Buyer's Guide To Modems

COMPUTE!'s GAZETTE

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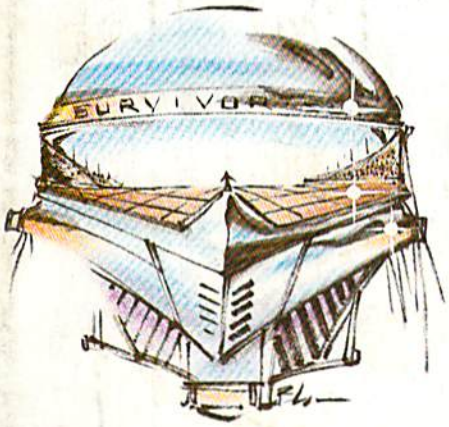

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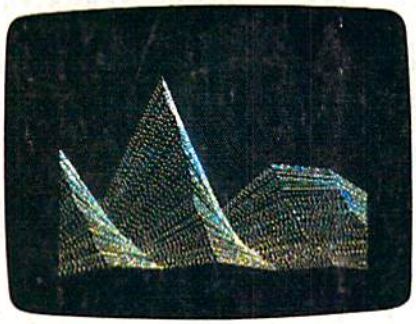

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Going online is easier and better than ever—especially for Commodore users.

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Also In This Issue:

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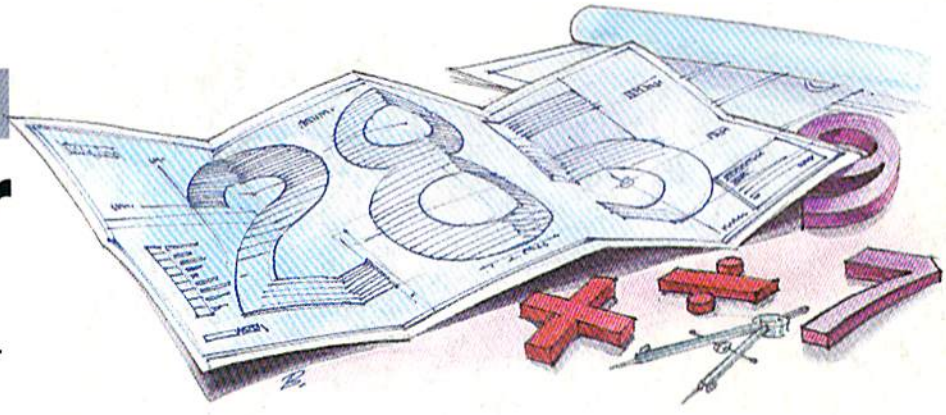

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Search For The Best High Quality Graphic Printer

If you have been looking very long, you have probably discovered that there are just too many claims and counter claims in the printer market today. There are printers that have some of the features you want but do not have others. Some features you probably don't care about, others are vitally important to you. We understand. In fact, not long ago, we were in the same position. Deluged by claims and counter claims. Overburdened by rows and rows of specifications, we decided to separate all the facts — prove or disprove all the claims to our own satisfaction. So we bought printers. We bought samples of all the major brands and tested them.

Our Objective Was Simple

We wanted to find that printer which had all the features you could want and yet be sold directly to you at the lowest price. We didn't want a "close-out special" of an obsolete product that some manufacturer was dumping, so we limited our search to only those new printers that had the latest proven technology. We wanted to give our customers the **best** printer on the market today at a bargain price.

The Results Are In

The search is over. We have reduced the field to a single printer that meets all our goals (and more). The printer is the SP-1000 from Seikosha, a division of Seiko (one of the foremost manufacturers in the world). We ran this printer through our battery of tests and it came out shining. This printer *can* do it all. Standard draft printing at a respectable 100 characters per second, and with a very readable 12 (horizontal) by 9 (vertical) character matrix. This is a full bi-directional, logic seeking, true descender printer.

"NLQ" Mode

One of our highest concerns was about print quality and readability. The SP-1000 has a print mode termed Near Letter Quality printing (NLQ mode). This is where the SP-1000 outshines all the competition. Hands down! The character matrix in NLQ mode is a very dense 24 (horizontal) by 18 (vertical). This equates to 41,472 addressable dots per square inch. Now we're talking ***quality*** printing. It looks like it was done on a typewriter. You can even print graphics using the standard graphics symbols built into your computer. The results are the best we've ever seen. The only other printers currently available having resolution this high go for hundreds more.

Features That Won't Quit

With the SP-1000 your computer can now print 40, 48, 68, 80, 96, or 136 characters per line. You can print in ANY of 35 character styles including 13 double width and 3 reversed (white on black) styles. You not only have the standard Pica, Elite, Condensed and Italics, but also true Superscripts and Subscripts. Never again will you have to worry about how to print H_2O or X^2. This fantastic machine will do it automatically, through easy commands right from your keyboard. Do you sometimes want to emphasize a word? It's easy, just use **bold** (double strike) or use *italics* to make the words stand out. Or, if you wish to be even more emphatic, underline the words. You can combine many of these modes and styles to make the variation almost endless. Do you want to express something that you can't do with words? Use graphics with your text — even on the same line. You have variable line spacing of 1 line per inch to infinity (no space at all) and 143 other software selectable settings in between. You can control line spacing on a dot-by-dot basis. If you've ever had a letter or other document that was just a few lines too long to fit a page, you can see how handy this feature is. Simply reduce the line spacing slightly and ... VOILA! The letter now fits on one page.

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Consistent Print Quality

Most printers have a ribbon cartridge or a single spool ribbon which gives nice dark printing when new, but quickly starts to fade. To keep the printers output looking consistently dark, the ribbons must be changed quite often. The SP-1000 solves this problem by using a wide (½") ribbon cartridge that will print thousands of pages before needing replacement. (When you finally do wear out your ribbon, replacement cost is only $11.00. Order *#2001.)*

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editor's notes

Happy New Year. If these are the March Editor's Notes, it must be January 3. The radio this morning brought news that Commodore has announced that its manufacturing facility in Great Britain, closed for the Christmas holidays, will not be reopened. Two hundred and seventy manufacturing employees will lose their jobs. Commodore will maintain its marketing operation in Great Britain, which employs 170.

At least this new year is behaving in a consistent fashion. Jack Tramiel's Atari Corporation has announced that the Atari ST will be moving out into the fast lane—the mass merchandisers will soon be selling an unenhanced version for a price projected to be less than $500. Specialty stores are to be selling the newly enhanced mega-version.

The Winter Consumer Electronics Show is one week away, and we're anxious to see who's doing and not doing what in support of, or anticipation of, whom. You'll get all the details in next month's issue. This issue, we think, is a strong one, with a number of excellent articles and programs. The telecommunications area has undergone some major changes in recent months, and has opened up in a large way to Commodore owners. "What's New Online for Commodore" explores the growing number of choices and includes lots of helpful information for newcomers and experienced online users alike. For those on the verge of exploring this exciting field, "A Buyer's Guide to Modems" should take the mystery out of making that important hardware choice.

If you're considering the purchase of a Commodore 128, or if you've just bought one, be sure to see "Storage and Display: Using Peripherals with the 128," an excerpt from a new release by COMPUTE! Books. Commodore 128 owners will also be interested in "128 Auto Boot," a four-program set that lets you automatically load and run a program—from 128 or 64 mode with a 1571 or 1541 disk drive—after turning on your 128.

Disk drive owners who have been programming or typing in programs for any time at all will find "Cataloger" a useful organizational tool. It makes it easy to find any program on any disk in your collection, and includes several extra thoughtful features. It's designed for 128, 64, Plus/4, and 16 users. Another highly useful tool in this issue is "The Coordinator," a carefully designed package for the Commodore 64 graphics programmer. It offers a full-featured system that lets you create and save high-resolution color screens, all with the speed and efficiency of machine language.

Two well-designed programs of educational value are "Number Construction Kit," for the 64, Plus/4, and 16, and "Clavier 64." The former is a clever way to practice and reinforce math skills. It includes three skill levels that cover a range of ages and abilities. Although it's primarily designed for math students younger than most of us here at COMPUTE!, we found it to be an entertaining challenge, sometimes embarrassingly so. Clavier 64 is an impressive three-voice music composer and player that's suitable for the casual tinkerer or serious composer. It can handle up to 35K of music data.

The games in this issue are each two-player contests that will provide hours of entertainment. "Survivor" and "Shifter" challenge the hand and eye as well as the mind. Both are designed to run on the 64, Plus/4, and 16.

In the months ahead, we have some excellent features, entertainment and educational software, and programming tools—all in all, the best value we can offer to Commodore owners. See you next month.

Robert C. Lock

Editor In Chief

Janice Elko

Editor

A Special Request

We remain keenly interested in tutorial and applications articles written by you, our readers. Many of you may not realize it, but much of what we publish here is freelance material contributed by you. Of necessity, we require creativity, a bit of uniqueness, topics we haven't covered fully or recently, and completeness. From our side we try to respond quickly, and urge that you understand in advance that, unavoidably, we many times feel that a particular topic has already been covered, or your submission happens to be ever so slightly overshadowed by someone else's on the same or a similar topic. We look forward to hearing from you.

