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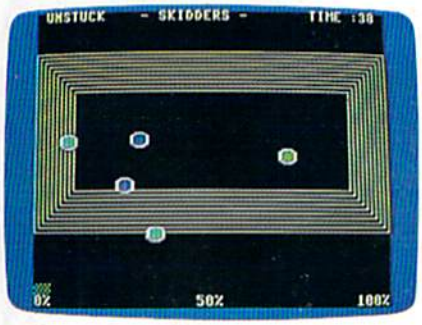

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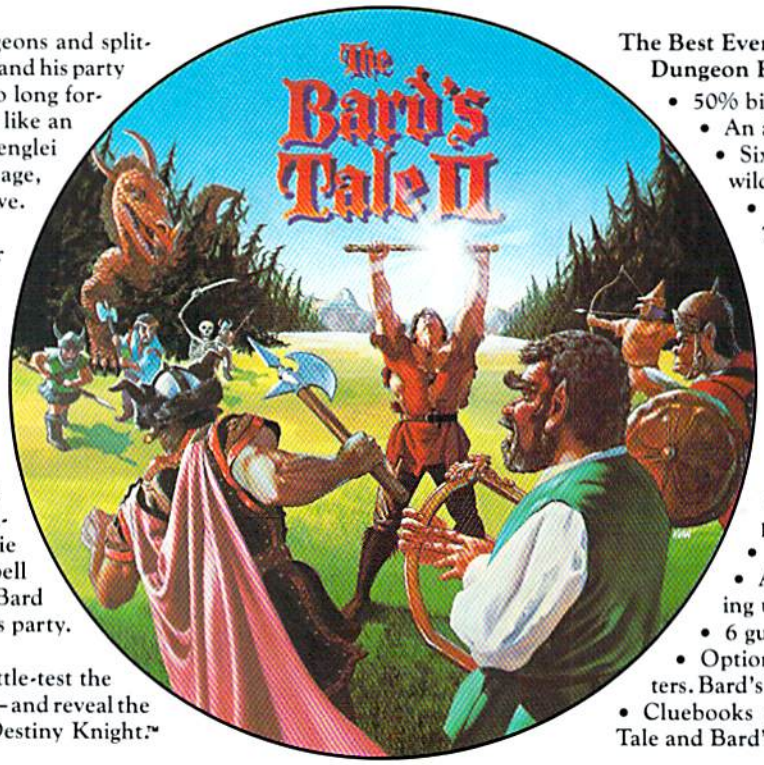

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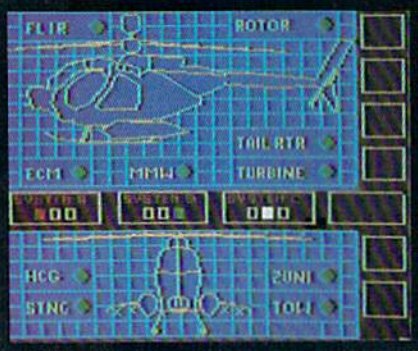

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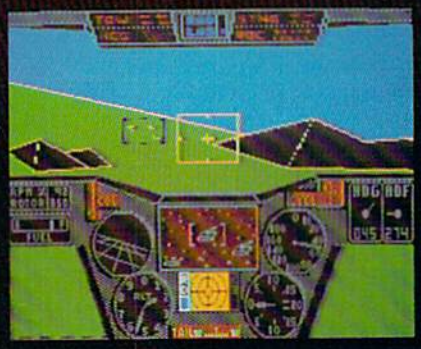

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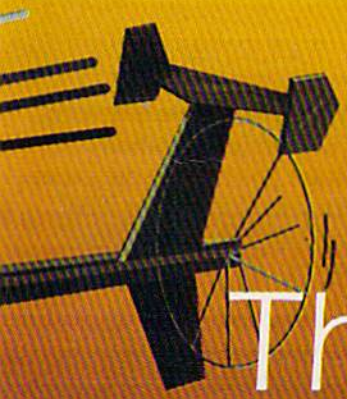

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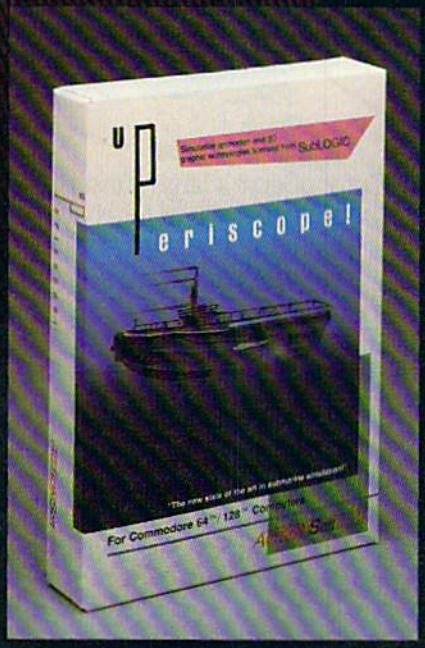

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editor's notes

One million Commodore 128s have sold this past year, and the Commodore 64 and 64C have continued to sell extremely well. Astonishing the competition, industry pundits, and even some people at Commodore itself, the enduring popularity of the Commodore eight-bit line is a testimony to the excellence of its fundamental design. The Commodore 64 has become the Volkswagen of the computer market, the most widely accepted personal computer ever.

The recent Consumer Electronics Show (see the feature beginning on page 22) offered additional evidence of the 64's continuing strength: There were many new software and peripheral products introduced in support of the 64; the quality of the software, particularly graphics and sound, continues to improve as designers find new ways to exploit the 64's features; and observers are now predicting that the 64 will continue to sell *into the 1990s*. All this points to a machine which was initially so well designed that it can compete effectively against technological progress in a market notorious for its rapid technical change.

Surrounding and supporting the 64 and its offspring are new products which remedy its weaknesses and amplify its strengths: new, faster disk drives; memory expansion; even hard disks. But the underlying design remains the same through all these changes. What is it that makes the 64 so special, so durable?

For one thing, it was initially, and remains today, a breakthrough in price/performance. At the time of its introduction, the 64 offered unparalleled sound capability via its SID chip, which represented a leap forward in computer sound capabilities, and still holds its own against the majority of other personal computers available now.

Another chip, the VIC, provides efficient control over video: high-resolution, multicolor, custom characters, and sprites. Programmers continue to be impressed by how easy it is on the Commodore systems to manipulate character sets and sprites. Compared to that of some competing systems, access to—and control over—the VIC chip is particularly efficient. It's one major reason why software engineers and professional programmers continue to push back the boundaries of what's possible visually on the 64.

A related issue is the excellent Commodore version of Microsoft BASIC. For one thing, there are no major bugs in this language, a less common achievement than most people realize. And from the start, programmers have been impressed with the special effects possible directly from 64 BASIC. Sprites are easy to work with, even for beginners. The screen map for character mode makes designing effective animation relatively painless. Color mapping permits dazzling graphics with a minimum of fuss. Also, there's enough memory, a full 64K of RAM, to write sophisticated, full-featured programs.

The computer's popularity has spawned an extraordinarily rich base of documentation and utility support to assist programmers in their efforts to create new software for the Commodore 64. If you want to know something about the 64, you can find it in one of the hundreds of books published about this machine. Likewise, there are dozens of powerful utilities, software tools, sprite editors, and such.

Another factor which continues to help sell the 64 is its price. Introduced at $600, it can now be purchased new for around $160. Peripherals, too, can be quite reasonable. If you want to start telecomputing, you can find modems for the 64 for as little as $30. Light pens, graphics tablets, and a host of other add-ons are all remarkably inexpensive, relative to many competing lines. And, of course, there's a tremendous amount of quality software—both traditional favorites and the new packages which continue to be introduced and continue to sell well.

Its low cost and the consequent high price/performance ratio also make the 64 attractive to specialists. Niche markets have sprung up using the 64 for everything from timing scientific experiments to controlling burglar alarm systems and monitoring the weather. Where previously a specially designed machine would have been required, now an inexpensive, fully programmable, general-purpose computer can be assigned to one task.

Overall, the 64 and its family can be expected to continue to sell well for the next several years. And COMPUTE! Publications will continue to supply some of the best applications, games, and utilities for this outstanding and surprisingly durable machine.

Richard Mansfield

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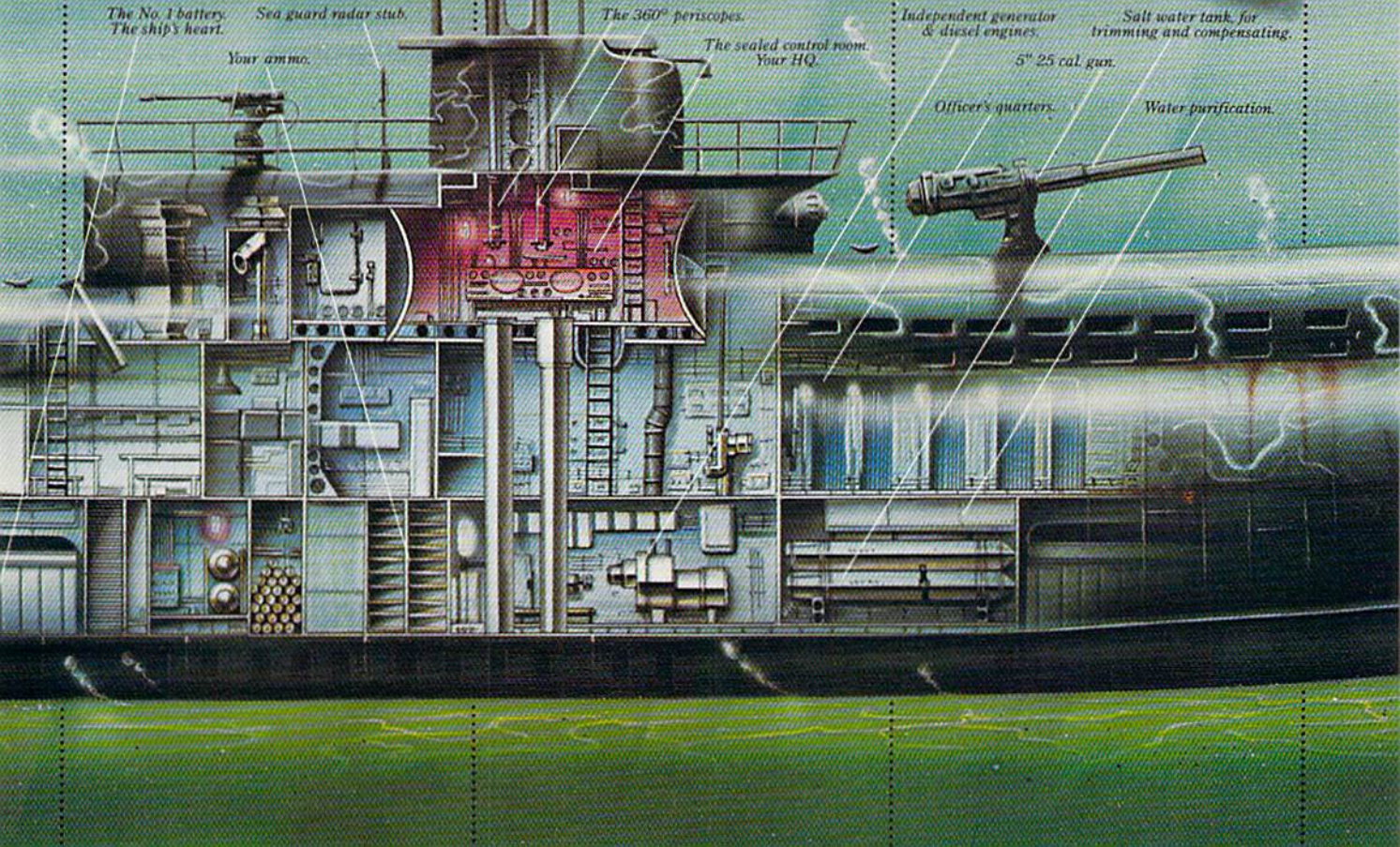

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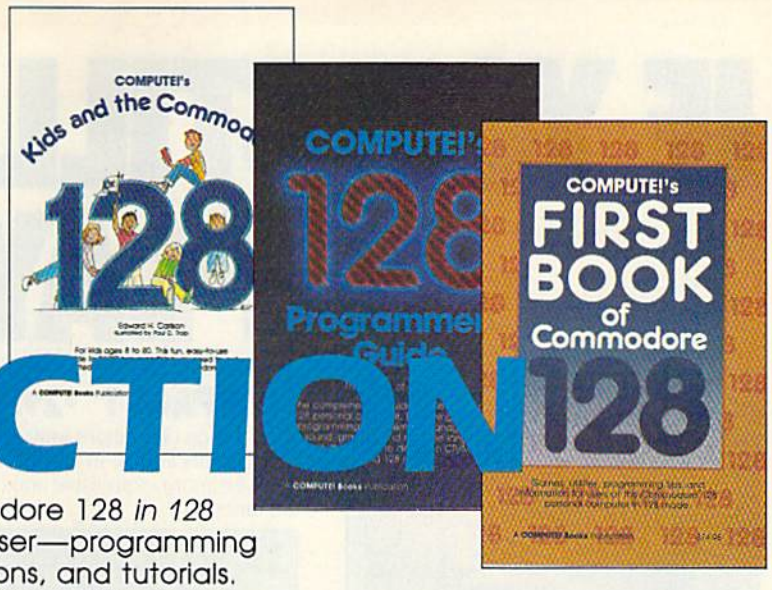

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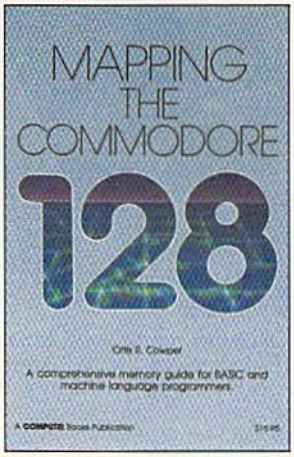

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Ottis R. Cowper
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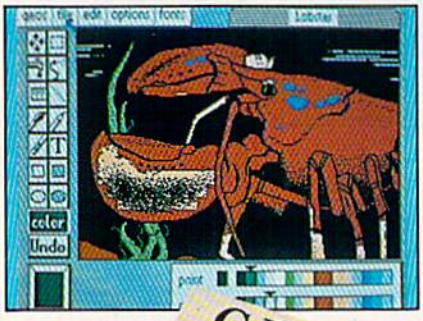

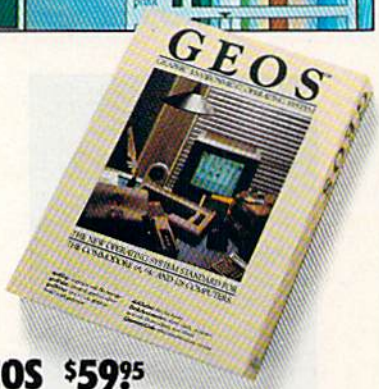

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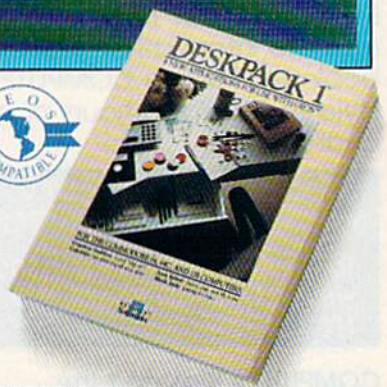

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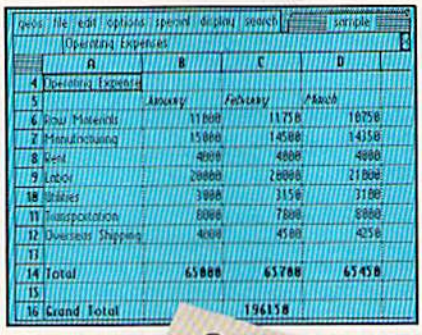

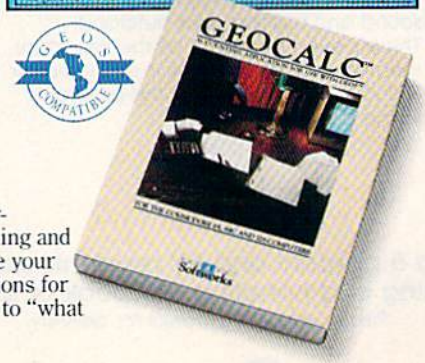

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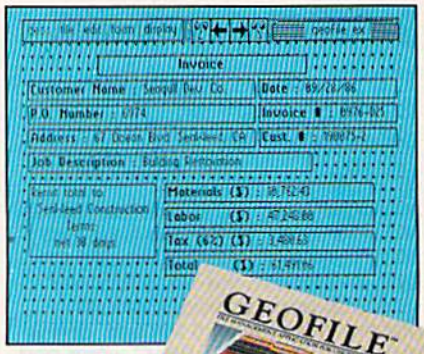

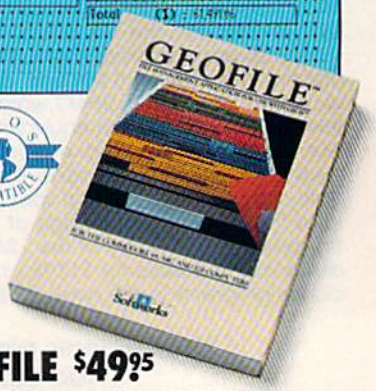

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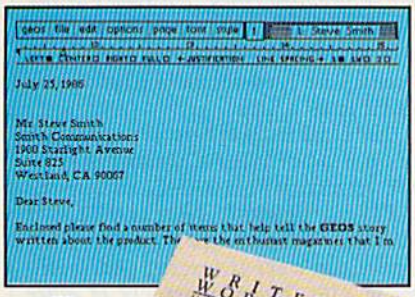

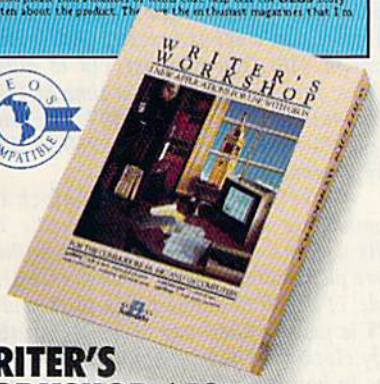

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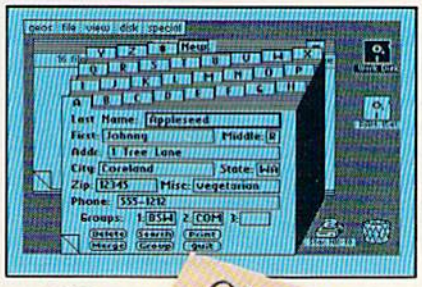

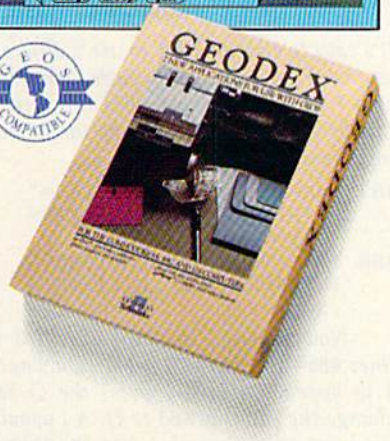

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Where Does Machine Language Come From?

I don't understand how programs are put into a SYS location. Is it possible to place a BASIC program in a SYS location?

James Glover

SYS is a BASIC statement which transfers control to a machine language (ML) program. It's similar to RUN in that it takes you out of immediate mode (where the computer is waiting for you to type something) and starts up a program. You can also use SYS from within a BASIC program. You can SYS to an ML routine, but you can't SYS to a BASIC program.

The BASIC interpreter knows where a BASIC program begins because it needs to keep track of the starting and ending locations of the program for editing and for disk and tape storage. An ML program, however, can begin at any memory location. Therefore, you must specify the address of the first byte of the machine language subroutine when you do a SYS. Many ML programs for the 64 begin at the unused memory block located at 49152. The line ***SYS 49152*** *begins execution of these programs.*

ML programs can be stored in memory in a variety of ways. Short programs are often POKEd into memory from BASIC. When you see a program with a block of DATA statements, those numbers are sometimes a machine language program. You can also load ML programs from tape or disk. Usually, you have to add a comma and a 1 after the LOAD command—for example, ***LOAD"program name",8,1****. Still other machine language routines are already in memory when you turn on the computer. These built-in routines make up the operating system and the BASIC language. (BASIC is itself a machine language program.)*

The built-in routines can be turned off and the memory there made available, but the memory can't be used for BASIC programs. To obtain the extra memory, you must turn off BASIC. If you then loaded a BASIC program into that area, you'd never be able to run it because RUN is a BASIC command and BASIC has been disabled.

MLX For Professional Typists

At work I am a data entry operator. I like the idea of the 64 MLX Keypad, where you use certain letters on the keyboard to stand for numbers, but the layout "MLX" uses is different than what I am used to at work. How can I change the MLX keypad?

Charles E. Waste II

It's easy to change MLX to use a different keypad. First, make sure you're using Version 1.1 of MLX (line 10 has the version number). Then add or change the following lines:

```
487 A=A-13*(A$=S$)-14*(A$="
    7")-15*(A$="8")-16*(A$=
    "9")
488 IF A THEN A$=MID$("ABCD
    123E456F0789",A,1):GOTO
     540
```

Now reassign the keys specified in lines 485–487. For instance, if you want a 1 to appear when you press the Q key, change the J in line 485 to Q. A J usually produces the numeral 1 (see the keypad chart in the MLX article elsewhere in this issue).

Jiffies And Clocks

I was trying to figure out how to use TI$ as a timer to keep up with how long it takes my child to do math problems. Can this clock be reset to zero (or any number) without turning off the 64? Also, I thought that all numeric variables were used without a dollar sign ($) on the variable name. Since TI$ holds a number, why isn't it displayed as TI?

Evidently TIME is another clock, because when I type PRINT TIME, it displays a progressively larger number. After some experimentation, I figured that this number advances approximately 60 times per second. Can you please explain about this also?

Randy Sibley

The variables TI$ and TI (or TIME$ and TIME—only the first two letters of the variable name are significant) tell you the value in the jiffy clock, but they put the time in slightly different formats. As you've discovered, the clock ticks 60 times a second. The 1/60-second unit of time is referred to as a jiffy.

The clock is set to zero whenever you turn on a 64 or other Commodore computer. To reset it from BASIC, include the line ***TI$ = "000000"****. Note that* ***TI = 0*** *won't work. You can read the value of TI, but you can't set it (except indirectly through TI$). You may set TI$ to other values; for example, to set a time of 1:35 you would use* ***TI$="013500"****. The time uses a 24-hour format: After 23:59:59, TI$ wraps around to 00:00:00.*

There's only one system clock in Commodore computers. The variable TI tells you the total number of jiffies that have passed since the clock was reset. Divide TI by 60 to convert this to seconds. TI$ is just another way of looking at the jiffy clock—it changes the number of jiffies to hours, minutes, and seconds. One reason to make TI$ a string variable (with a $ after the variable name) is that it prints the time in a consistent format with leading zeros. Because TI$ is a string, you can use the MID$ function to extract the hours, minutes, and seconds. To convert a string to a numeric value, use the VAL function. For example, ***PRINT VAL(TI$)*** *would print 120 for a time of 000120.*

The following short program for the 64 uses TI$ and TI to test reaction time. It illustrates how to use the jiffy clock to time an event (waiting for a keypress, in this case).

```
10 X=INT(RND(1)*5000)+1000:
   REM RANDOM NUMBER 1000-5
   999
20 FOR Y=1TOX:NEXT:REM DELA
   Y LOOP
30 IF PEEK(198)>0 THEN PRIN
   T"TOO EARLY":POKE198,0:G
   OTO 10
40 PRINT"PRESS A KEY"
50 TI$="000000"
60 GET A$:IF A$="" THEN 60
70 PRINT TI/60;"SECONDS":GO
   TO 10
```

Numbers With CHAR

I'm trying to write a simulation program for the Commodore 128. One problem I have run into is that I can't get variables to print in the graphics mode. Here is part of my program:

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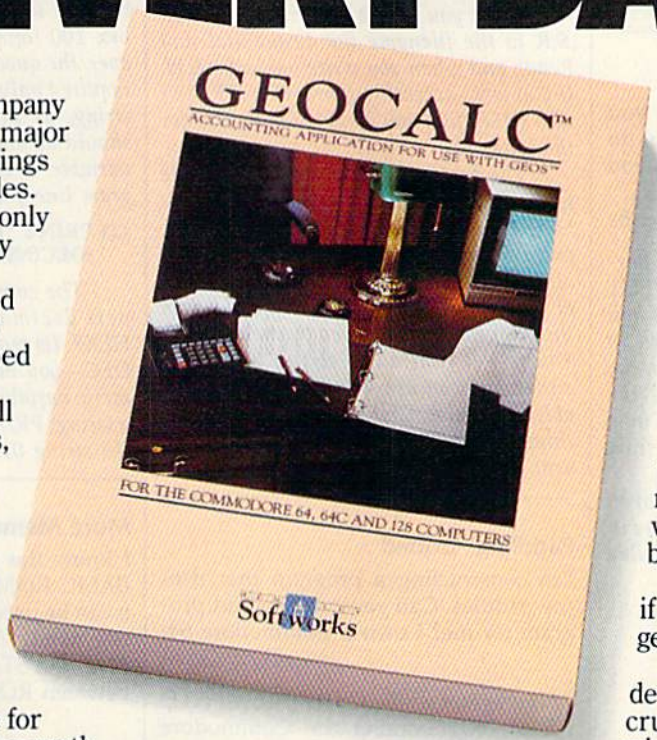

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7	Manufacturing	15000	14500	14150
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9	Labor	20000	20000	21000
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```
10 GRAPHIC 1,1
15 H=180
20 CHAR 1,5,5,"HEADING: ";H
```

The variable in line 20 doesn't print out.

Rick Grossenbacher

BASIC 7.0's CHAR statement won't print the value of a numeric variable; it will display only strings (or the contents of string variables). Fortunately, BASIC provides a simple way to generate a string containing the digits of a numeric variable—the STR$ function. For example, A$=STR$(123) produces the same result as A$="123", and STR$(H) will produce the string equivalent of the value of the numeric variable H. There's just one other consideration: Unlike PRINT, CHAR will display only a single string, so you can't use print separators like the semicolon you have in line 20 above. Instead, you must use the + operator to concatenate (join) any substrings into a single string. Here's a workable version of line 20 for your program fragment:

```
20 CHAR 1,5,5,"HEADING: "+STR$(H)
```

Filing Away Information

When you are in a program and you want to save some text, how do you do it? And after you save it, how do you load and list it?

Ashton C. Hobbs

A sequential file would suit your purposes. If you're familiar with the INPUT and PRINT commands, the INPUT# and PRINT# commands won't be hard to learn. INPUT reads information from the keyboard, and PRINT writes it to the screen. INPUT# and PRINT# act in a similar way, but they read and write from files you've opened.

To create a sequential file, you open it for writing, write to it, and then close it. The program below creates a file called NAMES on disk.

```
10 OPEN 1,8,2,"0:NAMES,S,W"
20 PRINT"TYPE FOUR NAMES"
30 INPUT A$:PRINT#1,A$
40 INPUT B$:PRINT#1,B$
50 INPUT C$:PRINT#1,C$
60 INPUT D$:PRINT#1,D$
70 CLOSE 1
```

If you now look at the disk directory, you'll see that there's a file called NAMES and it's a SEQ type file. You can turn off the computer, and the information will still be in the disk file. The program below reads and prints the names from the file.

```
10 OPEN 3,8,5,"NAMES,S,R"
20 FOR X=1 TO 4
30 INPUT#3,Z$:PRINT Z$
40 NEXT X
50 CLOSE 3
```

In the first program, the INPUT took information from the keyboard, but PRINT# sent it to the file. In the second, the INPUT# read the file and then PRINTed the information to the screen.

The OPEN statement at the beginning of each program must be followed by three numbers (numeric variables would work as well) and a filename (or a string variable). The commas must separate the three numbers, which indicate the logical file number, the device number, and the secondary address.

The logical file number identifies which file you're using and it must follow the PRINT# or INPUT# statement when you access the file. It can be any number in the range 1–127. The device number is 8 for single disk drives. Additional drives are usually numbered 9–11; printers are usually device 4; cassette drives are device 1. The secondary address means different things to different devices. For disk drives, it tells the drive which channel to use. When you're using sequential disk files, the secondary address may be any number from 2 to 14, but if you ever have more than one file open simultaneously, you must be careful that each file has a unique secondary address.

When you read a sequential file, add ,S,R to the filename (for Sequential and Read), and when you write one, add ,S,W. If you were accessing a program (PRG) or user (USR) file, you'd subsitute P *or* U *for the letter* S.

The first information to go into a file is the first to come out when you read it. Note that the variable names A$, B$, C$, and D$ were used in writing the file, but all four names came out as Z$. The name of the variable is not saved to the file, only the information contained by the variable. You're not limited to string variables, either. You can use strings, numeric variables, formulas, CHR$ codes. Almost anything you can PRINT to the screen can be sent to a disk file.

Paddling Around

I'm constructing a program that uses the paddles. Can you print a short program for me? I own a Commodore 64.

Terry Gavit

This program is adapted from COMPUTE! Books' Programming the Commodore 64. *The variables X and Y return the values of the two paddles and FB returns the value of the two fire buttons (each paddle normally has its own). The paddles should be plugged into port 2.*

```
10 POKE 56333,127
20 POKE 56322,192
30 POKE 56320,128
40 X=PEEK(54297)
50 Y=PEEK(54298):FB=PEEK(56
   320) AND 12:POKE 56322,2
   55:POKE 56333,129
70 PRINT X,Y,FB
80 GOTO 10
```

Run this program and turn the paddles. The program prints three numbers. The first two are the values of the two paddles. The third number contains the paddle fire button information. A 12 means that neither button is pressed, a 4 or an 8 means one of the buttons is pressed, and a 0 means that both are pressed.

Decoding DEC

I can't get DEC to work on my computer. The following line returns an ILLEGAL QUANTITY error message:

```
115 PRINT "DECIMAL NUMBER IS"
    ;DEC("N$")
```

Any suggestions?

Mark Todd

There is a particular syntax for the DEC function, available in the versions of BASIC in the Commodore 128, Plus/4, and 16. DEC generates the decimal numeric value of a character string which presumably holds a hexadecimal number. (You'll get an error message if the string contains any characters other than the numbers 0–9 or the letters A–F.) For example, PRINT DEC("100") returns 256, because that's the decimal equivalent of hex 100 (often written as $0100). However, the quotes inside the parentheses are required only when you are using a literal *string, as the "100" above. The quotes should be omitted when you use a string variable, so the proper version of the program line you mentioned would be:*

