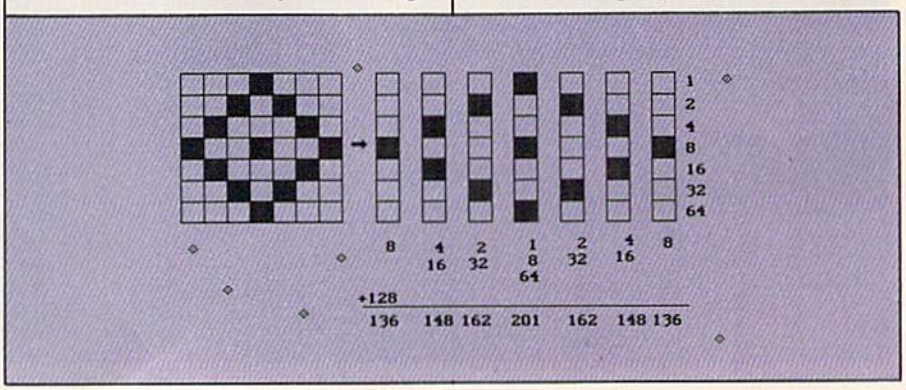
The 1525, 801, and 803 have a graphics mode which can be a lot of fun or a big headache. It requires you to take full control of the printing matrix. You turn on the graphics mode with CHR$(8), then send out codes to selectively strike certain pins on the printhead. The printhead is a column of thin wires. Each wire is represented by a single bit in a binary quantity from 128–255. An image is made up of a number of these vertical strips. To find the binary number representing a vertical image strip, just add up the numbers on all "on" (1) dots in a column, then add 128. All graphics codes must be summed with 128 to prevent confusion with other non-graphics information.

A complete image, shown in the figure below, is translated into vertical strips. Each strip is broken down into its binary value by adding up the values of the "on" bits.

This program prints the figure on the 1525/801/803:

```
10 FOR I=1 TO 9:READ A:A$=A$+
   CHR$(A):NEXT
20 DATA 8,136,148,162,201,162,148,136,15
30 OPEN 4,4:PRINT#4,A$:CLOSE 4
```

If you need to finely adjust the printhead position, you can use the dot-addressable tab command. This command causes subsequent graphics or text to start printing exactly at a particular dot-column. Normal text prints from columns 0



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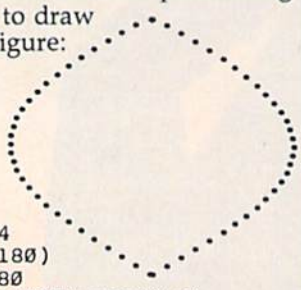
to 79. The dot-tab lets you adjust the printhead from positions 0 to 479, indicating that each character uses six dots across. Start with the dot position, a number from 0 to 479. Divide it by 256 to get a quantity called the "high byte." The remainder after the division is the "low byte." Then send the value out with:

```
CHR$(27);CHR$(16); CHR$(low byte);
  CHR$(high byte);
```

followed by text or graphics. This program uses the dot positioning command to draw an ovoid figure:



```
1 PRINT
5 OPEN 4,4
10 DIM X(180)
20 AR=↑/180
25 PS$=CHR$(27)+CHR$(16)
30 FOR I=0 TO 180 STEP 6
40 X=240+100*SIN(I*AR)
50 M1=X:M2=479-X:IF M1>M2 THEN
    M1=M2:M2=X
60 PRINT#4,CHR$(15);PS$;CHR$(M
   1/256);CHR$(M1AND255);"*";
65 PRINT#4,PS$;CHR$(M2/256);CH
   R$(M2AND255);"*";CHR$(8)
70 NEXT
```

It's easy to combine all the printer commands to create custom effects. Again, it's best illustrated by a program. In the program below, notice the CHR$(26) in lines 10 and 20. It's used with the CHR$(8) graphics command to repeat a series of graphics bytes. Follow the CHR$(26) with a CHR$ value representing the number of repeats, followed by the CHR$ code of the binary strip to be repeated.

```
10 OPEN4,4:PRINT#4,CHR$(8);CHR
   $(26);CHR$(132);CHR$(162);C
   HR$(15)
15 PRINT#4,CHR$(14);CHR$(18);"
   HELLO WORLD";CHR$(15)
20 PRINT#4,CHR$(8);CHR$(26);CH
   R$(132);CHR$(162);CHR$(15)
30 PRINT#4,CHR$(17);"LOWERCASE
    AND ";CHR$(145);"GRAPHICS
   {SPACE}ASDX UQI"
40 FORI=1TO9:READA:A$=A$+CHR$(
   A):NEXT
50 DATA 8,136,148,162,201,162,
   148,136,15
60 FORI=1TO10:PRINT#4,A$;:NEXT
   :PRINT#4
70 FORI=1TO20:X=16-8*SIN(I)
80 PRINT#4,CHR$(15);CHR$(27)CH
   R$(16)CHR$(0)CHR$(X);"Q"CHR
   $(8)
90 NEXT
100 CLOSE4:END
```

Other printers, with the proper graphics interface, will honor these 1525/801/803 codes. Most printers are capable of far more. You may need to enter graphics or transparent mode to fully access these features. Every printer has its own set of special commands. As with the 1525/801/803, you control the printer with CHR$ commands. Just find the index in your printer manual that gives a list of codes for special features, and plug the values into the CHR$ function as shown above. The ESC code, CHR$(27) is a special command that prefaces some other commands. If you're using a Commodore emulation interface, you may need to send the ESC code *twice* before commands requiring the ESC code.

COMPUTE!'s GAZETTE has published a number of articles and programs for printer users. For more information on printers, see: "Power BASIC: Hi-Res Screen Dump," for the 1525/801/803 printers (October 1984); "Hints & Tips: Abbreviated Printer Codes" (March 1985); "1526 Hi-Res Screen Dump" (April 1985); "A Buyer's Guide To Printers" (July 1985); and "Printer Wedge" (September 1985).

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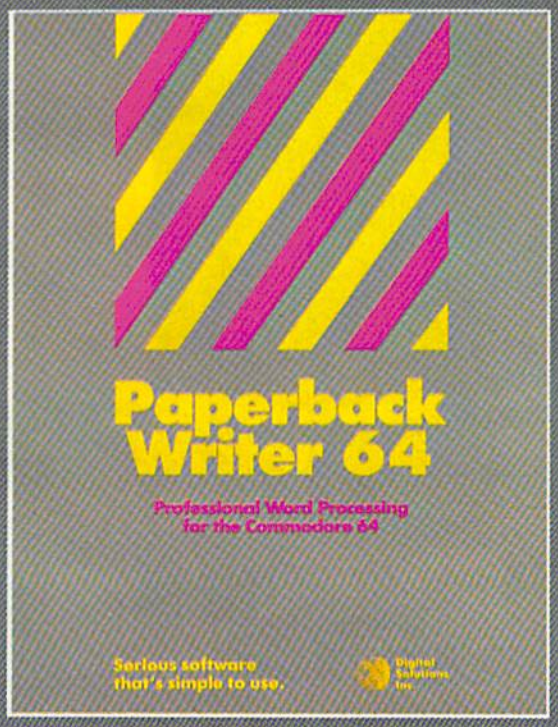

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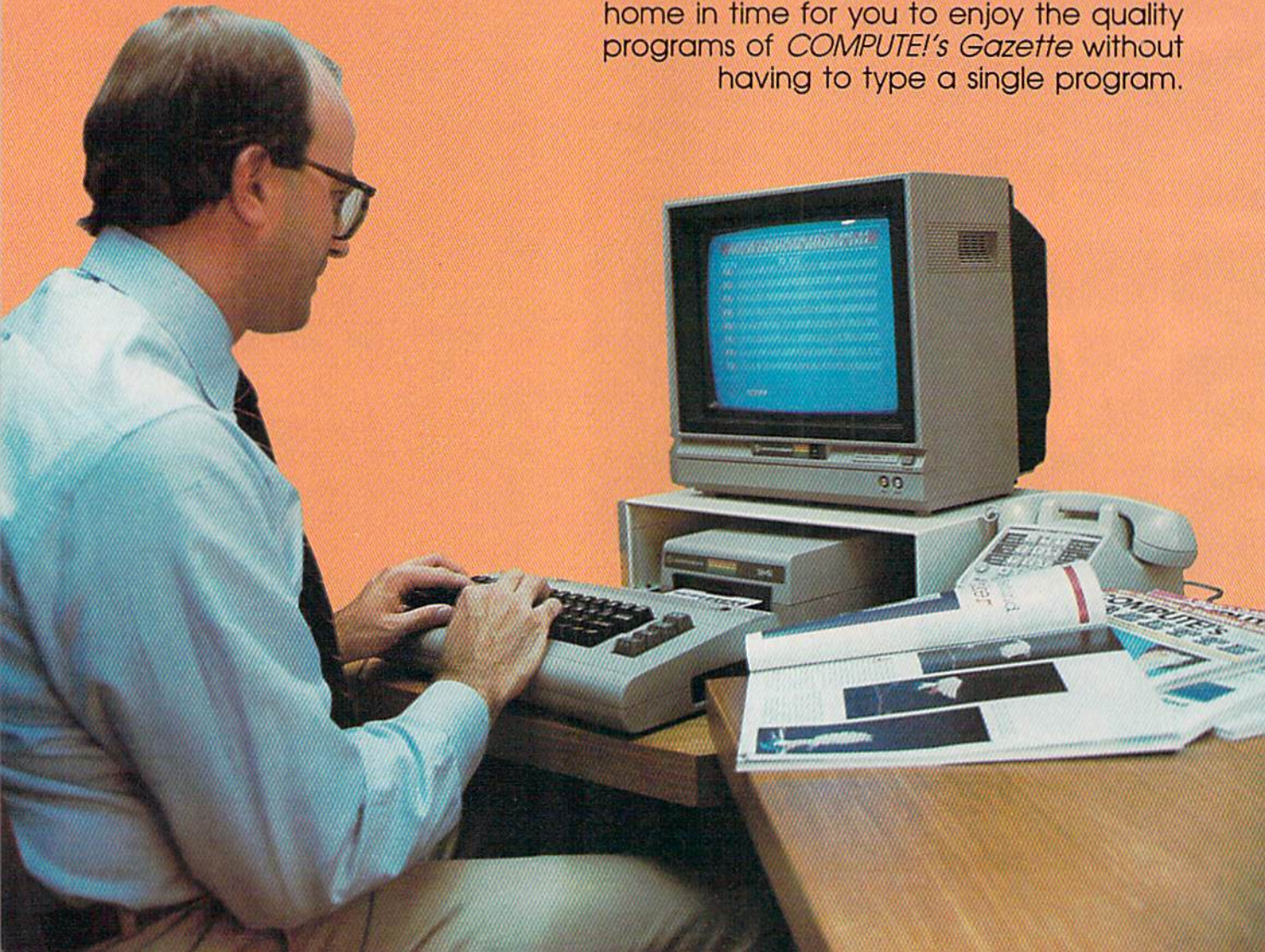

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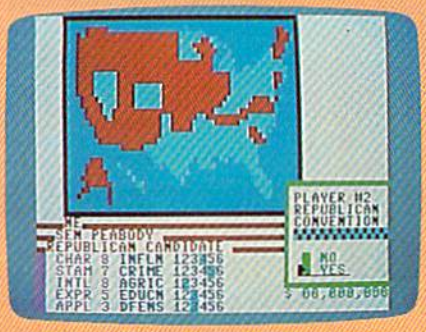

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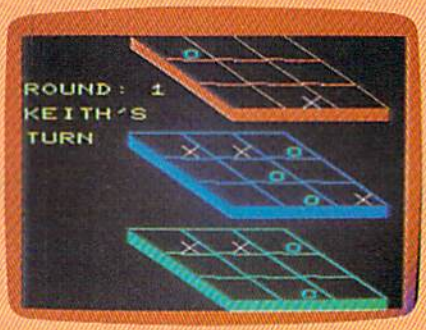

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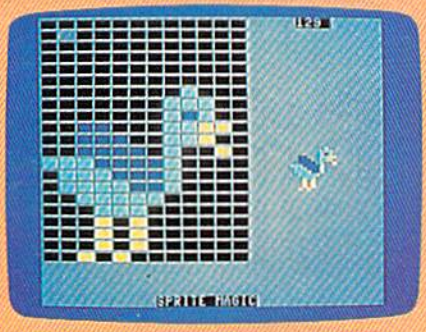

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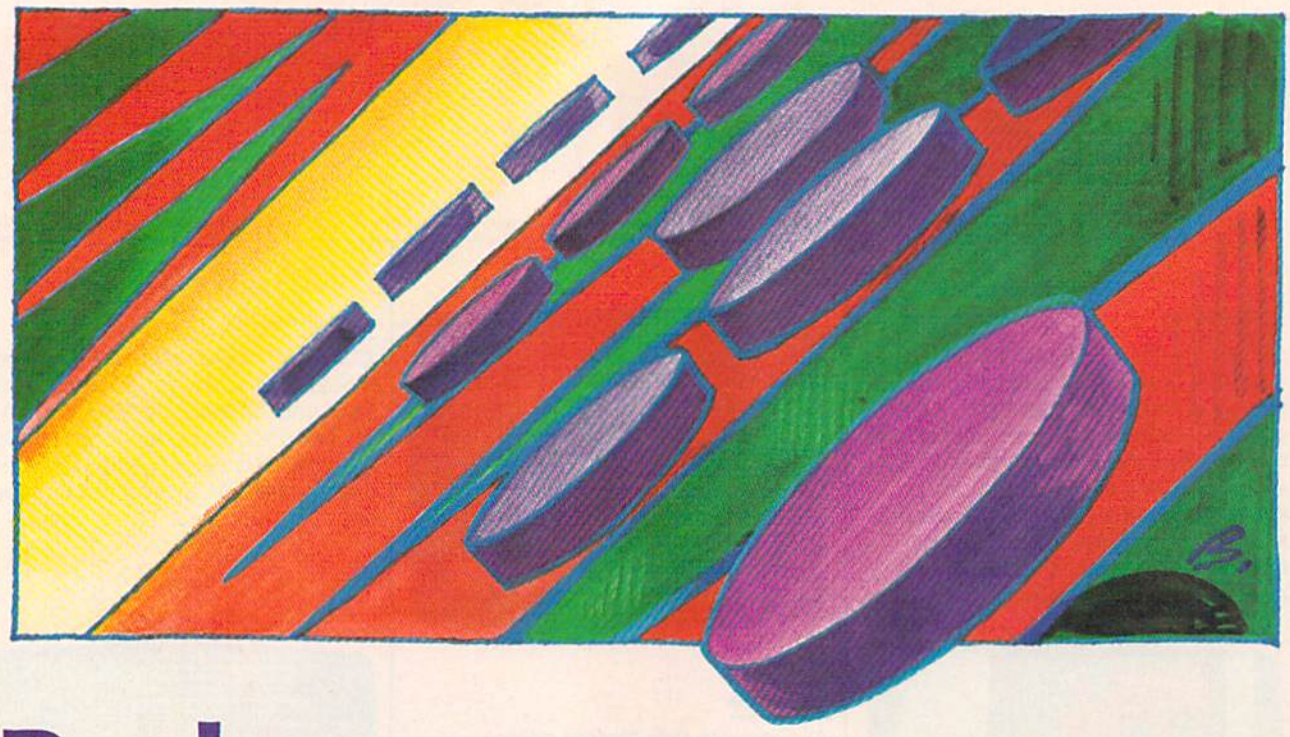
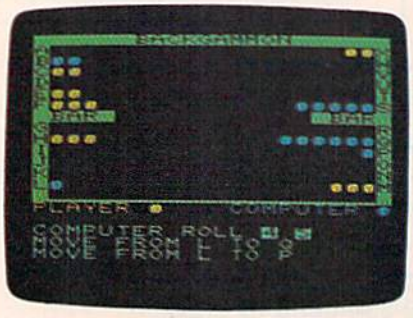
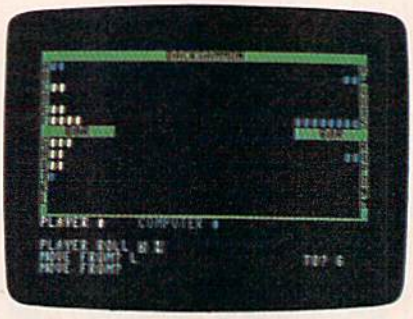


Backgammon

Jeffrey Vavasour and Geoff Rideout



Two blue pieces have been left in vulnerable positions (VIC version).



The computer may lose this game, but it's not over yet (64 version).

The classic game of backgammon combines equal parts of luck and strategy. This version observes all the regulations of standard backgammon. For the 64, VIC, Plus/4, and 16.

In this game of backgammon, you play against the computer. Using a decision-making algorithm described below, the computer figures out the best moves. You'll find it quite a challenge to come up with a winning strategy. The only thing missing is the doubling cube, which is sometimes used in gambling.

There are two versions, one for the 64 and one for the VIC. The program barely fits into an unexpanded VIC-20, so be careful not to add any extra spaces or REMarks. Plus/4 and 16 owners should enter the 64 version (ignore the rems which contain the Automatic Proofreader checksum at the end of each line), and make the following changes:

```
100 CT=2048:COLOR0,1
1150 POKE205,16:PRINT
1170 POKE205,16:PRINT:RETURN
```

When you've finished typing, save the program to tape or disk. Before you run the game, be sure that you're in uppercase/graphics mode (using the Commodore and SHIFT keys), otherwise the board representation will not appear correctly.

If you're already familiar with the rules of backgammon, skip over the next section.

The Rules Of Backgammon

If you're a newcomer to backgammon, we recommend that you ask someone who plays to teach you. Also, you can probably find books about backgammon at a local library. Here's an introduction to the basic rules:

The playing board contains 24 *points*, divided into four groups of six, with a bar running down the middle. Players take turns moving their pieces around the board, on the points. One player moves clockwise, the other counterclockwise. Your goal is to move all of your pieces into the *inner table* and then start moving the pieces off the board. The inner tables of the two players are directly opposite each other. On the screen, you move

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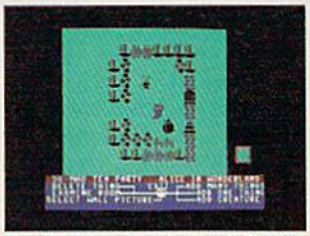

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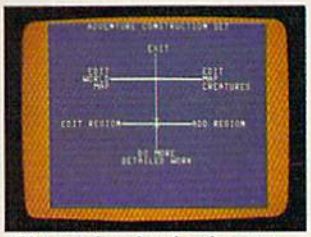

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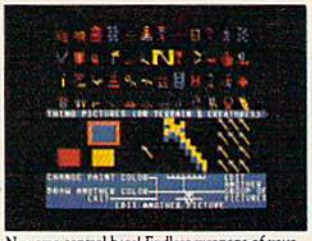

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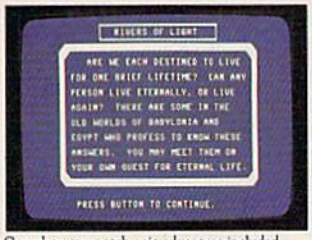

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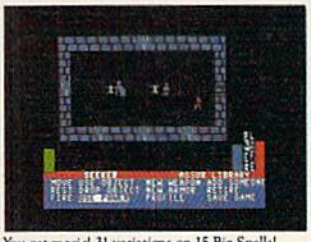

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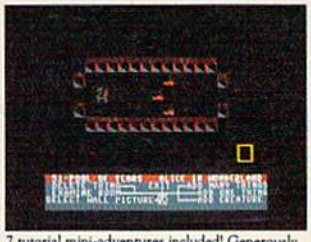

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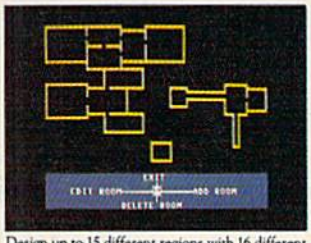

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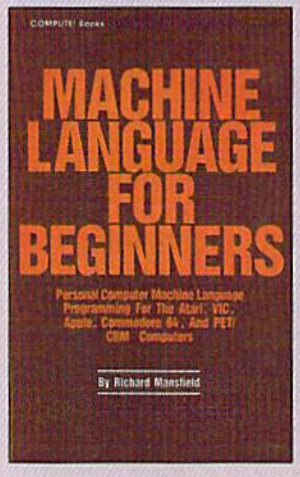

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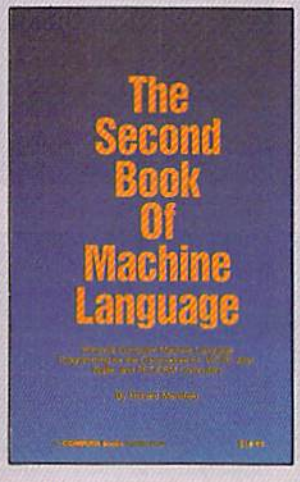

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clockwise from X to A toward your inner table in the upper-left corner (the positions labeled A–F). The computer moves counterclockwise toward positions S–X.

When it's your turn, you roll two dice. Say you get a 3 and a 5. You can move one piece three points and another five, or you can move a single piece five and then three, for a total of eight. Any piece can be moved from one position to another as long as the destination is not blocked. If your opponent has two or more pieces on a point, it's considered blocked and you can't move there.

If there's a single piece there, you can *blot* it: Your piece takes over the position and your opponent's blotted piece is moved to the bar in the middle. When one or more of your pieces is on the bar, you can't make any moves on the main field until the piece moves off the bar back onto the board. You have to move it to one of the points in your opponent's inner table, based on the roll of the dice. In this game, for example, if you have a piece on the bar and roll a 1 and a 5, you could move off the bar to position X (to use the 1) or position T (5). Then, you'd use the other number to move a single piece.

Rolling doubles gives you double the moves. So, if you roll two 3s, instead of two moves of three points, you get four moves of three.

Once you've moved all of your pieces to the inner table, the six points labeled A–F, you can start to *bear off*. Rolling a 2 and a 3 would allow you to remove one piece from B and one from C. The first player to remove all pieces from the board wins the game.

A lot of the strategy of backgammon is building safe positions, points containing two or more pieces. In general, you should not leave a single piece on a point where it can be blotted by the other player, although sometimes it's unavoidable. It also helps to have an understanding of the odds for rolling certain combinations with the dice.

Basic Game Play

Throughout the duration of the game, a graphic representation of the backgammon board is displayed on the upper portion of the screen. Board positions consist of the letters A through X (representing the board locations starting in the upper-left corner and running counterclockwise), BAR, and OFF (representing the location where pieces moved off the board are placed). Board positions are printed next to their appropriate locations.

When you run the program you're asked "WILL I GO FIRST?". If you want the computer to move first, respond with "Y". Otherwise, press "N". The computer will draw the board and place the game pieces in the starting position (you start with five pieces in your inner table, two at the far end in the computer's inner table, and eight in between). The computer has blue pieces which move counterclockwise from A to X. The yellow pieces are yours. They move clockwise from X to A.

When it's your turn, the message "PLAYER ROLL" is displayed below the game board followed by the result of the dice roll, which is based on a random throw. If you roll doubles, the number is printed four times to indicate that you have four moves. Below this you're presented with a "MOVE FROM?" prompt. Respond with the location you're moving from, by typing the appropriate letter A through X. If the location you entered does not contain any yellow pieces or is not within the range of the board, "ILLEGAL MOVE" is displayed below the prompt and the cursor returns to the beginning of your input. If you have any pieces on the bar, "MOVE FROM BAR" is displayed and the computer automatically skips to the "TO?" prompt.

After you've responded to the "FROM?" prompt as necessary, "TO?" will appear to the right of it. Answer this with a letter from A to X representing the destination on the board, or "OFF" indicating you wish to take the piece off the board. If the move you indicated is not permissible, "ILLEGAL MOVE" is displayed below your input and the cursor returns to the "FROM?" prompt.

If you can't move, typing "NO" in response to the "FROM?" or "TO?" prompt will cause the computer to skip the remainder of your turn and proceed with rolling the dice for its turn. If the screen becomes partially or completely erased during the game by some erroneous input, type "DRAW" in response to the "FROM?" or "TO?" prompt to redraw it. This can also be used to display any die or dice you've not yet used in a move.

In order to move off the board, all of your remaining pieces must be contained on positions A through F, your inner table.

When it's the computer's turn to move, the input area below the board is cleared, and the computer's rolls are displayed in the same form as the player's.

While the computer is evaluating each of its moves, "THINKING..." is displayed. The message "MOVE FROM xxx TO yyy" follows after a few seconds, indicating the computer's decision.

Once the computer has exhausted all of its moves, after it has used all of the dice or when it can not move due to some block (in which case "CAN NOT MOVE" is displayed), it will wait for a key to be pressed. At this time, "THINKING..." is not displayed. This gives you a chance to look at the move made by the computer. Press any key to proceed to your turn.

When the game is over, the computer displays a message indicating the winner and offers you a chance to play again.

How The VIC Version Works

The 64 and Plus/4 versions were translated almost directly from the original VIC version. With a few exceptions, the following notes apply to Plus/4 and 64 versions as well.

The pieces on the screen don't actually move from one position to another as you might think. There are always playing pieces on the points. To give the illusion of movement, the color of the appropriate screen position is POKEd with blue, yellow, or black. When a piece is removed, its color is changed to black with a "POKE x,0" command. If a piece is to appear at a location, either POKE x,6 (set to blue for the computer) or POKE x,7 (set to yellow for the player) is executed.

Because of this method of moving, the background should be black to avoid superfluous pieces appearing. If you wish to use a different background color, change

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the value in line 100 and replace all "POKE x,0"s with the appropriate color.

The address of the pieces are calculated with the FNP(x) command. Before this formula may be used, CT must contain the address of the beginning of the color table, Y must contain the piece number within the location which must be moved, and "x" is the board position from 1 to 24 representing locations A through X respectively.

The computer's strategy uses a process of evaluation and elimination. The program starts at the bar and scans the board through to location X using each of the die rolls. It then records the highest evaluation number (described below), highest evaluated move, and roll. If there is no evaluation number (it is 0) or there are pieces on bar and the evaluation is less than 128, the computer decides it cannot move. You are informed of this and its turn ends. Otherwise this process is repeated until all rolls are used.

A particular move is evaluated by adding up various values reflecting the advantage of such a move. The computer evaluates a move off the bar as 128 (being of most importance) and off the board as 64. Protection of two exposed pieces by moving one on top of the other is given a value of 32. If the move does not result in the exposing of any other pieces, either at the origin of the move or the destination, a value of 16 is added. If the opponent can be placed on bar, the evaluation is 8. Movement on the outer table is counted as 4. Also, for moves in which another piece will cover the one being moved, the evaluation is 2. Legal moves are given a value of 1; this allows a method of determining whether any legal moves were found at the end of the evaluation process.

Any of these values may be combined to form a general evaluation of the move. For instance, a move off the bar that places the other player on the bar is given a value of 136 (128 and 8). The accompanying table contains a list of move values, a brief description, and the line which contains them.

By changing these move values, you can change the computer's strategy, thereby increasing or decreasing the difficulty of play or just adding variation to the computer's judgment. If you wish to change a value, simply replace the number following the statement "E=E+..." in the appropriate line. When doing this, it's best to leave moves off the bar unchanged because a value less than 128 will prevent the computer from being able to move off the bar.

Expert players may find that they can beat the computer most of the time. Humans tend to take calculated risks that may eventually pay off. They may also look one or two moves ahead, something the computer doesn't take into consideration. The computer's process of evaluating every possible move makes it avoid risks if at all possible, which results in a fairly conservative game. If you're feeling ambitious, you might try to modify the algorithm, to improve on the basic idea.

To further aid anyone interested in understanding the processes of this program, a table of variable functions is included.

If you'd rather not type in the program (VIC version only), send $3, a blank tape, and self-addressed, stamped mailer to:

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Variable Descriptions (for all versions)

Variable	Description
A$	Used when waiting for a key at the end of the computer's turn.
B(x)	Board contents. B(0) is computer bar, B(1–24) represent board locations A through X, and B(25) is the number of pieces off the board. A positive number indicates computer pieces; a negative number indicates player.
CT	Pointer to start of color table.
E	Evaluation of current move being processed by the computer.
F$	Input from player's "FROM?" prompt.
H	Highest evaluated move by computer.
HP	Computer's highest evaluated position (0–24) or player's "FROM" position (1–25).
HR	Computer's highest evaluated roll or how far player wishes to move.
L$	21 spaces. Used to clear input area.
LN	Die number (0–3) of lowest computer roll.
LR	Value of lowest computer roll, same as R(LN).
M	Maximum number of pieces which may be displayed at the current position (10 for board, 7 for bar).
MF$	Indicates current turn. If string starts with "N", it is the player's turn; otherwise, it is the computer's turn.
OB	Nonzero indicates computer may move off board. Also contains the die number the player is using (HR usually equals R(OB)).
FNP(x)	Returns address in color table for a particular piece; "x" is the position from 1 to 24 and Y is the piece number within the position.
PB	Indicates the number of pieces the player has on bar (−2 means two pieces on bar).
PO	Indicates the number of pieces which the player has moved off bar.
R(x)	Contains the remaining rolls. Used die are indicated by a 0; "x" must be from 0 to 3.
FNR(x)	Returns a random number between 1 and 6.
T$	Input of player's "TO?" prompt.
X,Y,Z	Miscellaneous counters and pointers.
X$,Z$	Computer's "FROM" and "TO" respectively.

Computer Evaluation Ranking

Rank	Description
128	Move computer piece off bar.
64	Move computer piece off board.
32	Move an exposed piece to a position also containing an exposed computer piece.
16	A move which does not expose any pieces.
8	A move which places the player on bar.
4	A move that is not in the computer's inner table.
2	A move in which the piece will be covered by another piece in the same turn.
1	A legal move.

See program listings on page 126.

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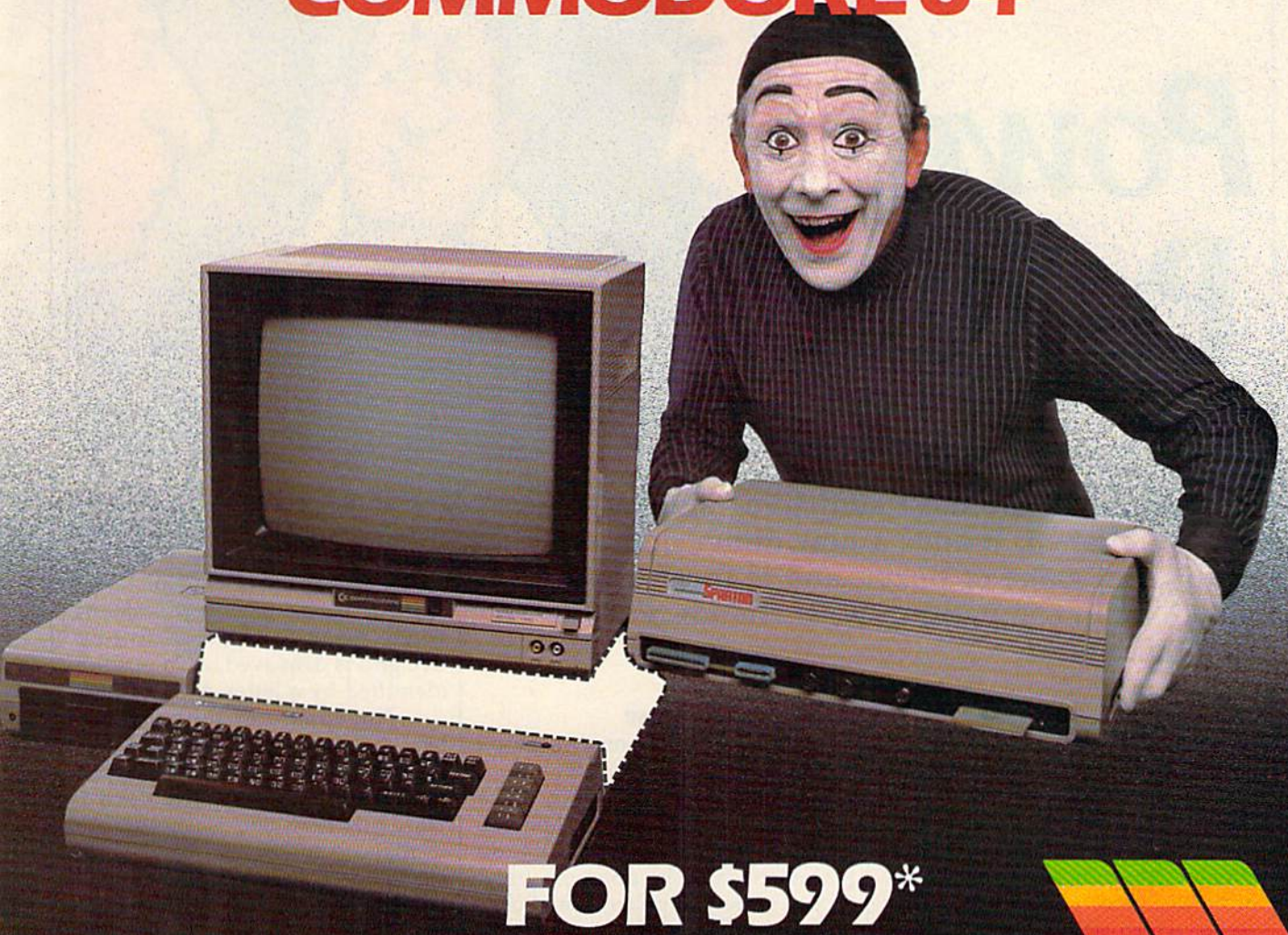

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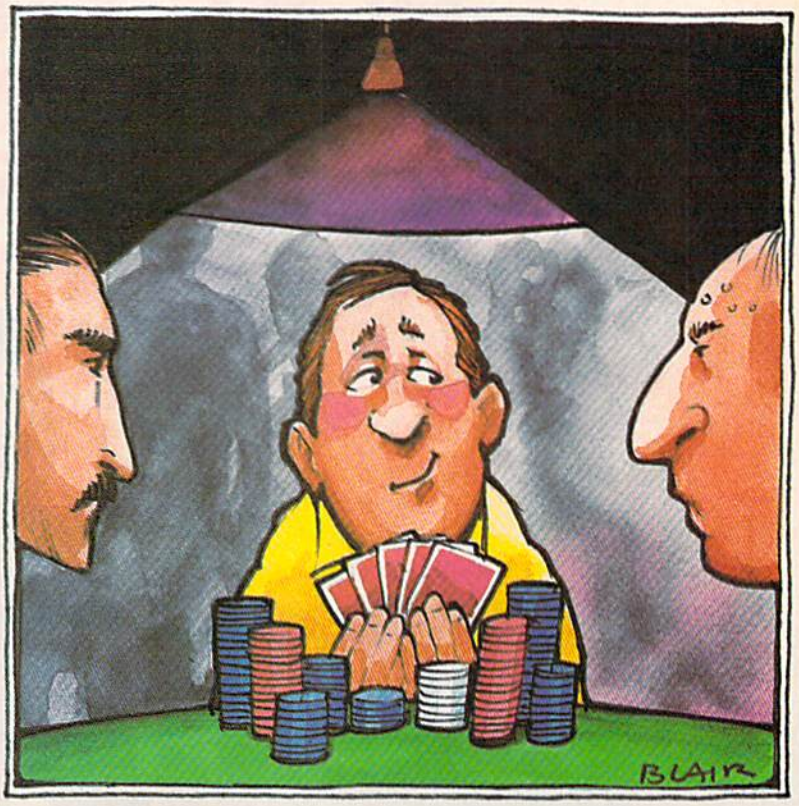

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A Double Purpose

Think of this game as two-dimensional poker. You play on a five-by-five grid and try to make the hands that gain the most points. Each card serves two hands, so placement must be done carefully. (If you're new to poker, see "Poker Hands.")

After entering the program, save a copy and type RUN. (If you're using a black-and-white TV, change the value of variable TV from 1 to 0 in line 100). You'll see a table of the number of points awarded for each kind of hand. After a pause of a few seconds, you're ready to begin. A five-by-five grid is displayed, each position identified by a letter A–Y.

The computer randomly selects a card and displays it. Place it in the grid by pressing the appropriate letter. After the card is placed, a new one is chosen and displayed, and so on, until all 25 cards have been placed. Choose your moves carefully, and remember: There are 52 cards in the deck, but you'll only have 25 to play with. The goal is to make the most points possible. Scoring is based on

Starting with an empty five-by-five grid, you're dealt a card selected randomly by the computer. As the game progresses, you build poker hands both horizontally and vertically. In the second photo, note the top row, where a 10 of diamonds will complete a straight flush. The third photo shows several additional hands: the straight flush on top, two pair in the second row, a straight across the bottom row, two pair in the first column, one pair in the second column, three of a kind in the third column and in the fourth, and four of a kind in the fifth.

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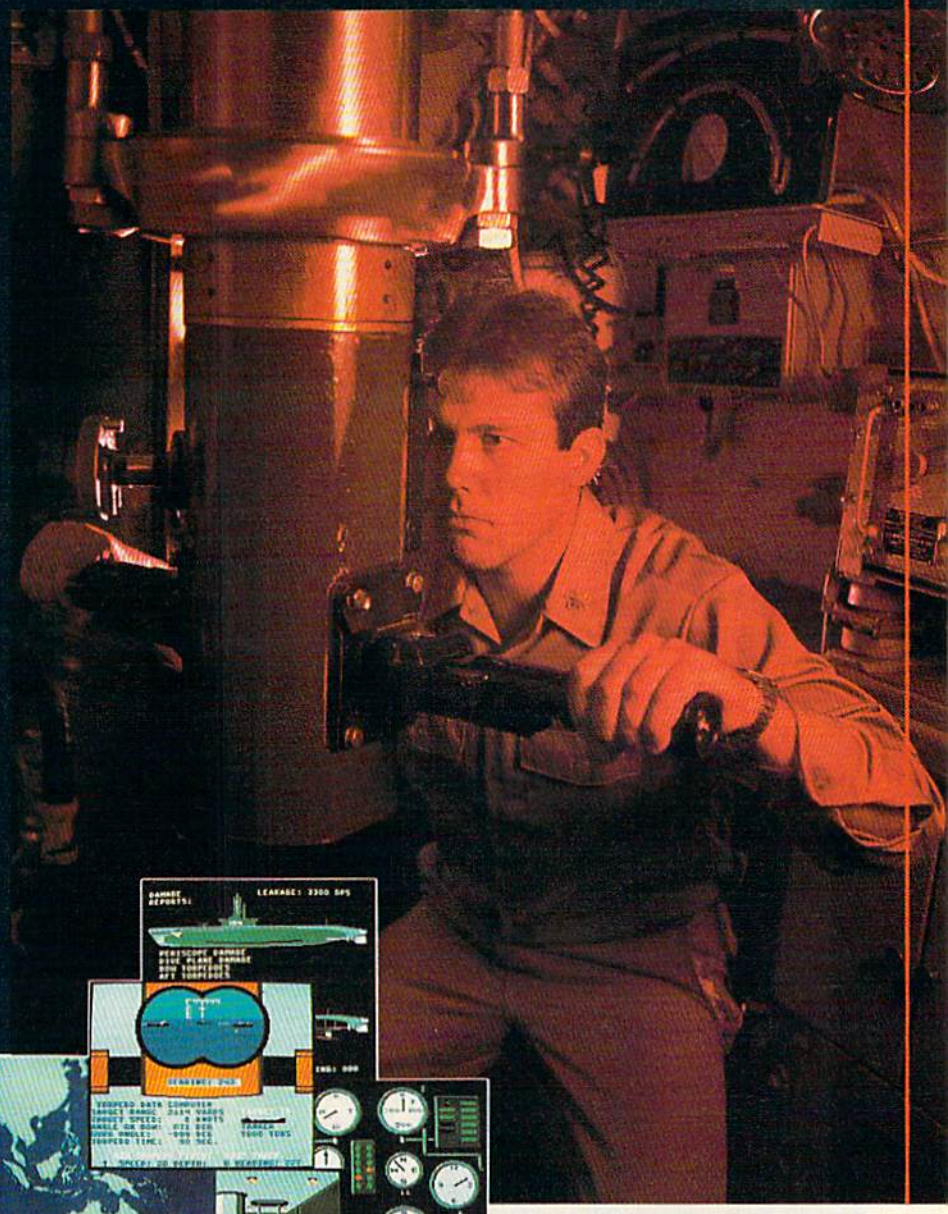

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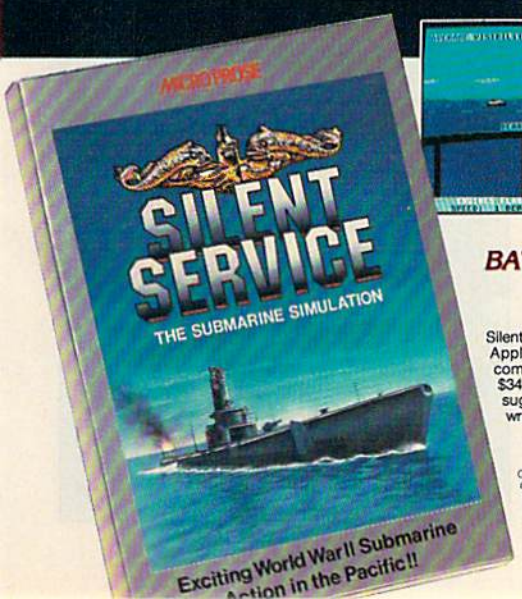

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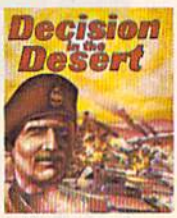

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Poker Hands

If you've never played poker, it's very easy to learn. There are 52 cards, divided into four sets (or *suits*) of 13. The suits are hearts, clubs, spades, and diamonds, and each suit consists of cards numbered 2–10 with a jack, queen, king, and ace. The object is to make one of the following hands (examples are in parentheses):

Royal flush: 10,J,K,Q,A—all of the same suit
Straight flush: a sequence of five of the same suit (9,10,J,Q,K—all diamonds)
Four of a kind: four of the same value (2,2,2,2)
Straight: five in sequence (4,5,6,7,8)
Full house: three of a kind plus a pair (10,10,10,4,4)
Three of a kind: three of the same value (9,9,9)
Flush: five of the same suit (2,K,8,A,5—all clubs)
Two pair: two groups of two, each of the same value (A,A,6,6)
One pair: two of the same value (10,10)

the hands you build. After a column or row is completed, points are totaled and added immediately to your score. (High score is displayed at all times on the screen also.)