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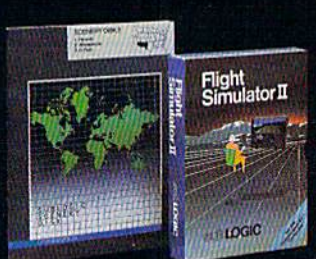

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Taking The Plunge

I am definitely going to buy a computer, but I know nothing about them. I would be using it for a monthly newsletter, reports for my three teenagers, checkbook balancing, and recipe filing. In my job at the Board of Education, I maintain lists of students who get free and reduced lunches. It would certainly save time if additions and deletions could be handled by the computer.

I had planned to buy a 64, but now there is the 128, and a friend advised me to wait for a new one that is a big improvement. Which computer should I buy?

Eleanore Palmison

We can't recommend one computer over another because there's no single "best" computer; each has advantages and drawbacks. But we can offer some suggestions for the first-time computer buyer.

Many experts advise shopping for software first. When you find a program that does what you want, buy the computer that can run it.

If you decide to look at software first, there are three general types of programs you'll want to look at: word processors, spreadsheets, and database managers. A word processing program manipulates text; it could be used for writing a newsletter or for your children's school reports. A spreadsheet manipulates numbers, which makes it suitable for balancing a checkbook or keeping track of a budget. A database management program manipulates information (a base of data), so it could be used to store your recipe file.

Any one of these three types of software could handle the list of students who receive reduced lunches, depending on what you need to do with the list. A word processor would be fine for adding and subtracting names and printing the final list. If you track lunches week by week to figure out percentages and budget numbers, you could use a spreadsheet. Finally, a database manager would be the right choice for alphabetizing names or calculating how many lunches are served in each school.

Consider also the age of the computer. A brand new computer might be very powerful, but you might have to wait some time for software to become available, perhaps a few months, perhaps a year or more. On the other hand, once a company has discontinued manufacturing a line of computers, software companies become reluctant to develop new programs. Often you'll see a new computer with little software available now, but much planned for the future. Mature computers are just the opposite: much software available now, but almost no new software planned for the future. The 128 is a curious mix of old and new: There's a lot of software for its CP/M and 64 modes, but very little for the 128 mode. You can expect to see more 128 software in the future.

Compatibility may be a factor in your decision about which computer to buy. If you use an IBM at work, there's a lot to be said for buying a computer that can read IBM disks if you think you might be bringing work home. On the other hand, if your children use Commodores at school, Commodore-compatibility would be a key consideration.

For many new buyers, price is important. Compare the cost of a system. If you plan to do word processing, remember that you'll need not only a computer, but a television or monitor, disk drive, and printer (and possibly an interface for the printer). Of the computers you're considering, the 64 is the least expensive, with the 128 costing slightly more.

Finally, talk to friends and relatives who own a computer. They should be able to provide suggestions and advice.

Escape From Lockup

I have found a way to get out of a locked up program with a Commodore 16 or Plus/4 without erasing the contents of memory. Hold down the RUN/STOP key while pressing and releasing the reset button. You will then be in the machine language monitor. Press X (for eXit) and type LIST to see that your program is still there. It's that simple!

Troy Pladson

Readers with a Plus/4, 16, or 128 can take advantage of this reset sequence, but VIC and 64 owners cannot (they have neither a reset button nor a built-in monitor). Another option on the 128 is to hold down the Commodore logo key, right below RUN/STOP, while the computer is being reset. This puts you directly into 64 mode.

128 Resets, Unnews, And POKEs

I'm mixed up about the terms "warm start" and "cold start." The Radio Shack Color Computer has a black reset button which unlocks the computer following a lockup while retaining the program in memory. I was under the impression that this is a warm start.

Commodore also has a reset button on the side of the 128. But if you press it, the entire system resets, erasing everything in memory. Why does this warm start erase the program while the other doesn't?

Also, in the May 1985 issue, you provided a list of POKEs for the 64, VIC, Plus/4, and 16 to disable certain commands or keys. Do you have the equivalent values for the 128?

Sean Conley

Technically, "cold start" is a complete reset of the computer while "warm start" is partial reset, a way to recover from a lockup without losing the program in memory. In practice, you'll often find these terms used interchangeably.

Turning the computer off and on performs the most extreme cold start, one in which all programs and variables are lost. On the 128, there are other means of resetting the computer (see the previous letter). If you press the reset switch by itself, the BASIC program is NEWed, and the 128 checks for a boot program on the disk. If a bootable disk is in the drive, it loads and runs; if not, you're left in BASIC.

There is a way to recover your BASIC program at this point. If it's a 128 BASIC program, type in the following line to UNNEW the program:

```
BANK 15:POKE(PEEK(45) + PEEK(46)
*256),1:SYS 24293
```

This line will not work correctly if you had previously allocated a hi-res

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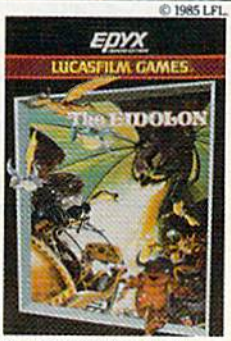

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graphics area. If you had been working with hi-res graphics, type **GRAPHIC 1:GRAPHIC 0** *before entering the POKE and SYS above.*

If you were working on a program in 64 mode, hold down the Commodore key while pressing the reset button. To recover the program, type:

POKE 2050,1:SYS 42291:POKE 45,PEEK (34):POKE 46,PEEK(35):CLR

Holding down the RUN/STOP key while pressing the reset switch is yet another type of reset. The machine is "unlocked" and you're left in the machine language monitor. Type X to exit to BASIC. Your 128 BASIC program remains intact.

In addition to these hardware techniques, you can reset the 128 by typing SYS 65341 (comparable to 64738 on the 64 and 64802 on the VIC). This SYS accesses a ROM routine which leaves you in BASIC and NEWs out the BASIC program. The techniques above will allow you to recover the program that was in memory.

Finally, the least destructive method of (partially) resetting the machine is to hold down the RUN/STOP key and press RESTORE. This allows you to recover from minor lockups without destroying your program or its variables.

Here are the POKEs you requested for the 128:

Disable LIST	**POKE 775,139**
Enable	**POKE 775,81**
Disable SAVE	**POKE 818,180**
Enable	**POKE 818,78**
Disable LOAD	**POKE 816,0**
Enable	**POKE 816,108**
Disable RUN/STOP	**POKE 808,100**
Enable	**POKE 808,110**
Disable RESTORE	**POKE 792,125**
Enable	**POKE 792,64**
Disable keyboard	**POKE 2592,0**
Enable	**POKE 2592,10**
No keys repeat	**POKE 2594,64**
All keys repeat	**POKE 2594,255**
Some keys repeat (space bar, INST/DEL, cursor keys)	**POKE 2594,0**
Clear keyboard buffer (before INPUT)	**POKE 208,0**
Change character color (numbers 0–15 correspond to colors 1–16)	**POKE 241,x**
Remove line numbers from LIST	**POKE 24,37**
Enable line numbers	**POKE 24,27**

Slower Listings

First, how do you slow down the listing of a long program? Second, I've been trying to convert some Apple programs to the 64, with limited success. How do you translate lines containing PEEKs and POKEs?

Richard K. Forsyth

On a VIC or 64, you can slow a listing to the screen by holding down the CTRL key. Press STOP to stop the listing altogether. To restart, you'll have to enter LIST again. There are utilities available to temporarily freeze the listing (SHIFT–LOCK does this in "MetaBASIC," which was published in the April 1985 issue of COMPUTE!'s GAZETTE). Some utilities even allow you to scroll forward and backward through the listing.

To achieve the same effect on a Plus/4, 16, or 128, hold down the Commodore key in the lower lefthand corner. These machines permit the use of CTRL-Q and CTRL-S to temporarily freeze and unfreeze the listing. The 128 also has a NO SCROLL key for pausing output to the screen.

Your second question is a little more difficult. Translating programs from one machine to another requires a good knowledge of both operating systems. Fortunately, there are many similarities in various dialects of BASIC. For example, FOR-NEXT loops are basically the same on most computers.

But PEEK and POKE are machine-level commands. You need to find out what the PEEK or POKE does on the Apple. Does it check to see if a key is pressed? Does it change the screen color? Once you know how it functions, you can figure out the equivalent on the 64. A memory map is almost a necessity when you're trying to convert POKEs. See "Machine Language For Beginners" elsewhere in this issue for more about memory maps.

Keys With No Character

I've been trying without success to read the SHIFT, CTRL, Commodore, and RESTORE keys. Can you help?

Juan Pablo Vicente

If you're using GET or INPUT, you won't be able to tell if any of those four keys is pressed. Here's why:

Most keys put printable letters or numbers on the screen. Others do something to the screen—clear it, change the cursor to a new color, move right a character, delete a character, and so on. Each character has its own ASCII number and a shape that can be displayed on a screen or printer. Control codes also have ASCII numbers and, while they're not printable, they have a visible effect on the screen.