```
115 PRINT "DECIMAL NUMBER IS"
    ;DEC(N$)
```

The complementary function to convert decimal values to hex strings is HEX$. Its requirements are the opposite of DEC—you must supply a number or numeric variable, and the function generates a string: PRINT HEX$(256) would display the string 0100.

More Memory For The 64

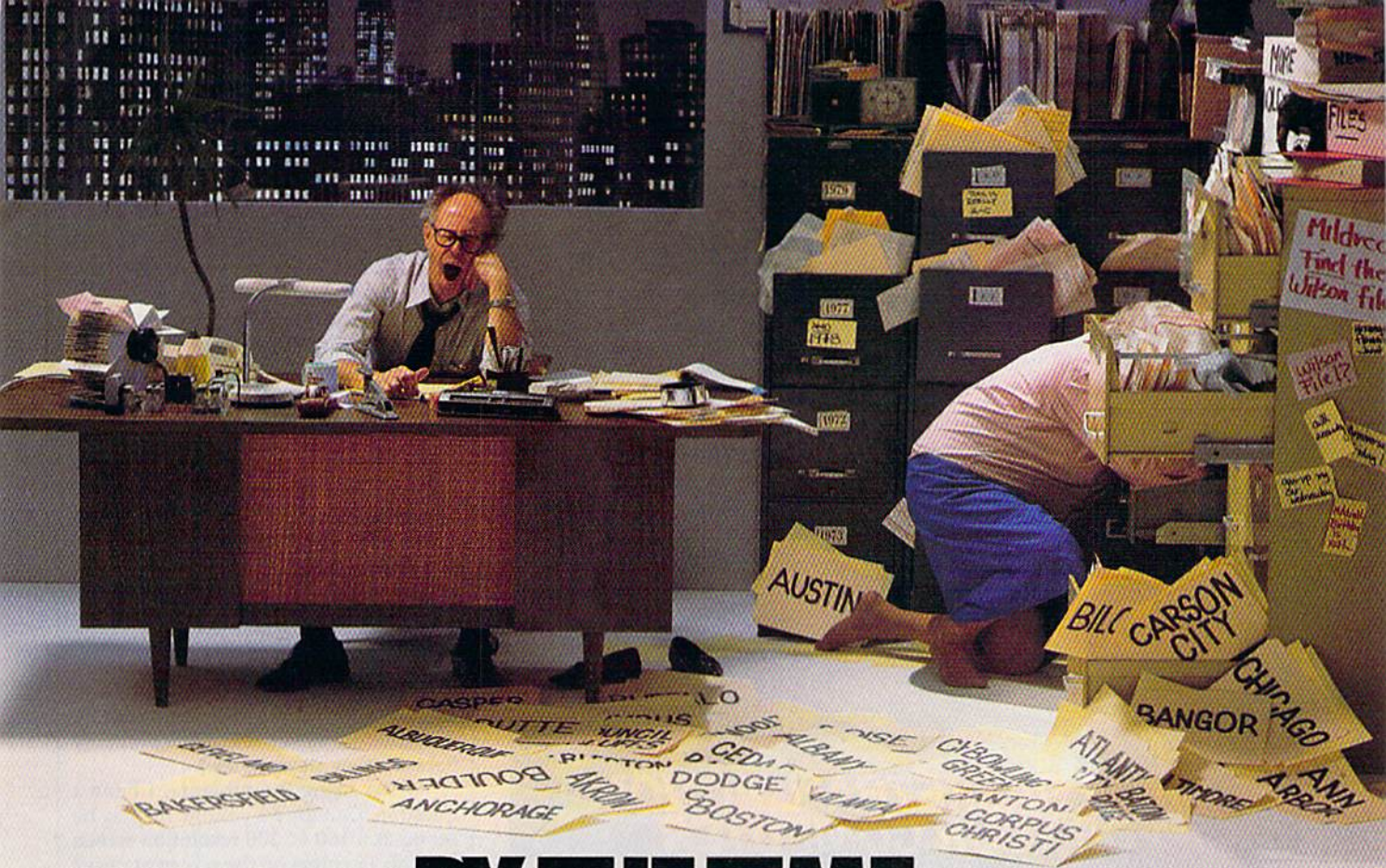
I know the 64 has 8K of RAM under BASIC ROM at 40960–49151 and that it can be used as long as BASIC isn't being used. Which machine language LDA and STA do I need to use to switch between ROM and RAM?

David P. Ballin

I have recently taught myself machine language out of a book. I'd like to write a program entirely in ML, with no BASIC at all, but I need about 50K of free RAM. The book says I can free a memory block from $0801 to $CFFF with LDA #$36: STA $01. However, when I do this, the computer crashes. Either something is wrong with my computer or I can't take advantage of this free RAM in direct mode. How can I program this memory?

Jeff Martin

Bit 0 of location 1 determines whether the computer sees memory at $A000–$BFFF as BASIC ROM or as the RAM under-



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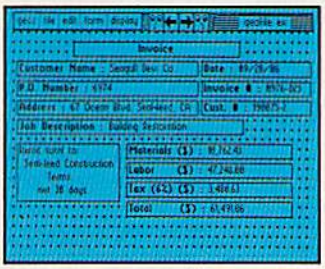

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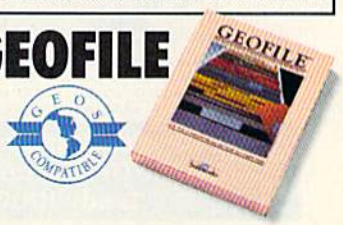

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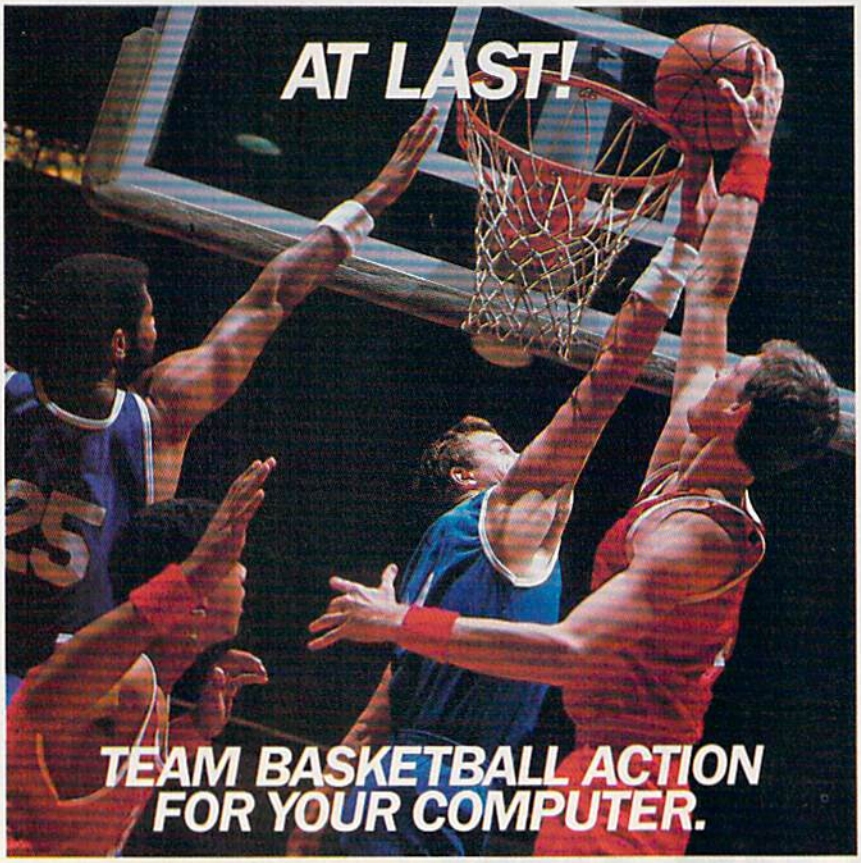

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Commodore Amiga screen shown.

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neath. If the bit is on, ROM is enabled. If it's off, the memory is available. On the 64, store a $06 into location $01 to turn off the BASIC ROM and store a $07 to turn it back on.

When you make this memory available, you pay a price—you lose BASIC ROM. BASIC is gone, which is fine if you're writing a program entirely in ML and if the program doesn't call any built-in ROM routines from that area. But you must store a $07 to location 1 before you end the ML program and return to direct mode. BASIC is in charge of monitoring your keypresses, printing them to the screen, and interpreting commands (like RUN or SYS) that you might type. If you've switched out BASIC, direct mode will seem to be locked up.

Hi-Res 80 Columns

I recently downloaded a program from a telecommunications service. It shows that bitmapped graphics are possible on the 128's 80-column screen, something Commodore never revealed (probably because they never knew).

After using the program, I have a question. Can the 80-column display be set up as a 160 × 200 resolution screen with all 16 colors on the screen at once?

Lyle C. Seplowitz

The chip that controls the 80-column display, the 8563, was designed by Commodore specifically for the 128, so it's certain that they did know about the 8563's hi-res bitmapped mode. It's true that the 128 System Guide *doesn't make any mention of it, but that's because BASIC and the operating system don't support bitmapped mode, so Commodore considers it an advanced topic. If you're interested in reading more about it, both* Mapping the Commodore 128 *(from COMPUTE! Books) and Commodore's own* Commodore 128 Programmer's Reference Guide *(published by Bantam Books) have sections that explain how the 80-column chip works.*

An explanation of all the 80-column chip's capabilities would require a complete article. To briefly answer your question about multiple colors, yes it it possible to display all 16 colors on the screen at once. In bitmapped mode, each pixel is represented by a single bit in the area of 80-column screen memory known as the bitmap. *Each bitmap bit controls whether the corresponding pixel will take the foreground color or the background color. The foreground and background colors can be specified in two ways. In the first, an area of screen memory can be set aside as* attribute memory. *Each byte in attribute memory holds foreground and background color values for a corresponding 8-by-8-pixel character cell in the display, analogous to color memory for the 40-column screen. Using this system,*

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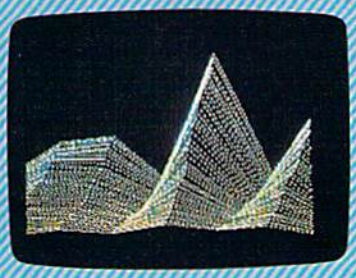

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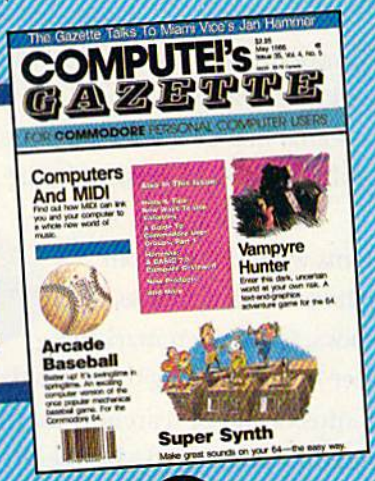

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each character-cell area can have independent foreground and background colors, and all 16 available colors can be displayed simultaneously.

The problem with this system is the amount of memory it requires. The size of the 80-column screen bitmapped display is programmable, but the default size is 640 pixels horizontally by 200 vertically, a total of 128,000 pixels. Since each byte consists of eight bits, 16,000 bytes of memory are needed for the bitmap. The 8563 chip has its own private bank of memory not shared with the rest of the system, but that bank contains only 16K (16,384 bytes). Thus, there's not enough memory remaining after the standard 16,000 bitmap is set up to provide the 2000 bytes required for the corresponding attribute memory area. The alternate color system, used in most of the bitmapped graphics examples we have seen so far, eliminates the need for attribute memory, but at the cost of restricting you to only two different colors for the display. That is, when attribute memory is eliminated, the foreground and background colors are common for all pixels in the display.

There are three ways to add additional colors to the hi-res screen. The first is to shrink the size of the bitmap, displaying only about 112,000 pixels. You can then allocate the free memory as attribute memory and display any one of 16 foreground colors in each 8-by-8-pixel area in the smaller 640-by-176-pixel display. The second method is to simulate bitmapped mode in text mode by redefining the 512 available character patterns. In other words, use custom characters. The third is to replace the 16K of 80-column screen memory with 64K, which requires desoldering the memory chips and soldering new ones in place. Needless to say, this would void your warranty and is not a project for novices.

Big Variables, Small Variables

I am working on a program that requires a lot of memory to load and a lot of memory to store variables. According to the *Programmer's Reference Guide*, five bytes of memory are used to store floating-point variables, while only two are required for an integer.

I wrote a simple program to print the current available RAM and then did some testing. A floating-point array of 100 values takes up 512 bytes, adhering closely to the 5-bytes rule. Dimensioning an array of 100 integer variables took up 209 bytes, close to 2 bytes per integer variable.

However, when I tried assigning a value to several different (scalar) variables, each required seven bytes, whether it was floating-point or integer. Why do individual variables take up the same amount of room?

John R. Bendixsen

Scalar non-array variables such as A, B, X$, A1%, or RA$ use seven bytes each because if every variable occupies a fixed amount of memory, searches can be faster. When you reference a variable, the system has to scan through memory to find it. If variables start at every seventh byte, the computer doesn't have to slow down to figure out where the next variable is.

Within the seven bytes, the first two indicate the variable name. A value of 128 may or may not be added to the first or second letter, depending on what type of variable it is. Floating-point variables use all five of the remaining bytes, integer variables use two of the five bytes, and string variables use three (one for the length of the string and two for a pointer to the address where the string is stored).

Arrays are handled a little differently. To find the value of A(52), BASIC first searches for the beginning of the A( ) array and then calculates the location of element 52. There's no need to look through the previous 52 values of the array. Floating-point arrays need five bytes per member, while integer arrays use less memory, only two bytes. If you consider that the statements DIM A(100) or DIM B%(100) create arrays of 101 elements, numbered 0–100 (not 1–100), then the first DIM should use 505 bytes, the second 202. The name of the array and a pointer to the beginning of the storage area adds an overhead of seven bytes, to give you a total of 512 and 209, the sizes you reported.

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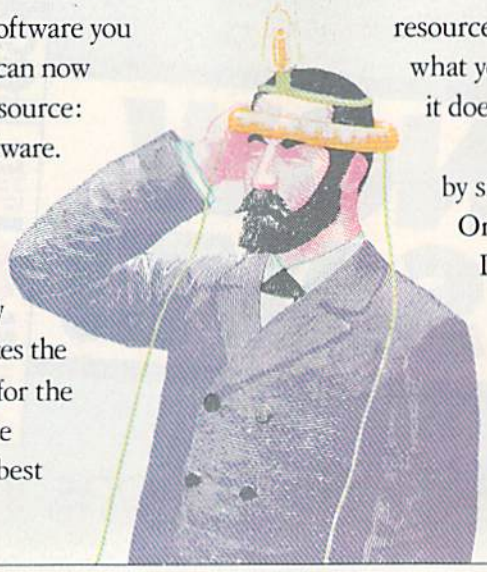

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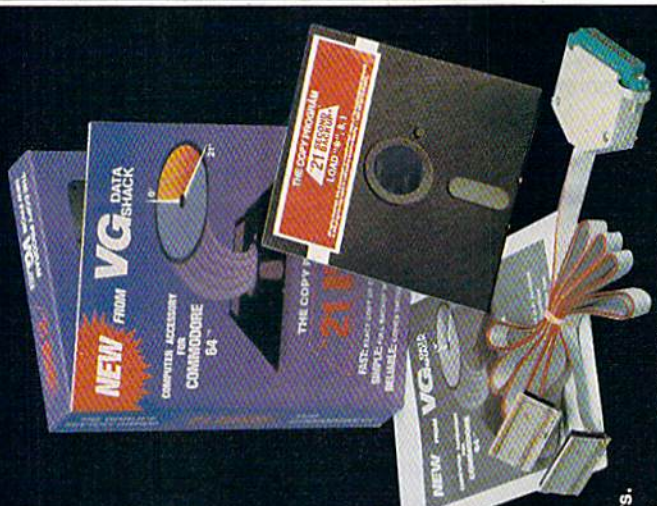

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UnREMarkable Programs

I am a Commodore 64 owner who does much programming on my own. It appears to me that many of the programs published in the GAZETTE have bad structure. It is important to have good structure so that the programs may be easily understood and modified by other programmers. In my opinion you should group blocks of the program that do one function and clearly mark and describe the function with REM statements. You should also use fewer GOTOs and use GOSUBs to call the subroutines separated from the program. Why does the GAZETTE use such bad structure in the programs it publishes?

Corey Luecht

There are many ways to judge the value of a computer program. One way is to ignore how the program is written and instead observe how it performs. A program that works well is, from one perspective, a well-written program. For instance, if you use a word processor, the internal structure of the program is unimportant, indeed it's unknown—instead, you want the word processor to help you do what you need to get done.

Many of the programs published in COMPUTE!'s Gazette are written by the readers of the magazine—and a lot of programmers write unstructured programs. When we select a program to be published, we look for many things: utility, entertainment value, ease of use, visual appeal, creativity, and programming technique. Although we appreciate the fact that many of our readers learn programming techniques from the programs we publish, we simply don't have the time to rewrite programs in the magazine to conform to our ideas of elegance.

For example, one factor that works against structured programs is size. A liberally commented program could easily be three times as large as a more compact, uncommented program. Such a program would take up too much space in the magazine. Also, in many cases, a structured program runs more slowly. What looks like an inelegant subroutine might be optimized for speed.

Although it is possible to write structured programs in BASIC, the language does not encourage it. In some cases, BASIC makes you pay a penalty for structure. REM statements take up both space and time. In a compiled language, comments are automatically deleted from the running program.

Many programmers think of BASIC as a language that is best used to quickly write utilities and test ideas. Some of these programmers see structured programming techniques as a hindrance.

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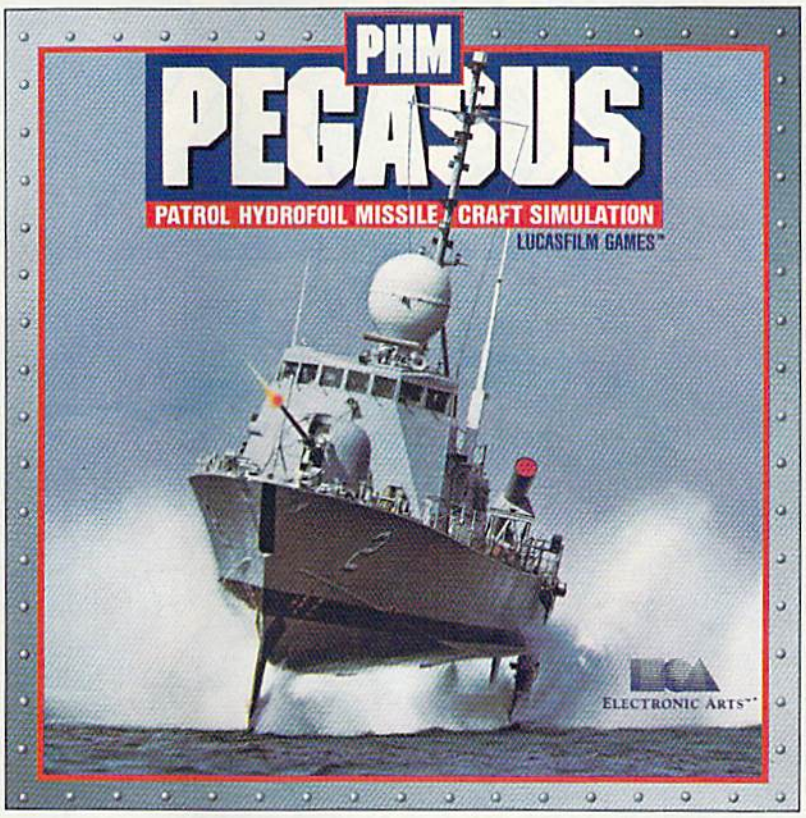

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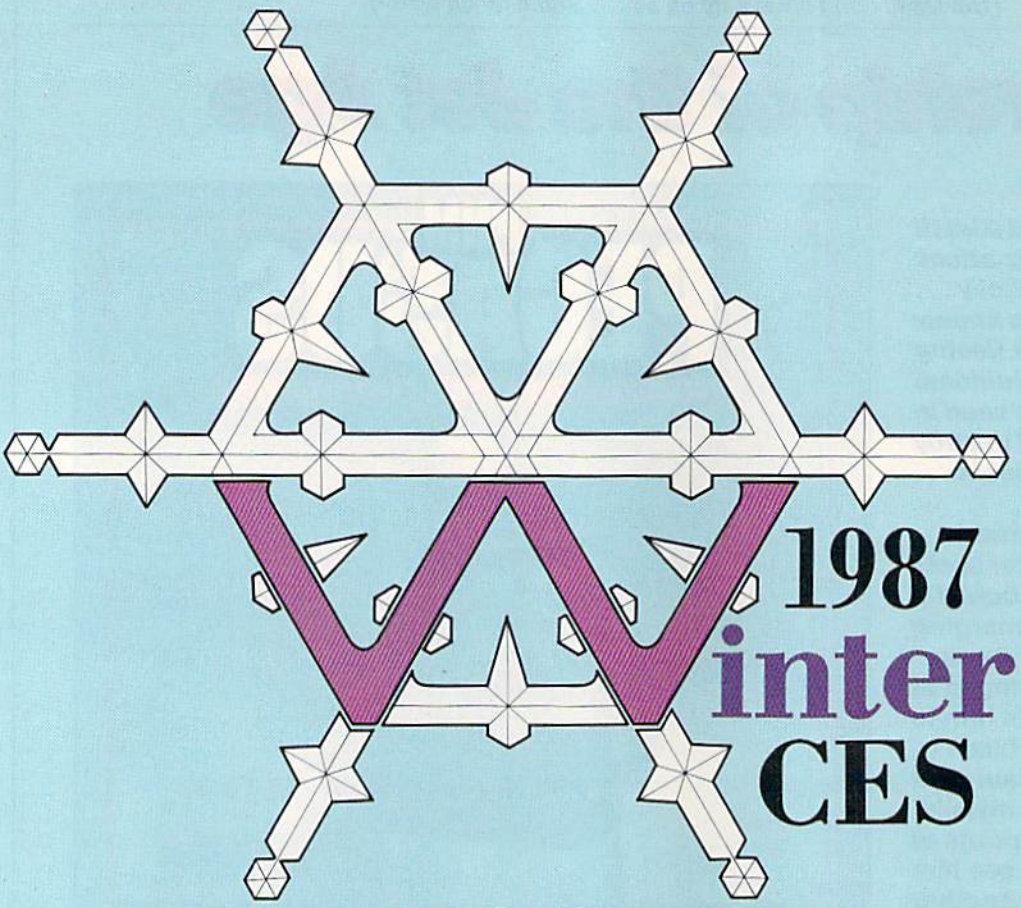


Lance Elko, Editor

The Consumer Electronics Show Report

A rare snowfall covered Las Vegas in early January as tens of thousands of people arrived for the Winter Consumer Electronics Show. With it came a flurry of exciting new hardware and software products—plus plenty of good news for Commodore owners.

Commodore 64 and 128 owners have a lot to smile about. For the past year, the new-generation 16-bit machines—the Amiga, Atari ST, Macintosh and Apple IIGS—have captured many of the headlines in the home computer market. While many 64 and 128 owners may have wondered if their machines were soon to follow the VIC-20's path to obsolescence, the good news is that these machines continue to sell *very* well.

Nowhere was the continuing health of the 64 and 128 more evident than at the Winter Consumer Electronics Show (CES), held in Las Vegas in early January. Looking more like an agitated beehive than a showcase for state-of-the-art electronics technology, the floor of the Las Vegas Convention Center teemed with more than 100,000 people. While the majority of CES product displays were in audio and video, the personal computer hardware and software element was significant.

Not surprisingly, Commodore and Atari had the largest and most popular booths in the computer section. Both companies announced a number of interesting new hardware products. They also shared their booth space with a variety of third-party hardware and software developers in support of their respective products.

Commodore showed two versions of an IBM PC-compatible for the American market that have been available for some time in Europe and Canada. (See "Commodore Goes Cloning In The U.S." following this article.) While Commodore's introduction of its PC compatibles was merely a formality—the debut of these machines in the U.S. market was announced months ago—Atari surprised everyone with its announcement of two low-priced PC compatibles and a $1,500 laser printer.

While Atari pulled a rabbit out of a hat, Commodore had a quiet surprise of its own. Hidden on the second floor of the booth, away from the public eye, were Commodore's two new Amigas: the 500—a

new low-cost but powerful version for the mass market—and the 2000—an expandable and multifaceted machine that converts easily into a PC compatible. (See "The New Amiga Family" following this article.)

The Commodore 128's new twin—the 128D.

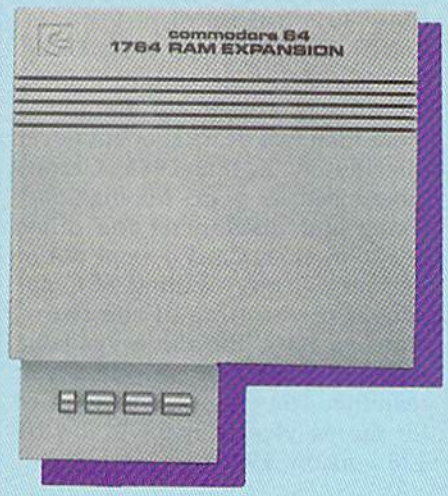
Teaching Old Dogs New Tricks

Things are looking up for Commodore. On the rebound with three consecutive profitable quarters—after a dismal and shaky six-consecutive-quarter loss—the company appears to be on steady ground. The cost-cutting measures implemented in 1985 and early 1986 are surely one reason for Commodore's newfound state of health. But another key factor in its resurgence is the sustained sales of the 128 and 64/64C, which still surprises even some Commodore staff. According to Nigel Shepherd, general manager of Commodore North America, the 128 sold about one million units in 12 months, while Commodore 64/64C sales were strong throughout the year. In 128 and 64 sales, Shepherd noted that toward the end of 1986, they "virtually sold everything to the walls. We virtually sold out of each machine."

In light of an optimistic forecast, Commodore announced a number of new 128 and 64 hardware products at CES. Shoppers who decide on the 128 will now have to choose between configurations. The new 128D, essentially the same computer as its twin, offers a new package design: a detachable keyboard (with a 24-inch cord) and a computer console that houses a 1571 disk drive and doubles as a monitor stand. According to Shepherd, this version of the 128 has been in Europe since 1985: "What happened was that the original design of that machine did not pass the FCC and required a substantial redesign. So...we continued to market it in Europe while we slowly but surely redesigned the machine for North America. That was the reason for its going to Europe but not here." He added that with a single power supply, the 128D "eliminates the unsightly wiring and the need for additional power cords." This machine should be available by May at a suggested retail price of around $550.

To make existing 128 and 64 systems more powerful, Commodore introduced a couple of new hardware products. The 1581 disk drive, a unit considerably smaller than the 1571 or 1541, supports 3½-inch disks. Designed to work with the 128 or 64 (also with the Plus/4 or 16), the 1581 is considerably faster than its predecessors (three times faster than the 1541), and it has a storage capacity of 808K. Also, 3½-inch disks—housed in a hard shell—suffer less disk damage. Accidental bending—not uncommon with the 5¼-inch floppy—is eliminated. Suggested retail price for the 1581 is $399.

Commodore 64 owners who want more memory should be pleased with the new 1764 RAM Expansion module, which plugs into the expansion port to add 256K of memory. Packaged with the module are two disks: a DOS program that lets you access the extra RAM as a RAM disk, and a *GEOS* RAM disk for use with all *GEOS* applications. The suggested retail price for the module and disks is $129.



Commodore's new RAM expander adds 256K of memory to the 64.

The Commodore 1581 Disk Drive offers faster data transfer and 808K storage capacity.

If you need a lot more memory for your 128 or 64, it's available. Two companies sharing space in Commodore's booth, JCT and Xetec, were showing hard drives. JCT (P.O. Box 286, Grants Pass, OR 97526) offers three versions of its hard drive: a 10-meg ($795), a 5-meg ($695), and a 3.7-meg ($595). These work with any machine that uses the Commodore serial bus (128, 64, Plus/4, 16, or VIC, for example). Data transfer on the JCT drives is 1.7–2 times faster than on the 1541, but a parallel option (cable and cartridge are an additional $50) for speeds 10–20 times faster is available. JCT also noted that a dual hard drive is planned and should be available this spring.

Xetec (2804 Arnold Rd., Salina, KS 67401) had on display the Lt. Kernal 20-Meg Hard Disk Drive. Developed by Fiscal Information, this drive was originally announced more than two years ago, but never distributed. In late 1985, Cardco announced its plans for manufacturing and distributing the drive, but soon after, Cardco went out of business. Xetec, awaiting FCC approval at the time of the show, plans to have the drive available through dealers by the time you read this. The suggested retail price for the 64 version is $899; for the 128 version, $949.

The Old War Horse

The Commodore 64, with its tremendous software base and impressive computing power at a very low price, is understandably still a huge bestseller. Interestingly, while some industry observers have been ringing the death knell for the 64 over the past two years, recent comments have gone in the other direction. Bing Gordon, vice president of marketing for Electronic Arts, thinks that the 64 will sell well into the 1990s. Nigel Shepherd agrees: "I think if somebody had said to me—maybe in '85—what future do you see for the 64, I would have been very aggressive and said 'At least through to '87.' But I think today you're talking certainly past 1990.

"So, it's not going to die....We finally said, 'Why should we try to supercede this product when there's still demand out there?' You're probably going to see some enhancements along the way with the 64. We're going to continue to look at that machine to see how we can make it more attractive and more competitive."

Better Than Ever

The massive software base is another reason that the 64 and 128 continue to sell well. While there were fewer packages announced at this CES than were introduced at the 1984 and 1985 shows, the overall quality of the new products is higher than ever. (For a complete report, see "Fine-Tuning The Software Market," elsewhere in this issue.)

When you compare the quality and prices of this year's products with those of 1983–85—when the market was inundated with Commodore software—it's apparent that the consumer is the beneficiary. Competition has weeded out a number of companies with substandard products, while some of the major players have consolidated product lines or merged with other quality publishers. The result is software that includes to date the best in 64/128 graphics, animation, sound, and utility. It remains to be seen whether developers can take the eight-bit Commodores any further, but, as it appears now, all bets are on.

Elsewhere In Electronics

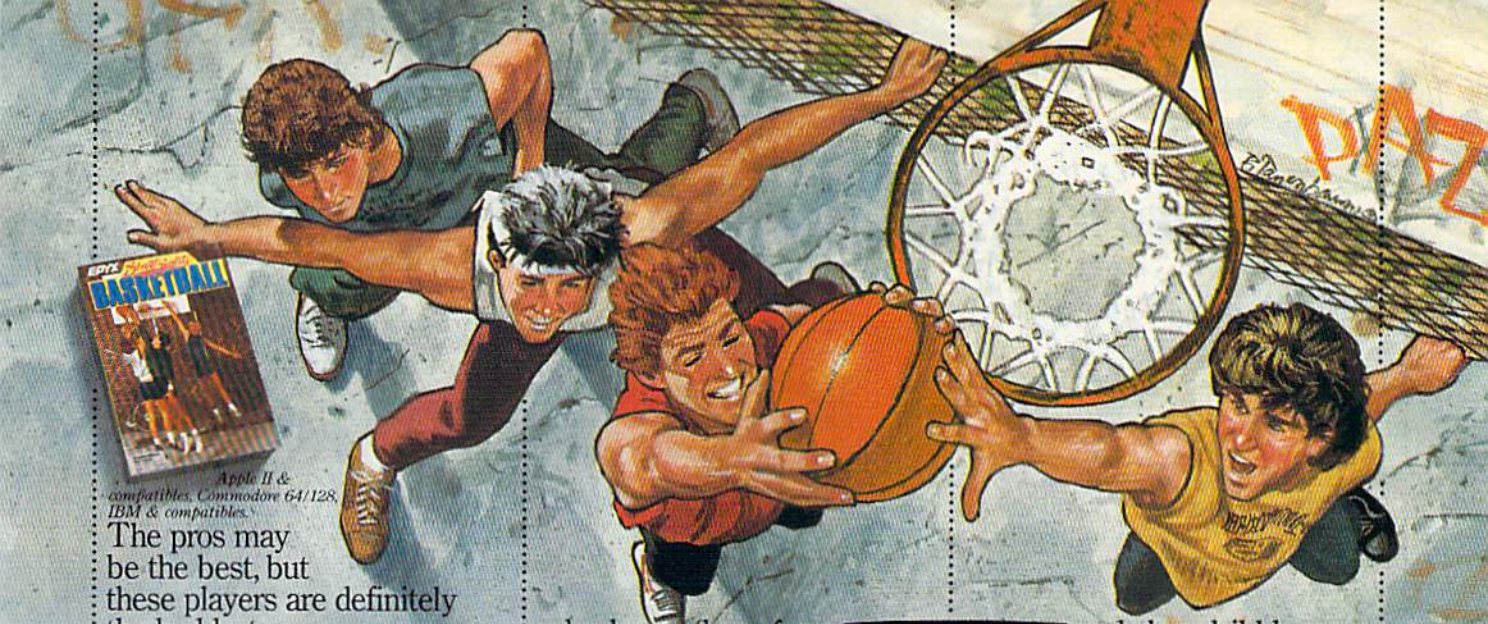
The home computer market is a significant part of CES, but the majority of products at the show are in the audio and video arena. The bulk of CES floor space is comprised of the latest in stereo components, VCRs, TVs, satellite dishes, CD players, video cameras, telephones, electronic keyboards and drum machines, calculators, and more. Familiar names abound—Sony, Pioneer, Casio, RCA, Maxell, Toshiba, 3M, and GE, to name a few. And there are hundreds of smaller companies who make accessories or support products for many of these hi-tech players.

One trend in consumer electronics evident from this year's CES is the continued strong movement toward *digital* electronics. At the show, digital TVs/monitors appeared to have remarkably crystal-clear resolution, and new digital VCRs featured rock-solid special effects. But much of the new-product attention was focused on Digital Audio Tape (DAT). Essentially a tape equivalent of the compact disc (CD), the technology and production capabilities for this medium are here, but the product itself is not on the market. DAT—about half the size of the standard cassette—is being sold in Japan and, according to many sources, will be in the U.S. later this year, perhaps as early as summer.

Like the CD, DAT offers vastly improved sound quality. But that's not all. Because data can be packed more densely, a lot more music can be stored—two hours per side. Many tape manufacturers have DAT ready but are hesitant to act until the hardware is available. But DAT deck manufacturers—Sony, Kenwood, and Onkyo, to name a few—are abstaining from production start up for a couple of reasons.

First, many audio manufacturers believe that DAT could seriously undercut the booming CD market, which has accelerated in the past year to the point where demand has greatly exceeded supply. Some would prefer to wait to release DAT players until the CD boom subsides. Second, there's the home taping controversy—piracy. With a DAT deck, the owner of a CD player could easily make a sterling copy. Thus, there is pressure on Congress from some in the recording industry to impose a 35 percent tariff on DAT players not equipped with a microchip-controlled device designed to prevent copying.

While some expect DAT to be here this summer, others have noted that, because of the formidable opposition, it would be unrealistic to expect it at all in 1987.



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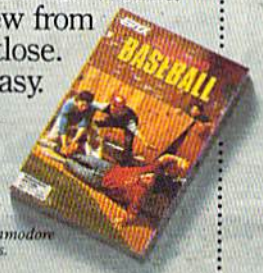

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Commodore Goes Cloning In The U.S.

Selby Bateman, Features Editor

To many loyal 64 and 128 owners, the idea may smack of heresy: Commodore introducing an IBM clone?

That's right. The same people bringing you the very popular 64 and 128 and the technologically stunning Amiga have jumped on the burgeoning IBM-compatible bandwagon in the United States. At the January Consumer Electronics Show (CES), Commodore introduced two IBM PC compatibles, the $999 PC10-1 and the $1,199 PC10-2.

At the same show, there were no fewer than a half-dozen other computer manufacturers demonstrating their own clones, including such companies as Amstrad, Victor, Blue Chip/ Hyundai, and Franklin. Even Atari showed two versions of an IBM compatible, priced aggressively at $499 and $699. Other manufacturers, such as Tandy, Leading Edge, Compaq, and Epson, are also marketing PC compatibles.

Those not familiar with the clone invasion that's been taking place over the last year may wonder what all the excitement is about. And those who are familiar with the IBM PC may wonder why anyone would bring to market a new computer whose technology has been virtually unchanged since 1981.

The answer to both questions lies in the unparalleled success of the IBM PC in the business market over the past six years, as well as the more recent capability of many companies to sell PC compatibles for substantially less than has IBM. The PC, with its MS-DOS operating system and a couple of disk drives, can cost as much as $1,500 from IBM. Clone-makers are selling the same machine (sometimes with better features) for as little as $600.

At those prices, the PC compatible becomes affordable not only by more small businesses, but by individual consumers as well. And as thousands of potential new buyers begin to move toward the clones, more and more companies are trying to get a share of this new market.

Commodore's PC10-2 is a $1,199 IBM PC compatible with two disk drives and 640K of RAM. The PC10-1 (not shown) is priced at $999 and contains one disk drive and 512K of RAM (expandable to 640K).

But Commodore is no newcomer to the IBM-clone environment. The two PCs Commodore exhibited at CES have been successfully marketed in almost identical form in Europe and Canada for some time. And there's every reason to believe the company may do quite well at selling the two versions of their PC compatible here in the states, although they'll face fierce competition for shelf space among dealers and for visibility among consumers already inundated with a bewildering array of information on other compatibles.

Commodore's pricing, relatively high when compared to that of some of the more recent clones, may also be a major factor in its 1987 PC sales. Undoubtedly, the company will come under pressure to lower the announced $999 and $1,199 prices. But Commodore, which will be selling its PC compatibles through dealers rather than mass market chains, wants to provide dealer margins of 35 percent to help promote wide distribution.

"We haven't gone for the jugular on price," says Nigel Shepherd, Commodore's North American general manager. "It's a very competitive business. What we've gone for with the PC is a price/feature combination that gives the dealer a margin [of profit]. And we think it will give us acceptable market share and acceptable profits."

The $999 PC10-1 comes with one built-in 360K double-sided, double-density disk drive, and 512K of RAM, which can be expanded to 640K. The $1,199 PC10-2 includes two built-in drives and 640K of RAM. Both units have room for installation of a half-height or full-height hard disk.

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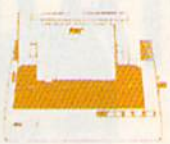

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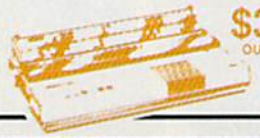

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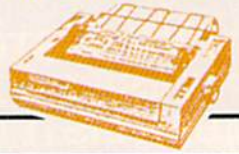

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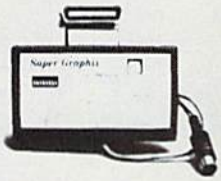

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8088 microprocessor running at 4.77 MHz, MS-DOS 3.2, a PC-XT compatible BIOS, a PC-XT compatible keyboard, and GW BASIC 3.2. There are also five full-sized expansion slots. The power supply can support two floppy drives, a 40-meg hard disk, and five expansion cards. The units also offer as standard equipment an RS-232 serial port, a Centronics parallel port, and an ATI Graphics Solutions Adapter, which is a built-in monochrome and color display card compatible with IBM, CGA, MDA, Hercules, and Planatronics video modes.

What do Commodore's clones mean for the 64, 128, and Amiga? Apparently not much, as far as sales and distribution are concerned. Sales of all three of the computers remain strong, Commodore's financial position has stabilized, and 1987 may turn out to be one of Commodore's best years in quite some time. At worst, Commodore officials expect the MS-DOS computers to have some impact on the amount of shelf space dealers have available for the 128.

Commodore's *New* Amigas

Selby Bateman, Features Editor

Not all of Commodore's products for 1987 were displayed on the floor of the Winter Consumer Electronics Show in Las Vegas. In a small room on the second level of Commodore's two-story exhibit booth, selected dealers and the press were given sneak previews of two new Amiga computers, offshoots of the original Amiga 1000.

Scheduled for introduction sometime this spring are the Amiga 500, a low-cost computer (under $650) with all the functionality of the earlier Amiga, and the Amiga 2000, an expandable multi-processing machine that starts for under $1,500 and can be built into a powerhouse micro with up to nine megabytes of memory.

With these introductions, Commodore provides three Amigas that can reach virtually any market niche, from the entry-level consumer to high-end professional and business markets. All three of the Amigas are 100-percent compatible with one another as long as the software follows the rules for version 1.2 of the Amiga operating system.

For those not thoroughly familiar with the Amiga, the most important points are these: Introduced in the fall of 1985, the Amiga 1000 was immediately recognized as a genuine breakthrough personal computer, featuring superb color graphics and stereo sound capabilities as well as true multitasking (running more than one active program simultaneously).

Based on the Motorola 68000 microprocessor, the Amiga also has three integrated custom chips—

Commodore's new Amiga 2000 computer is an expandable powerhouse machine that features both Amiga and IBM card slots; up to nine megabytes of RAM; a flexible combination of 3½-inch, 5¼-inch, and hard disk slots; a reconfigured keyboard; and the ability to run IBM and Amiga software simultaneously.

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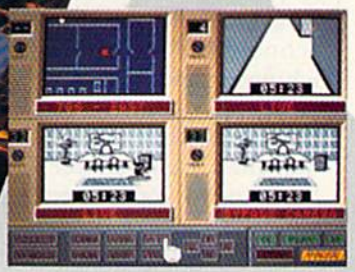

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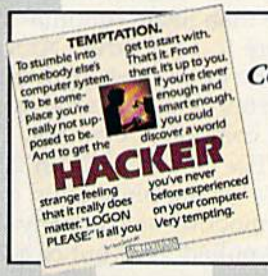

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code-named Portia, Daphne, and Agnes—which, respectively, control sound and input/output, video, and memory access. Agnes also coordinates the *blitter* and *copper* devices, which help the Amiga produce its amazing graphics and animation.

With monitor, the Amiga 1000 originally sold for about $2,000, although prices during 1986 dropped below $1,500. As you'll see, the two new Amigas dramatically change the future of the Amiga in terms of both price and expandability.

The Amiga 500

To paraphrase Apple Computer's Macintosh slogan, Commodore's new A500 is the Amiga for the *rest* of us.

For about half the price of the original 1000, the Amiga 500 comes with 512K of RAM, twice as much memory as its predecessor; a built-in 880K 3½-inch floppy disk drive; an expanded keyboard with separate cursor and numeric keypads; the Kickstart 1.2 operating system built into ROM instead of on disk; and a 35-watt external power supply. (The Amiga 500 uses about half the power of the 1000.) Unlike the original Amiga, the new machine's keyboard is not detached; instead, the one-piece unit resembles a cross between a Commodore 128 and an Atari 1040ST. The computer and keyboard are all one unit, and the drive is built into the right-hand side.

Commodore engineers radically redesigned the Amiga motherboard to make the 500 more economical to manufacture. The whole computer is now contained on a single, compact board. Yet, the only capability which suffered is that the weaker power supply will have to be supplemented if large amounts of extra memory or other devices are added. As with the earlier 1000, the 500 has two mouse/joystick ports, stereo audio outputs, RGB and composite video outputs, and the same system expansion bus. Only one change was made: The genders of the RS-232 serial port and Centronics-standard parallel port were swapped, so the Amiga 500 will work with commonly available IBM PC modem and printer cables. Also, Commodore senior engineer Jeff Porter says that Commodore is working on an optional RF modulator so the 500 can use a television as a monitor.

The 500 even makes it easier to expand memory to a full megabyte. Beneath the computer is a small, easily removable cover which hides a connector for a 512K memory expansion card. Installing the card is about as easy as plugging in a joystick. Commodore says the card will sell for under $150 and include a battery-backup realtime clock.

The Amiga 500 works with the same monitors as the Amiga 1000. Commodore's new $350 A2002 monitor can be switched between RGB and composite video, just as with the present 1080 monitor.

With color RGB monitor, a 512K Amiga 500 system will cost about $1,000; a one-megabyte system with monitor, about $1,150. Each Amiga 500 comes with a Workbench 1.2 disk, Amiga BASIC disk, and the usual manuals.

The only Amiga peripheral that won't work with the Amiga 500 is the long-awaited Genlock video interface. This is solely because of the Amiga 500's different physical configuration. Porter says a redesigned Genlock will probably be introduced for the 500.

The Amiga 2000

The real powerhouse of the Amiga lineup will be the Amiga 2000, a machine that can be expanded with up to nine megabytes of internal memory and which contains both Amiga and IBM PC expansion slots—including space for an optional Amiga Bridge card that lets the Amiga run IBM PC software.

The basic Amiga 2000 system, which is expected to sell (without monitor) for under $1,500, will have one meg of memory, seven expansion slots, a built-in 880K 3½-inch floppy disk drive, three drive ports, a detached keyboard, and a 200-watt power supply. The front of the Amiga 2000 system box contains space for two additional 3½-inch drives and one half-height PC-compatible 5¼-inch drive. These drive spaces accept any combination of floppy and hard drives. Inside the system box, you can add an almost unlimited variety of boards, drives, and coprocessors.

For example, you can add hard drive cards, math coprocessors, a multifunction card, video digitizers, graphics cards, and many others. You can divide a hard disk into one section for the Amiga and another section for the IBM PC, and transfer data back and forth between the two systems. And, by using the Bridge card, which plugs into two slots on the main circuit board, you can work with IBM PC files and Amiga files simultaneously—using the strongest features of each machine to accomplish whatever tasks you want.

Physically, the Amiga 2000 is similar in appearance to the 1000, but with a taller system box to allow for the extra disk drives and the card slots. The 95-key keyboard has been enlarged and slightly reconfigured. The mouse, keyboard, and joystick ports on the 2000 are clustered up front rather than being separated to the right side and the underside as on the 1000. And, importantly, the rear of the 2000 has standard connectors and IBM-style vertical slots, rather than the 1000's nonstandard connectors.

The Amiga 2000 will be able to use Commodore's new A2080 long-persistence monitor (about $500), which eliminates the jittery screen images that currently plague the Amiga 1000's highest-resolution screen modes.

The open architecture of the Amiga 2000 gives it a solid basis for future growth and modification. And the ingenious mixture of IBM and Amiga slots means that programmers can write hybrid software to take advantage of the best capabilities of each machine.

With the introduction of both the 500 and the 2000, some observers expect that the original Amiga 1000 will be gradually phased out. But, as a Commodore spokesperson put it, as long as there's a marketplace anywhere in the world that wants the 1000, Commodore will more than likely continue to manufacture it. For current Amiga owners, the good news is that the new systems don't in any way make their computers obsolete.

The Amiga 500 and 2000 provide a strong foundation on which Commodore—a company which in 1986 pulled itself out of a financial quagmire—can grow in the future.

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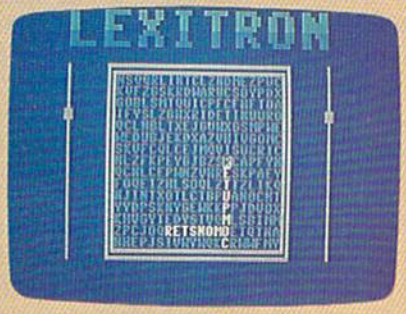

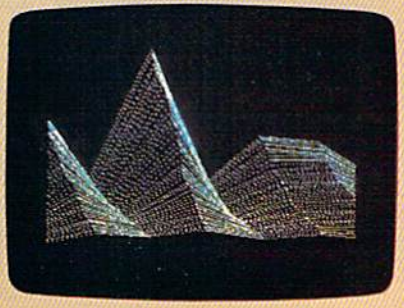

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Fine-Tuning The Software Market

Kathy Yakal, Assistant Features Editor

In the home market, with any electronic medium, you have to have fantastic audiovisual capabilities....Entertainment is going to be the big market that pulls it [the home computer] in. That's determined every other consumer electronic medium that's gone into the home.

—Trip Hawkins, President, Electronic Arts

The quality and innovative nature of new software—especially entertainment programs—continue to be crucial to the growth of today's home computer market. As Trip Hawkins and other industry leaders point out, the emphasis will increasingly be on supplying the same advanced sound and graphics that are so much a part of this technology-driven audio/video age.

At the Winter Consumer Electronics Show (CES), key computer manufacturers like Commodore and Atari continued to point the way toward greater computer audio/video capabilities with the Amiga and ST computers. And software publishers also displayed—and discussed—new programs that will stretch today's technology and will interest both new and experienced computer users.

Although there were not as many new-product announcements as in past years, and the number of highly visible software exhibitors on the floor was lower than at recent shows, many agree that this is just a part of the natural evolution of this segment of the industry. With only four major groups producing hardware for the home market—Commodore, Atari, Apple, and the MS-DOS–compatible companies—and with more realism about consumers' needs and wants, there seems to be less urgency to release dozens of new products monthly.

"New hardware with exciting price/performance characteristics, improvements in hardware and software retailing and distribution, and exciting new software ideas reawakened consumer excitement about home computing this past year," says Jim Levy, who recently stepped down as president of Activision Software. "As these conditions continue to develop, we expect sales rates of both new computers and software to pick up. The industry seems to be entering a new long-term growth phase."

Familiarity And Depth

While the growth phase that Levy mentions shows signs of a maturing and healthy market, it's clear that personal computers in the home are still far less common than many other consumer electronic products.

"In 1982, 4 percent of U.S. households were active users of home computers," says David Seuss, president of Spinnaker Software. "In 1986, 4 percent of U.S. households were active users of home computers. Compare that to VCRs (videocassette recorders). In 1982, 0 percent of U.S. households had VCRs. In 1986, 40 percent had one and used it every week. Why did it happen for VCRs and not computers? I think the simple answer is that the three preconditions of home electronics devices have not been met by our industry."

Those preconditions, according to Seuss and others, are a common computer standard, universal software compatibility, and operating procedures that all consumers can use easily. In other words, home computers need to be as universally standard as telephones or stereos or VCRs. Anyone who has a nodding acquaintance with the personal computer industry knows that's far from the current situation.

There are three areas that the software industry needs to address, Seuss adds. First, in the area of entertainment and education, more audio/video stimulation needs to be provided than has been provided in the past. "Computer-generated graphics are crude by standards that consumers use to judge video and audio stimulation," he says. "We have to deliver TV-quality pictures and sound."

Second, the process of getting information must be streamlined. "Every fact that exists in the world can be accessed by a patient librarian. The reality is none of us ever uses a millionth of the information that is relevant to a particular task we have," he says. "The reason is all of this data is simply not available in an efficient, accessible way."

And, finally, there need to be more practical applications for the home user. "I think sometimes we have been too grand in our aspirations for applications," Seuss says. "For example, we put together a complete home financial system that 95 percent of purchasers are not using within one week of purchase date. Programs are too ambitious, and require consumers to spend hours and hours every week utilizing the program. Don't give me an enormous financial accounting system for my home. Give me a program that calculates how much insulation I need in my walls."

Entertainment A Priority

Entertainment, education, information retrieval, and management of personal affairs are all tasks that the expanded memory, speed, and audio/video capabilities of the latest computers will better handle. In the meantime, today's software

publishers continue to deliver more finely-tuned products for accepted home applications.

Entertainment needs of consumers vary, but software sales figures point to the characteristics of those most widely enjoyed: simulations of real-life experiences, games incorporating familiar characters and/or themes, and entertainment products that stretch the graphics and sound capabilities of a machine and provide a rich and creative intellectual challenge or a demanding test of reflexes.

In those areas, a variety of new programs were announced at Winter CES. In fact, games comprised the lion's share of new product offerings for Commodore. As many industry leaders observed there, computer games seem to be enjoying a resurgence in popularity.

The following software programs were among those introduced at CES. Look for information on more new software in upcoming issues.

* * * * * * * * * * * * *

In Accolade's Comics, *you take on the persona of Steve Keene, and help thwart evil for the Chief of Spystuff, Inc. Detailed graphics and animation and a user-directed plot make this entertainment experience similar to directing the action in a comic book.*

Accolade

This entertainment software producer, which celebrated its first birthday at the show, announced *Accolade's Comics*, an interactive computer comic book. The story centers around Steve Keene, a spy whose mission is to foil evil plots for the Chief of Spystuff, Inc.

Unlike text-only adventures, *Accolade's Comics* offers the visual experience of reading a comic book on a computer screen, combining detailed graphics and animation. The player determines the direction of the story by continually selecting from a series of possible answers to questions asked of Keene. Some are dead ends, and others lead the player into various themes and plot twists. Because the user directs the plot, a variety of different endings are possible each time the game is played. Arcade action is incorporated when Keene falls into traps, inescapable positions, and embarrassing situations. The game retails for $39.95.

Accolade
20833 Stevens Creek Blvd.
Cupertino, CA 95014

"Leave her alone, you...." Last summer's hit movie Aliens *provides the characters and story for one of Activision's latest releases,* Aliens: The Computer Game.

Activision

Two years in the making, a graphics-and-text adventure titled *Portal* made its debut at CES. Rather than using a puzzle-solving or branching story approach, *Portal* is narrative literature, allowing the player to interact with the story and explore the unfolding futuristic world.

Transported to the year 2106, you are a lone space traveler who returns to earth and discovers that all of its inhabitants have vanished. Together with the sole survivor, a biological computer named Homer, you must find out why. Activision worked with adventure and science fiction author Rob Swigart to develop this unique approach. Suggested retail price is $39.95.

Another new game introduced by Activision is *Aliens: The Computer Game* ($34.95), based on last summer's hit movie.

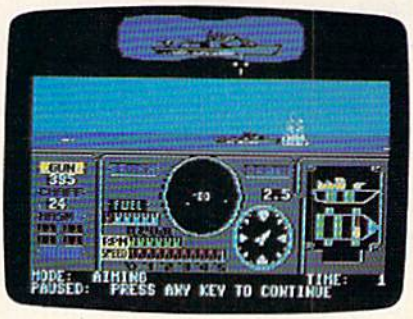
Activision
2350 Bayshore Pkwy.
Mountain View, CA 94043

Electronic Arts

Long a leader in discovering software-design talent, Electronic Arts has expanded its multimachine line of computer software and has introduced several new products for the Commodore 64.

Dan Dare: Pilot of the Future is a best-selling British import featuring Dan Dare, the U.K.'s most popular comic book hero. The game follows the adventure of Dare and his engaging pet, Stripey, as they travel to a distant asteroid and neutralize the threat posed by alien Treens. Each screen is a comic book panel complete with captions, full-color 3-D cartoon graphics, mazes, puzzles, fistfights, and a realistic soundtrack. Suggested retail price is under $20.

In *PHM Pegasus*, a combat simulation game, players complete a basic hydrofoil training session and become part of the T.A.G. (Terrorist



Commodore 64 games have been a mainstay of the Electronic Arts product line. Among those new products announced for the 64 at CES are Dan Dare: Pilot of the Future *and* PHM Pegasus.

Action Group) force. The task force can be called to action in any of the dangerous assignments awaiting the crew aboard the battle craft Pegasus, a hydrofoil armed with a cannon, chaff rockets, Harpoon or Exocet missiles, and Gabriel missiles. Heads-up onscreen displays reveal both your view from the craft's bridge and the view from an operations map. The price is $39.95.

The Bard's Tale II, 50-percent larger in program size and more challenging than its predecessor, revolves around your attempts to halt an evil force threatening to destroy the Realm. The fantasy world contains six complete cities and 25 dungeon levels. Animated monsters, magic spells, and realtime puzzles are among the special effects included to make the game an entertaining visual and intellectual challenge. *Bard's Tale II* is priced at $39.95.

Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404

Epyx is well-known as a producer of realistic sports simulations for the Commodore 64. Street Sports Basketball *is the first title in its new Street Sports line.*

Epyx

Epyx's early reputation in this industry stemmed from popular fantasy/role-playing games like *Temple of Apshai*. More recently, graphics/action-intensive hits like *Summer Games* helped maintain its reputation as a software leader. At CES, Epyx clearly broadened its scope, introducing games of both types, as well as a new productivity product.

Sub Battle Simulator, the first title in Epyx's new Masters Collection, is a detailed submarine simulation set during World War II, where players are put in command of one of six different classes of U.S. Navy submarines or German Kreigsmarine U-boats. Staged in either the Atlantic or the Pacific, the game allows players to choose from over 60 different missions or play out the entire war. Each mission is based on genuine historical data.

Street Sports Basketball is the lead title for a new line of sports software. Players pick their own three-person team from ten individuals with varying degrees of skill in different areas. Four neighborhood scenes, each with its own unique props like curbs, oil slicks, and fences, serve as challenging scenarios for fast-paced athletic action.

Epyx
600 Galveston Dr.
Redwood City, CA 94063

Firebird

Firebird, U.S. licensee for a continuing flow of home computer software from England and Europe, made a dramatic entrance into this market a year and a half ago with *Elite*. Firebird has since brought over a number of popular programs for all major home computer systems, including the graphically rich adventure, *The Pawn*. Besides introducing a business line at CES, Firebird announced several new programs for the Commodore 64, including a followup to *The Pawn* titled *Guild of Thieves*, which, from a sneak preview, looks to be even more graphically impressive than its predecessor.

In *Tracker* ($39.95), the player is given simultaneous control of eight Skimmer crafts to try to destroy the marauding hordes of renegade Cycloids. Fast maneuvers, high-speed 3-D battle sequences, and demanding play action challenge the player's reflexes, while the program's intuitive design also challenges the player intellectually.

Starglider ($39.95) puts the player in command of an airborne ground attack vehicle which must eventually do battle with the starship Starglider. Already a hit on the Atari ST, this game requires cunning, skill, and quick reflexes.

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

Infocom/Activision

Infocom set the standard for text adventure games with such classic programs as the *Zork* trilogy and many other respected games that followed. Recently acquired by Activision, the company continues to create a product line serving all major home computers.

In *Hollywood Hijinx* ($34.95), your Hollywood B-movie-mogul uncle, Buddy Burbank, and his wife have left you their entire estate, with one stipulation: You must find ten treasures hidden throughout their sprawling Malibu home. If you can't find them in one night, you lose the whole inheritance.

Bestselling humor writer Douglas Adams produced a zany hit for Infocom with his computer version of *Hitchhiker's Guide to the Galaxy*. Now he has designed *Bureaucracy*, in which you explore the endless layers of red tape that bind up bureaucratic institutions.

Infocom
125 Cambridge Park Dr.
Cambridge, MA 02140

MicroProse

A leader in simulation software, MicroProse announced an agreement recently made with author Tom Clancy to develop his number-one bestselling book, *Red Storm Rising*, into a home computer game along the lines of MicroProse's other military simulation software. The title is expected to appear sometime in late 1987.

MicroProse
120 Lakefront Dr.
Hunt Valley, MD 21030

Mindscape

Mindscape made its entry into the software market as an educational publisher, but has since gone on to market a line of entertainment programs, in addition. Five new arcade games for the Commodore 64 were announced at CES, including *Trailblazer*, a series of soccer races that offers a two-player split screen; and *Parallax*, a space exploration mission that turns into a battle to save the earth ($29.95 each).

Mindscape
3444 Dundee Rd.
Northbrook, IL 60062

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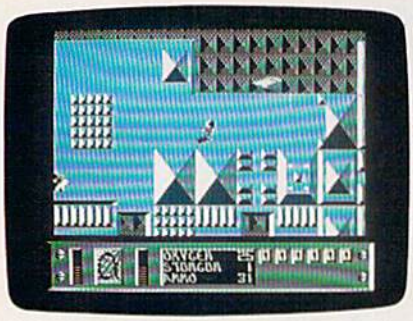


Since its startup as an educational software publisher in 1983, Mindscape has diversified its line to include software in the areas of entertainment, personal productivity, and desktop publishing. Five new arcade games for the Commodore 64 were introduced at CES, including Parallax.

Simon & Schuster

Prompted by the success of last year's bestselling graphics-and-text adventure, *Star Trek: The Kobayashi Alternative*, Simon & Schuster has released its second Star Trek fantasy, *The Promethean Prophecy* ($32.95). While exploring an unmapped sector of space, the Enterprise is attacked by aliens who contaminate the food supply, requiring you to beam down to a nearby planet to replenish the supply. To win the game, you must solve a series of puzzles found on the planet. The game's parser (the portion of the program that interprets your commands) was two years in development; it understands nearly 1000 words and can handle multiple sentences and objects.

Simon & Schuster
One Gulf + Western Plaza
New York, NY 10023

Inexpensive Classics

In addition to new products at CES, several companies announced new lower prices and bundled packages of older classic software game titles. These games run the gamut from arcade-action to strategy.

The Accolade Avantage line includes the *Spy vs. Spy I & II* action-strategy programs, the fast-action *Deceptor*, and the war strategy program *Desert Fox*, for $14.95 each.

Electronic Arts added to its line of Software Classics with *Archon II: Adept* and *Skyfox*, two action-strategy games; *Movie Maker*, an animation program; *Financial Cookbook*, a collection of personal finance and budget programs; and *Mind Mirror*, a personality profile game by Timothy Leary; each for under $15.

Activision announced the first in its series of Solid Gold Software titles: the classic *Pitfall!* and *Demon Attack* will be packaged together and sold for less than $15. And Infocom has bundled the three programs in the *Zork Trilogy* for $59.95.

A Standard User Interface

All of these games, as well as a variety of productivity and educational products introduced at the show, share one characteristic: compatibility with the Commodore 64 and 128. But that's where the similarity ends.

When those differences add to the variety and interest of a game or an educational package, that's no problem. But, say some observers, the many differences among computers and software shouldn't needlessly confuse and inhibit computer users.

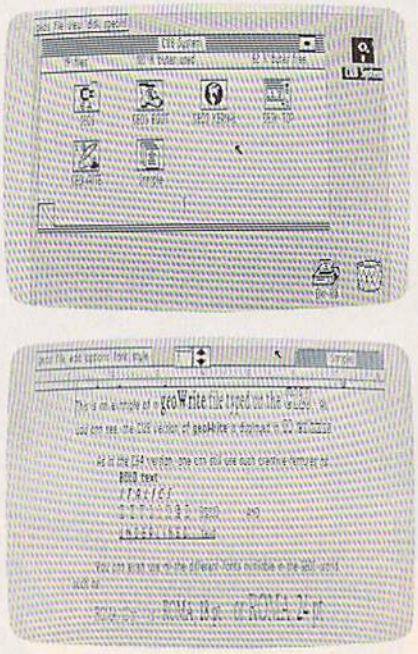
Take word processing programs, for example. Though many can execute the same text-editing functions, the commands necessary to use those features are different for each program. But, as Seuss has noted, for widespread acceptance of computers, the hardware and software should be as standardized and as compatible as possible—just as with television sets, toasters, and VCRs.

And that has already started to happen. "A lot of hardware companies have contributed, I think, to the standardization process, by starting to have a mechanism for a graphics environment interface," says Seuss. "Whether it's Atari with its PC-clone, Commodore with *GEOS*, or Apple with the Macintosh, there is a general movement in the direction of standardizing interfaces that will reduce drastically the differences between programs."

To have its product mentioned as an emerging standard might have seemed far-fetched to the *GEOS* designers at Berkeley Softworks even one short year ago. At the 1986 Winter Consumer Electronics Show, Berkeley premiered its new Commodore 64 operating system/user interface in a small booth, at a show where Commodore itself had little presence. Within the next 12 months, *GEOS* was adopted by Commodore as the official disk operating system for its 64, and a copy is now packaged with every machine that is sold. At the 1987 Winter CES, a financially rejuvenated Commodore drew impressive crowds at its booth, and Berkeley's presence in a large booth across the aisle was commanding.

Besides making disk access five to seven times faster and providing a friendly user interface that employs graphics like windows, icons, and pull-down menus, *GEOS* comes with its own word processing program, *geoWrite*, and drawing program, *geoPaint*. In addition, Berkeley continues to upgrade the system itself and offer add-on packages.

Writer's Workshop ($49.95) is a combination of four powerful *GEOS* application programs that provide a complete professional writing environment. *geoCalc* is a graphics-oriented spreadsheet that can be used for such financial tasks as bud-



At the Winter Consumer Electronics Show in 1986, Berkeley Softworks introduced GEOS, *which was adopted as the official graphics user interface for the Commodore 64. At the 1987 WCES, Berkeley premiered an 80-column version of* GEOS *for the Commodore 128 (in 128 mode). Berkeley also announced a number of new companion packages for the program, including* geoCalc *and* geoFile, *a spreadsheet and database manager.*

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geting, cost estimating, mortgage analysis, tax planning, and generating financial statements. *geoFile* ($49.95) is a database management system that lets the user set up a filing system using simply designed forms. *geoDex* ($49.95) is an electronic card file for names, addresses, phone numbers, and other miscellaneous information.

But perhaps the biggest news to come out of Berkeley Softworks at CES was its announcement of an 80-column version of *GEOS* for the Commodore 128. Expected to be available in the second quarter of 1987, this version will retail for $69, $10 more than its 64 counterpart.

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

For additional products introduced or exhibited at CES, see the News and Products section in this and upcoming issues.

On The Digital Horizon: Compact Disc–Interactive

Within the next few years, the crowded aisles and exhibit booths of the Consumer Electronics Show will contain one of the most exciting technological developments yet to come in the ongoing digital explosion: *compact disc–interactive*, currently referred to as CD-I.

Right now, no one can be sure exactly what this marriage of computers and compact laser discs will look like or how it will be introduced on a large scale. But the giant consumer electronics companies are already working hard on CD-I, and the computer software and hardware developers are looking at it with great interest.

To understand CD-I, you must first know a little something about the compact disc. Most people by now have heard of the growing popularity of audio compact discs, even if they don't yet own a disc player. These small plastic-coated aluminum discs contain music encoded digitally in pits that can be read by a low-power laser beam.

The same factors that make audio compact discs so popular apply to digital data from computers as well.

250,000 Pages Of Text

The two electronics companies that introduced audio compact discs to the world back in 1980—Sony and Philips—proposed the first digital-data compact disc application in 1983: *Compact Disc Read Only Memory (CD-ROM)*. A CD-ROM disc looks almost identical to an audio CD. But while a CD can hold only about 70 minutes of music, it can store up to 550 *megabytes* of data. That's about a quarter of a million pages of text.

With search-and-retrieval software, any of the data stored on the disc can be accessed in seconds and cross-referenced in a variety of ways. That capability makes CD-ROM an incredibly powerful research and reference tool for business, education, and, in more limited use, the home.

CD-ROM players are currently in production and dozens of applications are being developed. The first consumer-oriented package was produced by Grolier Electronic Publishing. Its *Academic American Encyclopedia*, along with a sophisticated indexing system, both fit on part of just one compact disc. The player-and-software combination (compatible with the IBM-PC) costs around $1,000.

In February 1986, Sony and Philips announced tentative specifications for a more consumer-oriented compact disc format, *compact disc–interactive*. CD-I combines state-of-the-art microcomputer technology with compact disc technology.

The initial technical specifications for CD-I call for a slightly modified CD-ROM player with a 68000 microprocessor (the same chip found in 16-bit computers like the Commodore Amiga, the Atari ST, and the Apple Macintosh) and a multitasking OS-9 operating system. So what you have is the processing power of the latest personal computers, the huge data storage capacity of CD-ROM, unmatched sound and music quality, and advanced graphics capabilities that will eventually allow full-motion video.

In addition, the manufacturers are working together to create a universal standard of compatibility. That means that you'll be able to play any audio CD or any CD-ROM disc on CD-I players manufactured by different hardware companies.

Computer software companies like Aegis Development are now beginning to explore the possibilities of the new compact disc–interactive (CD-I) technology.

CD-I technology will ultimately force us to rethink traditional notions of entertainment and education, says David Seuss, president of Spinnaker Software. For example, let's say you have a CD-I program that plays chess. You could store every game that's ever been played by grand masters. At any moment in a game, you could have the program display examples of how the experts handled similar or identical situations. And, of course, that's just the beginning.

With stereo sound, speech synthesis, full-motion video, and advanced graphics-and-text manipulation, CD-I players and programs will bring new meaning to the word *interactive*.

CD-I players and software may be widely available as early as Christmas of 1988. Much depends on whether the manufacturers of both hardware and software can continue to cooperate in the development of a single standard.

It's probable that by the early 1990s, advanced entertainment, educational, and productivity applications will be available through CD-I. This combination of computers and lasers has the potential to sell into millions of households over the next decade.

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Here are some suggestions which serve to improve the speed and accuracy of publication for prospective authors. COMPUTE!'s GAZETTE is primarily interested in new and timely articles on the Commodore 128, 64, Plus/4, and 16. We are much more concerned with the content of an article than with its style, but articles should as be clear and well-explained as possible.

The guidelines below will permit your good ideas and programs to be more easily edited and published:

1. The upper left corner of the first page should contain your name, address, telephone number, and the date of submission.

2. The following information should appear in the upper right corner of the first page. If your article is specifically directed to one model of computer, please state the model name. In addition, *please indicate the memory requirements of programs.*

3. The underlined title of the article should start about 2/3 of the way down the first page.

4. Following pages should be typed normally, except that in the upper right corner there should be an abbreviation of the title, your last name, and the page number. For example: Memory Map/Smith/2.

5. All lines within the text of the article must be double- or triple-spaced. A one-inch margin should be left at the right, left, top, and bottom of each page. No words should be divided at the ends of lines. And please do not justify. Leave the lines ragged.

6. Standard typing or computer paper should be used (no erasable, onionskin, or other thin paper) and typing should be on one side of the paper only (upper- and lowercase).

7. Sheets should be attached together with a paper clip. Staples should not be used.

8. If you are submitting more than one article, send each one in a separate mailer with its own tape or disk.

9. Short programs (under 20 lines) can easily be included within the text. Longer programs should be separate listings. *It is essential that we have a copy of the program, recorded twice, on a tape or disk.* If your article was written with a word processor, we also appreciate a copy of the text file on the tape or disk. Please use high-quality 10 or 30 minute tapes with the program recorded on both sides. The tape or disk should be labeled with the author's name and the title of the article. Tapes are fairly sturdy, but disks need to be enclosed within plastic or cardboard mailers (available at photography, stationery, or computer supply stores).

10. A good general rule is to spell out the numbers zero through ten in your article and write higher numbers as numerals (1024). The exceptions to this are: Figure 5, Table 3, TAB(4), etc. Within ordinary text, however, the zero through ten should appear as words, not numbers. Also, symbols and abbreviations should not be used within text: use "and" (not &), "reference" (not ref.), "through" (not thru).

11. For greater clarity, use all capitals when referring to keys (RETURN, CTRL, SHIFT), BASIC words (LIST, RND, GOTO), and the language BASIC. Headlines and subheads should, however, be initial caps only, and emphasized words are not capitalized. If you wish to emphasize, underline the word and it will be italicized during typesetting.

12. Articles can be of any length—from a single-line routine to a multi-issue series. The average article is about four to eight double-spaced, typed pages.

13. If you want to include photographs, they should be either 5×7 black and white glossies or color slides.

14. We do not consider articles which are submitted simultaneously to other publishers. If you wish to send an article to another magazine for consideration, please do not submit it to us.

15. COMPUTE!'s GAZETTE pays between $70 and $800 for published articles. In general, the rate reflects the length and quality of the article. Payment is made upon acceptance. Following submission (Editorial Department, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403) it will take from two to four weeks for us to reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. *Rejected manuscripts are returned to authors who enclose a self-addressed, stamped envelope.*

16. If your article is accepted and you have since made improvements to the program, please submit an entirely new tape or disk and a new copy of the article reflecting the update. We cannot easily make revisions to programs and articles. It is necessary that you send the revised version as if it were a new submission entirely, but be sure to indicate that your submission is a revised version by writing, "Revision" on the envelope and the article.

17. COMPUTE!'s GAZETTE does not accept unsolicited product reviews. If you are interested in serving on our panel of reviewers, contact our Features Editor for details.

64 or 128

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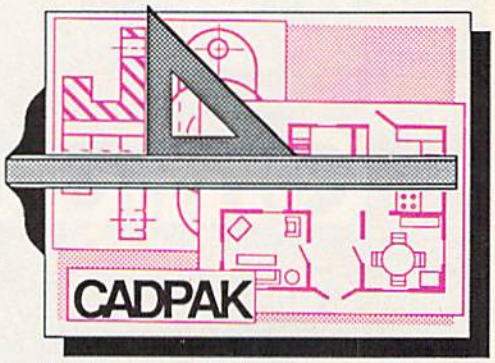

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Omicron

Sean Wagle

Be ready and alert. A host of deadly enemies can make quick work of you in this frantically paced, multilevel arcade-action game for the 64. A joystick is required.

"Omicron" is a game which creates a universe full of hostile aliens. To play and win, you must survive 16 waves of 15 enemies each. This is anything but an easy task—you'll be facing some of the deadliest and fastest creatures ever to visit the screen of your computer.

Omicron is written partly in BASIC and partly in machine language (ML). First, type in and save Program 1, the BASIC section of the program. Since the BASIC section attempts to load the ML portion of the program, don't run the program until you've typed in and saved Program 2.

Typing in Program 2, the ML section of Omicron, requires use of the "MLX" machine language entry program found elsewhere in this issue. When you run MLX, you'll be asked for the starting and ending addresses of the data you'll be entering. For Omicron, respond with the following values:

Starting Address: 33CE
Ending Address: 43BD

When you've finished typing in the data, save a copy to disk before leaving MLX. You must save the data from Program 2 under the name OMICRON ML, since that is the name Program 1 looks for. If you're using tape instead of disk, change the ,8,1 at the end of line 10 in Program 1 to ,1,1. Also, be sure to save the data for Program 2 immediately following Program 1 on the tape.

The player is about to finish this level by destroying the last enemy unit, just one of a host of fast and deadly aliens.

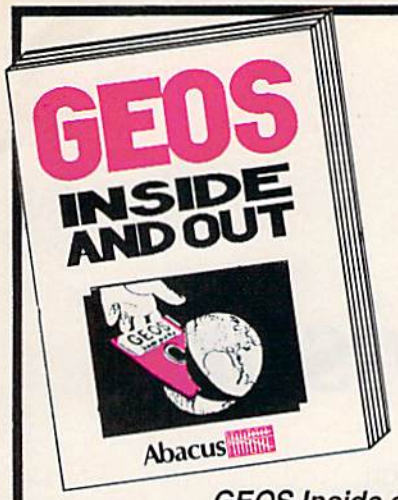
When you're ready to play Omicron, make sure that a joystick is first plugged into port 2; then load and run the BASIC program. *The game does not work properly unless the joystick is plugged in before you run the program.* When the title screen appears, choose one of the four skill levels by pressing a function key. It's recommended that you start with the Rookie level (f7) so you can get used to game play. The skill levels are as follows:

f1	Expert
f3	Pro
f5	Advanced
f7	Rookie

How To Play

When the game begins, your first ship appears in the upper left corner of the screen. You and your enemies can move freely, but you'll bounce off the edges of the screen and off the status board in the center of the screen, which holds the score, current level, and number of ships remaining.

The first thing to master is the joystick control of your ship. You can fire missiles by pressing the fire button. To move, aim the joystick in the desired direction. Since your ship can build momentum, your direction does not change immediately. The direction in which the ship points does not change unless you press the fire button while moving the joystick, so with careful planning you can move in one direction and shoot in another.



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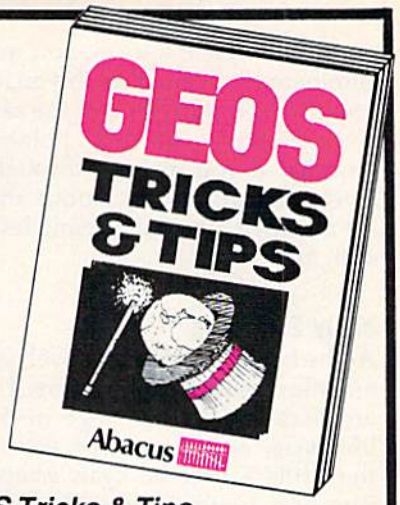

GEOS Inside and Out

If you use GEOS then our new book, ***GEOS Inside and Out***, has the info you need.

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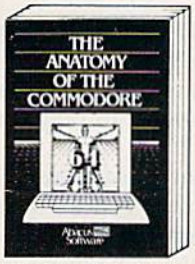

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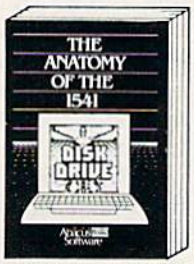

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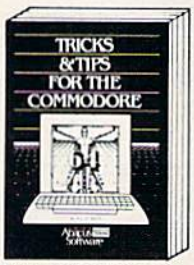

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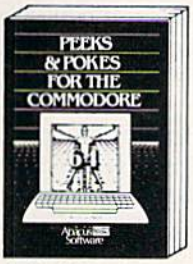

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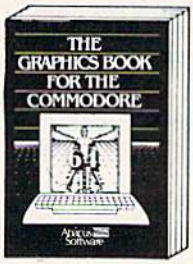

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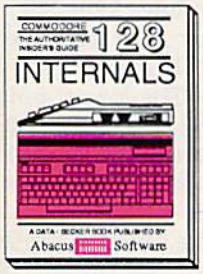

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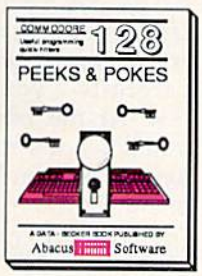

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To complete a level, you must eliminate all 15 enemies. If you lose a ship, you'll start over on the same level. A bonus of 1000 points is awarded if you make it through a level on your first try. Bonus ships are awarded after completing levels 4, 8, and 12.

Your Enemies

At the beginning of each level, your enemies are dark blue *drifters*. They are harmless at this stage in their life cycle. As time passes, some of the drifters become cyan *bombers*. Bombers leave an assortment of deadly objects in their wake. See the table for a description of all the enemies in Omicron.

If they are not destroyed, bombers become yellow *destroyers*. Destroyers move twice as fast as bombers, and they shoot yellow missiles which are similiar to the ones you fire. Watch destroyers carefully—they can change their direction at the first corner they encounter.

Near the end of the level, the remaining enemies can become orange *battle satellites*, which fire like destroyers, leave bombs like bombers, and bounce around the screen in a furious attack. Needless to say, you should try to kill these off as quickly as possible.

If you wish to pause the game at any time, press SHIFT or SHIFT LOCK. If you use RUN/STOP-RESTORE to break out of the game, you cannot restart play simply by running Program 1 again. Instead, you must turn the computer off and back on, then reload Program 1.

Enemies	Points	Color	Appears as
argon mine	10	cyan	◇
ricochet net	20	green	≡
splinter bomb	50	purple	✶
fusion bomb	100	yellow	F
indestructo	none	yellow	▲
mystery mine	10–100	cyan	?
drifter	200	blue	ϟ
bomber	200	cyan	ϟ
destroyer	400	yellow	ϟ
battle satellite	600	orange	ϟ

See program listings on page 102.

Improvisor

Donald Eddington

Anyone can play melodic music with the help of the 64 and this program. It's fun for children, but adults will enjoy it too.

The Commodore 64 has a powerful sound chip know as the SID (Sound Interface Device). You've probably heard what it can do in games and music programs. "Improvisor" lets you play along with SID to create music without much effort.

Improvisor can play music along with you or play alone. There are three ways to let Improvisor play solo—you can let the computer choose random notes, let it create a song with the program's "intelligence" routine, or let it play from its repertoire of familiar songs. But the best way to enjoy Improviser is to play along with the program. Don't worry if you've never played music before—Improviser will make sure that you sound great.

Typing It In

Improvisor is written entirely in BASIC. Type it in and save a copy to tape or disk. When you're ready to play, load and run the program.

When Improvisor starts, it loads 16 songs from DATA statements. This takes only a few seconds. When it's finished, Improvisor starts playing these songs, one after the other. Listen carefully—you may recognize a few. At the bottom of the screen you'll see the numbers 0–9. The 0 key is a rest, and the other numbers stand for the following notes.

R	F	G	A	C	D	F	G	A	C
0	1	2	3	4	5	6	7	8	9

Note that this is not a full major scale—the fourth and seventh notes of the scale have been removed. This prevents you from hitting a "bad" note.

Improvisor *offers a number of options, and you won't sound bad using any of them.*

Now press f1. You'll hear a random, computer-generated melody. This is a good way to get ideas for songs that you want to play on Improvisor.

Press f3 to hear the program's musical "artificial intelligence." The computer does some pattern analysis to determine the next note to play. This results in some very nice melodies. If you want to inspect the intelligence of the program or change it, examine lines 220–320.

Now it's your turn to make music. Press f5. Play notes by pressing keys 1–9. The lowest note is 1 and the highest is 9. For a rest, press 0. All notes are in the key of F. No matter what keys you press, you'll sound great.

You can press a function key at any time—even in the middle of the song—to change between the operating modes.

See program listing on page 106.

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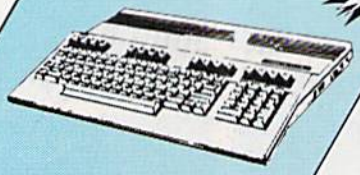

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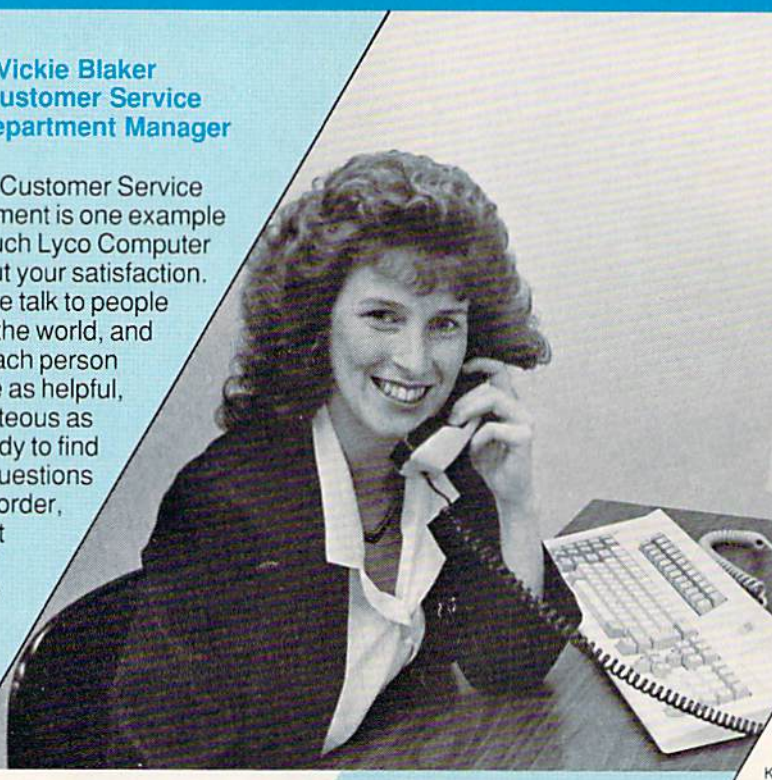

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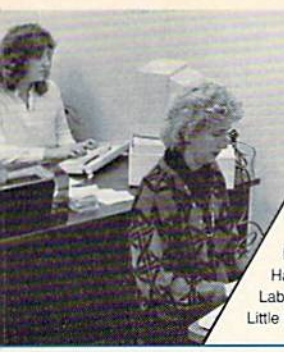

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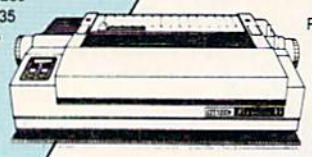

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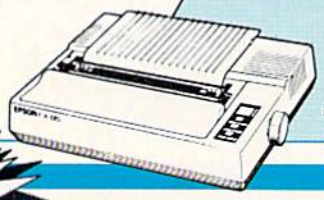

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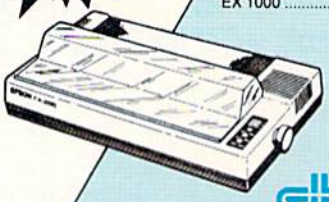

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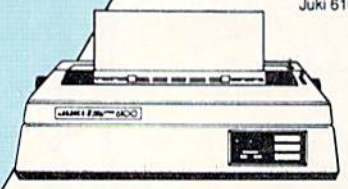

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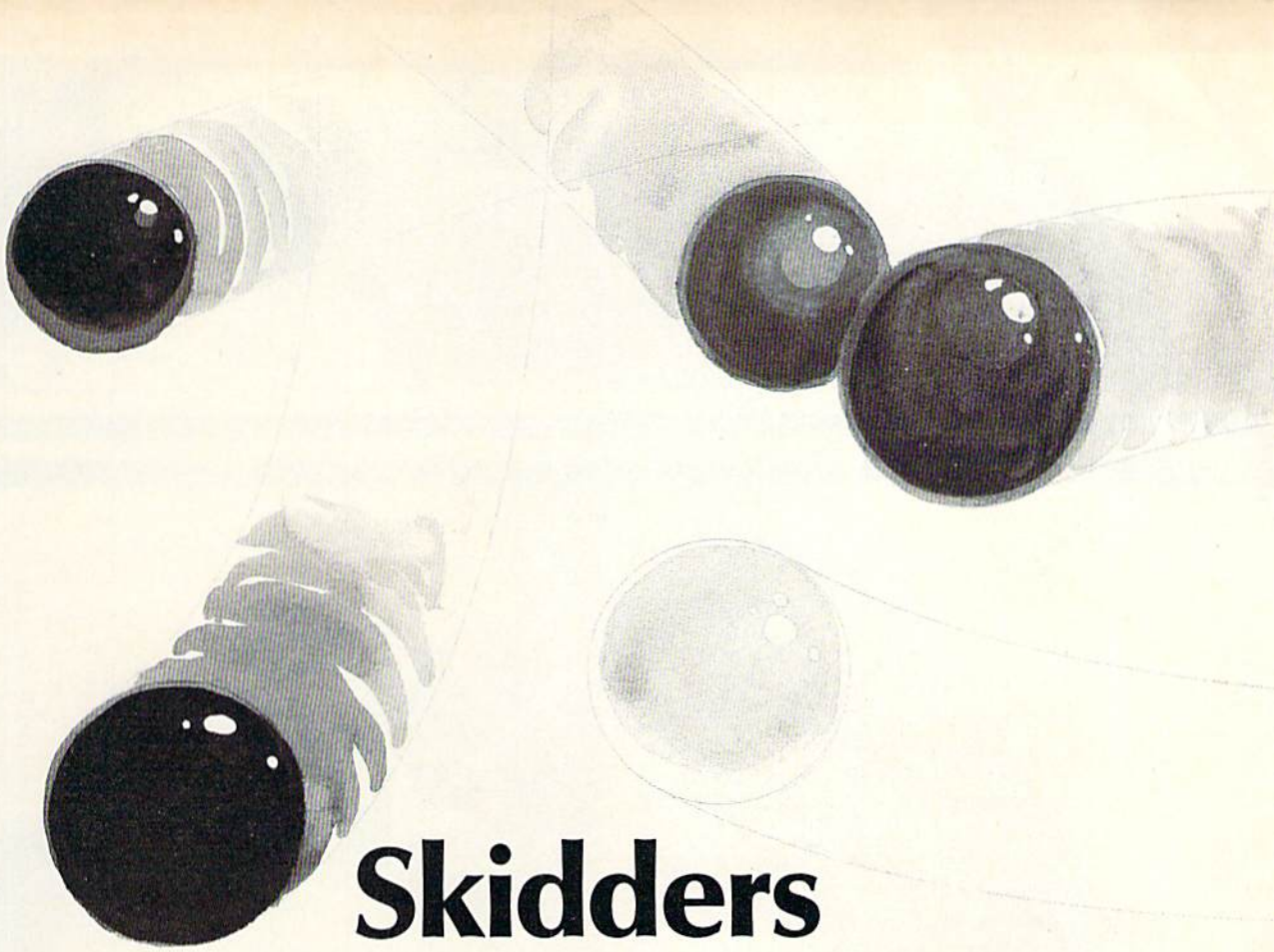


Skidders

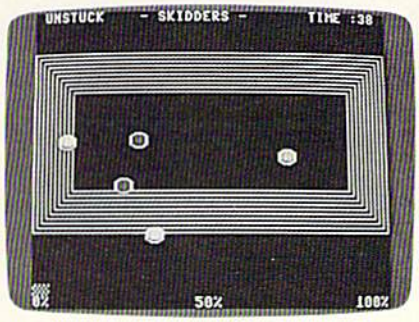
I. J. Lyles, Jr.

This arcade game for the 128 demands the quickest of reflexes. A joystick is required.

You are one of five skidders stuck in a closed universe. All five of you have tried to find a way out, but with no luck—go off the screen in any direction and you wrap around to the opposite edge. The enclosure has driven your friends mad—they fly around the screen at high speed in a desperate attempt to leave your universe and find one where someone is doing something more interesting. Stay away from them—at their speed, a single touch will destroy you.

"Skidders" is a game programmed entirely in BASIC for the 128. BASIC 7.0 provides so many useful sprite-movement and collision-detection features that games requiring machine language on the 64 can often be done in BASIC on the 128.

Type in the program and save a copy to tape or disk before attempting to run the program. To play Skidders, load the program and type RUN.



The player (the blue skidder) must act quickly to avoid a deadly collision.

Skidding For Your Life

Use a joystick plugged into port 2 to control your skidder. You are the light blue one lying in the center of the screen. Don't stay still for too long, though—you've got to dodge the other skidders, which come from every direction and move faster and faster as the game goes on.

Don't get hit even once—if you do, you'll lose. To win the game (and it's not easy), you must last 40 seconds. There is a countdown timer in the screen's upper right corner that displays exactly how many seconds you have left. The time is also graphically displayed at the bottom of the screen in the form of a bar graph. You start at 0 percent of time completed. When you reach 100 percent of time completed, 40 seconds will have passed, and you will have won.

There is a yellow wall surrounding the playing field. This border is not impenetrable, but it does slow you down. You can wend your way through: The top wraps around to the bottom and vice versa. The same is true of the left and right edges. If you find yourself caught in the wall, move off of it as quickly as possible. Your fellow skidders hold so much energy that they're unaffected by the wall—they'll come streaming through while your movement is hampered. It's a very hazardous place to visit. *See program listing on page 101.*

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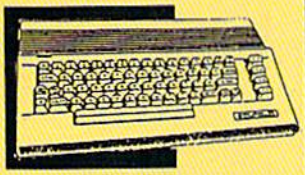

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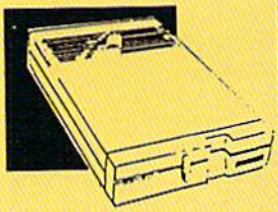

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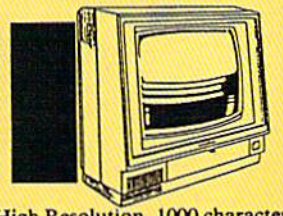

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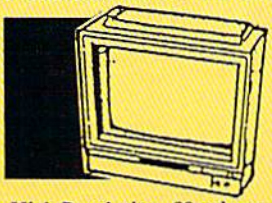

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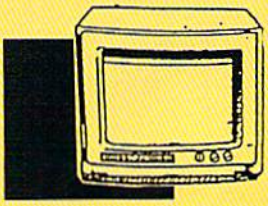

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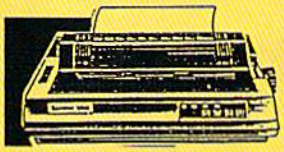

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Tass Times In Tonetown

From the *Tonetown Times* comes the following startling announcement:

Erstwhile Tonetown eyesore Jonboi Waltune, cited for aggravated tonelessness, left town quietly last night. Sore-eyed locals did not regret his departure.

"He just couldn't get a take on what's tass," said celebrated bodystylist Chaz, "no matter what he did. He wore the most untone shirts with ugly little emblems on them and blue scrub pants with someone else's name on one hip pocket."

For anyone about to visit Activision's *Tass Times in Tonetown*, the fate of poor Jonboi should serve as a warning. It is possible to commit many crimes in this strangest of worlds, but none is as major as simply being untass. In fact, your very survival depends on how well you alter your appearance, with a new pink hairstyle and a set of TroppoWear duds from Down Under, to convince the locals that you understand the meaning—and the importance—of the word *tone*. Fail at this, and you fail before you begin.

Fail at what? you ask. Why, at rescuing Gramps, of course. See, at some point during the last couple of days, Gramps, in whose living room you begin this adventure, has disappeared through a magic hoop, leaving behind nothing but a cryptic journal and some well-aged pizza. Because you want to find the guy, you decide to follow him through the hoop, and you end up in this really weird (but extremely tass) world. Tonetown, it's called—a place that is really, unquestionably, well ...different. Different from what? Everything, as it turns out.

It turns out, too, that Gramps knew about the place and visited it often. And so did his dog, who now accompanies you everywhere. Turns out as well that the dog—whose Tonetown name is Ennio—is more than just any ordinary mongrel. He's known here as The Legend, a six-time winner of the Inter-Moonal Ultra Journalism Award. He's helpful, and your association with him will get you into several very tass places.

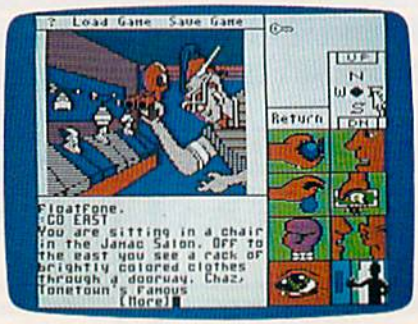
He can get you into Fast Freddie's for some ultratouch eats and tone tunes, and he can even get you backstage at a Daglets concert. He can also help you get a job with the *Tonetown Times*. What he won't willingly do, though, is take you to Franklin Snarl's pet store, because Snarl keeps some fairly disgusting pets in there. They're called blobpets, and even though they're all the rage in Tonetown these days, they're far from wonderful. Snarl, it seems, not only sells them, but also makes them.

Snarl is a snake. Literally. If you don't become tass, he'll kill you. Even if you do become tass, and then try to interfere with a couple of his business dealings, he'll kill you anyway. Franklin Snarl is the bad guy of this story, and rumor has it he is the one behind Gramps' disappearance. Guarding his hideaway, though, is this nose and this pair of eyes, and....

Tonetown is a cross between Alice's Wonderland, with its emphasis on strange language and weird creatures, and an episode of "The Monkees" TV show, with its overstated villains and its humorous attempts at being hip.

Clearly a crazy game, *Tass Times in Tonetown* is a thoroughly delightful change of pace. A graphics-and-text adventure in the manner of Activision's earlier *Borrowed Time*, *Tass Times* shares *Borrowed Time*'s good features—a clever interface and good, fun graphics—while dispensing, except at the beginning, with the earlier game's tendency to kill you off every time you turn around. In other words, *Tass Times* is a successful and enjoyable extension of the *Borrowed Time* system, going beyond that to provide a truly interesting and funny setting.

For recent text adventures, setting has become more important than plot. Exceptions such as Infocom's *Starcross*



notwithstanding, early adventures offered little in the way of fully imaginable worlds. In the past 18 months or so, this has changed. Authors seem much more concerned with offering players an interesting world to operate in, and with this new emphasis have come the best adventures to date. *Mindwheel* and *Brimstone* (Brøderbund-Synapse), and *A Mind Forever Voyaging* and *Trinity* (Infocom) demonstrate that a clearly presented, fascinating setting will do much to enhance an adventure's enjoyment. *Tass Times in Tonetown*, with a world filled with strange (but recognizable) characters speaking a strange (but recognizable) language, now joins the ranks of these other fine adventures.

Entering Tonetown is a little like entering a dream in which you never quite feel comfortable. Tonetown is a cross between Alice's Wonderland, with its emphasis on strange language and weird creatures, and an episode of "The Monkees" TV show, with its overstated villains and its humorous attempts at being hip. Still, I wish the designers had gone even further, demanding that we learn to talk tass in order to get things done, and maybe doing something like forcing us to rethink such concepts as parks, boats, and even directions. Tonetown would allow this kind of dream-like distortion, but all too little of it happens.

But the game is fun, and that's really all that counts. The parser works just fine, and after a little practice you can avoid dying in the first few moves. The interface eases play and gets rid of much of the frustration of other adventures. All this is good, but somehow, in a game set in such a unique world, it doesn't seem to matter. Here is an adventure in which traveling around,

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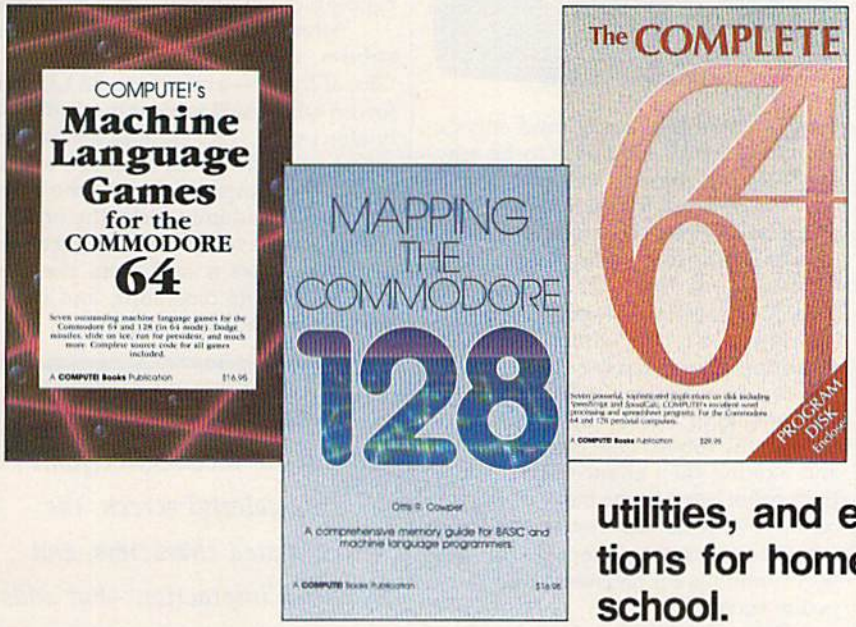

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visiting the tone spots and listening to the really tass talk, is as enjoyable as trying to solve the plot. If you want something different, try a visit to Tonetown. I guarantee you that wherever else you travel in adventureland, you won't find a place exactly like it.

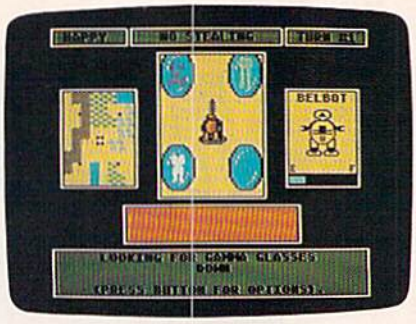
—*Neil Randall*

Activision
2350 Bayshore Frontage Rd.
Mountain View, CA 94043
$34.95

Robot Rascals

This new program from Electronic Arts is great fun. It takes the challenge of computer play and broadens it to encompass the fun and interaction of a family board game. As a multiplayer game, it provides an opportunity for good-natured competition that requires shrewd strategy and an instinct for revenge. In addition, the antics of the rascally robots delight and entertain throughout the game.

The program, written for the Commodore 64, comes with an easy-to-grasp, witty manual that contains both directions for play and advice on strategy. Two decks of cards are included: Luck cards, which are drawn during game play, and Item cards, which are



dealt out, four to a player, randomly determining which items are to be scavenged by the players' robots.

The object is for each player to use his or her robot to seek out and collect (scavenge) the four items designated by the Item cards. These items are on the planet Laustenfownd—yes, that's what it's called—a place whose geography includes lakes, rock-ridden fields, woods, open plains, and swampland. The changing terrain has varying effects on the robots, affecting their speed and altering their chances for damage. Each robot has a home base to which to return—with its scavenged goods, for repairs, or for safety. There are five teleport terminals on Laustenfownd to expedite travel.

Robot Rascals has four levels of play to choose from: superbeginner, beginner, standard, and advanced. Difficulty is determined by the setup (how the two decks of cards are used) and by the play level selected. After you set up, the computer helps the players choose their robots from the ten provided. Each player selects a color for his robot and a beginning energy level. This allows for both strategy and, later, handicapping among experts and beginners.

After the players have chosen their robots, the computer announces a Global Event—a condition on Laustenfownd which will favorably or adversely affect play. (At beginner levels there are no negative global events.) For each round, the computer changes the global event and randomly picks the order in which players take turns. During a turn, a player draws a card from the Luck pile, follows its directions, and moves his or her robot via the joystick.

Robot Rascals...*retains the wonder of a computer game—the colorful screen, the animated characters, and joystick interaction—but adds the traditional camaraderie and interplay of a family board or card game....*

The combined effects of the Luck cards, Item cards, global events, and individual player strategy allow for intriguing play. Theft, energy depletion, getting stuck with items that drain a robot's capabilities, and being teleported to another point on the planet can all be unfortunate mishaps.

The skillful combination of these varying elements is what makes *Robot Rascals* such a great game. It retains the wonder of a computer game—the colorful screen, the animated characters, and joystick interaction—but adds the traditional camaraderie and interplay of a family board or card game—the wisecracks, laughter, and unheeded pleas for mercy as someone succeeds in "getting even." This is a game that can come to the party, entertain a group, and bring the family together for some fun. In *Robot Rascals*, Electronic Arts has brought the computer game out of the study and placed it in the heart of the family room. And that's where the best games belong.

—*David and Robin Minnick*

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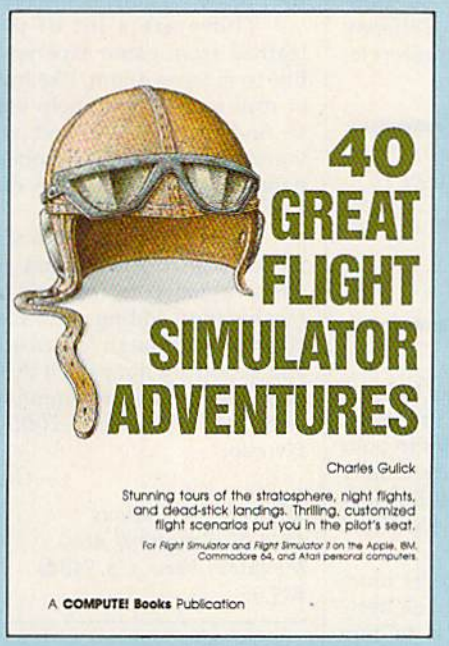

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Roadwar 2000

In the year 2000, bacteriological war destroyed civilization. Cities turned into prizes held by powerful factions, while the highways, which once carried the commerce of a great nation, became deadly battlefields. Now, at the request of what's left of the federal government, we have been trying to locate eight scientists, and return them to a secret underground lab so a vaccine can be developed to neutralize the microbes released during the war.

It hasn't been easy. Food and fuel are in short supply. We've been fighting constant battles with mutants, cannibals, and rival road gangs. We left Dallas a week ago with almost 300 people. Now we're in San Francisco with only 50. Out of the nine vehicles we started with, only a flatbed truck remains.

SSI is best known for its realistic simulations, war games, and fantasy role-playing games. But *Roadwar 2000*'s approach is something quite different.

Unlike other SSI games, which allow one player to play against the computer or which offer a two-player option, *Roadwar 2000* is a one-player game in which the computer plays an apparently subordinate role. However, it's easy to forget the computer is controlling the action. You may find yourself wondering about the Machiavellian intelligence controlling the opposition. You'll be encountering various groups of people. Sometimes you'll find mobs of starving people, ready to swear allegiance to you in return for a mouthful of food. You may even encounter trained mercenaries, ready to join forces with you and strengthen your band.

Other times, those you meet will be somewhat less than desirable—definitely not the type you'll want as companions as you travel through a hostile land.

Finding food and fuel is a serious problem. Since the country has fallen into anarchy, normal commerce is impossible. Searching and looting the ruins of the cities is the best way to locate caches of food. You'll need to monitor your stores of food and fuel closely. It's easy to find yourself in a barren wasteland without the means to continue your journey.

Your commands are issued through a series of menus displayed under maps of the area you currently occupy. Moving around the map in search of loot, people to recruit for your gang, or vehicles is the most common exercise. From time to time, you'll need to fix flat tires, cache surplus supplies, and conduct other necessary business. All commands are entered by pressing a single key.

Movement is over terrain you would expect: plains, farmland, mountains, desert, and woods. If you survive long enough, you'll move over 30 different types of terrain and through 120 cities. By the way, you're not limited to what was once the United States. Try visiting Mexico or Canada. Maybe a vacation in the Bahamas would be nice. But be warned; things have changed.

Many decisions are necessary. Stay in a city too long, and you could deplete the already limited resources of the area. As leader, you're responsible for equipping your force. Lead wisely, recruit the right mix of people and specialists, and you'll do well. Mistakes are costly, and your force may actually desert if you prove a weak and ineffectual leader.

You'll also need to strengthen your vehicles. More than a means of transportation, your vehicles may be hardened into real war wagons. Different vehicle types are available; motorcycles offer good fuel economy, but a bus can carry—and withstand—more firepower. You may have up to 15 vehicles in your gang, and each one is rated individually in 24 categories. A normal station wagon is no match for a battle-hardened off-road sedan.

Staying alive long enough to piece the puzzle together is the real problem.

Which combat tactics will be more effective? Is a hit-and-run attack best? Sometimes the best choice is to ram your opponent. *Roadwar 2000* offers the choices of detailed combat resolved down to the individual combatant, or simply the strategy involved with moving masses of people.

When you're meeting another road gang, combat is inevitable. There are three modes in which to resolve combat: abstract, tactical, and quick. When another gang is encountered, the computer prompts, FIGHT DETAILED ROAD COMBAT? If you answer *No*, the abstract mode is selected, where the battle is swift and bloody. Respond *Yes* and follow the prompts to select either tactical or quick combat.

During tactical combat, the display shifts to a smaller area, displaying your vehicles and the vehicles of the rival gang. You'll find many variable factors during detailed road combat. It's up to you to maneuver your vehicles, gain whatever advantage you can, then destroy your adversary. No time here to be merciful. Any sign of weakness will cost you dearly. If you've seen the combat sequences in the *Mad Max* films, then you know what to expect.

Combat is really only a small part of this game, although it's a crucial one. Shrewdness in noncombat situations is equally important. The tactics you employ will lead to your ultimate victory or defeat. Never lose sight of your goal to find the eight scientists and return them to the secret underground lab.

As with most SSI games, *Roadwar 2000* isn't a quick one-evening affair—playing time is estimated at over 50 hours. The game I'm presently enjoying has lasted well over the 50-hour mark.

Locating the eight scientists is difficult. You'll need the help of secret agents located around the country. They'll reveal themselves to you from time to time. Staying alive long enough to piece the puzzle together is the real problem.

There are a lot of things I've learned from game experience that I'd like to tell you about, like how a doctor or drill sergeant can help you. Or how to find the healers, and what to do when the mutated microbes contaminate your gang. But the discovery is part of the fun.

Roadwar 2000 offers a strategy and tactics scenario combined with swift, decisive action to form an unbeatable combination adding up to sustained excitement. Although fast arcade graphics and action are not part of this game, excellent graphics and attention to detail will make *Roadwar 2000* a lasting favorite.

—*George Miller*

Strategic Simulations
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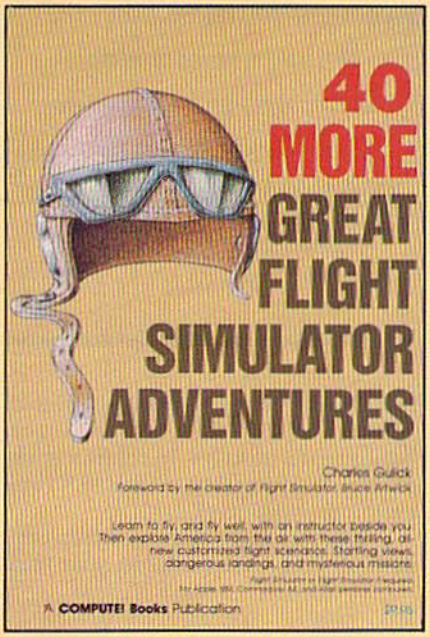

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Certificate Maker

Is there someone you want to reward for a job well done? Do you have students whose achievements you want to recognize? Then this program is for you.

Springboard Software has introduced *Certificate Maker* for the 64—a second cousin to the company's earlier *Newsroom* newsletter printing package that helps you make professional-looking certificates of merit. With over 200 certificate designs to choose from, the ability to make multiple certificates, and its easy-to-follow, menu-driven format, *Certificate Maker* is a handy, engaging program to have around.

You're given a manual that uses straightforward directions accompanied by a flow chart diagram composed of the actual menu screens. This manual also carries illustrations of the certificate designs provided on a second disk. These range from humorous, such as the "Couch Potato Award," to serious scholastic and religious awards that school and church classes might use.

All of the designs (called templates) can be partially customized by choosing one of 24 borders and one of five fonts, and by deciding how to word the certificate. The only part that can't be customized is the graphic. We think this is a bit of a drawback, especially since some templates are blank. You add the words, but there is no way to add a graphic. However, under the fonts section, the manual mentions possible future additions to *Certificate Maker*. Perhaps they'll expand on the graphic feature, too.

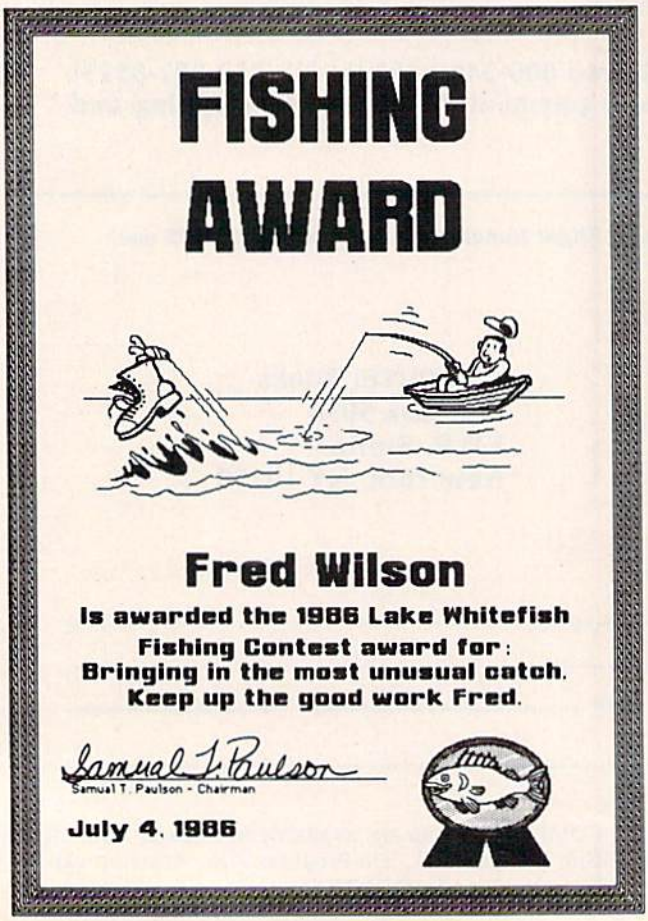
After you've followed the menus to design your certificate—a task so easy you can almost get by without reading the manual—you print it out. If you wish to make more than one of the same design, there is a way to make a series of certificates, each with a different person's name on it. This is done by creating a name file. You are allowed room for 75 names per file and 25 characters per name. The file, which must be stored on a separate data disk, is easily created with the aid of more clear-cut menus. It can be edited at any time, and it autoalphabetizes, too.

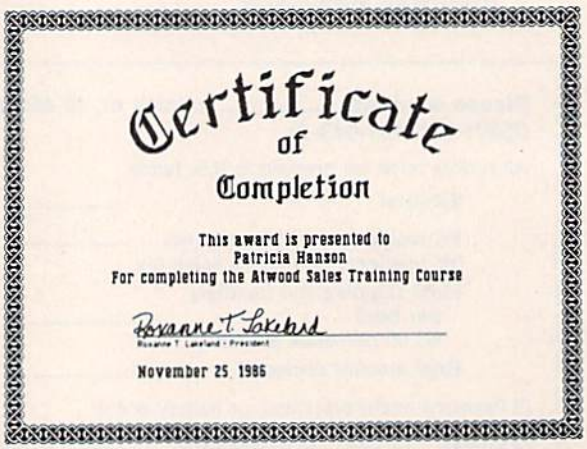
Printing the certificate revealed the only actual problem with *Certificate Maker* that we could find, and this is a problem that may be particular to one printer. We use a C. Itoh 8510 Prowriter. *Certificate Maker* is set up for making multiple certificates, but in doing so, we developed a travel problem. After we had printed eight or ten certificates, the certificate was being printed about a quarter-inch closer to the bottom of the page, significant when you're attempting a professional-looking, centered piece of work. Depending on the size of your name file, this could mean up to nine repositionings of printer paper for a multiple run of certificates, reducing the convenience of this feature. However, the problem could be peculiar to the C. Itoh Prowriter.

With over 200 certificate designs to choose from, the ability to make multiple certificates, and its easy-to-follow, menu-driven format, Certificate Maker *is a handy, engaging program to have around.*

Once your certificates are printed, you may wish to add one other touch. Springboard includes 36 colorful stickers which can be used as seals to further customize your work.

The usefulness of this program can't be beat. From congratulating your mate





Certificate Maker *offers 24 borders and 5 fonts for creating your own certificates.*

for some outstanding feat of spousemanship to marking the completion of a Sunday School year, from presenting a colleague with the "Infecting Co-Workers Award" to honoring your students' excellence in musical performance, there is practically no end to the ways you can use *Certificate Maker*. We passed out 24 Best Friends awards to our daughter's kindergarten class, ones that she helped make. The kids loved them, and the parents were impressed, too. Our school (using the Apple version) has also found ample uses for certificates. We recommend *Certificate Maker* highly—no matter whether you use your Commodore at home, school, church, or for any other organization that might wish to honor its members. Springboard deserves a certificate of its own for this creative, easy-to-use, practical program.

—David and Robin Minnick

Springboard Software
7808 Creekridge Circle
Minneapolis, MN 55435
$49.95

I Am The C128

I Am The C128 from Personal Choice Software (distributed by Activision) is a beginner's tour through the Commodore 128 computer in nine "volumes," or multipart chapters. For neophytes who prefer their tour on the computer screen rather than in a book or magazine, this disk is a fine introduction to programming in BASIC on the 128. You certainly get a closer, more intimate view this way; the hands-on approach has much to recommend it.

The tour consists of an introduction to microcomputing and software, the 128 (with emphasis on the keyboard) and disk drive, BASIC, graphics, and sound. The new 7.0 BASIC graphics and sound commands, as well as those accessing the disk drive, are particularly well covered in *I Am The C128*.

Required hardware—in addition to the 128—is a 1571 disk drive (the 1541 will not work) and a 40-column monitor (color preferred, but not essential). You also need a basic sound system (amplifier and speaker/headphones or TV sound) for the extensive sound and music demos. Though one might wish the program had accommodated the 1541, it is likely that *first-time users*—those for whom this program is written—will have purchased the 1571, rather than the older and slower drive. A color monitor/TV is ideal for both the material on screen graphics and the color-coded keyboard demonstration, but is otherwise incidental.

The nine volumes are titled Introduction, The C128, BASIC, Advanced BASIC, Disk Usage, Screen Graphics, Sprite Graphics, Sound Effects & Music, and Programming Hints. From a master table of contents, you choose a volume; a volume menu then presents a set of chapter headings. Once a chapter is selected, you're taken straight through the rest of the volume, ending with a review—a useful feature that summarizes the volume. At any point you may exit by pressing one of two keys: ESC returns you to the volume menu; F1 returns you to the main table of contents. You can also flip back and forth between pages (*slowly*) by using the up- and down-cursor keys.

... this disk is a fine introduction to programming in BASIC on the 128. You certainly get a closer, more intimate view this way; the hands-on approach has much to recommend it.

The program is virtually foolproof. The only way I have found to "confuse" the program is to hit ESC during the initial program display (which is long—the user will often wish to bypass it). The appropriate exit (not mentioned in the "Tourbook" pamphlet) is to press F1 (which is also the only way to recover from the above-mentioned abortive ESC).

Even with the use of screen blanking (FAST mode, I assume), quite a lot of time is expended in disk access—especially at initial load. Some volumes take over 30 seconds to bring up. Once into a volume there are no delays until you hit F1 or ESC, whereupon everything is reloaded. A single HELP screen, summarizing the various methods of navigating *I Am The C128*, is always immediately available.

The program is logically conceived and user-friendly. Overall, its most attractive feature is the large number of short programs displayed onscreen to study and run, particularly in the graphics and sound volumes. Sound and music treatment is especially comprehensive, with extensive program demos that are excellent overall; only a few are unnecessarily confusing (such as the filter and octave demos). In passing, I should point out one program error: The fifth ENVELOPE waveform is purported to be ring modulation; it is instead a simple triangle wave. For the bell-tone of actual ring modulation, an additional frequency must be given the modulating oscillator. (This was apparently not done, and use of a second oscillator is not mentioned).

For the most part, material is presented in textbook fashion, page by page. The program provides *some* interaction, *some* graphics, *some* demos, but not as much as there could be, as these are the major reasons for doing a tour on the computer itself. Probably the best examples for study are the separate SCREEN, SOUND, and SPRITE programs. All are well commented, though SOUND and SPRITE are short and simple. SCREEN, on the other hand, is substantial and of considerable help in showing how to create various shapes and figures onscreen.

I have discovered only one other problem detail that might confuse the beginner: The discussion of DIRECTORY under "Disc Usage" states that when you press F3, a disk directory will appear. This is true, *except in this program* (the alert "student" will no doubt try pressing F3 at this point).

All in all, this is a useful introduction for the neophyte wishing to take his or her first steps through 7.0 BASIC, particularly in relation to sound, graphics, and disk access. Armed with *I Am The C128* and the documentation packed with the computer, new users should be well on their way to developing BASIC programming expertise and to getting the powerful 128 to do what *they* want.

—Art Hunkins

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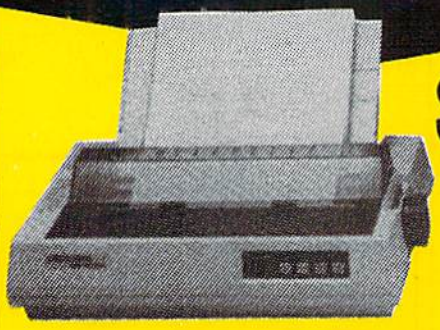

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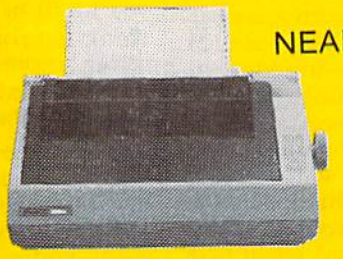

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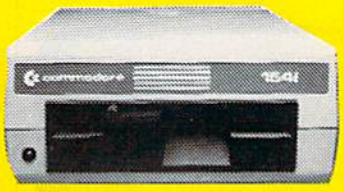

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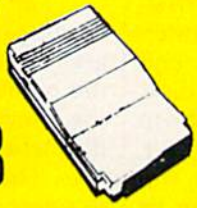

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Print Shop To GEOS

Bruce Wilkinson

Transfer Print Shop *graphics to* GEOS *with this clever utility.*

The *GEOS* operating system comes with a powerful paint program known as *geoPaint*, but so far there are few picture libraries available for it. *"Print Shop* To *GEOS"* lets you convert pictures and diagrams from Brøderbund's very popular *Print Shop* graphics printing program to *GEOS* file format so that you can use them in *geoPaint* and *geoWrite*.

Print Shop To *GEOS* is written entirely in BASIC. Type it in and save a copy to a *GEOS* work disk. Make sure that there's a Photo Scrap file on the disk. (If there isn't, you'll have to create one. First, run *geoPaint* by double-clicking on its icon from the *GEOS* deskTop. Following the instructions in your *GEOS* manual, CUT or COPY any part of the screen. Then exit *geoPaint*. This procedure saves the copy buffer into a file called Photo Scrap.) A word of caution: The *Print Shop* To *GEOS* program creates a temporary disk file named S, so if you already have a file of that name on the work disk, you must delete or rename it.

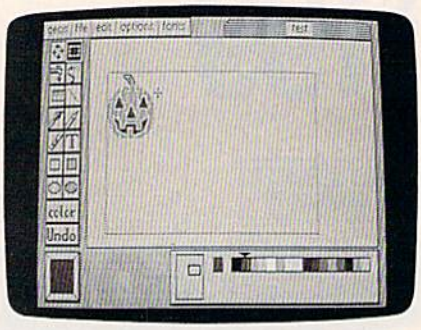
Moving Pictures

Once you have prepared the work disk, run the conversion program from the deskTop by placing the cursor on the program icon and double-clicking. When the program requests the *Print Shop* disk, remove the work disk and insert the disk holding the *Print Shop* graphic. The program then asks if the image is for a Commodore (side B) or Other (side A) printer. Although the program can handle either side A or side B of the *Print Shop* graphic library disks, side B graphics look better when printed from *GEOS*.

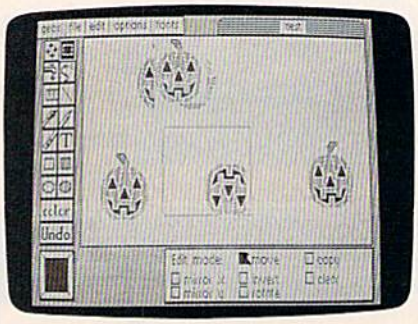
The program requests a filename for the desired *Print Shop* graphic image. If you aren't sure of the name, press RETURN to view the directory. The program lists the files which are likely to be graphics files. The criteria the program uses to select a file are that it must be a PRG file and it must be three blocks long for side A or two blocks long for side B. In some instances, files that are not graphics files may meet these criteria and appear in the list. Ignore these files.

Print Shop To *GEOS* lists up to 16 filenames. If there are more files in the directory, you may view them by pressing RETURN again. Press the left arrow key to abort the directory display. If you abort, the program asks that you insert a different disk. To load the image, type the name of the desired file and press RETURN. Alternatively, use the cursor keys to move the cursor to a filename and press RETURN.

Now place the *GEOS* work disk back into the drive and press RETURN. The program saves the image as a Photo Scrap file. After the file is saved, place the master *GEOS* disk in the drive and press RESTORE to reboot *GEOS*.



A Print Shop *picture has been loaded into* geoPaint.



Once in geoPaint, *the picture can be rotated and mirrored.*

You may now paste the captured image into a Photo Album, *geoPaint* file, or *geoWrite* file. By pasting the graphics into a Photo Album, an entire library of graphic images can be created for later use.

See program listing on page 98.

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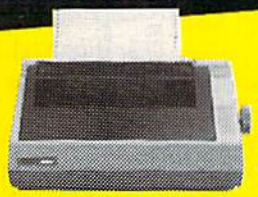

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The Versatile CIRCLE

Paul W. Carlson

The 128's CIRCLE command can do much more than draw circles, as you'll see with these short and impressive graphics demo programs.

The four programs accompanying this article demonstrate how easy it is to use the CIRCLE command to draw attractive geometric shapes on the Commodore 128.

A circle on the 128 is actually drawn as a polygon with 180 sides, so it's ideal for drawing many different geometric figures. We'll be drawing regular polygons—ones with all sides the same length and all angles the same size.

Program 4, which is based on "MODified Shapes for IBM," a program I had published in the May 1986 issue of COMPUTE!, shows the final result of all four programs. However, if you want to better understand the CIRCLE command, let's begin with Program 1.

A First Step

Type in Program 1. When you've finished typing, save a copy to tape or disk, then load the program and type RUN. This program draws three different shapes—an equilateral triangle, a square, and a hexagon. CIRCLE can be used to draw polygons with any number of sides, but these three are the shapes we'll be using in the final program.

To understand how CIRCLE can be used to produce these shapes, take a look at line 130 in the program:

```
130 CIRCLE C,CX,CY,XR,YR,SA,EA,0,
    360/NS
```

The command CIRCLE is followed by a list of arguments, each separated by a comma. Like all graphics statements that draw on the screen, the first argument, C, is the color source.

The next two arguments, CX and CY, are the horizontal and vertical coordinates of the center of the polygon that is to be drawn. The center of a polygon with an odd number of sides won't be midway between the top and bottom of the polygon—so you may notice that the triangle is not centered vertically on the screen, although it has the same center coordinates as the square and the hexagon.

The next two arguments, XR and YR, are the horizontal and vertical radius of an imaginary circle that passes through every corner of the polygon. It's here that we have to take into account the fact that the pixels on most monitors and TV screens aren't square. In high-resolution mode, a pixel's height is about 1.4 times its width. This height-to-width ratio is known as the aspect ratio. To prevent the shapes from being elongated vertically, the horizontal radius must equal the vertical radius times the aspect ratio. The variable AS in line 10 of the program is the aspect ratio—try changing its value to see what happens.

The next two arguments, SA and EA, are the starting and ending angles, measured in degrees. To draw a complete polygon the ending angle must be 360 degrees greater than the starting angle. The starting angle determines the position of the first vertex of the polygon. With a starting angle of zero, the first vertex would be at the very top of the polygon. The program uses a starting angle equal to 180 divided by the number of sides to turn the polygon clockwise so the last edge is horizontal at the top.

BASIC 7.0's CIRCLE command makes it easy to create pictures like this.

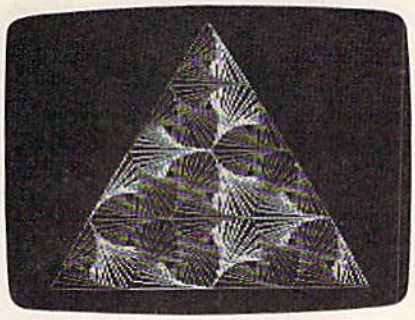
The next argument is the rotation angle. The program uses a rotation angle of zero degrees. You may wonder why I use the starting angle to rotate the polygons rather than the rotation angle. The reason is that any rotation angle other than zero or 180 degrees has the effect of changing the aspect ratio (unless the aspect ratio is 1). This leads to an important rule that is not stated in the manual: For any aspect ratio other than 1, use the starting angle to rotate the polygon, not the rotation angle.

The final argument is the number of degrees between the sides of the polygon. This is 360 divided by the number of sides.

The variable SU is not used by this program, but it is used in Program 2.

Scaling And Rotating

If you have Program 1 in memory, just add four lines—80, 90, 110, and 150—to create Program 2. (The underlined ↑ character in lines 80 and



In this photo, several small triangles were drawn with the CIRCLE command to make a larger triangle.

90 is π, achieved with SHIFT-↑.) When you've made these additions or have typed in all of Program 2, save it with a new filename. Then, load and run it. Lines 110–150 hold a FOR-NEXT loop with the CIRCLE command inside it. Each time through the loop, the polygon is scaled down by a factor of RF (computed in line 80) and rotated DA degrees (computed in line 90). The values of both RF and DA are determined by the value of the variable SU in line 10. It's interesting to change the value of SU slightly to see what happens.

Adding Color

Programs 1 and 2 plot complete polygons. However, the CIRCLE statement is able to draw partial polygons as well. Why would you want to do this? Suppose you wanted a polygon with sides of different colors; CIRCLE can do it. Program 3 can be made from Program 2 by adding or replacing lines 10, 60, 100, 120, and 140 from the listing of Program 3. Save the program with a different name, then load and run it. Lines 120–140 create another FOR-NEXT loop nested within the one that was in Program 2. Line 120 computes the ending angle by adding 360 divided by the number of sides to the starting angle, which causes the circle statement to draw just one side of the polygon each time through the loop. Because line 140 advances the starting angle by the same amount each time, a new side is drawn each time through the loop. The expression EA=SA+360 in lines 70 and 110 is no longer necessary and may be removed.

By drawing the polygons one side at a time, the program can use any of the three available colors for any side. The calculations for the variables B and C in lines 60 and 120 are used to determine the color each side will be.

Notice that the aspect ratio in line 10 was changed from 1.4 to 0.7. This is because in multicolor mode each pixel is twice as wide as in the high-resolution mode.

Complex Patterns

Program 4 combines the discoveries of the first three programs into a program that generates three different multicolored displays. Type it in, save it, and run it. As you watch the displays being drawn, remember that the only graphics command being used is CIRCLE.

This program rotates some of the triangles and squares counterclockwise inside each other to create the patterns. This means that the starting angles must decrease for each rotation. Because the CIRCLE command does not allow negative starting angles, the program adds 360 degrees to the starting angle to to insure that a negative number is not used. Note that any shape rotated 360 degrees is unchanged.

See program listings on page 108.

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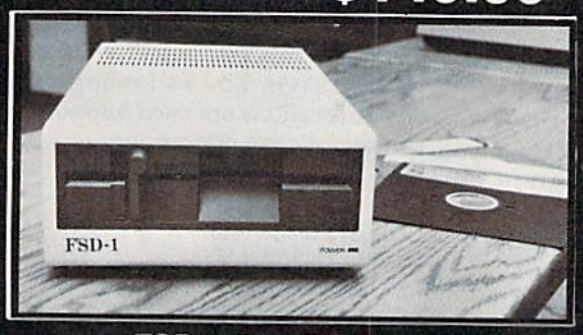

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Michael Henry

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combination, so you can also reactivate TurboSave simply by pressing SHIFT–RUN/STOP.

TurboSave causes no conflicts with BASIC, but machine language programmers should be aware of the memory locations used by the program. It occupies locations

Countdown Timer

Dave Flater

Here's a clever routine that makes the 64 or 128's internal clock count backward. It becomes a countdown clock that you can easily use in your own BASIC programs—a nice addition for realtime games.

If you've ever tried to make a countdown clock in BASIC, you'll know that it's difficult to make a good one. The only timer that BASIC recognizes is one that counts upward. Try this short program to see how the internal clock works:

```
90 PRINT"{CLR}"
100 TI$="000000"
110 PRINT "{HOME}";TI$
120 IF TI$<>"000100" THEN 110
```

The variable TI$ is a *reserved variable* that is maintained by the system. It counts up from zero when the computer is turned on. Another reserved variable is the numeric variable TI. Replace TI$ with TI in the above program to see the difference. While TI$ counts seconds that go by, TI counts 1/60 second intervals known as *jiffies*. "Countdown Timer," a machine language subroutine that you can use in your own BASIC programs, makes the system timer count down instead of up. Both TI$ and TI are affected by this change.

Counting Down

There are two versions of Countdown—Program 1 for the 64 and Program 2 for the 128. Type in the version for your computer. Since there are several DATA statements, which require accurate typing, use "The Automatic Proofreader" program found elsewhere in this issue. When you've finished typing in the program, be sure to save a copy to disk or tape before running it. Now load the program with a statement of the form LOAD"COUNTDOWN",8. (Use ,1 if you're using tape instead of disk.) Substitute for COUNTDOWN the name you used when you saved the program.

If you run this program, you won't be able to see any changes. However, a machine language program is in memory, ready to be used. To see the clock count down, type these lines with the program in memory:

```
90 PRINT"{CLR}"
100 SYS 679:REM SYS 3072 FO
    R 128
110 TI$="000100"
120 PRINT "{HOME}";TI$
130 IF TI$<>"000000" THEN 120
```

This program starts a one-minute countdown. When the clock reaches 000000, the program ends. Although this particular program stops when the clock reaches zero, the timer doesn't. It *wraps around* to a high number and counts down to zero again. This is something to keep in mind when writing your own programs that use Countdown. If you don't check the clock at least once a second, zero may come and go without your program noticing.

To use the timer, include the appropriate version (Program 1 for the 64 or Program 2 for the 128) in your own program. To make the timer count down, include a line in your program like this:

100 SYS 679:REM for the 64

or

100 SYS 3072:REM for the 128

See program listings on page 107.

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Todd Heimarck
Assistant Editor

If you typed in the memory display program from last month, load it into your 64 and get ready to take a look at a BASIC program. After loading it, type NEW. Then type in this short program and run it:

```
1 REM FIRST LINE
2 PRINT"LINE 2"
10 X1=1:X2=2:X4=4:X8=8
20 GG=9:GG%=9:GG$="NINE"
30 FORJ=1TO10:HH%(J)=J:NEXT
```

To start up the memory display program, SYS 49152. Take a look at location $002B (press the English pound symbol and enter 002B). Write down the first four numbers on the screen. They're pointers to the start of BASIC and the start of variables. When I typed in the BASIC program above, the four numbers starting at $2B were 01, 08, 69, and 08.

Hex Isn't Magic

Before we proceed, a word about hexadecimal. Hex is a numbering system that's convenient to use in certain situations. It uses base 16. Hex digits include the numbers 0–9 as well as the letters A–F. $A is the hex equivalent of 10, $B is 11, and so on, up to $F, which is 15. It's a common practice to mark hex numbers with a leading dollar sign. Thus, 88 means 88, but $88 means 136 (8 times 16 plus 8).

Remember that there's a difference between a value and the numerals used to express that value. Twelve pencils, a dozen pencils, and $0C pencils are the same. Twelve equals a dozen equals $0C.

If $88 is the same as 136, why use hexadecimal at all? Even though it seems more confusing, it's sometimes actually easier to use hex. If the memory display program is running and location $002B is still on the screen, the numbers 01 08 form a pointer to the start of the BASIC program. To decode this pointer in decimal, multiply the second number by 256 and add the first number. (On the 64 and 128, the low byte usually comes before the high byte.)

What the 01 08 means is that BASIC starts at 2049. In hex, the number is $0801. The decimal translation of 69 08 is 2153, $0869 in hex. When you're looking at pointers like this, translating 01 08 to $0801 and 69 08 to $0869 is much easier—you just flip the two numbers—than multiplying by 256 and adding.

Tokens And ASCII

We know that the BASIC program starts at $0801, so press the English pound key and enter that address. If you typed in the BASIC program above, you should see something that looks like this:

```
0801  10  08  01  00  8F  20  31  53
0809  54  20  4C  49  4E  45  00  1E
0811  08  02  00  99  22  4C  49  4E
```

That's what part of the BASIC program in memory looks like. Each program line starts with four bytes: two 2-byte numbers. The first is the *line link*, which points to the beginning of the next line, the second is the line number. At $0801, line 1 has the two numbers $0810 and $0001, which means the next line starts at $0810 and the line number is 1. At $0810, the numbers are $081E (the next line) and $0002 (the line number). Line 10 begins with $0836 and $000A ($A translates to decimal 10). Every line ends with a zero, and the final line link consists of two zeros to mark the end of the program.

The text of the program line falls between the four bytes at the beginning and the zero at the end. If you compare the ASCII on the right with the original lines, you'll see many of the characters you typed. But the REM seems to have disappeared from line 1 and the PRINT in line 2 has vanished.

The first byte after the line number in line 1 is $8F. That's the one-byte token for the REM statement. The first byte in the second program line is $99, the token for PRINT. On the 64, when you type in a line, it's *tokenized* before it's stored in memory. Every BASIC keyword has a token that lies in the range 128–255 ($80–$FF). On the 128, tokens may be either one or two bytes long, but on the 64, they're all single bytes.

Further down in memory, you'll see that line 30 is full of tokens—one each for FOR, =, TO, =, and NEXT.

Variables

Skip ahead to $0869 or whatever location you discovered in $2D. Press both SHIFT and the Commodore key to put the screen in upper/lowercase mode. Each non-array variable uses seven bytes: two for the variable name and five for the value.

Floating point variables such as X1, X2, and GG have both characters in lowercase (x1, x2, gg). Note that the values 1, 2, 4, and 8 are represented as $81, $82, $83, and $84. When you multiply by two, the mantissa remains the same but the binary exponent is increased by one.

The integer variable GG% has two uppercase characters (GG) in the name slot and only uses the first two bytes for the value. The two characters 00 and 09 after GG mean the value is nine. This is a rare exception to the low-byte/high-byte rule. In integer variables, the high byte comes first.

The string variable GG$ has one lowercase and one uppercase letter (gG). GG$ was set to equal the string *nine*. The three characters following the name are 04 4A 08. The first is the string length (*nine* has four characters). The second is the address of the string, $084A, with the low byte in front of the high byte. The final two bytes are meaningless.

simple answers to common questions

Tom R. Halfhill, Staff Editor

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

Q. Would it ever be possible for software and/or third-party manufacturers to undertake an MS-DOS emulator for the Commodore 128? Though I am no expert at this, it sounds reasonable to me that with the 512K memory expansion and the Z80 chip, it might be possible.

A. There's an adage which goes, "Any computer can emulate any other computer as long as speed is not a consideration." In other words, it *is* possible for a Commodore 128 to emulate an MS-DOS (IBM PC compatible) computer—or an Apple, or an Atari, or even a Cray-1 supercomputer—but it would run at a crawl. An eight-bit computer like the 128 simply lacks the horsepower to transparently emulate a more powerful machine like an IBM PC. Even the Amiga, which is more powerful than an IBM PC, cannot emulate the PC at full speed.

This assumes that the emulation is done entirely in software, however. Full-speed emulation is quite possible if additional hardware is brought into play. In this case, you'd need an 8088 or 8086 microprocessor, appropriate support chips, and read only memory (ROM) chips that simulate the IBM's BIOS (Basic Input/Output System). In effect, the emulator would be an MS-DOS computer without a keyboard or random access memory (RAM).

The drawback to this approach is that it's nearly as expensive as buying a complete MS-DOS computer, especially since low-end PC clones are available for around $600.

The Commodore 128's Z80 chip would be of little use. Although the Z80 probably has more in common with the IBM's 8088 than the 6502/6510–series chips, it's still very different from the 8088 and not powerful enough to emulate the IBM at full speed.

Q. I currently own a Commodore 64, a VIC-20, a 1541 disk drive, and a pair of Atari joysticks. I am thinking about purchasing a Commodore 128, and I'd like to know if the joysticks and the disk drive are compatible.

A. Your joysticks and disk drive are fully compatible with the Commodore 128. The 1571 disk drive which is sold for the 128 is desirable, but not required. Its main advantages are greater speed, increased storage capacity, and compatibility with CP/M disks when using the 128 in CP/M mode. (CP/M—which stands for Control Program/Microcomputers—is an old operating system for which a great deal of software has been written. Much of the software is oriented toward small-business applications.)

Q. One frequently sees, in copyrighted publications such as COMPUTE!'s Gazette, short programs and routines for enhancing screen displays, speeding up execution, or otherwise spicing up one's own programs. What are the ethical and legal ramifications of incorporating this code in our programs, especially if they might be sold or published?

A. The material which appears in COMPUTE!'s Gazette is intended for the use and enjoyment of our readers. Under U.S. copyright law, there is no problem with incorporating these routines into your own programs, because your purchase of the magazine grants you such use of the copyrighted material.

But if you want to sell or publish the resulting program, it's another story. According to the law, you must obtain written permission from the copyright holder to use copyrighted material. The holder may negotiate a fee for its use, or simply require that you include a copyright notice in your program. In any case, you must get permission in order to be on safe ground. If you're selling the program to our magazine, there's no problem, of course, since COMPUTE! Publications, Inc. holds the copyright.

Note that this law applies to copyrighted material of all kinds. For instance, if you wrote a computer program that used a copyrighted tune for musical background—say, "Yellow Submarine"—legally you'd have to obtain written permission from the copyright holder of that Beatles song before selling or publishing the program. Since this would likely involve the payment of royalties, you're better off sticking to tunes written by anonymous or long-deceased composers. On several occasions, our editorial programmers have been forced to rework submissions for this reason.

Also, note that the revamped U.S. copyright law expands the legal definition of what it means to "publish." Uploading a program to a bulletin board system (BBS) or allowing the members of your user group to make copies may well constitute publication should you run into copyright difficulties later.

• "Menu System" (October 1986) will not load files from disk because its Load function uses the descriptive name of the files instead of the actual name. To correct that problem, change the P$ in line 130 to L$:

```
130 S6$="50 PRINT"+CHR$(34)
    +"{CLR}{3 DOWN}LOAD"+CH
    R$(34)+";Q$;L$(K);Q$;E$
    (K):IFS$(K)>"
```

• "Power BASIC: Sanitation Engineer" (February 1987) crashes if used in conjunction with a program having more than one string array. To correct the problem, type in and save a copy of the following short program. Now put the disk containing the original Sanitation Engineer program in the disk drive and type RUN. The patch program will load Sanitation Engineer, correct the problem, and save the corrected program back to your disk. In order to save Sanitation Engineer, the patch program must call the Kernal SAVE routine dirrectly. Line 50 OPENs the program file SANITATION to store the corrected version and line 60 sets up the pointers for and calls the Kernal SAVE routine. (Lines 10, 30, and 50 of the patch program assume that your original copy of Sanitation Engineer is saved under the name SANITATION. If this is not the case, you must either change those lines in the patch program or rename the disk file to match the name used in the patch program.)