Here are the values for each hand:

Hand	Points
Royal flush	400
Straight flush	300
Four of a kind	160
Straight	120
Full house	100
Three of a kind	60
Flush	50
Two pair	30
One pair	10

To remember the value of each hand, you can press f1 at any time during the game to see the table of values. Press it again to resume play. Poker players may notice that some of the hands are out of order. Normally, a flush would be much higher on the list. But remember that you're drawing 25 cards and the odds for getting two or three flushes are very high. Higher point values have been given to hands that are less likely to occur.

Hands do not need to be in sequential order. For example, "5,6,4,7,8" is a valid straight. However, "roll-over" or "round the corner" straights such as "3,2,A,K,Q" are not allowed. Straights using an ace as low (A,2,3,4,5) or high (10,J,Q,K,A) are acceptable.

See program listing on page 124.

Program Construction

Line #	Function
100–380	Initialization
390–420	Print High Score
430–460	Print Score
470–490	Call Screen #2
500–550	Shuffle/Grid Set-Up
560–650	Game Play Routine
660–670	Test for Completed Row
680–690	Test for Completed Column
700–780	Game End Routine
790–890	Data Collection - Row
900–990	Data Collection - Column
1000–1120	Data Evaluation
1130–1150	Print/Flash Poker Hand
1160–1290	Data: Redefined Characters
1300–1310	Data: Cards/Suits
1320–1340	Data: Screen Location Table
1350–1730	Data: ML Routines

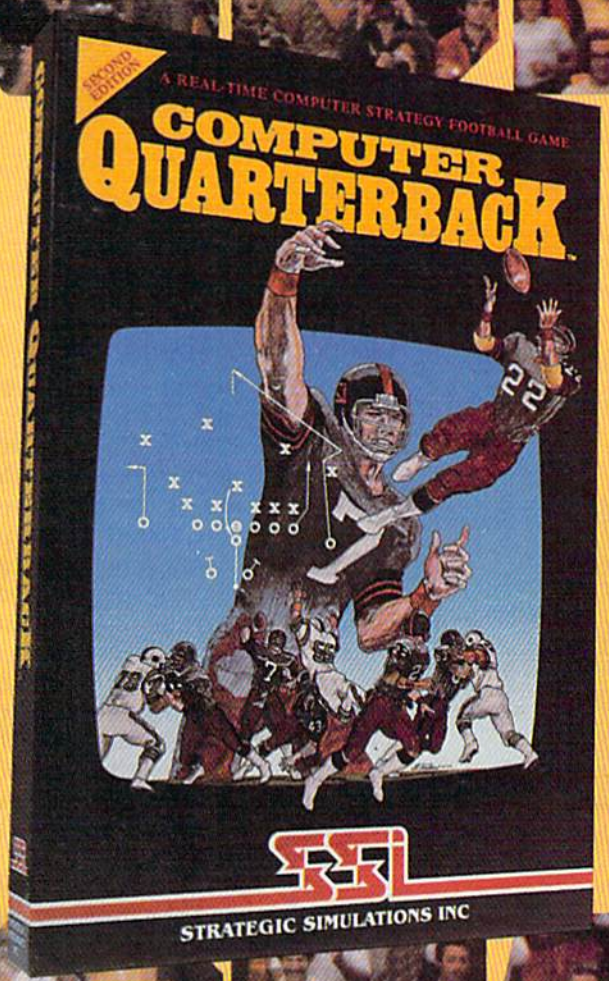
Variables

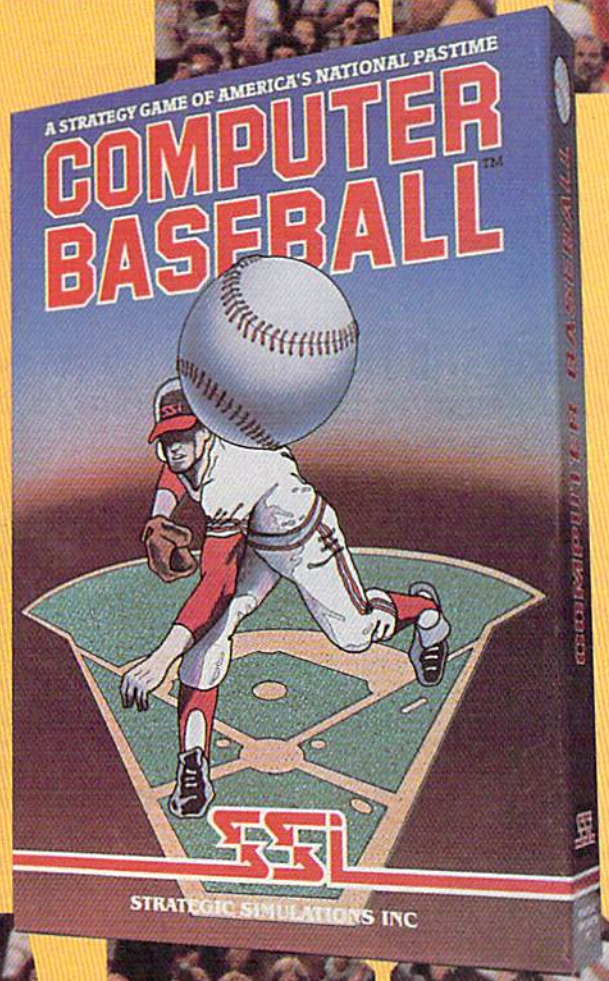
A$	"{16 DOWN}"
B$	"{1 DOWN}{27 RIGHT}"
C$	poker hand scored
CA	card (J1)
CK	shuffle check
CO	color
CS	total value of row/column
E	box used
H	box selected
HS	high score
K	same kind
L	same suit
NH	new high score
P	card to flash
R	straight
SC	score
SM	screen memory
SU	suit (J2)
TV	color or b/w television

Machine Language Routines

49166	White Background
49180	Clear Card
49194	Grid Set Up
49297	Draw Card
49396	Flash Off
49422	Flash On
49449	Save Color
49502	Restore Color

SUPER STARS





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Chicken Catcher

Steven McCloskey

Children will enjoy netting the chicken in this action game for the 64, VIC, Plus/4, and 16. A joystick is required.

You're equipped with a net and a pair of good, strong legs. And you'll need them in "Chicken Catcher." The object of the game is to catch a falling chicken in your net by timing your jump as you leap from one platform to another. The more chickens caught, the more points you collect.

Fowl Play

There are two separate versions of Chicken Catcher: Program 1 for the unexpanded VIC, and Program 2 for the 64. Plus/4 and Commodore 16 owners should type in the 64 version but substitute these lines:

```
20 POKE56,60:POKE55,0:CLR:FORI
   =819TO848:READA:POKEI,A:NEX
   T:SYS819
30 DATA160,0,185,0,208,153,0,6
   0,185,0,209,153,0,61,185,0,
   210,153,0,62,185,0,211
40 DATA153,0,63,136,208,229,96
   :FORC=15640TO15727:READA
50 POKEC,A:NEXT:POKE65298,PEEK
   (65298)AND251:POKE65299,PEE
   K(65299)AND3OR60
120 X=3355:Q=X:CL=-1024:FORA=1
    TO4:FORB=1TO2:FORC=1TO14:P
    OKEX+CL,6:POKEX,37
150 VOL 8:KB=239
190 JE=(JOY(1)AND127)=3:JW=(JO
    Y(1)AND127)=7:FB=JOY(1)>12
    8
660 SOUND 1,350,2
670 FORZ=550TO330+INT(RND(1)*1
    00)STEP-11:SOUND1,Z,1:NEXT
    :RETURN
700 SOUND 1,10,3:RETURN
710 SOUND1,Y*10,15:RETURN
720 SOUND 3,800,80:FORZZ=8TO0S
    TEP-1:VOLZZ:FORTD=1TO100:N
    EXT:NEXT:VOL8:RETURN
730 IFJOY(1)<128THEN730:ELSE R
    ETURN
```

The chicken catcher has just jumped down a platform in order to get in position to nab the descending chicken (VIC version).

Plus/4 and 16 owners should ignore the "rems" after each line in Program 2. These apply only to 64 owners.

After typing in the program, save a copy. Plug in a joystick (port 2 for the 64), load the program, and type RUN. A brief title screen is displayed, then the game begins. A timer at the top left of the screen counts down from 60, the number of seconds you have to net a chicken. The chicken slowly descends from the top center of the screen. There are eight platforms, four on each side, with a wide chasm dividing each group of four (see the sample screen). Your character begins on the platform at the top left.

Direct the movement of your player with the joystick. When the chicken is within striking distance, get a good running start and leap from the edge of the platform by pressing the fire button. At the apex of the leap, a yellow net appears in the hands of your player, and if you've timed your jump correctly the chicken is bagged. Points are awarded (the number of seconds remaining times ten), and the timer is reset to 60 seconds. You're then placed back at the starting position. The speed of the chicken increases for each successful netting, up to 25 in a row.

If you collide with the chicken, fall to the ground by missing a jump to another platform, or run out of time, the game is over. A prompt reminds you to press the fire button if you wish to play again.

If you fail to net the chicken but make a successful leap to another platform, you're still in the game. Three of the platforms are slightly shorter than the others, which means you can go to the edge and drop to the platform below. This puts you in position to nab the chicken as it descends. Note that once you drop to the lower platform, there's no way to climb back up.

Chicken Catcher can be played just for fun or in competition. Since high score is included, you can play to beat your own record or go for the highest score playing against a friend.

See program listings on page 121.

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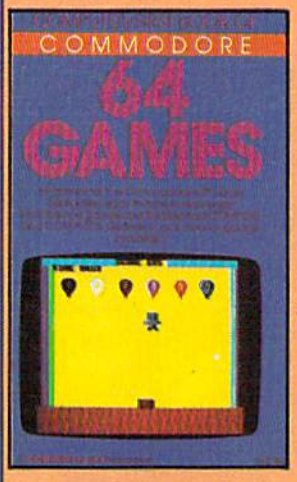

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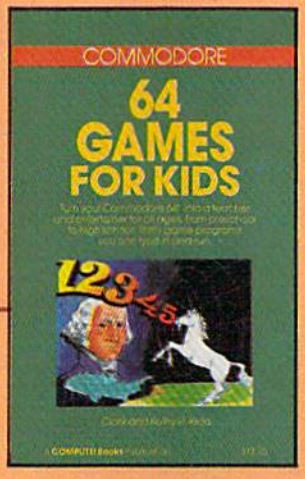

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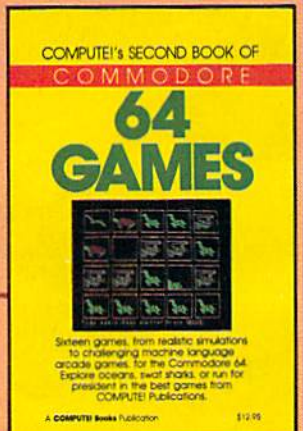

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Field Of Fire

For those who have enjoyed Brøderbund's *Operation Whirlwind*, here's a new game you'll find of interest: *Field of Fire* by Roger Damon, a talented game designer who was also responsible for *Operation Whirlwind*. Published by Strategic Simulations Inc. (SSI), *Field of Fire* bears the unmistakable marks of a Roger Damon design: ease of play, realistic simulation of World War II combat, and good, usable graphics for a game of this type.

Where *Operation Whirlwind* is based on armored warfare and tactics, *Field of Fire* is a tactical game centering on infantry units and soldier-to-soldier combat. Choosing from any one of eight well-defined scenarios or playing them all in sequence as a campaign game, you're in charge of Easy Company, a crack First Infantry Division.

Like *Operation Whirlwind*, *Field of Fire* is conducted in phases. Each of the four available phases—Fire, Movement, Assault, and Observation—allow you to conduct various activities ranging from attempting a flanking maneuver to throwing hand grenades and assaulting a position. Each unit in your command will operate differently, its capabilities based on the type of weapon (bazooka, machine gun, rifles) it carries and the platoon leader in charge. Moving from one phase to another is as simple as pressing a key, and orders are given to each man in the unit through the use of the joystick and an onscreen open cursor that targets the man you wish to send into action.

Field of Fire contains 32 standard characters, each of whom possesses, to some small extent, a unique personality. These characters can be renamed through the use of a character editor, adding a personal touch to this role playing aspect of *Field of Fire*. Characters improve in performance as they advance from one scenario to another, becoming, in effect, veterans as they survive each fire fight.

The beauty of *Field of Fire* is that it challenges without overwhelming. Not everyone has the time or desire to fight Rommel's entire African Campaign: Damon's designs allow the player to experience such elements as terrain effects and line-of-fire, factors that demand the player exercise intelligence and strategy, yet do not inundate him with minute details that bog down play for those who are not field general fanatics. Additionally, *Field of Fire* retains the realism necessary in a good wargame. You don't stop a tank with a rifle!

Field of Fire offers many challenging hours of play (either at one sitting or several, as games can be saved at any point during play) and provides World War II fans a chance to don the mantle of command in a realistic context.

—James Trunzo

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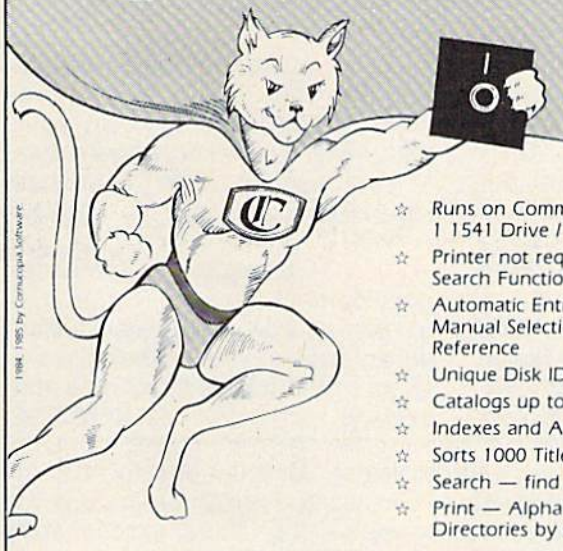

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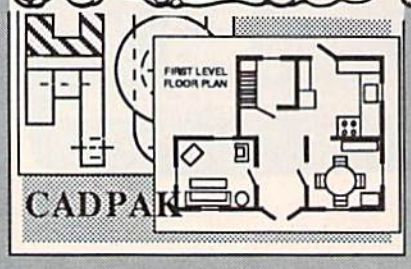

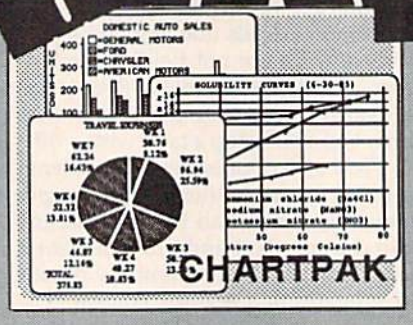

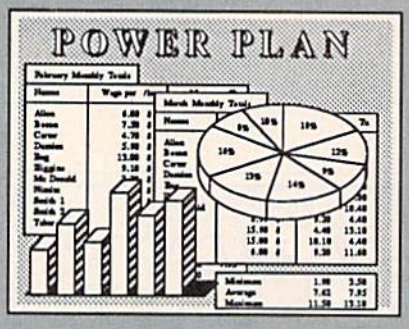

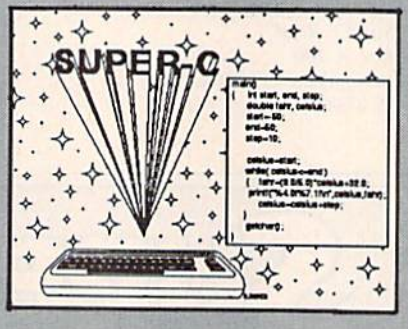

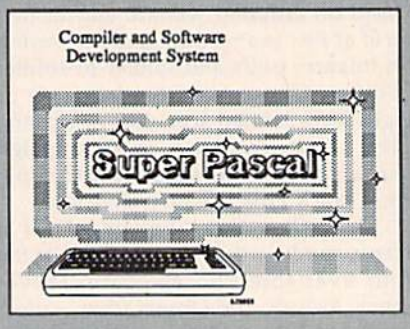

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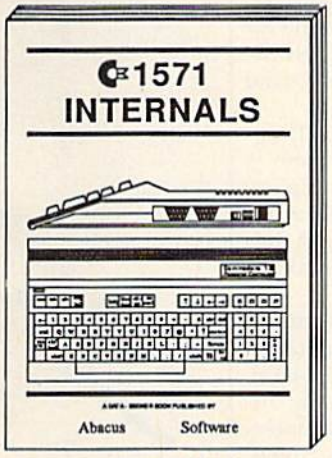

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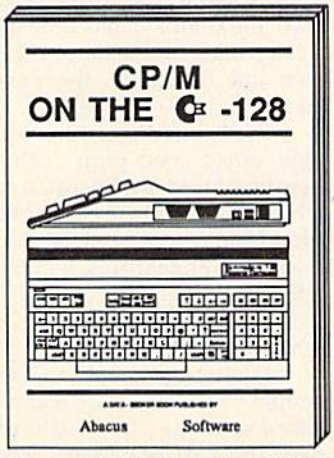

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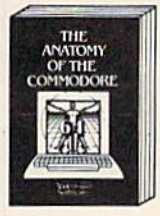

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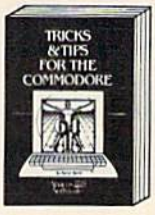

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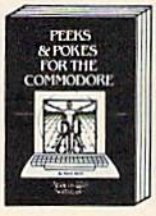

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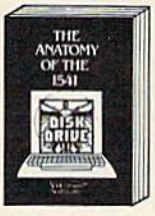

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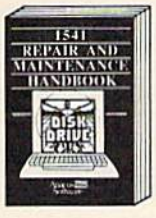

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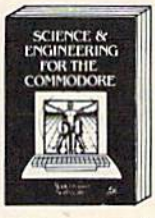

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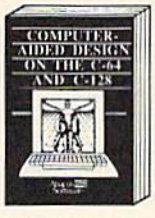

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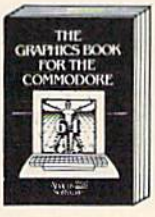

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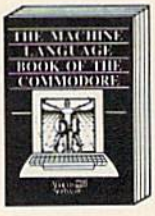

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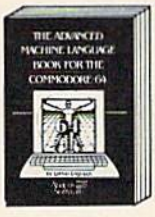

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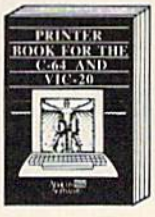

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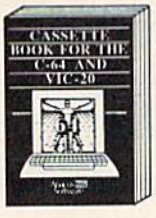

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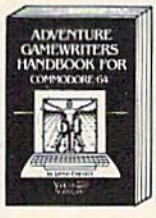

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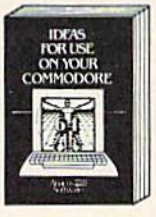

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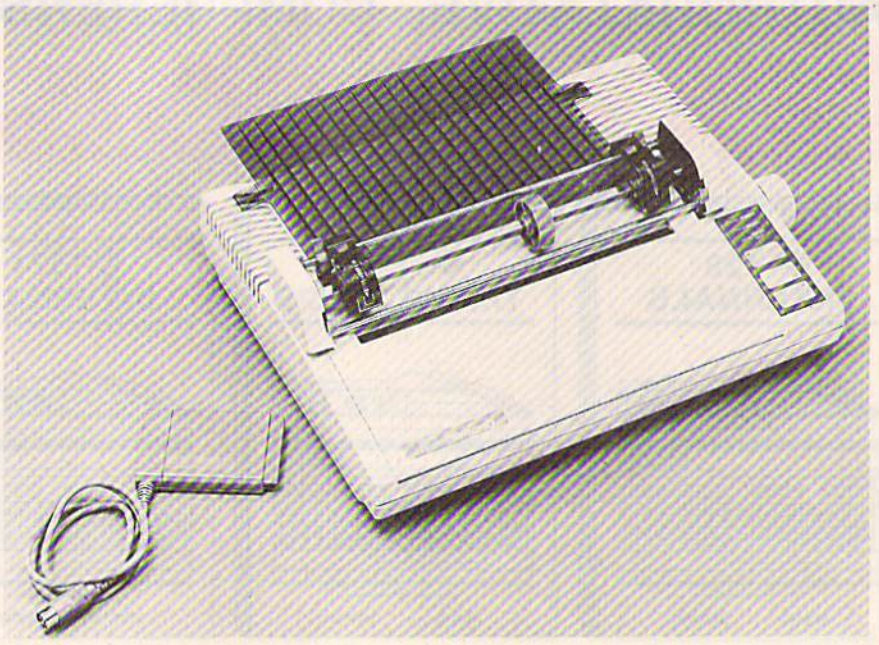
HomeWriter 10



If you ask someone why he or she decided to buy a particular printer, there are three answers that come up most often. One, it was the least expensive. Two, the company has been around for a long time, and a lot of other people own one. Or three, the print looked good.

The HomeWriter 10 is very affordable, offers good print quality, and is manufactured by Epson, a company which has a well-earned reputation for producing good printers. It also has many other features which make it attractive.

Ease of use is becoming more important than ever, as a new generation of computer owners enters the market, people who aren't as technically inclined as those who bought computers over the past few years. The HomeWriter 10 scores high marks in areas like paper-handling (continuous forms and letterhead are easily fed from the rear, with little slippage), set-up (the interface cable plugs into the back and runs to the disk drive), and ribbon changes (the cartridge snaps in easily).

Besides reversed and expanded print (standard on Commodore printers), the HomeWriter 10 offers four print styles: near letter quality (NLQ), emphasized, double-strike, and compressed (unfortunately, no italics for the Commodore version). To tell the printer which style you want, you touch a combination of areas on the printer's flat membrane control panel. For example, if you're writing a business letter and want it to look as crisp as possible, you'd touch ON LINE and FORM FEED simultaneously, ON LINE once again to signal NLQ, then FORM FEED, LINE FEED, and ON LINE to make the printer operational. To switch to a different style, turn the printer off and back on and reselect. This *SelecType* feature also allows you to combine emphasized and NLQ, for very sharp print.

The printer is fairly noisy, which is to be expected of a dot-matrix printer. It operates at 100 characters per second (cps) in draft mode, and 16 cps in near letter quality. Also, the HomeWriter 10 can print the Commodore graphics set. Sample graphics programs and an appendix showing how to create every graphics character possible are included in the manual. The DIP switches (switches on the rear of the printer controlling a variety of print capabilities) are easily changed.

Though paper-handling is quite nice with the standard friction-feed, Epson is offering an optional tractor-feed ($39.95) and cut-sheet feeder ($99.95). These might be useful for long printing jobs and small business use, but are usually unnecessary for the casual home user.

The HomeWriter 10 with the Commodore interface works with the 128, 64, and VIC-20.

—*Kathy Yakal*

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This is NLQ mode on the Epson HomeWriter 10.

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Project: Space Station

This Commodore 64 package is an exciting and demanding simulation of the planning necessary to build and operate the first space station. Completing this project will take many hours of careful thought and effort, so you'll need to plan on spending some time with it.

The first sentence of the manual says it all: "*Project: Space Station* is not a game." Although elements of an arcade-style game are present—controlling the shuttles during launches and landings, and maneuvering Construction Pods in orbit to build the space station—the key to success is careful planning.

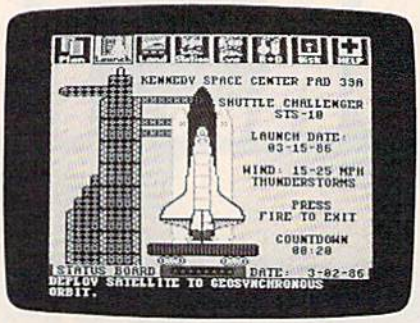
Your job is Mission Coordinator. You organize every phase of the mission and, most importantly, it's your responsibility to ensure that all items necessary for survival are in place.

Project: Space Station requires you to budget funds for completing your mission. You'll need money for planning, salaries, equipment, modules for the space station, and for various operating expenses. Once you've allocated funds to the necessary categories, you must present your budget for approval. Once approved, you're ready to begin your mission.

In order to support the mission, additional money is needed. Launching communications satellites is one way of raising funds, but the European Space Agency is also actively pursuing the same contracts as you. If you don't deliver, you'll lose the contract. Successful research and development projects can also generate needed revenue.

Hiring the right people for the job is another important factor. Can Edith Mason work successfully on a research and development project with Alan Puhassis, or will they be too busy bonking each other? Will a conflict in their personalities cause disruption on the station? Your personnel profiles may hold the key.

Project: Space Station does have some cosmetic flaws. At times the screen scrolling is not as smooth as it could be, and it's possible to push modules off the top of the screen during an EVA (Extra Vehicular Activity), only to have them reappear at the bottom of the screen. However, these minor flaws don't affect the realism of the simulation. The first time a member of your space station crew is lost during a solar flare or an EVA, you'll feel it.



Almost all commands are issued through menus under joystick control, thus, a lot of typing is unnecessary. HesWare recommends *Project: Space Station* for ages 12 and older. With its 125-page manual and realistic complexity, this program is not for the easily distracted.

—*George Miller*

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Carriers at War

Carriers at War puts you in charge of the most important aircraft carrier battles of World War II. The six scenarios take you from Pearl Harbor at the start of the war to the Philippine Sea near the end. The battles of Coral Sea, Midway, the Solomons, and Santa Cruz make up the rest. The Pearl Harbor scenario is a solitaire tutorial, with the manual guiding you through step by step. Learning to play the game is quite easy.

Carriers at War, available for the Commodore 64, is menu-driven. In fact, the number of menus is rather intimidating, but, after following the tutorial through the Pearl Harbor scenario, you're used to them. All menus are interconnected. Their purposes range from getting sighting reports to launching air strikes. The menus allow you to study the weather, give orders to task groups and individual carriers, save and restore games in progress, and even resign the game. They greatly ease the game's complexity.

You may play either the American or Japanese side (or both if you want

to). Commands are broken into Land and Naval forces, and further into as many as two Land Areas and four Task Forces. You may choose to command any or all of these forces, and the computer will handle whatever you don't want. If you have enough players, you could assign different groups to different players. The computer will handle forces of both sides at the same time.

The game offers a great deal of flexibility. You are cast into a fixed role, without all details at your disposal, but within that role you may do as you wish. After you give orders, you start the clock, which runs in five-minute (game time) increments. You may stop it at any time to watch the changing status of your planes, to abort missions, to change orders, or even to check the weather.

Another area of the game which adds flexibility is the scenario design module. Perhaps the most exciting part of the package, the module allows you to draw maps, design ships and planes, establish task forces and missions, and then to play it out as a scenario. You may research historical scenarios or invent hypothetical battles. A separate booklet takes you step-by-step through the design of a Ceylon scenario, then provides enough equipment statistics and design suggestions to satisfy even the most ardent historian.

Carriers at War is a superb package for anyone interested in the strategy of carrier battles. Not an action game, it handles its complexity of choices with a series of well-designed menus. Most computer wargames have used many of the design principles of board wargames, adding the benefits the computer has to offer. *Carriers at War* is no exception to this, but it is one of the very best. Designers Roger Keating and Ian Trout lament that they had only 64K to work with; we can only wonder what they will do with the 512K of the new generation of computers.

—Neil Randall

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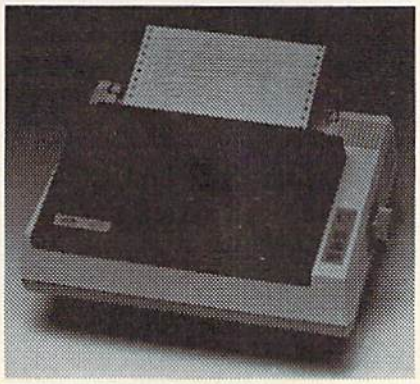

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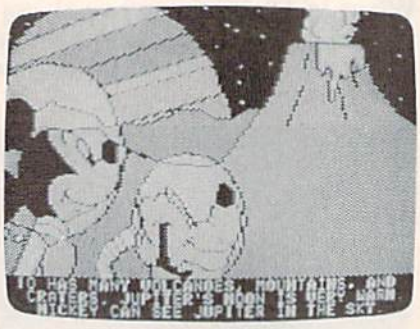
Mickey's Space Adventure

Learning fundamental facts about the various planets in our solar system is both entertaining and visually delightful as presented in Sierra On-Line's *Mickey's Space Adventure*. Released by Sierra under the Walt Disney label, this educational game is available for the Commodore 64. It enchants the user throughout the 150-scene journey with its dazzling graphics and challenges the player with intriguing puzzles.

The basic scenario is simple, as you would expect in a program designed primarily for children (ages 8 and up): With your aid, Mickey and Pluto undertake the task of traveling throughout the solar system, hunting for the scattered pieces of the shattered "memory crystal," vital to the inhabitants of the planet Oron. Under the guise of "playing," those who sit down at the control panel of the Oron spaceship learn facts about the solar system, such as the names and positions of the planets and their moons, the atmosphere and surfaces of the planets, relative sizes of the planets and much more. The program also teaches less obvious lessons in deductive reasoning, problem solving, mapping skills, and reading comprehension. All in all, the program and its illustrated guide provide a sound educational experience for the user.

The graphics are top notch, and playing procedure is extremely simple, making excellent use of on-screen instructions. All possible actions are displayed under each graphics screen and selected by either a joystick or cursor keys. Once the choice has been made, it's activated with either the push of a button or stroke of a key. Furthermore, Sierra/Disney has made it almost impossible to make a serious error, a factor not to be overlooked—especially when an older "child" (like mom or dad) is playing.

Without ruining the surprises or the challenge, a few helpful hints before playing will aid in preventing severe frustration at the very beginning of the adventure. The game opens with Mickey and Pluto walking around the neighborhood, and it won't be long before they (you) come upon the spaceship. The obvious choice is to enter the ship and try to begin the adventure. You won't get far, however. Searching the spaceship, you'll soon discover that you must find the first piece of the crystal on Earth; this task will be stated explicitly. What won't be mentioned is that it's crucial to take on board the ship all objects found in Mickey's home. They will be needed to procure other crystals on other planets. My seven-year-old managed to make it to Mars



and find an alien with a piece of the crystal, only to discover that it wouldn't give it to her no matter what she did.

Much later we discovered that the on-screen instruction that will allow you to trade with the aliens only appears if you have objects with which to do so. So it was back to Earth to collect some "valuables," but only after having invested several hours of playing time and achieving little towards completing the game.

All in all, *Mickey's Space Adventure* is rewarding as both an entertainment and an educational package. Its ease of use and challenge, combined with excellent graphics, make this one of the better buys in the educational software market today.

—James Trunzo

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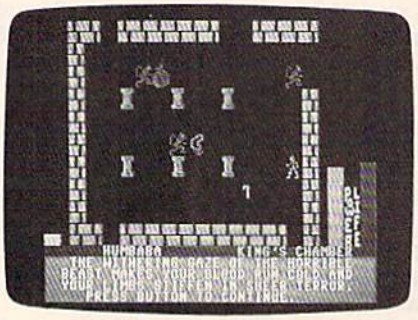
Adventure Construction Set

This game for the Commodore 64 is actually three adventure games in one, with something to offer *every* caliber of player. First among *Adventure Construction Set's* three components is *The Land of Adventuria*, a tutorial designed to introduce prospective game players to the laws of survival in computerized worlds of make believe. Using a set of "mini-adventures," the player is guided through an instructional tour introducing the common elements found in most role-playing contests. Once you've developed the ability to dismantle these preliminary puzzles, you can try your hand at building your own adventure with the game's construction option. This is the real power of *Adventure Construction Set*—the opportunity for you to design worlds of your own.



Choosing from one of three basic construction sets—Fantasy, Spy/-Mystery, or Science Fiction—you set the stage as you see fit. You control everything from the landscapes and the mood swings of the inhabitants to the ultimate goals of the game, all with appropriate background music. The construction set includes up to 500 different characters, 8500 props of every size and structure, 240 separate screens, and up to 335 different text messages. Build an entire galaxy from scratch, or let the computer do the dirty work after you set the mood, goal, and challenge. There's even the option of tailoring one of the eight adventures already included on the disk. Also on the disk is *The River of Light*, an intricate and involving adventure game by experienced software creator Stuart Smith, who designed *Adventure Construction Set*. All options are menu-driven, simplifying game play even for a novice. The only real drawback is waiting the initial 20 minutes it takes to set up and create your personal adventure disk. The three programs in this package could easily have been sold as separate games. Together, this adventure triple-play is a highly recommended bargain.

Electronic Arts
2755 Campus Dr.
San Mateo, CA 94403
$39.95 (disk)

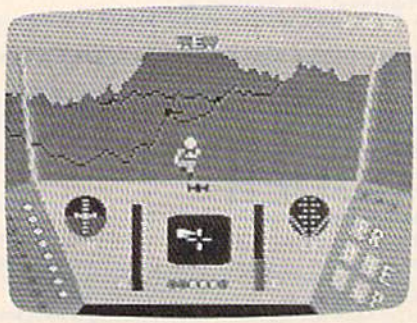
The Sea Voyagers

Education is certainly more than just memorizing facts, but when that activity is necessary, it's often best done in an entertaining, engaging format. *The Sea Voyagers* provides such an arena for learning about 30 New World explorers. The program is divided into four sections. *Explorer Profile* is a tutorial designed to help you memorize facts about each explorer. As you select one, his portrait appears on the screen, along with the name of his ship and his lifespan. A flag pops up and a nation's anthem is played to indicate what country he sailed for, and his voyages are plotted out on a map.

Once you think you've absorbed all of that information, you can move on to three different practice games. In *Who Goes There?*, you are given clues and asked to guess which explorer matches them. *Explorer Mix* gives you three sets of facts and three explorers' names—you match the correct name to the correct facts. And *Explorer Match* is like poker. Five explorers' names are displayed, and you decide which of them sailed for the same country, discarding any singles. Then you get new explorers to replace the ones you threw away, hoping for two, three, four, or five of a kind, or a full house. This last section has one- or two-player, and easy or hard options.

The *EasyKey*, a plastic keyboard overlay that contains all of the explorers' names as well as keys that indicate program functions, makes *The Sea Voyagers* very easy to operate. Graphics and sound on the Commodore 64 version are excellent. It's a helpful learning tool, appropriate for both the classroom and the home.

CBS Software
CBS, Inc.
One Fawcett Pl.
Greenwich, CT 06836
$39.95 (disk)



Rescue On Fractalus!

You'll have your hands full in this arcade-style action game developed by the Lucasfilm Games Division, part of the same company that produced the *Star Wars* movies. Using a joystick, you pilot a Valkyrie class fighter on a rescue mission to the surface of the planet Fractalus. Jaggi saucers and antiaircraft guns attempt to stop you as you pick up downed fellow pilots. Navigation and weaponry skills are both important, as well as the strategic savvy to meet the challenges of roaming a hostile planet full of unexpected surprises.

Rescue on Fractalus! is a sophisticated mix of colorful graphics, excellent sound effects, and an engaging game scenario. The constantly changing environment is created by fractal geometry, hence the name of the planet. Engines whine, saucers whoosh about, Jaggi antiaircraft fire explodes around you, and pilots race to your ship, pounding on the hull for entry. But the emphasis throughout is on your planning and responses as you maneuver the ship among craggy peaks, searching the long-range radar for pilots and Jaggi gun emplacements. The more successful you are, the tougher it gets. This is the first of four (so far) Lucasfilm games to be available for the Commodore 64 from Epyx. If the others can match *Rescue on Fractalus!*, this will be a superb series of programs.

Epyx, Inc.
1043 Kiel Ct.
Sunnyvale, CA 94089
$40 (disk)

Colonial Conquest

If you've ever thought of trying to rule the world, but just didn't have the time and energy required to actually carry it off, *Colonial Conquest* may be the next best option. World domination is the goal as you and up to five other players (real or computer-controlled) use diplomacy, espionage, and armed forces (armies and navies) to control the globe. The game revolves around the ambitions of six major nations—England, Germany, France, USA, Japan, and Russia—and offers three different scenarios: 1880 and 1914 versions, in which each nation has its historically accurate spheres of colonial influence, and a standard version in which each nation controls only its own boundaries. There are more than 120 minor countries which the major nations attempt to control. The colorful world map scrolls smoothly, four screens wide and two screens tall.

Colonial Conquest is an addictive game as you cycle through building, fortification, espionage, subversion, movement, and combat phases of the contest. The game is particularly intriguing when more than one human player is involved, but can be played enjoyably by just one person.

Strategic Simulations, Inc. (SSI)
883 Stierlin Rd., Bldg. A-200
Mountain View, CA 94043-1983
$39.95 (disk)

HOMEBASE

If you've been looking for a database system for personal recordkeeping, but don't want the complexity and prices of some of the more popular systems, ComputerEasy was thinking of you when they designed *HOMEBASE*. This program is fast and easy to use, and includes a step-by-step on-screen tutorial that introduces you to the program.

This inexpensive filing system for the Commodore 64 lets you define up to 15 fields, with up to 80 characters in each field. Each file can contain up to 700 records, large enough for keeping records for most homes, clubs, and even some small businesses. It's easy to add, change, delete, or find any item in the file by using the various search routines. If you get confused, help screens may be called from within the program. *HOMEBASE* also includes a useful utility, Report Writer, which can be used to create form letters, mailing labels, and other short documents. *HOMEBASE* files can even be used with some Commodore 64 sequential file-based word processors.