But the SHIFT, CTRL, and Commodore keys have neither ASCII values nor character shapes. They're almost never used alone; they're usually held down while another key is pressed. In uppercase/graphics mode, typing a SHIFT-S prints a heart character, Commodore-S prints a corner graphic, and CTRL-S homes the cursor. Each regular key can have up to four definitions, depending on whether these three keys are up or down.

Although you can't use GET or INPUT for these three keys, there is a way to read them. Try the following one-line program (for VIC and 64):

10 PRINT PEEK(653):GOTO 10

Your letter didn't say which computer you own, but if you own a Plus/4 or 16, substitute 1347 for 653 in the program above. Commodore 128 owners using 128 mode should PEEK location 211. The numbers printed on the screen have the following meanings:

0	*No shift key*
1	*SHIFT*
2	*Commodore*
4	*CTRL*

If more than one key is down, the numbers will be added together. Thus, pressing both SHIFT and CTRL will return a value of 5 (1 + 4). In addition, the 128 returns a value of 8 for the ALT key, and 16 for CAPS LOCK.

The RESTORE key is another matter. It's directly wired into one of the interface chips. Pressing it triggers an interrupt which, among other things, checks for the RUN/STOP key. Reading the RESTORE key is not impossible, but it's not a matter of a PEEK or two. You'd need a machine language wedge to intercept the interrupt-handling routine.

Our Readers Are Writers

I'm writing a program for my VIC and 64 and would like to sell it to your magazine. What do I have to do?

Patrice Côté

Many of our programs are written by our readers. Elsewhere in this issue is the "COMPUTE's Gazette Author's Guide," which includes guidelines for submitting programs. Also, individual copies of the Author's Guide are available on request. (Please include a self-addressed stamped envelope.)

The two most important things to include are a disk (or tape) containing the program and instructions on what it does. Submissions are reviewed carefully by several staff members. If we decide we'd like to publish it, we send a contract to the author. If the author agrees to the price, he signs and returns the contract. Sometimes we do not accept what are often excellent programs, however. This can happen for several reasons: The program may be too long to publish, it may be too similar to an article we have scheduled for an upcoming issue, or it may be inappropriate for our audience. We welcome all submissions from readers, and wish to emphasize again that every program submitted is carefully reviewed.

For Numbers Only

I have a program that uses two arrays and saves the data in them to disk. About half the time, when I read the

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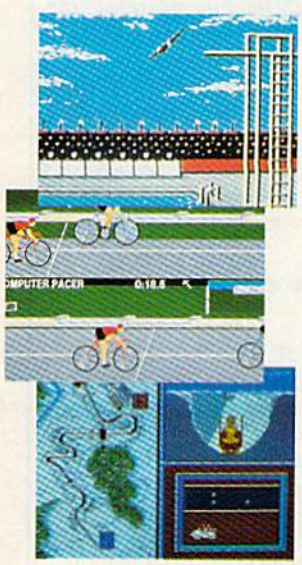

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file, I get a FILE DATA error. The program works fine until I save and reload the data. Is there a way to avoid this problem?

Ron McAdow

You didn't include a copy of your program, so we can only guess where your problem may lie. It's likely that your program is trying to read numeric data but is receiving strings—alphanumeric characters—instead. The FILE DATA error which you encountered is equivalent to the REDO FROM START error which occurs during keyboard input. We can easily trigger this error. First, type in the following one-line BASIC program:

10 INPUT A

Here, variable A is used to store a number and thus is known as a numeric variable. For inputting character string data, you'd have to change A to A$ (the dollar sign designates the variable as a string type).

Type RUN. When prompted by the question mark (which means the computer is waiting for input), type in some character other than a number. Press RETURN and a REDO FROM START error message will be displayed on the screen.

The same restriction regarding data types applies when inputting data from the disk. For instance, the statement **10 INPUT#1,A** *attempts to read numeric information from file number 1 (assuming you opened file one to a disk file). If the file contains string data instead of numbers, a FILE DATA error results. The program asks the file for numeric information, but gets non-numeric characters instead.*

So, to fix your problem, check the data output and input routines. Make sure that the types of data accessed are in parallel between these two routines. In other words, data saved as numeric data to the disk should only be loaded back in as numeric data. The same should be true of any string data.

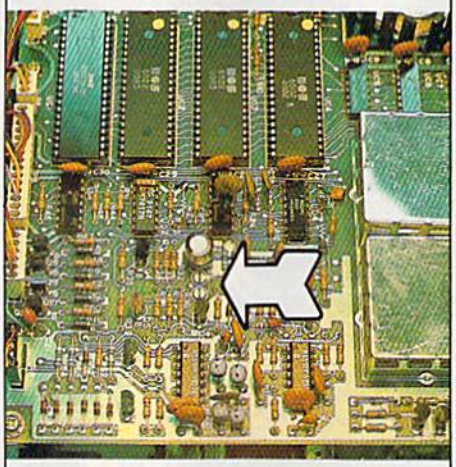
Also, you noted that you were using the save-with-replace command to save over files with the same name. This routine is known to contain bugs on the 1541 (it is uncertain whether this error affects the newer 1571 as well). It is preferable to scratch the old data file before saving another one by the same name.

Disk Device Numbers

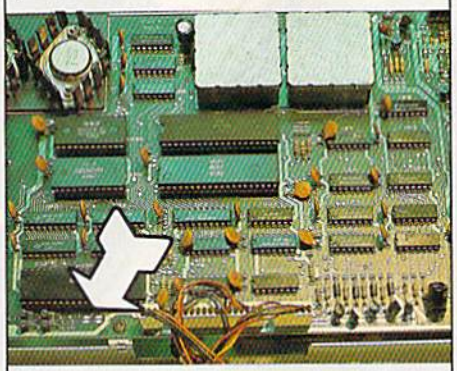
I've tried to change the device number of a 1541 drive by the hardware method in the User's Manual, but I can't find the device number jumpers.

Isao Sakata

First unplug your disk drive and open it by removing the screws on the bottom. You may also have to remove a perforated metal shield. Look for two circular areas. Each is divided in half, with the two halves connected by a thin piece of solder. You can find the jumpers near the center of the circuit board, near the front. Your disk drive should look like this if it has a tan case (the same color as the 64):



If you have an older 1541 with the white case, the color of a VIC-20, the jumpers are on the left edge:



In both drives, jumper 1 is nearest to the front of the drive. Jumper 2 is towards the rear. To change the device number, cut the solder traces as follows:

Jumper 1	*Jumper 2*	*Device Number*
whole	*whole*	*8*
cut	*whole*	*9*
whole	*cut*	*10*
cut	*cut*	*11*

Take a sharp object and scrape away the solder that connects the two halves. Do this very carefully, to avoid damaging the circuit board.

Some of our readers have replaced the solder traces with switches, so the device number can be easily changed. We don't recommend doing this unless you're good with a soldering iron.

Copying Tape Files To Disk

I have a tape-based address file program that uses sequential text files. I now have a disk drive and would like to know if there is a routine that would copy the tape file to disk.

Robby Obendorf

The following program will do the job. Wind the tape to just before the beginning of the file you want to copy then put a disk with enough room to hold the file into the disk drive. Now run the copy program. It will ask you to press play on tape, then after the file is done copying, the message DONE appears on the screen.

```
10 INPUT"{CLR}{3 DOWN}FILENAME
   ";N$
20 OPEN 1,1,0,N$:OPEN 2,8,2,N$
   +",S,W"
30 GET#1,A$:IFST=64THENCLOSE2:
   CLOSE1:PRINT"{CLR}
   {3 DOWN}DONE":END
40 PRINT#2,A$;:GOTO30
```

The program is very simple. Line 10 inputs the name of the file you want to copy. In line 20, a file is opened to read from tape and another is opened to write to disk.

Line 30 gets characters until the reserved variable ST is equal to 64. ST is a reserved system variable that changes values depending on certain conditions. The variable ST is set to 64 when the end of file is reached. Once this happens, the files are both closed and the program ends. Line 40 outputs the character received from tape to the disk drive.

Undimension For 128

The April 1985 "Hints & Tips" describes a useful procedure for "undimensioning" arrays without affecting other variables. POKE 49,PEEK(47): POKE 50,PEEK(48) does it on the 64. Can you tell us the equivalent POKEs for the 128?

R.L. Clark

Many computers, including the Commodore 64 and 128, use a series of memory locations (usually in zero page) to keep track of the location of beginning and ending addresses for BASIC text, variables, and strings. For example, locations 43–44 (45–46 for the 128) hold the address of the start of BASIC text in low-byte, high-byte format.