```
HF 10 IF A=0 THEN A=1:PRINT"LO
      ADING...":LOAD "SANITATI
      ON",8,1
CJ 20 FOR I=52020 TO 52027:REA
      DA:POKEI,A:NEXT
SH 30 OPEN15,8,15,"S0:SANITATI
      ON":INPUT#15,EN,EM$,ET,E
      S:CLOSE15:PRINTEN;EM$;ET
      ;ES
QR 40 PRINT "SAVE THE CORRECTE
      D VERSION..."
KG 50 OPEN1,8,1,"0:SANITATION,
      P,W"
KJ 60 POKE193,32:POKE194,202:P
      OKE780,193:POKE781,240:P
      OKE782,203:SYS65496
HP 70 CLOSE1
XA 80 DATA 228,50,144,4,197,49
      ,176,240
```

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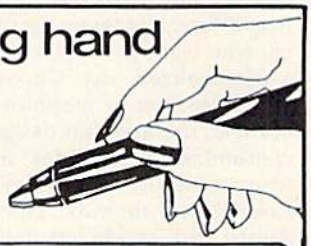

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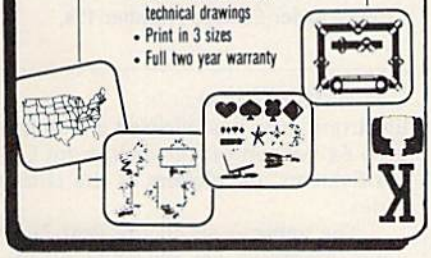

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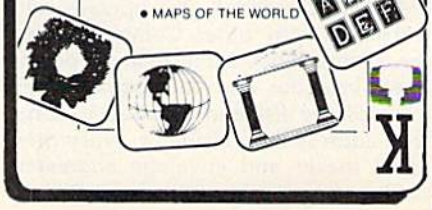

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Calendar Creator Kit

Epyx has introduced an easy-to-use program that lets you design your own daily, weekly, monthly, or yearly calendars. *Create a Calendar* offers an assortment of calendar types and decorative fonts, borders, and graphics suitable for special occasions. In addition, graphics from Epyx's *Graphics Scrapbook* or Brøderbund's *Print Shop* may also be used. Multiple lines of text and graphics can be placed on any day of the year; regularly scheduled events can be repeated automatically.

Suggested retail cost is expected to be $20-$30.

Epyx, 600 Galveston Dr., P.O. Box 8020, Redwood City, CA 94063

Circle Reader Service Number 170.

Award-Making Software

Hi Tech Expressions has expanded its product line with the introduction of *AwardWare*, a program for computer users who want to express recognition in a personalized way. Choosing from a large selection of graphics, fonts, and borders, the user can design and print customized certificates, awards, announcements, stationery, coupons, tickets, and memos. The Create An Award Disk option lets the user design an award and send it to a friend, who can load it and see it on the screen in a flashing marquee.

AwardWare retails for $14.95.

Hi Tech Expressions, 2699 S. Bayshore Dr., Suite 1000A, Coconut Grove, FL 33133

Circle Reader Service Number 171.

Desktop Accessory And Word Processing For Commodore 64

Timeworks recently introduced two new productivity programs for the Commodore 64.

Partner 64 is a cartridge-based system that offers eight memory-resident desktop accessories that operate concurrently with other Commodore 64 programs. They include an appointment calendar and date book, memo pad, phone list and autodialer, name and address list, calculator, typewriter, label maker and envelope addresser, and screen print function. Suggested retail price is $59.95.

Word Writer 3 is a word processing program for the Commodore 64 that includes an 85,000-word spelling checker, an integrated thesaurus, an outline processor, 80-column print preview mode, a highlighting feature, and automatic program setup. Documents from *Word Writer 3* can also be incorporated into the *GEOS* environment. The program retails for $49.95.

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

Circle Reader Service Number 172.

Inexpensive Commodore 64 Software

Several software publishers have announced new lines, or additions to old lines, of inexpensive software for the Commodore 64. Though some of these are titles previously published by other software companies, many newly released programs are part of these offerings.

Mindscape: Mindscape introduced its Thunder Mountain line at CES, a grouping of programs previously published in the United States or Europe, for $9.95 each. Initial releases include *Rambo: First Blood, Part II; Voodoo Island; Maxi Golf;* and *Forbidden Castle.*

Mindscape, 3444 Dundee Rd., Northbrook, IL 60062

Tri Micro: All programs in Tri Micro's French Vanilla line are priced at less than $10. They include *Printed Word*, a word processor available separately for $6.99 or in tandem with dictionary, file manager, or spreadsheet; educational programs like *BASIC Lessons, Advanced BASIC Lessons, Captains of Industry,* and *Words to Grow On/ Snowdrifts and Sunny Skies;* and entertainment products like *Rug Rider/Pancho, Saboteur/ Jet Set Willy II, White Viper/ Combat Lynx,* and *Touchdown/ Ten Pin.*

Tri Micro, 2116 S. Wright St., Santa Ana, CA 92705

BCI Software: New titles available from BCI include *Video-Phile*, a video library organizer for $19.99; *Montezuma's Revenge* and *Chess* for $9.99 each; and an expansion of its Printer's Library Series, graphics disks following various themes for $9.99 each.

BCI Software, 1140 Greenwood Lake Turnpike, P.O. Box 730, Ringwood, NJ 07456

Computer Easy International: CEI currently has 25 programs available in the areas of education, entertainment, and personal productivity. New for Commodore are *Crazy Conveyors, Pinball Math,* and *Touch Typing Tutor* at $9.95 each.

Computer Easy International, 414 E. Southern Rd., Tempe, AZ 85282

International Computer Disc: ICD offers a line of Commodore 64 games, each for less than $10. Commodore owners can choose from *S.A.G.A. Adventures #2,3,4* for $6.99 each; and *Gladiator, Split Personalities,* and *Mat II* for $9.99 each.

International Computer Disc, 50 Charles Lindbergh Blvd., Uniondale, NY 11553

Circle Reader Service Number 173.

Memory Cartridge

A new nonvolatile memory cartridge from Scinert Micro eliminates the tedium of manually loading often-used utility programs, function key settings, screen configurations, and so on, on power-up. Unlike EPROM cartridges, this cartridge makes changing contents easy: The loader program can set the user's program (BASIC or ML) to autoload, autoload and run on power-up, or be available by a SYS jump to the cartridge. A write-protect switch guards against accidental write access.

Scinert Micro Computer Products, P.O. Box 17546, Austin, TX 78760

Circle Reader Service Number 174.

Car Battle Game

Electronic Arts has released a Commodore 64 version of *Autoduel*, from Origin Systems, developers of the *Ultima* series.

The game is set in the year 2030, when highways are patrolled by marauding outlaws, and motorized arena combat is the most popular spectator sport of the day. In this futuristic setting, you must earn prestige and money in the dangerous arenas, highways, and cities. As you continue to survive, your abilities, fame, and fortune grow, which

allows you to purchase and custom-build your own vehicles, complete with weapons, armor, power plants, suspension, and body style. If you choose, and if you are an experienced autoduelist, you may specialize your talents as an arena fighter, a courier, or a vigilante, ridding the land of road outlaws and cycle gangs. As your skills continue to increase, you may achieve enough status to be enlisted by the FBI in order to find and destroy the ultimate evil force. *Autoduel* retails for $49.95.

Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94403

Circle Reader Service Number 175.

Attack Helicopter Simulation

MicroProse has announced *Gunship*, a realistic simulation of the Hughes AH-64A Apache combat helicopter, for the Commodore 64.

Gunship simulates the skill and action of high-speed, low-level helicopter flight. The game follows the career development of a helicopter pilot by tracking the player's record from early training through rank promotions and world missions and on to the possible award of a Congressional Medal of Honor.

All flying maneuvers are accurately represented in 3-D graphics. The high-tech information and weapons systems include lasers, video cameras, night viewers, radar warnings, jammers, onboard computers, missiles, rockets, flares, and a 30mm cannon. An 84-page operations manual and keyboard overlay are part of the package.

Gunship retails for $34.95.

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

Circle Reader Service Number 176.

New Arcade Action Games

Data East, publisher of popular action games like *Karate Champ* and *Kung Fu Master*, has released three new arcade hits for the Commodore 64. *Breakthru*, *Express Raider*, and *Ikari Warriors* are available for $19.95 each.

Data East USA, 470 Needles Dr., San Jose, CA 95112

Circle Reader Service Number 177.

Fantasy /Role-Playing Game

A new fantasy /role-playing game from Sierra, *Wrath of Denethenor*, is based on a Nordic legend about a prince who sells his soul to the devil, and is then killed by a thief out to get his ill-obtained wealth. The player takes on the roles of sorcerer, thief, and fighter as he travels around the lands surrounding Denethenor's domain.

Wrath of Denethenor retails for $19.95.

Sierra On-Line, P.O. Box 485, Coarsegold, CA 93614

Circle Reader Service Number 178.

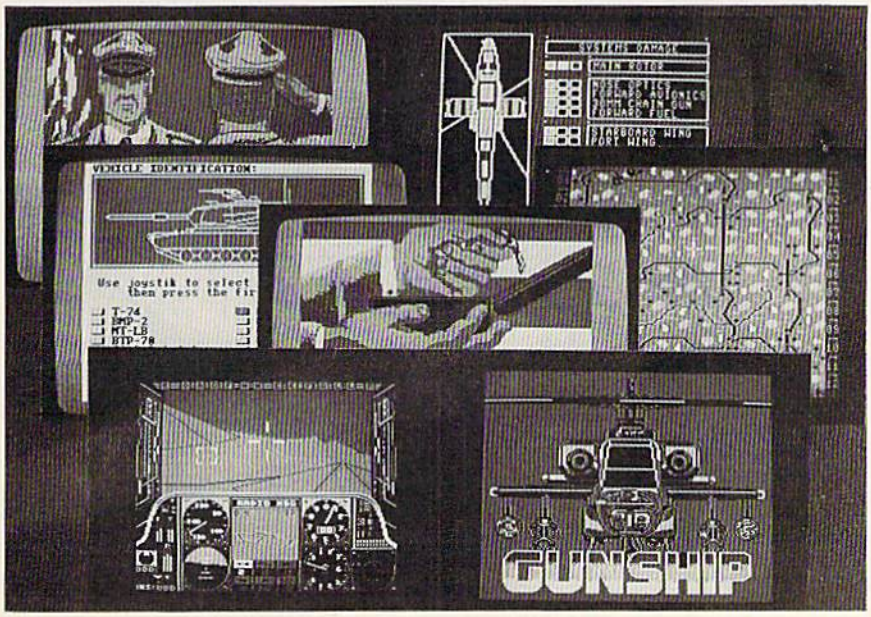
Thought Processor

Brøderbund has introduced *Thinking Cap*, an outline processor and thought organizer for the Commodore 64. By automatically formatting and organizing thoughts and ideas, *Thinking Cap* is designed to make writing an easier, more productive task. Its features include print formatting, outline templates, text editing, boldface and underline, and easy, automatic printer support.

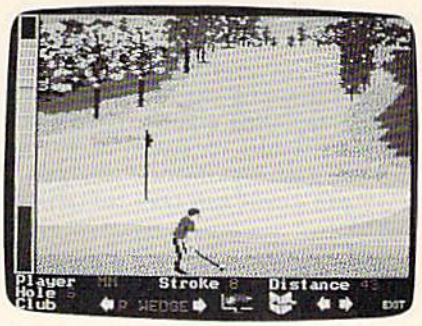
Thinking Cap retails for $49.95.

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

Circle Reader Service Number 179.



Gunship *is another in the line of simulation titles from MicroProse.*



Famous Course Disk: Volume II *provides three new golf courses for use with Accolade's* Mean 18.

New Courses For *Mean 18*

As a result of the popularity of its golf simulation game *Mean 18*, Accolade has released *Famous Course Disk: Volume II*. In addition to the three famous courses contained on the *Mean 18* disk, this new disk contains simulations of Turnberry (Scotland), Inverness Club (Ohio), and Harbour Town (South Carolina). Users can incorporate the additional disk to expand their course selection, with program commands identical to those used in *Mean 18*. Suggested retail price is $19.95.

Accolade, 20833 Stevens Creek Blvd., Cupertino, CA 95014.

Circle Reader Service Number 180.

Arcade Action Games

Capcom has released a line of action games for the Commodore 64. *Gun-Smoke*, *Ghosts 'n' Goblins*, *1942*, and *Trojan* require physical dexterity and quick thinking skills. All Commodore 64 versions retail for $29.95 each.

Capcom, 1283-C Old Mountain View /Alviso Rd., Sunnyvale, CA 94089

Circle Reader Service Number 181.

Four Games In One

Indoor Sports from Mindscape gives you four action games in one package: bowling, darts, air hockey, and Ping-Pong. One- and two-player options, realistic 3-D graphics and animation, and high-score tracking are offered.

Mindscape, 3444 Dundee Rd., Northbrook, IL 60062

Circle Reader Service Number 182.

128 Accounting System

Microsphere has released *Cash In—Cash Out* for the Commodore 128. The program is a cash basis accounting system designed specifically for a small-to-medium-sized business. The system records sales and expenses when checks are actually written for expenses or received for sales (cash basis method) rather than when sales are ordered

or expenses are incurred (accrual method). Modules are included for customizing business information, tracking sales, disbursing expenses, handling payroll, reporting regular reports, displaying graphics on screen or printer, and doing general financial analysis.

Cash In—Cash Out retails for $69.95.

Microsphere, Plymouth Center, 521 Plymouth St., Greensburg, PA 15601

Circle Reader Service Number 183.

Print Utility

Unison World recently introduced *PrintMaster Plus*, a printing utility that allows users to create customized signs, banners, stationery, calendars, and greeting cards. Each design option—Text, Graphics, and Layout—can be addressed repeatedly, in any order, before the final printout. You can also preview your work at each step.

With *PrintMaster Plus*, you can choose from over 100 different graphics; 280 additional graphics are available because of its compatibility with Unison World's *Art Gallery I* and *Art Gallery II*. The program also features a built-in graphics editor which allows the user to create or modify artwork. Ten type fonts are available.

The Commodore 64 version of *PrintMaster Plus* retails for $39.95.

Unison World, 2150 Shattuck Ave., Suite 902, Berkeley, CA 94704

Circle Reader Service Number 184.

Commodore 128 Integrated Software

Trio offers the Commodore 128 owner a word processor, spreadsheet, and database manager integrated on one disk. Also available for the Commodore 64, it retails for $69.95.

Softsync, 162 Madison Ave., New York, NY 10016

Circle Reader Service Number 185.

300/1200–Baud Modem

The TCM-1200H Hayes Compatible Modem has been introduced by Trans Com for use with the Commodore 64 and 128. The modem is an autoselect 300/1200–baud unit with originate and answer modes, eight LED status indicators, and eight DIP switches on the back panel.

Besides the full set of Hayes AT commands, the TCM-1200H is both Bell 212 and CCITT V.22 compatible. It requires no RS-232 interface to connect to the computer and is powered from the computer, eliminating the need for a power pack. Other features include a speaker with level control, two phone jacks, computer connecting cable, and tone or pulse dialing. Software is included for both the 64 and 128, along with a starter kit for the QuantumLink telecommunications service.

The modem carries a two-year warranty, and is priced at $179.95.

Trans Com, 703-13 Annoreno Dr., Addison, IL 60101.

Circle Reader Service Number 186.

64 Expanders And Connectors

Aprotek, known for its low-cost printers, has released three new products for the Commodore 64.

Aprospand-64 is a four-slot expander that allows the user to install up to four cartridges and use them either independently or in any combination allowed by the function of each cartridge. It also has a push-button reset switch that lets you make a restart without turning the computer off and back on again. The power line between computer and cartridges is fused to protect the computer from faulty cartridges. Suggested retail price is $33.

Extender-64 is a ribbon cable device that lets the user extend the location of a cartridge expander like the Aprospand-64 or compatible, allowing repositioning of cartridges. Price is $23.

USR-232 is a universal RS-232 interface for use with all Commodore computers equipped with a user port. Self-powered, it plugs into the user port, allowing additional devices to be plugged in. All RS-232–compatible devices and software can be used with the USR-232. Suggested list price is $43.

Aprotek, 1071-A Avenida Acaso, Camarillo, CA 93010

Circle Reader Service Number 187.

MIDI Products For 64

Sonus announced a full line of MIDI hardware and software at CES for a variety of computers, including the Commodore 64. The *Super Sequencer* ($275.95) is a professional MIDI recording system and librarian that includes a built-in system-exclusive librarian where you can store sound patches and functions. Other features included are set beginning and end of sequences; delete pitch and mod wheel; sustain pedal; volume change; and transposition of sequence or track. *Glass Tracks* ($69.95) is a smaller version of the sequencer. *ScoreWriter* ($199.95) offers manuscript printout, editing, and sequencing. A MIDI interface is also available for $75.

Sonus, 21430 Strathern St., Suite H, Canoga Park, CA 91304

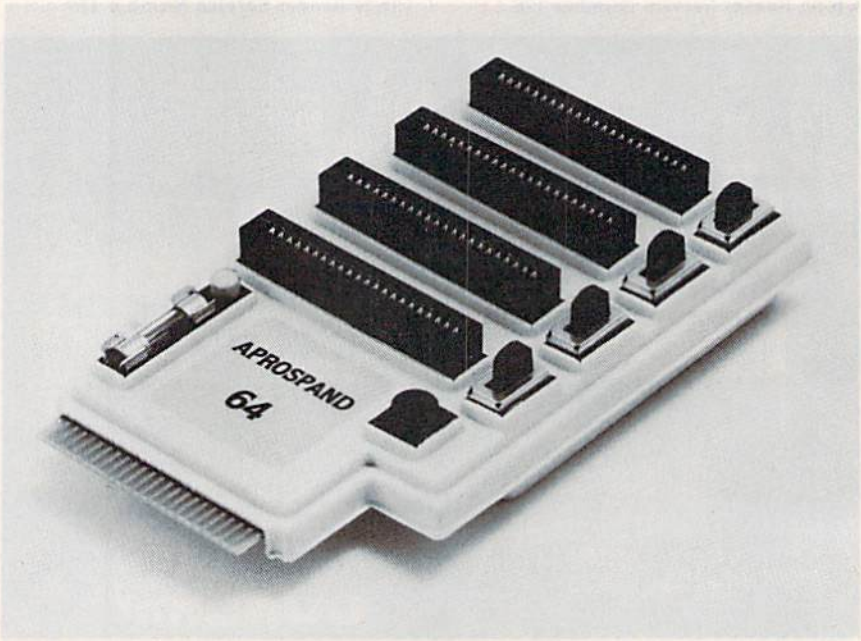
Circle Reader Service Number 188.

World War II Strategy

War in the South Pacific is among the new strategy entertainment programs released by Strategic Simulations (SSI) for the Commodore 64.

The game includes three scenarios from which to choose: the Battle of the Coral Sea (May 1942), the Invasion of Guadalcanal (August 1942), and the Japanese attempt to counterattack on Guadalcanal (October 1942). Each scenario plays to March 1943. More than 400 ships, 17 types of aircraft, and numerous infantry units can be engaged in one-, four-, or eight-hour modes of play.

Each hourly turn allows for every ship, plane, and infantry company to be accounted for, including damage re-



Aprospand 64 is a four-slot cartridge expander for the Commodore 64.

ports. The game is designed for two players, or can be played against the computer. Suggested retail price is $59.95.

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

Circle Reader Service Number 189.

Multifunction Plug-In Cartridge Expands Commodore's Capabilities

The Final Cartridge from H & P Computers is a completely external operating system created specifically for the Commodore 64. Though it does not reside in RAM or use any working memory, it is always standing by to assist, improve, and speed up the functioning of hardware and software.

The Final Cartridge is plugged into the back of the keyboard housing. It provides five-times-faster loading and saving; ten-times-faster tape access; preprogramming for function keys that eliminates long, tedious command sequences; an extended machine language monitor with relocated load-scrolling up and down, bankswitching, and so on; and a Centronics printer interface. The BASIC tool kit features such functions as automatic line-numbering, one-touch deletion of large program blocks, and recovery of accidentally deleted programs.

The menu-driven Freezer feature offers 16 submenus, four resets, print vector setting, color changes, Centronics/serial screen dumps, reverse printing, and automatic backup to disk or tape. The Gamekiller kills sprite-to-sprite or sprite-to-background collision. And the Screendump feature prints full-page, lo-res, hi-res, and multicolor graphics from games and paint programs like *Doodle* and *KoalaPad*, and searches automatically from the memory address of the picture.

The Final Cartridge provides many keyboard extras, and creates 24K of additional RAM. Suggested retail price is $44.95.

Home & Personal Computers Of America, 154 Valley St., South Orange, NJ 07079

Circle Reader Service Number 190.

Abacus Telecommunications And Portfolio Management

Abacus Software has released two new software packages for the Commodore 64 and 128. *SpeedTerm*, originally designed for the 128, includes both the 64 and 128 versions in one package. This command-driven terminal communications program lets you communicate with other computer users via online services such as CompuServ, GEnie, Delphi, The Source, and others.

SpeedTerm offers a large capture buffer—the 64 version has 24K and the 128 version has 45K. Also, *SpeedTerm* supports both XMODEM and Punter file-transfer protocols. The software supports partial VT52 terminal emulation and works with most popular modems. This program features a command mode with over 30 commands and user-defined function keys. The 128 version can be used with either a 40- or an 80-column monitor and a 1541 or 1571 disk drive. The complete package includes a 70-page manual with tutorials.

The new Commodore 128 version of *Personal Portfolio Manager* contains many of the features of the original 64 version plus additional functions. It can be used by the home or professional user to manage a portfolio, obtain up-to-the-minute quotes and news, and perform analyses.

Other uses include recording taxable or nontaxable dividends and interest income, reconciling brokerage accounts, tailoring reports, and entering quotes manually or automatically through Warner Computer Systems and Dow Jones. The software includes an autorun and timing feature so the system will log on, update quotes, log off, and print reports. Over 1000 open transactions can be retained on a single disk.

Personal Portfolio Manager for the Commodore 128 can be used with either a 40- or an 80-column monitor and a 1541 or 1571 disk drive.

SpeedTerm retails for $39.95; *Personal Portfolio Manager*, $59.95.

Abacus Software, P.O. Box 7219, Grand Rapids, MI 49510

Circle Reader Service Number 191.

The Final Cartridge, from H & P Computers Of America, is an external operating System for the Commodore 64.

Electronic Network For Commodore

A new service for Commodore 64 owners has been introduced that combines the features of an electronic bulletin board system (BBS) with a disk-based electronic magazine.

Spectrum Electronic Network is an offline BBS and magazine on a disk, featuring 16 different special interest groups (SIGs) devoted to a variety of topics. They include a technical help line, providing useful BASIC programming tips and shortcuts in a question-and-answer format; an electronic pen-pal forum, which enables subscribers to contact and exchange private mail with other users across the U.S.; a freeware trading post; a writer's roundtable; and New Age Horizons, which explores psychic and metaphysical topics.

This service differs from conventional online BBSs and subscriber networks in that there are no long distance charges, busy signals, time limits, or access fees. Rather, subscribers receive a monthly disk with continuously updated features, public messages, and private mail.

New subscribers pay a one-time fee of $14.95 for the operating system software and support utilities; a two-month subscription is included in the package at no extra cost. Thereafter, a flat monthly subscription fee of $6 is charged.

Spectrum 1 Network, P.O. Box 4903, Panorama City, CA 91412-4903

Circle Reader Service Number 192.

It's easy to make a copy.
It's quick.
It's illegal.
It's wrong.

It's hard to believe.

People who wouldn't think of shoplifting a software product on their lunch hour don't think twice about going back to the office and making several illegal copies of the same software.

Making unauthorized copies of software is a violation of U.S. Copyright Law. Yet, the problem has reached epidemic proportions because many people are unaware, or simply choose to ignore the law. The software industry is urging decision-makers and software users to take steps to stop software piracy in their organizations. In the meantime, the industry has been forced to prosecute willful copyright violators.

There are legal, moral and economic imperatives forbidding theft of copyrighted software.

There is a free pamphlet on the subject. Call or write for a copy. A copy. A copy. A copy for everyone you know. Please ask for Priscilla.

ADAPSO

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(703) 522-5055

How To Type In *COMPUTE!'s GAZETTE* Programs

Each month, COMPUTE!'s GAZETTE publishes programs for the Commodore 128, 64, Plus/4, 16, and VIC-20. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

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

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then 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

⟨ 1 ⟩	COMMODORE	1	
⟨ 2 ⟩	COMMODORE	2	
⟨ 3 ⟩	COMMODORE	3	
⟨ 4 ⟩	COMMODORE	4	
⟨ 5 ⟩	COMMODORE	5	
⟨ 6 ⟩	COMMODORE	6	
⟨ 7 ⟩	COMMODORE	7	
⟨ 8 ⟩	COMMODORE	8	

The Automatic Proofreader

Philip I. Nelson, Assistant Editor

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, 16, and VIC-20 and prevents nearly every kind of typing mistake.

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

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

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

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

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

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

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

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP– RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, 65526 for the Plus/4 and 16, and 64802 for the VIC). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

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

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

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA+
   29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,136
   ,137
```

MLX Machine Language Entry Program For Commodore 64 and 128

Ottis R. Cowper, Technical Editor

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

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

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

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

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

Entering A Listing

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

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

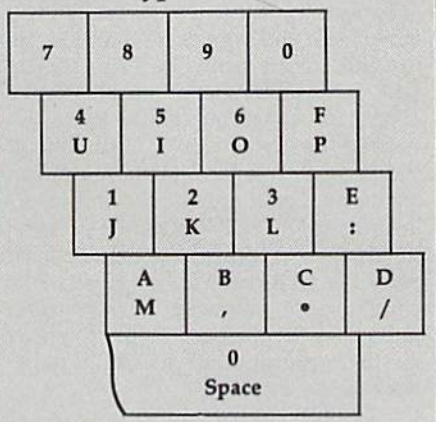
Invalid Characters Banned

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

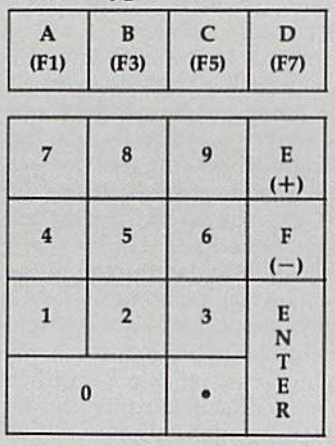
Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, 128 MLX redefines the function keys and + and − keys on the numeric keypad so that you can enter data one-handed. (The 64 version incorporates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

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

64 MLX Keypad



128 MLX Keypad



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

Editing Features

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

number prompt.

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

Display Data

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

Other Menu Options

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

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

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

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

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

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

The Finished Product

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

An Ounce Of Prevention

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

Program 1: MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
       I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
       4=254:Z5=255:Z6=256:Z7=
       127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
       :BS=PEEK(55)+Z6*PEEK(56
       ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
       :S$=" ":D$=CHR$(20):Z$=
       CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
       +23:POKE I,0:NEXT:POKE
       {SPACE}SD+24,15:POKE 78
       8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
       R$(8):POKE 53280,15:POK
       E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
       {2 SPACES}§8 @3
       {2 SPACES}"SPC(28)"
       {2 SPACES}{OFF}{BLU} ML
       X II {RED}{RVS}
       {2 SPACES}"SPC(28)"
       {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
       {3 SPACES}COMPUTE!'S MA
       CHINE LANGUAGE EDITOR
       {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
```

```
        RESS[4]";:GOSUB300:SA=A
        D:GOSUB1040:IF F THEN18
        0
GF 190  PRINT"{BLK}{2 SPACES}EN
        DING ADDRESS[4]";:GOSUB
        300:EA=AD:GOSUB1030:IF
        {SPACE}F THEN190
KR 200  INPUT"{3 DOWN}{BLK}CLEA
        R WORKSPACE [Y/N][4]";A
        $:IF LEFT$(A$,1)<>"Y"TH
        EN220
PG 210  PRINT"{2 DOWN}{BLU}WORK
        ING...";:FORI=BS TO BS+
        EA-SA+7:POKE I,0:NEXT:P
        RINT"DONE"
DR 220  PRINTTAB(10)"{2 DOWN}
        {BLK}{RVS} MLX COMMAND
        {SPACE}MENU {DOWN}[4]":
        PRINT T$"{RVS}E{OFF}NTE
        R DATA"
BD 230  PRINT T$"{RVS}D{OFF}ISP
        LAY DATA":PRINT T$"
        {RVS}L{OFF}OAD FILE"
JS 240  PRINT T$"{RVS}S{OFF}AVE
         FILE":PRINT T$"{RVS}Q
        {OFF}UIT{2 DOWN}{BLK}"
JH 250  GET A$:IF A$=N$ THEN250
HK 260  A=0:FOR I=1 TO 5:IF A$=
        MID$("EDLSQ",I,1)THEN A
        =I:I=5
FD 270  NEXT:ON A GOTO420,610,6
        90,700,280:GOSUB1060:GO
        TO250
EJ 280  PRINT"{RVS} QUIT ":INPU
        T"{DOWN}[4]ARE YOU SURE
         [Y/N]";A$:IF LEFT$(A$,
        1)<>"Y"THEN220
EM 290  POKE SD+24,0:END
JX 300  IN$=N$:AD=0:INPUTIN$:IF
        LEN(IN$)<>4THENRETURN
KF 310  B$=IN$:GOSUB320:AD=A:B$
        =MID$(IN$,3):GOSUB320:A
        D=AD*256+A:RETURN
PP 320  A=0:FOR J=1 TO 2:A$=MID
        $(B$,J,1):B=ASC(A$)-C4+
        (A$>"@")*C7:A=A*C6+B
JA 330  IF B<0 OR B>15 THEN AD=
        0:A=-1:J=2
GX 340  NEXT:RETURN
CH 350  B=INT(A/C6):PRINT MID$(
        H$,B+1,1);:B=A-B*C6:PRI
        NT MID$(H$,B+1,1);:RETU
        RN
RR 360  A=INT(AD/Z6):GOSUB350:A
        =AD-A*Z6:GOSUB350:PRINT
        ":";
BE 370  CK=INT(AD/Z6):CK=AD-Z4*
        CK+Z5*(CK>Z7):GOTO390
PX 380  CK=CK*Z2+Z5*(CK>Z7)+A
JC 390  CK=CK+Z5*(CK>Z5):RETURN
QS 400  PRINT"{DOWN}STARTING AT
        [4]";:GOSUB300:IF IN$<>
        N$ THEN GOSUB1030:IF F
        {SPACE}THEN400
EX 410  RETURN
HD 420  PRINT"{RVS} ENTER DATA
        {SPACE}":GOSUB400:IF IN
        $=N$ THEN220
JK 430  OPEN3,3:PRINT
SK 440  POKE198,0:GOSUB360:IF F
         THEN PRINT IN$:PRINT"
        {UP}{5 RIGHT}";
GC 450  FOR I=0 TO 24 STEP 3:B$
        =S$:FOR J=1 TO 2:IF F T
        HEN B$=MID$(IN$,I+J,1)
HA 460  PRINT"{RVS}"B$L$;:IF I<
        24THEN PRINT"{OFF}";
HD 470  GET A$:IF A$=N$ THEN470
FK 480  IF(A$>"/"ANDA$<":")OR(A
        $>"@"ANDA$<"G")THEN540
GS 485  A=-(A$="M")-2*(A$=",")-
        3*(A$=".")-4*(A$="/")-5
        *(A$="J")-6*(A$="K")
FX 486  A=A-7*(A$="L")-8*(A$=":
        ")-9*(A$="U")-10*(A$="I
        ")-11*(A$="O")-12*(A$="
        P")
CM 487  A=A-13*(A$=S$):IF A THE
        N A$=MID$("ABCD123E456F
        0",A,1):GOTO 540
MP 490  IF A$=R$ AND((I=0)AND(J
        =1)OR F)THEN PRINT B$;:
        J=2:NEXT:I=24:GOTO550
KC 500  IF A$="{HOME}" THEN PRI
        NT B$:J=2:NEXT:I=24:NEX
        T:F=0:GOTO440
MX 510  IF(A$="{RIGHT}")ANDF TH
        ENPRINT B$L$;:GOTO540
GK 520  IF A$<>L$ AND A$<>D$ OR
        ((I=0)AND(J=1))THEN GOS
        UB1060:GOTO470
HG 530  A$=L$+S$+L$:PRINT B$L$;
        :J=2-J:IF J THEN PRINT
        {SPACE}L$;:I=I-3
QS 540  PRINT A$;:NEXT J:PRINT
        {SPACE}S$;
PM 550  NEXT I:PRINT:PRINT"{UP}
        {5 RIGHT}";:INPUT#3,IN$
        :IF IN$=N$ THEN CLOSE3:
        GOTO220
QC 560  FOR I=1 TO 25 STEP3:B$=
        MID$(IN$,I):GOSUB320:IF
         I<25 THEN GOSUB380:A(I
        /3)=A
PK 570  NEXT:IF A<>CK THEN GOSU
        B1060:PRINT"{BLK}{RVS}
        {SPACE}ERROR: REENTER L
        INE [4]":F=1:GOTO440
HJ 580  GOSUB1080:B=BS+AD-SA:FO
        R I=0 TO 7:POKE B+I,A(I
        ):NEXT
QQ 590  AD=AD+8:IF AD>EA THEN C
        LOSE3:PRINT"{DOWN}{BLU}
        ** END OF ENTRY **{BLK}
        {2 DOWN}":GOTO700
GQ 600  F=0:GOTO440
QA 610  PRINT"{CLR}{DOWN}{RVS}
        {SPACE}DISPLAY DATA ":G
        OSUB400:IF IN$=N$ THEN2
        20
RJ 620  PRINT"{DOWN}{BLU}PRESS:
         {RVS}SPACE{OFF} TO PAU
        SE, {RVS}RETURN{OFF} TO
         BREAK[4]{DOWN}"
KS 630  GOSUB360:B=BS+AD-SA:FOR
        I=BTO B+7:A=PEEK(I):GOS
        UB350:GOSUB380:PRINT S$
        ;
CC 640  NEXT:PRINT"{RVS}";:A=CK
        :GOSUB350:PRINT
KH 650  F=1:AD=AD+8:IF AD>EA TH
        ENPRINT"{DOWN}{BLU}** E
        ND OF DATA **":GOTO220
KC 660  GET A$:IF A$=R$ THEN GO
        SUB1080:GOTO220
EQ 670  IF A$=S$ THEN F=F+1:GOS
        UB1080
AD 680  ONFGOTO630,660,630
CM 690  PRINT"{DOWN}{RVS} LOAD
        {SPACE}DATA ":OP=1:GOTO
        710
PC 700  PRINT"{DOWN}{RVS} SAVE
        {SPACE}FILE ":OP=0
RX 710  IN$=N$:INPUT"{DOWN}FILE
        NAME[4]";IN$:IF IN$=N$
        {SPACE}THEN220
PR 720  F=0:PRINT"{DOWN}{BLK}
        {RVS}T{OFF}APE OR {RVS}
        D{OFF}ISK: [4]";
FP 730  GET A$:IF A$="T"THEN PR
        INT"T{DOWN}":GOTO880
HQ 740  IF A$<>"D"THEN730
HH 750  PRINT"D{DOWN}":OPEN15,8
        ,15,"I0:":B=EA-SA:IN$="
        0:"+IN$:IF OP THEN810
SQ 760  OPEN 1,8,8,IN$+",P,W":G
        OSUB860:IF A THEN220
FJ 770  AH=INT(SA/256):AL=SA-(A
        H*256):PRINT#1,CHR$(AL)
        ;CHR$(AH);
PE 780  FOR I=0 TO B:PRINT#1,CH
        R$(PEEK(BS+I));:IF ST T
        HEN800
FC 790  NEXT:CLOSE1:CLOSE15:GOT
        O940
GS 800  GOSUB1060:PRINT"{DOWN}
        {BLK}ERROR DURING SAVE:
        [4]":GOSUB860:GOTO220
MA 810  OPEN 1,8,8,IN$+",P,R":G
        OSUB860:IF A THEN220
GE 820  GET#1,A$,B$:AD=ASC(A$+Z
        $)+256*ASC(B$+Z$):IF AD
        <>SA THEN F=1:GOTO850
RX 830  FOR I=0 TO B:GET#1,A$:P
        OKE BS+I,ASC(A$+Z$):IF(
        I<>B)AND ST THEN F=2:AD
        =I:I=B
FA 840  NEXT:IF ST<>64 THEN F=3
FQ 850  CLOSE1:CLOSE15:ON ABS(F
        >0)+1 GOTO960,970
SA 860  INPUT#15,A,A$:IF A THEN
         CLOSE1:CLOSE15:GOSUB10
        60:PRINT"{RVS}ERROR: "A
        $
GQ 870  RETURN
EJ 880  POKE183,PEEK(FA+2):POKE
        187,PEEK(FA+3):POKE188,
        PEEK(FA+4):IFOP=0THEN92
        0
HJ 890  SYS 63466:IF(PEEK(783)A
        ND1)THEN GOSUB1060:PRIN
        T"{DOWN}{RVS} FILE NOT
        {SPACE}FOUND ":GOTO690
CS 900  AD=PEEK(829)+256*PEEK(8
        30):IF AD<>SA THEN F=1:
        GOTO970
SC 910  A=PEEK(831)+256*PEEK(83
        2)-1:F=F-2*(A<EA)-3*(A>
        EA):AD=A-AD:GOTO930
KM 920  A=SA:B=EA+1:GOSUB1010:P
        OKE780,3:SYS 63338
JF 930  A=BS:B=BS+(EA-SA)+1:GOS
        UB1010:ON OP GOTO950:SY
        S 63591
AE 940  GOSUB1080:PRINT"{BLU}**
         SAVE COMPLETED **":GOT
        O220
XP 950  POKE147,0:SYS 63562:IF
        {SPACE}ST>0 THEN970
FR 960  GOSUB1080:PRINT"{BLU}**
         LOAD COMPLETED **":GOT
        O220
DP 970  GOSUB1060:PRINT"{BLK}
        {RVS}ERROR DURING LOAD:
        {DOWN}[4]":ON F GOSUB98
        0,990,1000:GOTO220
PP 980  PRINT"INCORRECT STARTIN
        G ADDRESS (";:GOSUB360:
        PRINT")":RETURN
GR 990  PRINT"LOAD ENDED AT ";:
        AD=SA+AD:GOSUB360:PRINT
         D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
         ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
        *256):POKE193,AL:POKE1
        94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
        *256):POKE174,AL:POKE1
        75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
        1050
HA 1040 IF(AD>511 AND AD<40960
```

```
        )OR(AD>49151 AND AD<53
        248)THEN GOSUB1080:F=0
        :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
        {SPACE}INVALID ADDRESS
         {DOWN}{BLK}":F=1:RETU
        RN
AR 1060 POKE SD+5,31:POKE SD+6
        ,208:POKE SD,240:POKE
        {SPACE}SD+1,4:POKE SD+
        4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
        TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
        240:POKE SD,0:POKE SD+
        1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
        KE SD+4,0:POKE SD,0:PO
        KE SD+1,0:RETURN
```

Program 2: MLX For Commodore 128

```
AE 100 TRAP 960:POKE 4627,128:
       DIM NL$,A(7)
XP 110 Z2=2:Z4=254:Z5=255:Z6=2
       56:Z7=127:BS=256*PEEK(4
       627):EA=65280
FB 120 BE$=CHR$(7):RT$=CHR$(13
       ):DL$=CHR$(20):SP$=CHR$
       (32):LF$=CHR$(157)
KE 130 DEF FNHB(A)=INT(A/256):
       DEF FNLB(A)=A-FNHB(A)*2
       56:DEF FNAD(A)=PEEK(A)+
       256*PEEK(A+1)
JB 140 KEY 1,"A":KEY 3,"B":KEY
        5,"C":KEY 7,"D":VOL 15
       :IF RGR(0)=5 THEN FAST
FJ 150 PRINT"{CLR}"CHR$(142);C
       HR$(8):COLOR 0,15:COLOR
        4,15:COLOR 6,15
GQ 160 PRINT TAB(12)"{RED}
       {RVS}{2 SPACES}[9 @]
       {2 SPACES}"RT$;TAB(12)"
       {RVS}{2 SPACES}{OFF}
       {BLU} 128 MLX {RED}
       {RVS}{2 SPACES}"RT$;TAB
       (12)"{RVS}{13 SPACES}
       {BLU}"
FE 170 PRINT"{2 DOWN}
       {3 SPACES}COMPUTE!'S MA
       CHINE LANGUAGE EDITOR
       {2 DOWN}"
DK 180 PRINT"{BLK}STARTING ADD
       RESS[4]";:GOSUB 260:IF
       {SPACE}AD THEN SA=AD:EL
       SE 180
FH 190 PRINT"{BLK}{2 SPACES}EN
       DING ADDRESS[4]";:GOSUB
        260:IF AD THEN EA=AD:E
       LSE 190
MF 200 PRINT"{DOWN}{BLK}CLEAR
       {SPACE}WORKSPACE [Y/N]?
       [4]":GETKEY A$:IF A$<>"
       Y" THEN 220
QH 210 PRINT"{DOWN}{BLU}WORKIN
       G...";:BANK 0:FOR A=BS
       {SPACE}TO BS+(EA-SA)+7:
       POKE A,0:NEXT A:PRINT"D
       ONE"
DC 220 PRINT TAB(10)"{DOWN}
       {BLK}{RVS} MLX COMMAND
       {SPACE}MENU [4]{DOWN}":
       PRINT TAB(13)"{RVS}E
       {OFF}NTER DATA"RT$;TAB(
       13)"{RVS}D{OFF}ISPLAY D
       ATA"RT$;TAB(13)"{RVS}L
       {OFF}OAD FILE"
HB 230 PRINT TAB(13)"{RVS}S
       {OFF}AVE FILE"RT$;TAB(1
       3)"{RVS}C{OFF}ATALOG DI
       SK"RT$;TAB(13)"{RVS}Q
       {OFF}UIT{DOWN}{BLK}"
AP 240 GETKEY A$:A=INSTR("EDLS
       CQ",A$):ON A GOTO 340,5
       50,640,650,930,940:GOSU
       B 950:GOTO 240
SX 250 PRINT"STARTING AT";:GOS
       UB 260:IF(AD<>0)OR(A$=N
       L$)THEN RETURN:ELSE 250
BG 260 A$=NL$:INPUT A$:IF LEN(
       A$)=4 THEN AD=DEC(A$)
PP 270 IF AD=0 THEN BEGIN:IF A
       $<>NL$ THEN 300:ELSE RE
       TURN:BEND
MA 280 IF AD<SA OR AD>EA THEN
       {SPACE}300
PM 290 IF AD>511 AND AD<65280
       {SPACE}THEN PRINT BE$;:
       RETURN
SQ 300 GOSUB 950:PRINT"{RVS} I
       NVALID ADDRESS {DOWN}
       {BLK}":AD=0:RETURN
RD 310 CK=FNHB(AD):CK=AD-Z4*CK
       +Z5*(CK>Z7):GOTO 330
DD 320 CK=CK*Z2+Z5*(CK>Z7)+A
AH 330 CK=CK+Z5*(CK>Z5):RETURN
QD 340 PRINT BE$;"{RVS} ENTER
       {SPACE}DATA ":GOSUB 250
       :IF A$=NL$ THEN 220
JA 350 BANK 0:PRINT:F=0:OPEN 3
       ,3
BR 360 GOSUB 310:PRINT HEX$(AD
       )+":";:IF F THEN PRINT
       {SPACE}L$:PRINT"{UP}
       {5 RIGHT}";
QA 370 FOR I=0 TO 24 STEP 3:B$
       =SP$:FOR J=1 TO 2:IF F
       {SPACE}THEN B$=MID$(L$,
       I+J,1)
PS 380 PRINT"{RVS}"B$+LF$;:IF
       {SPACE}I<24 THEN PRINT"
       {OFF}";
RC 390 GETKEY A$:IF (A$>"/" AN
       D A$<":") OR(A$>"@" AND
        A$<"G") THEN 470
AC 400 IF A$="+" THEN A$="E":G
       OTO 470
QB 410 IF A$="-" THEN A$="F":G
       OTO 470
FB 420 IF A$=RT$ AND ((I=0) AN
       D (J=1) OR F) THEN PRIN
       T B$;:J=2:NEXT:I=24:GOT
       O 480
RD 430 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO 360
XB 440 IF (A$="{RIGHT}") AND F
        THEN PRINT B$+LF$;:GOT
       O 470
JP 450 IF A$<>LF$ AND A$<>DL$
       {SPACE}OR ((I=0) AND (J
       =1)) THEN GOSUB 950:GOT
       O 390
PS 460 A$=LF$+SP$+LF$:PRINT B$
       +LF$;:J=2-J:IF J THEN P
       RINT LF$;:I=I-3
GB 470 PRINT A$;:NEXT J:PRINT
       {SPACE}SP$;
HA 480 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:L$="
       {27 SPACES}"
DP 490 FOR I=1 TO 25 STEP 3:GE
       T#3,A$,B$:IF A$=SP$ THE
       N I=25:NEXT:CLOSE 3:GOT
       O 220
BA 500 A$=A$+B$:A=DEC(A$):MID$
       (L$,I,2)=A$:IF I<25 THE
       N GOSUB 320:A(I/3)=A:GE
       T#3,A$
AR 510 NEXT I:IF A<>CK THEN GO
       SUB 950:PRINT:PRINT"
       {RVS} ERROR: REENTER LI
       NE ":F=1:GOTO 360
DX 520 PRINT BE$:B=BS+AD-SA:FO
       R I=0 TO 7:POKE B+I,A(I
       ):NEXT I
XB 530 F=0:AD=AD+8:IF AD<=EA T
       HEN 360
CA 540 CLOSE 3:PRINT"{DOWN}
       {BLU}** END OF ENTRY **
       {BLK}{2 DOWN}":GOTO 650
MC 550 PRINT BE$;"{CLR}{DOWN}
       {RVS} DISPLAY DATA ":GO
       SUB 250:IF A$=NL$ THEN
       {SPACE}220
JF 560 BANK 0:PRINT"{DOWN}
       {BLU}PRESS: {RVS}SPACE
       {OFF} TO PAUSE, {RVS}RE
       TURN{OFF} TO BREAK[4]
       {DOWN}"
XA 570 PRINT HEX$(AD)+":";:GOS
       UB 310:B=BS+AD-SA
DJ 580 FOR I=B TO B+7:A=PEEK(I
       ):PRINT RIGHT$(HEX$(A),
       2);SP$;:GOSUB 320:NEXT
       {SPACE}I
XB 590 PRINT"{RVS}";RIGHT$(HEX
       $(CK),2)
GR 600 F=1:AD=AD+8:IF AD>EA TH
       EN PRINT"{BLU}** END OF
        DATA **":GOTO 220
EB 610 GET A$:IF A$=RT$ THEN P
       RINT BE$:GOTO 220
QK 620 IF A$=SP$ THEN F=F+1:PR
       INT BE$;
XS 630 ON F GOTO 570,610,570
RF 640 PRINT BE$"{DOWN}{RVS} L
       OAD DATA ":OP=1:GOTO 66
       0
BP 650 PRINT BE$"{DOWN}{RVS} S
       AVE FILE ":OP=0
DM 660 F=0:F$=NL$:INPUT"FILENA
       ME[4]";F$:IF F$=NL$ THE
       N 220
RF 670 PRINT"{DOWN}{BLK}{RVS}T
       {OFF}APE OR {RVS}D{OFF}
       ISK: [4]";
SQ 680 GETKEY A$:IF A$="T" THE
       N 850:ELSE IF A$<>"D" T
       HEN 680
SP 690 PRINT"DISK{DOWN}":IF OP
        THEN 760
EG 700 DOPEN#1,(F$+",P"),W:IF
       {SPACE}DS THEN A$=DS$:G
       OTO 740
JH 710 BANK 0:POKE BS-2,FNLB(S
       A):POKE BS-1,FNHB(SA):P
       RINT"SAVING ";F$:PRINT
MC 720 FOR A=BS-2 TO BS+EA-SA:
       PRINT#1,CHR$(PEEK(A));:
       IF ST THEN A$="DISK WRI
       TE ERROR":GOTO 750
GC 730 NEXT A:CLOSE 1:PRINT"
       {BLU}** SAVE COMPLETED
       {SPACE}WITHOUT ERRORS *
       *":GOTO 220
RA 740 IF DS=63 THEN BEGIN:CLO
       SE 1:INPUT"{BLK}REPLACE
        EXISTING FILE [Y/N][4]
       ";A$:IF A$="Y" THEN SCR
       ATCH(F$):PRINT:GOTO 700
       :ELSE PRINT"{BLK}":GOTO
        660:BEND
GA 750 CLOSE 1:GOSUB 950:PRINT
       "{BLK}{RVS} ERROR DURIN
       G SAVE: [4]":PRINT A$:G
       OTO 220
FD 760 DOPEN#1,(F$+",P"):IF DS
        THEN A$=DS$:F=4:CLOSE
       {SPACE}1:GOTO 790
```

```
PX 770 GET#1,A$,B$:CLOSE 1:AD=
       ASC(A$)+256*ASC(B$):IF
       {SPACE}AD<>SA THEN F=1:
       GOTO 790
KB 780 PRINT"LOADING ";F$:PRIN
       T:BLOAD(F$),B0,P(BS):AD
       =SA+FNAD(174)-BS-1:F=-2
       *(AD<EA)-3*(AD>EA)
RQ 790 IF F THEN 800:ELSE PRIN
       T"{BLU}** LOAD COMPLETE
       D WITHOUT ERRORS **":GO
       TO 220
ER 800 GOSUB 950:PRINT"{BLK}
       {RVS} ERROR DURING LOAD
       : [4]":ON F GOSUB 810,8
       20,830,840:GOTO220
QJ 810 PRINT"INCORRECT STARTIN
       G ADDRESS (";HEX$(AD);"
       )":RETURN
DP 820 PRINT"LOAD ENDED AT ";H
       EX$(AD):RETURN
EB 830 PRINT"TRUNCATED AT ENDI
       NG ADDRESS ("HEX$(EA)")
       ":RETURN
FP 840 PRINT"DISK ERROR ";A$:R
       ETURN
KS 850 PRINT"TAPE":AD=POINTER(
       F$):BANK 1:A=PEEK(AD):A
       L=PEEK(AD+1):AH=PEEK(AD
       +2)
XX 860 BANK 15:SYS DEC("FF68")
       ,0,1:SYS DEC("FFBA"),1,
       1,0:SYS DEC("FFBD"),A,A
       L,AH:SYS DEC("FF90"),12
       8:IF OP THEN 890
FG 870 PRINT:A=SA:B=EA+1:GOSUB
        920:SYS DEC("E919"),3:
       PRINT"SAVING ";F$
AB 880 A=BS:B=BS+(EA-SA)+1:GOS
       UB 920:SYS DEC("EA18"):
       PRINT"{DOWN}{BLU}** TAP
       E SAVE COMPLETED **":GO
       TO 220
CP 890 SYS DEC("E99A"):PRINT:I
       F PEEK(2816)=5 THEN GOS
       UB 950:PRINT"{DOWN}
       {BLK}{RVS} FILE NOT FOU
       ND ":GOTO 220
GQ 900 PRINT"LOADING ...{DOWN}
       ":AD=FNAD(2817):IF AD<>
       SA THEN F=1:GOTO 800:EL
       SE AD=FNAD(2819)-1:F=-2
       *(AD<EA)-3*(AD>EA)
JD 910 A=BS:B=BS+(EA-SA)+1:GOS
       UB 920:SYS DEC("E9FB"):
       IF ST>0 THEN 800:ELSE 7
       90
XB 920 POKE193,FNLB(A):POKE194
       ,FNHB(A):POKE 174,FNLB(
       B):POKE 175,FNHB(B):RET
       URN
CP 930 CATALOG:PRINT"{DOWN}
       {BLU}** PRESS ANY KEY F
       OR MENU **":GETKEY A$:G
       OTO 220
MM 940 PRINT BE$"{RVS} QUIT
       [4]";RT$;"ARE YOU SURE
       {SPACE}[Y/N]?":GETKEY A
       $:IF A$<>"Y" THEN 220:E
       LSE PRINT"{CLR}":BANK 1
       5:END
JE 950 SOUND 1,500,10:RETURN
AF 960 IF ER=14 AND EL=260 THE
       N RESUME 300
MK 970 IF ER=14 AND EL=500 THE
       N RESUME NEXT
KJ 980 IF ER=4 AND EL=780 THEN
        F=4:A$=DS$:RESUME 800
DQ 990 IF ER=30 THEN RESUME:EL
       SE PRINT ERR$(ER);" ERR
       OR IN LINE";EL
```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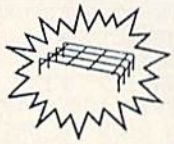

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- ☐ For The Beginner
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BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Print Shop To *GEOS*

Article on page 66.