ComputerEasy International, Inc.
414 East Southern
Tempe, Arizona 85282
$19.95 (disk)

Show Director

You're the screenwriter, director, music and sound effects coordinator, and editor in *Show Director*, a package in Mindscape's *Pixelwerks* line of software. Designed for children ages eight and up, this program lets you create a short movie on your Commodore 64. Before you write a script for your movie, it's best to run through the "Show" option so you'll know what scenery, characters, and sound effects are available. Once you have a story in mind, go back and write it, using the program's built-in word processor. Your movie can have up to three scenes.

You can choose from 12 already-created backgrounds for scenery (including an enchanted forest, a prehistoric cave, and a desert oasis), or create your own. Forty different characters "audition" for you (people, animals, vehicles, and monsters); you may put up to four in each scene. Then go back and run through each scene, directing the action by animating the characters in sync with each other to tell the story. This is done using either a joystick or the keyboard.

Finally, add music and sound effects to emphasize important moments and add realism to your show. Sad, scary, dramatic, and funny music, as well as sounds like motors, earthquakes, and ghost noises are included. Though not meant to be a professional animation package, *Show Director* is very enjoyable. The graphics are quite good and the instructions understandable. It's a fun program for children who want to write stories and create their own cartoon movies. One cautionary note: The disk access time between scenes is rather slow, which may discourage some younger children.

Mindscape, Inc.
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Northbrook, IL 60062
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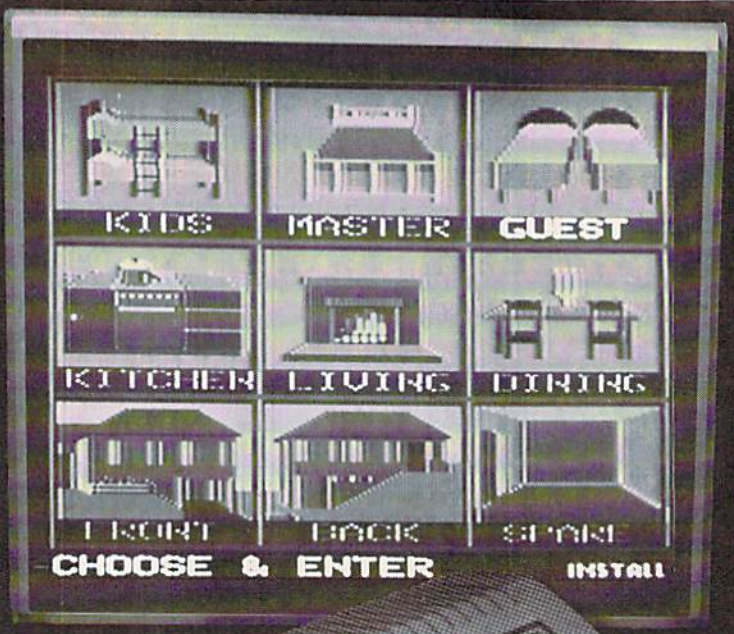

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Exploring 128 BASIC

An End To PEEKs And POKEs

Todd Heimarck, Assistant Editor

BASIC 7.0 is the most powerful Commodore BASIC to date. If you learned programming on a VIC or 64, you'll appreciate the many new commands which greatly simplify programming. In a line or two, you can accomplish what might have taken five or ten on a VIC or 64. Program examples for the 128 are included. With minor modifications, they'll also run on the Plus/4 and 16.

The Commodore 128 has two things going for it. The first is 122,365 *available* bytes of memory, twice as much memory as a Plus/4, three times as much as a 64, and 34 times as much as an unexpanded VIC. If you wish, you can add still more memory—the 128 is expandable to 512K.

The second and even more impressive feature is the new BASIC 7.0, which virtually eliminates the need for PEEKs and POKEs. BASIC programmers can forget about looking up the memory locations for high-resolution graphics or trying to remember how to define a sprite. (Machine language programmers, of course, will still be concerned with how PEEKs and POKEs affect the computer.)

The 128's BASIC includes all commands from BASIC 2.0 (the language in the VIC and 64), all commands except one (RLUM) from BASIC 3.5 (found in the Plus/4 and 16), the disk commands from the Commodore PET, plus many brand new commands.

If you're experienced at programming the VIC or 64, you'll enjoy exploring the new BASIC. Let's look at what you can do with the 128.

Sprites And Music Without POKEs

The Plus/4 has more memory and a better BASIC than the 64. But Commodore eliminated two very popular features of the 64: sprites and the SID chip. Sprites, objects which can be moved independently around the screen, are often used as characters in games. The Sound Interface Device (SID chip), best described as a minisynthesizer, can produce sounds and music that would be impossible on computers with simple tone generators.

Creating sprites on the 64 can be difficult, even if you know what you're doing. First, you have to convert the shape to DATA statements, either on graph paper or with a sprite editor. Next, each sprite needs several POKEs to set X and Y positions, colors, expansion, priorities, and so on.

The 128 makes sprites easy. A sprite editor program is built in—just enter SPRDEF to turn it on. Draw the sprite on the screen, and the shape can be immediately saved to memory. You then use the SPRITE command to turn it on, give it a color, and set priority, expansion, and multicolor mode. MOVSPR moves it to a specific position on the screen. You can also include a speed and direction—the sprite will move automatically, until you tell it to stop.

Another option is to draw a shape on the hi-res screen, save it into a variable with SSHAPE (Save SHAPE), and put that shape into a sprite with SAVSPR. The shape can be stored to disk through BSAVE or by putting the SSHAPEd variable into a sequential file.

While the sprite is moving around the screen, you can check for collisions with COLLISION. This command works like a conditional GOSUB. When a sprite hits an object on the screen, the program automatically goes to a subroutine. Within the subroutine, BUMP tells you which sprites are involved. There are also commands for reading sprite colors and positions. It's all done without a single POKE.

Music is just as easy to program. The new commands give you much easier access to the capabilities of the SID chip. PLAY "DEF,"

for example, plays the notes D, E, and F. There are three voices, six octaves, and ten envelopes (including piano, accordion, calliope, drum, flute, guitar, harpsichord, organ, trumpet, and xylophone). The notes of the melody can range from sixteenths to whole notes. You can define your own instruments with ENVELOPE and FILTER. TEMPO speeds up or slows down the melody being played. There's also a SOUND command for explosions, blips, and other sound effects.

More Control Over Programming

Numerous commands to help the programmer are included. AUTO enables automatic line numbering, and RENUMBER renumbers lines. DELETE removes a range of lines from the program. KEY allows you to put commonly used strings into function key definitions. HELP is very useful when you're debugging a program; it lists the line where the error occurred and indicates where the problem is (there's also a HELP key, which does the same thing). TRON turns on the trace function, so you can follow a program line by line. TRAP is like GOTO; when it's enabled, an error does not halt the program—it causes the program to jump to an error-handling routine you've written.

New reserved variables include ER (the error number if something goes wrong in a program), EL (the line number where an error occurred), and ERR$ (the name of the error). RESUME makes the program continue after an error has stopped it. And if the light on the disk drive starts blinking because of a disk error, you no longer have to open the error channel and input the error information. Just type PRINT DS,DS$ to find out what went wrong.

Other disk commands, most of which are self-explanatory, include APPEND, BACKUP, BLOAD, BOOT, BSAVE, CATALOG, COLLECT, CONCAT, COPY, DIRECTORY, DCLEAR, DCLOSE, DLOAD, DOPEN, DSAVE, DVERIFY, HEADER, RECORD, RENAME, and SCRATCH.

You can experiment with machine language by using the built-in ML monitor, entered via MONITOR. It's similar to *Micromon* or *Supermon*. Once you've written an ML program, start it up with the new version of the SYS command, which allows passing of values to the A, X, Y, and P registers. Once you exit to BASIC, you can look at the last values in these registers with RREG (Read REGister). DEC and HEX assist in making conversions between decimal and hexadecimal. Commodore has added XOR (eXclusive OR) to complement AND and OR. There are also ways of handling data that may be in a different bank of memory: BANK, FETCH, STASH, SWAP.

Enhancements And Improvements

In addition to the normal PRINT statement, there's PRINT USING, which allows formatting of strings and numbers before they're printed. This is especially useful when you're dealing with financial information and want dollars and cents printed. PUDEF allows prior definition of which characters will appear in PRINT USING statements. When you print out a check, for example, you might want leading asterisks instead of spaces.

The CHAR statement is a variation on PRINT, but it works on both text and hi-res screens. Since you can include the X and Y positions, it works like PRINT-AT, which is found on other computers.

IF-THEN now includes ELSE and BEGIN/BEND. BEGIN and BEND mark off a section of the program that will be executed only if the previous IF condition is true. FOR-NEXT loops can be replaced with DO-LOOP (see the example below).

MID$ has a new feature: It can assign a string to the middle of another string. So A$="HELLO": MID$(A$,2)= "IPP" would make A$ into "HIPPO." INSTR finds the position of one string inside another. It could tell you, for example, that "DEF" is inside "ABCDEFGHI," starting at the fourth position.

The RESTORE command can be followed by a line number to set the READ-DATA pointer to a specific line.

PRINT FRE(0) now displays how much memory is available in the first bank of memory, where programs are stored, while FRE(1) displays how much memory is left in the bank containing variables. And since the variables are kept separate from the program, adding a line to a program does not destroy variable definitions. You can stop a program, make some changes, and then GOTO a line to resume the program with previously defined variables.

The Slowest Commodore—And The Fastest

How fast is the 128? As a simple benchmark, we ran a FOR-NEXT loop that counted from 1 to 10,000 and printed the number of jiffies (a jiffy is 1/60 second). The 128 was the fastest *and* the slowest Commodore computer (it was tested twice, once with the FAST command, once with SLOW):

Speed in Jiffies	Computer
929	128 (SLOW)
895	+4/16
653	64
612	VIC
440	128 (FAST)

There's a good reason why the 128 can be both the fastest and the slowest. All Commodore BASICs are *interpreted*, which means the computer figures out (interprets) what the program should be doing as the program is running. Some other languages—even other BASICs—are *compiled*. Compiled programs are written with an editor program (similar to a word processor) and then compiled into object code that's closer to machine language than an interpreted program. (See last month's feature on C for more about compiled languages.)

When an interpreted BASIC gets to a command like PRINT, it has to look through a list of commands to find the location of the routine that makes PRINT work. Adding more commands to the Plus/4, and even more to the 128, makes the list longer. So the computer has to spend more time searching for command definitions. In addition, TO has several meanings in BASIC 7.0. You can loop FOR D=1 TO 10000, or DRAW from one point TO another, or copy files from one disk drive TO another.

The 128, with the biggest and best Commodore BASIC, is also the slowest of the bunch, as you can see from the timings above. To adjust for this, Commodore has added two new commands: FAST and SLOW.

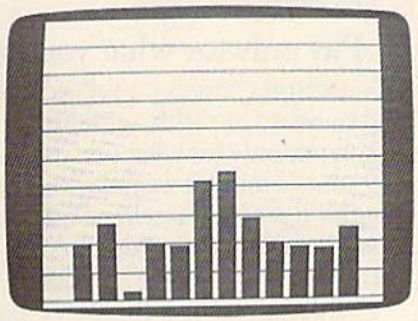
The clock that drives the main processing chip runs at 1 megahertz (MHz), or 1,000,000 cycles per second. The FAST command doubles the speed of the clock to 2 MHz. It's especially good in programs that require a lot of calculations. There's a tradeoff, though. The 40-column screen goes blank while FAST is in effect. But if you want speed, the screen display probably won't matter. If you own a 64 and tape drive, you're probably used to seeing the screen blank while programs are loaded.

The VIC-20 has been the fastest Commodore computer for the last few years. Now there's a faster one.

Hi-Res Graphics

The sound, programming, disk access, and other commands are great improvements. But the new hi-res graphics commands are the most fun to play with. Rather than trudging through a long list of what the commands do, let's look at three short graphics programs.

The first program creates a bar chart. It reads values from DATA statements, figures out a scale, and draws the chart. The number of values is limited only by the horizontal resolution of the screen (320 pixels). The values can be any positive number; the graph will be scaled accordingly.



Program 1: Bar Chart

```
10 TRAP40
20 READN:IFN>MAXTHENMAX=N
30 TL=TL+1:GOTO20
40 TRAP100:SC=INT(1+LOG(MAX*1.
   2)/LOG(10)):YY=10↑(3-SC):XX
   =500/(TL+2)
50 GRAPHIC1:SCNCLR:SCALE1,500,
   1023:COLOR0,2:COLOR1,5:COLO
   R4,5
60 FORJ=1TO10:DRAW1,0,J*100TO4
   99,J*100:NEXT:RESTORE
70 FORJ=1TOTL:READN:XC=J*XX:YC
   =1000-(N*YY):BOX1,XC,YC,XC+
   XX*.75,1000,0,1:NEXT
80 GETKEYA$:GRAPHIC0:END
90 DATA252,183,185,203,289,446
   ,418,193,204,34,272,203
100 GRAPHIC0:PRINT"LINE"EL"SEE
    MS TO HAVE AN ERROR: ":PRI
    NTERR$(ER)
```

First, lines 20–30 set up a loop to READ through the DATA statements. Normally, you'd expect an OUT OF DATA error as soon as there are no more items to read. But line 10 prevents the program from stopping. TRAP40 tells the computer to go to line 40 if an error occurs. Forcing an error to happen is not particularly good programming practice, but it illustrates one use of TRAP.

By the time we get to line 40, the variable MAX holds the highest value, and TL is the total number of bars to be plotted. We change the TRAP target to line 100, which switches to the text screen (GRAPHIC0) prints the line number with the error (EL) and the type of error (ERR$(ER)). If you type the program correctly, this error routine shouldn't be necessary.

The business with the logarithms is part of the scaling. Dividing the LOG of a number by the LOG of 10 and taking the INTeger value gives you the number of digits to the left of the decimal place. Another way to do this would be SC=LEN(STR$(INT(MAX*1.2)))−1.

We'll be using the screen as if it were graph paper 500 squares across by 1024 squares deep. The screen is really only 320 by 200, and it's not possible to get better resolution than that, but the SCALE command in line 50 allows you to treat the screen as if it had more points.

A single command, GRAPHIC1 in line 50, turns on hi-res mode. Other options would be to split the screen between hi-res and text or to go into multicolor hi-res (with or without text split). SCNCLR clears whichever screen (hi-res or text) is currently being displayed. COLOR0, the background, is set to white. The foreground (COLOR1) and border (COLOR4) are painted purple. The 128 uses color numbers 1–16, rather than 0–15, so you can look at the keyboard and find the color number from the colors printed on the numeric keys. Blue would be color 7, for example.

We can now start the graph. In line 60, ten lines are drawn across the screen, as background for the bars. The first number after DRAW is the color (color 1 was set to purple in the previous line). It's followed by the X and Y coordinates of the beginning and the end of the line. RESTORE resets the DATA statements so the values can be read again.

All of the bars are drawn in the next loop. The values are taken from DATA statements and the coordinates (XC and YC) are calculated for the top left corner of the bar. BOX then plots a rectangle, based on the X and Y positions of two opposite corners. To make the bars fatter, increase the .75 up to a value of 1. Decrease it to make thinner bars. The second to the last number after BOX means the rectangle should not be rotated. The last number 1 after BOX fills in the rectangle after it's drawn.

Finally, we wait for a keypress. GETKEY works like GET, except it stops the program until a key is pressed. GRAPHIC0 sends us back to the text screen and the program ends.

Everything has been done in ten lines, without a single PEEK, POKE, AND, or OR. If you wrote such a program on the 64, it would be at least twice as long. And you'd need a reference guide to find all the POKEs and formulas for turning pixels on and off.

The Pie Chart

The next example program reads a list of values from DATA statements and creates a pie chart.

The first line may look strange to VIC and 64 owners, with the DO-UNTIL-LOOP structure. The typical FOR-NEXT loop starts counting at one number and ends when it reaches a specified value. But this loop starts at DO and repeats over and over when it reaches the LOOP statement. Three things can terminate the loop. It can loop WHILE an expression is true (when

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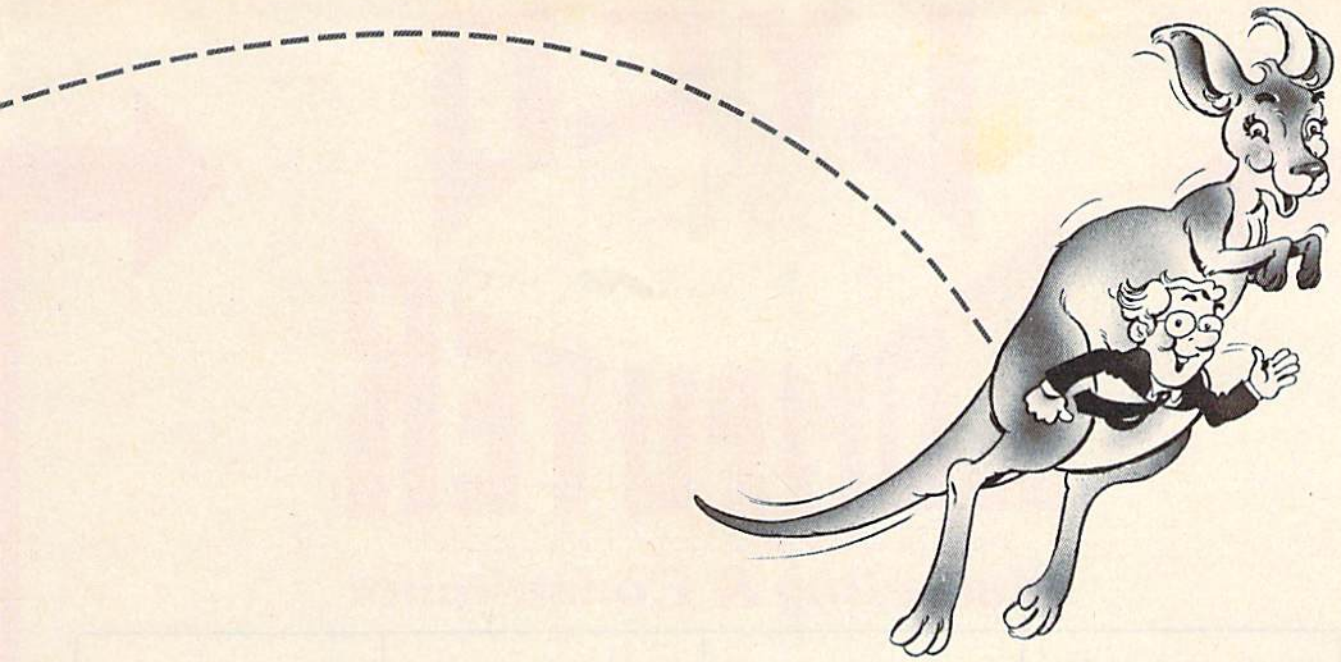

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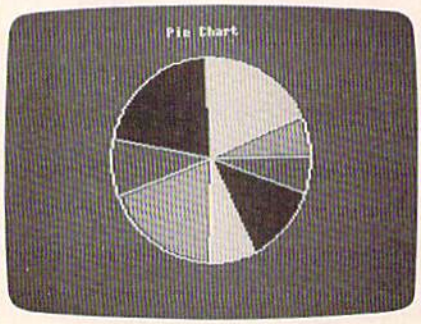
it's false, the loop ends). Or DO-LOOP can continue while some expression is false, UNTIL it's true. Or, the EXIT command can get you out of the loop.



Program 2: Pie Graph

```
10 DO UNTIL A$="END":READA$:TL
   =TL+1:SUM=SUM+VAL(A$):LOOP:
   TL=TL-1
20 GRAPHIC3,1:COLOR0,13:COLOR1
   ,3:COLOR2,2:COLOR3,15:COLOR
   4,13:SCALE1:WIDTH1
30 CIRCLE2,512,512,300,360:CHA
   R2,14,1,CHR$(14)+" PIE CHAR
   T ",0
40 XS=812:YS=512:PC=0:AN=0:RES
   TORE
50 FORJ=1TOTL:DRAW2,512,512TOX
   S,YS:READN:TN=AN+(N/SUM)*2*
   ↑
60 YS=512-SIN(TN)*360:XS=512+C
   OS(TN)*300
70 MA=PN+(AN-PN)/2
80 AT=512-SIN(MA)*270:XT=512+C
   OS(MA)*225
90 PAINTPC,XT,AT,1
100 PN=AN:AN=TN:PC=(PC+1)AND3:
    NEXT
110 GETKEYA$:GRAPHIC0,1:COLOR0
    ,12:LIST
120 DATA1235,3679,4168,1718,36
    96,1467,2375,1137,END
```

In this case, the loop reads a variable A$ from DATA statements. It continues UNTIL it finds the word "END." TL is the total number of items on the list—the numbers which will be translated to slices of the pie graph. SUM is the total of the values. We don't need a maximum in this program.

Line 20 enables the multicolor hi-res screen and clears it (adding ",1" after GRAPHIC3 is another way of doing SCNCLR). The different colors are set, and SCALE is turned on (to the default value of 1024 by 1024). WIDTH1 makes the graphics routines use the thinnest lines available.

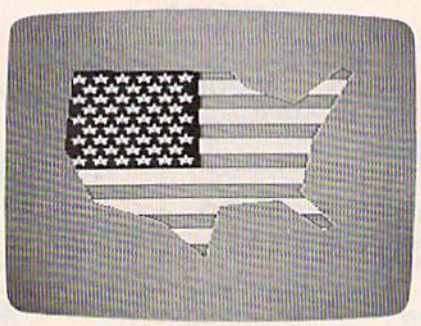
Next, the CIRCLE command draws a circle in color 2, centered on the screen. CIRCLE could have been called POLYGON, because it can also create triangles, squares, pentagons, hexagons, and other regular shapes. The label "Pie Chart" is then printed in upper/lowercase above the circle. The CHAR command, as noted above, prints at a specified location on any text or hi-res screen. In this case, we're printing in color 2, starting at the fourteenth column and first row.

The rest of the program is math, to convert the numbers from the DATA statements first into percentages of the total and then into angles (which will add up to 360 degrees). Note the underlined ↑ at the end of line 50. That means you should type a shifted ↑, the pi character (π).

We don't need to go into the details of trigonometric functions like sine and cosine. They're necessary to calculate the angles for the sides of the wedges. After the wedge is on the screen, we also have to find a point in the middle of the angle and use PAINT to fill it with color (line 90).

The U.S. On A Flag

The final program best illustrates the power of the new graphics commands. It's just nine lines long, plus three for DATA statements. The result is an American flag superimposed on a map of the U.S.



Program 3: Map With Flag

```
10 GRAPHIC3,1:COLOR0,7:COLOR1,
   3:COLOR2,2:COLOR3,16:COLOR4
   ,16:WIDTH1:C=1
20 FORJ=35TO160STEP10:HX=64*(J
   >96)+75:BOXC,HX,J,150,J+9,0
   ,1:C=3-C:NEXT
30 DRAW2,19,40 TO 21,45 TO 16,
   42 TO 22,42 TO 17,45 TO 19,
   40
40 SSHAPE SA$,15,40,24,45:NS=5
   :IN=0
50 FORJ=0TO8:SY=J*7+40:FORK=0T
   ONS:SX=K*10+14+IN:GSHAPESA$
   ,SX,SY:NEXTK:NS=9-NS:IN=5-I
   N:NEXTJ
60 X=15:Y=36:FORJ=1TO15:READNX
   ,NY:DRAW3,X,YTONX,NY:X=NX:Y
   =NY:NEXT
70 DRAW3,X,YTO15,36
80 PAINT3,80,1,0
90 GETKEYA$:GRAPHIC0
100 DATA90,38,98,50,120,60,143
    ,35,148,39
110 DATA128,86,122,120,138,143
    ,132,146,112,126
120 DATA84,130,77,165,56,140,2
    4,126,11,90
```

Line 10 jumps right into the multicolor hi-res screen. Colors 0–3 are set to blue, red, white, and light gray. Line 20 draws the 13 stripes, using the BOX command, alternating between red and white. The expression (J>96) will equal 0 if false and −1 if true. It's needed to make the stripes shorter at the top of the flag, so there will be room for the stars.

A single white star is created in line 30. There should be 50 stars on the flag, but it's only necessary to draw one to begin with. The SSHAPE (Save SHAPE) in line 40 copies the star (10 pixels wide and 6 deep) into the variable SA$. Once it's saved, we can use SA$ like a rubber stamp and quickly make all 50 stars appear.

Line 50 calculates X and Y positions for each of the 50 stars and GSHAPEs them into place. The flag is done.

The coordinates of the roughly drawn U.S. map shape have been put into DATA statements to be read in line 60. DRAW puts the edges of the map on the screen, on top of the flag. Finally, line 80 fills the area outside the map with light gray.

The Question Of Compatibility

VIC and 64 owners may wonder about hardware and software compatibility between their systems and the 128. As far as we can tell, tape drives, disk drives, monitors, modems, joysticks, and other peripherals will work with the 128 in either 64 mode or 128 mode. In addition, the 64 mode is completely compatible with all 64 software (on disk, tape, or cartridge) we have tested. The CP/M option, however, requires the newer, faster 1571 (single double-sided drive) or 1572 (dual double-sided drive). And the tape drives and joysticks for the

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CLR
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CONT
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DATA
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DIM
END
EXP
FN
FOR/NEXT
FRE
GET
GET#
GOSUB
GOTO/GO TO
IF/THEN
IF/GOTO
INPUT
INPUT#
INT
LEFT$
LEN
LET
LIST
LOAD
LOG
MID$
NEW
ON/GOTO
ON/GOSUB
OPEN
PEEK
POKE
POS
PRINT
PRINT#
READ
REM
RESTORE
RETURN
RIGHT$
RND
RUN
SAVE
SGN
SIN
SPC
SQR
STEP
STOP
STR$
SYS
TAB
TAN
TO
USR
VAL
VERIFY
WAIT

Commands From BASIC 3.5 (Plus/4 And 16)

AUTO
BACKUP
BOX
CHAR
CIRCLE
COLLECT
COLOR
COPY
DEC
DELETE
DIRECTORY
DLOAD
DO/LOOP/WHILE/UNTIL/EXIT
DRAW
DSAVE
ERR$
GETKEY
GRAPHIC
GSHAPE
HEADER
HELP
HEX$
IF/THEN/ELSE
INSTR
JOY
KEY
LOCATE
MONITOR
PAINT
PRINT USING
PUDEF
RCLR
RDOT
RENAME
RENUMBER
RESUME
RGR
SCALE
SCNCLR
SCRATCH
SOUND
SSHAPE
TRAP
TRON
TROFF
VOL

Commands From BASIC 4.0 (PET/CBM)

APPEND
CATALOG
CONCAT
DCLOSE
DOPEN
RECORD

Commands From BASIC 7.0 (128 Only)

BANK
BEGIN/BEND
BLOAD
BOOT
BSAVE
BUMP
COLLISION
DCLEAR
DVERIFY
ENVELOPE
FAST
FETCH
FILTER
GO 64
PEN
PLAY
POINTER
POT
RREG
RSPCOLOR
RSPPOS
RSPRITE
RWINDOW
SLEEP
SLOW
SPRCOLOR
SPRDEF
SPRITE
SPRSAV
STASH
SWAP
TEMPO
WIDTH
WINDOW
XOR

Plus/4 and 16 will not work on the 128 because the connectors are of different sizes.

There are two video outputs available in 128 and CP/M mode: 40-column composite video and 80-column RGB (the 64 mode has no 80-column option). You can have two screens containing completely different text. Early reports on the 128 noted that the 80-column option is available only with an RGB (Red, Green, Blue) monitor. That's true if you want 80 columns and color; we've hooked up the 128 to an IBM RGB monitor using a standard cable. But pin 7 of the IBM cable is not used and Commodore has put 80-column monochrome output on that pin. We've wired up a cable that allows 80 columns (black and white only) on a 1701 or 1702 monitor. (Cardco recently announced such a cable, at a suggested price of $9.95.) You *can* have 80 columns, but no color, on your Commodore monitor with only a slight sacrifice of resolution.

Notes For The Plus/4 And 16

One of the big differences between the Plus/4 and the 128 is that the Plus/4 can control luminance levels, giving you a palette of 121 colors, versus the 16 colors on the 128. If you make the changes below, the programs will run on a Plus/4 or 16. But the colors may be strange shades of green, yellow, and purple. Experiment with the COLOR commands in each program, to find a good combination for your monitor or TV. Remember that COLOR on the Plus/4 allows you to specify luminance, so use three numbers rather than two.

In Program 1 (Bar Chart), change the SCALE command in line 50 to SCALE1, without the two extra numbers. SCALE is either on or off on the Plus/4 and 16, you can't adjust it. The default scale is 1024 by 1024, so change the 500 at the end of line 40 to 1024. And change the 499 in line 60 to 1023.

WIDTH is not part of BASIC 3.5, so you should remove it from line 20 of Program 2 (Pie Graph). Apart from changing the colors around, there are no other corrections needed for this program.

Delete WIDTH from line 10 of Program 3 also. The result will be a bizarre-looking flag of pastel colors, so you'll have to play around with the COLOR commands in line 10, to find acceptable shades of red, white, and blue.

BASIC 7.0 Keywords

All Commodore BASICs contain the commands of version 2.0, found on the VIC and 64. Version 3.5, from the Plus/4 and 16, included many useful new graphics commands as well as some new commands and functions for program control. The new BASIC 7.0 has all of the previous commands (except RLUM, used to read a color's luminance in BASIC 3.5), and much more, giving 128 programmers the most powerful BASIC yet available on a Commodore computer.

Screen Customizer

Christian Elfers

If you prefer certain screen colors and use various machine language programs during programming sessions, here's a way to keep them from being disabled. A short utility originally written for the 64, we've added a version for the VIC.

Many programmers have individual preferences for certain background and border colors and use them when programming. Unfortunately, whenever RUN/STOP–RESTORE is pressed, the computer resets these colors. Most of the time it's too much of a nuisance to re-POKE the values for these colors. Also, RUN/STOP–RESTORE will disable some machine language programs, such as "Automatic Proofreader." In order to re-enable the program, the appropriate SYS must be entered. During a programming session, pressing RUN/STOP–RESTORE and repeatedly resetting screen colors and re-enabling programs gets tiresome.

One Key Default

"Screen Customizer" is designed to fix these problems. Type in the appropriate version for your computer and save it to tape or disk. From now on, before you begin a programming session, load and run Screen Customizer. Whenever you press the RESTORE key on the 64, the screen colors will be set to a black border, gray background, white cursor, and white characters. These colors can be changed by POKEing 1020 with the desired border color, 1021 with the screen color, 1022 with the cursor color, and 1023 with the character color (colors are numbered 0–15 and correspond to the colors available on the top row of the keyboard). Screen Customizer can be turned off by typing **POKE32776,0.** To turn it back on, type **POKE32776,48.**

VIC users should press RUN/STOP–RESTORE (RESTORE alone won't work). POKE 2 with the character color, and POKE 3 with the background/border color. **SYS673** toggles Screen Customizer off and on.

The 64 version of Screen Customizer will also prevent most machine language programs from becoming disabled. Note to tape users: Automatic Proofreader must be disabled before a tape save by typing SYS8 because pressing RESTORE will no longer disable the Proofreader. Location 8 is used because it almost always contains a zero. A SYS to any location containing a zero resets the computer like RUN/STOP–RESTORE without Screen Customizer activated.

Remember that every time you load in a new machine language program, such as the Proofreader or the DOS Wedge, you must tell Screen Customizer you did so by typing **SYS 32785.** Otherwise the program will be disabled by pressing RUN/STOP–RESTORE. This is required only for programs which are normally disabled by RUN/STOP–RESTORE.

How It Works

Here's how the 64 version works. It takes advantage of the "auto-start" feature normally used for cartridges. When the computer is first turned on, it checks for a cartridge by looking for specific data at locations 32772–32776. If these locations contain the ASCII values of the characters "CBM80", the computer will jump to whatever address is pointed to by locations 32768–32769 in low-byte/high-byte format. Locations 32770–32771 must also contain the same address. The computer also checks for this combination during a warm start (SYS64738) or when you press RESTORE. I changed these locations so that when RESTORE is pressed, the computer jumps to Screen Customizer.

When Screen Customizer is activated for the first time, it transfers the values in locations 768–819 into a temporary storage area. These locations contain important vectors. They tell the computer what to do every 1/60 second, or when RETURN is pressed, or when the commands LIST, OPEN, CLOSE, LOAD, and SAVE are entered.

Some machine language programs change the values in these locations to point to a customized routine. Normally, whenever RUN/STOP–RESTORE is pressed, these locations are reset to their normal values, thus disabling the customized routines. But Screen Customizer transfers the values from the temporary storage area back to locations 768–819, thus preventing most machine language programs from being disabled. The program then sets the screen colors and returns to BASIC.

In addition, since the RESTORE key causes a nonmaskable interrupt (NMI), pressing RESTORE with Screen Customizer activated enables you to recover from keyboard lock-up bugs without having to turn the computer off and on to regain control.

See program listings on page 120.

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Auto-File

David Miller

Loading and listing an ordinary disk directory doesn't tell you which programs are in BASIC and which are in machine language. And if you select a machine language program, how do you know the SYS address? This utility eliminates all guesswork. It automatically loads and runs BASIC and machine language programs from your directory. For the Commodore 64.

Subscribers to the GAZETTE DISK know how convenient it is to load the menu program, pick a program from the list, and press a key to see it automatically load and run. With "Auto-File" you can simply enter LOAD"*",8,1 and it does the rest of the work. You'll see a list of the programs on the disk. You can then cursor to the one you want and press a function key to load it. Auto-File even figures out if the program is written in BASIC or machine language.

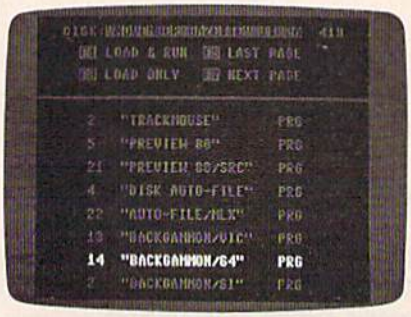
Paging Through The Directory

Auto-File is an all machine language utility which creates a "menu" program to load and run programs automatically. It's a good idea to save the menu program (called .DIR) as the first entry on the disk, so all you have to do is type LOAD"*",8,1. The program loads the directory into the computer's memory and then lists the disk name, number of blocks free, and the next eight files on the disk. Press f7 to flip forward a page to view the next eight files or f5 to move back a page. You can run forward through the last page into the first. However, you can't go back a page with f5 if you're on the first one.

When you see the program you want to load, use the cursor up/down key to move to it. The filename is highlighted in white letters while you're moving the cursor.

At this point, the selected file can be loaded using f3, or loaded and run with f1. (It's not necessary to remember the assignments of each function key because they're displayed on the screen until a file is loaded. Auto-File can be used without external support such as notes or documentation.)

After a program is selected, the load address is read from the disk and the file is loaded. The address determines how the program is to be handled. Auto-File first checks for a load address of 2049 ($0801), which would indicate a BASIC program or any machine language program started by a RUN. If 2049 is not the load address, it looks for an address of 32768 ($8000). If this is where the file begins, Auto-File then checks to see if it contains the auto-start cartridge information (some programs fool the operating system into thinking that a cartridge is plugged in). Failing all these tests, control is turned over to the program by SYSing to the load address.



A single keypress loads and runs a program from the menu.

Auto-File works well with all types of programs. Some rules of caution should be observed however, but they're fairly obvious. Sequential files, although listed by the directory, shouldn't be selected because only program files can be loaded with Auto-File. Also, some utilities may load into screen memory, and these can overwrite Auto-File and cause the machine to lock up.

Typing In The Program

Auto-File is written entirely in machine language, so you must use "MLX," the machine language entry program published frequently in the GAZETTE. Follow these steps to enter Auto-File:

1. Reset the computer by turning it off and then on again.
2. Enter this line: **POKE44,27: POKE27*256,0:NEW.**
3. Load MLX and run it.
4. Enter the following information when prompted:

   Starting address: **2049**
   Ending address: **3026**

5. Type in Auto-File and save it. Before using it for the first time, reset the computer by turning it off and then on, or by entering SYS64738.

Once you have a copy of Auto-File saved on disk, you'll be able to load and run it just as you would any BASIC program even though it's in machine language.

Using The Program

The program you typed in and saved is not the same auto-boot program that will be on your disks. You'll need to follow the instructions below to create the menu program, which will be called ".DIR". You can then LOAD ".DIR",8,1 and it will automatically run (or LOAD"*",8,1 if it's the first program on the disk). This two-step approach is used because ".DIR" actually loads in at address 648 ($0288), and it would be impossible to type it in and save it from this location. Most of the .DIR program loads into screen memory from the initial auto-load, which you can see when actually using it.

This technique may seem strange, but there are some good reasons for using it. First, ".DIR" is an auto-loading program, and a BASIC vector is changed to initiate it. Second, screen memory is used because of the length of the code. It's quickly relocated to a less volatile location so the program runs using two separate locations in memory. This keeps the program as one file on the disk so things are nice and neat.

To use Auto-File to create .DIR, follow these steps:

1. Format a new disk.
2. Load Auto-File, but don't run it yet.
3. Insert the formatted disk.
4. Type RUN.

".DIR" will now be written to the disk. When it's finished, you can insert another formatted disk and type RUN again. This procedure can be repeated as often as needed.

It should be noted that it is not necessary to write this as the first file on the disk. It can be written to a disk already containing programs, but you would have to enter LOAD".DIR",8,1 instead of simply LOAD"*",8,1. If you'd like to move the disk's first program to another location, you can use the copy and scratch commands. Enter **OPEN 15,8,15: PRINT#15, "C0:*newname*=*0:oldname*"**, substituting the name of the first program for *oldname*. An exact copy of the program will be made to another location in the directory. Next, scratch the old version with **PRINT#15, "S0:** ***oldname*****"**. The next program written to the disk will go into the first position in the directory. Follow the instructions above to put .DIR there.

Another small option is included. Some programs have multiple files for the same program with a boot that loads them all. You might want to be selective about which programs are listed. Try this procedure:

1. Change the names of the programs you want listed so that they are preceded by a period. For example, "FILENAME" becomes ".FILENAME". (To rename a file, **OPEN 15,8,15: PRINT#15, "R0:** *newname*=*0:oldname*".)
2. Load "Auto-File",8.
3. Enter **POKE2526,3**.
4. Insert the destination disk and type RUN.

Now only those programs that begin with a period will be listed for selection by .DIR. Any programs to be added to this disk must be treated in the same manner.

See program listing on page 120.

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Preview-80
For *SpeedScript*

Ernest R. Hunter and Kevin Martin

Here's a utility that greatly enhances the popular word processor *SpeedScript*. "Preview-80" adds several features, including the ability to display a document in 80-column format, a page at a time. You can see what it will look like before spending time and paper printing it out. It works with *all* Commodore 64 versions of *SpeedScript*.

It's probably happened to everyone who's used *SpeedScript*: You write a short letter and print it out, only to find that "Sincerely" is at the bottom of page 1 and your name is at the top of the next page. So you go back, edit a few lines, and print it again. It's not a disaster, but it can be annoying. It's also difficult to print numbers aligned in columns, because of the way word wrap works.

SpeedScript can show you a 40-column preview if you press SHIFT-CTRL-P. In versions 1.0–2.1, you have to specify device 3. But this option gives you only a rough idea of what the final printout will look like. With "Preview-80," you can see exactly what's going to be printed. And it's very easy to use.

Typing It In

Note that this is not a stand-alone program. You must have a copy of one of the 64 versions of the *SpeedScript* word processing program. See "What Is *SpeedScript*?" for information about obtaining this word processor.

Preview-80 is a 1K machine language program. "MLX," published frequently in COMPUTE!'s GAZETTE, is required to type it in. After loading and running MLX, answer the prompts for starting and ending addresses with 52000 and 53061, respectively. Type in Preview-80 and save it to tape or disk.