Here's a list of some of the important zero-page pointers in the Commodore 64 and 128:

Function	*Commodore 64*	*Commodore 128*
Beginning of BASIC text	*43–44*	*45–46*
End of BASIC text	*45–46*	*4624–4625*
Start of variables	*45–46*	*47–48*
Start of arrays/End of variables	*47–48*	*49–50*
End of arrays (+1)	*49–50*	*51–52*
Bottom of string storage	*51–52*	*53–54*

On the 64, free memory is any address between end of arrays and the bottom of string storage. That section—in bank one—is free on the 128, which also has free memory above the end of BASIC text. (Programs and variables must share memory on the 64, but they have their own banks of memory on the 128.)

One way to redimension an array is

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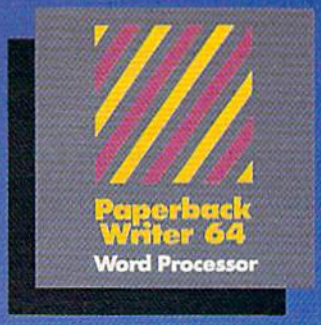

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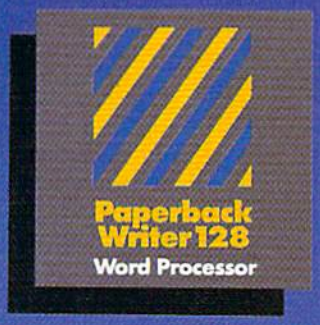

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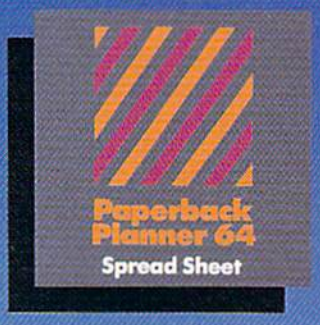

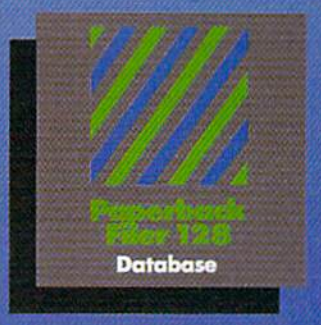

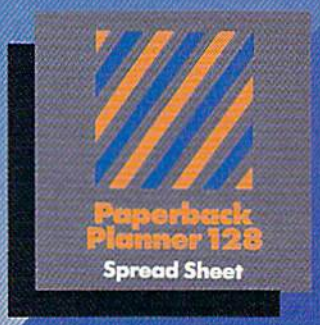

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to use the CLR command. This command sets all the variable pointers to the end of BASIC text. Although this does not actually erase the variables in memory, they can no longer be read. The CLR command clears all variable types.

The technique you mentioned (for the 64) clears out arrays only by moving the value in the start of arrays pointer into the end of arrays pointer. The following program for the 128 uses this same technique to redimension an array while retaining the value of other variables.

```
10 DIM A(10):C=4
20 POKE 51,PEEK(49):POKE 52,PE
     EK(50)
30 DIM A(10):PRINT C
```

Commodore Modems And Compatibility

Will my VICModem, which I did not use at all with my VIC-20, work with my 64?

Richard Gray

Yes and no. A modem by itself is just an input/output device. It's as compatible as a joystick—if a joystick works on the VIC, it will work on a 64, but you must PEEK different locations to read it.

You can plug the VICModem into your 64, but software is required to send and receive characters. The hardware (the modem) is compatible, but a VIC terminal program probably won't run on your 64, unless it's a very simple BASIC program. You should have received a tape or disk with the modem. On it, you'll find one terminal program for the VIC and one for the 64. If you have the right software, the modem will work with your 64.

The VICModem and the 1650 Automodem are not compatible with the Plus/4, although the 1660 does work with that computer. Modems do not work with the 16; it lacks an RS-232 port. And all of the above-mentioned modems can be used on the 128.

Reading The Second And Third Clocks

I've tried and tried to use the two Time Of Day (TOD) clocks on the 64, but have had no luck whatsoever. I know these are the locations:

56328—tenths of seconds
56329—seconds
56330—minutes
56331—hours (AM/PM is bit seven)

56584—tenths of seconds
56585—seconds
56586—minutes
56587—hours (AM/PM is bit seven)

I know they run in BCD and from what I hear, it stops updating the memory locations but keeps counting until you pull the values out.

Jim Cooper

With PRINT TI or PRINT TI$, you can read the jiffy clock from BASIC. The two TOD clocks are a little more difficult to use, but they're more reliable over the long run because the jiffy clock is sometimes thrown off by tape or disk access. To use the TOD clocks, you first have to learn something about how BCD (Binary Coded Decimal) works. There is also one rule for PEEKing and POKEing properly.

BCD is a special way of counting. In a way it's a compromise between decimal and hexadecimal. If you PEEKed a BCD counter as it increased in value from 1 to 25, you would see the following values:

1, 2, 3, 4, 5, 6, 7, 8, 9, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 32, 33, 34, 35, 36, 37

It doesn't seem to make much sense until you look at the hexadecimal values. These are the same numbers as above, but they've been translated into hex:

$01, $02, $03, $04, $05, $06, $07, $08, $09, $10, $11, $12, $13, $14, $15, $16, $17, $18, $19, $20, $21, $22, $23, $24, $25

The pattern should be clear. After nine, you skip ahead to 16, because 16 has a hex value of $10. To convert an ordinary decimal to BCD, multiply the number in the tens' place by 16 and add the digit in the ones' place. To regain the decimal value, take the number in the sixteens' place and multiply by ten (the math would be 10*(B AND 240)/16). To this number, add the digit in the ones' place (B AND 15).

So if you PEEK the hours' byte of a Time Of Day clock and get a value of 16, the time is 10:00. If you PEEK the minutes byte and find a 66, it means 42 minutes—decimal 66 is hex $42, so 66 really means 42. After a time, you get used to the conversions.

The rule about PEEKing and POKEing is simple: Always start at the hours byte and end at the tenths byte. So a FOR-NEXT loop must count backwards, using a STEP value of −1. PEEKing or POKEing the hours, minutes, or seconds stops the clock. Actually, the clock keeps running, but the values for PEEKing or POKEing are temporarily frozen. There's a good reason for this. Let's say the time is 7:59:59.9. You PEEK the hours byte and find a seven. If the clock kept going, by the time you PEEKed the minutes value, it might be 8:00, so you'd see a zero. You would incorrectly calculate the time to be 7:00, instead of 8:00. To prevent this problem, the clock stops updating as soon as you PEEK or POKE, and it doesn't start up again until you do something with the tenths register.

Greater-Than In Machine Language

I would like to know how to perform greater-than and less-than operations in machine language. For example, what is the equivalent of the BASIC line **10 IF X<24 THEN X=24**?

David Cardin

Machine language has three "compare" operations which can be used to check the relative size of two numbers. The ML instructions are CMP (compare the number in the accumulator to another number), CPX (compare the X register to a number), and CPY (compare the Y register). Each has several addressing modes, which are listed in the Programmer's Reference Guide.

To understand how a compare works, you have to know a little about adding and subtracting. Consider a simple sum such as 4 + 8. The result (in decimal) is 12, but you don't always write down the two digits "12." If there are several columns to be summed, you write a two and "carry the one" to the top of the next column, to be added to the numbers there. Machine language addition follows the same procedure. The computer's carry flag can either be on (set) or off (cleared); it operates like a ninth bit for eight-bit addition.

To add two numbers takes three steps: Clear the carry flag (CLC), load the accumulator with the first number (LDA), and then add-with-carry (ADC). The result of the addition will be found in the accumulator. If the answer is between 0 and 255, the carry remains clear. Otherwise, the carry is set. For example, 250 + 9 would set the carry and return a value of 3, while 20 + 30 would result in 50 (and nothing would be carried).

To subtract, you first set the carry (SEC), then load a number into the accumulator (LDA) and subtract-with-carry (SBC). If the carry is still set after the subtraction, then the first number was equal to or greater than the number subtracted. In other words, if the carry is set, the result was a positive number (or zero). But when the carry is clear after SBC, it means the second number was larger and the result would be a negative number.

A compare operation is just like a subtraction in the way the carry flag is affected. The following routine illustrates how to compare a number to 24:

```
033C LDA $C900;  PUT NUMBER FROM
                 MEMORY INTO .A
033F CMP #$18;   COMPARE TO
                 DECIMAL 24
0341 BCS $0348;  BRANCH IF CARRY
                 SET (>= 24)
0343 LDA #$18;   CARRY CLEAR, SO
                 LOAD 24 INTO .A
0345 STA $C900;  AND STORE IT AT
                 $C900
0348 RTS;        RETURN FROM
                 SUBROUTINE
```

The number in $C900 will always be in the range 0–255. If it's greater than or equal to 24, the CMP at 033F will leave the carry set. CMP #$18 is like subtracting 24 but it does not alter the value in the accumulator. So, if the carry is set, the BCS at $0341 jumps ahead to the RTS, with the accumulator still holding the value from location $C900. Otherwise, we put a 24 into $C900.