```
SD 10 AD=22528:POKE53281,0:POK
      E53280,0:PRINT"{CLR}
      {25 DOWN}"
FK 20 PRINT"{5 SPACES}{YEL}
      {RVS}{A}CCCCCCCCCCCCCCCC
      CCCCCCCCCCCC{S}"
PM 30 PRINT"{5 SPACES}{RVS}BPR
      INT SHOP TO GEOS CONVERT
      ERB"
DJ 40 PRINT"{5 SPACES}{RVS}{Z}
      CCCCCCCCCCCCCCCCCCCCCCCC
      CCCC{X}"
SE 50 FORN=1TO11:PRINT:NEXT:GO
      TO190
SD 60 FF=0:PRINT#15,"U1:2 0"+S
      TR$(T)+STR$(S)
SS 70 GET#2,A$:TN=ASC(A$+CHR$(
      0)):GET#2,A$:SN=ASC(A$+C
      HR$(0))
DC 80 FORN=0TO7:PRINT#15,"B-P:
      2,"+STR$(32*N+2)
RQ 90 GET#2,A$:IFA$<>CHR$(131)
      THEN160
RP 100 GET#2,A$:TP=ASC(A$+CHR$
       (0)):GET#2,A$:SP=ASC(A$
       +CHR$(0)):H$=""
CB 110 GET#2,A$:IFA$<>CHR$(160
       )THENH$=H$+A$:GOTO110
SD 120 IFH$<>DI$THEN160
FR 130 FF=1:KP=N:N=7
MQ 140 PRINT#15,"B-P:2,"+STR$(
       32*KP+30)
ER 150 GET#2,A$:SL=ASC(A$+CHR$
       (0)):GET#2,A$:SH=ASC(A$
       +CHR$(0))
DX 160 NEXT:IFTN=0THENRETURN
SC 170 IFFF=1THENRETURN
CB 180 T=TN:S=SN:GOTO60
EQ 190 PRINT"{WHT}{9 UP}
       {2 SPACES}PLACE PRINT S
       HOP DATA DISK IN DRIVE"
SD 200 PRINT"{DOWN}{7 SPACES}P
       RESS {RVS}RETURN{OFF} W
       HEN READY..."
KP 210 GETA$:IFA$<>CHR$(13)THE
       NGOSUB970:GOTO210
ME 220 POKE53280,0
XR 230 PRINT"{CLR}{3 DOWN}
       {2 SPACES}ARE THESE GRA
       PHICS FOR A {RVS}C{OFF}
       OMMODORE"
DC 240 PRINT"{DOWN}{11 SPACES}
       OR {RVS}O{OFF}THER PRIN
       TER?";
BP 250 GETA$:IFA$="C"THENSF=2:
       W=6:H=45:GOTO280
EB 260 IFA$="O"THENSF=3:W=11:H
       =52:GOTO280
RF 270 GOTO250
SC 280 NL=INT(H/8+1)*8:PRINT"
       {CLR}"
QC 290 PRINT"{DOWN}TYPE FILE N
       AME OR PRESS {RVS}RETUR
       N{OFF} FOR LIST":INPUTN
       $
RH 300 IFN$=""THENGOSUB680
SD 310 OPEN15,8,15:OPEN8,8,0,N
       $:INPUT#15,EN,EB$,ET,ES
CK 320 IFEN<>0THENCLOSE8:CLOSE
       15:PRINT"{CLR}{DOWN}";S
       PC(20-LEN(EB$)/2)EB$:N$
       =="":GOTO290
FX 330 PRINT"{CLR}{12 DOWN}"SP
       C(16-LEN(N$)/2)"LOADING
       "+N$
JM 340 POKE185,0:POKE780,0:POK
       E781,0:POKE782,88:SYS65
       493:CLOSE8:CLOSE15
GS 350 PRINT"{CLR}{DOWN}
       {8 SPACES}PLACE GEOS DI
       SK IN DRIVE"
DR 360 PRINT"{DOWN}{7 SPACES}P
       RESS {RVS}RETURN{OFF} W
       HEN READY..."
KQ 370 GETA$:IFA$<>CHR$(13)THE
       NGOSUB970:GOTO370
BF 380 POKE53280,0:PRINT"
       {DOWN}{9 SPACES}SAVING
       {SPACE}PHOTOSCRAP FILE"
MR 390 OPEN15,8,15,"I0":INPUT#
       15,EN,EB$,ET,ES:IFEN<>0
       THEN1000
DQ 400 OPEN2,8,2,"S,U,W":INPUT
       #15,EN,EB$,ET,ES:IFEN<>
       0THEN1000
HP 410 PRINT#2,CHR$(W)CHR$(NL)
       CHR$(0)CHR$(2*W)CHR$(0)
       ;
MX 420 FORN=0TOH-1:PRINT#2,CHR
       $(128+W);:FORM=0TOW-1
RC 430 PRINT#2,CHR$(PEEK(AD+W*
       N+M));:NEXT:NEXT
FQ 440 PRINT#2,CHR$((NL-H-2)*W
       )CHR$(0)CHR$(W*NL/8)CHR
       $(191)CHR$(0);:CLOSE2
FE 450 DATA80,104,111,116,111,
       32,83,99,114,97,112
HB 460 P$="":FORN=0TO10:READX:
       P$=P$+CHR$(X):NEXT
MG 470 OPEN2,8,2,"#":T=18:S=1:
       DI$=P$:GOSUB60
MH 480 IFFF=0THENPRINT"{DOWN}
       {RVS}NO PHOTO SCRAP FIL
       E":GOTO640
RJ 490 T1=T:S1=S:FS=256*SH+SL-
       1:T2=TP:S2=SP:K1=KP
KK 500 T=18:S=1:DI$="S":GOSUB6
       0
MM 510 PRINT#15,"B-P:2,"+STR$(
       32*KP+3)
BS 520 PRINT#2,CHR$(T2)CHR$(S2
       );
DE 530 PRINT#15,"B-P:2,"+STR$(
       32*KP+30)
HE 540 FH=INT(FS/256):FL=FS-25
       6*FH
AM 550 PRINT#2,CHR$(FL)CHR$(FH
       );
HF 560 PRINT#15,"U2:2 0"+STR$(
       T)+STR$(S)
CR 570 PRINT#15,"U1:2 0"+STR$(
       T1)+STR$(S1)
DQ 580 PRINT#15,"B-P:2,"+STR$(
       32*K1+3)
XF 590 PRINT#2,CHR$(TP)CHR$(SP
       );
QQ 600 PRINT#15,"B-P:2,"+STR$(
       32*K1+30)
XD 610 PRINT#2,CHR$(SF+1)CHR$(
       0);
MB 620 PRINT#15,"U2:2 0"+STR$(
       T1)+STR$(S1)
CC 630 PRINT#15,"S0:S"
PA 640 CLOSE2:CLOSE15
GC 650 PRINT"{CLR}{10 DOWN}
       {18 RIGHT}DONE"
HF 660 PRINT"{DOWN}{4 SPACES}P
       LACE {RVS}GEOS{OFF} MAS
       TER DISK IN DRIVE"
PJ 670 PRINT"{DOWN}{7 SPACES}H
       IT {RVS}RESTORE{OFF} TO
       REBOOT GEOS":END
AG 680 OPEN15,8,15,"I0":OPEN2,
       8,2,"#":X=0:M=0:T=18:S=
       1:N=0
JB 690 PRINT"{CLR}{2 SPACES}TH
       E GRAPHIC FILES ON THIS
       DISK ARE:"
PR 700 PRINT#15,"U1:2 0"+STR$(
       T)+STR$(S)
RH 710 GET#2,A$:TN=ASC(A$+CHR$
       (0)):GET#2,A$:SN=ASC(A$
       +CHR$(0))
BQ 720 PRINT#15,"B-P:2,"+STR$(
       N*32+2)
XE 730 GET#2,A$:FT=ASC(A$+CHR$
       (0)):IF(191ANDFT)<>130T
       HENN=N+1:GOTO810
KQ 740 PRINT#15,"B-P:2,"+STR$(
       N*32+30)
SQ 750 GET#2,A$:FS=ASC(A$+CHR$
       (0)):GET#2,A$:FS=FS+256
       *ASC(A$+CHR$(0))
CJ 760 IFFS<>SFTHENN=N+1:GOTO8
       10
QQ 770 PRINT#15,"B-P:2,"+STR$(
       N*32+5):D$=""
QA 780 GET#2,A$:IFA$<>CHR$(160
       )THEND$=D$+A$:GOTO780
DS 790 X=X+1:M=M+1:IFM=16THENM
       =0:GOTO840
EC 800 PRINT"{3 SPACES}"+CHR$(
       34)+D$+CHR$(34):N=N+1
JS 810 IFN<8THEN720
FB 820 N=0:T=TN:S=SN:IFT<>0THE
       N700
BD 830 IFT=0THEN860
KK 840 PRINT"{8 SPACES}PRESS
       {RVS}RETURN{OFF} TO SEE
       MORE"
XR 850 PRINT"{DOWN}{4 SPACES}T
       YPE ← AND PRESS {RVS}RE
       TURN{OFF} TO ABORT"
FK 860 IFX=0THENPRINT"{DOWN}
       {8 SPACES}NONE{DOWN}":G
       OTO930
CF 870 PRINT"{DOWN}{6 SPACES}P
       LACE CURSOR NEXT TO NAM
       E OR"
XA 880 PRINT"{3 SPACES}TYPE NA
       ME AND PRESS {RVS}RETUR
       N{OFF} TO LOAD":INPUTN$
AP 890 IFN$="←"THENN$="":GOTO9
       20
BH 900 IFN$<>""THENCLOSE2:CLOS
       E15:RETURN
BH 910 IFT<>0THEN690
JF 920 PRINT"{CLR}";
GC 930 CLOSE2:CLOSE15:PRINT"
       {DOWN}{4 SPACES}PLACE A
       NOTHER DATA DISK IN DRI
       VE"
MC 940 PRINT"{DOWN}{7 SPACES}P
       RESS {RVS}RETURN{OFF} W
       HEN READY..."
QX 950 GETA$:IFA$<>CHR$(13)THE
       NGOSUB970:GOTO950
MF 960 POKE53280,0:GOTO680
JG 970 A=A+1:IFA>10THENPOKE532
       80,2
PA 980 IFA>20THENPOKE53280,0:A
       =0
CE 990 RETURN
HR 1000 PRINT"{CLR}";SPC(20-LE
        N(EB$)/2)"{DOWN}{RED}"
        +EB$
GQ 1010 PRINT"{DOWN}{GRN}
        {11 SPACES}RESETTING D
        RIVE...{WHT}"
```

```
CH 1020 PRINT#15,"UJ":FORN=1TO
        1500:NEXT:CLOSE15:CLOS
        E2:GOTO380
```

TurboSave 64

See instructions in article on page 71 before typing in.

```
0801:0B 08 00 00 9E 32 30 36 EC
0809:31 00 00 00 A0 1B B9 0E A4
0811:0D 99 C5 02 88 D0 F7 A2 01
0819:A1 84 FD 86 FE A0 3B A2 D6
0821:08 84 FB 86 FC A2 05 A0 5B
0829:00 B1 FB 91 FD C8 D0 F9 EC
0831:E6 FC E6 FE CA D0 F2 4C 8C
0839:C6 02 EE D8 07 20 AB 07 AF
0841:EE D8 07 20 AB 07 EE D8 12
0849:07 A0 E8 20 AD 07 84 6D 24
0851:A9 03 8D D8 07 AD 00 1C 41
0859:09 0C 8D 00 1C A9 EE 8D 95
0861:0C 1C A9 07 85 6E A9 12 6F
0869:85 18 A9 00 85 87 85 88 55
0871:20 07 06 20 C7 05 A6 80 36
0879:A4 81 8E EB 07 8C EC 07 18
0881:20 AB 07 A6 80 A4 81 86 F7
0889:18 84 19 AD 00 03 08 F0 D1
0891:0D 20 6F 04 A6 80 A4 81 60
0899:8E 00 03 8C 01 03 20 EF 5E
08A1:04 E6 88 28 D0 DA 4C AB 37
08A9:06 A9 03 85 6F 20 B8 05 52
08B1:D0 2A A5 80 C9 12 F0 12 FB
08B9:90 14 E6 80 A5 80 C9 24 E2
08C1:D0 EB A9 11 85 80 C6 6F A6
08C9:D0 E3 A9 72 D0 48 C6 80 4D
08D1:D0 DB A9 13 85 80 C6 6F D2
08D9:D0 D3 F0 EE 84 6F A5 81 03
08E1:18 69 0A 85 81 A5 80 20 B5
08E9:4B F2 8D 4E 02 C9 15 D0 25
08F1:02 E6 81 C5 81 B0 0C 38 68
08F9:A5 81 ED 4E 02 85 81 F0 F9
0901:02 C6 81 20 0D F2 F0 03 11
0909:4C 98 EF A9 00 85 81 20 39
0911:0D F2 D0 F4 A9 71 20 C7 EA
0919:E6 20 2C C1 A9 01 85 1C C0
0921:85 1D 4C DA EB EA EA EA 40
0929:EA 20 6A 05 A9 03 85 31 EB
0931:20 E9 F5 85 3A 20 8F F7 4E
0939:20 3D 05 A2 09 50 FE B8 B5
0941:CA D0 FA A9 CE 8D 0C 1C C7
0949:A9 FF 8D 03 1C A2 05 8D 15
0951:01 1C B8 50 FE B8 CA D0 48
0959:FA A0 BB B9 00 01 50 FE C7
0961:B8 8D 01 1C C8 D0 F4 B1 3A
0969:30 50 FE B8 8D 01 1C C8 84
0971:D0 F5 50 FE 4C 00 FE A9 6D
0979:00 45 16 45 17 45 18 45 37
0981:19 85 1A 20 34 F9 A2 5A EF
0989:20 EF 05 50 FE B8 AD 01 84
0991:1C D9 24 00 D0 06 C8 C0 9D
0999:08 D0 F0 60 CA D0 E9 A9 1F
09A1:27 4C DC 04 A5 18 38 E5 1A
09A9:22 F0 30 B0 07 49 FF 69 E0
09B1:01 A0 CA 2C A0 E8 8C 84 CE
09B9:05 0A A8 AE 00 1C E8 8A 9D
09C1:29 03 85 4B AD 00 1C 29 5D
09C9:FC 05 4B 8D 00 1C A9 94 36
09D1:8D 05 18 2C 05 18 30 FB 96
09D9:88 D0 E0 A5 18 85 22 20 16
09E1:4B F2 AD 00 1C 29 9F 1D ED
09E9:B4 05 8D 00 1C 60 00 20 CB
09F1:40 60 A5 80 AA A0 00 C8 99
09F9:C8 C8 C8 CA D0 F9 B1 6D A7
0A01:60 A9 12 85 D0 85 D1 E6 71
0A09:D0 A5 D0 85 80 20 B8 05 5C
0A11:D0 0D C6 D1 A5 D1 85 80 C6
0A19:F0 0C 20 B8 05 F0 E8 A9 9F
0A21:F6 85 81 4C 6F 04 4C DA 06
0A29:04 A9 D0 8D 05 18 A9 28 A0
0A31:2C 05 18 10 71 2C 00 1C F8
0A39:30 F6 AD 01 1C B8 A0 00 ED
0A41:60 A2 01 86 19 20 6F 06 E4
0A49:A0 00 98 48 A8 B9 02 03 78
0A51:D0 0C A5 87 D0 12 84 86 5C
0A59:A5 19 85 87 D0 0A A2 00 A3
0A61:BD ED 07 D9 05 03 F0 36 9A
0A69:68 18 69 20 D0 DD AE 01 43
0A71:03 AD 00 03 D0 CD A4 87 31
0A79:D0 C6 A4 19 84 81 86 86 8B
0A81:A9 02 8D A8 04 A0 48 20 7A
0A89:A2 04 A9 0A 8D A8 04 A2 7F
0A91:12 A4 81 84 87 8C 01 03 C3
0A99:8E 00 03 4C EF 04 C8 E8 24
0AA1:E0 10 90 BC A9 63 4C DC 58
0AA9:04 A9 03 85 31 20 6A 05 C6
0AB1:20 3D 05 20 EF 05 50 FE FA
0AB9:B8 AD 01 1C 91 30 C8 D0 27
0AC1:F5 A0 BA 50 FE B8 AD 01 8C
0AC9:1C 99 00 01 C8 D0 F4 20 F5
0AD1:E0 F8 A9 22 A6 38 E4 47 13
0AD9:D0 CC 20 E9 F5 AA A9 27 01
0AE1:E4 3A D0 C2 60 A0 00 B9 7C
0AE9:00 07 99 00 03 C8 C0 AA 5A
0AF1:D0 F5 A9 00 99 00 03 C8 BC
0AF9:D0 FA A2 12 86 18 86 80 CC
0B01:84 19 20 EF 04 A5 87 85 ED
0B09:19 20 6F 06 A2 00 A4 86 E6
0B11:C0 FF D0 0F 8A 9D 00 03 60
0B19:E8 D0 FA 8E 00 03 8C 01 46
0B21:03 A0 00 BD EA 07 99 02 65
0B29:03 C8 E8 E0 13 D0 F4 A5 89
0B31:88 99 0B 03 20 EF 04 4C 98
0B39:E2 04 A0 00 78 A9 00 8D CD
0B41:00 18 A9 04 2C 00 18 D0 35
0B49:FB A2 04 48 68 EA EA EA BA
0B51:EA EA EA EA EA AD 00 02
0B59:18 6A 26 21 6A 6A 26 21 57
0B61:CA D0 EF A5 21 99 00 04 DC
0B69:C8 D0 D7 A9 02 8D 00 18 0C
0B71:60 20 AB 07 4C 00 04 A4 B4
0B79:3A C8 D0 03 20 93 F6 20 86
0B81:43 A5 A9 49 20 A8 FF 20 30
0B89:AE FF A5 90 29 80 F0 06 E7
0B91:A9 05 38 4C D4 02 AE 0E A3
0B99:DC AC 11 D0 86 27 84 28 7A
0BA1:A2 00 8E 0E DC 8E 11 D0 CF
0BA9:A9 AB 85 FD 20 A1 A5 20 03
0BB1:A3 A5 A9 45 20 8F A5 A9 C0
0BB9:E2 20 A8 FF A9 07 20 A8 B0
0BC1:FF 20 AE FF A9 17 8D 00 7A
0BC9:DD A0 00 EA 88 D0 FD 84 AD
0BD1:FB A9 A1 85 FC 20 38 A5 5B
0BD9:20 4D A5 E6 FC 20 38 A5 F4
0BE1:20 4D A5 E6 FC 20 38 A5 FC
0BE9:20 4D A5 A9 82 8D EA A0 73
0BF1:A2 00 A0 01 B1 BB C9 3A C7
0BF9:D0 02 C8 C8 88 B1 BB 9D BE
0C01:ED A0 E8 C8 C4 B7 D0 F5 7E
0C09:A9 A0 E0 10 B0 06 9D ED 02
0C11:A0 E8 D0 F6 A0 E8 20 4F 75
0C19:A5 A6 C1 A4 C2 8E 02 A0 25
0C21:8C 03 A0 86 FB 84 FC A2 4B
0C29:04 20 12 A5 98 48 20 4D 5B
0C31:A5 68 AA F0 04 A2 02 D0 1A
0C39:F0 2C 00 DD 10 FB A6 27 97
0C41:A4 28 8E 0E DC 8C 11 D0 74
0C49:18 4C 59 A4 A0 00 B1 FB 5A
0C51:9D 00 A0 E6 FB D0 02 E6 C8
0C59:FC A5 FC C5 AF D0 0D A5 D5
0C61:FB C5 AE D0 07 8E 01 A0 E0
0C69:8C 00 A0 60 E8 D0 DF 88 B4
0C71:D0 F6 A0 00 B1 FB 99 00 74
0C79:A0 C8 D0 F8 60 A5 BA 20 EC
0C81:B1 FF A9 FF 4C 93 FF A0 F8
0C89:00 2C 00 DD 10 FB B9 00 6E
0C91:A0 85 95 18 AD 12 D0 E9 D0
0C99:30 90 06 29 07 C9 02 90 35
0CA1:F3 A9 07 8D 00 DD A2 04 98
0CA9:A9 00 06 95 2A 06 95 2A 6F
0CB1:0A 0A 0A 0A 8D 00 DD CA 26
0CB9:D0 EE A9 17 48 68 48 68 79
0CC1:48 68 8D 00 DD C8 D0 C6 44
0CC9:60 48 20 43 A5 A9 4D 20 EA
0CD1:A8 FF A9 2D 20 A8 FF 68 52
0CD9:4C A8 FF A0 00 A9 57 20 C1
0CE1:8F A5 A5 FD 20 A8 FF A9 0D
0CE9:07 20 A8 FF A9 20 AA 20 E5
0CF1:A8 FF B9 00 A4 20 A8 FF 8C
0CF9:C8 E6 FD CA D0 F4 4C AE 3E
0D01:FF A2 CD A0 02 8E 32 03 39
0D09:8C 33 03 4C D4 02 A9 36 93
0D11:85 01 4C C7 A5 A9 36 85 F9
0D19:01 4C 3D A4 A0 37 84 01 A4
0D21:A4 3A C8 D0 03 4C 74 A4 19
0D29:60 00 00 00 00 00 00 00 73
```

List Formatter

Article on page 74.

Program 1: LIST Formatter—64 Version

```
FF 10 FORI=53020TO53243:READA:
      POKEI,A:X=X+A:NEXTI
MH 20 IFX<>30512THENPRINT"DATA
       STATEMENT ERROR.":STOP
DS 30 DATA 76,170,207,76,211,2
      07,140,206,207,142
RR 40 DATA 205,207,141,204,207
      ,165,95,205,207,207
EH 50 DATA 208,7,165,96,205,20
      8,207,240,27,165
DD 60 DATA 95,141,207,207,165,
      96,141,208,207,173
FD 70 DATA 202,207,24,229,97,2
      33,1,170,169,32
GX 80 DATA 32,210,255,202,16,2
      50,173,204,207,36
SE 90 DATA 15,48,3,76,100,207,
      32,232,207,76
DP 100 DATA 26,167,173,203,207
       ,201,58,208,15,32
SM 110 DATA 215,170,169,32,174
       ,202,207,202,32,210
HK 120 DATA 255,202,16,250,173
       ,204,207,201,129,208
KJ 130 DATA 15,173,202,207,201
       ,15,176,8,238,202
PQ 140 DATA 207,169,32,32,210,
       255,173,204,207,201
BC 150 DATA 130,208,10,173,202
       ,207,201,7,144,3
BB 160 DATA 206,202,207,32,232
       ,207,141,203,207,76
AB 170 DATA 26,167,162,34,142,
       6,3,160,207,140
CM 180 DATA 7,3,169,242,141,2,
       3,169,207,141
EC 190 DATA 3,3,169,0,141,203,
       207,141,207,207
PC 200 DATA 141,208,207,96,0,0
       ,0,0,0,0
BM 210 DATA 0,0,0,169,26,141,6
       ,3,169,167
JD 220 DATA 141,7,3,169,131,14
       1,2,3,169,164
EM 230 DATA 141,3,3,96,172,206
       ,207,174,205,207
KX 240 DATA 173,204,207,96,72,
       169,6,141,202,207
AP 250 DATA 104,76,131,164
```

Program 2: LIST Formatter—128 Version

```
XX 10 FORI=3072TO3293:READA:PO
      KEI,A:X=X+A:NEXTI
CD 20 IFX<>22851THENPRINT"DATA
       STATEMENT ERROR.":STOP
PQ 30 DATA 76,142,12,76,183,12
      ,140,178,12,142
KP 40 DATA 177,12,141,176,12,1
      65,97,205,179,12
RQ 50 DATA 208,7,165,98,205,18
      0,12,240,27,165
XA 60 DATA 97,141,179,12,165,9
      8,141,180,12,173
```

```
EK 70 DATA 174,12,24,229,99,23
      3,1,170,169,32
MD 80 DATA 32,210,255,202,16,2
      50,173,176,12,36
AM 90 DATA 17,48,3,76,72,12,32
      ,202,12,76
JM 100 DATA 81,81,173,175,12,2
      01,58,208,15,32
EF 110 DATA 152,85,169,32,174,
      174,12,202,32,210
SD 120 DATA 255,202,16,250,173
      ,176,12,201,129,208
AC 130 DATA 15,173,174,12,201,
      15,176,8,238,174
JC 140 DATA 12,169,32,32,210,2
      55,173,176,12,201
JH 150 DATA 130,208,10,173,174
      ,12,201,7,144,3
XA 160 DATA 206,174,12,32,202,
      12,141,175,12,76
PR 170 DATA 81,81,162,6,142,6,
      3,160,12,140
PK 180 DATA 7,3,169,212,141,2,
      3,169,12,141
MJ 190 DATA 3,3,169,0,141,175,
      12,141,179,12
KX 200 DATA 141,180,12,96,0,0,
      0,0,0,0
GM 210 DATA 0,0,0,169,81,141,6
      ,3,141,7
BF 220 DATA 3,169,198,141,2,3,
      169,77,141,3
MG 230 DATA 3,96,172,178,12,17
      4,177,12,173,176
QF 240 DATA 12,96,72,169,6,141
      ,174,12,104,76
DC 250 DATA 198,77
```

Program 3: LIST Formatter—Plus/4 and 16 Version

```
ME 10 POKE56,63:POKE55,0:CLR:F
      ORI=16150TO16373:READA:P
      OKEI,A:X=X+A:NEXTI
FQ 20 IFX<>25417THENPRINT"DATA
       STATEMENT ERROR.":STOP
FK 30 DATA 76,164,63,76,205,63
      ,140,200,63,142
GE 40 DATA 199,63,141,198,63,1
      65,95,205,201,63
GR 50 DATA 208,7,165,96,205,20
      2,63,240,27,165
CJ 60 DATA 95,141,201,63,165,9
      6,141,202,63,173
XR 70 DATA 196,63,24,229,97,23
      3,1,170,169,32
XM 80 DATA 32,210,255,202,16,2
      50,173,198,63,36
GJ 90 DATA 15,48,3,76,94,63,32
      ,226,63,76
AG 100 DATA 110,139,173,197,63
      ,201,58,208,15,32
HE 110 DATA 62,144,169,32,174,
      196,63,202,32,210
KS 120 DATA 255,202,16,250,173
      ,198,63,201,129,208
ME 130 DATA 15,173,196,63,201,
      15,176,8,238,196
AK 140 DATA 63,169,32,32,210,2
      55,173,198,63,201
EH 150 DATA 130,208,10,173,196
      ,63,201,7,144,3
KH 160 DATA 206,196,63,32,226,
      63,141,197,63,76
RD 170 DATA 110,139,162,28,142
      ,6,3,160,63,140
HP 180 DATA 7,3,169,236,141,2,
      3,169,63,141
BJ 190 DATA 3,3,169,0,141,197,
      63,141,201,63
MR 200 DATA 141,202,63,96,0,0,
      0,0,0,0
HM 210 DATA 0,0,0,169,110,141,
      6,3,169,139
KA 220 DATA 141,7,3,169,18,141
      ,2,3,169,135
AF 230 DATA 141,3,3,96,172,200
      ,63,174,199,63
AH 240 DATA 173,198,63,96,72,1
      69,6,141,196,63
KS 250 DATA 104,76,18,135
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

TurboSave 128

See instructions in article on page 70 before typing in.

```
0C00:4C 48 0D 08 85 06 86 07 CA
0C08:84 08 BA BD 02 01 85 64 1B
0C10:18 69 02 9D 02 01 BD 03 3B
0C18:01 85 65 90 03 FE 03 01 E2
0C20:68 AA 20 30 0C 08 48 A9 D8
0C28:00 8D 00 FF EA 68 28 60 4D
0C30:A0 02 B1 64 48 88 B1 64 C1
0C38:48 8A 48 A6 07 A4 08 A9 0F
0C40:40 8D 00 FF EA A5 06 40 16
0C48:08 85 06 86 07 84 08 BA 04
0C50:BD 02 01 85 64 18 69 02 98
0C58:9D 02 01 BD 03 01 85 65 48
0C60:90 03 FE 03 01 68 AA 20 B0
0C68:75 0C 08 48 A9 40 8D 00 2D
0C70:FF EA 68 28 60 A0 02 B1 0E
0C78:64 48 88 B1 64 48 8A 48 A2
0C80:A6 07 A4 08 A9 00 8D 00 2B
0C88:FF EA A5 06 40 20 03 0C 05
0C90:E1 0D 90 03 4C 4E F5 60 07
0C98:20 48 0C 9E 0C 60 AD 1C 97
0CA0:0A 29 BF 8D 1C 0A 60 20 C2
0CA8:48 0C AD 0C 60 AD 1C 0A 5A
0CB0:60 00 00 00 00 00 00 00 F8
0CB8:00 00 00 00 00 00 00 00 D0
0CC0:00 00 00 00 00 00 00 00 D8
0CC8:00 00 00 00 00 00 00 00 E0
0CD0:00 00 00 00 00 00 00 00 E8
0CD8:00 00 00 00 00 00 00 00 F0
0CE0:00 00 00 00 00 00 00 00 F8
0CE8:00 00 00 00 00 00 00 00 01
0CF0:00 00 00 00 00 00 00 00 09
0CF8:00 00 00 00 00 00 00 00 11
0D00:4C 35 13 4C 84 0F 4C FE AC
0D08:11 4C 01 12 4C 94 12 4C 24
0D10:D1 11 4C 07 11 4C CA 0F AF
0D18:4C 7E 11 4C A9 0F 4C 4C 4D
0D20:12 4C 8D 0C 13 0E 00 08 A1
0D28:80 82 04 62 13 06 13 07 A7
0D30:13 02 00 54 55 52 42 4F 61
0D38:53 41 56 45 A0 A0 A0 A0 D4
0D40:A0 A0 A0 4C 02 00 00 01 BC
0D48:A9 8D A2 0C CD 32 03 D0 BD
0D50:05 EC 33 03 F0 4D AC 32 07
0D58:03 8C 95 0C AC 33 03 8C 4F
0D60:96 0C 8D 32 03 8E 33 03 59
0D68:A9 0C 85 6C A9 6B 8D B9 A1
0D70:02 A0 00 84 6B B9 00 0C 4A
0D78:A2 00 20 AF 02 C8 D0 F5 AD
0D80:A2 00 A0 16 86 2F 84 30 8B
0D88:86 31 84 32 86 33 84 34 24
0D90:A2 02 BD B9 0D 95 6A CA 2E
0D98:10 F8 A9 6A A2 09 A0 10 5F
0DA0:20 B3 0D A0 00 B9 CC 0D F0
0DA8:F0 08 20 48 0C D2 FF C8 3A
0DB0:D0 F3 60 20 48 0C 21 C0 B3
0DB8:60 BC 0D 01 42 41 4E 4B E2
0DC0:31 3A 53 59 53 31 32 2A EF
0DC8:32 35 36 0D 0D 54 55 52 97
0DD0:42 4F 53 41 56 45 20 45 AB
0DD8:4E 41 42 4C 45 44 20 0D FF
0DE0:00 A5 BA C9 08 B0 02 38 97
0DE8:60 A2 10 A9 A0 9D 32 0D 65
0DF0:CA D0 FA A4 B7 F0 F0 88 3A
0DF8:30 09 20 48 0C AE F7 C9 CA
0E00:3A D0 F4 C8 C4 B7 F0 19 98
0E08:20 48 0C AE F7 C9 2A F0 DE
0E10:10 C9 2C F0 0C C9 3F F0 32
0E18:08 9D 33 0D E8 E0 10 90 52
0E20:E2 8A F0 C3 20 35 13 90 37
0E28:01 60 20 48 0C BC F5 20 C4
0E30:84 0F B0 40 20 94 12 B0 94
0E38:3B AD 2A 0D D0 3B AD 27 69
0E40:0D 48 A9 03 8D 27 0D A2 20
0E48:00 20 4F 0F AA 68 8D 27 80
0E50:0D 8A B0 20 AD 25 0D 8D 57
0E58:2A 0D A9 02 8D 2B 0D A0 F5
0E60:00 98 91 6D C8 D0 FB A0 CD
0E68:01 A9 FF 91 6D A2 00 20 9E
0E70:01 12 90 05 20 4C 12 18 62
0E78:60 20 07 11 B0 F6 A2 00 65
0E80:8E 31 0D 8E 32 0D A6 C6 94
0E88:BD F0 F7 85 6B A9 C1 8D 2A
0E90:AA 02 AD 47 0D 85 6D F0 F6
0E98:03 A0 FC 2C A0 FE 84 6E 39
0EA0:18 A5 AE E5 C1 AA A5 AF 1A
0EA8:E5 C2 90 10 D0 04 E4 6E 4A
0EB0:90 0C 20 CA 0F 90 11 20 C5
0EB8:4C 12 18 60 A2 00 E8 E8 58
0EC0:8E 2F 0D A9 00 8D 2E 0D CB
0EC8:EE 31 0D D0 03 EE 32 0D 9C
0ED0:20 E5 12 AD 26 0D 20 5E 97
0ED8:12 A9 01 20 5E 12 AD 24 45
0EE0:0D 20 5E 12 AD 25 0D 20 B4
0EE8:5E 12 AD 2E 0D 08 20 5E 78
0EF0:12 AD 2F 0D 28 D0 05 18 DE
0EF8:65 6D 65 6D 20 5E 12 46 8B
0F00:6D 90 0A A5 C1 20 5E 12 F1
0F08:A5 C2 20 5E 12 A0 00 A6 4D
0F10:6B 20 A2 02 20 5E 12 C8 C7
0F18:C4 6E 90 F3 20 0A 13 20 F4
0F20:7E 12 20 7E 12 C9 02 B0 5A
0F28:8E A5 C1 65 6E 85 C1 90 23
0F30:02 E6 C2 AD 2E 0D F0 0C CF
0F38:8D 24 0D AD 2F 0D 8D 25 90
0F40:0D 4C 9C 0E 20 7E 11 B0 3A
0F48:03 20 A9 0F 4C B7 0E 8E 02
0F50:45 0D 20 CA 0F B0 29 AD 40
0F58:45 0D AA 18 69 04 85 6E 08
0F60:A0 00 84 6D AD 2E 0D 91 08
0F68:6D C8 AD 2F 0D 91 6D 20 C1
0F70:01 12 B0 0C AD 2E 0D 8D 38
0F78:24 0D AD 2F 0D 8D 25 0D 8A
0F80:AE 45 0D 60 A9 12 8D 24 C3
0F88:0D A9 00 8D 25 0D A2 01 14
0F90:20 FE 11 B0 13 A0 03 B1 7E
0F98:6D 8D 28 0D F0 0A A9 35 DE
0FA0:8D 24 0D A2 02 20 FE 11 F9
0FA8:60 A9 12 8D 24 0D A9 00 25
0FB0:8D 25 0D A2 01 20 01 12 47
0FB8:B0 0F AD 28 0D F0 0A A9 15
0FC0:35 8D 24 0D A2 02 20 01 90
0FC8:12 60 A2 03 AD 25 0D 8D 36
0FD0:2F 0D AD 24 0D 8D 2E 0D C9
0FD8:20 D1 11 18 AD 2F 0D 6D D0
0FE0:27 0D CD 30 0D 90 07 ED 39
0FE8:30 0D F0 02 E9 01 8D 2F 3E
0FF0:0D AD 2E 0D C9 24 90 03 9A
0FF8:4C 7F 10 0A 0A A8 B9 00 26
1000:05 D0 23 8D 2F 0D C0 48 8B
1008:F0 46 90 0E 98 69 03 C9 5F
1010:90 90 EA A9 11 CA D0 E3 CD
1018:F0 65 98 E9 03 D0 DE A9 7E
1020:13 CA D0 D7 F0 59 98 8D BF
1028:43 0D 4A 4A 8D 2E 0D 20 7A
1030:D1 11 AD 2F 0D 8D 44 0D 5A
1038:AE 2F 0D EC 30 0D 90 14 D6
1040:A2 00 EC 44 0D 8E 44 0D CB
1048:8E 2F 0D D0 EB A9 71 60 73
1050:A9 72 38 60 8A 4A 4A 4A 4B
1058:38 6D 43 0D A8 8A 29 07 F1
```

```
1060:AA B9 00 05 3D F6 11 D0 4D
1068:05 EE 2F 0D D0 CA B9 00 A2
1070:05 5D F6 11 99 00 05 AE DF
1078:43 0D DE 00 05 18 60 AD 50
1080:28 0D F0 CC AC 2E 0D B9 D4
1088:B9 05 D0 21 8D 2F 0D C0 F6
1090:35 F0 BD 90 0C C8 C0 47 94
1098:90 ED A0 34 CA D0 E8 F0 30
10A0:AF 88 C0 24 B0 E1 A0 36 99
10A8:CA D0 DC F0 A3 98 8D 2E D5
10B0:0D 0A 6D 2E 0D E9 6B 8D DE
10B8:43 0D 98 20 D1 11 AD 2F 30
10C0:0D 8D 44 0D AE 2F 0D EC 5D
10C8:30 0D 90 10 A2 00 EC 44 8A
10D0:0D 8E 44 0D 8E 2F 0D D0 90
10D8:EB A9 71 60 8A 4A 4A 4A E9
10E0:18 6D 43 0D A8 8A 29 07 6A
10E8:AA B9 00 06 3D F6 11 D0 E5
10F0:05 EE 2F 0D D0 CE B9 00 3B
10F8:06 5D F6 11 99 00 06 AE EA
1100:2E 0D DE B9 05 18 60 A2 DF
1108:00 8E 2F 0D E8 8E 2E 0D 6F
1110:A9 12 38 ED 2E 0D F0 30 29
1118:0A 0A A8 B9 00 05 D0 12 3A
1120:A9 12 6D 2E 0D 0A 0A A8 79
1128:B9 00 05 D0 05 EE 2E 0D 22
1130:D0 DE 20 26 10 AE 2E 0D 7D
1138:8E 24 0D 8E 2C 0D AE 2F 57
1140:0D 8E 25 0D 8E 2D 0D 60 A5
1148:AD 28 0D D0 04 38 A9 72 C0
1150:60 8E 2E 0D A9 35 38 ED 5D
1158:2E 0D A8 B9 B9 05 D0 18 21
1160:A9 35 18 6D 2E 0D A8 B9 2F
1168:B9 05 D0 0C EE 2E 0D AD 7B
1170:2E 0D C9 12 90 DE B0 D5 7E
1178:20 AD 10 4C 35 11 A9 12 30
1180:8D 24 0D AD 2A 0D 8D 25 B4
1188:0D A2 00 20 FE 11 B0 40 B9
1190:AC 2B 0D A2 1E A9 00 99 D0
1198:00 04 C8 CA D0 F9 AC 2B 74
11A0:0D AD 29 0D 99 00 04 AD 2D
11A8:2C 0D 99 01 04 AD 2D 0D A5
11B0:99 02 04 AD 31 0D 99 1C 88
11B8:04 AD 32 0D 99 1D 04 BD 66
11C0:33 0D 99 03 04 C8 E8 E0 19
11C8:10 90 F4 A2 00 20 01 12 74
11D0:60 8E 30 0D A2 03 C9 24 76
11D8:90 02 E9 23 DD EE 11 B0 B0
11E0:03 CA D0 F8 BD F2 11 AE 6B
11E8:30 0D 8D 30 0D 60 01 12 19
11F0:19 1F 15 13 12 11 01 02 14
11F8:04 08 10 20 40 80 A9 00 7A
1200:2C A9 01 A8 8A 18 69 04 DA
1208:85 6E 20 E5 12 AD 26 0D 8D
1210:20 5E 12 98 08 20 5E 12 37
1218:AD 24 0D 20 5E 12 AD 25 7B
1220:0D 20 5E 12 A0 00 84 6D 3B
1228:28 F0 14 B1 6D 20 5E 12 F4
1230:C8 D0 F8 20 0A 13 20 7E 69
1238:12 20 7E 12 C9 02 60 20 95
1240:0A 13 20 7E 12 91 6D C8 94
1248:D0 F8 F0 EA A8 20 E5 12 83
1250:20 5E 12 98 09 80 20 5E D0
1258:12 20 0A 13 58 60 AA AD 47
1260:00 DD CD 00 DD D0 F8 45 1F
1268:6A 29 40 F0 F2 8E 0C DC E9
1270:A5 6A 49 40 85 6A A9 08 60
1278:2C 0D DC F0 FB 60 AD 00 5D
1280:DD 49 10 2C 0D DC 8D 00 A1
1288:DD A9 08 2C 0D DC F0 FB 83
1290:AD 0C DC 60 A2 00 8E 2A 8C
1298:0D A9 12 E8 8D 24 0D 8E 24
12A0:25 0D A2 00 20 FE 11 A0 AE
12A8:02 B1 6D D0 25 AD 2A 0D 36
12B0:D0 09 8C 2B 0D AD 25 0D 3A
12B8:8D 2A 0D 98 29 E0 18 69 BF
12C0:22 A8 90 E5 A0 01 B1 6D 6A
12C8:AA 88 B1 6D D0 CE 18 A9 0D
12D0:63 60 C8 C8 A2 FF C8 E8 F3
12D8:E0 10 B0 F3 BD 33 0D D1 6D
12E0:6D F0 F3 D0 D6 AD 05 D5 D0
12E8:09 08 8D 05 D5 A9 7F 8D 77
12F0:0D DC A9 00 8D 05 DC A9 EB
12F8:03 8D 04 DC AD 0E DC 29 D8
1300:80 09 55 8D 0E DC 2C 0D 75
1308:DC 60 AD 0E DC 29 80 09 E0
1310:08 8D 0E DC AD 05 D5 29 83
1318:F7 8D 05 D5 60 20 48 0C BB
1320:B1 FF 60 20 48 0C 93 FF C6
1328:60 20 48 0C A8 FF 60 20 76
1330:48 0C AE FF 60 A0 00 84 5D
1338:90 20 98 0C A5 BA 20 1D F7
1340:13 A9 FF 20 23 13 A9 55 6A
1348:20 29 13 A9 30 20 29 13 2D
1350:20 2F 13 A5 90 D0 07 20 05
1358:A7 0C 29 40 D0 02 38 60 DD
1360:A9 E7 85 6B A9 13 85 6C CD
1368:A2 00 A9 05 8E E4 13 8D 21
1370:E5 13 A5 BA 20 1D 13 A9 F3
1378:6F 20 23 13 A0 00 B9 E1 4E
1380:13 20 29 13 C8 C0 06 90 74
1388:F5 A0 00 B1 6B 20 29 13 2E
1390:C8 C0 20 90 F6 20 2F 13 02
1398:A9 00 C5 90 85 90 D0 D2 38
13A0:AD E4 13 18 69 20 8D E4 86
13A8:13 AD E5 13 69 00 8D E5 FD
13B0:13 A5 6B 69 20 85 6B 90 4C
13B8:02 E6 6C C9 BC A5 6C E9 03
13C0:15 90 AF A5 BA 20 1D 13 89
13C8:A9 6F 20 23 13 A9 55 20 DF
13D0:29 13 A9 43 20 29 13 20 A5
13D8:2F 13 A9 40 85 6A 78 18 73
13E0:60 4D 2D 57 E0 06 20 78 7D
13E8:AD 00 1C 09 08 8D 00 1C 8C
13F0:A0 00 84 1F 84 06 A9 12 8B
13F8:85 80 20 D2 05 C6 06 20 A2
1400:D2 05 20 88 05 85 2C 20 16
1408:88 05 A8 10 20 A5 1E 49 E8
1410:10 85 1E 98 29 7F C9 02 CB
1418:90 10 C9 66 F0 06 C9 10 6F
1420:B0 05 69 1E 4C 45 E6 4C 82
1428:C8 C1 4C 94 C1 20 88 05 9C
1430:85 80 20 88 05 85 81 98 A1
1438:F0 21 A0 00 20 88 05 99 FB
1440:00 03 C8 D0 F7 20 F8 05 86
1448:48 20 CE 81 A5 69 20 9E 40
1450:05 68 20 9E 05 20 B2 81 92
1458:4C 1B 05 20 CE 81 20 BE 8B
1460:05 48 A0 00 B9 00 03 20 25
1468:9E 05 C8 D0 F7 F0 DD AD 34
1470:00 18 49 08 2C 0D 40 8D EB
1478:00 18 A9 08 2C 0D 40 F0 63
1480:FB AD 0C 40 60 AA AD 00 A0
1488:18 CD 00 18 D0 F8 45 1F C5
1490:29 04 F0 F2 8E 0C 40 A5 66
1498:1F 49 04 85 1F A9 08 2C 57
14A0:0D 40 F0 FB 60 20 D2 05 6B
14A8:B0 0E A9 88 85 00 58 00 47
14B0:EA A5 00 30 FC 78 C9 02 1A
14B8:60 A5 81 85 07 A5 80 38 0B
14C0:F0 1C C9 47 B0 18 C5 06 8D
14C8:85 06 18 F0 11 A9 B0 85 5D
14D0:00 58 00 EA A5 00 30 FC 48
14D8:78 C9 02 2C A9 66 60 20 7A
14E0:D2 05 B0 15 A0 00 98 59 AA
14E8:00 03 C8 D0 FA 85 3A AD 08
14F0:00 1C 29 10 D0 04 A9 08 38
14F8:38 60 20 8F F7 20 7D 06 93
1500:B0 61 A0 09 2C 0F 18 30 7D
1508:FB 2C 00 1C 88 D0 F5 A9 1A
1510:FF 8D 03 1C AD 0C 1C 29 BE
1518:1F 09 C0 8D 0C 1C A9 FF 29
1520:A0 05 8D 01 1C 2C 0F 18 65
1528:30 FB 2C 00 1C 88 D0 F5 89
1530:A0 BB B9 00 01 2C 0F 18 BF
1538:30 FB 8D 01 1C C8 D0 F2 D3
1540:B9 00 03 2C 0F 18 30 FB 9F
1548:8D 01 1C C8 D0 F2 2C 0F 43
1550:18 30 FB AD 0C 1C 09 E0 B0
1558:8D 0C 1C A9 00 8D 03 1C C2
1560:85 50 18 60 A5 12 85 16 01
1568:A5 13 85 17 A5 06 85 18 B4
1570:A5 07 85 19 45 18 45 17 9D
1578:45 16 85 1A 20 34 F9 A9 8C
1580:5A 85 4B 20 BB 06 B9 24 32
1588:00 2C 0F 18 30 FB CD 01 2F
1590:1C D0 07 C8 C0 08 D0 EE 21
1598:18 60 C6 4B D0 E5 A9 02 E7
15A0:38 60 A2 0F A0 00 2C 00 A1
15A8:1C 10 0A 88 D0 F8 CA D0 7F
15B0:F5 A9 03 38 60 AD 01 1C FB
15B8:A0 00 18 60 00 00 00 00 3C
```

Skidders

Article on page 52.

```
XF 10 FAST:COLOR0,1:COLOR4,7:C
      OLOR1,8:GRAPHIC1,1
CK 20 S=2:SS=4:X=100:Y=100:X0=
      0:Y0=30:X2=319:Y2=150:VO
      L15:ENVELOPE2,1,1,1,8,3:
      ENVELOPE3,0,2,8,12,3
BG 30 MOVSPR1,0#0:MOVSPR1,120,
      130:SPRITE1,1,4,0,0,0,1:
      IFPEEK(3603)<>85THENCOLO
      R4,6:GOSUB320
AC 40 TT=2340:TY=39:CHAR1,12,0
      ,"- SKIDDERS -":CHAR1,31
      ,0,"TIME :":C$(1)="UNSTU
      CK":C$(2)="{2 SPACES}STU
      CK":C=1
PJ 50 CHAR1,0,24,"0%":CHAR1,18
      ,24,"50%":CHAR1,36,24,"1
      00%"
CX 60 DO:BOX1,X0,Y0,X2,Y2:X0=X
      0+4:Y0=Y0+3:X2=X2-4:Y2=Y
      2-3:I=I+1:LOOP UNTIL I=1
      0
MG 70 L=0:FORT=2TO5:MOVSPRT,T*
      40,10:SPRITET,1,T+2,0,0,
      0,1:NEXT
HQ 80 FORT=2TO5:A(T)=135+INT(R
      ND(1)*90)+1:NEXT:FORT=2T
      O5:MOVSPRT,A(T)#S:S(T)=2
      :NEXT:B=BUMP(1):TI$="000
      000":SLOW
KP 90 J=JOY(2):IFJANDJ<>128THE
      NMOVSPR1,J*45-45#4:ELSEM
      OVSPR1,0#0
GP 100 W=BUMP(2):IF(WAND1)THEN
       MOVSPR1,0#0:C=2
CA 110 IF(WAND1)<>1ANDC=2THENC
       =1
HP 120 IFC<>CATHENCHAR1,1,0,C$
       (C):CA=C:PLAY"T2O4E"
DD 130 GOSUB160:B=BUMP(1):IF(B
       AND1)THEN200:ELSEIFBTHE
       NB=BUMP(1)
FP 140 SS=1+INT(RND(1)*4)+1:IF
       RSPPOS(SS,1)<40ORRSPPOS
       (SS,1)>240THENGOSUB300
QB 150 IFV<TYTHEN90:ELSEGOTO28
       0
MF 160 TK$=TU$:V=VAL(RIGHT$(TI
       $,2)):TU$=STR$(TY-V):L=
       LEN(TU$):TU$=RIGHT$(TU$
       ,L-1):IFL<3THENTU$="0"+
       TU$
JE 170 CHAR1,37,0,TU$:IFTU$<>T
       K$THENQ$=Q$+"{+}":GOTO1
       90
BB 180 RETURN
EA 190 COLOR1,6:CHAR1,0,23,Q$,
       1:COLOR1,8:RETURN
RR 200 FORT=1TO5:MOVSPRT,A(T)#
       1:NEXT
GB 210 IFB=3THENN=2:ELSEIFB=5T
       HENN=3:ELSEIFB=9THENN=4
       :ELSEIFB=17THENN=5
MP 220 IFNTHEN230:ELSESPRSAV1,
       E$:PLAY"T3O2QD":FORT=6T
       O8:SPRSAVT,1:NEXT:SPRIT
       E1,0:SPRSAVE$,1:GOTO240
BS 230 SPRSAV1,E$:SPRSAVN,F$:P
       LAY"T3O2QD":FORT=6TO8:S
       PRSAVT,1:SPRSAVT,N:NEXT
       :SPRITE1,0:SPRITEN,0:SP
       RSAVE$,1:SPRSAVF$,N
```

```
PE 240 CHAR1,15,8,"TOUGH LUCK"
RA 250 CHAR1,12,10,"ANOTHER TR
       Y Y/N?"
FR 260 GETKEYA$:IFA$="Y"THENRU
       N:ELSEIFA$<>"N"THEN260
FA 270 GRAPHIC0,1:PRINT"
       {6 DOWN} MISSION ENDED"
       :FORT=1TO5:MOVSPRT,0#0:
       SPRITET,0:NEXT:END
XX 280 FORT=2TO8:PLAY"T501QE":
       SPRITE1,,T:FORG=1TO10:N
       EXT:NEXT:SPRITE1,0,4:SO
       UND1,6000,6
SD 290 COLOR4,6:CHAR1,15,8,"YO
       U WIN!!":GOTO250
KQ 300 MOVSPRSS,0#0:S(SS)=S(SS
       )+1:IFS(SS)>12THENS(SS)
       =12
AF 310 MOVSPRSS,INT(RND(1)*360
       )+1#S(SS):RETURN
FB 320 COLOR4,8:FORT=3584TO4095
       :POKET,0:NEXT:COLOR4,3
CQ 330 DO:READH$:IFH$="-1"THEN
       EXIT
XQ 340 L$=LEFT$(H$,2):R$=RIGHT
       $(H$,2):POKE3584+DEC(L$
       ),DEC(R$):LOOP
DG 350 FORT=2TO4:SPRSAVT,T+4:N
       EXT:FORT=2TO5:SPRSAV1,T
       :NEXT:COLOR4,7:RETURN
MF 360 DATA 1355,1501,16AA,174
       0,1806,19AA,1A90,1B06
RG 370 DATA 1CAA,1D90,1E06,1FA
       A,2090,2106,22AA,2390
PE 380 DATA 2406,25AA,2690,270
       7,28AA,29D0,2A01,2BFF
PX 390 DATA 2C40,2E55,4D41,4F0
       4,5202,5311,56AA,5740
SJ 400 DATA 5806,592A,5A91,5B0
       A,5CA2,5D80,5E42,5F2A
EB 410 DATA 6088,6106,62AA,640
       6,65A2,6698,6707,682A
JB 420 DATA 6910,6A01,6BFE,6C4
       0,6E11,6F0C,7020,7301
AB 430 DATA 7404,8440,8840,891
       0,8D01,9110,9202,9310
JQ 440 DATA 9520,96AA,9701,980
       2,9928,9A20,9B80,9CA2
SQ 450 DATA 9E02,9F2A,A008,A12
       0,A2A8,A5A0,A610,A710
GF 460 DATA A828,ABC0,AC40,AD0
       4,AE01,AF04,B130,B380
PE 470 DATA B44C,B503,B901,BA0
       1,C5C0,C930,CDC0,D003
HG 480 DATA D10C,D530,D688,D92
       0,DC82,DF08,E120,E280
EM 490 DATA E520,E630,E808,ED0
       C,EEC0,F103,F430,F530
CE 500 DATA FAC0,-1
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Screen Mapper

Article on page 73.