To install Preview-80, follow these instructions:

```
LOAD "PREVIEW80",8,1 (for disk)
LOAD "PREVIEW80" (for tape)
Type NEW
LOAD "SPEEDSCRIPT",8 (for disk)
LOAD "SPEEDSCRIPT" (for tape)
(don't type RUN)
Type SYS 52000
```

Once you enter SYS 52000, you're automatically in *SpeedScript*. Preview-80 is also in memory. It's completely transparent until you need to use it.

Switching It On

Preview-80 works with all versions of *SpeedScript*. To get to Preview-80, press SHIFT-CTRL-P. Next, if you're using version 3.0 or 3.1, choose the screen option. If you're using any of the earlier versions, respond to the prompts for device number and secondary address by typing 3 each time. After a brief pause, you'll be in Preview-80. The title is displayed in the upper left corner of the screen, and the current cursor position (the inverse character is the cursor) is displayed in the upper right. The remainder of the screen is the text page display, 80 columns horizontally and 66 lines vertically. Be sure to leave the *SpeedScript* page formatting commands at their default positions. If you attempt to reset the boundaries, the results will be unpredictable and may cause the program to crash. Preview-80 will try to format the text on an 80 × 66 page.

You won't see all 80 columns by 66 rows at the same time because the 64's screen doesn't have high-enough resolution. The screen display has the usual 40 characters in 25 rows, but it acts as a window you can move around the 80 x 66 page.

You can move around the screen in two ways. The first is with the cursor keys, each keypress moving one cursor position at a time. The second and faster way is to use these control keys: CTRL-T to get to the top of the screen, CTRL-B to get to the bottom, CTRL-L to get to the left-most position on the screen, and CTRL-R to get to the right. By moving around, you can see exactly what the document will look like on a printed page—a true preview.

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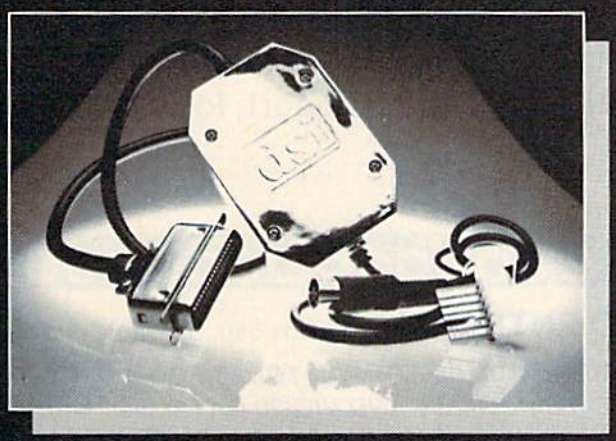

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- Works properly with all Commodore compatible software.
- Transparent Mode Lock Controls.
- Total Emulation of Commodore's Graphic, Character, and Command Set.
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- Combining of Expanded and Condensed Print features.
- Fully Shielded from end to end.

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Smith Corona Fast Text 80
Smith Corona DP series
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MPI SX Printer **
MPI X Printer**
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BMC
Mannesmann Tally MT160
Olympia Compact NP
Brother CE-50***
Brother CE-58***
Brother DM-40
Brother DX-5
Fujitsu
Epson

The PPI works with all Centronics compatible parallel printers that utilize standard ASCII characters and command sets in the transparent mode.

* Must have the Smith Corona Messenger Module #17376 interface.
** Special adapter cable is required.
*** Must have the Brother IF-50 interface.
**** Must have the Royal IF-600 interface.

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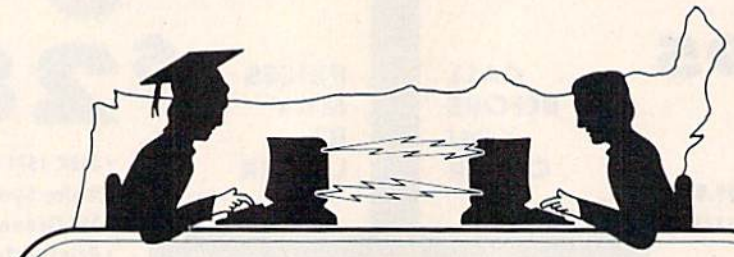

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10" Comstar 10X — This Bi-directional Tractor/Friction Printer prints standard sheet 8½"x11" paper and continuous forms or labels. High resolution bit image graphics, underlining, horizontal tab setting, true lower descenders, with super scripts and subscripts, prints standard pica, compressed, expanded, block graphics, etc. Fantastic value. (Centronics parallel interface.)
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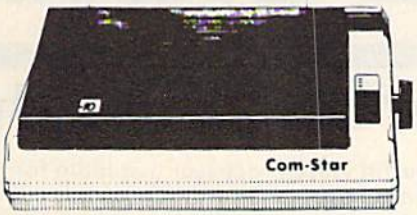

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15½" Comstar 15X — Has all the features of the 10" Comstar 10X plus a wider 15½" carriage and more powerful electronics to handle large ledger business forms! (Better than FX-100). The 15½" Comstar 15X also prints on standard size paper and continuous forms and labels. Fantastic value. (Centronics parallel interface.)
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List $499.00 **10" Printer**

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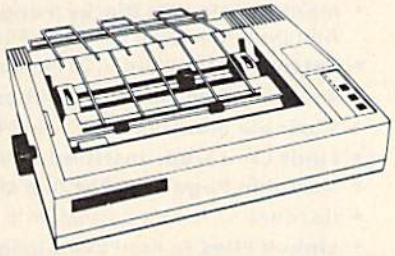
1 Year Warranty
150-170 CPS
High Speed



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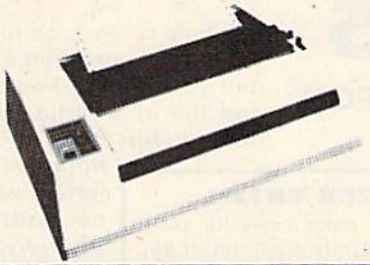
*Lifetime warranty**
165-185 CPS
High Speed & Letter Quality



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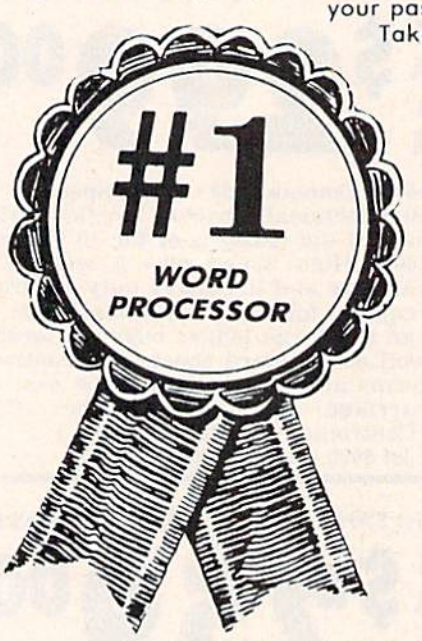
40 or 80 Columns in Color

This is the easiest to use and most powerful word processor available for the Commodore 64. As you type on the screen, you will see your letters and words appear on the screen exactly as they will be printed (i.e. Italics will be *Italic*, Bold Face will be **Bold Face**). With the printer files you can customize Paperback Writer 64 to use all the fancy features of your printer. Loads EZ Script®, Paperclip®, & Wordpro 64® Files so you can easily upgrade your past wordprocessing text that you've written with obsolete wordprocessors. Take a look at some of the other features:



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Full help screens on line with additional help on the disks mean you don't even need a manual. If you're in the middle of a page and you want to know how to use a special function just hit F7 and the information will appear before your eyes. If you still don't understand hit F7 again and a more detailed explanation appears. Then simply hit F8 and you're back in the letter where you left off. No manual lookup necessary. This is the easiest word processor in the world to use. List $99.00.
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FACTS

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- Drives are sensitive to smoke, dust and all micro particles.
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The Doctor disk drive cleaner can be used with single or double sided 5¼" disk drives. The Doctor is an easy to use fast method of maintaining efficient floppy diskette drive operation. The Doctor cleaner comes with 2 disks and is packed in a protective plastic folder to prevent contamination. List $29.95. **Sale $19.95.** ** Coupon $14.95.*

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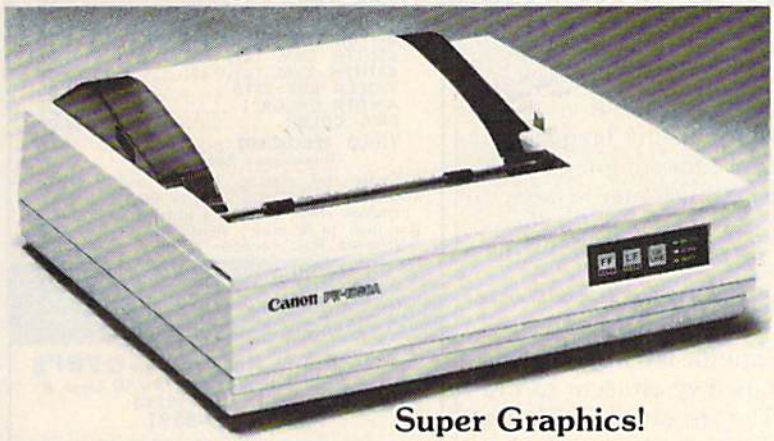

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The original version, *SpeedScript* 1.0, ran as a type-in program for the VIC and 64 in the January 1984 GAZETTE. That issue sold out fairly quickly and is no longer available. Version 2.0 added some improvements (and fixed some bugs); it appeared on the first GAZETTE DISK (May 1984) as a bonus for subscribers. This is the only version with a custom character set and a help screen. The May 1984 DISK also includes a documentation file. Version 2.1, a variation on 2.0 without the character set or help screen, appears in *COMPUTE!'s Second Book Of 64*; no disk is available. Version 3.0 for the 64 added many features requested by readers. It ran in COMPUTE!, our sister publication, in March 1985. Later issues included *SpeedScript* for the VIC, Atari, and Apple. March back issues are still available, and there's a disk as well. The latest version is 3.1, in *COMPUTE!'s SpeedScript For The 64* (COMPUTE! Books, $9.95). The book and an accompanying disk include the program and the machine language source code. Each of the disks costs $12.95 plus $2 for shipping and handling. For more information, call COMPUTE! Customer Service at 800-334-0868 or 919-275-9809 in North Carolina and foreign countries.

press CTRL-N. This will erase the current page and display the next one. After the last page has been displayed, CTRL-N returns you to *SpeedScript*. If you suddenly decide you want to edit something in the document and want to return to *SpeedScript*, press the RUN/STOP key. This always returns you to *SpeedScript* from Preview-80.

The last Preview-80 command is a very useful one. CTRL-P allows you to print the text page currently displayed. This is especially handy when printing a long document. For example, if you find a mistake on one page of a long document, it's easy to make the change and reprint that one page.

Finally, two words of caution: First, when printing a *SpeedScript* document to the printer, pressing RUN/STOP to quit printing will not always work. If it doesn't work the first time, try it again. It will soon work, it's just a bit more sensitive with Preview-80. Second, Preview-80 takes away 12K of *SpeedScript* text space. Long documents may have to be broken up into smaller ones.

Technical Notes

Preview-80 is vectored into *SpeedScript* through the CHROUT, CLOSE, and STOP vectors. The CHROUT routine is used to trap the characters as they are sent to Preview-80. They're saved in the text display buffer to be displayed when the buffer is full, and saved in the printing buffer to be printed when the print page command is selected.

The CLOSE vector is trapped to make sure the last page is displayed. If a close is issued, then the last page needs to be displayed. This also cleans up some of the routines to make Preview-80 ready for the next printing.

The STOP routine was changed to check only for the RUN/STOP key being pressed. The normal STOP routine performs a CLRCHN before exiting after detecting that the RUN/STOP key was pressed.

Preview-80 Commands

CTRL-T:	**moves to top of page**
CTRL-B:	**moves to bottom of page**
CTRL-L:	**moves to left edge of page**
CTRL-R:	**moves to right edge of page**
CTRL-N:	**next page**
CTRL-P:	**prints the page currently displayed**
RUN/STOP:	**returns to *SpeedScript***

See program listing on page 119.

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64 Music Maker

Curtis Sieber

This short machine language program turns your 64 into a musical keyboard that plays up to three notes simultaneously. And it leaves BASIC free so you can write or type in BASIC programs. Several useful options are included.

Because of the SID (Sound Interface Device) chip, the 64 has better sound than almost any other personal computer. With three voices and an impressive 96-note range (eight octaves with twelve notes each), it's a complex and powerful addition to any computer. But to harness its power requires dozens of POKEs in BASIC. This machine language program makes playing melodies much easier.

"64 Music Maker" turns your 64 into a polyphonic keyboard that plays up to three notes simultaneously in real time. And it leaves BASIC free. The program is written entirely in machine language, so you can program in BASIC and have full access to the musical keyboard.

There are two pitch ranges: low-to-mid and mid-to-high. By pressing the left SHIFT key (or SHIFT-LOCK), you jump from the low-to-mid range to the mid-to-high. Here are the keys that will play notes:

```
 2 3  5 6 7  9 0  - £
 q w e r t y u i o p @ * ↑
 a  d f  h j k  : ;
  z x c v b n m , . / SHIFT
```

Those readers who have played a piano or other keyboard instrument will recognize the layout of the keyboard. The top row (2–£) represents the black keys, the sharps and flats, the next row (qwerty) represents the white keys, and so on. The keyboard covers a little more than three octaves. The octaves above the letter "q" are "i," "x," and the period (".").

Making Music

Since Music Maker is written in machine language, "MLX" is required to type it in. MLX appears frequently in COMPUTE!'s GAZETTE. After loading MLX, run it. When prompted for the starting and ending addresses, enter 49152 and 49637. After typing in Music Maker, save a copy to tape or disk, then turn your 64 off and then on. Load it back in using LOAD "MUSICMAKER",8,1 for disk, or LOAD "MUSICMAKER" for tape. Next type NEW and press RETURN. To run the program, type SYS49152 and press RETURN. The keyboard is activated.

The musical keyboard is "transparent" to BASIC, so you can program, just play music, or type in a BASIC program. (If you type PRINT FRE(0) + 65536, you'll notice that you have your normal 38K free for BASIC programs.) You can also load in the DOS Wedge and run it and neither Music Maker nor the wedge will be affected.

Options

Pressing a key does two things: It plays a note and it prints the corresponding letter to the screen. If you're trying to figure out a melody, this can be helpful. You can see which keys to press to replay the song. You can also do BASIC programming with musical (but probably not melodic) accompaniment.

Two other waveforms (tonal qualities) are available with a single POKE. Press RUN/STOP-RESTORE, then POKE 49388,17 and press RETURN. Next, enter SYS49152. You'll have a calliope sound. Repeat this process, substituting a 129 for 17 in the above POKE, for a noise waveform. The default waveform has a value of 33, so you can enter POKE 49388,33 to get back to the original sound.

Technical Notes

Music Maker is written entirely in machine language and works by wedging into the IRQ interrupt. To set up a machine language subroutine in the interrupt is not that difficult. Say that your program starts at $033C (828). All you have to do is to run this small bit of machine language to reset the pointer at $0314:

```
SEI             ; set the interrupt bit to
                  disable interrupts
LDA  #$3C       ; low byte of your
                  routine
STA  $0314      ; low byte of pointer
LDA  #$03       ; high byte of your
                  routine
STA  $0315      ; high byte of pointer
CLI             ; clear the interrupt bit
                  to re-enable interrupts
RTS             ; and return.
```

The routine at $033C will then be executed 60 times a second. Be sure that wherever you normally place an RTS to return control to the user, you replace that with JMP $EA31, which is the location of the normal interrupt. You might have something like this at the very end of your wedge routine:

```
LDA  #$00       ; change screen color
STA  $D021      ; to black.
JMP  $EA31      ; and continue with
                  normal interrupts.
```

See program listing on page 123.

Disk Encoder

Tim Solis

This clever program offers a sure way to protect your disk files from unauthorized access. For the Commodore 64.

A number of techniques for protecting files from unwanted snooping have been published, but most of them don't do the job if your disk is in the hands of a clever programmer. This utility provides a foolproof method for protecting program files (machine language and BASIC) and sequential disk files from unauthorized access. It accomplishes this by scrambling selected files, and it will unscramble them only if the proper codes are given.

A Demonstration Test

Before we begin our discussion of how this utility works, type in and save a copy of "Disk Encoder." (Be sure to read "Special Typing Instructions" below before you start.) Then, for a demonstration of how it works, type in this short program:

```
100 REM THIS IS A TEST !
```

Save it to disk with the filename "TEST." Load Disk Encoder and run it. (Even though Disk Encoder is written entirely in machine language, you can use the normal LOAD and RUN commands.) The program first prompts you to insert the disk with the program(s) you want encoded and press the space bar. Next, it displays a filename from the disk directory and asks if you want it loaded. If this isn't the "TEST" filename, press N, and Disk Encoder will skip to the next available file in the directory. (Occasionally, you may notice that some files on your disk are bypassed. This can happen if the file in question isn't a program or sequential file, or if the file is too large to load into memory.)

When you select the "TEST" file, it is loaded into Disk Encoder's buffer area. The computer then asks for a code. This can be a name, a number, or whatever, *up to ten characters in length.* You are then prompted for a second code. Like the first, it can be anything you choose; however, it must be shorter than the first code. (If you accidentally type in a second code that's longer than or the same length as the first, you'll be prompted again to enter the second code.) It's helpful, of course, to choose meaningful codes, names you'll remember. In fact, it's easiest to use the same codes for all disks you wish to protect.

After you enter the codes, they're scrambled together and written to your disk as a sequential file with the name "VERIFY CODE." From now on, these two codes are used to encode and decode any or all files which Disk Encoder offers to load on this disk. The "TEST" file, which has been waiting in the buffer area, is now encoded and written back to disk. The program then checks for any I/O errors and quits.

Now load the "TEST" file you've just encoded and list it. You'll see a lot of garbage. And sometimes when you list an encoded program, your computer will do strange things. This is because the BASIC interpreter is trying to make sense of the program.

When you're ready to decode the "TEST" file, type NEW, then reload and run Disk Encoder. Next, insert the disk with the "TEST" file and enter your codes. If you type in the wrong codes (remember, spaces count too), Disk Encoder will shut itself down; you'll have to run it again and enter the correct codes.

After the proper codes are given, the "TEST" file is decoded and written to disk. Load the "TEST" file and LIST it. You'll see that it's back to its original form.

Special Typing Instructions

Disk Encoder is written entirely in machine language and requires "MLX" to type it in. MLX is published frequently in the GAZETTE. Follow these instructions carefully:

1. After turning on your 64, type **POKE 44,24: POKE 6144,0: NEW**
2. Load and run MLX.
3. When prompted for the starting and ending addresses, enter **2049** and **3758,** respectively.
4. Type in Disk Encoder and save a copy.

Even though Disk Encoder is written in machine language, you don't have to load with ,8,1 or remember a SYS address. Just **LOAD"DISK ENCODER",8** and type **RUN.**

How It Works

After you've typed in the two codes, Disk Encoder will look on the disk for the "VERIFY CODE" file. If it's found, it will be compared with the two codes you've just typed in. If they match, the program skips to the encode/decode routine. If "VERIFY CODE" isn't found, Disk Encoder assumes this is the first time you're encoding a file on this disk. The program then takes the two codes you've typed in and EORs them together.

EOR (or Exclusive OR) compares two bytes, bit by bit. If both bits are the same value (either both 1 or both 0), the result is 0. If the bits are different, the result is 1. For example, take the words *CAT* and *DOG*. In binary form they look like this:

C	A	T
0100 0011	0100 0001	0101 0100
D	**O**	**G**
0100 0100	0100 1111	0100 0111

If you EOR them together, byte by byte, they look like this:

Result
0000 0111 0000 1110 0001 0011

This is what happens to the two codes before they're written to disk. Why are the codes scrambled? If they weren't, someone could read the "VERIFY CODE" file off the disk and gain access to the programs on your disk.

To see how the two codes are decoded after being read from disk, let's look again at the example above. If *CAT* is EORed with the code in Result, it gives us the *DOG*. Likewise, if *DOG* is EORed with the code in Result, we get *CAT*. If *any other word* were EORed with the code in Result, it wouldn't yield *DOG* or *CAT*. This is why two codes are used in this program. The second code you type in is EORed with the "VERIFY CODE," which in turn gives the code in Result. This is then compared with the first code you typed in. If the two match, the code is verified.

The encode/decode routine for the files operates in the same EOR function as described above; however, it is EORed with both codes to provide an extra measure of security. When this process is complete, the old file on your disk is scratched, then the file in the buffer area is written to disk.

A Few Tips

It's recommended that you disable all resident programs such as wedges, monitors, and so on, before you use Disk Encoder. This will prevent the possibility of the system crashing if one of these programs is overwritten.

If at some point you wish to change your codes on a disk, follow these steps carefully:

1. Make sure all your files on the disk are decoded.
2. Scratch the "VERIFY CODE" file.
3. Load Disk Encoder.
4. Run Disk Encoder.
5. Select a file to be encoded.
6. Enter new codes.
7. Repeat steps 4 through 6 until all files to be protected are encoded.

If you accidentally scratch the "VERIFY CODE" on a disk that contains encoded files, you can still recover them by running Disk Encoder and entering the original codes. This will produce another "VERIFY CODE" file to replace the one that was scratched.

See program listing on page 122.

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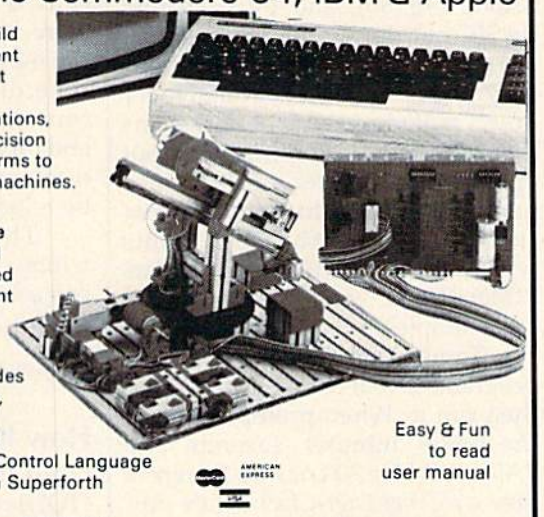

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Digi-Clock

George W. Miller, Assistant Technical Editor

Have you ever sat down at the keyboard and lost all track of time? This program will help. It features a realtime clock that runs while you program, and remains unaffected by disk or tape operations. For the Commodore 64.

Some programmers enter a different time dimension when they sit down to work on a new program. Their intense concentration often causes them to miss meals, forget appointments, or stay awake into the wee hours.

"Digi-Clock" continuously prints the current time at the top of the screen, so the user can remember what time it is. It won't interfere with your programming and is simple to use.

No Interference

Digi-Clock is an interrupt-driven machine language routine. It resides underneath BASIC at hex $A000 (40960), and by switching BASIC out during the interrupt, all normal memory areas, including the cassette buffer, are available for other programs. And it maintains accurate time during input/output operations. However, since the program is interrupt-driven, it will not function with other programs which work via the IRQ vectors ("MetaBASIC" and various wedges are examples).

To use Digi-Clock, type in the program, save it to tape or disk, and then run it. When prompted, enter the hours, minutes, seconds, and "A" or "P" for AM or PM. *Be sure to save a copy of Digi-Clock before running it because it will remove itself from memory by executing a NEW after being run.*

The program then waits for you to press a key to start the clock. It immediately removes itself from memory, displaying the time at the top of the screen while you proceed with normal use of the machine.

Digi-Clock can be run in immediate mode or with BASIC and ML programs, providing the ML program doesn't use locations 40960–41114 ($A000–$A09A), or change the IRQ Vector to point to some interrupt-driven routine of its own. When Digi-Clock is running, it uses the top screen line. This means your screen display is 24 lines instead of the normal 25. This won't affect your programming as the normal top line is simply moved down one line.

If you want to test Digi-Clock with a program where the top screen line *must* be displayed, press RUN/STOP–RESTORE and the clock is no longer displayed. But the correct time is still maintained by the 64's CIA chip. To reenable the time display, enter SYS 628. Of course, if you turn the computer off and on again, the CIA clocks will be reset, and Digi-Clock will need to be reloaded and run.

The time is displayed with white characters, but if you'd like some other color, enter:

POKE 40981, ***color number***

where *color number* is a value 0–15.

How It Works

Digi-Clock uses the Time Of Day (TOD) counters on CIA#1, the 6526 CIA chip. The registers are located at 56328–56331 ($DC08–$DC0B). The CIA clock is preferable to the jiffy clock because the jiffy clock, which is used for timekeeping by the variables TI and TI$, is not updated during input and output operations, whereas the CIA clock never stops.

The clock keeps accurate time, even with heavy disk or tape access.

The short routine for setting pointers for the Digi-Clock IRQ routine is located at 682 ($2AA), an unused area of memory.

CIA Problems

While testing the program, it became apparent that some of the early 64 models have defective CIA chips. In some of these machines, the TOD clock is updated about twice as often as it should be. The problem becomes obvious only with programs which use the TOD clock (such as Digi-Clock).

To see if your 64 has a defective CIA, enter:

PRINT PEEK (65408)

If a 0 is returned, you have one of the original ROM computers, and you may have a defective CIA. Now enter:

POKE 56328,0

This starts the TOD clock counting. Then enter:

10 PRINT "{CLR}{DOWN}";PEEK (56329):GOTO 10

Type RUN and press RETURN. Your screen should display a number which changes value once every second. If it changes more often than that, you probably have a defective CIA. Note that comparatively very few 64 owners will have this problem.

See program listing on page 128.

BASIC magic

More About Screen Titles

Michael S. Tomczyk

Michael S. Tomczyk is a former Commodore marketing executive and product designer. His recent book, The Home Computer Wars, *describes the rise of Commodore and is published by COMPUTE! Books.*

This month we'll continue our discussion on making screen titles and examine the LEN function in more detail.

Using The LEN Function To Count String Characters

If you define your title as a *string variable*, you can use the LENgth function to count how many characters there are in the title, then use that number to position your title horizontally on the screen. We'll start easy and work our way up. Try this example:

```
10 H$="HALLEY'S COMET":PRINTH$
```

Type RUN and press RETURN. The string variable H$ is defined as the phrase "HALLEY'S COMET". You can define words, sentences, even editing commands, as string variables. Pick the string variable you want to use (like A$, A1$, Z$), then make it equal to a word or phrase—and be sure to put the word or phrase inside quotation marks.

Now, let's see if we can get the computer to figure out how many characters, including spaces and punctuation marks, there are in the phrase represented by H$. To do this, we'll use the LEN function, like this:

```
10 H$="HALLEY'S COMET":PRINTLE
   N(H$)
```

The computer responds by displaying the number 14, because there are 14 character positions in the phrase "HALLEY'S COMET" You can also use the LEN function like this:

```
10 H$="HALLEY'S COMET"
20 PRINT"THE PHRASE {RVS}"H$"
   {OFF} HAS"LEN(H$)
30 PRINT"CHARACTERS IN IT."
```

Before going on, read the REM section below about where to put quotation marks. It will help clarify what we did here.

Line 10 defines the variable. In line 20, we start with a PRINT command at the beginning of the line, and this PRINT command goes with everything else that follows. First, we PRINT "THE PHRASE" and then, still inside quotation marks, we hold down the CONTROL key and at the same time press the RVS ON key. Then we PRINT the variable H$, which is the same as PRINTing the phrase we defined it as in line 10. Note that in BASIC programs, variables always go outside quotation marks. Next we turn reverse off by going back inside quotation marks and holding down the CONTROL key and the RVS OFF key at the same time. Then we PRINT the word HAS, still inside quotation marks. Then we go outside the quotes to PRINT the LENgth of H$. We PRINT the rest of our sentence in line 30.

REM: *If you read this column regularly, you've probably noticed I repeat this lesson quite a lot. Getting comfortable with where the quotation marks go is one of the aspects of BASIC that confuses many beginning programmers. Just remember that numbers, variables, and BASIC functions that use variables (like LEN, STR$, CHR$, etc.) go outside quotation marks. Words, phrases, editing commands, and CONTROL commands, like color selection, go inside quotation marks.*

Now let's use the LEN function to center our title on the screen.

Using LEN To Center A Title

If you wanted to center a title on the screen, you could do it *manually* like this:

```
10 H$="AMIGA IS HERE!"
20 PRINT CHR$(147);
30 FOR C=1 TO 13:PRINT " ";:NE
   XT C:PRINTH$
```

Line 10 defines the variable C$ as the phrase, "AMIGA IS HERE!" Line 20 clears the screen by PRINTing CHR$(147) and a semicolon. PRINTing CHR$(147) is the same as clearing the screen. All characters, colors, and editing commands have CHR$ codes which can be PRINTed. The codes are found in the back of your user's manual.

The semicolon is needed because *all PRINT statements* automatically move down to the next line. Because we PRINTed CHR$(147), the next PRINT command in line 30 would normally move down one line. The semicolon acts like glue to keep it on the top line. Try this program with and without the semicolon.

Line 30 uses a FOR-NEXT loop to PRINT a space 13 times. We got the number 13 by counting the number of characters and spaces in our title, which is 14. Then we subtracted 14 from the number of horizontal positions on the screen, which is 40 (or 22 on the VIC); 40 − 14 is 26, so we divide that in half to get 13, which is how many spaces we need on the left side of the title if we want to center it. That's why the computer PRINTs 13 spaces—only then do we get around to PRINTing H$ which is the same as PRINTing the title.

Automatic Centering

You can also create an *automatic centering formula* by changing line 30 to the following (VIC owners should substitute 22 for 40):

```
30 FOR C=1 TO (40-LEN(H$))/2:P
   RINT " ";:NEXT C:PRINT H$
```

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Now any title you define as H$ will be centered, as long as it's less than 40 characters long. The formula works just like our manual example above, except here instead of counting how many characters there are in H$ we use the LEN function to let the computer do the counting. Then we subtract that number from 40 and divide by 2. That's the formula, and we use this in the FOR-NEXT loop.

Note that in a formula the parentheses have to be balanced—that is, the same number of right and left parentheses. That's why we have two right parentheses next to each other. They balance the two left parentheses.

Now let's go one step farther and let the user type in his or her own title, and have it automatically centered on the screen.

Letting The User Choose A Title

This variation lets the user enter a title and then automatically centers it horizontally on the screen. All you have to do is change line 10:

```
10 PRINT CHR$(147);"WHAT WOULD
   YOU LIKE TO CALL YOUR STOR
   Y";:INPUT H$
20 PRINTCHR$(147);
30 FOR C=1 TO (40-LEN(H$))/2:P
   RINT " ";:NEXT C:PRINT H$
```

The only difference here is that we begin by clearing the screen and asking the user to type in a title. As we always do when using an INPUT, we give the user a prompt message that asks a question or provides instruction. Here, the message asks the user to type the name of a story. You don't have to type a question mark because the INPUT statement does it for you, and the semicolon "glues" the question mark to the end of the PRINTed sentence. Without the semicolon, the question mark will appear on the next line.

The INPUT statement displays the question mark, waits for the user to type in a title, then defines that title as a string variable—in this case, H$. H$ becomes the title which was selected by the user.

The rest of the program is the same as in our previous examples.

You could also tell the user to keep the length of the title less than 40 characters, if you wanted to go

into more detail—but this is a "secondary" message. How can you put it at the bottom of the screen, then go back to the top of the screen to display the main message and get the INPUT?

Here's one way to do it:

```
10 PRINT CHR$(147);:FOR L=1 TO
   10:PRINT:NEXT L
15 PRINT "TYPE A TITLE LESS TH
   AN 40 CHARACTERS{4 SPACES}L
   ONG, THEN PRESS RETURN"
20 PRINT CHR$(19);"WHAT WOULD
   {SPACE}YOU LIKE TO CALL YOU
   R STORY";:INPUT H$
25 PRINT CHR$(147);
30 FOR C=1 TO (40-LEN(H$))/2:P
   RINT " ";:NEXT C:PRINT H$
```

We begin as in the previous version, by clearing the screen. Then we use a FOR-NEXT loop to PRINT ten blank lines, which positions the cursor ten lines down on the screen. In line 15 we PRINT our secondary instruction about the length of the title and pressing the RETURN key.

Line 20 uses the HOME command instead of CLEAR. PRINTing CHR$(19) is the same as pressing the HOME key. HOME sends the cursor to the top left corner of the screen *without* erasing the screen. This leaves our secondary message from line 15 on the screen while we display our primary message and ask for the user to enter the story title.

Line 30 is the same as before.

We've gone from a simple title we manually centered on the screen to a title that centers itself and then to a title that a user can enter and have automatically centered. Try mixing the techniques we've just discussed with those from last month.

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Commodore Microcomputer, Sept/Oct 1985

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VIZAWRITE CLASSIC for C128

This is the new word processor from Vizastar's author, Kevin Lacy and is the successor to Omniwriter, which he also wrote. All the features of Omniwriter are there, plus many significant enhancements, like auto pagination, on-line help, pull-down menus, full-function calculator and more. Up to 8 'newspaper-style' variable-width columns can help with newsletters.

Three different proportionally-spaced "near letter quality" fonts are also built-in for use with Commodore or Epson compatible printers. You can merge almost any other word processor file directly into Vizawrite, including Paper Clip and Omniwriter. Naturally, it is also compatible with Vizastar. At all times, what you see on the screen is exactly the way it will be printed out. Vizawrite can do mail-merges and has an integrated 30,000 word spelling checker that you can expand yourself.

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Both Vizawrite and Vizastar are written in 100% machine language and run in the 128's FAST mode, making it lightning fast. They require a C128 with 80 column color or monochrome monitor. Both come with a cartridge, a diskette, a backup, and a reference manual. Vizastar also includes a 50 page tutorial book. Both work with 1541 or 1571 disk drives.

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computing for families

Gobbledygook Processing

Fred D'Ignazio
Associate Editor

Fred D'Ignazio is an associate editor of COMPUTE! *and* COMPUTE!'s GAZETTE. *He is a regular commentator on public TV's "Educational Computing" and on* The New Tech Times, *a public TV program on consumer electronics. Fred's latest book is* Computing Together: A Parents and Teachers Guide to Using Computers With Young Children *(COMPUTE! Publications, 1984, $12.95). Fred is an avid computer networker and welcomes electronic letters from his readers. Write to Fred on The Source (BCA638), CompuServe (75166,267), MCI Mail (Fred D'Ignazio), or c/o COMPUTE! Publications.*

In last month's column, I suggested ideas for turning your machine into a computer sandbox. This month, we'll look at a way you can do that for young children. I call it "Gobbledygook Processing." I recommend it as a gentle, first step into computing.

Gobbledygook processing is nice because it's so simple. You simply turn on your computer and let your kids start pushing keys on the keyboard. You don't even need accessories, like a printer or a disk drive.

But if you want to do *enhanced* gobbledygook processing, you might want to try a program, "Screen Typing," I recently received from one of our readers—William R. Breeden from St. Louis, Missouri. According to Breeden:

> I do not have any kids of my own, but I do have neighbors with small children, and my Commodore 64 system is very popular with them. They are two little girls, ages five and nine, and they are always asking their mothers if they can "go over to Bill's house and play with his computer."
>
> I have several games (both commercial and homemade) that use the joystick. After about ten or fifteen minutes, they will ask me to "get this game out so we can type letters and numbers on the screen." This did not surprise me at all; have you ever known a child that didn't like to draw on chalkboards or write on simple plain paper?
>
> Having two or more children wanting to type at the same time can lead to some amount of quibble. "She got to type more words than I did," or, "I didn't get as long of a turn!" How can you try to avoid this? Why, that's simple! I wrote a program that controls the turns, giving each child equal time. And I included easy-to-remember functions like clearing the screen and changing colors.
>
> This fairly short program for the Commodore 64 controls turns, defines f1 as Clear Screen, f3 as Change Letter Color, f5 as Change Border Color, f7 as Change Screen Color, and INST/DEL as, naturally, Delete a Character. It ignores the cursor controls, the case change keys, and the real Clear Home key (I found that the children like the function keys).
>
> The quote key (CHR$ 34) becomes the single quote or apostrophe key (CHR$ 39) to avoid problems that I recently discovered. Also, Screen Typing will not allow the letter color and the screen color to be the same, since the letters would seem to disappear. This, however, does not stop children from coming up with combinations that are very hard to see on a color TV (green letters on a pink screen, etc.). The effect of the Change Letter Color key (f3) is more dramatic when there are more characters on the screen.
>
> The program controls turns by printing the child's name at the top of the screen when it's his or her turn to type. An asterisk appears after the child's name when the turn is almost over.
>
> I hope you like Screen Typing as much as the children and I do!
>
> Sincerely yours,
> William Breeden,
> St. Louis, MO.

William Breeden's neighbors take turns gobbledygook processing with "Screen Typing."

Breeden sent me his Screen Typing program in response to my comments about my children and the Macintosh mouse in my March 1985 COMPUTE! column. In his letter, he wrote:

> I don't know how much Macintosh Kids will like this program, but I do know that Not-Yet-Mouse-Spoiled Kids enjoy searching for letters and numbers on the keyboard. It must seem like some sort of fancy chalkboard with changing colors. And whether the children know it or not, this activity does increase their computer literacy.

My children and I enjoy Bill's program, and it makes me think that there are lots of you readers who could create "gobbledygook processing" programs or "computer sandbox" programs on your own. (See "Computing for Families," in the September and October issues of GAZETTE.) If you have a program you'd like to show me, I'd love to see it. Please send a disk (or tape) with the program, a copy of the program listing, and short, simple instructions on how to use the program to:

Fred D'Ignazio
c/o COMPUTE! Publications
P.O. Box 5406
Greensboro, NC 27403

See program listing on page 119.

simple answers to common questions

Tom R. Halfhill, Staff Editor

Each month, COMPUTE!'s GAZETTE *tackles some questions commonly asked by Commodore users and by people shopping for their first home computer. 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.*

Q. I have two questions. First, I've seen ads in the GAZETTE for devices called EPROMs. They say that users can program and erase their own cartridges. How can they do that, and how does the program remain there when the cartridge is removed? I thought programs on cartridges were burned into chips and couldn't be erased. I asked a friend who works for a computer company about it, and he said it uses something called *firmware*. This is my second question. I know what hardware and software are, but what is firmware?

A. You've asked two very good questions, because your assumptions about cartridges *are* partially correct. You've simply hit upon the inevitable exception to every rule.

It's true that programs stored in cartridges are burned into memory chips so they can't be erased when you unplug the cartridge or shut off the computer. This is a major advantage of storing programs on cartridges. Another is that you don't have to wait for the program to load, as you do with programs on disk or tape.

Usually, mass-production cartridge programs are permanently burned into memory chips called *Read Only Memories* (ROMs). As the name implies, a computer can read information from ROM chips, but cannot alter the information. However, there are two other variations of ROM chips also used in cartridges.

The first is called a PROM—*Programmable Read Only Memory.* This is a type of ROM chip which can be programmed once by the user. After the program is stored in the PROM chip, it cannot be changed. The device used to program a PROM chip is called a *PROM burner* (a term which is sometimes confused with the character played by Sissy Spacek in the movie *Carrie*).

Another variation is the EPROM—*Eraseable-Programmable Read Only Memory.* This is a PROM chip which can be erased as well as programmed. EPROMs are easy to spot because the top of the chip contains a small "window." (Sometimes the window is protected by a sticker.) The window exposes the EPROM circuitry, which is designed to be sensitive to certain wavelengths of ultraviolet light. If the chip is exposed for a certain time to this light (which can come from a special lamp or even strong sunshine), the circuitry is completely erased.

The EPROM chip can then be reprogrammed with an EPROM burner, a device similar in function to a PROM burner. An EPROM burner sends pulses of electricity through the chip to encode the new program. Unless the EPROM is exposed to ultraviolet light again, it stores the new program permanently, even when the cartridge is unplugged from the computer or the power is shut off.