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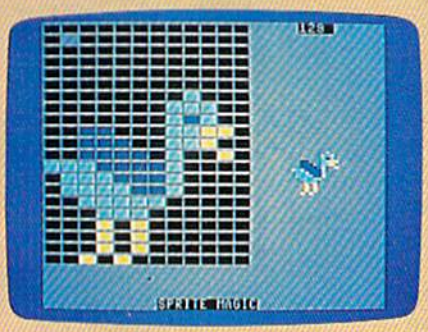

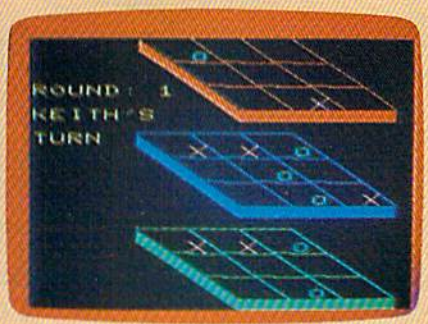

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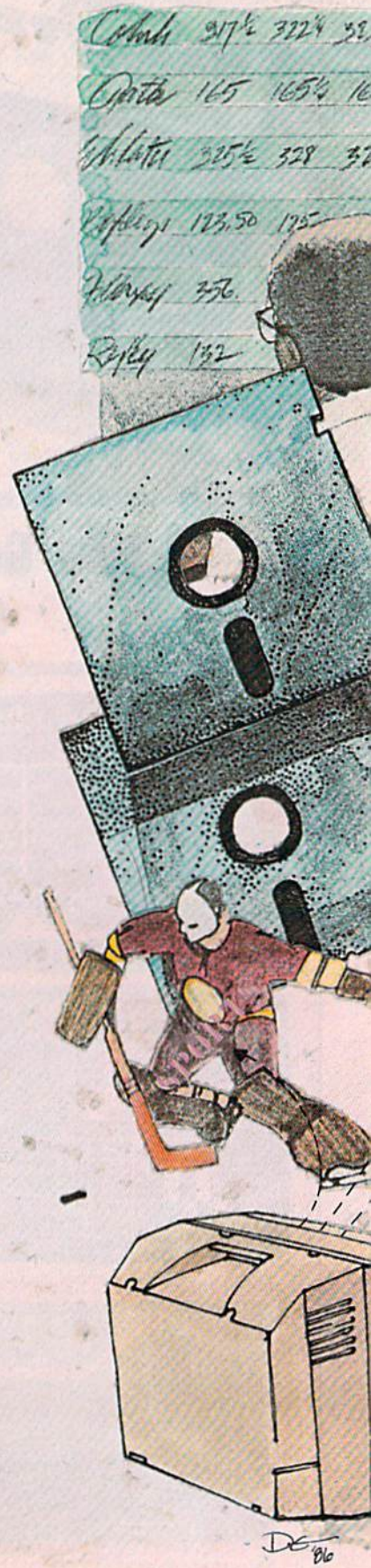
What's New ONLINE For Commodore

Kathy Yakal, Assistant Features Editor



If you've held off on buying a modem because you've heard horror stories about two-hundred dollar phone bills, you might want to reconsider. In most cases, a local phone call can connect you to one of many different online information services, some of which have been designed especially for Commodore owners. If you're not in touch with what's online, you're in for a pleasant surprise.

It's an unusual computer owner who doesn't like to swap information with other computer owners. Even if you don't have problems with, or questions about, your machine, you probably just like to know who else is out there and how they're using their computers. User groups and electronic bulletin board systems do a good job of providing this kind of support and information, but they're usually limited to people in a specific geographical area.

Nationwide networks, in the form of online information services, provide a wider outlet for sharing information. Services that have been around for a long time, like CompuServe, offer special interest areas within their vast databases, areas where machine-specific information can be shared.

Until recently, the Commodore Special Interest Group (SIG) on CompuServe was probably the most widely-recognized national clearinghouse for Commodore information. Some of the most knowledgable Commodore supporters around the country served as system operators (*sysops*), and Commodore engineers were accessible to answer technical questions.

Several months ago, Commodore decided to start a telecommunications service of its own, and removed its prime support from CompuServe. The Commodore SIG there is now operated by the Toronto PET User Group (TPUG), although Commodore employees still provide technical support. And many of the old CompuServe sysops are managing SIGs on some promising new online information services.

It's a very interesting time for Commodore owners in this early stage of telecommunications. You have your choice of a number of different services, many of which are just starting out, and each of which has its own personality. The best Commodore resources are available in a variety of different formats and price ranges.

Shopping for an online information service is not unlike shopping for a personal computer. When you were deciding which computer to buy, you

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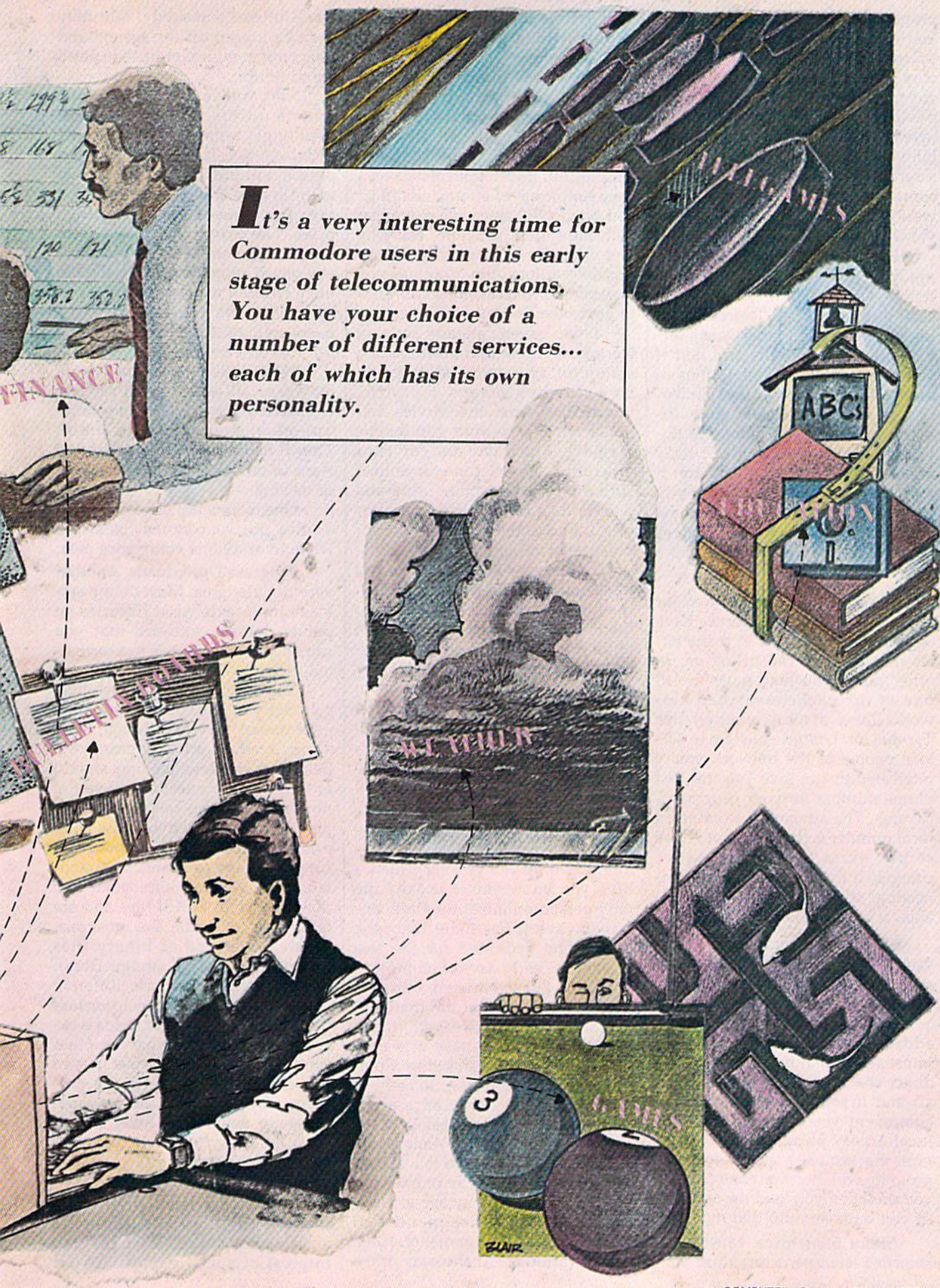

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probably asked friends for advice. You considered how much money you were willing to invest. You may have read articles about different machines, and talked to salespeople in stores. Maybe you investigated the manufacturer's stability in the market. And after considering your reasons for buying a computer, checked to see if software was available for your individual needs.

Some of the same factors may apply if you're looking to join an online service. Unfortunately, you can't do a "test-drive" before deciding to join, but you can try out a service for a few months and quit if you don't enjoy it. Descriptions of many of the services sound similar, though they are actually quite different when you get online. The flavor of each service is strongly affected by the people who run it and the users who contribute to it.

Let's take a look at some of the common features these services share before getting into specifics for each.