```
FJ 10 PR=1:REM SET PR=0 FOR 15
      26 SERIES, PR=1 FOR 1525
       SERIES
MA 20 SM=1024:CM=55296:REM SM=
      3072:CM=2048 ON THE PLUS
       4/16
ES 30 B$=CHR$(8):C1$=CHR$(14):
      C$=CHR$(15):REM PRINTER
      {SPACE}CODES
DC 40 IFPR=0THENB$=""
HE 50 D$=CHR$(207):E$=CHR$(165
      ):F$=CHR$(163)
QQ 60 PRINT"{CLR}":PRINT"{UP}
      {RVS}{11 SPACES}MEMORY M
      AP PRINTER{11 SPACES}"
AK 70 PRINT"{5 DOWN}{2 RIGHT}
      {RVS} 1 {OFF} SMALL SCRE
      EN MAP"
JH 80 PRINT"{2 RIGHT}{RVS} 2
      {OFF} SMALL COLOR MAP"
SE 90 PRINT"{2 RIGHT}{RVS} 3
      {OFF} SMALL GRAPHIC 320
      {SPACE}X 200 MAP"
HX 100 PRINT"{2 RIGHT}{RVS} 4
       {SPACE}{OFF} LARGE SCRE
       EN MAP"
KK 110 PRINT"{2 RIGHT}{RVS} 5
       {SPACE}{OFF} LARGE COLO
       R MAP"
XS 120 PRINT"{2 RIGHT}{RVS} 6
       {SPACE}{OFF} LARGE GRAP
       HICS MAP"
BK 130 PRINT"{2 RIGHT}{RVS} 7
       {SPACE}{OFF} QUIT"
GR 140 PRINT"{2 DOWN}{2 RIGHT}
       MAKE YOUR SELECTION"
RE 150 GETA$:IFA$=""THEN150
GA 160 A=ASC(A$)-48:IFA=7THEN2
       10:IFA<1ORA>6THEN150
KA 170 GOSUB490:ONAGOSUB220,23
       0,240,340,360,380
ES 180 PRINT"{CLR}{12 DOWN}
       {2 RIGHT}PRINT ANOTHER
       {SPACE}?"
FR 190 GETA$:IFA$=""THEN190
RF 200 IFA$="Y"THEN60
FA 210 PRINT"{CLR}":END
BS 220 S$="SCREEN":S=SM:GOSUB6
       20:RETURN
HP 230 S$="COLOR":S=CM:GOSUB62
       0:RETURN
EX 240 PRINT#4,C1$"SMALL GRAPH
       ICS MAP"
DH 250 X=24:GOSUB500
AM 260 PRINT#4,"0{3 SPACES}.
       {4 SPACES}1{4 SPACES}.
       {4 SPACES}2{4 SPACES}.
       {4 SPACES}3"
AM 270 PRINT#4,"{9 SPACES}0
       {9 SPACES}0{9 SPACES}0"
EP 280 PRINT#4,"{9 SPACES}0
       {9 SPACES}0{9 SPACES}0"
HF 290 FORI=10TO200STEP10:PRIN
       T#4,C$;
AP 300 FORX=1TO32:PRINT#4,D$;:
       NEXT:PRINT#4,"T";:PRINT
       #4,I;B$
PK 310 NEXTI
KS 320 PRINT#4,C$"§32 T3"
DB 330 GOSUB520:RETURN
PR 340 PRINT#4,C1$"{10 SPACES}
       LARGE SCREEN MAP"
RJ 350 X=22:GOSUB500:S=SM:S$=S
       TR$(S):GOSUB530:RETURN
JA 360 PRINT#4,C1$"{10 SPACES}
       LARGE COLOR MAP"
EP 370 X=22:GOSUB500:S=CM:S$=S
       TR$(S):GOSUB530:RETURN
HJ 380 PRINT#4,C1$"{9 SPACES}L
       ARGE GRAPHICS MAP"
SR 390 X=18:GOSUB500
EM 400 PRINT#4,"§A3C THIS BLOC
       K IS ADDRESS 0,0. ADD 1
       0 GOING DOWN AND ACROSS
       "B$
EC 410 PRINT#4,C$"-"B$
PR 420 FORX=10TO200STEP10
BA 430 PRINT#4,C1$;:FORI=1TO32
       :PRINT#4,D$;:NEXTI
KD 440 PRINT#4,E$B$
MM 450 PRINT#4,C1$;:FORI=1TO33
       :PRINT#4,E$;:NEXTI
DJ 460 PRINT#4,B$:NEXTX
PS 470 PRINT#4,C1$"§32 T3"
CX 480 GOSUB520:RETURN
EE 490 PRINT"{CLR}{6 DOWN}PRIN
       TING...":OPEN4,4:RETURN
JJ 500 IFPR=0THENOPEN6,4,6:PRI
       NT#6,CHR$(X):CLOSE6
GM 510 PRINT#4,C$:RETURN
FF 520 PRINT#4,C$:PRINT#4:CLOS
       E4:RETURN
RD 530 PRINT#4,"§A3C THIS BLOC
       K STARTS AT"S$". ADD 40
        FOR EACH ROW YOU GO DO
       WN."B$
PS 540 PRINT#4,C$"-"B$:FORX=1T
       O25
RA 550 PRINT#4,C1$;:FORI=0TO39
PX 560 PRINT#4,D$;:NEXTI:PRINT
       #4,B$
FD 570 PRINT#4,C1$;:FORI=0TO39
SA 580 PRINT#4,E$;:NEXTI:PRINT
       #4,B$:NEXTX
RR 590 PRINT#4,C1$;:FORI=0TO39
BH 600 PRINT#4,F$;:NEXTI
FE 610 X=24:GOSUB500:FORX=STOS
       +960STEP40:PRINT#4,X:NE
       XT:GOSUB520:RETURN
FH 620 PRINT#4,C1$"{3 SPACES}S
       MALL "S$" MAP"
SP 630 P$="{6 SPACES}":IFS=CMT
       HENP$="{7 SPACES}"
MX 640 X=24:GOSUB500
FH 650 PRINT#4,P$"0{4 SPACES}.
       {4 SPACES}1{4 SPACES}.
       {4 SPACES}2{4 SPACES}.
       {4 SPACES}3{4 SPACES}."
BA 660 PRINT#4,P$"{10 SPACES}0
       {9 SPACES}0{9 SPACES}0"
RC 670 FORI=STOS+960STEP40
HM 680 PRINT#4,C$I;:FORX=0TO39
       :PRINT#4,D$;:NEXT:PRINT
       #4,"T"B$:NEXTI
QS 690 PRINT#4,C$P$"§40 T3"
AM 700 GOSUB520:RETURN
```

Omicron

Article on page 44.

Program 1: Omicron—BASIC section

```
QS 2 POKE 792,193
AC 10 IFPEEK(13274)<>169THENLO
      AD"OMICRON ML",8,1
JP 20 SYS13274
BX 27 POKE 808,234
XC 30 POKE56,48:CLR:BL=51908:F
      =15:SCR=1024
QE 40 IFPEEK(788)=0THENFORT=0T
      O149:READD$:NEXT:GOSUB15
      10:GOTO60
CH 50 GOSUB1200
KH 60 GOSUB1000
ES 70 GOSUB780
KS 80 GOSUB580
RG 90 SYS51838:POKE56322,255:I
      F(PEEK(53280)ANDF)=0THEN
      220
PE 100 LV=LV-1:POKE251,48
SB 110 FORT=0TO64:POKE163,0:PO
       KE164,3
DA 120 POKE53280,T:POKE53232,(
       3ANDT)+220
SK 130 NEXT
EG 140 POKE164,0:CS=CS+1
EF 150 IFLV=0THEN170
KA 160 GOTO80
JQ 170 POKE53178,0:POKE53179,0
```

```
JS 180 POKE53272,21:PRINT"
       {CLR}{9 DOWN}"SPC(11)"
       {CYN}G A M E{3 SPACES}O
        V E R"
BD 190 FORT=0TO2000:NEXT
DS 200 FORT=0TO7:SL=SL+PEEK(83
       2+T)*10↑(7-T):NEXT
XX 210 LD=DF:GOTO60
MJ 220 REM :::::::::: GAME WON
       ::::::::::
KS 230 IFL<15THEN430
KD 240 POKE53178,0:POKE251,48:
       POKE53281,1:FORT=2TO7:W
       (T)=PEEK(1442+T)-176:NE
       XT
DH 250 PRINT"{CLR}{WHT},,,,,,,
       ,,,,,,,,,,,,,,,,,,,,,,,,
       ,,,,,,,,,,":FORT=0TO9:P
       RINT:NEXT
MC 260 PRINTSPC(11)"{RVS}{BLK}
       CONGRATULATIONS!"
BC 270 PRINT"{RVS}"SPC(11)"CON
       GRATULATIONS{K}":FORT=0
       TO8:PRINT:NEXT
DJ 280 PRINT"{WHT},,,,,,,,,,,,
       ,,,,,,,,,,,,,,,,,,,,,,,,
       ,,,,,";
DM 290 FORT=0TO75
JD 300 X=INT(RND(1)*34+4):Y=IN
       T(RND(1)*19+3):PL=X+(Y*
       40)+SCR:IFPEEK(PL)<>32T
       HEN340
HA 310 POKEPL+54272,1:POKEPL+5
       4273,0
MF 320 POKEPL,39+RND(0)*2:POKE
       PL+1,8
XE 330 SYS49680:POKE53280,T
FG 340 NEXT
XG 350 PRINT"{CLR}":POKE53272,
       21
PR 360 POKE251,80:PRINT"
       {5 DOWN}{BLU}{7 SPACES}
       YOU HAVE SURVIVED OMICR
       ON!"
MB 370 PRINT"{DOWN}{RED}
       {7 SPACES}BONUS"(DF+1)*
       5000"POINTS AWARDED FOR
       "
DG 380 PRINT"{DOWN}{12 SPACES}
       EACH REMAINING SHIP."
HD 390 PRINT"{DOWN}{PUR} "LV"S
       HIPS *"(DF+1)*5000"="(D
       F+1)*5000*LV"EXTRA POIN
       TS."
DX 400 FORT=0TO4500:NEXT:POKE2
       51,48
QR 410 FORT=0TO7:POKE832+T,W(T
       ):NEXT
FF 420 POKE836,PEEK(836)+(DF+1
       )*5*LV:GOTO170
GC 430 REM :::::::: LEVEL COMP
       LETED ::::::
AX 440 POKE53178,1:POKE53179,0
EH 450 IFCS<>0THEN510
CB 460 POKE 808,234:PRINT"
       {HOME}{3 DOWN}{YEL}
       {RVS}{2 RIGHT}
       {36 SPACES}"
QJ 470 PRINT"{2 RIGHT}{RVS}
       {2 SPACES}BONUS 1000 FO
       R EXCELLENT PLAY !!
       {2 SPACES}"
DS 480 PRINT"{UP}{2 RIGHT}
       {RVS}{2 SPACES}BONUS
       {E}{3 A} FOR EXCELLENT
       {SPACE}PLAY {2 K}
       {2 SPACES}"
XD 490 PRINT"{2 RIGHT}{RVS}
       {36 SPACES}"
XG 500 POKE251,64:FORT=0TO2000
       :NEXT:POKE251,0:POKE836
       ,PEEK(836)+1
EB 510 CS=0:L=L+1:IF(3AND(L))<
       >0THEN570
FQ 520 PRINT"{HOME}{17 DOWN}
       {RVS}{GRN}{10 RIGHT}
       {20 SPACES}"
RH 530 PRINT"{RVS}{10 RIGHT}
       {3 SPACES}BONUS SHIP !!
       !{3 SPACES}"
QS 540 PRINT"{RVS}{UP}
       {10 RIGHT}{3 SPACES}BON
       US SHIP {3 K}{3 SPACES}
       "
XP 550 PRINT"{RVS}{10 RIGHT}
       {20 SPACES}"
KA 560 POKE251,80:FORT=1TO2000
       :NEXT:POKE251,0:LV=LV+1
       :IFLV>9THENLV=9
JM 570 GOTO80
FJ 580 REM :::::: BETWEEN LEVE
       LS :::::::::
KF 590 IFCS>0THENPOKE53232,209
       :POKE53184,18:POKE53200
       ,60
AG 600 POKE53178,1:POKE53179,0
       :POKE251,48:POKE53216,1
QA 610 DR=INT(RND(0)*2)
BD 620 FORT=0TO7:POKE840+T,0:N
       EXT
RC 630 POKE844,L:POKE841,Q(DF,
       0,LANDF):POKE842,Q(DF,1
       ,LANDF):POKE165,Q(DF,2,
       LANDF)
KQ 640 SYS13262:POKE49408+32,3
SK 650 FORT=1TO15:POKE49408+32
       +T,1:POKE53232+T,216:PO
       KE53216+T,14
RC 660 POKE53200+T,RND(0)*48+1
       70:POKE53184+T,RND(0)*9
       0+40:POKE49408+48+T,DR
KJ 670 AD=0:IFDR=1THENPOKE4940
       8+96+T,2:AD=2
CC 680 POKE49408+T+80,T:POKE49
       408+7*16+T,((RND(0)*256
       )AND252)+AD
RR 690 NEXT
RD 700 POKE1531,LV+176:POKE157
       1,LV+240
AF 710 POKE1522,(L+1)/10+176:P
       OKE1562,(L+1)/10+240:LC
       =L+1
DG 720 IFLC>9THENLC=LC-10:GOTO
       720
GD 730 POKE1523,LC+176:POKE156
       3,LC+240
GJ 740 POKE164,80:POKE163,1
FJ 750 POKE49408,0:POKE49408+1
       6,0:SYS51908:FORT=0TO4:
       SYS49680:NEXT
BA 760 POKE53178,255:POKE53179
       ,255
BG 770 RETURN
SM 780 REM ::::::: NEW GAME SE
       TUP ::::::::
AK 790 POKE53280,0:LV=5
BH 800 L=0:SL=0:CS=0:PRINT"
       {CLR}":POKE53272,31:SYS
       51800
FH 810 FORT=0TO11:POKE828+T,0:
       NEXT
MB 820 FORT=53160TO53248:POKET
       ,0:NEXT
KA 830 X=16384+SCR:FORT=0TO255
       STEP4
HA 840 POKEX+T,RND(0)*25+134:P
       OKEX+T+1,RND(0)*48+58:P
       OKEX+T+2,RND(0)*25+16
FC 850 POKEX+T+3,RND(0)*48+170
       :NEXT
HR 860 PRINT"{CLR}{BLU},,,,,,,
       ,,,,,,,,,,,,,,,,,,,,,,,,
       ,,,,,,,,,,";
FS 870 FORT=1TO8:PRINT","SPC(3
       8)",";:NEXT
HK 880 PRINT",{8 SPACES},,,,,,
       ,,,,,,,,,,,,,,,,,,
       {8 SPACES},";
XK 890 FORT=0TO3:PRINT",
       {8 SPACES},{7}
       {20 SPACES}{BLU},
       {8 SPACES},";:NEXT
AK 900 PRINT",{8 SPACES},,,,,,
       ,,,,,,,,,,,,,,,,,,
       {8 SPACES},";
JQ 910 FORT=1TO8:PRINT","SPC(3
       8)",";:NEXT
FA 920 PRINT"{BLU},,,,,,,,,,,,
       ,,,,,,,,,,,,,,,,,,,,,,,,
       ,,,,,";
FB 930 PRINT"{BLU},,,,,,,,,,,,
       ,,,,,,,,,,,,,,,,,,,,,,,,
       ,,,,";:POKE2023,44:POKE
       56295,6
JM 940 PRINT"{HOME}{10 DOWN}
       {RVS}"SPC(10)"{7}
       {4 SPACES}SCORE=000000
       {4 SPACES}"
JH 950 PRINT"{RVS}{UP}"SPC(10)
       "{4 SPACES}SCORE{X}
       {6 A}{4 SPACES}"
MR 960 PRINT"{RVS}"SPC(10)"
       {2 SPACES}LEVEL=00 SHIP
       S=0{2 SPACES}"
PH 970 PRINT"{RVS}{UP}"SPC(10)
       "{2 SPACES}LEVEL{X}
       {2 A} SHIPS{X}{A}
       {2 SPACES}"
MK 980 POKE53184,18:POKE53200,
       60:POKE53232,209
CE 990 RETURN
AS 1000 REM :::::::: TITLE SCR
        EEN ::::::::
MR 1010 POKE53178,0:POKE53179,
        0:POKE251,48
HR 1020 POKE53280,0:POKE53281,
        0:PRINT"{CLR}";
MP 1030 L$(0)="ROOKIE":L$(1)="
        ADVANCED":L$(2)="PRO":
        L$(3)="EXPERT"
XQ 1040 SP$="{7}{RVS}{7 RIGHT}
        {27 SPACES}"
SX 1050 PRINT"{3 DOWN}"SP$:PRI
        NT"{RVS}"SPC(13)" O M
        {SPACE}I C R O N ":PRI
        NTSP$
XC 1060 PRINT"{DOWN}{6}
        {3 SPACES}SELECT A SKI
        LL LEVEL AND GET READY
        ."
BE 1070 PRINT"{2 DOWN}{1}"SPC(
        10)"YOUR SELECTIONS AR
        E...":SP=13
SF 1080 PRINTSPC(SP)"{WHT}
        {DOWN}F1 ... EXPERT"
EC 1090 PRINTSPC(SP)"F3 ... PR
        O"
XA 1100 PRINTSPC(SP)"F5 ... AD
        VANCED"
CB 1110 PRINTSPC(SP)"F7 ... RO
        OKIE"
HK 1120 IFSL>HYTHENHY=SL:WD=LD
SA 1130 PRINTSPC(2)"{DOWN}
        {CYN}LAST GAME'S SCORE
        :"SL"ON "L$(LD)"."
QR 1140 PRINTSPC(2)"HIGHEST SC
        ORE YET:"HY"ON "L$(WD)
        "."
FP 1150 A(3)=1:A(6)=2:A(5)=3:A
        (4)=4
PP 1160 Z=PEEK(203):IFZ>60RZ<3
        THEN1160
XG 1170 X=A(Z):DF=X-1
BH 1180 IFX<1THEN1160
MM 1190 RETURN
```

```
SG 1200 REM :::::: DOUBLE CHAR
        ACTERS ::::::
XK 1210 POKE 53280,0:POKE53281
        ,0
CR 1215 PRINT"{CLR}{10 DOWN}
        {YEL}CREATING NEW CHAR
        ACTER SET...PLEASE WAI
        T"
PG 1220 POKE56334,PEEK(56334)A
        ND254:POKE1,PEEK(1)AND
        251
CR 1230 B=15360:A=53252:FORK=0
        TO63:FORT=0TO3
QE 1240 POKEB+K*8+T*2,255-PEEK
        (53248+K*8+T):POKEB+1+
        K*8+T*2,255-PEEK(53248
        +K*8+T)
QE 1250 POKE15872+K*8+T*2,255-
        PEEK(A+K*8+T):POKE1587
        3+K*8+T*2,255-PEEK(A+K
        *8+T)
JP 1260 NEXT:NEXT:POKE1,55:POK
        E56334,1
MQ 1270 REM ::::::::: 16 SPRIT
        ES :::::::::
XC 1280 SA=51968+40
DB 1290 FORT=0TO149:READV$
DM 1300 L$=LEFT$(V$,1)
HX 1310 IFASC(L$)>64THENHN=ASC
        (L$)-55
PE 1320 IFASC(L$)<65THENHN=ASC
        (L$)-48
PQ 1330 R$=RIGHT$(V$,1)
RG 1340 IFASC(R$)>64THENLN=ASC
        (R$)-55
CM 1350 IFASC(R$)<65THENLN=ASC
        (R$)-48
KS 1360 B=HN*16+LN:POKESA+T,B:
        NEXT
AM 1370 POKE53265,27:POKE56333
        ,127:POKE788,0:POKE789
        ,203
DH 1380 POKESA+109,PEEK(648)+3
        :POKE53274,129
JK 1390 DATA A5,FD,29,01,AA,49
        ,01,A8,BD,B2,CF,8D,1C,
        D0
FR 1400 DATA BD,B4,CF,8D,1D,D0
        ,BD,B6,CF,8D,17,D0,BD,
        B8
FG 1410 DATA CF,8D,1B,D0,BD,BA
        ,CF,8D,15,D0,AD,1E,D0,
        99
XP 1420 DATA BC,CF,AD,1F,D0,99
        ,BE,CF,A9,01,8D,19,D0,
        A5
KD 1430 DATA FD,29,01,0A,0A,0A
        ,AA,A0,00,84,FE,A9,01,
        85
DA 1440 DATA FC,BD,C0,CF,0A,99
        ,00,D0,90,06,A5,FC,05,
        FE
HF 1450 DATA 85,FE,BD,D0,CF,99
        ,01,D0,8A,84,FF,29,07,
        A8
JD 1460 DATA BD,E0,CF,99,27,D0
        ,BD,F0,CF,99,F8,07,A4,
        FF
KA 1470 DATA 18,26,FC,E8,C8,C8
        ,C0,10,D0,CD,A5,FE,8D,
        10
XP 1480 DATA D0,AD,1F,D0,E6,FD
        ,A9,00,8D,12,D0,AD,0D,
        DC
CG 1490 DATA 29,01,F0,03,4C,31
        ,EA,4C,BC,FE
BG 1500 REM ::::::::: GAME SE
        TUP :::::::::
KK 1510 DIMQ(3,2,15)
EH 1520 FORD=0TO3:FORK=0TO2:FO
        RT=0TO15
PJ 1530 READV:IFK=2THENV=15-V
PJ 1540 IFK=1THENV=V*32+31
ES 1550 Q(D,K,T)=V:NEXT:NEXT:N
        EXT
KD 1560 RETURN
PS 1570 DATA 1,1,1,1,1,1,1,1,1
        ,1,2,2,2,2,2,2
CX 1580 DATA 1,1,2,2,3,3,4,4,5
        ,6,3,4,4,3,3,3
XR 1590 DATA 0,0,0,0,0,0,0,0,0
        ,0,0,0,0,0,0,0
AH 1600 DATA 1,1,1,1,1,1,2,2,2
        ,2,2,2,2,2,2,2
GX 1610 DATA 1,2,3,4,5,5,2,3,4
        ,4,5,5,7,6,6,6
MF 1620 DATA 0,1,1,1,1,1,1,1,1
        ,1,1,1,1,1,1,1
JE 1630 DATA 1,1,1,1,1,2,2,2,2
        ,2,2,3,3,3,3,3
DE 1640 DATA 3,4,5,7,7,2,3,3,4
        ,5,5,4,6,3,4,4
AG 1650 DATA 1,1,1,1,2,2,2,2,1
        ,1,2,2,1,2,2,2
QH 1660 DATA 4,4,4,3,3,2,2,1,3
        ,3,3,4,7,4,4,4
GJ 1670 DATA 1,3,5,2,3,6,7,7,3
        ,3,5,3,2,4,5,7
FG 1680 DATA 1,1,1,2,2,3,3,4,2
        ,3,1,2,2,2,2,3
```

Program 2: Omicron—ML section

See instructions in article on page 44 before typing in.

```
33CE:A2 00 8A 9D 00 C1 E8 E0 6B
33D6:80 D0 F8 60 A9 68 85 AE 7F
33DE:A9 39 85 AF A0 00 A2 00 5E
33E6:A9 90 85 B0 A9 C1 85 B1 13
33EE:B1 AE 91 B0 C8 D0 F9 E8 7D
33F6:E6 AF E6 B1 E0 0B D0 F0 7A
33FE:60 00 00 00 00 C0 00 00 98
3406:70 00 00 3C 00 00 1F 00 A8
340E:00 0F C0 00 7F F0 00 0F 21
3416:C0 00 1F 00 00 3C 00 00 B3
341E:70 00 00 C0 00 00 00 00 CA
3426:00 00 00 00 00 00 00 00 8E
342E:00 00 00 00 00 00 00 00 96
3436:00 00 00 00 00 00 00 00 9E
343E:00 00 00 00 00 00 38 00 17
3446:03 F8 00 3F F0 00 FF F0 DA
344E:00 0F F0 00 07 F0 00 0F A3
3456:E0 00 0E E0 00 00 60 00 BF
345E:00 60 00 00 60 00 00 00 E1
3466:00 00 00 00 00 00 00 00 CE
346E:00 00 00 00 00 00 00 00 D6
3476:00 00 00 00 00 00 00 00 DE
347E:00 00 00 00 00 06 00 00 FE
3486:06 00 00 0F 00 00 0F 00 01
348E:00 1F 80 00 3F C0 00 7F 4B
3496:E0 00 7F E0 00 F6 F0 00 2B
349E:C6 30 00 86 10 00 00 00 5F
34A6:00 00 00 00 00 00 00 00 0F
34AE:00 00 00 00 00 00 00 00 17
34B6:00 00 00 00 00 00 00 00 1F
34BE:00 00 00 00 00 E0 00 00 AA
34C6:FE 00 00 7F E0 00 7F FC A9
34CE:00 7F 80 00 7F 80 00 3F 64
34D6:C0 00 38 C0 00 38 00 00 93
34DE:18 00 00 18 00 00 00 00 D4
34E6:00 00 00 00 00 00 00 00 4F
34EE:00 00 00 00 00 00 00 00 57
34F6:00 00 00 00 00 00 00 00 5F
34FE:00 00 00 00 00 00 70 00 48
3506:01 E0 00 07 C0 00 1F C0 9E
350E:00 7F 80 00 FF F0 00 7F AB
3516:80 00 1F C0 00 07 C0 00 4E
351E:01 E0 00 00 70 00 00 00 C4
3526:00 00 00 00 00 00 00 00 90
352E:00 00 00 00 00 00 00 00 98
3536:00 00 00 00 00 00 00 00 A0
353E:00 00 18 00 00 18 00 00 0C
3546:38 00 00 38 C0 00 3F C0 95
354E:00 7F 80 00 7F 80 00 7F 26
3556:FC 00 7F E0 00 FE 00 00 39
355E:E0 00 00 00 00 00 00 00 39
3566:00 00 00 00 00 00 00 00 D0
356E:00 00 00 00 00 00 00 00 D8
3576:00 00 00 00 00 00 00 00 E0
357E:00 00 86 10 00 CF 30 00 5A
3586:EF 70 00 7F E0 00 7F E0 E3
358E:00 3F C0 00 1F 80 00 0F EA
3596:00 00 0F 00 00 06 00 00 FA
359E:06 00 00 00 00 00 00 00 0C
35A6:00 00 00 00 00 00 00 00 11
35AE:00 00 00 00 00 00 00 00 19
35B6:00 00 00 00 00 00 00 00 21
35BE:00 00 00 60 00 00 60 00 EF
35C6:00 60 00 0E E0 00 0F F0 40
35CE:00 07 F0 00 0F F0 00 FF 55
35D6:F0 00 3F F8 00 03 F8 00 2F
35DE:00 78 00 00 18 00 00 00 28
35E6:00 00 00 00 00 00 00 00 51
35EE:00 00 00 00 00 00 00 00 59
35F6:00 00 00 00 00 00 00 00 61
35FE:00 00 03 E0 00 07 F8 00 E5
3606:1F 1C 00 1F 00 00 0F C0 D9
360E:00 07 E0 00 07 E0 00 03 17
3616:F0 00 00 F8 00 30 F8 00 3D
361E:3F F0 00 0F E0 00 00 00 5E
3626:00 00 00 00 00 00 00 00 92
362E:00 00 00 00 00 00 00 00 9A
3636:00 00 00 00 00 00 00 00 A2
363E:00 00 0E 00 00 38 00 00 4D
3646:70 00 00 71 C0 00 7F F8 FF
364E:00 3F FC 00 1F FE 00 07 26
3656:E7 00 01 C3 00 00 07 00 21
365E:00 0E 00 00 7C 00 00 00 32
3666:00 00 00 00 00 00 00 00 D2
366E:00 00 00 00 00 00 00 00 DA
3676:00 00 00 00 00 00 00 00 E2
367E:00 00 00 00 00 00 00 00 EA
3686:C0 00 00 C0 78 00 C3 FC A7
368E:00 E7 FE 00 FF E7 00 7F F3
3696:E3 00 7F C3 00 1F 03 00 A3
369E:00 00 00 00 00 00 00 00 0B
36A6:00 00 00 00 00 00 00 00 13
36AE:00 00 00 00 00 00 00 00 1B
36B6:00 00 00 00 00 00 00 00 23
36BE:00 00 00 78 00 00 FC 00 AC
36C6:01 C6 00 03 E3 00 07 F3 B6
36CE:00 07 F0 00 07 F0 00 C3 DA
36D6:E0 00 61 C0 00 3F 80 00 E9
36DE:1F 00 00 00 00 00 00 00 DA
36E6:00 00 00 00 00 00 00 00 53
36EE:00 00 00 00 00 00 00 00 5B
36F6:00 00 00 00 00 00 00 00 63
36FE:00 00 00 00 00 00 00 00 6B
3706:00 00 00 01 E0 00 03 F0 82
370E:00 03 F0 00 03 F0 00 01 38
3716:E0 00 00 00 00 00 00 00 F4
371E:00 00 00 00 00 00 00 00 8C
3726:00 00 00 00 00 00 00 00 94
372E:00 00 00 00 00 00 00 00 9C
3736:00 00 00 00 00 00 00 00 A4
373E:00 00 00 00 00 1C 00 00 1D
3746:1F E0 00 0F FE 00 0F FC 80
374E:00 0F F8 00 0F F8 00 1F 1B
3756:F0 00 3D E0 00 38 70 00 B4
375E:00 30 00 00 00 00 00 00 D8
3766:00 00 00 00 00 00 00 00 D4
376E:00 00 00 00 00 00 00 00 DC
3776:00 00 00 00 00 00 00 00 E4
377E:00 00 F0 0C 00 7C 3C 00 36
3786:1F F8 00 0F FE 00 1E 3C 24
378E:00 7E 38 00 0F 3C 00 1F 2C
3796:FF 00 3D E3 00 78 70 00 AD
379E:F0 70 00 00 18 00 00 00 62
37A6:00 00 00 00 00 00 00 00 15
37AE:00 00 00 00 00 00 00 00 1D
37B6:00 00 00 00 00 00 00 00 25
37BE:00 00 F3 CE 00 7F FC 00 90
37C6:38 3C 00 F0 0F 00 F0 0F D8
37CE:00 F8 0F 00 38 0F 00 38 93
37D6:1E 00 3C 3C 00 7F F0 00 7F
37DE:F1 E0 00 70 78 00 00 00 49
```

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37E6:00 00 00 00 00 00 00 00 55
37EE:00 00 00 00 00 00 00 00 5D
37F6:00 00 00 00 00 00 00 00 65
37FE:00 00 00 00 00 FF FF 00 6D
3806:00 00 00 00 00 00 07 1E A2
380E:78 E0 03 07 0E 1C 38 70 85
3816:E0 C0 38 38 38 70 70 F0 07
381E:E0 E0 18 18 18 18 18 18 25
3826:18 18 1C 1C 1C 0E 0E 07 2A
382E:07 07 C0 E0 70 38 1C 0E B4
3836:07 03 00 00 00 00 F0 3C 09
383E:0F 03 00 00 00 FF FF 00 F6
3846:00 00 07 1E 78 E0 00 00 C0
384E:00 00 03 07 0E 1C 38 70 51
3856:E0 C0 03 03 03 03 0C 0C 40
385E:0C 0C 18 18 18 18 18 18 C5
3866:18 18 C0 C0 C0 C0 30 30 A6
386E:30 30 C0 E0 70 38 1C 0E D3
3876:07 03 F0 3C 0F 03 00 00 91
387E:00 00 00 00 00 FF FF 00 EE
3886:00 00 07 1E 78 E0 00 00 01
388E:00 00 03 07 0E 1C 38 70 91
3896:E0 C0 07 07 0F 0E 0E 1C E1
389E:1C 1C 18 18 18 18 18 18 12
38A6:18 18 E0 E0 E0 70 70 38 35
38AE:38 38 C0 E0 70 38 1C 0E 1A
38B6:07 03 F0 3C 0F 03 00 00 D1
38BE:00 00 00 00 00 FF FF 00 2F
38C6:00 00 00 00 00 00 07 1E 63
38CE:78 E0 03 07 0E 1C 38 70 46
38D6:E0 C0 30 30 30 30 C0 C0 75
38DE:C0 C0 18 18 18 18 18 18 CD
38E6:18 18 0C 0C 0C 0C 03 03 45
38EE:03 03 C0 E0 70 38 1C 0E 72
38F6:07 03 00 00 00 00 F0 3C C9
38FE:0F 03 00 00 00 00 00 00 B7
3906:00 00 0C 00 30 0E 60 00 74
390E:1C 00 42 81 19 28 31 18 D2
3916:43 18 77 59 83 7A A9 96 A4
391E:B4 66 ED FC AE BC CC 97 AB
3926:EA 3E 18 3C 66 DB DB 66 25
392E:3C 18 F0 0F F0 0F F0 0F 88
3936:F0 0F C3 66 3C FF 3C 66 84
393E:C3 00 3F 3F 30 3E 3E 30 95
3946:30 30 3C C3 03 3C 30 30 3A
394E:00 30 00 FC E3 E3 FC E3 29
3956:E3 FC E7 E7 E7 3C 3C FF 1E
395E:FF FF EF D7 BB 7D FE FF 1E
3966:FF FF 08 09 01 05 04 06 94
396E:02 0A 03 03 00 83 83 83 8D
3976:00 03 00 83 83 83 00 03 0F
397E:03 03 01 02 03 28 29 2A A8
3986:2B 2C 50 51 53 54 78 79 0F
398E:7A 7B 7C A1 A2 A3 03 0D 7D
3996:04 07 01 03 05 07 09 0B 7E
399E:0D 0F 53 2B 2A 29 51 79 8A
39A6:7A 7B 10 11 12 13 14 15 62
39AE:16 17 18 19 1A 1B 1C 1D 19
39B6:1E 1F 00 01 02 03 04 05 39
39BE:06 07 08 09 0A 0B 0C 0D 29
39C6:0E 0F 53 53 2B 2A 2A 2A 24
39CE:29 51 51 51 79 7A 7A 7A 8E
39D6:7B 53 53 2B 2B 2B 2A 29 7C
39DE:29 29 51 79 79 79 7A 7B 14
39E6:7B 7B A9 D7 85 AE A2 00 D4
39EE:A9 03 85 AF A0 52 B1 AE 03
39F6:C9 20 B0 22 9D 00 40 A5 A1
39FE:AE 9D 00 41 A5 AF 9D 60 6B
3A06:42 18 48 69 D4 85 AF B1 0F
3A0E:AE 29 0F 9D 00 43 E8 68 27
3A16:85 AF A9 20 91 AE B1 AE C9
3A1E:C9 21 90 09 C9 25 B0 05 AB
3A26:38 E9 01 91 AE A5 AE C9 9D
3A2E:98 D0 06 A5 AF C9 07 F0 E1
3A36:08 E6 AE D0 B9 E6 AF D0 E4
3A3E:B5 A9 FF 9D 00 40 30 12 45
3A46:C0 52 F0 03 20 BE C3 A6 28
3A4E:02 20 FA C2 A6 02 EA 4C B6
3A56:E4 C2 A2 00 BD 00 40 C9 7A
3A5E:FF F0 5E A8 B9 D0 C1 85 7F
3A66:B3 B9 F0 C1 A8 BD 00 41 DA
3A6E:85 AE BD 00 42 85 AF 86 17
3A76:02 B1 AE C9 21 B0 1F C9 9E
3A7E:20 F0 06 A9 24 91 AE 10 6F
3A86:35 A5 B3 91 AE A5 AF 18 12
3A8E:69 D4 85 AF A6 02 20 08 1E
3A96:C4 91 AE 10 21 EA 20 E8 86
3A9E:C2 C9 25 90 19 C9 2B B0 8B
3AA6:15 C9 26 D0 9B A5 B3 49 0E
3AAE:18 91 AE 20 81 C5 69 D4 36
3AB6:85 AF A9 0F 91 AE E8 D0 E9
3ABE:9B 60 48 BD 00 43 C9 02 A0
3AC6:B0 02 68 60 68 A9 81 60 74
3ACE:EA 60 00 00 A5 AE 85 B0 74
3AD6:A5 AF 18 69 D4 85 B1 A0 64
3ADE:52 EA EA EA EA EA EA EA 07
3AE6:EA EA EA EA B1 AE C9 25 98
3AEE:D0 0F EE 46 03 A9 FF 20 B0
3AF6:2C CA A9 24 91 AE 38 B0 14
3AFE:D0 C9 27 D0 2E A5 AF 20 C7
3B06:4A CA AD 46 03 18 69 05 BE
3B0E:8D 46 03 A9 20 91 AE A2 1F
3B16:00 BD C8 C1 A8 B1 AE C9 64
3B1E:20 D0 09 BD C0 C1 91 AE B4
3B26:A9 0A 91 B0 E8 E0 08 D0 DC
3B2E:E8 F0 A2 C9 28 D0 26 EE 06
3B36:45 03 A9 FF 20 41 CA A9 8A
3B3E:20 91 AE A2 00 BC A8 C1 2F
3B46:B1 AE C9 20 D0 08 A9 24 9A
3B4E:91 AE A9 08 91 B0 E8 E0 F0
3B56:14 D0 EA 60 EA C9 29 D0 10
3B5E:15 20 35 CA A5 8F 29 03 7B
3B66:AA BD BC C1 A0 52 91 B0 77
3B6E:8A 18 69 25 91 AE C9 2A B4
3B76:D0 1D A9 FF 8D FF FF A9 E7
3B7E:20 91 AE 91 B0 A5 A2 29 E2
3B86:03 AA EE FF FF CA E0 FF F3
3B8E:D0 F8 A9 FF 8D FF FF 60 AD
3B96:C0 52 B0 15 84 AB 38 A9 56
3B9E:52 E5 AB 85 AC 38 A5 AE C5
3BA6:E5 AC 85 AE B0 02 C6 AF A1
3BAE:60 38 98 E9 52 18 65 AE 81
3BB6:85 AE 90 02 E6 AF 60 EA 6F
3BBE:EA EA 20 20 20 25 25 25 70
3BC6:26 20 26 26 27 26 27 27 C6
3BCE:27 28 28 28 25 2C 29 20 B6
3BD6:04 0C 00 08 29 29 29 29 3C
3BDE:29 29 BD 00 43 D0 02 A9 F6
3BE6:01 60 EA EA EA EA EA EA C5
3BEE:EA 4C 08 C3 4C 78 C5 4C 47
3BF6:07 C5 A2 00 BD 20 C1 F0 99
3BFE:F3 C9 03 D0 F2 BD 00 C1 9F
3C06:30 0A 18 7D C0 CF 9D C0 35
3C0E:CF 18 90 0D 38 29 7F 85 42
3C16:02 BD C0 CF E5 02 9D C0 47
3C1E:CF BD 10 C1 30 0A 18 7D 63
3C26:D0 CF 9D D0 CF 18 90 0D C8
3C2E:29 7F 85 02 BD D0 CF 38 F4
3C36:E5 02 9D D0 CF BD C0 CF A9
3C3E:C9 0F B0 10 BD 00 C1 29 11
3C46:7F 9D 00 C1 A9 0F 9D C0 87
3C4E:CF 20 00 C6 BD C0 CF C9 7D
3C56:A4 90 10 A9 A3 9D C0 CF C6
3C5E:20 00 C6 BD 00 C1 09 80 35
3C66:9D 00 C1 BD D0 CF C9 37 52
3C6E:B0 10 A9 38 9D D0 CF BD 89
3C76:10 C1 29 7F 9D 10 C1 20 55
3C7E:0D C6 BD D0 CF C9 DD 90 E5
3C86:10 A9 DC 9D D0 CF BD 10 38
3C8E:C1 09 80 9D 10 C1 20 0D E8
3C96:C6 BD C0 CF C9 2C 90 41 58
3C9E:C9 87 B0 3D BD D0 CF C9 62
3CA6:A8 B0 36 C9 70 90 32 20 4D
3CAE:4B C6 BD C0 CF C9 30 B0 F8
3CB6:02 A9 2B C9 82 90 02 A9 A0
3CBE:88 9D C0 CF BD D0 CF C9 92
3CC6:74 B0 02 A9 6F C9 A4 90 FC
3CCE:02 A9 A8 9D D0 CF EA EA 28
3CD6:EA EA EA EA EA EA EA EA 4F
3CDE:EA BD 20 C1 C9 03 F0 6A 03
3CE6:BC 20 C1 F0 65 84 B3 BD 6F
3CEE:60 C1 D0 11 FE C0 CF BC 8A
3CF6:70 C1 B9 00 44 DD C0 CF 3A
3CFE:B0 03 20 28 C6 BD 60 C1 C6
3D06:C9 01 D0 11 DE D0 CF BC 67
3D0E:70 C1 B9 00 44 DD D0 CF 73
3D16:90 03 20 28 C6 BD 60 C1 CF
3D1E:C9 02 D0 11 DE C0 CF BC 7F
3D26:70 C1 B9 00 44 DD C0 CF 6B
3D2E:90 03 20 28 C6 BD 60 C1 E7
3D36:C9 03 D0 11 FE D0 CF BC 19
3D3E:70 C1 B9 00 44 DD D0 CF A3
3D46:B0 03 20 28 C6 A4 B3 88 19
3D4E:D0 9B E8 E0 10 F0 03 4C D9
3D56:22 C4 60 AD 46 03 18 69 D1
3D5E:02 8D 46 03 A9 E5 85 BD E3
3D66:A9 E4 85 BE 18 A5 AF 60 A2
3D6E:18 1C 08 0C 0E 10 12 14 A6
3D76:18 1C 18 14 12 10 0E 0C 41
3D7E:08 06 28 24 20 1C 18 14 7B
3D86:10 0C 28 24 20 1C 18 14 09
3D8E:10 0C 60 30 20 10 58 28 3D
3D96:10 0C 50 28 10 08 50 40 2A
3D9E:30 20 00 00 00 00 00 00 39
3DA6:00 00 00 00 00 00 00 00 21
3DAE:00 00 A0 10 80 20 60 30 B3
3DB6:50 40 40 50 30 60 20 70 2A
3DBE:10 80 30 30 30 18 18 18 94
3DC6:50 50 28 28 28 28 20 20 47
3DCE:00 00 EA EA EA EA EA EA 19
3DD6:EA EA E0 00 D0 09 AD 3C DF
3DDE:03 49 FF 8D 3C 03 60 E0 95
3DE6:00 D0 08 AD 3D 03 49 FF F9
3DEE:8D 3D 03 60 EA EA 60 3D E6
3DF6:03 EE 10 C1 EE 10 C1 60 68
3DFE:60 EA BD 30 C1 D0 0F FE 8D
3E06:60 C1 BD 60 C1 29 03 9D 37
3E0E:60 C1 FE 70 C1 60 DE 60 BF
3E16:C1 BD 60 C1 29 03 9D 60 FB
3E1E:C1 DE 70 C1 60 BD D0 CF C8
3E26:38 E9 70 85 B1 BD D0 CF 95
3E2E:38 E9 A8 49 FF C5 B1 B0 16
3E36:02 85 B1 BD C0 CF 38 E9 C6
3E3E:2A 85 B0 BD C0 CF 38 E9 C2
3E46:87 49 FF C5 B0 B0 02 85 07
3E4E:B0 A5 B0 C5 B1 B0 0C 20 87
3E56:00 C6 BD 00 C1 49 80 9D 0E
3E5E:00 C1 60 20 0D C6 BD 10 68
3E66:C1 49 80 9D 10 C1 60 60 A8
3E6E:60 60 A2 00 8E 02 DC AD 6B
3E76:00 DC 29 0F 49 0F DD 90 13
3E7E:C1 D0 10 AD 00 DC 29 10 C2
3E86:D0 09 8A 18 69 D0 8D F0 1B
3E8E:CF 90 05 E8 E0 08 D0 DF EE
3E96:AD 00 DC 29 10 D0 08 A5 91
3E9E:B4 F0 03 20 DC C6 EA AD 99
3EA6:00 DC 29 10 D0 03 CA 86 2F
3EAE:AC 20 4A C7 60 60 AD C0 EF
3EB6:CF 85 AE AD D0 CF 85 AF AD
3EBE:20 1C C7 B1 B0 C9 21 B0 06
3EC6:23 AD F0 CF 29 07 0A 91 66
3ECE:B0 18 A5 B1 69 D4 85 B1 D4
3ED6:A9 00 91 B0 A5 BE D0 09 38
3EDE:A9 10 85 BD A9 70 8D BE A9
3EE6:00 E6 AC 60 A9 02 8D 20 49
3EEE:D0 E6 AC 60 EA EA A9 00 7F
3EF6:85 B0 A9 04 85 B1 A5 AF C5
3EFE:38 E9 2A 4A 4A 4A AA E0 AD
3F06:00 F0 0F 18 A5 B0 69 28 0F
3F0E:85 B0 90 02 E6 B1 CA 38 79
3F16:B0 ED A5 AE 38 E9 0A 4A CF
3F1E:4A A8 60 EA AE 3C 03 E0 F3
3F26:FB D0 01 E8 E0 04 D0 01 3F
3F2E:CA 8E 3C 03 AE 3D 03 E0 BE
3F36:FB D0 01 E8 E0 04 D0 01 4F
3F3E:CA 8E 3D 03 AD 00 DC 29 ED
3F46:01 D0 03 CE 3D 03 AD 00 18
3F4E:DC 29 02 D0 03 EE 3D 03 24
3F56:AD 00 DC 29 04 D0 03 CE 12
3F5E:3C 03 AD 00 DC 29 08 D0 DD
3F66:03 EE 3C 03 A9 FF 8D 02 44
3F6E:DC AD 3C 03 10 02 49 7F 19
3F76:8D 00 C1 AD 3D 03 10 02 E6
3F7E:49 7F 8D 10 C1 60 A5 AD BC
3F86:D0 03 20 98 C6 A9 00 85 1E
3F8E:AD 60 EA EA EA EA EA EA CB
3F96:EA 00 AD 4B 03 CD 49 03 D9
3F9E:B0 5F A2 00 8E 48 03 E8 26
3FA6:BD 20 C1 C9 01 D0 39 AD 4C
3FAE:4A 03 18 7D 40 C1 9D 40 72
3FB6:C1 90 03 FE 50 C1 BD 50 DF
3FBE:C1 C9 04 90 05 A9 03 9D 8C
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3FC6:E0 CF BD 50 C1 C9 20 90 6C
3FCE:17 A9 07 9D E0 CF A9 02 99
3FD6:9D 20 C1 A5 A2 29 01 9D 18
3FDE:30 C1 EE 4B 03 38 B0 19 EB
3FE6:BD 20 C1 F0 07 C9 03 F0 E9
3FEE:03 EE 48 03 AD 48 03 CD 46
3FF6:49 03 B0 05 E8 E0 10 D0 FC
3FFE:A7 20 EB C8 A2 01 BD 20 18
4006:C1 F0 3F BD F0 CF 18 69 C7
400E:01 29 DB 9D F0 CF 86 02 84
4016:BD E0 CF C9 03 D0 0E 20 DB
401E:97 E0 A6 02 A5 8E 29 1F 70
4026:D0 03 20 80 C8 BD E0 CF AA
402E:C9 07 D0 03 20 BA C8 BD DA
4036:E0 CF C9 08 D0 0C A5 A2 79
403E:29 07 D0 03 20 80 C8 20 14
4046:BA C8 E8 E0 10 D0 B7 A5 5A
404E:B4 F0 02 A2 00 86 B4 4C 9F
4056:EA C8 BD D0 C0 85 B0 BD 7E
405E:E0 C0 85 B1 BC F0 C0 AD 24
4066:4C 03 29 0F 0A A6 A2 30 44
406E:03 18 69 01 AA B1 B0 C9 FA
4076:20 D0 16 BD E8 C3 91 B0 04
407E:E9 01 29 03 AA A5 B1 18 F0
4086:69 D4 85 B1 BD BC C1 91 B2
408E:B0 A6 02 60 BD D0 C0 85 8F
4096:B0 BD E0 C0 85 B1 86 02 09
409E:20 97 E0 A6 02 BC F0 C0 41
40A6:B1 B0 C9 20 D0 14 A5 8F 19
40AE:29 0F 91 B0 18 A5 B1 69 E8
40B6:D4 85 B1 A9 07 91 B0 EA 9E
40BE:EA EA A6 02 60 A2 01 BD B1
40C6:C0 CF 85 AE BD D0 CF 85 8D
40CE:AF 86 02 20 1C C7 A6 02 5A
40D6:A5 B0 9D D0 C0 A5 B1 9D B4
40DE:E0 C0 98 9D F0 C0 BD F0 E3
40E6:CF C9 DC 90 0F FE F0 CF 8C
40EE:C9 DF 90 08 A9 0E 9D F0 90
40F6:CF 9D F0 CF BD 20 C1 C9 9D
40FE:00 F0 4D B1 B0 C9 20 B0 1E
4106:02 90 07 C8 B1 B0 C9 20 1F
410E:B0 3E A5 B1 69 D4 85 B1 A3
4116:B1 B0 29 0F C9 02 B0 30 9B
411E:BD 20 C1 0A 18 6D 45 03 64
4126:8D 45 03 A9 00 9D 20 C1 34
412E:A9 DC 9D F0 CF 20 20 CA 89
4136:BD E0 C0 85 B1 A9 20 91 46
413E:B0 BD E0 CF C9 07 D0 03 B0
4146:CE 4B 03 A9 0A 9D E0 CF 56
414E:E8 E0 10 F0 03 4C ED C8 7C
4156:AD 4E 03 C5 A5 D0 33 A2 79
415E:01 BD 20 C1 F0 27 EE 4E 41
4166:03 A9 02 AC 4C 03 C0 03 D2
416E:90 01 EA C0 08 90 01 0A 71
4176:9D 00 C1 9D 10 C1 A9 03 B7
417E:9D 20 C1 A9 08 9D E0 CF F2
4186:A9 FF 8D FF FF E8 E0 10 05
418E:D0 CF AD C0 CF 85 AE AD CE
4196:D0 CF 85 AF 20 1C C7 A5 C7
419E:B1 85 AF 18 69 D4 85 B1 2E
41A6:B1 B0 29 0F C9 01 F0 13 8B
41AE:A5 AF 85 B1 B1 B0 C9 20 BF
41B6:F0 09 C9 2A F0 05 A9 02 C0
41BE:8D 20 D0 A2 07 BD 40 03 07
41C6:C9 0A 90 0A E9 0A FE 3F 18
41CE:03 9D 40 03 B0 EF 69 B0 3B
41D6:9D A2 05 69 40 9D CA 05 1B
41DE:CA E0 01 D0 E0 A0 00 AD 63
41E6:4B 03 F0 02 A0 10 AD 4E FC
41EE:03 C5 A5 90 02 A0 20 84 79
41F6:FB 60 A9 3E 85 BD A9 44 63
41FE:85 BE EE 4E 03 60 A9 95 39
4206:85 BD A9 8D 85 BE 60 20 D2
420E:97 E0 A9 21 85 BD A9 39 8D
4216:85 BE 60 A9 01 85 A3 A9 C2
421E:1E 85 A4 60 C9 08 B0 09 86
4226:A9 FD 85 A3 A9 FE 85 A4 E2
422E:60 60 A9 0F 8D 18 D4 A9 41
4236:F0 8D 06 D4 8D 14 D4 8D 98
423E:0D D4 A9 11 8D 04 D4 A9 94
4246:21 8D 0B D4 A9 81 8D 12 ED
424E:D4 A9 00 85 FB 85 A4 60 9F
4256:20 20 C4 20 98 C6 20 10 BD
425E:C2 4C BF CB 20 C0 C7 AD 4D
4266:60 39 48 A2 00 BD 61 39 8F
426E:9D 60 39 E8 E0 07 D0 F5 4A
4276:68 8D 67 39 AD 8D 02 D0 8B
427E:FB A9 0E 38 E5 A5 18 69 10
4286:10 CD 4E 03 D0 01 60 AD 79
428E:20 D0 29 0F F0 01 60 A5 5F
4296:CB C9 3E D0 BB 00 A9 00 79
429E:85 AE 85 B0 A9 04 85 AF 65
42A6:A9 D8 85 B1 A0 00 B1 B0 1B
42AE:29 0F C9 0E F0 0E C9 06 FE
42B6:F0 0A B1 AE C9 20 F0 04 0C
42BE:A9 24 91 AE E6 AE E6 B0 AE
42C6:D0 E4 E6 AF E6 B1 A5 AF BD
42CE:C9 08 D0 DA 60 A3 60 EA 3F
42D6:EA EA E6 FA A5 FA 29 0F 92
42DE:18 65 FB AA BD 98 C5 8D 5C
42E6:01 D4 A5 BE F0 05 38 E5 B3
42EE:BD 85 BE 8D 08 D4 A5 A4 E7
42F6:F0 03 38 E5 A3 85 A4 8D 24
42FE:0F D4 A5 FD 29 01 AA 49 C0
4306:01 A8 BD B2 CF 8D 1C D0 D7
430E:BD B4 CF 8D 1D D0 BD B6 D1
4316:CF 8D 17 D0 BD B8 CF 8D D5
431E:1B D0 BD BA CF 8D 15 D0 79
4326:AD 1E D0 99 BC CF AD 1F 5E
432E:D0 99 BE CF A9 01 8D 19 DD
4336:D0 A5 FD 29 01 0A 0A 0A 2F
433E:AA A0 00 84 FE A9 01 85 B0
4346:FC BD C0 CF 0A 99 00 D0 57
434E:90 06 A5 FC 05 FE 85 FE 51
4356:BD D0 CF 99 01 D0 8A 84 68
435E:FF 29 07 A8 BD E0 CF 99 45
4366:27 D0 BD F0 CF 99 F8 07 59
436E:A4 FF 18 26 FC E8 C8 C8 92
4376:C0 10 D0 CD A5 FE 8D 10 AC
437E:D0 AD 1F D0 E6 FD A9 00 4C
4386:8D 12 D0 AD 0D DC 29 01 7C
438E:F0 03 4C 31 EA 4C BC FE EB
4396:EA A2 00 86 AE E8 BD 20 58
439E:C1 F0 02 E6 AE E8 E0 10 DB
43A6:D0 F4 A5 AE D0 01 60 4C 0A
43AE:8A CA 00 00 00 00 00 00 2D
43B6:00 00 00 00 00 00 00 00 3D
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Easy Disk LOAD And SAVE

Article on page 75.