Without taking a cartridge apart, it's not immediately obvious whether it contains ROMs, PROMs, or EPROMs, since they function identically. PROMs and EPROMs are generally used by small software companies or for cartridges which aren't expected to sell a great number of copies. If a company knows it will be producing a certain cartridge in large quantities, it's usually more economical to order ROMs.

PROMs and EPROMs also are used for product development and by home hobbyists. For instance, it's possible to customize the operating system in your computer or disk drive by prying out the ROM chips and replacing them with your own PROMs or EPROMs. You could also make cartridge versions of your favorite disk- or tape-based programs by storing them on PROMs or EPROMs, then plugging the chips into a bare cartridge board. However, this requires some technical expertise and isn't recommended for those who possess more than two thumbs.

The term *firmware* was invented to cover such hybrids as cartridges, which are a combination of software and hardware. Functionally, a cartridge is software, since it contains a program; but once it's plugged into the computer, it's like part of the hardware.

Q. What is a "parser"?

A. A parser is a program (or subroutine within a program) that interprets keyboard input from a user. For example, text-oriented adventure games have parsers which act on such commands as OPEN BOX or GO WEST. Because computers have a difficult time understanding human languages—which are complex and full of ambiguities—most parsers are fairly primitive. Usually they are limited to interpreting simple two-word sentences which consist of a verb followed by a noun, selected from a restricted vocabulary. OPEN BOX is simple enough for most parsers to handle, but they run into problems with sentences like "Lift the lid of the receptacle so I can see what's inside."

A New Data Storage Device

Charles Brannon
Program Editor

We've received an occasional letter from a reader who has typed in a long program, only to lose it when the computer is turned off. The feeling of shock, discovering that the program is gone, is like loading a dishwasher with china and silver, only to find it empty after a power failure. Information stored in RAM can't survive without an uninterrupted flow of electricity. What you need is a more permanent long-term form of storage, outside of your computers's RAM.

Most Commodore 64 owners buy a disk drive when they buy the computer, or soon upgrade, if only to access the Commodore 64 software library. Practically all 64 software is only available on disk. Some programs are stored on plug-in ROM cartridges, a medium especially popular with the VIC (since a disk drive costs more than the computer). Some VIC programs, but very few 64 programs, are available on cassette tape.

If you're using your computer in isolation, with no need for commercial software, you can choose any mass storage you need. A cassette drive is fine for occasional computing, but its slow speed can tax your patience. "TurboTape" (COMPUTE!, January 1985 and COMPUTE!'s GAZETTE, July 1985) and commercial tape-speedup software makes tape use reasonable. In fact, "TurboTape" can load a program faster than the 1541 disk drive.

What A Wafer

But tape drives aren't yet obsolete technology. A company named Entrepo has spent about $8 million to develop the Quick Data Drive (QDD), a high-speed, inexpensive mass storage technique using magnetic tape. The QDD doesn't use cassette tapes. Instead, Entrepo uses a "stringy floppy," or wafer cassette. The wafer is a tiny tape shell (a little larger than a book of matches) holding a continous loop of magnetic tape. The drive can transport the tape at much higher speeds than cassette tape, with no risk of breakage.

The QDD is a dedicated data device, unlike cassette drives, which were adapted from audio tape players. The tiny QDD drive (2-1/4 × 3-1/2 × 6 inches) can store from 25K to 170K on a tape, depending on the tape length. A shorter tape permits a faster seek time. Like cassette tapes, wafers are accessed serially. You have to skip past one program to get to the next, so a short tape lessens the time it takes to loop completely through the tape. With a ten-foot tape (25K), the average access time to locate a file is eight seconds. It takes nearly a minute to find a file on the 170K, 62-foot tape. It's best to use short tapes for quick work, and longer tapes for backups. The 170K tape is ideal for archiving a disk.

Once the file is found, it loads extremely quickly. Entrepo claims that the QDD can load a 24K program in 20 seconds as compared to one minute for a disk or eight minutes for a cassette drive.

The QDD comes with a custom wafer management system, the Quick Operating System (QOS). The QOS permits you to use normal SAVE and LOAD commands, just as with tape. The QOS supports named files and directories. You can also read and write high-speed wafer data files.

An extension of QOS, the File Management Utility (FMU), is loaded into RAM and available with LOAD "FMU". It permits you to copy programs from tape or disk to the wafer or vice-versa, format a new wafer, view a wafer directory, create a new QOS master tape, delete a file (makes the file inaccessible, but doesn't free up the space used), and clean the QDD with an optional cleaning wafer (you can use a cotton swab and alcohol to do this manually).

Phantom QOS

QOS and FMU can also be run from *Phantom QOS* (an optional cartridge). This lets you instantly access the QDD, and is less sensitive to interference from other programs. This is handy, since many programs would otherwise wipe out QOS from memory. Unfortunately, many programs, such as *SpeedScript*, can't work in tandem with QOS and the QDD, since they take over the entire system. With the *Phantom QOS* cartridge, I was able to load and run *SpeedScript* from a wafer, but could not load or save *SpeedScript* documents to the QDD. This could be a primary limitation of the QDD system, one which Entrepo should investigate more fully.

The QDD may not be a substitute for a disk drive, but is a workable alternative. You can even buy some commercial software on wafer. Entrepo sells some commercial products on the wafer format, including *Aztec Warrior* from Cosmi ($14.95), *Impossible Mission* from Epyx ($25.95), *Speed File*, a database by Blue Bush Software ($34.95), and *Word Manager/Plan Manager*, a word processor and spreadsheet ($49.95). However, no software company directly supports the wafer format. You're limited to what software Entrepo can convert to wafer format. Entrepo continues to convert software to wafer format, and sells these programs for anywhere from $14.95 to $49.95. They expect to double their current number of programs by Christmas.

Entrepo
1294 Lawrence Station Rd.
Sunnyvale, CA 94089
Quick Data Drive, QOS master wafer, blank wafer $84.95
Phantom QOS Cartridge $29.95

machine language for beginners

Richard Mansfield
Senior Editor

A BASIC Fuse

Many ML programs start with a line like: 10 SYS 4000. I tried to find out how this was done in ML. Can you explain how this BASIC line was coded?

It's useful, especially for people who aren't familiar with ML, to be able to LOAD a program and just type RUN. They don't have to know about SYS or where to SYS, they can just treat an ML program as if it were a BASIC program and RUN it. That's why you'll often see this little BASIC fuse which ignites ML above it. Here's how to do it with an assembler:

```
10 *= 2049
20;                    set start of assembly to start of basic.
30;                    then assemble a line number and the sys token
40 .BYTE 11 8 10 0 158
50;                    now insert the sys address as characters
60 .BYTE "2070"
70;                    and add three zeros to mark end of basic program
80 .BYTE 0 0 0
90;                    and then reset the assembler to make it
100;                   put your ML program at the address given.
110 *= 2070
120 LDA #12:STA 5000; etc. Continue on here with ordinary ML.
```

The three zeros in line 80 are essential. When a program is loaded, lines are "relinked," in case the beginning of BASIC has been moved. A relink is where the computer goes rushing up through a BASIC program, making the pointers within each line point to the next line. These pointers will need this adjustment if the BASIC program has been relocated, since the pointers would contain invalid absolute RAM addresses following a relocation.

Three zeros signal the end of a BASIC program, and prevent any relinking beyond the zeros. Without their stopping it, the computer would continue on an insane path up through your ML program looking for line links, mindlessly altering ML instructions, and punching holes in the data throughout your program.

Flags Up And Down

Could you please describe what "flags" are in machine language programming?

A flag is a simple kind of variable. It has only two states: up or down, true or false, 1 or 0. If you were writing a game program, you might give the player the option of using either the keyboard or a joystick. From time to time, your program will want to know what was chosen and it can look to a "type-of-input" flag for the answer. You would set up this flag in the zone of your program which holds other data like screen messages, scores, etc.: **5000 INPUTFLAG .BYTE 1**

At the start of the game, you print a message "Joystick or Keyboard (J or K)" and then, assuming that the player enters "J" and a 1 in this flag is supposed to signal joystick input to your program, you would do nothing (1 is already there when you assembled the flag). If the player types K, you would **LDA #0:STA INPUTFLAG** to set the flag down. Later, you could **LDA INPUTFLAG: BEQ KEYROUTINE** if you needed to do something special to provide for keyboard input at some point in the program.

The microprocessor also has some flags built in, but they're all compressed into a single byte. Inside the microprocessor there is a special byte called the Status Register which holds information in a peculiar way: the *bits* within that byte are flags. Each bit is thought of as a separate entity.

Although *you* don't need to pay much attention to them, the microprocessor's flags are important to the branching instructions (BNE, BEQ, BCC, BCS, etc.) because a branch is or is not taken based on whether a particular flag is up (1) or down (0). For example, BEQ will only branch if the Z (zero) flag is up. BNE (Branch if Not Equal to zero) will only branch if that flag is down.

Who controls these flags? The computer does. It automatically sets the flags as necessary each time an instruction executes. Some instructions don't affect the flags, but many do. If you LDA #0, that sets the Z flag up. Then, a BEQ would branch, zero having been the result of the LDA instruction. Similarly, SEC:LDA #12:SBC #12 would flip up the Z flag and you could follow with a branching instruction.

Most of the flags can be ignored in all but the most esoteric programs. The two flags you'll normally be indirectly involved with are Z and C (carry) flags. The C flag is useful because you'll want to test it with the BCS (Branch if Carry Set) instruction for "greater-than" conditions or check for "less-than" conditions using the BCC branch (Branch if Carry Clear).

You can directly manipulate the flags, but the only time you'll want to do this is just before you add or subtract. Every time you subtract, you first need to SEC (SEt the Carry flag). Every time you add, you first need to CLC (CLear the Carry flag). That's because you don't want to introduce any random carries into your math. But, this is the only situation where beginning and intermediate ML programs will ever need to directly intervene with the Status Register and its collection of flags.

User Group Update

When writing to a user group for information, please remember to enclose a stamped, self-addressed envelope.

Send additions, corrections, and deletions for this list to:

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Greensboro, NC 27403
Attn: Commodore User Groups

User Group Notes

A new user group has formed for aircraft designers, builders, and pilots. Contact Carl Bogardus, Aircraft Designers, Builders and Pilots International, 1220 Birch Dr., Las Cruces, NM 88001.

The Suncoast 64s have a new address: P.O. Box 6628, Ozona, FL 34265.

The Southwestern Ohio Commodore Users Group also has a new address: P.O. Box 46644, Cincinnati, OH 45246.

New Listings

ALABAMA

WireGrass Micro-Computer Society, 104 Ridgedale Dr., Dothan Al 36301; or, 109 Key Bend Rd., Enterprise, AL 36301

ARIZONA

The Unknown Users, Steven E. Clark, P.O. Box 1471, Phoenix, AZ 85001

ARKANSAS

Commodore Club of Pine Bluff, Bruce Ashcraft, 3102 Daffodil, Pine Bluff, AR 71603

Triple-D Commodore Users, Don Hinkle, Jr., P.O. Box 301, Reyno, AR 72462

CALIFORNIA

Auburn Commodore Computer Club, Dan Wojdac, 2840 Lynn Lane, Auburn, CA 95603

Fremont, Union City, Newark, Hayward Users Group (F.U.N.H.U.G.), Russ Fisher, 36015 Pizarro Dr., Fremont, CA 94536

Librascope Computer Club, George Webb, 833 Sonora Ave., Glendale, CA 91201

COLORADO

Colorado Pet Users Group (CPUG), 676 S. Quentin St., Aurora, CO 80012

GEORGIA

C-64 Friendly Users Group, 2410 Hog Mountain Rd., Watkinsville, GA 30677

FLORIDA

Commodore Computer Club, P.O. Box 60514, Jacksonville, FL 32236-0514

IDAHO

Banana Belt Commodore Users Group (B.B.C.U.G.), P.O. Box 1272, Lewiston, ID 83501

ILLINOIS

Commonwealth Edison Employees Commodore Users' Group, John McDowell, 1910 S. Briggs St., Joliet, IL 60433-9987

IOWA

The Exchange, J. Hillsten, 102 E. Market Suite 1, Iowa City, IA 52240

MAINE

Southern Arostook Commodore User's Group (S.A.C.U.G.), Robert Reece, P.O. Box 451, Houlton, ME 04730

Commodore Hackers Advanced Operating System (CHAOS), Joseph Mayo, 750 Hancock St., Rumford, ME 04276

MARYLAND

User Group U.S.A., David Snyder, Rt. 2, Box 197, Pomfret, MD 20675

Rosedale Users Group (R.U.G.), Mike Bragg, 12 Bardia Ct., Rosedale, MD 21237

MICHIGAN

Van Buren Users' Group (V-BUG), Robert Tompsett, 50984 35 1/2 St., Maple Lake, Paw Paw, MI 49079

MINNESOTA

Worthington Commodore Computer Society, Mark Derby, Rt. 2, Box 261, Worthington, MN 56187

NEBRASKA

Lincoln Commodore User's Group, P.O. Box 30665, Lincoln, NE 68503

NEVADA

Tri-Level Commodore Users Group, Time Tepas or Elton Blair, P.O. Box 43272, Las Vegas, NV 89116

NEW JERSEY

Cumberland County Commodore Users Group, William Sampson, 1976 N. East Ave., Vineland, NJ 08360

NEW YORK

Micro-Hut Users Group, Joseph Moon III, 62 E. Main St., Bay Shore, NY 11706

Riverhead Commodore Club, Marlin Miller, 39 Further Ln., Riverhead, NY 11901

NORTH CAROLINA

Salisbury Compute, C.A. Huffman, Rt. 1, Box 349B, Salisbury, NC 28144

Cleveland/Gaston Commodore User's Group (CGCUG), Robert Stone, Rt. 2, Box 234-C, Shelby, NC 28150

SOUTH CAROLINA

B.I.B.S., Taine Gilliam, SPO 786, Charleston, SC 29424

Spartanburg Commodore Users Group (S.P.A.R.C.U.G.), P.O. Box 319, Spartanburg, SC 29304

TEXAS

Commodore Brazos Users Group (C-BUG), P.O. Box 9622, College Station, TX 77840

VERMONT

Green Mountain Commodore Users Group (GMCUG), P.O. Box 6087, Rutland, VT 05701

WEST VIRGINIA

West Virginia Statewide Users Group, Box 50, Kilsyth, WV 25859-0050

C-64 Programmers of America, Rt. 1, Box 119A, Meadow Bridge, WV 25976

WISCONSIN

Milwaukee Area Commodore Enthusiasts (M.A.C.E.), P.O. Box 183, Greendale, WI 53129

Kewaunee & Brown County Computer Club (KB Triple C), Chris Sevcik, Rt. 2, Kewaunee, WI 54216

OUTSIDE THE U.S.

CANADA

International Commodore 64 Users Group, Jason Belsey, 22559, Hinch Cres, Maple Ridge, BC Canada, V2X 7H5

ITALY

San Vito Commodore Users Group, Gary Guenther, Box 958 NSGA, APO, NY 09240-5363

PERU

Lima Commodore Club, Monte Grande 109 #508, Lima 33, Peru

64 Disk Boot For BASIC Programs

Andrew Werth

If you've discovered a clever time-saving technique or a brief but effective programming shortcut, send it to "Hints & Tips," c/o COMPUTE!'s GAZETTE. *If we use it, we'll pay you $35.*

Have you ever wanted to be able to load a program and see it automatically run? The traditional technique for making autorun programs is to write a machine language boot program that loads and runs the other program. So you need to type in a utility program which creates the boot program which, in turn, loads and runs the main program.

But there's a much easier way to create an autorun program. You don't need to know machine language—you don't even have to type in a program. It's just a matter of adding one line to your BASIC program and entering a few POKEs before you save to disk (unfortunately, the technique doesn't work with tape because the tape buffer gets in the way).

First, load a BASIC program from disk and enter LIST–10. Make sure there isn't a line 1. If there is, renumber it appropriately. Now add this line:

```
1 POKE 770,131: POKE 771,164
```

There's an important pointer in locations 770–771 (see below for an explanation). This line sets the pointer back to normal when the program first runs.

Now insert a formatted disk and save the program with this series of POKEs:

```
POKE 770,113: POKE 771,168: POKE 43,0:
  POKE 44,3: SAVE "filename",8
```

Press RETURN only after you've typed the whole line; don't enter any of the POKEs on separate lines. The four POKEs and the SAVE *must* be on the same logical line (which will take up two screen lines). After the program is saved to disk, the computer will lock up. Remove the disk and turn your 64 off and then on. Now, enter **LOAD "*filename*",8,1** and you should see the program load and automatically run. The screen will be overwritten by parts of the previous screen, which was saved along with the BASIC program. If you prefer not to see the extra characters, you can preface the POKEs and SAVE above with a PRINT statement that clears the screen.

Everything from location 768 to the end of your BASIC program is saved, so if you've changed vectors in that area, they will remain changed. To disable the STOP or RESTORE keys, or prevent others from LISTing, enter these POKEs before saving (they can be on separate lines if you like):

POKE 808,239 (disable STOP)
POKE 792,193 (disable RESTORE)
POKE 775,191 (disable LIST)

Of course, these protection schemes are double-edged. If you prevent the STOP key from working, you won't be able to use it yourself if you want to break out of the program. It's best to keep a backup copy in case you need to make a change sometime later. Save the backup as a regular BASIC program without the autorun feature and without LIST or STOP protection. Here are the POKEs to set things back to normal:

POKE 808,237 (enable STOP)
POKE 792,71 (enable RESTORE)
POKE 775,167 (enable LIST)

How It Works

You don't have to understand how the program works to use it, but for those interested, here's a brief explanation.

The IMAIN vector, at locations 770–771, holds the address of a routine called MAIN. Sixty times a second, MAIN checks to see if a key has been pressed. No one can type that fast, so when a program is not running, the 64 spends most of its time waiting.

Once it detects a keypress, MAIN prints the character on the screen and waits for more keystrokes. If you press RETURN, it evaluates the line you've typed. If the line starts with a number, the 64 assumes you're typing in a BASIC program and adds the line to the program in memory. Otherwise, it tries to execute the commands you entered.

Elsewhere in memory is the routine for running a BASIC program (MAIN goes to this routine when you type RUN and press RETURN). The POKEs above caused the IMAIN vector to point to RUN instead of MAIN. So after loading the autorun program, the computer looks for the MAIN routine by jumping through the IMAIN vector. But IMAIN points to RUN, so BASIC jumps there and automatically runs the program just loaded.

To include the doctored IMAIN in the saved program, we lowered the beginning of BASIC to hexadecimal $0300 (decimal 768) right before saving. The computer locks up because after the SAVE the computer looks at IMAIN. But we've changed IMAIN to point to RUN, so it tries to run the program beginning at $0300 (because we lowered the pointer to the beginning of BASIC). There's no BASIC program there, just a bunch of pointers, so the computer freezes up. You have to reset it—turn it off and then on—to straighten things out.

news & products

64 Business Packages

InfoDesigns has released a series of integrated business accounting packages for the Commodore 64 and 128 computers. The programs include *General Ledger*, which tracks income, expenses, net worth, and also prints financial reports; *Payroll*, which maintains employee files, generates reports, and calculates and prints paychecks; *Inventory*, which maintains up to 1800 inventory items per disk, carries out automated parts ordering, and produces inventory reports; *Payables*, which keeps track of vendors, unpaid invoices, and prints aged open invoice listing and checks; and *Receivables*, which maintains open invoice items, prints bills, and produces a series of management reports.

Each of the modules automatically posts data to the *General Ledger's* customized chart of accounts. The *General Ledger* program can maintain up to 300 accounts, 1500 transactions per update, unlimited transactions per month, and several key reports (G/L audit listing, profit and loss statement, balance sheet, and trial balance).

The modules are available on disk in two versions, one for $49.95 each and the other for $79.95 each.

Info Designs, Inc., 445 Enterprise Court, Bloomfield Hills, MI 48013

Circle Reader Service Number 260.

Printer/Word Processor Packages

Two new printers from Blue Chip Electronics, the D12/10 and the M120/NLQ, are each packaged with a built-in Commodore interface and a word processor for Commodore computers.

The D12/10 is a daisywheel printer which prints at a rate of 12 characters per second. Its printing capabilities include sub- and superscripts, eight languages, bold, underlining, pica and elite. The M120/NLQ offers near-letter-quality dot-matrix printing at a rate of 100 characters per second. It features six graphics modes, 44 European characters, and 140 special and graphics characters.

Each printer has a built-in Commodore interface and is compatible with the Commodore 64, 128, 16, Plus/4, SX64, and VIC-20. The word processing software included with each printer is a version of *Fleetwriter* by Professional Software. It features on-screen tutorials, a calculator, telecommunications functions, and an 80-column preview mode. Each printer and software package sells for $249.

Blue Chip Electronics, Inc., Two W. Alameda Dr., Tempe, AZ 85282

Circle Reader Service Number 261.

The $249 D12/10 letter-quality daisy wheel printer from Blue Chip Electronics.

Life-Like Baseball

Three-dimensional perspectives and animation are among the features of *Hardball*, a new baseball simulation from Accolade. Six different pitches—fast balls, sliders, curve balls, screwballs, change-ups, and sinkers—can be thrown by either a right- or left-handed pitcher. Also possible are intentional walks, substitutions, bunts, base stealing, and infield/outfield repositioning.

Hardball is available for the Commodore 64 and 128, and requires a joystick. Suggested retail price is $29.95.

Accolade, Inc., 20863 Stevens Creek Blvd., Cupertino, CA 95014

Circle Reader Service Number 262.

New MIDI Software

Passport Designs, Inc., has introduced several new programs for use with the MIDI music interface. Among them are *MIDI/4 plus* and *MIDI/8*, four-channel and eight-channel recording programs featuring auto-correct, punch in/out, fast forward/rewind, sequence chaining, and synchronization to tape, MIDI, and drum machines. *MIDI/4 plus* and *MIDI/8* run on the Commodore 64 with a disk drive, a MIDI synthesizer, and the MIDI interface. The tape sync feature requires an external sync box or the new MIDI interface with tape sync. *MIDI/4 plus* retails for $99.95; *MIDI/8* for $149.95.

Also new for the MIDI is a series of 13 educational programs for the Commodore 64 called *Musicware*. The programs cover lessons in theory, ear training, and sight reading from elementary to advanced levels. Among the titles are *Keyboard Blues, Keyboard Note Drill*, and *Keyboard Kapers*. The programs run on the Commodore 64 and require a MIDI synthesizer and MIDI interface. Prices range from $39.95 to $79.95 for each program.

Another new Passport release is the MIDI version of Brøderbund's popular program *The Music Shop*, with which users can create, store, and edit compositions. Up to eight voices and eight time signatures are available. The program runs on the Commodore 64 or 128 and requires a disk drive, a MIDI keyboard, a joystick, the MIDI interface, and a dot-matrix printer with graphics interface. Suggested retail price is $99.95.

Passport Designs, Inc. 625 Miramontes St., Ste. 103, Half Moon Bay, CA 94019

Circle Reader Service Number 263.

Printer Interface

Omnitronix has released the PRINTMASTER/S, an RS-232 printer interface which hooks up to the Commodore serial bus and provides complete RS-232 signals for use with any RS-232 printer. The PRINTMASTER/S is switch selectable for 300, 600, 1200, and 2400 baud, plus parity, word, and stop bits.

The interface also supports all Commodore graphics on all RS-232 versions of dot-matrix printers, including Epson, Okidata, Gorilla, C. Itoh, and more. Suggested list price is $119.50.

Omnitronix Inc., P.O. Box 43, Mercer Island, WA 98040

Circle Reader Service Number 264.

Viewtron For Commodore

Viewdata Corporation is now offering its Viewtron online service to Commodore users in most cities. Subscribers to Viewtron have access to up-to-the-minute news, weather forecasts, continuous sports scores, current stock prices, airline schedules and fares, an encyclopedia, consumer reports, and movie and book reviews. Subscribers can also send electronic messages, and pay bills through certain banks.

Viewdata has also developed services especially for Commodore subscribers. These include Commodore software reviews and ratings, discounts on software and hardware, Commodore special interest clubs, and software and hardware advice from experts and other subscribers.

Viewtron is available in all areas of the country with access to a Telenet, Tymnet, or Uninet number except Massachusetts, New Hampshire, Vermont, and Maine. Rates for Viewtron are nine cents a minute weekends and evenings after 6 p.m., and 22 cents a minute weekdays. There is no monthly minimum and no charge for subscribers using 1200-baud modems. The Viewtron Software Starter Kit sells for $9.95, or is included without charge with the purchase of an Anchor Automation modem from Viewdata.

Viewdata Corp. of America, Inc., 1111 Lincoln Rd., 7th Floor, Miami Beach, FL 33139

Circle Reader Service Number 265.

Electronic Gradebook

Smoky Mountain Software's new *Grade Manager III* is a grade calculation, management, and reporting system for teachers of all levels. The program can hold information on up to 95 assignments, grades for up to six terms per school year, times absent, times tardy, and bonus points. Each file (class or subject) can have up to 100 students, with an unlimited number of files.

Up to 30 files, or 600 students records, can be merged for the Report Card Summary. *Grade Manager III* runs on the Commodore 64 or 128; retail price is $69.95.

Smoky Mountain Software, P.O. Box 1710, Brevard, NC 28712

Circle Reader Service Number 266.

Karate Champ At Home

A version of the arcade game *Karate Champ* is now available for the Commodore 64 and 128. Using a joystick, players can execute spins, kicks, somersaults, reverse punches, and defensive blocks. The player can compete against the computer or against another player.

Play begins with a warm-up, followed by three rounds of competition. As a player's competence increases, each level of play becomes more difficult. The game requires a joystick, and sells for $29.95.

Data East USA, Inc., 470 Gianni St., Santa Clara, CA 95054

Circle Reader Service Number 267.

Karate Champ *for the Commodore 64 and 128.*

Analog Interface

Proteus Electronics has released the "Simple Interface" Analog Data Acquisition System, which consists of the Simple IF interface card and the Analog Data Acquisition Conditioner (ADAC). The system enables Commodore users to digitize 16 channels of analog signals. Possible applications are heating/cooling/solar control, voltage measurements, robotics, and weather station monitoring.

The Data Acquisition System can be operated in two modes: normal mode, where all channels are scanned, or fast mode, where only the desired number of channels are scanned. The Simple IF card plugs into the expansion port on the back of the computer. Programming may be performed using BASIC or machine language. A demo disk which demonstrates the system is available for $9.95 .

For the Commodore 64, 128, or VIC-20 (with adapter); suggested retail is $99.90.

Proteus Electronics, Inc., P.O. Box 693, Bellville, OH 44813

Circle Reader Service Number 268.

Of Words And Wallabies

Wally's Word Works, a new educational program from Sunburst, features a bouncing wallaby who hops along sentences and picks up words. Players earn points by directing Wally to deposit a word in the correct part-of-speech pocket.

The program is available for the Commodore 64 and comes in a choice of three packages: *Wally's Workout*, the elementary level; *Pocket Pitfalls*, the junior high level; and *Rover's Revenge*, for senior high to adult. The $65 price includes a teacher's disk with backup, one student disk, and a teacher's guide.

Sunburst Communications, Inc., 39 Washington Ave., Pleasantville, NY 10570

Circle Reader Service Number 269.

New Star Trek Adventure

Players can now assume the role of Captain Kirk in a new text adventure game from Simon & Schuster. The challenge of *Star Trek: The Kobayashi Adventure* is to solve a mystery while the fate of the galaxy hangs in the balance. Players command all the resources of the Enterprise—phasers, transporters, communications, sensor, and crew. The game incorporates a "personality database" for each of the familiar Star Trek characters.

Produced in cooperation with the original creators of the Star Trek television series, the program is available for the Commodore 64 for $39.95.

Simon & Schuster Electronic Publishing, 1230 Avenue of the Americas, New York, NY 10020

Circle Reader Service Number 270.

Action Hockey

Artworx has released *International Hockey*, a sequel to its popular *Slapshot Hockey*. With the new version, the user can play directly against the computer at three different skill levels. The game also features speech synthesis and two-player action.

International Hockey is available for the Commodore 64 and 128; list price is $24.95.

Artworx Software Company, Inc., 150 N. Main St., Fairport, NY 14450

Circle Reader Service Number 271.

Family File

A new set of four programs for home management is available from Spectrum 1 Network. Called Peace of Mind, the package includes *Home Inventory*, a file for recording possessions and their values; *Credit Card Guardian*, which can hold data on up to 60 credit cards; *Private Messages*, a text file of up to 100 lines; and *Vital Statistics*, which stores information about bank accounts, insurance, investments, names and addresses, and more.

Peace of Mind runs on the Commodore 64; suggested retail price is $19.95.

Spectrum 1 Network, P.O. Box 7464, Burbank, CA 91510

Circle Reader Service Number 272.

Paper Airplane Kit

The Great International Paper Airplane Kit for the Commodore 64 has been introduced from Simon & Schuster. Included are over a dozen full-page paper airplane designs from biplanes to space shuttles. A library of aviation graphics can be used to furnish the planes with insignias, logos, rockets, windows, engines, pilots, and stewardesses.

Accompanying the package is a step-by-step manual that offers instructions and suggestions, along with a history of paper airplanes. Suggested price is $34.95.

Simon & Schuster Electronic Publishing Inc., 1230 Avenue of the Americas, New York, NY 10020

Circle Reader Service Number 273.

More *Print Shop* Graphics

Brøderbund has released a new volume of graphics for its popular program *The Print Shop*. *The Print Shop Graphics Library, Disk 2* contains 120 new designs, symbols and pictures. Graphics for health, sports, animals, hobbies, and jobs are among those included.

The *Library* runs on the Commodore 64 with disk drive and the original *Print Shop* program. Suggested retail price is $24.95.

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

Circle Reader Service Number 274.

Submarine Simulation

MicroProse has released a World War II submarine simulation for the Commodore 64 called *Silent Service*. The player captains a U.S. wartime submarine in the Pacific from the engine room, conning tower, and ship's bridge. Combat weapons include five-inch gun and Mark XIV torpedoes. Maps and charts of the Southwest Pacific and an attack plotting system enable strategic planning. Players can select from various patrol sectors and complexity levels.

Silent Service retails for $34.95.

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

Circle Reader Service Number 275.

Talking Teacher

A new educational program from Imagic uses speech synthesis, animated letters, and music to teach vocabulary, spatial relationships, and placement of letters on the keyboard. *Talking Teacher* contains a 200-plus vocabulary and is designed for children ages two to eight.

For the Commodore 64; suggested retail price is $34.95.

Imagic, 2400 Bayshore Frontage Rd., Mountain View, CA 94043

Circle Reader Service Number 276.

The Whole Bit, Revised

Applied Technologies has released Version 2.1 of *The Whole Bit*, its word processing program for the Commodore 64. Features of this program include user-customized print commands; menu selection of printers; 80-column preview capability; chain file/chain print; user-selectable screen and character colors; standard text editing features; and left, right, and block justification.

The program is now available with the instruction manual on the program disk, from which it can be chain printed, for $24.95. Or it can be purchased with a hardcopy instruction manual in a binder for $39.95.

Applied Technologies, Inc., Computer Products Division, Lyndon Way, Kittery, ME 03904

Circle Reader Service Number 277.

bug-swatter

Modifications and Corrections

• Several readers reported that although "QuickScan" (September) works fine, it seems to prevent loads, saves, and disk access in general. This is no fault of QuickScan; the highlighted bar is made up of sprites, and sprites can interfere with the timing of disk reads and writes. Press RUN/STOP–RESTORE to disable QuickScan before saving or loading.

• "Weather Prophet" (September) requires a few corrections. First, most entries should be in whole numbers. Don't use fractions for wind speed, temperature, humidity, etc. Two exceptions are rainfall and snowfall, which are measured in fractions of an inch.

If you request a search for a record number past the end of the file, the program crashes. Change line 1070 to avoid this:

```
1070 PRINT"RECORD NUMBER FOR
  SEARCH?": INPUTR: IF R>TR%
  THEN GOSUB 1100: GOTO 1060
```

Also, the GOTO 1270 in line 1680 should be changed to GOTO 100 to reset variables when an entry is being corrected.

Readers who use the "Automatic Proofreader" may have encountered an incorrect checksum for line 2290. Adding a period after the message in the PRINT statement will fix this.

• While "Crunch" (August) is crunching a program, it analyzes lines for IF-THEN statements and references to other lines in the program. It handles GOTO (one word) correctly, but doesn't recognize GO TO (two words) as the equivalent of GOTO. Readers who have encountered an UNDEF'D STATEMENT error in a crunched program should load the original uncrunched version and change any instance of GO TO to GOTO.

• Readers who tried to type in "Automatic Syntax Checker" (October) may have noticed the instructions were incorrect. The starting address is not 49152, but 2049. To avoid memory conflicts, follow these directions:

1. Enter **POKE 44,15: POKE 3840,0: NEW**

2. Load and run MLX.

3. In response to the prompts, enter a starting address of 2049, ending address 3008.

4. After typing (and saving) the program, reset the computer—turn it off and on—before loading and running Automatic Syntax Checker.

How To Type In *COMPUTE!'s GAZETTE* Programs

Each month, COMPUTE!'s GAZETTE publishes programs for the VIC-20, Commodore 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. Also, carefully read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We publish two programs, appearing in alternating months, designed to make your typing effort 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 back on, erasing whatever was in memory. So be sure to *save a copy of your 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 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, [ ], 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. 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 {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.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT + ↑	

For Commodore 64 Only

When You Read:	Press:	See:
[1]	COMMODORE + 1	
[2]	COMMODORE + 2	
[3]	COMMODORE + 3	
[4]	COMMODORE + 4	
[5]	COMMODORE + 5	
[6]	COMMODORE + 6	
[7]	COMMODORE + 7	
[8]	COMMODORE + 8	

MLX Machine Language Entry Program For Commodore 64

Charles Brannon, Program Editor

MLX is a labor-saving utility that allows almost fail-safe entry of machine language programs published in COMPUTE!'s GAZETTE. You need to know nothing about machine language to use MLX—it was designed for everyone.

MLX is a new way to enter long machine language (ML) programs with a minimum of fuss. MLX lets you enter the numbers from a special list that looks similar to BASIC DATA statements. It checks your typing on a line-by-line basis. It won't let you enter illegal characters when you should be typing numbers. It won't let you enter numbers greater than 255 (forbidden in ML). It won't let you enter the wrong numbers on the wrong line. In addition, MLX creates a ready-to-use tape or disk file. You can then use the LOAD command to read the program into the computer, as with any program:

```
LOAD "filename" (for tape)
LOAD "filename",8,1 (for disk)
```

To start the program, you enter a SYS command that transfers control from BASIC to machine language.The starting SYS number always appears in the appropriate article.

Using MLX

Type in and save MLX (you'll want to use it in the future). When you're ready to type in an ML program, run MLX. MLX asks you for two numbers: the starting address and the ending address. These numbers are given in the article accompanying the ML program.

You'll see a prompt corresponding to the starting address. The prompt is the current line you are entering from the listing. It increases by six each time you enter a line. That's because each line has seven numbers—six actual data numbers plus a *checksum number*. The checksum verifies that you typed the previous six numbers correctly. If you enter any of the six numbers wrong, or enter the checksum wrong, the computer rings a buzzer and prompts you to reenter the line. If you enter it correctly, a bell tone sounds and you continue to the next line.

MLX accepts only numbers as input. If you make a typing error, press the INST/DEL key; the entire number is deleted. You can press it as many times as necessary back to the start of the line. If you enter three-digit numbers as listed, the computer automatically prints the comma and goes on to accept the next number. If you enter less than three digits, you can press either the SPACE bar or RETURN key to advance to the next number. The checksum automatically appears in inverse video for emphasis.

To simplify your typing, MLX redefines part of the keyboard as a numeric keypad:

```
  U I O          7 8 9
H J K L  become  0 4 5 6
  M , .          1 2 3
```

MLX Commands

When you finish typing an ML listing (assuming you type it all in one session) you can then save the completed program on tape or disk. Follow the screen instructions. If you get any errors while saving, you probably have a bad disk, or the disk is full, or you've made a typo when entering the MLX program itself.

You don't have to enter the whole ML program in one sitting. MLX lets you enter as much as you want, save it, and then reload the file from tape or disk later.

MLX recognizes these commands:

SHIFT-S: Save **SHIFT-N: New Address**
SHIFT-L: Load **SHIFT-D: Display**

When you enter a command, MLX jumps out of the line you've been typing, so we recommend you do it at a new prompt. Use the Save command to save what you've been working on. It will save on tape or disk, as if you've finished, but the tape or disk won't work, of course, until you finish the typing. Remember what address you stop at. The next time you run MLX, answer all the prompts as you did before, then insert the disk or tape. When you get to the entry prompt, press SHIFT-L to reload the partly completed file into memory. Then use the New Address command to resume typing.

To use the New Address command, press SHIFT-N and enter the address where you previously stopped. The prompt will change, and you can then continue typing. Always enter a New Address that matches up with one of the line numbers in the special listing, or else the checksum won't work. The Display command lets you display a section of your typing. After you press SHIFT-D, enter two addresses within the line number range of the listing. You can abort the listing by pressing any key.

What if you forgot where you stopped typing? Use the Display command to scan memory from the beginning to the end of the program. When you reach the end of your typing, the lines will contain a random pattern of numbers. When you see the end of your typing, press any key to stop the listing. Use the New Address command to continue typing from the proper location.

See program listing on page 123.

Computing For Families: Screen Typing

(Article on page 108.)