Access Numbers. Some major networks, like CompuServe, have dedicated phone lines in many cities that you can call to log on. In other cases, you may have to call one of the packet-switched networks (also a local number) like Tymnet or Uninet. Customer service people at the network you're interested in can give you the best phone number for your geographical area. The advantage to calling a local number is that you don't have to pay extra for long-distance charges. If there's a charge for connecting, it's usually very reasonable, a few dollars per hour.

Sign-On Procedures. This varies, but generally you'll have to spend a few minutes online going through a registration process. You'll be asked for your name and address, your billing preference (most accept major credit cards and direct checking account withdrawal), and, in some cases, what kind of equipment you're using and your local access phone number. Services that require a specific terminal program will then automatically log you on when you load the software (if you have an auto-dial modem).

Menu Structures. Most use a *branched menu* structure. You start at the top, the main menu, and choose which general area you want to enter. Once there, you'll work your way through a series of lower menus into more specific areas. To get back up to the top, to move around again, or sign off, you'll often have to work your way back again. Most systems have a very simple set of commands to let you get around. Once you're familiar with the system structure, you may find it quicker to go directly to your favorite sections. On CompuServe, for example, you can enter GO CBM to get to the Commodore area.

If you haven't already done so, learn how to use the downloading feature of your terminal program. Downloading means capturing information from the service and transferring it to your computer's memory, a printer, and/or your disk drive. If you can't download with the program you're using and plan to do a lot of telecommunicating, it's advisable to get a more sophisticated program. Every online service has extensive help files, and it's a good idea to download them the first time you get on, then print them out so you can refer to them until you're familiar with the system. Most people online are very willing to help a new user, but it saves everyone time and money if you learn on your own. If you do need to ask for help, keep your inquiries brief, or ask for directions to an area of the system where you can find answers.

Online Conferencing. Online services have become much more interactive. If you've ever called a BBS, you know you're usually the only person online at the time, unless the sysop has more than one phone line dedicated for the service. In the early days of online services, you knew that there were lots of other people on at the time, but couldn't communicate with them. Now, most services have at least a general conference area, like CompuServe's CB simulator. Some have special interest conference areas within different SIGs, making it easier to locate people who want to talk about what you want to talk about.

When you enter an online conference area, you may see a warning about the consequences of making offensive comments. Heed those warnings. At the very least, you'll offend somebody. You may even be logged off the system and asked not to return, or have to pay a fee to rejoin.

After you've entered, everyone who is online in that area will usually get a message announcing your presence. If you're a new user, people will probably welcome you to the system and may ask who you are. Try to keep your greetings brief. The unspoken protocol on these conference areas suggests that you return people's greeting and bid them farewell when you're going to leave, but five minutes of saying hello and good-bye to each other can run up everyone's phone bill.

Most systems provide a way for you to talk privately with another user. If you want to talk to someone else, you can page them. They'll be sent a message that you want to talk, and can either accept or decline.

One more word of advice: Never give out your system password while in an online conference area.

Program Downloads. Another very popular area. Most online services have extensive libraries of public domain software that you can download and save to a formatted disk.

This is probably the most difficult area you'll encounter on online information services, though here again, reading and capturing the help files on downloading should answer all your questions. If you're not using a service-specific terminal program, you'll need to know what *protocols* your terminal program supports. Messages and documentation are generally uploaded and downloaded as ASCII files and are fairly easy to handle. But most programs are stored as binary files (sometimes called image files). Download protocols use different checksum methods to help ensure that what one computer sends is exactly, byte for byte, what the other computer receives, because if even one character is incorrect the program may not work. Be prepared for some down time here. Downloading programs can be time-consuming, especially if you're running at 300 baud.

Message Boards. Similar to those found on BBS's, these are areas where you can leave general-interest or specific questions for

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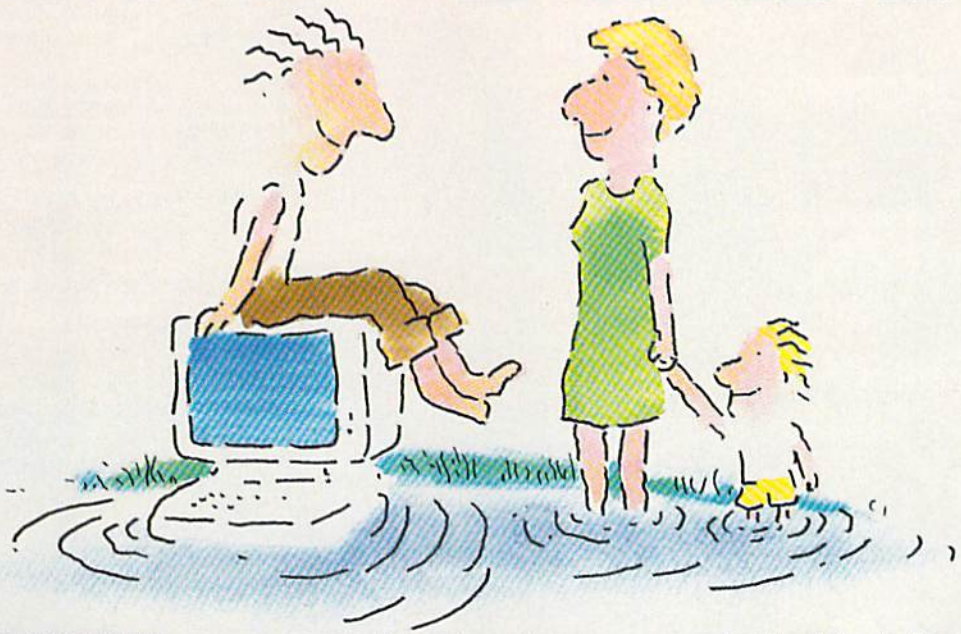

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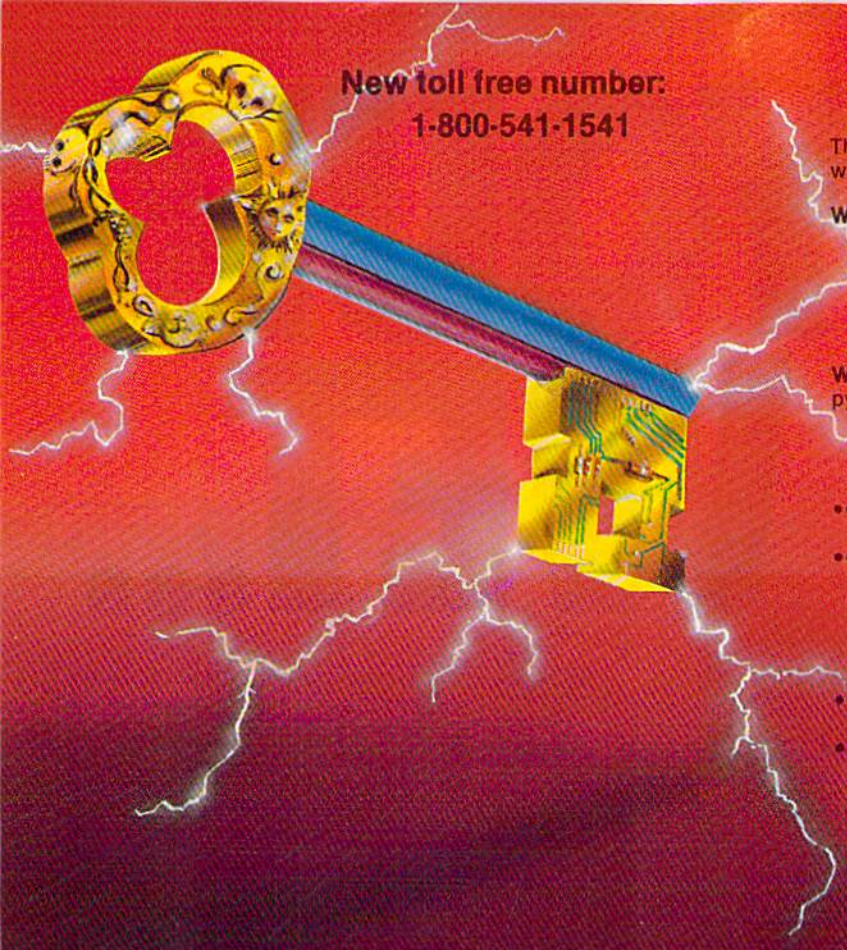

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The chart below compares ACTUAL MEASURED loading times.

PROGRAM	STAR DOS	REGULAR LOAD	MACH 5	FAST LOAD	MAGNUM LOAD
Fission II (EPYX)	?	144 sec	43 sec	41 sec	31 sec
Music Shop (BRODERBUND)	?	105 sec	105 sec*	105 sec*	21 sec
Hitchhiker's Guide to the Galaxy (INFOCOM)	?	70 sec	70 sec*	**	68 sec*
On-field Football (GAMESTAR)	?	159 sec	66 sec	63 sec	56 sec
EASY FINANCE I (COMMODORE)	?	58 sec	13 sec	13 sec	11 sec

* = Will not fast load — defaulted back to regular load.
** = *Failed to load at all.*

FIVE VERSIONS OF MAGNUM LOAD ARE AVAILABLE TO FIT ANY NEED.