```
AR 10 POKE56,PEEK(56)-1:CLR:H=
      PEEK(56):L=PEEK(55):SA=H
      *256+L
GR 20 FORI=SATOSA+214:READA:PO
      KEI,A:X=X+A:NEXT
XM 30 IFX<>27368THENPRINT"DATA
       STATEMENT ERROR.":STOP
CR 40 LV=SA+24:LH=INT(LV/256):
      LL=LV-LH*256:POKESA+1,LL
      :POKESA+6,LH
MA 50 SV=SA+141:SH=INT(SV/256)
      :SL=SV-SH*256:POKESA+11,
      SL:POKESA+16,SH
CJ 60 PRINT"{CLR}SYS"SA"TO ACT
      IVATE."
EC 70 DATA 169,24,141,48,3,169
      ,192,141,49,3
XD 80 DATA 169,141,141,50,3,16
      9,192,141,51,3
BC 90 DATA 96,76,51,245,133,14
      7,169,0,133,144
JJ 100 DATA 165,186,208,3,76,1
       9,247,201,3,240
DJ 110 DATA 249,144,234,164,18
       3,208,3,76,16,247
RS 120 DATA 166,185,32,175,245
       ,169,96,133,185,32
RX 130 DATA 213,243,165,186,32
       ,9,237,165,185,32
BS 140 DATA 199,237,32,19,238,
       133,174,133,2,165
DQ 150 DATA 144,74,74,176,127,
       32,19,238,133,175
GA 160 DATA 133,3,224,3,208,16
       ,104,104,32,229
DP 170 DATA 244,165,2,133,20,1
       65,3,133,21,76
QX 180 DATA 48,225,224,2,208,2
       2,104,104,162,0
RA 190 DATA 32,229,244,134,45,
       132,46,169,0,32
DQ 200 DATA 144,255,32,51,165,
       76,89,166,76,229
QK 210 DATA 244,165,186,208,3,
       76,19,247,201,3
BH 220 DATA 240,57,144,52,165,
       185,201,1,208,13
QK 230 DATA 32,250,245,32,215,
       170,169,1,133,10
SQ 240 DATA 76,111,225,201,2,2
       08,26,32,253,174
PJ 250 DATA 32,138,173,32,247,
       183,132,193,133,194
HP 260 DATA 32,253,174,32,138,
       173,32,247,183,?132
EK 270 DATA 174,133,175,76,250
       ,245,76,89,246,76
BR 280 DATA 241,245,76,48,245
```

Improvisor

Article on page 46.

```
RG 10 NT=0:FORT=0TO9:READCO(T)
      ,CH(T):NEXT
XX 20 DATA 1,18,8,6,4,7,2,1,14
      ,3,5,4,12,6,9,7,5,1,6,3
JP 30 POKE53280,6:POKE53281,15
FD 40 PRINT"{CLR}{DOWN}{BLK}",
      "{BLU}THE GRAND IMPROVIS
      OR":PRINT"{DOWN}{RED}","
      {3 SPACES}{RVS} SHORT-TU
      NES "
SA 50 PRINT"{RED}{DOWN}
      {2 SPACES}TYPE {RVS}F1
      {OFF} KEY, AND C-64 GOES
       RANDOM.":REM FLAG=0 AND
       RA=1
SD 60 PRINT"{4}{DOWN}
      {2 SPACES}TYPE {RVS}F3
      {OFF} KEY, AND C-64 WILL
       COMPOSE.":REM IF TUNE=0
RH 70 PRINT"{BLU}{DOWN}
      {2 SPACES}TYPE {RVS}F5
      {OFF} KEY, AND YOU CAN P
      LAY ALONG.":FLAG=0:REM A
      ND TUNE=0
ED 80 PRINT"{1}{DOWN}
      {2 SPACES}TYPE {RVS}F7
      {OFF} KEY, AND YOU WILL
      {SPACE}HEAR TUNES.":TUNE
      =1:PRINT:REM FLAG=0
DX 90 PRINT"{7}{DOWN} THESE AR
      E THE TUNES WHICH I MEMO
      RIZED."
JA 100 DATA 144,31,5,28,144,31
       ,156,144,31,30,5,28,156
       ,31,30,5
DC 110 DIMH1(32),L1(32),H2(32)
       ,L2(32),IN(16),TUNES(51
       2)
```

```
GQ 120 PRINT"{DOWN}{4}":GOTO33
       0
AK 130 REM ARRAY VALUES FOR AC
       COMPANIMENT TO THE IMPR
       OVISATIONS
MH 140 DATA0,0,0,0,5,152,11,48
       ,14,24,22,96,4,48,8,97,
       14,25,22,96
SS 150 DATA5,152,11,48,14,24,2
       2,96,4,48,8,97,4,112,8,
       225
HF 160 DATA4,180,9,104,15,210,
       22,96,3,35,6,71,15,210,
       22,96
PB 170 DATA4,180,9,104,15,210,
       22,96,3,35,6,71,3,244,7
       ,233
DP 180 DATA4,48,8,97,14,239,21
       ,31,3,35,6,71,14,239,21
       ,31
CC 190 DATA4,48,8,97,14,239,21
       ,31,3,35,6,71,3,187,7,1
       19
CP 200 DATA4,48,16,195,4,180,1
       4,239,4,251,14,24,5,71,
       12,143
KJ 210 DATA5,152,11,48,4,48,14
       ,24,5,152,11,48,0,0,0,0
XE 220 REM A SHORT ROUTINE TO
       {SPACE}GIVE THE C-64 A
       {SPACE}LITTLE A.I. IN M
       USIC COMPOSITION
EJ 230 AI=INT(RND(0)*23)+1:NE=
       131
DB 240 IFAI>16THENON(AI-16)GOT
       O260,270,280,290,300,31
       0,320
RC 250 R=TU((AI*16)+P):RETURN
AA 260 R=0:RETURN
JC 270 R=2:RETURN
SF 280 R=3:RETURN
GE 290 R=5:RETURN
KH 300 R=7:RETURN
XG 310 R=8:RETURN
PE 320 R=0:RETURN
SA 330 PRINT"{HOME}{20 DOWN}
       {2 RIGHT}{7}{RVS} I AM
       {SPACE}MEMORIZING SIXTE
       EN TUNES NOW. "
HC 340 FORK=1TO16:READIN(K):NE
       XT
PC 350 FORI=0TO32:READH1(I),L1
       (I),H2(I),L2(I):NEXTI
QQ 360 FORT=0TO9:READH3(T),L3(
       T):NEXTT
MJ 370 FORTN=1TO512:READTUNES(
       TN):NEXT:TUNE=1
EP 380 FORS=1TO20:POKE1823+S,3
       2:POKE1863-S,32:FORD=1T
       O33:NEXTD:NEXTS
DR 390 L1=54272:L2=54279:L3=54
       286
QE 400 H1=L1+1:H2=L2+1:H3=L3+1
JX 410 V1=L1+4:V2=L2+4:V3=L3+4
HG 420 POKE54296,12:CH=1874:CO
       =56146
QM 430 POKEV1+1,10:POKEV1+2,70
FH 440 POKEV2+1,10:POKEV2+2,70
KP 450 POKEV3+1,10:POKEV3+2,75
       :POKEV3-1,8
HM 460 P=1:REM PLAY ACCOMPANIM
       ENT AND GET MELODY NOTE
        FROM MELODY ARRAY
GE 470 Q=Q+1:IFQ=17THENFORT=1T
       O111:NEXT:POKE53281,7:
       GOTO930
EA 480 PRINT"{HOME}{23 DOWN}
       {BLK}{10 SPACES}0 1 2 3
        4 5 6 7 8 9 "
BP 490 PRINT"{HOME}{19 DOWN}"
CK 500 PRINT"{7}"SPC(7)"{RVS}
       {SPACE}NOW PLAYING IMPR
       OV."CHR$(IN(Q))"{RVS} #
       ";Q;"{LEFT} "
XH 510 POKEV1,32:POKEV2,32:POK
       EV3,64:NT=NT+1
DE 520 GETA$:NE=150:IFA$=""THE
       NA$="5"
XM 530 IFA$="{F7}"THENFLAG=0:T
       UNE=1:RA=0:PRINT"{HOME}
       {3 DOWN}{1}","
       {3 SPACES}{RVS} SHORT-T
       UNES{2 SPACES}":GOSUB92
       0
HM 540 IFA$="{F5}"THENFLAG=0:T
       UNE=0:RA=0:PRINT"{HOME}
       {3 DOWN}{BLU}","
       {2 SPACES}{RVS} NOW YOU
        PLAY. ":GOSUB910
EA 550 IFA$="{F3}"THENFLAG=1:T
       UNE=0:RA=0:PRINT"{HOME}
       {3 DOWN}{4}","
       {2 SPACES}{RVS} C-64 CO
       MPOSES.":GOSUB900
GQ 560 IFA$="{F1}"THENFLAG=0:T
       UNE=0:RA=1:PRINT"{HOME}
       {3 DOWN}{RED}","
       {2 SPACES}{RVS} C-64
       {2 SPACES}RANDOM. ":GOS
       UB890
DC 570 R=VAL(A$):IFFLAGTHENGOS
       UB230
JB 580 IFRATHENR=INT(RND(1)*10
       )
MH 590 IFTUNETHENR=TUNES(NT)
PD 600 IFR>9THENR=0
XK 610 POKEH1,H1(P):POKEL1,L1(
       P):POKEH2,H2(P):POKEL2,
       L2(P)
AJ 620 IFP=31THENR=1
XJ 630 IFP=32THENR=0
PM 640 IFH3(R)=0GOTO660
JB 650 POKEH3,H3(R):POKEL3,L3(
       R):POKEV3,65
KF 660 POKEV1,33:POKEV2,33:POK
       ECH+40+(R*2),CH(R):POKE
       CO+40+(R*2),CO(R)
BQ 670 FORT=1TONE:NEXT
PR 680 POKECH+40+(R*2),32:P=P+
       1:IFP=33THENP=1:GOTO470
MR 690 A$="":GOTO510
XH 700 DATA0,0,22,96,25,30,28,
       49,33,135,37,162,44,193
       ,50,60,56,99,67,15
JP 710 REM EACH LINE OF DATA C
       ONTAINS THE NOTES FOR O
       NE LITTLE IMPROV.--16 D
       IFF.
PJ 720 DATA4,4,0,5,6,7,8,0,7,7
       ,0,8,7,6,5,0,4,4,0,2,4,
       7,9,0,9,8,7,4,6,0,1,0
RE 730 DATA4,5,6,5,4,5,6,5,7,8
       ,7,8,7,0,0,8,7,8,9,8,7,
       8,9,8,6,7,6,5,6,0,1,0
BM 740 DATA4,4,5,4,8,8,7,6,7,8
       ,7,6,5,0,6,5,4,9,7,9,4,
       9,7,0,9,9,4,4,6,0,1,0
XH 750 DATA1,2,3,4,1,2,3,0,7,6
       ,5,0,7,6,5,0,4,4,9,9,4,
       4,7,0,9,8,7,8,6,4,1,0
GK 760 DATA4,4,3,5,4,0,3,0,7,7
       ,6,5,7,0,5,0,4,4,2,3,4,
       4,4,0,9,9,8,7,8,6,1,0
SS 770 DATA4,4,8,6,4,4,8,6,7,7
       ,6,5,7,8,7,0,4,4,9,0,9,
       9,4,0,7,4,5,4,3,1,1,0
XG 780 DATA1,2,3,4,5,6,7,8,7,0
       ,5,0,7,6,5,0,4,9,7,9,4,
       0,7,0,9,7,4,5,6,0,1,0
AX 790 DATA3,3,3,0,3,3,3,0,2,2
       ,2,3,2,0,5,0,4,4,4,0,9,
       9,9,0,4,9,4,9,6,4,1,0
SB 800 DATA3,4,5,3,4,5,4,3,2,3
       ,2,7,2,0,5,0,4,9,4,7,9,
       7,4,0,9,8,7,5,6,0,1,0
JB 810 DATA4,4,5,4,8,8,7,6,7,7
       ,5,5,7,0,6,5,4,2,4,5,4,
       2,4,0,9,4,5,4,3,1,1,0
SE 820 DATA3,0,3,2,1,0,1,0,2,3
       ,2,5,2,3,2,0,4,4,4,9,4,
       4,4,0,9,8,7,4,6,6,1,0
JC 830 DATA8,9,9,0,8,7,6,0,7,8
       ,9,8,7,0,5,0,4,4,5,4,9,
       0,4,0,7,6,5,4,6,4,1,0
AB 840 DATA5,5,4,0,5,5,4,0,3,3
       ,2,0,3,3,2,0,4,4,7,0,4,
       4,9,0,4,4,5,4,3,1,1,0
HC 850 DATA1,3,4,5,6,5,4,3,2,3
       ,2,0,7,8,7,0,4,5,4,9,4,
       5,4,0,8,7,6,5,6,0,1,0
HP 860 DATA9,8,7,6,5,4,3,4,2,3
       ,4,5,7,6,5,0,9,4,4,5,4,
       9,4,0,9,8,7,4,6,6,1,0
BH 870 DATA4,5,4,6,4,5,4,0,2,3
       ,2,5,2,3,2,0,4,5,4,7,4,
       4,4,0,9,8,7,4,5,6,1,0
JR 880 REM INSTRUCTIONS FOR EA
       CH FUNCTION
GE 890 PRINT"{HOME}{14 DOWN}
       {RED} NOTE SEQUENCES US
       ING A RANDOM FUNCTION."
       :RETURN
MK 900 PRINT"{HOME}{14 DOWN}
       {4} THE C-64'S A. I. IN
        MUSIC COMPOSITION. ":R
       ETURN
MX 910 PRINT"{HOME}{14 DOWN}
       {BLU} NUMBERS FOR NOTES
        - LETTERS FOR RESTS. "
       :RETURN
BP 920 PRINT"{HOME}{14 DOWN}
       {7} THESE ARE THE TUNES
        WHICH I MEMORIZED. ":R
       ETURN
HE 930 PRINT"{CLR}{BLU}
       {4 RIGHT}THAT'S ALL THE
        GRAND IMPROVISOR"
SK 940 PRINT"{11 RIGHT}WILL PL
       AY FOR NOW."
```

Power BASIC:
Countdown Timer

Article on page 82.

Program 1: Countdown Timer—64 Version

```
QD 10 FORI=679TO733:READA:X=X+
      A:POKEI,A:NEXT
CG 20 IFX<>7836THENPRINT"DATA
      {SPACE}STATEMENT ERROR."
      :STOP
AQ 30 DATA 120,169,180,141,20,
      3,169,2,141,21
HP 40 DATA 3,88,96,198,162,165
      ,162,201,255,208
XS 50 DATA 28,198,161,165,161,
      201,255,208,20,198
PD 60 DATA 160,165,160,201,255
      ,208,12,169,79,133
KH 70 DATA 160,169,25,133,161,
      169,255,133,162,3?2
FQ 80 DATA 188,246,76,52,234
```

Program 2: Countdown Timer—128 Version

```
QK 10 FORI=3072TO3135:READA:PO
      KEI,A:X=X+A:NEXT
AB 20 IFX<>8696THENPRINT"DATA
      {SPACE}STATEMENT ERROR."
      :STOP
```

```
JJ 30 DATA 120,169,13,141,20,3
      ,169,12,141,21
PG 40 DATA 3,88,96,216,32,36,1
      92,176,3,76
PH 50 DATA 125,250,198,162,165
      ,162,201,255,208,28
XJ 60 DATA 198,161,165,161,201
      ,255,208,20,198,160
CK 70 DATA 165,160,201,255,208
      ,12,169,79,133,160
FS 80 DATA 169,25,133,161,169,
      255,133,162,32,25
QH 90 DATA 246,76,110,250
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

The Versatile CIRCLE

Article on page 68.

The Versatile Circle—Program 1

```
SX 10 SU=.1:CX=160:CY=100:AS=1
      .4:C=1
SM 20 COLOR 0,12:COLOR 4,14:CO
      LOR 5,14:GRAPHIC 0,1
AQ 30 INPUT"NO. OF SIDES (3,4
      {SPACE}OR 6) OR 0 TO QUI
      T";NS
EF 40 IF NS=0 THEN GRAPHIC CLR
      :END
GH 50 IF NS<>3 AND NS<>4 AND N
      S<>6 THEN 30
GX 70 YR=90:XR=AS*YR:SA=180/NS
      :EA=SA+360
DR 100 COLOR 0,7:COLOR 1,15:CO
       LOR 4,7:GRAPHIC 1,1
DA 130 CIRCLE C,CX,CY,XR,YR,SA
       ,EA,0,360/NS
FX 160 GETKEY A$:GOTO 20
```

The Versatile Circle—Program 2

```
SX 10 SU=.1:CX=160:CY=100:AS=1
      .4:C=1
SM 20 COLOR 0,12:COLOR 4,14:CO
      LOR 5,14:GRAPHIC 0,1
AQ 30 INPUT"NO. OF SIDES (3,4
      {SPACE}OR 6) OR 0 TO QUI
      T";NS
EF 40 IF NS=0 THEN GRAPHIC CLR
      :END
GH 50 IF NS<>3 AND NS<>4 AND N
      S<>6 THEN 30
GX 70 YR=90:XR=AS*YR:SA=180/NS
      :EA=SA+360
DK 80 H=↑/NS:S=SIN(H):T=TAN(H)
      :RF=SQR(4*S*S*SU*(SU-1)+
      1)
PQ 90 DA=ATN(2*SU*T/((1-2*SU)*
      T*T+1))*180/↑
DR 100 COLOR 0,7:COLOR 1,15:CO
       LOR 4,7:GRAPHIC 1,1
EG 110 FOR NR=1 TO 20:EA=SA+36
       0
DA 130 CIRCLE C,CX,CY,XR,YR,SA
       ,EA,0,360/NS
HR 150 YR=RF*YR:XR=AS*YR:SA=IN
       T(SA+DA+.5):NEXT
FX 160 GETKEY A$:GOTO 20
```

The Versatile Circle—Program 3

```
RJ 10 SU=.1:CX=80:CY=100:AS=.7
SM 20 COLOR 0,12:COLOR 4,14:CO
      LOR 5,14:GRAPHIC 0,1
AQ 30 INPUT"NO. OF SIDES (3,4
      {SPACE}OR 6) OR 0 TO QUI
      T";NS
EF 40 IF NS=0 THEN GRAPHIC CLR
      :END
GH 50 IF NS<>3 AND NS<>4 AND N
      S<>6 THEN 30
PJ 60 B=4:IF NS=4 THEN B=3
GX 70 YR=90:XR=AS*YR:SA=180/NS
      :EA=SA+360
DK 80 H=↑/NS:S=SIN(H):T=TAN(H)
      :RF=SQR(4*S*S*SU*(SU-1)+
      1)
PQ 90 DA=ATN(2*SU*T/((1-2*SU)*
      T*T+1))*180/↑
BC 100 COLOR 0,2:COLOR 1,3:COL
       OR 2,6:COLOR 3,7:COLOR
       {SPACE}4,2:GRAPHIC 3,1
EG 110 FOR NR=1 TO 20:EA=SA+36
       0
HM 120 C=0:FOR W=1 TO NS:EA=SA
       +360/NS:C=C+1:IF C=B TH
       EN C=1
DA 130 CIRCLE C,CX,CY,XR,YR,SA
       ,EA,0,360/NS
AG 140 SA=SA+360/NS:NEXT
HR 150 YR=RF*YR:XR=AS*YR:SA=IN
       T(SA+DA+.5):NEXT
FX 160 GETKEY A$:GOTO 20
```

The Versatile Circle—Program 4

```
BJ 10 COLOR 0,12:COLOR 4,14:CO
      LOR 5,14:GRAPHIC 0,1:AS=
      .7
CR 20 PRINT"{5 DOWN}";SPC(14);
      "T - TRIANGLES":PRINT
XF 30 PRINT SPC(14);"S - SQUAR
      ES":PRINT
CH 40 PRINT SPC(14);"H - HEXAG
      ONS":PRINT
KB 50 PRINT SPC(14);"Q - QUIT"
      :PRINT:PRINT
XQ 60 PRINT:PRINT SPC(11);"PRE
      SS T, S, H, OR Q";
XJ 70 GETKEY A$:IF A$<>"T" AND
       A$<>"S" AND A$<>"H" AND
       A$<>"Q" THEN 60
RR 80 IF A$="Q" THEN SCNCLR 0:
      GRAPHIC CLR:END
AC 90 COLOR 0,1:COLOR 1,7:COLO
      R 2,5:COLOR 3,4:COLOR 4,
      1:GRAPHIC 3,1
JP 100 IF A$="S" THEN 290
GB 110 IF A$="H" THEN 390
RC 120 SU=.1:II=1:RF=SQR(1-3*S
       U+3*SU*SU)
KJ 130 DA=ATN(SQR(3)*SU/(2-3*S
       U))*180/↑
CD 140 C=1:FOR J=0 TO 3:II=-II
       :JJ=1:C=J+1:IF C=4 THEN
        C=1
RA 150 P=C+1:IF P=4 THEN P=0
PS 160 FOR I=0 TO 6:JJ=-JJ:IF
       {SPACE}I<J OR I>6-J THE
       N 270
FF 170 YR=32:XR=AS*YR:CX=23+19
       *I:CY=180-48*J-(I AND 1
       )*16+(J AND 1)*JJ*16
KK 180 C=C+1:IF C=4 THEN C=1
JX 190 P=P+1:IF P=4 THEN P=1
XE 200 IF II=JJ THEN A=0:R=1:W
       =C
FM 210 IF II<>JJ THEN A=180:R=
       -1:W=P
RQ 220 IF I=3 AND J=2 THEN W=3
JF 230 FOR NR=1 TO 11:FOR S=1
       {SPACE}TO 3:IF II=JJ TH
       EN W=W+1:IF W=4 THEN W=
       1
EH 240 IF II<>JJ THEN W=W-1:IF
        W=0 THEN W=3
FJ 250 CIRCLE W,CX,CY,XR,YR,A,
       A+120,,120:A=A+120:NEXT
        S
CQ 260 YR=RF*YR:XR=AS*YR:A=360
       +A+R*DA:NEXT NR
QS 270 NEXT I,J
JG 280 GETKEY A$:GOTO 10
KA 290 SU=.12:RF=SQR(1-2*SU+2*
       SU*SU)
EG 300 DA=ATN(SU/(1-SU))*180/↑
       :C=1
QH 310 FOR I=0 TO 3:C=C+1:IF C
       =3 THEN C=1
SM 320 FOR J=0 TO 3:IF C=1 THE
       N C=2:ELSE C=1
AG 330 YR=31.82:XR=AS*YR:CX=35
       +30*I:CY=166-44*J
PP 340 A=45:R=1:IF (I AND 1)=(
       J AND 1) THEN A=135:R=-
       1
EK 350 FOR NR=1 TO 15:FOR S=1
       {SPACE}TO 4:C=C+1:IF C=
       3 THEN C=1
AC 360 CIRCLE C,CX,CY,XR,YR,A,
       A+90,,90:A=A+90:NEXT S
QM 370 YR=RF*YR:XR=AS*YR:A=360
       +A+R*DA:NEXT NR,J,I
HJ 380 GETKEY A$:GOTO 10
AS 390 SU=.2:RF=SQR(1-SU+SU*SU
       )
GB 400 DA=ATN(SQR(3)*SU/(2-SU)
       )*180/↑
BM 410 FOR J=0 TO 2:FOR I=0 TO
        2:IF J=0 AND I<>1 THEN
        470
JQ 420 E=4:IF I=1 THEN E=31
FB 430 YR=31:XR=AS*YR:CX=47+32
       *I:CY=186-54*J-E:A=30:C
       =0
JC 440 FOR NR=1 TO 20:FOR S=1
       {SPACE}TO 6:C=C+1:IF C=
       4 THEN C=1
BF 450 CIRCLE C,CX,CY,XR,YR,A,
       A+60,,60:A=A+60:NEXT S
SX 460 YR=RF*YR:XR=AS*YR:A=A+D
       A:NEXT NR
RP 470 NEXT I,J
BC 480 GETKEY A$:GOTO 10
```

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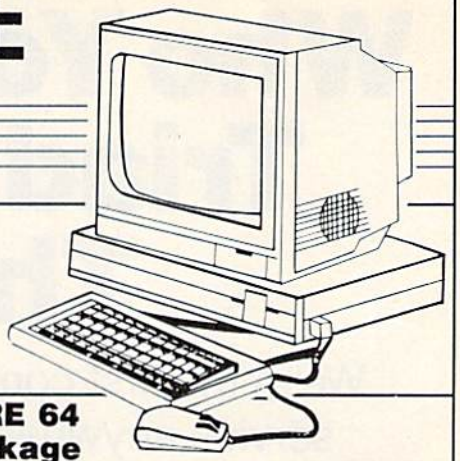

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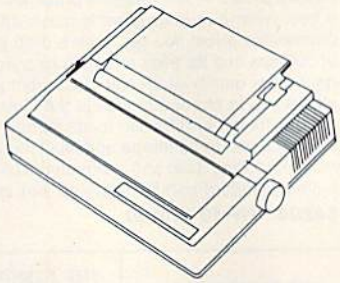

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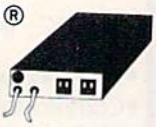

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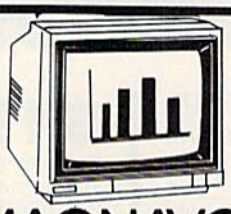

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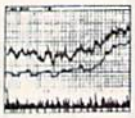

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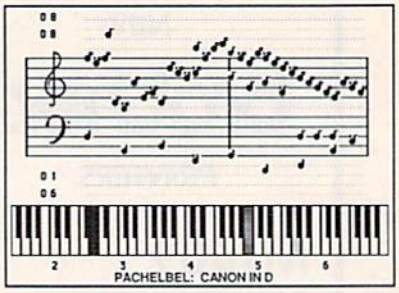

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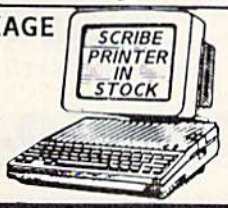

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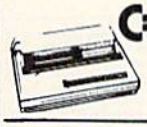

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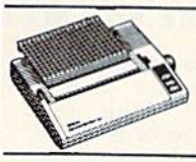

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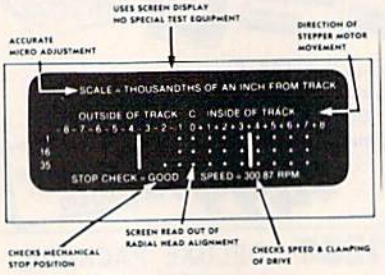

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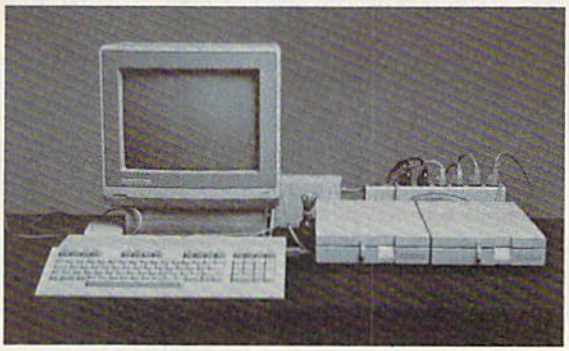

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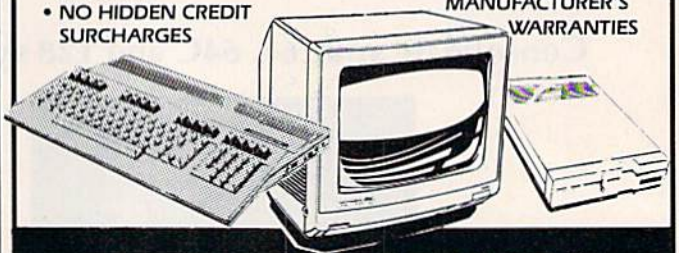

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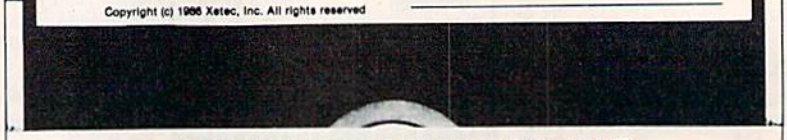

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- Supports more than 100 printers
- 80 columns
- PRG file merge
- File names can be picked from disk directories
- 4 keyboard macros
- Headers/footers
- Page number in decimal or Roman
- On screen underlining/highlighting of text blocks
- On screen status display, including pictures of fonts
- New font preview displays printer output on screen
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- Multi-color help screens
- Right-to-left editing features for foreign languages
- Loads in approximately 15 seconds with 1571 drive
- New formatters for inserting graphics into documents

Word Processing Printing Features

- 50 + two-letter format controls (embedded in text files)
- Fractional character spacing used on word-wrap, justification, centering, and right alignment
- Proportional spacing (user-adjustable)
- Columnar printing (up to 4 columns)
- Overlaying of 2 or more characters (for phonetic markings, diacritics, etc.)
- 30 single-keystroke text modifiers (embedded in text files)
- Combine any or all of the following effects: underlining (adjustable) more than 20 pitches : more than 50 line spacing sizes : condensed text : boldfacing : inversion (white letters on black) : superscripts (adjustable) : 3 text heights (micro-normal-tall)

Setup Module

- Two system setups can be made. In each, user can select his preference of: colors (screen, text, cursor), printer interface (20 choices), and printer (over 100 choices)

Font & Character Set Creators

- Disk commands for maintenance of fonts or sets
- Grid for character creation/editing (manipulated with cursor keys, joystick, or light pen)
- Editing commands include: invert, flip, negate, shift, clear, copy
- Character can be printed while editing (font creator only)

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Burgondy	Hairpin	Olde English	Tech
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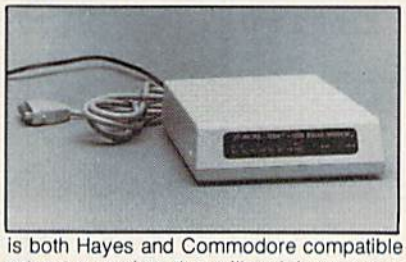

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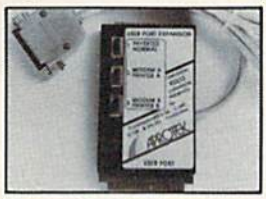

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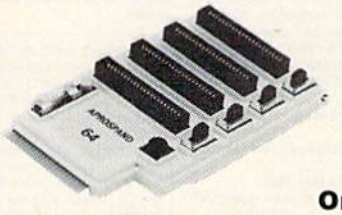

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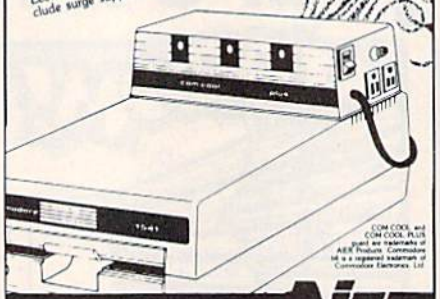

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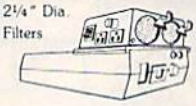

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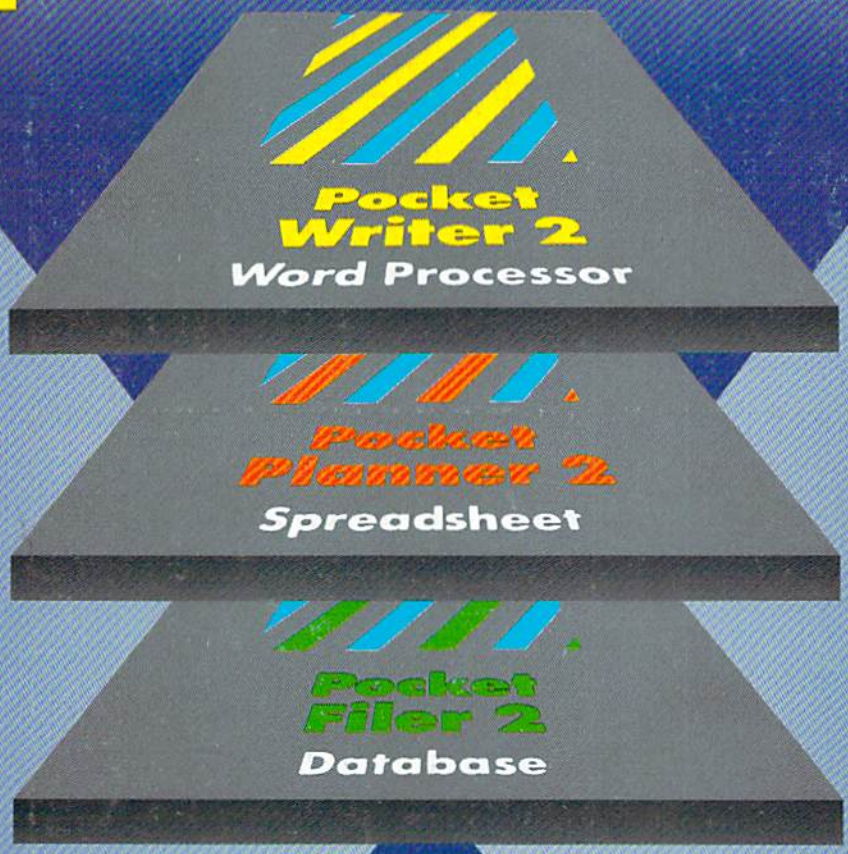

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