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

```
100 POKE53280,0:POKE53281,0:PR
    INT"{CLR}{WHT}"     :rem 137
110 PRINTTAB(7);"{RVS}SCREEN T
    YPING"              :rem 170
120 PRINT"{DOWN}{RVS} F1 {OFF}
     CLEAR SCREEN":PRINT"
    {DOWN}{RVS} F3 {OFF} CHANG
    E LETTER COLOR"     :rem 229
130 PRINT"{DOWN}{RVS} F5 {OFF}
     CHANGE BORDER COLOR":PRIN
    T"{DOWN}{RVS} F7 {OFF} CHA
    NGE SCREEN COLOR"   :rem 154
140 DIMP$(12):L$="{BLK}{WHT}
    {RED}{CYN}{PUR}{GRN}{BLU}
    {YEL}{£1}{£2}{£3}{£4}{£5}{£6}{£7}
    {£8}":PRINTCHR$(8)  :rem 131
150 INPUT"ENTER NUMBER OF PEOP
    LE";N:IFN>12THEN150:rem 17
160 FORI=1TON           :rem 38
170 PRINT"{DOWN}PERSON NUMBER"
    I"'S NAME";         :rem 125
180 INPUTP$(I):P$(I)=LEFT$(P$(
    I),30):NEXTI        :rem 187
190 INPUT"{DOWN}NUMBER OF SECO
    NDS PER TURN";D:D=INT(D):I
    FD<30THEN190        :rem 75
200 TI$="000000":T1=0:L=0:B=0:
    S=0:P=0:TU=1        :rem 62
210 REM TYPING LOOP     :rem 140
220 GETA$               :rem 217
230 IFTI>T1THEN510      :rem 73
240 IFA$=""THEN220      :rem 206
250 IFASC(A$)<133THEN270
                        :rem 78
260 ONASC(A$)-132GOTO340,380,4
    40,470              :rem 167
270 IFA$=CHR$(20)THENPRINTCHR$
    (29)CHR$(20)CHR$(20)MID$(L
    $,L+1,1)"{RVS} {OFF}{LEFT}
    ";:GOTO320          :rem 23
280 IFA$="{HOME}"ORA$="{DOWN}"
    ORA$="{RIGHT}"ORA$="{CLR}"
    ORA$="{UP}"ORA$="{LEFT}"OR
    A$=CHR$(148)THEN220
                        :rem 169
290 IFA$=CHR$(34)THENA$=CHR$(3
    9)                  :rem 20
300 IFA$=CHR$(13)ORA$=CHR$(141
    )THENPRINTCHR$(29)CHR$(20)
    ;                   :rem 13
310 PRINTMID$(L$,L+1,1);A$;"
    {RVS} {OFF}{LEFT}";
                        :rem 172
320 IFPEEK(1063)<>96THEN340
                        :rem 19
330 GOTO220             :rem 99
340 REM CLEAR SCREEN    :rem 162
350 PRINT"{CLR}";MID$(L$,L+1,1
    );P$(P):POKE1063,96:rem 69
360 IFTU=1THENPOKE1024+LEN(P$(
    P)),42:POKE55296+LEN(P$(P)
    ),L                 :rem 194
370 GOTO220             :rem 103
380 REM CHANGE LETTER COLOR
                        :rem 116
390 L=L+1:IFL>15THENL=0
                        :rem 110
400 IFL=STHEN390        :rem 202
410 FORQ=0TO2:FORI=55296+QTO56
    295STEP3:POKEI,L:NEXTI,Q
                        :rem 195
420 GETJ$:IFJ$<>""THEN420
                        :rem 158
430 GOTO220             :rem 100
440 REM CHANGE BORDER COLOR
                        :rem 95
450 B=B+1:IFB>15THENB=0:rem 67
460 POKE53280,B:GOTO220:rem 64
470 REM CHANGE SCREEN BACKGROU
    ND COLOR            :rem 68
480 S=S+1:IFS>15THENS=0
                        :rem 138
490 IFS=LTHEN480        :rem 211
500 POKE53281,S:GOTO220:rem 77
510 REM NEXT TURN       :rem 2
520 IFTU=0THEN560       :rem 6
530 P=P+1:IFP>NTHENP=1  :rem 99
540 POKE53280,0:POKE53281,0:L=
    1:B=0:S=0           :rem 197
550 T1=T1+(D*60)-720:TU=0:GOTO
    340                 :rem 81
560 REM 12 MORE SECONDS WARNIN
    G                   :rem 58
570 TU=1:T1=T1+720:POKE1024+LE
    N(P$(P)),42:POKE55296+LEN(
    P$(P)),L            :rem 134
580 GOTO220             :rem 106
```

Preview-80

Version by Kevin Martin, Editorial Programmer

(See instructions in article on page 90 before typing in.)

```
52000 :173,063,009,201,179,208,097
52006 :008,169,131,141,063,009,047
52012 :076,067,203,173,066,009,126
52018 :201,167,240,008,169,159,226
52024 :141,177,009,076,067,203,217
52030 :169,119,141,066,009,169,223
52036 :213,141,038,003,169,203,067
52042 :141,039,003,169,103,141,158
52048 :028,003,169,203,141,029,141
52054 :003,169,202,141,040,003,132
52060 :169,203,141,041,003,032,169
52066 :122,204,076,013,008,072,081
52072 :165,152,240,090,165,186,078
52078 :201,003,208,084,173,244,255
52084 :206,208,065,138,072,152,189
52090 :072,165,001,141,115,204,052
52096 :041,254,133,001,165,251,205
52102 :141,111,204,165,252,141,124
52108 :112,204,165,253,141,113,104
52114 :204,165,254,141,114,204,204
52120 :032,239,204,173,111,204,091
52126 :133,251,173,112,204,133,140
52132 :252,173,113,204,133,253,012
52138 :173,114,204,133,254,173,197
52144 :115,204,133,001,104,168,133
52150 :104,170,169,000,141,244,242
52156 :206,140,115,204,032,122,239
52162 :204,172,115,204,104,076,045
52168 :145,242,165,145,201,127,201
52174 :096,173,108,204,076,202,041
52180 :241,141,108,204,165,145,192
52186 :016,252,169,000,133,198,218
52192 :165,152,240,235,165,186,087
52198 :201,003,208,229,165,001,013
52204 :141,115,204,041,254,133,100
52210 :001,140,110,204,142,109,180
52216 :204,164,251,140,111,204,042
52222 :164,252,140,112,204,164,010
52228 :253,140,113,204,164,254,108
52234 :140,114,204,172,116,204,192
52240 :132,251,172,117,204,132,000
52246 :252,172,118,204,132,253,129
52252 :172,119,204,132,254,160,045
52258 :000,173,108,204,145,253,149
52264 :238,118,204,208,003,238,025
52270 :119,204,172,121,204,032,130
52276 :177,204,169,001,133,198,166
52282 :169,014,141,119,002,173,164
52288 :120,204,201,066,208,003,098
52294 :032,239,204,173,111,204,009
52300 :133,251,173,112,204,133,058
52306 :252,173,113,204,133,253,186
52312 :173,114,204,133,254,173,115
52318 :115,204,133,001,173,108,060
52324 :204,174,109,204,172,110,049
52330 :204,096,000,000,000,000,150
52336 :000,000,000,000,000,160,016
52342 :000,181,000,000,169,000,212
52348 :141,116,204,141,157,204,063
52354 :141,120,204,141,121,204,037
52360 :141,118,204,169,160,141,045
52366 :117,204,141,158,204,169,111
52372 :181,141,119,204,169,032,226
52378 :160,000,153,255,255,200,153
52384 :208,250,238,158,204,173,111
52390 :158,204,201,192,240,004,141
52396 :169,032,208,236,096,201,090
52402 :013,240,031,201,008,240,143
52408 :023,201,032,144,018,072,162
52414 :041,128,074,141,238,204,248
52420 :104,041,063,013,238,204,091
52426 :145,251,238,121,204,096,233
52432 :206,121,204,096,238,120,169
52438 :204,169,000,141,121,204,029
52444 :173,116,204,024,105,080,154
52450 :141,116,204,173,117,204,157
52456 :105,000,141,117,204,096,127
52462 :000,173,244,206,240,001,078
52468 :096,173,116,204,201,160,170
52474 :208,007,173,117,204,201,136
52480 :000,240,241,169,000,141,023
52486 :240,206,141,241,206,141,157
52492 :242,206,141,243,206,133,159
52498 :198,169,006,160,000,153,192
52504 :000,216,153,000,217,153,251
52510 :000,218,153,000,219,200,052
52516 :208,241,160,000,185,245,051
52522 :206,240,006,032,202,241,201
52528 :200,208,245,032,096,206,011
52534 :032,228,255,240,251,174,210
52540 :092,205,221,092,205,240,091
52546 :006,202,208,248,076,054,092
52552 :205,202,138,010,170,169,198
52558 :205,072,169,050,072,189,067
52564 :105,205,072,189,104,205,196
52570 :072,096,011,002,012,014,041
52576 :016,018,020,145,157,017,213
52582 :029,003,125,205,136,205,037
52588 :145,205,160,205,240,205,244
52594 :251,205,004,206,022,206,240
52600 :040,206,062,206,084,206,156
52606 :169,042,141,241,206,169,070
52612 :023,141,243,206,096,169,242
52618 :000,141,240,206,141,242,084
52624 :206,096,032,122,204,104,140
52630 :104,169,001,133,198,169,156
52636 :014,141,119,002,096,165,181
52642 :184,141,238,204,032,204,141
52648 :255,169,000,032,189,255,044
52654 :169,007,162,004,168,032,204
52660 :186,255,032,192,255,162,238
52666 :007,032,201,255,169,181,007
52672 :133,252,169,000,133,251,106
52678 :160,000,177,251,032,210,004
52684 :255,200,240,015,204,118,212
52690 :204,208,243,165,252,205,207
52696 :119,204,208,236,076,227,006
52702 :205,230,252,208,237,032,106
52708 :204,255,169,007,032,103,230
52714 :203,174,238,204,076,201,050
52720 :255,169,040,141,240,206,011
52726 :169,039,141,242,206,096,115
52732 :169,000,141,241,206,141,126
52738 :243,206,096,173,243,206,145
52744 :240,004,206,243,206,096,235
52750 :173,241,206,240,003,206,059
52756 :241,206,096,173,242,206,160
52762 :240,004,206,242,206,096,252
52768 :173,240,206,240,241,206,058
52774 :240,206,096,173,243,206,178
52780 :201,023,240,004,238,243,225
52786 :206,096,173,241,206,201,149
52792 :042,240,219,238,241,206,218
52798 :096,173,242,206,201,039,251
52804 :240,004,238,242,206,096,070
52810 :173,240,206,201,040,240,150
```

```
52816 :197,238,240,206,096,169,202
52822 :255,141,244,206,032,122,062
52828 :204,104,104,096,173,241,246
52834 :206,133,252,169,080,133,047
52840 :251,024,169,000,162,008,206
52846 :106,102,251,144,003,024,228
52852 :101,252,202,016,245,133,041
52858 :252,165,251,024,109,240,139
52864 :206,133,251,165,252,105,216
52870 :160,133,252,169,040,133,253
52876 :253,169,004,133,254,160,089
52882 :000,162,000,177,251,145,113
52888 :253,200,192,040,208,247,012
52894 :236,243,206,208,009,172,208
52900 :242,206,177,253,009,128,155
52906 :145,253,160,000,165,251,120
52912 :024,105,080,133,251,165,166
52918 :252,105,000,133,252,165,065
52924 :253,024,105,040,133,253,228
52930 :165,254,105,000,133,254,081
52936 :232,224,024,208,200,173,237
52942 :240,206,056,109,242,206,241
52948 :170,032,031,207,141,033,058
52954 :004,142,034,004,173,241,048
52960 :206,056,109,243,206,170,190
52966 :032,031,207,141,038,004,171
52972 :142,039,004,096,000,000,005
52978 :000,000,000,019,208,082,039
52984 :069,214,073,069,087,056,048
52990 :048,032,032,032,032,032,206
52996 :032,032,032,032,032,032,196
53002 :032,032,032,032,032,032,202
53008 :032,032,032,032,032,195,115
53014 :058,048,049,032,210,058,221
53020 :048,049,000,169,000,248,030
53026 :224,000,240,006,024,105,121
53032 :001,202,208,250,216,141,034
53038 :238,204,041,015,024,105,161
53044 :048,170,173,238,204,074,191
53050 :074,074,074,024,105,048,201
53056 :096,013,013,013,013,013,225
```

Power BASIC: Screen Customizer

(Article on page 87.)

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Program 1: Screen Customizer—64 Version

```
10 POKE56,128:CLR          :rem 221
20 FORG=32768TO32876:READA:C=C
   +A:POKEG,A:NEXT         :rem 26
30 IFC<>13765THENPRINT"{CLR}TY
   PING ERROR IN LINES 100-150
   .":STOP                 :rem 193
40 A$="{8 SPACES}":PRINT"{CLR}
   {DOWN}{6 SPACES}PRESS {RVS}
   RESTORE{OFF} TO ACTIVATE."
                           :rem 112
50 PRINT"{2 DOWN}"A$"POKE1020,
   <BORDER COLOR>"         :rem 214
60 PRINT A$"POKE1021,<SCREEN C
   OLOR>"                  :rem 116
70 PRINT A$"POKE1022,<CURSOR C
   OLOR>"                  :rem 148
80 PRINT A$"POKE1023,<CHARACTE
   R COLOR>"               :rem 69
90 PRINT"{2 DOWN}TYPE {RVS}SYS
    32785{OFF} TO READ NEW VEC
   TOR VALUES"             :rem 150
100 DATA 11,128,11,128,195,194
    ,205,56,48,161,128,32,17,1
    28,76,29,128,160       :rem 225
110 DATA 204,185,52,2,153,128,
    128,200,208,247,96,169,0,1
    41,252,3,169,11        :rem 160
120 DATA 141,253,3,169,1,141,2
    54,3,141,255,3,169,58,141,
    0,128,141,2,128        :rem 147
130 DATA 108,20,3,32,129,255,3
    2,138,255,160,204,185,128,
    128,153,52,2,200       :rem 199
140 DATA 208,247,173,255,3,141
    ,33,208,173,252,3,141,32,2
    08,173,254,3,141       :rem 205
150 DATA 134,2,169,147,32,210,
    255,173,253,3,141,33,208,1
    62,255,76,139,227      :rem 14
```

Program 2: Screen Customizer—VIC Version

```
10 FORA=673TO760:READB:C=C+B:P
   OKEA,B:NEXT:IFC<>9728THENPR
   INT"{CLR}ERROR IN DATA":END
                           :rem 120
20 PRINT"{CLR}TYPE SYS 673 TO
   {SPACE}TURN{2 SPACES}CUSTOM
   IZER ON AND OFF"        :rem 243
30 PRINT"{DOWN}POKE LOCATION 2
    WITH{2 SPACES}THE CHARACTE
   R COLOR"                :rem 40
40 PRINT"{DOWN}POKE LOCATION 3
    WITH{2 SPACES}THE BACKGROU
   ND/BORDER COLOR"        :rem 106
50 DATA 162,173,160,254,173,24
   8,2,73,1,141            :rem 13
60 DATA 248,2,240,4,162,186,16
   0,2,142,24              :rem 164
70 DATA 3,140,25,3,96,72,138,7
   2,152,72                :rem 77
80 DATA 173,29,145,16,46,45,30
   ,145,170,41             :rem 226
90 DATA 2,240,41,32,63,253,208
   ,3,108,2                :rem 60
100 DATA 160,44,17,145,32,52,2
    47,32,225,255          :rem 59
110 DATA 208,19,32,249,253,32,
    24,229,165,2           :rem 16
120 DATA 141,134,2,165,3,141,1
    5,144,108,2            :rem 200
130 DATA 192,76,255,254,76,222
    ,254,0                 :rem 240
```

Auto-File

(See instructions in article on page 88 before typing in.)

```
2049 :013,008,010,000,158,040,230
2055 :050,048,054,055,041,000,255
2061 :000,000,046,068,073,082,026
2067 :169,001,162,008,160,001,008
2073 :032,186,255,169,004,162,065
2079 :015,160,008,032,189,255,178
2085 :032,192,255,169,086,133,136
2091 :251,169,008,133,252,162,250
2097 :001,032,201,255,160,000,186
2103 :177,251,032,210,255,200,156
2109 :208,002,230,252,192,206,127
2115 :208,242,165,252,201,011,122
2121 :208,236,169,001,032,195,146
2127 :255,032,231,255,108,002,194
2133 :160,136,002,016,010,128,025
2139 :004,015,000,000,072,235,161
2145 :000,000,000,000,000,000,097
2151 :000,000,000,000,000,000,103
2157 :000,000,000,000,000,000,109
2163 :000,000,000,000,000,000,115
2169 :173,017,208,041,239,141,172
2175 :017,208,160,000,185,000,185
2181 :004,153,000,008,185,000,227
2187 :005,153,000,009,185,000,235
2193 :006,153,000,010,200,208,210
2199 :235,169,004,141,136,002,070
2205 :169,131,141,002,003,169,004
2211 :164,141,003,003,160,000,122
2217 :185,143,009,240,006,032,016
2223 :210,255,200,208,245,160,173
2229 :040,169,099,032,210,255,218
2235 :136,208,250,169,064,032,022
2241 :144,255,169,036,141,000,170
2247 :002,169,046,141,001,002,048
2253 :076,243,003,139,227,169,038
2259 :002,124,165,026,167,228,155
2265 :167,134,174,000,000,000,180
2271 :000,076,072,178,000,049,086
2277 :234,102,254,071,254,074,194
2283 :243,145,242,014,242,080,177
2289 :242,051,243,087,241,202,027
2295 :241,237,246,062,241,047,041
2301 :243,102,254,165,244,237,218
2307 :245,032,064,003,076,179,090
2313 :003,032,064,003,108,002,221
2319 :160,169,128,032,144,255,135
2325 :169,147,032,210,255,162,228
2331 :000,160,002,200,177,253,051
2337 :201,034,208,249,200,177,078
2343 :253,201,034,240,007,157,163
2349 :000,002,232,076,085,003,187
2355 :134,063,169,002,168,162,237
2361 :008,032,186,255,165,063,254
2367 :162,000,160,002,032,189,096
2373 :255,032,192,255,162,002,199
2379 :032,198,255,032,228,255,051
2385 :141,167,002,032,228,255,138
2391 :141,168,002,169,002,032,089
2397 :195,255,032,231,255,169,206
2403 :001,133,184,169,000,133,207
2409 :185,174,167,002,172,168,205
2415 :002,032,213,255,032,231,108
2421 :255,165,174,133,045,133,254
2427 :047,165,175,133,046,133,054
2433 :048,096,173,168,002,201,049
2439 :008,208,038,173,167,002,219
2445 :201,001,208,031,169,000,239
2451 :133,198,169,082,141,119,221
2457 :002,169,085,141,120,002,160
2463 :169,078,141,121,002,169,071
2469 :013,141,122,002,169,004,104
2475 :133,198,108,002,003,162,009
2481 :005,189,015,253,221,003,095
2487 :128,208,006,202,208,245,156
2493 :076,226,252,108,167,002,252
2499 :169,042,076,001,008,000,235
2505 :000,000,000,000,000,000,201
2511 :000,000,141,002,002,169,009
2517 :001,162,008,160,000,032,064
2523 :186,255,169,001,162,000,224
2529 :160,002,032,189,255,169,008
2535 :000,162,192,160,015,032,024
2541 :213,255,056,138,233,030,138
2547 :133,251,152,233,000,133,121
2553 :252,169,019,032,210,255,162
2559 :169,017,032,210,255,169,083
2565 :008,133,211,160,004,185,194
2571 :192,015,240,006,032,210,194
2577 :255,200,208,245,169,146,216
2583 :032,210,255,169,034,133,088
2589 :211,160,000,177,251,170,230
2595 :200,177,251,032,205,189,065
2601 :056,165,251,233,032,133,143
2607 :251,165,252,233,000,133,057
2613 :252,169,016,133,254,169,022
2619 :000,133,253,032,027,009,001
2625 :173,017,208,009,016,141,117
2631 :017,208,032,138,255,032,241
2637 :228,255,240,251,201,017,245
2643 :208,006,032,237,008,076,138
2649 :124,008,201,145,208,006,013
2655 :032,217,008,076,124,008,048
2661 :201,133,208,003,076,052,006
2667 :003,201,134,208,003,076,220
2673 :058,003,201,135,208,006,212
2679 :032,127,009,076,124,008,239
2685 :201,136,208,203,032,109,246
2691 :009,076,124,008,024,165,025
2697 :253,074,074,074,074,170,088
2703 :024,189,249,236,133,243,193
2709 :181,226,073,092,133,244,074
2715 :160,006,177,243,073,015,061
2721 :145,243,200,192,032,208,157
2727 :245,096,032,183,008,165,128
2733 :253,208,005,165,247,076,103
2739 :232,008,056,233,032,133,105
2745 :253,076,183,008,032,183,152
2751 :008,165,253,197,247,208,245
2757 :004,169,000,240,003,024,125
2763 :105,032,133,253,076,183,217
```

```
2769 :008,160,000,169,006,153,193
2775 :064,217,153,048,218,153,044
2781 :248,218,200,208,244,024,083
2787 :162,008,160,000,032,240,061
2793 :255,096,165,254,197,252,172
2799 :240,004,169,224,208,002,062
2805 :165,251,133,247,032,002,051
2811 :009,169,000,133,253,032,079
2817 :071,009,165,253,197,247,175
2823 :240,007,197,247,024,105,059
2829 :032,208,238,169,000,133,025
2835 :253,076,183,008,169,017,213
2841 :032,210,255,169,006,133,062
2847 :211,160,000,177,253,170,234
2853 :200,177,253,032,205,189,069
2859 :160,002,177,253,240,006,113
2865 :032,210,255,200,208,246,176
2871 :169,013,032,210,255,096,062
2877 :165,254,197,252,240,005,150
2883 :230,254,076,027,009,169,064
2889 :016,133,254,076,027,009,076
2895 :165,254,201,016,240,005,192
2901 :198,254,076,027,009,165,046
2907 :252,076,027,009,147,017,107
2913 :029,029,029,068,073,083,152
2919 :075,058,013,029,029,029,080
2925 :029,029,164,164,157,157,041
2931 :017,018,070,049,146,032,191
2937 :076,079,065,068,032,038,223
2943 :032,082,085,078,032,032,212
2949 :018,070,053,146,157,157,222
2955 :145,164,164,017,032,076,225
2961 :065,083,084,032,080,065,042
2967 :071,069,013,029,029,029,135
2973 :029,029,164,164,157,157,089
2979 :017,018,018,070,051,146,227
2985 :032,076,079,065,068,032,009
2991 :079,078,076,089,032,032,049
2997 :032,018,070,055,146,145,135
3003 :157,157,164,164,017,032,110
3009 :078,069,088,084,032,080,112
3015 :065,071,069,013,017,000,178
3021 :000,013,013,013,013,013,014
```

Chicken Catcher

(Article on page 62.)

Program 1: Chicken Catcher—VIC Version

```
100 PRINT"{CLR}{11 DOWN}
    {4 RIGHT}CHICKEN CATCHER":
    POKE52,28:POKE56,28:CLR
                        :rem 254
110 FORI=7168TO7679:POKEI,PEEK
    (I+25600):NEXT      :rem 147
120 FORC=7448TO7535:READA:POKE
    C,A:NEXT:POKE36869,255:CL=
    30720:PRINT"{CLR}":GOTO180
                        :rem 94
130 DATA8,24,8,127,62,28,20,20
    ,62,34,62,34,62,34,62,34,2
    55,133,253,165,165,191,161
    ,255                :rem 184
140 DATA12,12,8,14,8,28,52,38,
    24,24,8,56,8,28,22,50,13,1
    3,9,15,8,8,8,12,1,3,7,15,1
    5,7,3               :rem 203
150 DATA1,88,88,72,120,8,8,8,2
    4,64,96,112,120,120,112,96
    ,64,28,28,8,62,28,28,20,20
                        :rem 247
160 DATA0,0,0,0,0,0,11,139,255
                        :rem 112
170 PRINT"{CLR}{DOWN} ";:FORZ=
    1TO3:PRINTCHR$(HZ(Z));:NEX
    T                   :rem 33
180 X=7835:FORA=1TO4:FORB=1TO2
    :FORC=1TO7:POKEX+CL,6:POKE
    X,37:X=X+1:NEXT:X=X+6
                        :rem 182
190 NEXT:X=X+84:NEXT:POKE7854,
    32:POKE7945,32:POKE8074,32
                        :rem 130
200 X=7847:POKEX+CL,6:POKEX,37
    :POKEX+110+CL,6:POKEX+110,
    37:POKEX+220+CL,6:POKEX+22
    0,37                :rem 149
210 POKEX+330+CL,6:POKEX+330,3
    7                   :rem 15
220 D=20:I=5:S=0:W=36874:POKEW
    +4,15               :rem 241
230 A=7816:C=44:TI$="000000":E
    =7734:P=0:R=0:K=0:L=0:N=0:
    O=0:B=0:POKEE+CL,2:POKEE,3
    5                   :rem 233
240 Y=250:D=D-1:IFD=0THEND=1
                        :rem 123
250 J=37151:POKEJ+3,255:POKEJ+
    3,127               :rem 207
260 X=PEEK(J+1)AND128:JE=-(X=.
    ):X=PEEK(J):JW=-((XAND16)=
    .):FB=-((XAND32)=.):rem 58
270 IFJETHENM=1:C=38:R=0:K=0:L
    =L+1:POKEW,130:GOTO300
                        :rem 162
280 IFJWTHENM=-1:C=39:P=O:L=0:
    K=K+1:POKEW,130:GOTO300
                        :rem 255
290 K=0:L=0:M=0:C=44    :rem 92
300 IFPEEK(A+22)=32THENM=22:V=
    1:POKEW,0:Y=Y-1:POKEW+2,Y:
    GOTO320             :rem 114
310 IFFBTHEN420         :rem 112
320 F=0                 :rem 72
330 B=B+1:IFB=DTHENB=0:POKEE,3
    2:E=E+22:POKEE+CL,2:POKEE,
    35                  :rem 244
340 POKEW+2,0:IFE=8174THENPOKE
    E,32:E=7734         :rem 186
350 IFF=1THEN310        :rem 158
360 IFA>8163THENPOKEW,0:POKEA,
    45:GOSUB680:GOTO600:rem 42
370 POKEW,0             :rem 124
380 POKEA,32:A=A+M:POKEA,C:POK
    EA+CL,4:T=60-INT(TI/60):PR
    INT"{HOME}TIME:{BLK}";T;"
    {LEFT} "            :rem 120
390 PRINT"{HOME}{10 RIGHT}SCOR
    E:{BLK}";S:PRINT"{HOME}
    {DOWN}{10 RIGHT}H.S. :
    {BLK}";U            :rem 24
400 IFT=0THEN600        :rem 169
410 GOTO260             :rem 102
420 IFP=1ORR=1THEN320    :rem 8
430 IFK>4THEN530        :rem 170
440 IFL>4THEN460        :rem 174
450 GOTO320             :rem 103
460 IFF=1THEN480        :rem 168
470 POKEA,32:A=A-21:POKEA+CL,4
    :POKEA,40:POKEA+CL-22,7:PO
    KEA-22,41:F=1:GOTO330
                        :rem 62
480 POKEA,32:POKEA-22,32:A=A+1
    :POKEA+CL,4:POKEA,40:POKEA
    +CL-22,7:POKEA-22,41:N=N+1
                        :rem 79
490 IFPEEK(A+1)=35THENGOSUB680
    :GOTO600            :rem 58
500 IFPEEK(A-21)=35THENS=S+T*1
    0:POKEA,32:POKEA-21,32:POK
    EA-22,32:F=0:GOSUB690:GOTO
    230                 :rem 76
510 IFN=3THENN=0:POKEA,32:POKE
    A-22,32:A=A+23:F=0:P=1:GOT
    O330                :rem 75
520 GOTO480             :rem 108
530 IFF=1THEN550        :rem 164
540 POKEA,32:A=A-23:POKEA+CL,4
    :POKEA,42:POKEA+CL-22,7:PO
    KEA-22,43:F=1:GOTO330
                        :rem 66
550 POKEA,32:POKEA-22,32:A=A-1
    :POKEA+CL,4:POKEA,42:POKEA
    +CL-22,7:POKEA-22,43:O=O+1
                        :rem 85
560 IFPEEK(A-1)=35THENGOSUB680
    :GOTO600            :rem 58
570 IFPEEK(A-23)=35THENS=S+T*1
    0:POKEA,32:POKEA-23,32:POK
    EA-22,32:F=0:GOSUB690:GOTO
    230                 :rem 87
580 IFO=3THENO=0:POKEA,32:POKE
    A-22,32:A=A+21:F=0:R=1:GOT
    O330                :rem 84
590 GOTO550             :rem 113
600 POKEW+4,0:POKEW+3,0:PRINT"
    {HOME}{2 DOWN}{6 SPACES}GA
    ME{2 SPACES}OVER":GOSUB700
                        :rem 56
610 IFS>UTHENU=S:GOTO630
                        :rem 44
620 GOTO170             :rem 105
630 PRINT"{CLR}{4 DOWN} NEW HI
    GH SCORE{BLK}";U    :rem 231
640 PRINT"{3 DOWN}{4 SPACES}EN
    TER INITIALS{5 SPACES}":PR
    INT"{3 DOWN}{9 RIGHT}:===
    {3 LEFT}";:FORZ=1TO3
                        :rem 126
650 GETA$:IFA$=""THEN650
                        :rem 89
660 HZ(Z)=ASC(A$):PRINTA$;:NEX
    T                   :rem 147
670 PRINT"{HOME}{19 DOWN}":GOS
    UB700:GOTO170       :rem 32
680 POKEW+3,220:FORL=15TO0STEP
    -1:POKEW+4,L:POKEA+CL,L:FO
    RM=1TO50:NEXT:NEXT:RETURN
                        :rem 34
690 POKEW,0:FORZ=254TO240+INT(
    RND(1)*10)STEP-1:POKEW+2,Z
    :NEXT:RETURN        :rem 53
700 PRINT"HIT FIREBUTTON TO PL
    AY";                :rem 99
710 X=PEEK(J):FB=-((XAND32)=.)
    :IFFBTHENRETURN     :rem 22
720 GOTO710             :rem 106
```

Program 2: Chicken Catcher—64 Version

```
10 PRINT"{CLR}{11 DOWN}{BLK}
   {13 SPACES}CHICKEN CATCHER
                        :rem 221
20 POKE53281,1:POKE56,48:POKE5
   5,0:CLR:POKE56334,0:POKE1,5
   1                    :rem 157
30 FORI=12288TO12799:POKEI,PEE
   K(I+40960):NEXT      :rem 200
40 POKE1,55:POKE56334,1:KB=198
                        :rem 203
50 FORC=12568TO12655:READA:POK
   EC,A:NEXT:POKE53272,28
                        :rem 163
60 DATA8,24,8,127,62,28,20,20,
   62,34,62,34,62,34,62,34,255
   ,133,253,165,165,191
                        :rem 254
65 DATA 161,255,12,12,8,14,8
                        :rem 92
70 DATA28,52,38,24,24,8,56,8,2
   8,22,50,13,13,9,15,8,8,8,12
   ,1,3,7,15,15,7,3,1   :rem 131
80 DATA88,88,72,120,8,8,8,24,6
   4,96,112,120,120,112,96,64,
   28,28,8,62,28,28,20,20
                        :rem 108
90 DATA0,0,0,0,0,0,11,139,255
                        :rem 66
100 PRINT"{CLR}":GOTO120
                        :rem 251
110 PRINT"{CLR}{DOWN}{3 RIGHT}
    {RED}";:FORZ=1TO3:PRINTCHR
    $(HZ(Z));:NEXT      :rem 142
120 X=1307:Q=X:CL=54272:FORA=1
    TO4:FORB=1TO2:FORC=1TO14:P
    OKEX+CL,6:POKEX,37:rem 120
130 X=X+1:NEXT:X=X+5    :rem 221
```

```
140 NEXT:X=X+162:NEXT:POKEQ+32
    ,32:POKEQ+200,32:POKEQ+432
    ,32:D=20:S=0:I=5    :rem 54
150 FORA=54272TO54295:POKEA,0:
    NEXT:POKE54296,15:W=54276:
    POKEW+1,20:POKEW-3,4
                        :rem 47
160 A=Q-34:C=44:TI$="000000":E
    =Q-224:P=0:R=0:K=0:L=0:N=0
    :O=0:B=0:POKEE+CL,2
                        :rem 249
170 POKEE,35            :rem 160
180 Y=50:D=D-1:IFD=0THEND=1
                        :rem 76
190 JE=(PEEK(56320)AND8)=0:JW=
    (PEEK(56320)AND4)=0:FB=(PE
    EK(56320)AND16)=0 :rem 101
210 IFJETHENM=1:C=38:R=0:K=0:L
    =L+1:GOSUB700:GOTO240
                        :rem 112
220 IFJWTHENM=-1:C=39:P=O:L=0:
    K=K+1:GOSUB700:GOTO240
                        :rem 205
230 K=0:L=0:M=0:C=44    :rem 86
240 IFPEEK(A+40)=32THENM=40:V=
    1:Y=Y-1:GOSUB710:GOTO260
                        :rem 12
250 IFFBTHEN360         :rem 118
260 F=0                 :rem 75
270 B=B+1:IFB=DTHENB=0:POKEE,3
    2:E=E+40:POKEE+CL,2:POKEE,
    35                  :rem 247
280 IFE=Q+697THENPOKEE,32:E=Q-
    183                 :rem 215
290 IFF=1THEN250        :rem 164
300 IFA>Q+636THENGOSUB720:POKE
    A,45:GOTO550        :rem 80
320 POKEA,32:A=A+M:POKEA,C:POK
    EA+CL,4:T=60-INT(TI/60):PR
    INT"{HOME}{BLU}{3 RIGHT}TI
    ME:";T;"{LEFT} "    :rem 88
330 PRINT"{HOME}{RED}"SPC(22)"
    SCORE:";S:PRINT"{HOME}
    {DOWN}"SPC(22)"H.S. :";U
                        :rem 136
340 IFT=0THEN550        :rem 176
350 GOTO190             :rem 107
360 IFP=1ORR=1THEN260   :rem 14
370 IFK>4THEN470        :rem 176
380 IFL>4THEN400        :rem 171
390 GOTO260             :rem 109
400 IFF=1THEN420        :rem 156
410 POKEA,32:A=A-39:POKEA+CL,4
    :POKEA,40:POKEA+CL-40,7:PO
    KEA-40,41:F=1:GOTO270
                        :rem 68
420 POKEA,32:POKEA-40,32:A=A+1
    :POKEA+CL,4:POKEA,40:POKEA
    +CL-40,7:POKEA-40,41
                        :rem 218
430 N=N+1:IFPEEK(A+1)=35THENGO
    SUB720:GOTO550      :rem 162
440 IFPEEK(A-39)=35THENS=S+T*1
    0:POKEA,32:POKEA-39,32:POK
    EA-40,32:F=0:GOTO680
                        :rem 17
450 IFN=3THENN=0:POKEA,32:POKE
    A-40,32:A=A+41:F=0:P=1:GOT
    O270                :rem 81
460 GOTO420             :rem 105
470 IFF=1THEN490        :rem 170
480 POKEA,32:A=A-41:POKEA+CL,4
    :POKEA,42:POKEA+CL-40,7:PO
    KEA-40,43:F=1:GOTO270
                        :rem 72
490 POKEA,32:POKEA-40,32:A=A-1
    :POKEA+CL,4:POKEA,42:POKEA
    +CL-40,7:POKEA-40,43
                        :rem 231
500 O=O+1               :rem 204
510 IFPEEK(A-1)=35THENGOSUB720
    :GOTO550            :rem 52
520 IFPEEK(A-41)=35THENS=S+T*1
    0:POKEA,32:POKEA-41,32:POK
    EA-40,32:F=0:GOTO680:rem 2
530 IFO=3THENO=0:POKEA,32:POKE
    A-40,32:A=A+39:F=0:R=1:GOT
    O270                :rem 91
540 GOTO490             :rem 111
550 PRINT"{HOME}{3 DOWN}{GRN}
    {5 SPACES}GAME OVER PRESS
    {SPACE}FIREBUTTON !"
                        :rem 213
560 FORZ=1TO1000:NEXT:GOSUB730
                        :rem 123
570 IFS>UTHENU=S:GOTO590
                        :rem 54
580 GOTO110             :rem 104
590 PRINT"{CLR}{4 DOWN}{RED}"S
    PC(11)"NEW HIGH SCORE{BLK}
    ";U:POKEKB,0        :rem 55
600 PRINT SPC(10)"{2 DOWN}ENTE
    R INITIALS{3 SPACES}===
    {3 LEFT}";:FORZ=1TO3
                        :rem 132
610 GETA$:IFA$=""THEN610
                        :rem 81
620 HZ(Z)=ASC(A$):PRINTA$;:NEX
    T                   :rem 143
630 PRINT"{HOME}{19 DOWN}{BLK}
    "SPC(9)"HIT FIREBUTTON TO
    {SPACE}PLAY! "      :rem 229
640 GOSUB730            :rem 180
650 GOTO110             :rem 102
660 POKEW,32:POKEW,33   :rem 5
670 FORZ=50TO30+INT(RND(1)*10)
    STEP-1:POKEW-3,Z:NEXT:RETU
    RN                  :rem 177
680 GOSUB660:GOTO160    :rem 196
700 POKEW-3,4:POKEW,32:POKEW,3
    3:RETURN            :rem 154
710 POKEW,32:POKEW,33:POKEW-3,
    Y:RETURN            :rem 192
720 POKEW,128:POKEW,129:POKEW+
    1,24:RETURN         :rem 54
730 WAIT56320,16,16:RETURN
                        :rem 15
```