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C	C64, one 1541 drive AND one MSD drive (switchable)	$29.95
D	C128 computer and one 1541 drive***	$24.95
E	C128 and one MSD drive (single or dual)***	$24.95

*** = Fully compatible with 128 & CP/M modes. Cartridge versions MUST be UNPLUGGED to access 128 & CP/M modes!

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- Half tracks that are used
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- RAM recorder records custom DOS

Shadow-scan any disk, then read exact list of:

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- Track to track synchronization

Exclusive snap shot recorder will give you an exact copy of the 1541 RAM and can be viewed, saved or printed. Plus many more features included.

*Requires Shadow

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Highly sophisticated and integrated piece of hardware that turns you 1541 into something you've always wanted.

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- Drive reset switch
- Device number change
- Half track indicator
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- Shadow on-off indicator

The Shadow display will give you an accurate display of precisely what track you are accessing during a normal load even if the program does a read past track 35.

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other users. Even if you don't want to leave a message, it's interesting to just "cruise" these areas and see what people are talking about. You'll find experts answering questions from beginners, as well as programmers trading tips and techniques.

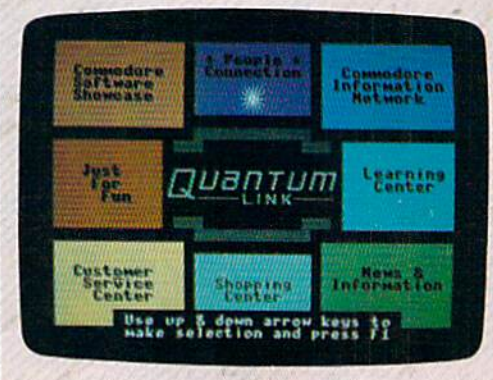
If you have questions about the system and can't find anyone to help, or just don't want to tie up someone online, you can leave messages here for the sysops. Most sysops respond quickly to user questions.

News from Commodore. Information about new products from Commodore, price changes, reports from trade shows, and other general news of interest to Commodore owners are posted in the message or bulletin areas of many services.

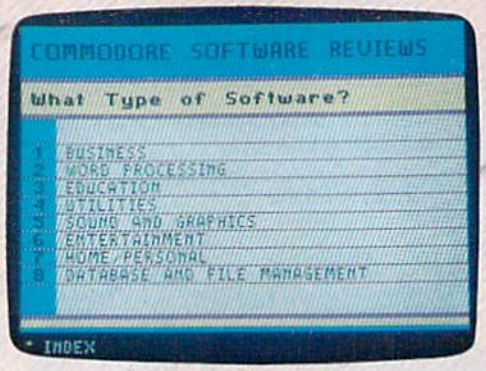
Telegames. Many services offer games that can be played with other people currently online. These range from traditional board and card games to the complicated fantasy/strategy game *MegaWars* on CompuServe.

Online Shopping. Though this application is still in its infancy, many services let you browse through "catalogs" of merchandise from which you can order while online.

News, Sports, and Weather Information. You might be able to catch something online before it hits the newspaper here, though it's usually faster and cheaper to get this kind of information from a print publication. However, if you live in a rural area without easy access to a timely newspaper or a television station, you might find this feature extremely useful.



QuantumLink's main menu takes advantage of the color graphics capability of the Commodore 64.



Viewtron features reviews of many different kinds of software.

Over the last year, two new services have gone online specifically for Commodore users. Some older networks have added or enhanced their Commodore SIGs, and at least one new general interest service has gone online with a Commodore SIG. Though all these services share many of the features listed above, each has something a little special tailored for different people. Here's a look at some of the highlights on each of these new systems.

American People/Link. The Commodore Club on this interactive online service is one of its most active areas, containing a massive data library. Like other services, it also features a conference area and message boards.

American Home Network, Inc., Arlington Ridge Office Center, 3215 N. Frontage Rd., Suite 1505, Arlington Heights, IL 60004; 800-524-0100 (Illinois residents call 312-870-5200), $3.95/hour (300 baud) and $4.95/hour (1200 baud) non-prime time. Prime time fees vary according to node used.

CompuServe. See "The Commodore SIG," elsewhere in this issue.

CompuServe, P.O. Box 20212, Columbus, OH 43220 800-848-8199. $39.95 registration fee; $12.50/hour (300 baud) $15/hour (1200 baud) prime time; and $6/hour (300 baud) $12.50/hour (1200 baud) non-prime time.

Delphi. Though Delphi has been around for a couple of years, the software was recently enhanced to provide for greater flexibility and usefulness. It's a general interest service, providing a forum for all kinds of computer users. There's a wide range of SIGs there, covering every major home computer as well as broader topics like astronomy, books, ham radio, movies, and travel.

Delphi has a general online conference area and a general mail area; you can check for mail or to see who's online when you first sign on. Each SIG also has its own conference and mail operations. When you enter a SIG, you can enter the conference area, ask to see who's online and where they are in conference, and either join a group in progress or look for a particular user. The MAILTHRU feature lets you send mail through Delphi to CompuServe, The Source, and MCI Mail.

Flagship Commodore is the special Commodore area on Delphi. Its sysop is Deb Christensen, former telecommunications manager for Commodore. The SIG features a public domain software library; round table discussion areas on things like graphics and music, the 128 computer, and 64 programming; bulletins on general Commodore information; and software reviews. Christensen also runs Flagship Amiga, a similar service for Amiga users.

Two other SIGs on Delphi that are not Commodore-specific but

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Mitey Mo turns your Commodore 64 into a telecommunications giant. It's the best-performing modem with upload/download.

Mitey Mo is being hailed as "the best price/performance communications package available." Its software has received the endorsement of the U.S. Commodore Users Group, which gives a money-back guarantee to members. It is truly the industry standard, and no wonder. It's the most user-friendly modem you can buy—it will take you online faster and easier than anything else.

Mitey Mo opens up a world of practical and exciting uses for your C-64. It lets you send and receive electronic mail, link up with community bulletin boards, play computer games with people in distant places, tap into library resources, and much more. All at your convenience.

Until Mitey Mo, Commodore's 1650 Automodem was the obvious choice when you went looking for a modem for your computer. Like Mitey Mo, it has "auto answer"—it receives data while unattended. And both modems are "auto dialers"—you dial right on the computer's keyboard. But that's about where the similarity ends.

Mitey Mo can dial up to 9 numbers sequentially. But suppose you dial a number and find it's busy. Mitey Mo has "auto redial"—it hangs up and redials immediately until it gets through. With the other modem you have to redial each time—and somebody with auto redialing can slip in ahead of you.

Mitey Mo is menu driven. It lists the things you can do on the screen. Select a number and you're on your way. Since Automodem isn't menu driven, you'll be hunting through the manual a lot.

With Mitey Mo, your computer's function keys are programmable—you can save yourself plenty of keystrokes. Not so with the other modem. And only Mitey Mo lets you store data to review or print it later.

Mitey Mo has just one switch, the Smart 64 software does the rest. With the other modem you'll have to remember to check three switches, otherwise you may be answering when you mean to be originating.

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MODEM FEATURES	MITEY MO	COMMODORE AUTOMODEM
Auto Dial/Answer	YES	YES
Auto Redial	YES	NO
Smart 64 Software	YES	NO
Function Keys Programmable	YES	NO
Upload/Download Text & X-Modem	YES	NO
VT-52/VT-100 Emulation	YES	NO
Menu Driven	YES	NO
28K Software Buffer	YES	NO
Easy-to-Use Manual	YES	NO
Bell 103 Compatible	YES	YES
Multiple Baud Rates	YES	YES
Cable Included	YES	YES
Single Switch Operation	YES	NO
Warranty	3 years	90 days

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The Commodore SIG

There was a time when the term *Commodore SIG* (Special Interest Group) described an area on CompuServe. Started in 1983, the SIG was a special online forum staffed by Commodore employees and volunteer sysops (system operators) around the country. It consisted of the Commodore Newsletter, which provided information directly from Commodore; the Commodore HOTLINE, a question and answer area supported by Commodore Customer Support; and three smaller SIGs, where users exchanged information and public domain programs with Commodore representatives and other users via electronic mail and an online conference area.

Several months ago, Commodore agreed to lend exclusive marketing support to a new online service, QuantumLink, which would be designed solely for Commodore owners. This created a rather awkward situation when Commodore's contract renegotiations with CompuServe came up last summer. The two would, in effect, be competitors.

As a result, CompuServe has restructured its Commodore-related areas. The Toronto PET User Group (TPUG) now manages the three SIGs formerly operated by Commodore. But Commodore continues to maintain a presence on CompuServe, offering message boards, a conference area, a user interest log (where you can get information about other members), and the Commodore newsletter.