Disk Encoder

(See instructions in article on page 102 before typing in.)

```
2049 :011,008,000,000,158,050,228
2055 :048,054,049,000,000,000,158
2061 :169,054,133,001,032,231,121
2067 :255,169,012,160,133,032,012
2073 :251,011,169,015,162,008,129
2079 :160,015,032,186,255,169,080
2085 :000,032,189,255,032,192,225
2091 :255,032,228,255,201,032,022
2097 :208,249,162,015,032,201,148
2103 :255,169,073,032,210,255,025
2109 :032,204,255,169,001,162,116
2115 :008,160,000,032,186,255,196
2121 :169,002,162,095,160,014,163
2127 :032,189,255,032,192,255,010
2133 :162,001,032,198,255,032,253
2139 :228,255,032,228,255,032,097
2145 :228,255,032,228,255,208,023
2151 :003,076,255,008,032,228,193
2157 :255,208,006,032,228,255,069
2163 :076,189,008,201,191,240,252
2169 :002,176,065,032,228,255,111
2175 :208,060,169,000,141,093,030
2181 :014,160,002,032,228,255,056
2187 :201,034,208,249,032,228,067
2193 :255,201,034,240,007,153,011
2199 :096,014,200,076,143,008,176
2205 :032,228,255,201,032,240,121
2211 :249,141,093,014,169,000,061
2217 :153,096,014,140,094,014,168
2223 :032,204,255,173,093,014,178
2229 :201,080,240,012,201,083,230
2235 :240,008,032,228,255,208,134
2241 :251,076,096,008,032,204,092
2247 :255,169,012,160,233,032,036
2253 :251,011,169,014,160,066,108
2259 :032,251,011,169,014,160,080
2265 :098,032,251,011,169,013,023
2271 :032,210,255,032,228,255,211
2277 :201,089,240,047,201,078,061
2283 :208,245,162,003,169,145,143
2289 :032,210,255,202,208,250,118
2295 :162,001,032,198,255,076,203
2301 :189,008,032,204,255,169,086
2307 :001,032,195,255,169,015,158
2313 :032,195,255,169,013,160,065
2319 :004,032,251,011,169,055,025
2325 :133,001,096,032,204,255,230
2331 :169,001,032,195,255,162,073
2337 :015,032,201,255,169,002,195
2343 :162,008,160,002,032,186,077
2349 :255,173,094,014,162,096,071
2355 :160,014,032,189,255,032,221
2361 :192,255,032,013,012,201,250
2367 :048,240,003,076,238,011,167
2373 :162,002,032,198,255,169,119
2379 :000,133,253,169,016,133,011
2385 :254,169,013,160,031,032,228
2391 :251,011,160,000,032,228,001
2397 :255,145,253,200,208,002,132
2403 :230,254,165,144,240,242,094
2409 :132,253,032,204,255,032,245
2415 :013,012,201,048,240,003,116
2421 :076,238,011,169,002,032,133
2427 :195,255,169,013,160,051,198
2433 :032,251,011,032,043,012,254
2439 :172,115,014,140,126,014,204
2445 :185,115,014,153,126,014,236
2451 :136,208,247,169,013,160,056
2457 :063,032,251,011,032,043,073
2463 :012,172,115,014,140,137,237
2469 :014,185,115,014,153,137,015
2475 :014,136,208,247,173,137,062
2481 :014,205,126,014,144,010,178
2487 :169,014,160,024,032,251,065
2493 :011,076,150,009,169,002,094
2499 :162,008,160,002,032,186,233
2505 :255,169,017,162,075,160,015
2511 :013,032,189,255,032,192,152
2517 :255,032,013,012,201,048,006
2523 :240,017,201,054,240,003,206
2529 :076,238,011,173,160,014,129
2535 :201,050,208,246,076,022,010
2541 :010,162,002,032,198,255,128
2547 :160,000,032,228,255,153,047
2553 :149,014,200,165,144,240,137
2559 :245,136,140,148,014,032,202
2565 :204,255,032,013,012,201,210
2571 :048,208,041,169,002,032,255
2577 :195,255,076,145,010,169,099
2583 :002,032,195,255,169,003,167
2589 :162,008,160,003,032,186,068
2595 :255,169,017,162,092,160,122
2601 :013,032,189,255,032,192,242
2607 :255,032,013,012,201,048,096
2613 :240,003,076,238,011,172,025
2619 :126,014,140,115,014,185,141
2625 :126,014,153,115,014,136,111
2631 :208,247,160,000,162,000,080
2637 :185,116,014,093,138,014,125
2643 :153,116,014,232,200,204,234
2649 :115,014,240,007,236,137,070
2655 :014,240,233,208,233,162,161
2661 :003,032,201,255,160,000,240
2667 :185,116,014,032,210,255,151
2673 :200,204,115,014,208,244,074
2679 :169,013,032,210,255,032,062
2685 :204,255,032,013,012,201,074
2691 :048,240,003,076,238,011,235
2697 :169,003,032,195,255,076,099
2703 :193,009,160,000,162,000,155
2709 :185,149,014,093,138,014,230
2715 :153,149,014,232,200,204,083
2721 :148,014,240,007,236,137,175
2727 :014,240,233,208,233,172,243
2733 :126,014,204,148,014,208,119
2739 :014,185,148,014,217,126,115
2745 :014,208,006,136,208,245,234
2751 :076,204,010,169,013,160,055
2757 :109,032,251,011,076,120,028
2763 :012,169,013,160,131,032,208
2769 :251,011,056,165,253,233,154
2775 :003,141,091,014,165,254,115
2781 :233,000,141,092,014,169,102
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2787 :016,133,252,169,000,133,162
2793 :251,160,000,162,000,177,215
2799 :251,093,127,014,145,251,096
2805 :232,200,208,002,230,252,089
2811 :165,252,205,092,014,208,163
2817 :005,204,091,014,240,007,050
2823 :236,126,014,240,224,208,031
2829 :224,169,000,133,251,169,191
2835 :016,133,252,160,000,162,230
2841 :000,177,251,093,138,014,186
2847 :145,251,232,200,208,002,045
2853 :230,252,165,252,205,092,209
2859 :014,208,005,204,091,014,067
2865 :240,007,236,137,014,240,155
2871 :224,208,224,169,013,160,029
2877 :154,032,251,011,162,015,174
2883 :032,201,255,169,083,141,180
2889 :095,014,160,000,185,095,110
2895 :014,240,007,032,210,255,069
2901 :200,076,077,011,169,036,142
2907 :141,095,014,032,204,255,064
2913 :172,094,014,169,044,153,231
2919 :096,014,200,173,093,014,181
2925 :153,096,014,200,169,044,017
2931 :153,096,014,200,169,087,066
2937 :153,096,014,200,140,094,050
2943 :014,169,003,162,008,160,131
2949 :003,032,186,255,173,094,108
2955 :014,162,096,160,014,032,105
2961 :189,255,032,192,255,032,076
2967 :013,012,201,048,240,003,156
2973 :076,238,011,169,013,160,056
2979 :189,032,251,011,162,003,043
2985 :032,201,255,169,000,133,191
2991 :251,169,016,133,252,160,132
2997 :000,177,251,032,210,255,082
3003 :230,251,208,002,230,252,080
3009 :165,252,197,254,208,239,228
3015 :165,251,197,253,208,233,226
3021 :032,204,255,032,013,012,241
3027 :201,048,240,003,076,238,249
3033 :011,169,003,032,195,255,114
3039 :169,015,032,195,255,169,034
3045 :013,160,216,032,251,011,144
3051 :076,019,009,032,231,255,089
3057 :169,014,160,159,032,251,002
3063 :011,076,019,009,132,251,233
3069 :133,252,160,000,177,251,202
3075 :240,007,032,210,255,200,179
3081 :076,001,012,096,162,015,115
3087 :032,198,255,160,000,032,180
3093 :207,255,153,159,014,200,241
3099 :201,013,208,245,032,204,162
3105 :255,169,000,153,159,014,015
3111 :173,159,014,096,162,000,131
3117 :169,164,032,210,255,169,020
3123 :157,032,210,255,142,115,194
3129 :014,032,228,255,240,251,053
3135 :174,115,014,201,013,240,052
3141 :029,201,020,240,014,224,029
3147 :010,176,223,157,116,014,003
3153 :032,210,255,232,076,045,163
3159 :012,224,000,240,209,202,206
3165 :032,210,255,076,045,012,211
3171 :170,169,032,032,210,255,199
3177 :138,032,210,255,173,115,004
3183 :014,208,005,104,104,076,110
3189 :194,010,096,032,231,255,167
3195 :169,013,160,255,032,251,235
3201 :011,076,019,009,147,032,167
3207 :032,032,032,032,032,032,071
3213 :032,032,032,032,032,032,077
3219 :032,068,073,083,075,032,254
3225 :069,078,067,079,068,069,071
3231 :082,013,013,013,032,032,088
3237 :032,073,078,083,069,082,070
3243 :084,032,068,073,083,075,074
3249 :032,084,079,032,066,069,027
3255 :032,069,078,067,079,068,064
3261 :069,068,047,068,069,067,065
3267 :079,068,069,068,013,013,249
3273 :013,032,032,032,032,032,118
3279 :032,032,032,032,032,032,143
3285 :065,078,068,032,080,082,106
3291 :069,083,083,032,060,083,117
3297 :080,065,067,069,062,013,069
3303 :013,000,032,032,032,076,160
3309 :079,065,068,032,084,072,125
3315 :073,083,032,070,073,076,138
3321 :069,032,040,089,047,078,092
3327 :041,063,013,013,000,032,161
3333 :032,032,017,017,045,045,193
3339 :045,045,045,032,078,079,079
3345 :032,070,073,076,069,083,164
3351 :032,045,045,045,045,045,024
3357 :013,000,013,032,032,032,151
3363 :076,079,065,068,073,078,218
3369 :071,032,070,073,076,069,176
3375 :046,013,013,000,032,032,183
3381 :032,067,079,068,069,032,144
3387 :049,058,032,000,032,032,006
3393 :032,067,079,068,069,032,156
3399 :050,058,032,000,030,058,043
3405 :086,069,082,073,070,089,034
3411 :032,067,079,068,069,044,186
3417 :083,044,082,030,058,086,216
3423 :069,082,073,070,089,032,254
3429 :067,079,068,069,044,083,255
3435 :044,087,147,017,017,017,180
3441 :032,032,032,018,087,082,140
3447 :079,078,071,032,067,079,013
3453 :068,069,046,013,013,000,078
3459 :147,017,017,017,032,032,137
3465 :032,067,079,068,069,032,228
3471 :086,069,082,073,070,073,084
3477 :069,068,013,013,000,032,088
3483 :032,032,069,078,067,079,000
3489 :068,069,047,068,069,067,037
3495 :079,068,069,032,080,072,055
3501 :065,083,069,032,067,079,056
3507 :077,080,076,069,084,069,122
3513 :046,013,013,000,032,032,065
3519 :032,087,082,073,084,073,110
3525 :078,071,032,070,073,076,085
3531 :069,032,084,079,032,068,055
3537 :073,083,075,046,013,013,000
3543 :000,032,032,032,070,073,198
3549 :076,069,032,083,085,067,121
3555 :067,069,083,083,070,085,172
3561 :076,076,089,032,067,079,140
3567 :080,073,069,068,032,084,133
3573 :079,032,068,073,083,075,143
3579 :046,013,013,000,032,032,131
3585 :032,018,080,082,079,067,103
3591 :069,068,085,082,069,032,156
3597 :065,066,079,082,084,069,202
3603 :068,046,013,013,000,032,191
3609 :032,032,018,067,079,068,065
3615 :069,032,050,032,077,085,120
3621 :083,084,032,066,069,032,147
3627 :083,072,079,082,084,069,000
3633 :082,032,084,072,065,078,206
3639 :032,067,079,068,069,032,146
3645 :049,046,013,013,000,032,214
3651 :032,032,032,032,032,032,003
3657 :032,032,032,032,032,032,009
3663 :032,032,032,032,032,032,015
3669 :013,145,032,032,032,000,083
3675 :000,000,000,000,036,048,175
3681 :058,032,032,032,032,032,059
3687 :032,032,032,032,032,032,039
3693 :032,032,032,032,032,000,013
3699 :000,000,000,000,000,000,115
3705 :000,000,000,000,000,000,121
3711 :000,000,000,000,000,000,127
3717 :000,000,000,000,000,000,133
3723 :000,000,000,000,000,000,139
3729 :000,000,000,000,000,000,145
3735 :000,000,000,000,000,000,151
3741 :000,000,000,000,000,000,157
3747 :000,000,000,000,000,000,163
3753 :000,013,013,013,013,013,234
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64 Music Maker

(See instructions in article on page 101 before typing in.)

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49152 :032,235,192,088,169,110,058
49158 :141,020,003,169,193,141,161
49164 :021,003,120,096,000,127,123
49170 :127,253,253,253,251,251,126
49176 :251,251,247,247,247,239,226
49182 :239,239,239,223,223,223,136
49188 :191,191,191,253,253,251,086
49194 :251,251,251,247,247,247,000
49200 :239,239,239,239,223,223,170
49206 :223,191,191,191,127,127,080
49212 :127,191,247,253,254,191,043
49218 :253,254,191,247,253,254,238
49224 :191,253,254,191,247,253,181
49230 :191,247,253,254,191,251,185
49236 :239,127,251,239,223,127,010
49242 :239,223,127,251,239,223,112
49248 :127,239,223,127,251,239,022
49254 :255,255,255,035,083,134,095
49260 :187,244,048,112,180,251,106
49266 :071,152,237,071,167,012,056
49272 :119,223,097,255,104,247,141
49278 :143,048,218,143,078,024,012
49284 :239,210,195,195,209,239,139
49290 :031,096,181,030,156,049,169
49296 :223,165,135,134,162,223,162
49302 :062,193,107,060,057,099,216
49308 :190,075,015,012,069,191,196
49314 :125,131,214,121,115,199,043
49320 :124,151,003,003,003,003,199
49326 :003,004,004,004,004,005,198
49332 :005,005,006,006,007,007,216
49338 :007,008,008,009,009,010,237
49344 :011,011,012,013,014,014,011
49350 :015,016,017,018,019,021,048
49356 :022,023,025,026,028,029,101
49362 :031,033,035,037,039,042,171
49368 :044,047,050,053,056,059,013
49374 :062,067,071,075,079,084,148
49380 :089,094,100,106,112,119,080
49386 :126,169,033,141,004,212,151
49392 :141,011,212,141,018,212,207
49398 :169,089,141,005,212,141,235
49404 :006,212,141,012,212,141,208
49410 :013,212,141,019,212,141,228
49416 :020,212,169,015,141,024,077
49422 :212,096,169,000,160,000,139
49428 :185,017,192,141,000,220,007
49434 :173,001,220,025,061,192,186
49440 :217,061,192,240,016,200,190
49446 :192,041,208,234,169,000,114
49452 :133,251,133,252,160,000,205
49458 :076,090,193,169,253,141,204
49464 :000,220,173,001,220,009,167
49470 :127,201,127,208,013,185,155
49476 :129,192,133,251,185,194,128
49482 :192,133,252,076,090,193,242
49488 :185,105,192,133,251,185,107
49494 :170,192,133,252,140,016,221
49500 :192,164,002,192,000,240,114
49506 :010,136,132,002,172,016,054
49512 :192,200,076,020,193,096,113
49518 :169,000,133,002,032,016,206
49524 :193,165,251,141,000,212,054
49530 :165,252,141,001,212,169,038
49536 :001,133,002,032,016,193,249
49542 :165,251,141,007,212,165,051
49548 :252,141,008,212,169,002,156
49554 :133,002,032,016,193,165,175
49560 :251,141,014,212,165,252,163
49566 :141,015,212,165,197,201,065
49572 :064,208,003,076,049,234,030
49578 :201,004,240,015,201,005,068
49584 :240,017,201,006,240,019,131
49590 :201,003,240,021,076,049,004
49596 :234,238,033,208,076,049,002
49602 :234,238,032,208,076,049,007
49608 :234,238,134,002,076,049,165
49614 :234,169,000,141,033,208,223
49620 :141,032,208,169,007,141,142
49626 :134,002,076,049,234,255,200
49632 :000,000,255,255,000,000,222
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MLX: 64 Version

(Article on page 118.)

```
10 REM LINES CHANGED FROM MLX
   {SPACE}VERSION 2.00 ARE 750
   ,765,770 AND 860     :rem 50
20 REM LINE CHANGED FROM MLX V
   ERSION 2.01 IS 300 :rem 147
100 PRINT"{CLR}{6 3}";CHR$(142);
    CHR$(8);:POKE53281,1:POKE5
    3280,1               :rem 67
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101 POKE 788,52:REM DISABLE RU
    N/STOP              :rem 119
110 PRINT"{RVS}{39 SPACES}";
                        :rem 176
120 PRINT"{RVS}{14 SPACES}
    {RIGHT}{OFF}£*£{RVS}
    {RIGHT} {RIGHT}{2 SPACES}
    £*£{OFF}£*£{RVS}£{RVS}
    {14 SPACES}";       :rem 250
130 PRINT"{RVS}{14 SPACES}
    {RIGHT} £G£{RIGHT}
    {2 RIGHT} {OFF}£{RVS}£
    £*£{OFF}£*£{RVS}
    {14 SPACES}";       :rem 35
140 PRINT"{RVS}{41 SPACES}"
                        :rem 120
200 PRINT"{2 DOWN}{PUR}{BLK} M
    ACHINE LANGUAGE EDITOR VER
    SION 2.02{5 DOWN}":rem 238
210 PRINT"£5£{2 UP}STARTING AD
    DRESS?{8 SPACES}{9 LEFT}";
                        :rem 143
215 INPUTS:F=1-F:C$=CHR$(31+11
    9*F)                :rem 166
220 IFS<256OR(S>40960ANDS<4915
    2)ORS>53247THENGOSUB3000:G
    OTO210              :rem 235
225 PRINT:PRINT:PRINT   :rem 180
230 PRINT"£5£{2 UP}ENDING ADDR
    ESS?{8 SPACES}{9 LEFT}";:I
    NPUTE:F=1-F:C$=CHR$(31+119
    *F)                 :rem 20
240 IFE<256OR(E>40960ANDE<4915
    2)ORE>53247THENGOSUB3000:G
    OTO230              :rem 183
250 IFE<STHENPRINTC$;"{RVS}END
    ING < START{2 SPACES}":GOS
    UB1000:GOTO 230     :rem 176
260 PRINT:PRINT:PRINT   :rem 179
300 PRINT"{CLR}";CHR$(14):AD=S
                        :rem 56
310 A=1:PRINTRIGHT$("0000"+MID
    $(STR$(AD),2),5);":";
                        :rem 33
315 FORJ=ATO6           :rem 33
320 GOSUB570:IFN=-1THENJ=J+N:G
    OTO320              :rem 228
390 IFN=-211THEN 710    :rem 62
400 IFN=-204THEN 790    :rem 64
410 IFN=-206THENPRINT:INPUT"
    {DOWN}ENTER NEW ADDRESS";Z
    Z                   :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETH
    ENPRINT"{RVS}OUT OF RANGE"
    :GOSUB1000:GOTO410:rem 225
417 IFN=-206THENAD=ZZ:PRINT:GO
    TO310               :rem 238
420 IF N<>-196 THEN 480
                        :rem 133
430 PRINT:INPUT"DISPLAY:FROM";
    F:PRINT,"TO";:INPUTT
                        :rem 234
440 IFF<SORF>EORT<SORT>ETHENPR
    INT"AT LEAST";S;"{LEFT}, N
    OT MORE THAN";E:GOTO430
                        :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINT
    RIGHT$("0000"+MID$(STR$(I)
    ,2),5);":";         :rem 30
451 FORK=0TO5:N=PEEK(I+K):PRIN
    TRIGHT$("00"+MID$(STR$(N),
    2),3);",";          :rem 66
460 GETA$:IFA$>""THENPRINT:PRI
    NT:GOTO310          :rem 25
470 NEXTK:PRINTCHR$(20);:NEXTI
    :PRINT:PRINT:GOTO310
                        :rem 50
480 IFN<0 THEN PRINT:GOTO310
                        :rem 168
490 A(J)=N:NEXTJ        :rem 199
500 CKSUM=AD-INT(AD/256)*256:F
    ORI=1TO6:CKSUM=(CKSUM+A(I)
    )AND255:NEXT        :rem 200
510 PRINTCHR$(18);:GOSUB570:PR
    INTCHR$(146);       :rem 94
511 IFN=-1THENA=6:GOTO315
                        :rem 254
515 PRINTCHR$(20):IFN=CKSUMTHE
    N530                :rem 122
520 PRINT:PRINT"LINE ENTERED W
    RONG : RE-ENTER":PRINT:GOS
    UB1000:GOTO310      :rem 176
530 GOSUB2000           :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):
    NEXT:POKE54272,0:POKE54273
    ,0                  :rem 227
550 AD=AD+6:IF AD<E THEN 310
                        :rem 212
560 GOTO 710            :rem 108
570 N=0:Z=0             :rem 88
580 PRINT"£££";         :rem 81
581 GETA$:IFA$=""THEN581
                        :rem 95
582 AV=-(A$="M")-2*(A$=",")-3*
    (A$=".")-4*(A$="J")-5*(A$=
    "K")-6*(A$="L")     :rem 41
583 AV=AV-7*(A$="U")-8*(A$="I"
    )-9*(A$="O"):IFA$="H"THENA
    $="0"               :rem 134
584 IFAV>0THENA$=CHR$(48+AV)
                        :rem 134
585 PRINTCHR$(20);:A=ASC(A$):I
    FA=13ORA=44ORA=32THEN670
                        :rem 229
590 IFA>128THENN=-A:RETURN
                        :rem 137
600 IFA<>20 THEN 630    :rem 10
610 GOSUB690:IFI=1ANDT=44THENN
    =-1:PRINT"{OFF}{LEFT}
    {LEFT}";:GOTO690    :rem 62
620 GOTO570             :rem 109
630 IFA<48ORA>57THEN580
                        :rem 105
640 PRINTA$;:N=N*10+A-48
                        :rem 106
650 IFN>255 THEN A=20:GOSUB100
    0:GOTO600           :rem 229
660 Z=Z+1:IFZ<3THEN580  :rem 71
670 IFZ=0THENGOSUB1000:GOTO570
                        :rem 114
680 PRINT",";:RETURN    :rem 240
690 S%=PEEK(209)+256*PEEK(210)
    +PEEK(211)          :rem 149
691 FORI=1TO3:T=PEEK(S%-I)
                        :rem 67
695 IFT<>44ANDT<>58THENPOKES%-
    I,32:NEXT           :rem 205
700 PRINTLEFT$("{3 LEFT}",I-1)
    ;:RETURN            :rem 7
710 PRINT"{CLR}{RVS}*** SAVE *
    **{3 DOWN}"         :rem 236
715 PRINT"{2 DOWN}{PRESS {RVS}
    RETURN{OFF} ALONE TO CANCE
    L SAVE){DOWN}"      :rem 106
720 F$="":INPUT"{DOWN} FILENAM
    E";F$:IFF$=""THENPRINT:PRI
    NT:GOTO310          :rem 71
730 PRINT:PRINT"{2 DOWN}{RVS}T
    {OFF}APE OR {RVS}D{OFF}ISK
    : (T/D)"            :rem 228
740 GETA$:IFA$<>"T"ANDA$<>"D"T
    HEN740              :rem 36
750 DV=1-7*(A$="D"):IFDV=8THEN
    F$="0:"+F$:OPEN15,8,15,"S"
    +F$:CLOSE15         :rem 212
760 T$=F$:ZK=PEEK(53)+256*PEEK
    (54)-LEN(T$):POKE782,ZK/25
    6                   :rem 3
762 POKE781,ZK-PEEK(782)*256:P
    OKE780,LEN(T$):SYS65469
                        :rem 109
763 POKE780,1:POKE781,DV:POKE7
    82,1:SYS65466       :rem 69
765 K=S:POKE254,K/256:POKE253,
    K-PEEK(254)*256:POKE780,25
    3                   :rem 17
766 K=E+1:POKE782,K/256:POKE78
    1,K-PEEK(782)*256:SYS65496
                        :rem 235
770 IF(PEEK(783)AND1)OR(191AND
    ST)THEN780          :rem 111
775 PRINT"{DOWN}DONE.{DOWN}":G
    OTO310              :rem 113
780 PRINT"{DOWN}ERROR ON SAVE.
    {2 SPACES}TRY AGAIN.":IFDV
    =1THEN720           :rem 171
781 OPEN15,8,15:INPUT#15,E1$,E
    2$:PRINTE1$;E2$:CLOSE15:GO
    TO720               :rem 103
790 PRINT"{CLR}{RVS}*** LOAD *
    **{2 DOWN}"         :rem 212
795 PRINT"{2 DOWN}(PRESS {RVS}
    RETURN{OFF} ALONE TO CANCE
    L LOAD)"            :rem 82
800 F$="":INPUT"{2 DOWN} FILEN
    AME";F$:IFF$=""THENPRINT:G
    OTO310              :rem 144
810 PRINT:PRINT"{2 DOWN}{RVS}T
    {OFF}APE OR {RVS}D{OFF}ISK
    : (T/D)"            :rem 227
820 GETA$:IFA$<>"T"ANDA$<>"D"T
    HEN820              :rem 34
830 DV=1-7*(A$="D"):IFDV=8THEN
    F$="0:"+F$          :rem 157
840 T$=F$:ZK=PEEK(53)+256*PEEK
    (54)-LEN(T$):POKE782,ZK/25
    6                   :rem 2
841 POKE781,ZK-PEEK(782)*256:P
    OKE780,LEN(T$):SYS65469
                        :rem 107
845 POKE780,1:POKE781,DV:POKE7
    82,1:SYS65466       :rem 70
850 POKE780,0:SYS65493 :rem 11
860 IF(PEEK(783)AND1)OR(191AND
    ST)THEN870          :rem 111
865 PRINT"{DOWN}DONE.":GOTO310
                        :rem 96
870 PRINT"{DOWN}ERROR ON LOAD.
    {2 SPACES}TRY AGAIN.{DOWN}
    ":IFDV=1THEN800     :rem 172
880 OPEN15,8,15:INPUT#15,E1$,E
    2$:PRINTE1$;E2$:CLOSE15:GO
    TO800               :rem 102
1000 REM BUZZER         :rem 135
1001 POKE54296,15:POKE54277,45
     :POKE54278,165     :rem 207
1002 POKE54276,33:POKE 54273,6
     :POKE54272,5       :rem 42
1003 FORT=1TO200:NEXT:POKE5427
     6,32:POKE54273,0:POKE5427
     2,0:RETURN         :rem 202
2000 REM BELL SOUND     :rem 78
2001 POKE54296,15:POKE54277,0:
     POKE54278,247      :rem 152
2002 POKE 54276,17:POKE54273,4
     0:POKE54272,0      :rem 86
2003 FORT=1TO100:NEXT:POKE5427
     6,16:RETURN        :rem 57
3000 PRINTC$;"{RVS}NOT ZERO PA
     GE OR ROM":GOTO1000
                        :rem 89
```

Power Poker

(Article on page 58.)

```
100 PRINT"{CLR}"CHR$(8):TV=1:X
    =53280              :rem 162
110 IFTV=1THENPOKEX,5:POKEX+1,
    5:POKEX+2,13:POKEX+3,1:POK
    EX+4,5:GOTO130      :rem 128
120 POKEX,12:POKEX+1,12:POKEX+
    2,15:POKEX+3,1:POKEX+4,12
                        :rem 48
130 DIMH1(35),H2(35),SM(30),E(
    29),CK(25,25),J1(25),J2(25
    ),CA(14)            :rem 214
```

```
140 A$="{16 DOWN}":B$="{DOWN}
    {27 RIGHT}":HS=0    :rem 14
150 GOSUB470:PRINT"{CLR}"
                        :rem 79
160 PRINTCHR$(144)SPC(8)"
    {2 DOWN}POKER HAND POINT V
    ALUES"              :rem 218
170 PRINTSPC(11)"{3 DOWN}ROYAL
     FLUSH...400":PRINTSPC(11)
    "STR FLUSH.....300"
                        :rem 244
180 PRINTSPC(11)"4 OF A KIND..
    .160":PRINTSPC(11)"STRAIGH
    T.....120"          :rem 5
190 PRINTSPC(11)"FULL HOUSE...
    .100":PRINTSPC(11)"3 OF A
    {SPACE}KIND....60":rem 245
200 PRINTSPC(11)"FLUSH.......
    ..50":PRINTSPC(11)"TWO PAI
    R.......30"         :rem 30
210 PRINTSPC(11)"ONE PAIR.....
    ..10"               :rem 174
220 PRINTCHR$(19)CHR$(5)A$SPC(
    13)"{2 DOWN}LOADING
    {2 SPACES}DATA"     :rem 226
230 FORI=1TO573:READA:T=T+A:NE
    XT                  :rem 16
240 IFT<>113126THENPRINT"ERROR
     IN DATA STATEMENTS.":STOP
                        :rem 18
250 RESTORE:POKE56334,PEEK(563
    34)AND254:POKE1,PEEK(1)AND
    251                 :rem 22
260 FORI=0TO511:POKEI+14336,PE
    EK(I+53248):NEXT    :rem 226
270 POKE1,PEEK(1)OR4:POKE56334
    ,PEEK(56334)OR1     :rem 136
280 FORX=14336TO14343:READA:PO
    KEX,A:NEXT          :rem 247
290 FORX=14552TO14591:READA:PO
    KEX,A:NEXT          :rem 253
300 FORX=14640TO14703:READA:PO
    KEX,A:NEXT          :rem 238
310 FORX=14808TO14839:READA:PO
    KEX,A:NEXT          :rem 255
320 FORX=1TO4:READSU(X):READCO
    (X):NEXT            :rem 202
330 FORX=2TO14:READCA(X):NEXT
                        :rem 72
340 FORX=5TO30:READSM(X):MSB=I
    NT(SM(X)/256):LSB=SM(X)-(M
    SB*256)             :rem 95
350 POKE823+X,LSB:POKE850+X,MS
    B:NEXT              :rem 4
360 FORX=49152TO49533:READML:P
    OKEX,ML:NEXT        :rem 179
370 POKE53272,(PEEK(53272)AND2
    40)OR14             :rem 49
380 POKE53265,PEEK(53265)OR64:
    GOTO500             :rem 137
390 D$=STR$(HS):PRINTCHR$(19)A
    $B$SPC(9)"H S"      :rem 231
400 IFLEN(D$)=2THENPRINTB$SPC(
    10)D$"{3 LEFT}00"CHR$(5):R
    ETURN               :rem 104
410 IFLEN(D$)=3THENPRINTB$SPC(
    9)D$"{3 LEFT}0"CHR$(5):RET
    URN                 :rem 18
420 PRINTB$SPC(8)HSCHR$(5):RET
    URN                 :rem 52
430 D$=STR$(SC):PRINTCHR$(19)A
    $B$"SCORE"          :rem 78
440 IFLEN(D$)=2THENPRINTB$SPC(
    2)D$"{3 LEFT}00":RETURN
                        :rem 182
450 IFLEN(D$)=3THENPRINTB$SPC(
    1)D$"{3 LEFT}0":RETURN
                        :rem 135
460 PRINTB$SC:RETURN    :rem 61
470 POKE53272,(PEEK(53272)AND1
    5)OR240:POKE648,60:RETURN
                        :rem 234
480 GETI$:IFI$=""THEN480
                        :rem 107
490 POKE53272,(PEEK(53272)AND1
    5)OR16:POKE648,4:RETURN
                        :rem 139
500 PRINTCHR$(19)CHR$(5)A$SPC(
    13)"{2 DOWN}{2 SPACES}SHUF
    FLING{2 SPACES}{GRN}":FORX
    =1TO25              :rem 128
510 J1(X)=INT(RND(.)*13)+2:J2(
    X)=INT(RND(0)*4)+1:IFCK(J1
    (X),J2(X))=1THEN510
                        :rem 200
520 CK(J1(X),J2(X))=1:E(X+4)=0
    :NEXT               :rem 198
530 SC=0:NH=0:PRINTCHR$(19)A$S
    PC(13)"{2 DOWN}{12 SPACES}
    ":GOSUB490          :rem 24
540 PRINTCHR$(147):SYS49194:PR
    INTCHR$(144):GOSUB390:GOSU
    B430                :rem 177
550 PRINTB$CHR$(144)"{DOWN}PRE
    SS F1 FOR":PRINTB$"{UP}POI
    NT VALUES"          :rem 20
560 FORN=1TO25:POKE781,30:SYS4
    9166                :rem 35
570 POKE251,CA(J1(N)):POKE252,
    SU(J2(N)):POKE10,CO(J2(N))
    :POKE781,30:SYS49297
                        :rem 148
580 POKE198,0           :rem 202
590 GETI$:IFI$=""THEN590
                        :rem 111
600 IFI$="{F1}"THENSYS49449:GO
    SUB470:GOSUB480:SYS49502:G
    OTO580              :rem 204
610 H=ASC(I$)-60:IFH<5ORH>29TH
    EN580               :rem 36
620 IFE(H)=1THEN580     :rem 63
630 E(H)=1:H1(H)=J1(N):POKE781
    ,30:SYS49180        :rem 95
640 POKE781,H:SYS49166:POKE883
    +H,CO(J2(N))        :rem 201
650 POKE251,CA(J1(N)):POKE252,
    SU(J2(N)):POKE10,CO(J2(N))
    :POKE781,H:SYS49297
                        :rem 120
660 ROW=INT(H/5)*5:A=ROW:B=A+4
    :BX=0:FORX=ATOB:IFE(X)=1TH
    ENBX=BX+1           :rem 95
670 NEXT:IFBX=5THENGOSUB790
                        :rem 0
680 A=(H-ROW)+5:B=A+20:BY=0:FO
    RX=ATOBSTEP5:IFE(X)=1THENB
    Y=BY+1              :rem 115
690 NEXT:IFBY=5THENGOSUB900
                        :rem 252
700 CK(J1(N),J2(N))=0:NEXTN:IF
    SC>HSTHENHS=SC:NH=1:rem 30
710 PRINTCHR$(19)B$"{DOWN} PLA
    Y AGAIN":FORT=1TO300:NEXT
                        :rem 196
720 IFNH=1THENPOKE646,PEEK(532
    81):GOSUB390        :rem 37
730 PRINTCHR$(19)B$"{DOWN}
    {3 SPACES}Y OR N{3 SPACES}
    ":FORT=1TO300:NEXT:rem 120
740 IFNH=1THENPRINTCHR$(144):G
    OSUB390             :rem 43
750 GETI$:IFI$="Y"THENPRINTCHR
    $(147):SYS49449:GOSUB470:G
    OTO500              :rem 71
760 IFI$="N"THEN780     :rem 54
770 GOTO710             :rem 111
780 POKE53265,27:POKE53272,21:
    PRINTCHR$(147)CHR$(144):EN
    D                   :rem 20
790 L=0:R=0:K=0:CS=0:P=1
                        :rem 121
800 FORX=ATOB:H2(X)=H1(X):CS=C
    S+H1(X):L=L+PEEK(SM(X)+82)
    :NEXT               :rem 237
810 H2(B+1)=0:FORX=ATOB:FORXX=
    ATOB                :rem 127
820 IFH2(XX)<H2(X)THENC=H2(X):
    H2(X)=H2(XX):H2(XX)=C
                        :rem 31
830 NEXT:NEXT:FORX=ATOB:POKE88
    2+P,0:FORXX=ATOB    :rem 69
840 IFH1(XX)=H1(X)THENK=K+1:IF
    XX<>XTHENPOKE882+P,X
                        :rem 172
850 NEXT:P=P+1:NEXT:H2(A-1)=0:
    FORX=ATOB:IFH2(X-1)=1+H2(X
    )THENR=R+1          :rem 39
860 NEXT:IFR=4THENGOSUB890
                        :rem 185
870 IFL/5=PEEK(SM(B)+82)THENGO
    SUB890:GOTO1080     :rem 229
880 GOTO1000            :rem 154
890 SS=1-(B-A=20)*4:P=1:FORX=A
    TOBSTEPSS:POKE882+P,X:P=P+
    1:NEXT:RETURN       :rem 166
900 L=0:R=0:K=0:CS=0:P=1
                        :rem 114
910 FORX=ATOBSTEP5:H2(X)=H1(X)
    :CS=CS+H1(X):L=L+PEEK(SM(X
    )+82):NEXT          :rem 96
920 H2(B+5)=0:FORX=ATOBSTEP5:F
    ORXX=ATOBSTEP5      :rem 103
930 IFH2(XX)<H2(X)THENC=H2(X):
    H2(X)=H2(XX):H2(XX)=C
                        :rem 33
940 NEXT:NEXT:FORX=ATOBSTEP5:P
    OKE882+P,0:FORXX=ATOBSTEP5
                        :rem 41
950 IFH1(XX)=H1(X)THENK=K+1:IF
    XX<>XTHENPOKE882+P,X
                        :rem 174
960 NEXT:P=P+1:NEXT:H2(A-5)=0:
    FORX=ATOBSTEP5:IFH2(X-5)=1
    +H2(X)THENR=R+1     :rem 162
970 NEXT:IFR=4THENGOSUB890
                        :rem 187
980 IFL/5=PEEK(SM(B)+82)THENGO
    SUB890:GOTO1080     :rem 231
990 GOTO1000            :rem 156
1000 IFR=4THENSC=SC+120:C$="
     {2 SPACES}STRAIGHT":GOTO1
     130                :rem 41
1010 IFK=7THENSC=SC+10:C$="
     {2 SPACES}ONE PAIR":GOTO1
     130                :rem 156
1020 IFK=9THENSC=SC+30:C$="
     {2 SPACES}TWO PAIR":GOTO1
     130                :rem 185
1030 IFK=11THENSC=SC+60:C$=" 3
      OF A KIND":GOTO1130
                        :rem 239
1040 IFK=13THENSC=SC+100:C$="
     {2 SPACES}FULL HOUSE":GOT
     O1130              :rem 165
1050 IFK=17THENSC=SC+160:C$="
     {SPACE}4 OF A KIND":GOTO1
     130                :rem 41
1060 IFH2(A)=14ANDR=3ANDCS=28T
     HENSC=SC+120:C$="
     {2 SPACES}STRAIGHT":GOSUB
     890:GOTO1130       :rem 26
1070 RETURN             :rem 168
1080 IFR=4THEN1110      :rem 13
1090 IFH2(A)=14ANDCS=28THENSC=
     SC+300:C$="{2 SPACES}STR
     {SPACE}FLUSH":GOTO1130
                        :rem 66
1100 SC=SC+50:C$="{3 SPACES}FL
     USH":GOTO1130      :rem 151
1110 IFH2(A)=14THENSC=SC+400:C
     $=" ROYAL FLUSH":GOTO1130
                        :rem 186
1120 SC=SC+300:C$="{2 SPACES}S
     TR FLUSH"          :rem 136
1130 FORX=1TO8:PRINTCHR$(19)CH
     R$(144)"{DOWN}"B$C$:SYS49
```

```
     396:FORT=1TO75:NEXT
                          :rem 144
1140 PRINTCHR$(19)CHR$(5)"
     {DOWN}"B$C$:SYS49422:FORT
     =1TO75:NEXT:NEXT     :rem 218
1150 PRINTCHR$(19)B$"{DOWN}
     {12 SPACES}":GOSUB430:RET
     URN                  :rem 54
1160 DATA255,255,255,255,255,2
     55,255,0,1,3         :rem 70
1170 DATA7,15,31,63,127,255,12
     8,192,224,240        :rem 116
1180 DATA248,252,254,255,127,6
     3,31,15,7,3          :rem 21
1190 DATA1,0,254,252,248,240,2
     24,192,128,0         :rem 57
1200 DATA0,0,0,0,0,0,0,0,0,28
                          :rem 131
1210 DATA62,127,255,255,255,12
     7,0,56,124,254       :rem 167
1220 DATA255,255,255,254,63,31
     ,15,7,3,1            :rem 168
1230 DATA0,0,252,248,240,224,1
     92,128,0,0           :rem 200
1240 DATA0,3,15,31,31,15,3,57,
     0,192                :rem 207
1250 DATA240,248,248,240,192,1
     56,127,255,255,127
                          :rem 122
1260 DATA57,1,3,0,254,255,255,
     254,156,128          :rem 20
1270 DATA192,0,0,1,3,7,15,31,6
     3,127,0              :rem 48
1280 DATA128,192,224,240,248,2
     52,254,255,255,255,127
                          :rem 66
1290 DATA57,1,3,0,255,255,255,
     254,156,128,192,0    :rem 60
1300 DATA155,2,166,2,170,0,187
     ,0,178,179,180       :rem 164
1310 DATA181,182,183,184,185,1
     77,138,145,139,129
                          :rem 133
1320 DATA1024,1029,1034,1039,1
     044,1224,1229,1234
                          :rem 102
1330 DATA1239,1244,1424,1429,1
     434,1439,1444,1624,1629
                          :rem 127
1340 DATA1634,1639,1644,1824,1
     829,1834,1839,1844,1254
                          :rem 151
1350 DATA169,95,133,251,169,64
     ,133,252,32,72       :rem 180
1360 DATA192,76,99,192,169,159
     ,133,251,169,128     :rem 48
1370 DATA133,252,32,72,192,76,
     99,192,169,223       :rem 189
1380 DATA133,251,169,192,133,2
     52,32,72,192,76      :rem 228
1390 DATA99,192,169,0,133,10,1
     62,30,202,134        :rem 113
1400 DATA79,32,0,192,32,79,192
     ,160,41,138          :rem 21
1410 DATA105,60,145,253,32,225
     ,192,224,5,208       :rem 157
1420 DATA233,96,169,0,133,2,76
     ,83,192,169          :rem 33
1430 DATA41,133,2,24,189,55,3,
     101,2,133            :rem 156
1440 DATA253,189,82,3,105,0,13
     3,254,96,160         :rem 70
1450 DATA4,165,252,145,253,136
     ,208,251,32,131      :rem 211
1460 DATA192,162,4,160,4,165,2
     51,145,253,136       :rem 167
1470 DATA208,251,32,131,192,20
     2,208,241,166,79     :rem 12
1480 DATA96,24,165,253,105,40,
     133,253,165,254      :rem 224
1490 DATA105,0,133,254,96,32,7
     9,192,160,0          :rem 19
1500 DATA165,251,145,253,201,1
     77,240,43,169,164    :rem 62
1510 DATA133,2,32,83,192,165,2
     51,145,253,169       :rem 170
1520 DATA82,133,2,32,83,192,16
     0,0,165,252          :rem 9
1530 DATA145,253,105,1,200,145
     ,253,105,1,160       :rem 142
1540 DATA40,145,253,105,1,200,
     145,253,76,225       :rem 155
1550 DATA192,200,169,176,145,2
     53,169,162,133,2     :rem 19
1560 DATA32,83,192,165,251,145
     ,253,169,176,200     :rem 22
1570 DATA145,253,76,169,192,13
     4,79,32,72,192       :rem 194
1580 DATA24,165,254,105,212,13
     3,254,165,10,133     :rem 2
1590 DATA251,76,108,192,160,5,
     190,114,3,224        :rem 118
1600 DATA0,240,11,132,78,169,1
     ,133,10,32           :rem 200
1610 DATA227,192,164,78,136,19
     2,0,208,233,96       :rem 182
1620 DATA160,5,190,114,3,224,0
     ,240,12,132          :rem 245
1630 DATA78,189,115,3,133,10,3
     2,227,192,164        :rem 122
1640 DATA78,136,192,0,208,232,
     96,160,249,185       :rem 186
1650 DATA0,216,153,0,128,185,2
     50,216,153,250       :rem 157
1660 DATA128,185,244,217,153,2
     44,129,185,238,218
                          :rem 133
1670 DATA153,238,130,136,192,2
     55,208,227,160,249
                          :rem 123
1680 DATA169,0,153,0,216,153,2
     50,216,153,244       :rem 163
1690 DATA217,153,238,218,136,1
     92,255,208           :rem 245
1700 DATA239,96,160,249,185,0,
     128,153,0,216        :rem 124
1710 DATA185,250,128,153,250,2
     16,185,244,129,153
                          :rem 117
1720 DATA244,217,185,238,130,1
     53,238,218,136,192
                          :rem 122
1730 DATA255,208,227,96
                          :rem 169
```

Backgammon

(Article on page 50.)

Program 1: Backgammon—VIC Version

```
100 CT=37888+4*(PEEK(36866)AND
    128):POKE36879,8      :rem 32
110 L$="{21 SPACES}"      :rem 131
120 PRINT"{CLR}{CYN}BACKGAMMON
    "                     :rem 102
130 INPUT"{DOWN}WILL I GO FIRS
    T{2 SPACES}Y{3 LEFT}";MF$
                          :rem 58
140 DIMB(25):DIMR(3):DEFFNR(X)
    =INT(RND(X)*6)+1      :rem 173
150 DEFFNP(X)=CT-((X-(X>6))*22
    +Y)*(X<13)-((26-(X+(X<19))
    )*22-Y-1)*(X>12)      :rem 41
160 DATA2,0,0,0,0,-5,0,-3,0,0,
    0,5,-5,0,0,0,3,0,5,0,0,0,0
    ,-2                   :rem 247
170 FORX=1TO24:READB(X):NEXTX
                          :rem 96
180 PRINT"{CLR}{RVS}{GRN}
    {6 SPACES}BACKGAMMON
    {6 SPACES}";          :rem 56
190 FORX=1TO12:PRINTCHR$(64+X)
    ;"{OFF}{BLK}QQQQQQQQQQQQQQ
    QQQQQQ{GRN}{RVS}";CHR$(89-
    X);                   :rem 54
200 IFX=6THENPRINT" BAR {OFF}
    {BLK}QQQQQQQQQQQQ{GRN}
    {RVS} BAR ";          :rem 239
210 NEXTX:PRINT" {OFF}{20 P}
    {RVS} ";              :rem 192
220 PRINT"{OFF}{YEL}PLAYER Q
    {4 SPACES}{BLU}COMPUTER Q"
                          :rem 146
230 FORX=1TO24:IFB(X)=0THEN270
                          :rem 52
240 Z=ABS(B(X)):IFZ>10THENZ=10
                          :rem 40
250 FORY=1TOZ             :rem 66
260 POKEFNP(X),6.5-SGN(B(X))/2
    :NEXTY                :rem 157
270 NEXTX:X=1:Z=CT+170    :rem 91
280 IFX<7ANDX<=B(0)THENPOKEZ,6
    :Z=Z-1:X=X+1:GOTO280
                          :rem 142
290 X=1:Z=CT+159          :rem 147
300 IFX<7ANDX<=-PBTHENPOKEZ,7:
    Z=Z+1:X=X+1:GOTO300
                          :rem 123
310 GOSUB1130:PRINT"{CYN}";
                          :rem 190
320 IFLEFT$(MF$,1)="N"THENPRIN
    T"PLAYER ";:GOTO340
                          :rem 185
330 PRINT"COMPUTER ";     :rem 17
340 PRINT"ROLL";:IF F$="DR"ORT
    $="DRAW"THEN360       :rem 182
350 R(0)=FNR(X):R(1)=FNR(X):R(
    2)=0:R(3)=0:IFR(0)=R(1)THE
    NR(2)=R(1):R(3)=R(1)
                          :rem 237
360 FORX=0TO3:IFR(X)>0THENPRIN
    T" {RVS}";CHR$(R(X)+48);"
    {OFF}";               :rem 202
370 NEXTX:PRINT           :rem 248
380 IFLEFT$(MF$,1)="N"THEN830
                          :rem 119
390 PRINT"THINKING...{UP}"
                          :rem 228
400 OB=0:FORZ=0TO18:IFB(Z)>0TH
    EN420                 :rem 111
410 NEXTZ:OB=1            :rem 103
420 H=0:HP=0:HR=0:FORY=0TO3:X=
    0:IFR(Y)=0THEN580     :rem 133
430 E=0                   :rem 73
440 IFB(X)<1ORR(Y)+X>25THEN570
                          :rem 15
450 IFX=0ANDB(X)>0THENE=E+128
                          :rem 213
460 IFX+R(Y)=25THENE=E+64
                          :rem 215
470 IFB(X)=1ANDB(X+R(Y))=1THEN
    E=E+32                :rem 92
480 IFB(X)<>2ANDB(X+R(Y))>0THE
    NE=E+16               :rem 157
490 IFB(X+R(Y))=-1THENE=E+8
                          :rem 50
500 IFX<19THENE=E+4       :rem 119
510 IFB(X+R(Y))<-1OR(OB=0AND(X
    +R(Y))=25)THEN570     :rem 211
520 E=E+1:IFY=3ORX+R(Y)=25ORB(
    X+R(Y))>0THEN560      :rem 251
530 Z=Y+1                 :rem 228
540 IFR(Z)>0ANDX+R(Y)-R(Z)>-1A
    NDX+R(Y)-R(Z)<25THENIFB(X+
    R(Y)-R(Z))>0THENE=E+2:GOTO
    560                   :rem 147
550 Z=Z+1:IFZ<4THEN540    :rem 66
560 IFH<ETHENH=E:HR=R(Y):HP=X
                          :rem 96
570 X=X+1:IFX<25THEN430
                          :rem 111
580 NEXTY                 :rem 53
```

```
590 IFH<128ANDB(0)>0THEN680
                          :rem 29
600 IFH>0THEN700          :rem 161
610 LR=7:FORY=0TO3        :rem 102
620 IF R(Y)<LRANDR(Y)>1THENLR=
    R(Y):LN=Y             :rem 171
630 NEXTY:IFLR=7THEN680
                          :rem 217
640 FORX=0TO25-LR:IFB(X)>0THEN
    680                   :rem 10
650 NEXTX:X=26-LR         :rem 52
660 IFB(X)>0THENR(LN)=25-X:GOT
    O400                  :rem 32
670 X=X+1:IFX<25THEN660
                          :rem 117
680 PRINT"{RVS}CAN NOT MOVE
    {OFF}":MF$="N"        :rem 205
690 GETA$:ON-(A$="")GOTO690:GO
    TO310                 :rem 254
700 FORX=0TO3:IFR(X)<>HRTHENNE
    XTX                   :rem 183
710 R(X)=0                :rem 0
720 IFB(HP)<11ANDHP>0THENY=B(H
    P):POKEFNP(HP),0      :rem 76
730 B(HP)=B(HP)-1:Z$=CHR$(HP+H
    R+64):IFHP+HR>24THENZ$="OF
    F"                    :rem 151
740 X$=CHR$(HP+64):IFHP=0THENX
    $="BAR"               :rem 162
750 PRINT"MOVE FROM ";X$;" TO
    {SPACE}";Z$           :rem 106
760 IFB(HP+HR)=-1THENPB=PB-1:B
    (HP+HR)=0:IFPB>-7THENPOKEC
    T+158-PB,7            :rem 25
770 IFHP=0ANDB(0)<8THENPOKECT+
    170-B(0),0            :rem 64
780 Y=B(HP+HR)+1:B(HP+HR)=Y
                          :rem 65
790 IFHP+HR<25ANDY<11THENPOKEF
    NP(HP+HR),6:GOTO810:rem 87
800 IFB(25)=15THENGOSUB1130:PR
    INT"I WIN.":GOTO1160
                          :rem 227
810 FORX=0TO3:IFR(X)>0THEN390
                          :rem 24
820 NEXTX:MF$="N":GOTO690
                          :rem 3
830 PRINT"MOVE FROM";:IFPB<0TH
    ENPRINT" BAR":HP=25:F$="Y"
    :GOTO880              :rem 181
840 INPUTF$:F$=LEFT$(F$,2):IFF
    $="NO"THENMF$="":GOTO310
                          :rem 158
850 IFF$="DR"THEN180      :rem 117
860 IFF$<"A"ORF$>"X"THEN1120
                          :rem 48
870 HP=ASC(F$)-64:IFB(HP)>=0TH
    EN1120                :rem 47
880 INPUT"{8 LEFT}TO";T$:HP=AS
    C(F$)-64:HR=ASC(F$)-ASC(T$
    ):IFT$="NO"THENMF$="":GOTO
    310                   :rem 39
890 IFT$="DRAW"THEN180    :rem 31
900 X=0:IFT$="OFF"THENHR=HP
                          :rem 153
910 PRINTL$;"{UP}{RIGHT}";
                          :rem 255
920 FORX=0TO3:IFHR<>R(X)THENNE
    XTX:ON-(HR<>HP)GOTO1120
                          :rem 185
930 OB=X:IFHR<>HPTHEN980:rem 7
940 Z=HP+1:FOROB=0TO3:IFR(OB)=
    HPTHENZ=7:GOTO960      :rem 254
950 IFR(OB)<HPTHENNEXTOB:GOTO1
    120                   :rem 107
960 FORX=ZTO24:IFB(X)<0THEN112
    0                     :rem 145
970 NEXTX                 :rem 55
980 IFB(HP-HR)>1ANDHP<>HRTHEN1
    120                   :rem 3
990 IFB(HP-HR)>0ANDHP<>HRTHENB
    (HP-HR)=0:B(0)=B(0)+1:IFB(
    0)<7THENPOKECT+171-B(0),6
                          :rem 1
1000 Y=-PB:M=7:Z=CT+158+Y:PB=P
     B+1                  :rem 189
1010 IFHP<25THENPB=PB-1:Y=-B(H
     P):B(HP)=B(HP)+1:Z=FNP(HP
     ):M=11               :rem 143
1020 IFY<MTHENPOKEZ,0      :rem 72
1030 IFHP=HRTHEN1080       :rem 186
1040 Y=B(HP-HR)-1:B(HP-HR)=Y:I
     FB(HP-HR)>10THEN1100
                          :rem 184
1050 Y=-Y:Z=FNP(HP-HR)     :rem 71
1060 IFY<11THENPOKEZ,7:rem 104
1070 GOTO 1100             :rem 195
1080 PO=PO+1               :rem 160
1090 IFPO=15THENGOSUB1130:PRIN
     T"YOU WIN.":GOTO1160
                          :rem 110
1100 R(OB)=0:FORX=0TO3:IFR(X)>
     0THEN830             :rem 27
1110 NEXTX:MF$="":GOTO310
                          :rem 211
1120 PRINT"ILLEGAL MOVE
     {12 LEFT}{UP}";:GOTO830
                          :rem 252
1130 POKE214,16:PRINT:POKE211,
     0                    :rem 62
1140 FORX=1TO5:PRINTL$:NEXTX:P
     RINTL$;              :rem 197
1150 POKE214,16:PRINT:POKE211,
     0:RETURN             :rem 90
1160 INPUT"PLAY AGAIN (Y/N)";A
     $:IFLEFT$(A$,1)="Y"THENRU
     N                    :rem 34
```

Program 2: Backgammon—64 Version

```
100 CT=55296:POKE 53280,0:POKE
     53281,0              :rem 255
110 L$="{39 SPACES}"      :rem 131
120 PRINT"{CLR}{CYN}{7 DOWN}"T
    AB(14)"BACKGAMMON":PRINTTA
    B(14)"{10 T}"         :rem 164
130 INPUT"{2 DOWN} WILL I GO F
    IRST{2 SPACES}Y{3 LEFT}";M
    F$                    :rem 75
140 DIMB(25):DIMR(3):DEFFNR(X)
    =INT(RND(X)*6)+1      :rem 173
150 DEFFNP(X)=CT-((X-(X>6))*40
    +Y)*(X<13)-((26-(X+(X<19))
    )*40-Y-1)*(X>12)      :rem 41
160 DATA 2,0,0,0,0,-5,0,-3,0,0
    ,0,5,-5,0,0,0,3,0,5,0,0,0,
    0,-2                  :rem 247
170 FORX=1TO24:READB(X):NEXTX
                          :rem 96
180 PRINT"{CLR}{RVS}{GRN}
    {15 SPACES}BACKGAMMON
    {15 SPACES}";:FORX=1TO12
                          :rem 37
190 PRINTCHR$(64+X);"{OFF}
    {BLK}QQQQQQQQQQQQQQQQQQQQQQ
    QQQQQQQQQQQQQQQQQQ{GRN}
    {RVS}";CHR$(89-X);:rem 251
200 IFX=6THENPRINT"{3 SPACES}B
    AR{3 SPACES}{OFF}{BLK}QQQQ
    QQQQQQQQQQQQQQQQQQ{GRN}
    {RVS}{3 SPACES}BAR
    {3 SPACES}";          :rem 25
210 NEXTX:PRINT" {OFF}{38 P}
    {RVS} ";              :rem 14
220 PRINT"{OFF}{YEL}PLAYER Q
    {4 SPACES}{BLU}COMPUTER O"
                          :rem 146
230 FORX=1TO24:IFB(X)=0THEN270
                          :rem 52
240 Z=ABS(B(X)):IFZ>10THENZ=10
                          :rem 40
250 FORY=1TOZ             :rem 66
260 POKEFNP(X),86.5-SGN(B(X))/
    2:NEXTY               :rem 213
270 NEXTX:X=1:Z=CT+310    :rem 87
280 IFX<7ANDX<=B(0)THENPOKEZ,8
    6:Z=Z-1:X=X+1:GOTO280
                          :rem 198
290 X=1:Z=CT+289          :rem 151
300 IFX<7ANDX<=-PBTHENPOKEZ,87
    :Z=Z+1:X=X+1:GOTO300
                          :rem 179
310 GOSUB1180:GOSUB1150:PRINT"
    {CYN}";               :rem 68
320 IFLEFT$(MF$,1)="N"THENPRIN
    T"PLAYER ";:GOTO340
                          :rem 185
330 PRINT"COMPUTER ";     :rem 17
340 PRINT"ROLL";:IF F$="DR"ORT
    $="DRAW"THEN360       :rem 182
350 R(0)=FNR(X):R(1)=FNR(X):R(
    2)=0:R(3)=0:IFR(0)=R(1)THE
    NR(2)=R(1):R(3)=R(1)
                          :rem 237
360 FORX=0TO3:IFR(X)>0THENPRIN
    T" {RVS}";CHR$(R(X)+48);"
    {OFF}";               :rem 202
370 NEXTX:PRINT           :rem 248
380 IFLEFT$(MF$,1)="N"THEN830
                          :rem 119
390 PRINT"THINKING...{UP}"
                          :rem 228
400 OB=0:FORZ=0TO18:IFB(Z)>0TH
    EN420                 :rem 111
410 NEXTZ:OB=1            :rem 103
420 H=0:HP=0:HR=0:FORY=0TO3:X=
    0:IFR(Y)=0THEN580      :rem 133
430 E=0                   :rem 73
440 IFB(X)<1ORR(Y)+X>25THEN570
                          :rem 15
450 IFX=0ANDB(X)>0THENE=E+128
                          :rem 213
460 IFX+R(Y)=25THENE=E+64
                          :rem 215
470 IFB(X)=1ANDB(X+R(Y))=1THEN
    E=E+32                :rem 92
480 IFB(X)<>2ANDB(X+R(Y))>0THE
    NE=E+16               :rem 157
490 IFB(X+R(Y))=-1THENE=E+8
                          :rem 50
500 IFX<19THENE=E+4       :rem 119
510 IFB(X+R(Y))<-1OR(OB=0AND(X
    +R(Y))=25)THEN570     :rem 211
520 E=E+1:IFY=3ORX+R(Y)=25ORB(
    X+R(Y))>0THEN560      :rem 251
530 Z=Y+1                 :rem 228
540 QA=0:IFR(Z)>0ANDX+R(Y)-R(Z
    )>-1ANDX+R(Y)-R(Z)<25THEN
    {SPACE}QA=1           :rem 50
545 IFQA=1THENIFB(X+R(Y)-R(Z))
    >0THENE=E+2:GOTO560
                          :rem 246
550 Z=Z+1:IFZ<4THEN540    :rem 66
560 IFH<ETHENH=E:HR=R(Y):HP=X
                          :rem 96
570 X=X+1:IFX<25THEN430
                          :rem 111
580 NEXTY                 :rem 53
590 IFH<128ANDB(0)>0THEN680
                          :rem 29
600 IFH>0THEN700          :rem 161
610 LR=7:FORY=0TO3        :rem 102
620 IF R(Y)<LRANDR(Y)>1THENLR=
    R(Y):LN=Y             :rem 171
630 NEXTY:IFLR=7THEN680
                          :rem 217
640 FORX=0TO25-LR:IFB(X)>0THEN
    680                   :rem 10
650 NEXTX:X=26-LR         :rem 52
660 IFB(X)>0THENR(LN)=25-X:GOT
    O400                  :rem 32
670 X=X+1:IFX<25THEN660
                          :rem 117
680 PRINT"{2 DOWN}{6 SPACES}
    {RVS}CAN NOT MOVE - PRESS
```

```
    {SPACE}A KEY{OFF}":MF$="N"
                          :rem 211
690 GETA$:ON-(A$="")GOTO690:GO
    TO310                 :rem 254
700 FORX=0TO3:IFR(X)<>HRTHENNE
    XTX                   :rem 183
710 R(X)=0                :rem 0
720 IFB(HP)<11ANDHP>0THENY=B(H
    P):POKEFNP(HP),0      :rem 76
730 B(HP)=B(HP)-1:Z$=CHR$(HP+H
    R+64):IFHP+HR>24THENZ$="OF
    F"                    :rem 151
740 X$=CHR$(HP+64):IFHP=0THENX
    $="BAR"               :rem 162
750 PRINT"MOVE FROM ";X$;" TO
    {SPACE}";Z$           :rem 106
760 IFB(HP+HR)=-1THENPB=PB-1:B
    (HP+HR)=0:IFPB>-7THENPOKEC
    T+288-PB,87           :rem 85
770 IFHP=0ANDB(0)<8THENPOKECT+
    310-B(0),0            :rem 60
780 Y=B(HP+HR)+1:B(HP+HR)=Y
                          :rem 65
790 IFHP+HR<25ANDY<11THENPOKEF
    NP(HP+HR),86:GOTO810
                          :rem 143
800 IFB(25)=15THENGOSUB1150:PR
    INT"I WIN.":GOTO 1190
                          :rem 232
810 FORX=0TO3:IFR(X)>0THEN390
                          :rem 24
820 NEXTX:PRINT"{HOME}{7 DOWN}
    "SPC(14)"{RVS}PRESS A KEY"
    :MF$="N":GOTO690      :rem 65
830 F$="@":PRINT"MOVE FROM";:I
    FPB<0THENPRINT" BAR":HP=25
    :F$="Y":GOTO880       :rem 26
840 INPUTF$:F$=LEFT$(F$,2):IFF
    $="NO"THENMF$="":GOTO310
                          :rem 158
850 IFF$="DR"THEN180      :rem 117
860 IFF$<"A"ORF$>"X"THEN1140
                          :rem 50
870 HP=ASC(F$)-64:IFB(HP)>=0TH
    EN1140                :rem 49
880 T$="@":INPUT"{8 LEFT}TO";T
    $:HP=ASC(F$)-64:HR=ASC(F$)
    -ASC(T$)              :rem 205
890 IFT$="NO"THENMF$="":GOTO31
    0                     :rem 52
900 IFT$="DRAW"THEN180    :rem 23
910 X=0:IFT$="OFF"THENHR=HP
                          :rem 154
920 PRINTL$;"{UP}{RIGHT}";
                          :rem 0
930 FORX=0TO3:IFHR<>R(X)THENNE
    XTX:ON-(HR<>HP)GOTO1140
                          :rem 188
940 OB=X:IFHR<>HPTHEN990:rem 9
950 Z=HP+1:FOROB=0TO3:IFR(OB)=
    HPTHENZ=7:GOTO970      :rem 0
960 IFR(OB)<HPTHENNEXTOB:GOTO1
    140                   :rem 110
970 FORX=ZTO24:IFB(X)<0THEN114
    0                     :rem 148
980 NEXTX                 :rem 56
990 IFB(HP-HR)>1ANDHP<>HRTHEN1
    140                   :rem 6
1000 QA=0:IFB(HP-HR)>0ANDHP<>H
     RTHENB(HP-HR)=0:B(0)=B(0)
     +1:QA=1              :rem 137
1010 IFQA=1ANDB(0)<7THENPOKECT
     +311-B(0),86         :rem 153
1020 Y=-PB:M=7:Z=CT+288+Y:PB=P
     B+1                  :rem 195
1030 IFHP<25THENPB=PB-1:Y=-B(H
     P):B(HP)=B(HP)+1:Z=FNP(HP
     ):M=11               :rem 145
1040 IFY<MTHENPOKEZ,0      :rem 74
1050 IFHP=HRTHEN1100       :rem 181
1060 Y=B(HP-HR)-1:B(HP-HR)=Y:I
     FB(HP-HR)>10THEN1120
                          :rem 188
1070 Y=-Y:Z=FNP(HP-HR)    :rem 73
1080 IFY<11THENPOKEZ,87
                          :rem 162
1090 GOTO 1120            :rem 199
1100 PO=PO+1              :rem 153
1110 IFPO=15THENGOSUB1150:PRIN
     T"YOU WIN.":GOTO 1190
                          :rem 108
1120 R(OB)=0:FORX=0TO3:IFR(X)>
     0THEN830             :rem 29
1130 NEXTX:MF$="":GOTO310
                          :rem 213
1140 PRINT"ILLEGAL MOVE
     {12 LEFT}{UP}";L$;"{UP}":
     GOTO830              :rem 126
1150 POKE214,16:PRINT     :rem 231
1160 FORX=1TO5:PRINTL$:NEXTX:P
     RINTL$;              :rem 199
1170 POKE214,16:PRINT:RETURN
                          :rem 3
1180 PRINT"{HOME}{7 DOWN}"SPC(
     14)"{11 SPACES}":RETURN
                          :rem 31
1190 INPUT"PLAY AGAIN (Y/N)";A
     $:IFLEFT$(A$,1)="Y"THENRU
     N                    :rem 37
```

Digi-Clock

(Article on page 104.)

```
10 PRINT"{CLR}{DOWN}
   {13 SPACES}DIGI-CLOCK{DOWN}
   "                      :rem 157
20 PRINT"{DOWN}ENTER {RVS} SYS
    682 {OFF} TO RESTART CLOCK
    AFTER{2 SPACES}PRESSING RU
    N/STOP-RESTORE.       :rem 221
30 PRINT"{DOWN}{4 SPACES}CHANG
   E CLOCK COLOR BY ENTERING:
                          :rem 229
40 PRINT"{DOWN}{7 SPACES}POKE
   {SPACE}40981, COLOR NUMBER
                          :rem 205
50 GOSUB290               :rem 128
60 INPUT"{DOWN}HOUR";HR:rem 94
70 IFHR<1ORHR>12THENPRINT"MUST
    BE IN RANGE 1-12":GOTO60
                          :rem 71
80 H$=STR$(HR):IFLEN(H$)=2THEN
   H=0:R=HR:GOTO100       :rem 56
90 H=VAL(LEFT$(H$,2)):R=VAL(RI
   GHT$(H$,1))            :rem 69
100 HR=(H*16)+R           :rem 15
110 INPUT"{DOWN}MIN";MI:rem 44
120 IFMI<0ORMI>59THENPRINT"MUS
    T BE IN RANGE 0-59":GOTO11
    0                     :rem 171
130 M$=STR$(MI):IFLEN(M$)=2THE
    N160                  :rem 229
140 M=VAL(LEFT$(M$,2)):I=VAL(R
    IGHT$(M$,1))          :rem 119
150 MI=(M*16)+I           :rem 12
160 INPUT"{DOWN}SEC";SE:rem 42
170 IFSE<0ORSE>59THENPRINT"MUS
    T BE IN RANGE 0-59":GOTO16
    0                     :rem 185
180 S$=STR$(SE):IFLEN(S$)=2THE
    N210                  :rem 244
190 S=VAL(LEFT$(S$,2)):E=VAL(R
    IGHT$(S$,1))          :rem 138
200 SE=(S*16)+E           :rem 12
210 PRINT"{DOWN}{RVS}A{OFF}M O
    R {RVS}P{OFF}M";:INPUTA$
                          :rem 243
220 IFA$<>"A"ANDA$<>"P"THEN210
                          :rem 143
230 IFA$="P"THENHR=HROR128
                          :rem 54
240 IFA$="P"ANDHR=146THENHR=18
                          :rem 15
250 IFA$="A"ANDHR=18THENHR=146
                          :rem 1
260 PRINT"{3 DOWN}PRESS ANY KE
    Y WHEN READY TO START CLOC
    K"                    :rem 62
270 GETG$:IFG$=""THEN270
                          :rem 97
280 POKE679,HR:POKE680,MI:POKE
    681,SE:SYS695:PRINT"{CLR}"
    :NEW                  :rem 105
290 I=682                 :rem 193
300 READ A:IF A=256 THEN320
                          :rem 152
310 POKE I,A:I=I+1:GOTO300
                          :rem 228
320 I=40960               :rem 30
330 READ A:IF A=256 THEN RETUR
    N                     :rem 230
340 POKE I,A:I=I+1:GOTO330
                          :rem 234
350 DATA 120,169,210,141,20,3,
    169                   :rem 75
360 DATA 2,141,21,3,88,96,32
                          :rem 93
370 DATA 170,2,173,167,2,141,1
    1                     :rem 233
380 DATA 220,173,168,2,141,10,
    220                   :rem 72
390 DATA 173,169,2,141,9,220,1
    69                    :rem 46
400 DATA 0,141,8,220,96,169,54
                          :rem 192
410 DATA 133,1,32,0,160,169,55
                          :rem 181
420 DATA 133,1,76,49,234,256
                          :rem 100
430 DATA 169,32,162,12,157,0,4
                          :rem 187
440 DATA 232,224,40,208,248,16
    9,32                  :rem 138
450 DATA 141,0,4,141,9,4,169
                          :rem 88
460 DATA 1,162,0,157,0,216,232
                          :rem 179
470 DATA 224,12,208,248,169,58
    ,141                  :rem 147
480 DATA 3,4,141,6,4,173,11
                          :rem 34
490 DATA 220,72,41,15,24,105,4
    8                     :rem 239
500 DATA 141,2,4,104,72,41,112
                          :rem 170
510 DATA 74,74,74,74,24,105,48
                          :rem 204
520 DATA 201,48,208,5,169,32,7
    6                     :rem 249
530 DATA 74,160,169,49,141,1,4
                          :rem 196
540 DATA 104,42,176,8,169,1,14
    1                     :rem 243
550 DATA 10,4,76,94,160,169,16
                          :rem 201
560 DATA 141,10,4,169,13,141,1
    1                     :rem 228
570 DATA 4,173,10,220,72,41,15
                          :rem 182
580 DATA 24,105,48,141,5,4,104
                          :rem 187
590 DATA 41,240,74,74,74,74,24
                          :rem 205
600 DATA 105,48,141,4,4,173,9
                          :rem 140
610 DATA 220,72,41,15,24,105,4
    8                     :rem 233
620 DATA 141,8,4,104,41,240,74
                          :rem 183
630 DATA 74,74,74,24,105,48,14
    1                     :rem 250
640 DATA 7,4,173,8,220,96,0,25
    6                     :rem 246
```

Classified

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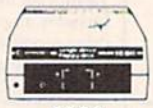

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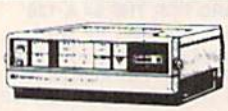

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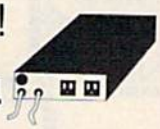

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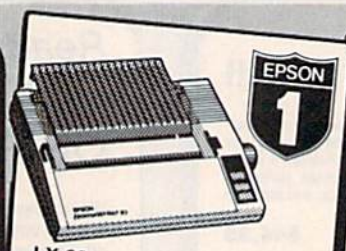

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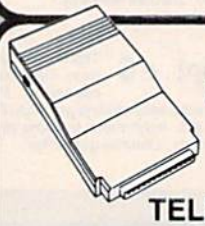

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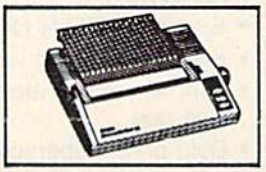

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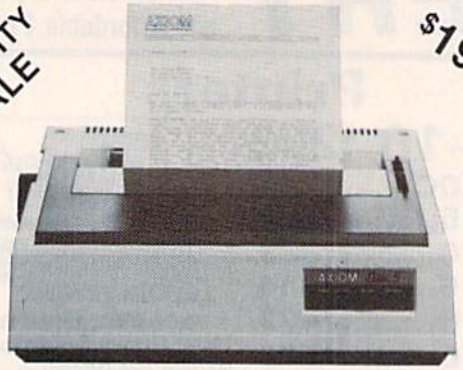

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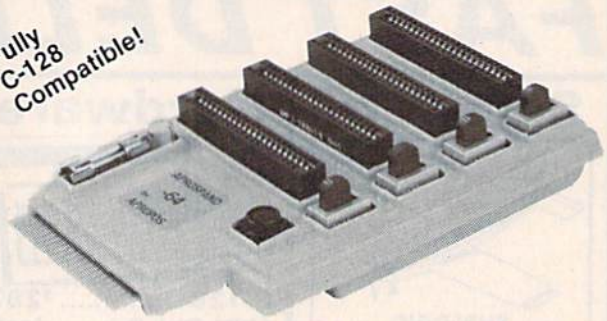

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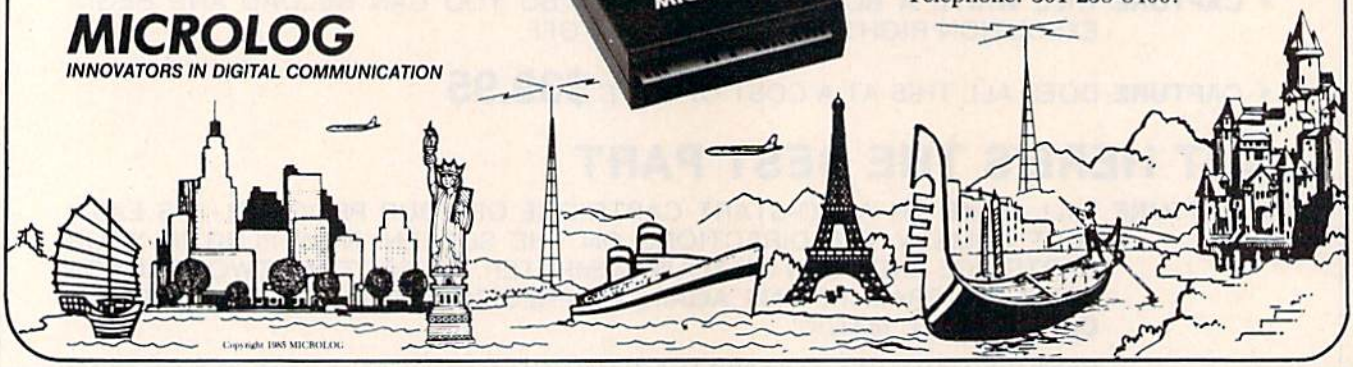

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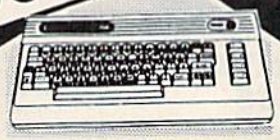

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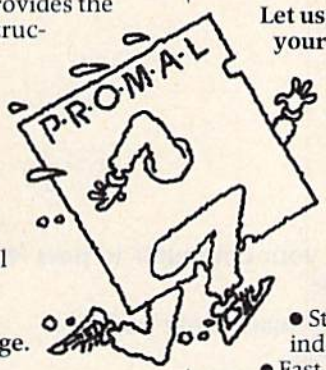

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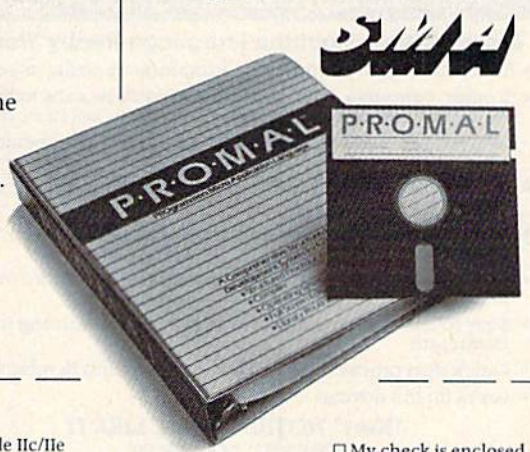

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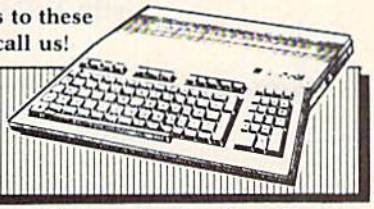

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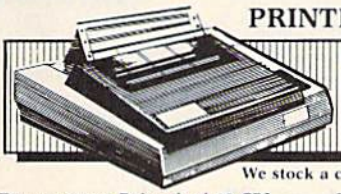

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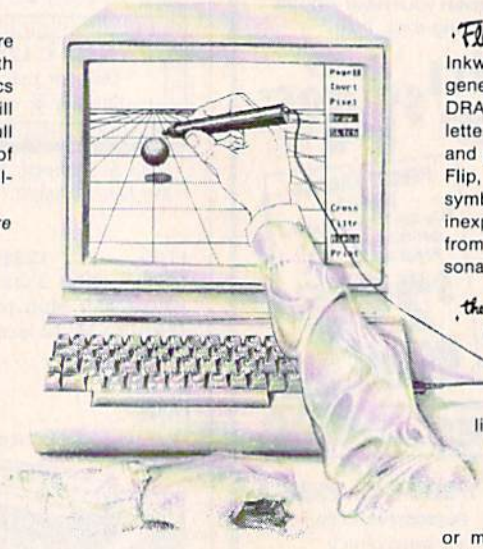

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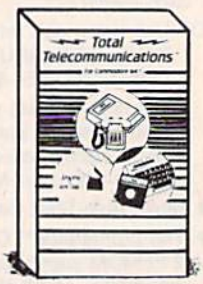

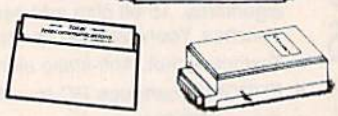

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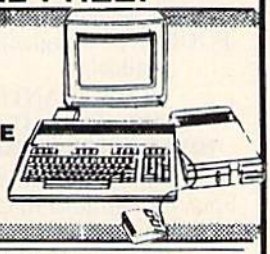

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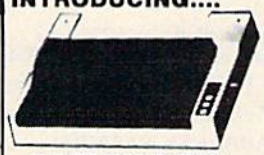

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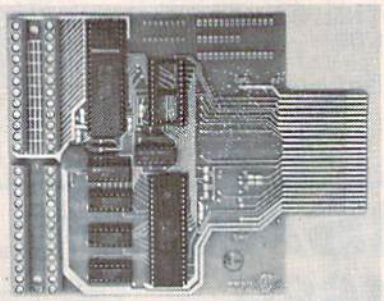

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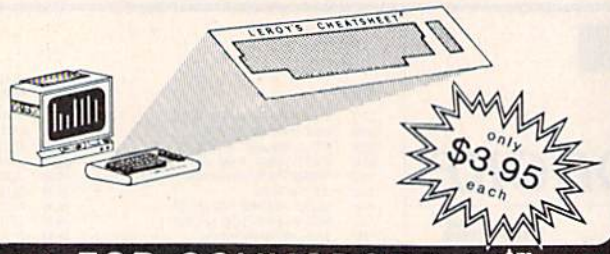

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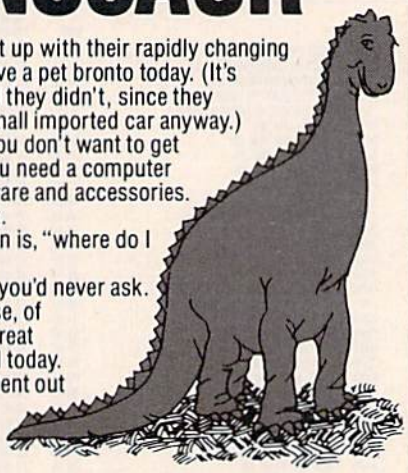

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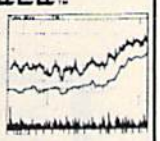

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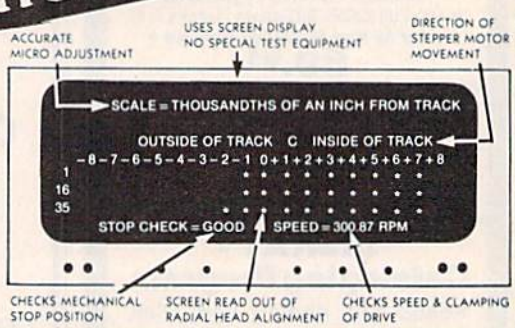

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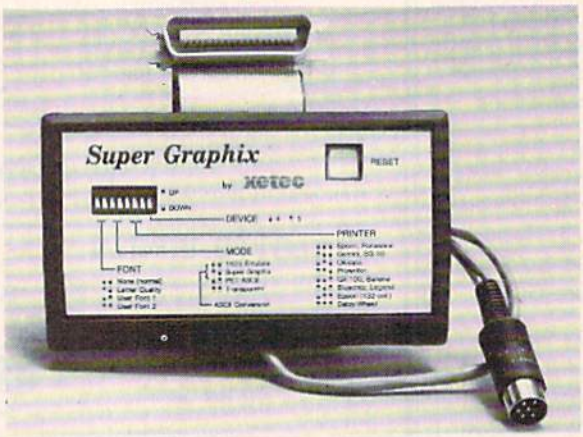

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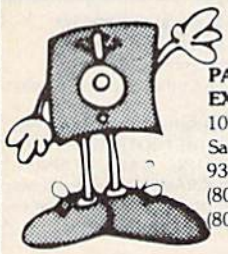

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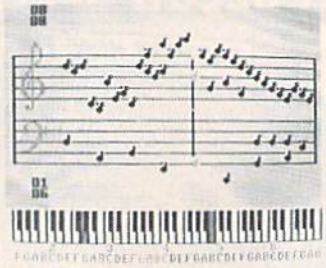

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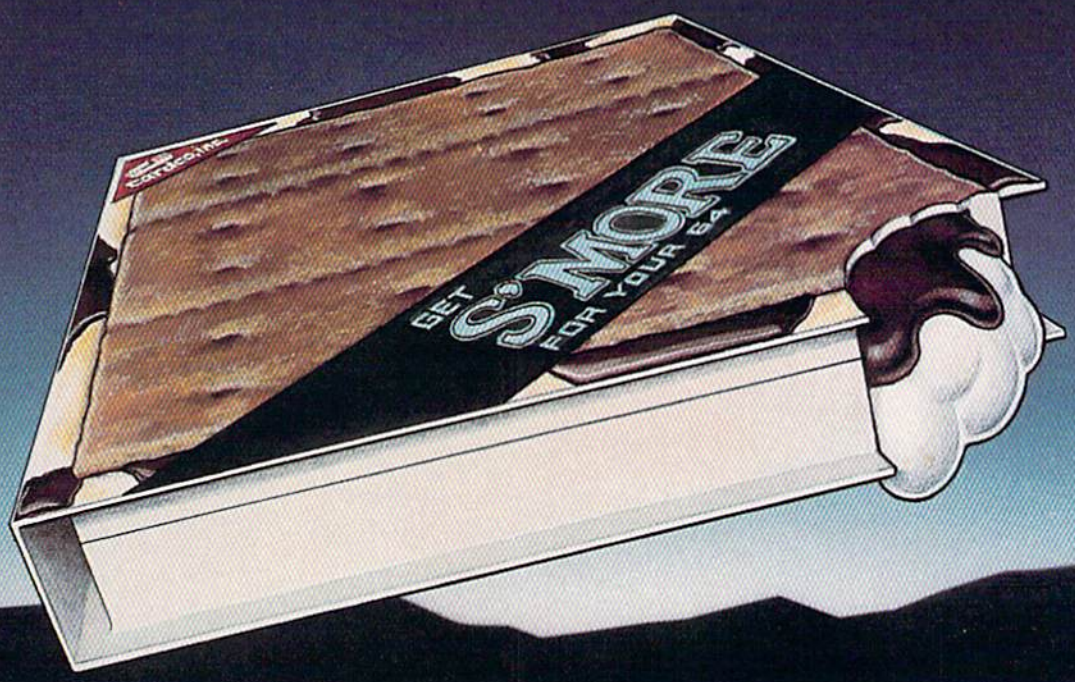

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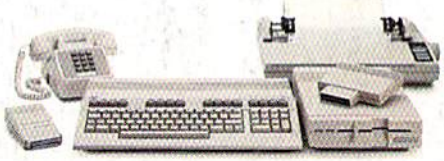

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