Why a separate network for Commodore owners? The reason relates not only to providing a machine-specific service, but to the continued health of the whole industry, says Steve Case, Quantum's vice president of marketing. "In order to really expand the market for computers long term, we had to create a dramatically increased utility because it seemed to a lot of people that the computer penetration level has slowed down. Somebody had to create a whole bunch of new ideas why people should buy computers.

"Telecommunications opened up a lot of those doors, but current services out there were a little expensive and a little too difficult to use. For the average guy, we needed to offer the market something that was a little easier and cheaper and more useful. In terms of moving the SIG over (to QuantumLink), that's just part of the process of trying to put everything in place in a single network to make it as convenient for our people as possible."

Since graphics capabilities of home computers differ, most online information services can display only text. QuantumLink, accessible only by Commodore computers, offers color graphics in many of its screen displays. This means you must get a special system disk from Quantum. You can't call the service using a regular terminal program.

Let's walk through your first time on QuantumLink. After you've loaded the program, you're asked a series of questions. Quantum will want to know how you wish to be billed (MasterCard, VISA, or automatic checking account deductions), what kind of modem you're using, how you'd like your name to appear to other users on the system, and what phone number you'll be calling to get on. This information is then stored on your disk. If you have an auto-dial modem, all you have to do is load the program, and you'll be connected to the system. (If you ever need to change this information, load the *Change Access* file on the disk.)

Once you're connected, what can you do? Here are some highlights.

People Connection lets you chat online with other members in a CB-type environment. *QGuides* are always available here to answer questions. People Connection also offers private interaction between users. If you want to speak to a specific person, you can transmit an online message, which will appear in a window at the top of the person's screen. So you can send messages back and forth without

which many Commodore users frequent are the Micro Artists Network (MANIAC), which contains a lot of sound and graphics programs available for downloading, and BOZART Magazine, a forum for writers to share their work (contributors receive a small royalty for each access by another user).

Delphi, 3 Blackstone Court, Cambridge, MA 02139 800-544-4005. $49.95 registration fee; $16/hour prime time and $6/hour non-prime time.

GEnie. This is a new telecommunications network sponsored by General Electric. Features include LiveWire (a CB simulator), E-Mail, software libraries, electronic newsletters and magazines, shopping services, and sophisticated gaming.

Deb Christensen also runs the Commodore SIG here, Flagship Commodore. Its structure is similar to that on Delphi, though it may evolve a little differently as a new group of users comes online.

If you wish, you can join GEnie via modem. Call 800-638-8369; on connection, enter **HHH** and return; at the U# prompt, enter **5JM11999,GEnie;** and press RETURN. The system will guide you through registration.

General Electric Information Services, 401 N. Washington St.,

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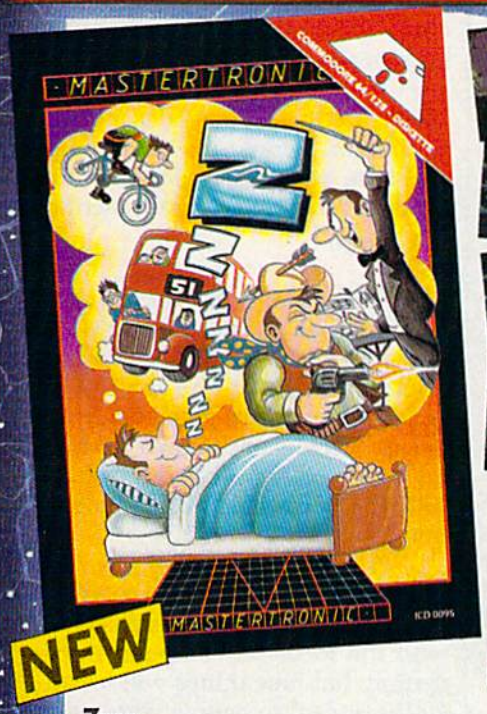

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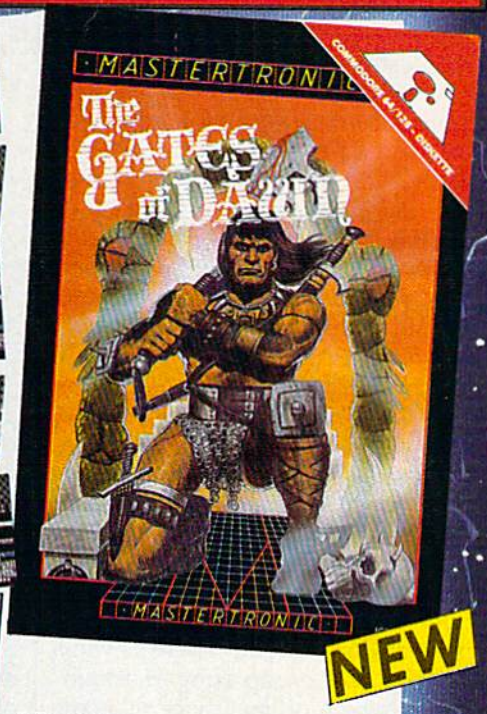

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missing out on what's going on. (This feature is available no matter what department you're in—you can send a message to any user currently signed on to the system.) If you want to find a partner to play an online game, the system will help you find someone who's interested.

Special conferences are also held here. QuantumLink schedules several forums a week, times at which Commodore representatives are available to answer questions online. (The people asking questions are never identified, so you don't have to worry about asking a stupid question.) General interest conferences on specific topics are also held.

The Commodore Information Network is similar to the old Commodore SIG on CompuServe, though different in structure. You can send questions to Commodore representatives, download public domain programs, read software reviews, and get updates on what's new at Commodore. There's even a special user group support roundtable, which offers advice on starting and maintaining Commodore user groups.

Just For Fun is just what it sounds like. Test your knowledge of trivia, read movie reviews, and compete with fellow subscribers in professional sports pools. The Shopping Center offers online shopping. In the Learning Center, you can sign up for the Electronic University, or do research using the online *American Academic Encyclopedia.* The Software Showcase lets you download previews of commercial software. And if you have any questions about QuantumLink itself, go to Customer Service.

Moving around within each department or from one department to another is very simple. You use only the function keys. To select a menu item, you cursor down to it and press f1. Pressing f3 lets you save up to 85 lines (this feature may be upgraded to allow more extensive downloads). Pressing f5 erases the current screen display, and f7 moves you back to the previous menu.

"What we've tried to do is create a more event-oriented social system so you really do want to check in every night...because you don't want to miss anything."

The monthly charge for QuantumLink is $9.95. Many of its services are free, but some, like program downloads and conference areas, require an additional six cents a minute ($3.60 an hour). When you're in one of these QLink Plus areas, you'll see a plus sign (+) in the upper-left corner of your screen indicating the extra charge.

If you've been on other online services, QuantumLink may seem a bit slow to you. There are two reasons for this, according to Steve Case. First, the use of color and graphics makes it necessarily run slower. And QuantumLink's software is designed to do an extensive amount of error-checking, so you don't get "garbage" characters on the screen.

Most services are dramatically better at 1200 baud, but, says Case, the fact of the matter is that there are a lot of 300 baud modems being used. There hasn't really been an inexpensive 1200 baud modem for the Commodore market until quite recently. Until 1200 baud is more of a standard, technicians at Quantum will look at ways to speed up 300 baud transmission without sacrificing quality.

At this point, much of the communication on QuantumLink concerns computer-related issues. Case says one of the long-term goals of the system is to go beyond being a technical resource, and offer a recreational, educational forum for people with all kinds of interests.

"The service you see now is a starting point, not an ending point," says Case. "It was designed with the focus on computer information, but new things will broaden the appeal to people who aren't user group hackers."

Emphasis on special events is one way to make that happen, he says. "Most services are information and retrieval oriented, and it doesn't matter if you got on Tuesday or Thursday because the information is the same. What we've tried to do is create a more event-oriented social system so you really do want to check in every night just to see what's happening because you don't want to miss anything."

To subscribe to QuantumLink, write to QuantumLink Customer Service, 8620 Westwood Center Drive, Vienna, VA 22180 or call 800-392-8200.

Rockville, MD 20850; 800-638-9636, ext. 21. $18.00 registration fee; $35/hour prime time and $5/hour non-prime time.

QuantumLink. (See "The Commodore SIG," elsewhere in this issue.

Viewtron. Color graphics highlight this new service offered to Commodore owners by Viewdata Corporation, a subsidiary of Knight-Ridder Newspapers. The service was initially available only through a single-function terminal, but has been revised to allow microcomputer owners to access it.

Viewtron offers the same kind of information and user interaction as the other major online services. Commodore owners can read software and hardware reviews, get advice from Commodore experts and other users, and get discounts on hardware and software via mail order. Because of its graphics capabilities, subscribers must obtain a special system disk from Viewdata to access it.

Viewdata Corporation of America, Inc., 1111 Lincoln Rd., 7th Floor, Miami Beach, FL 33139; 800-543-5500, Department 9401. $9.95 for Software Starter Kit; 22 cents/minute prime time and 9 cents/minute non-prime time after the first free hour.

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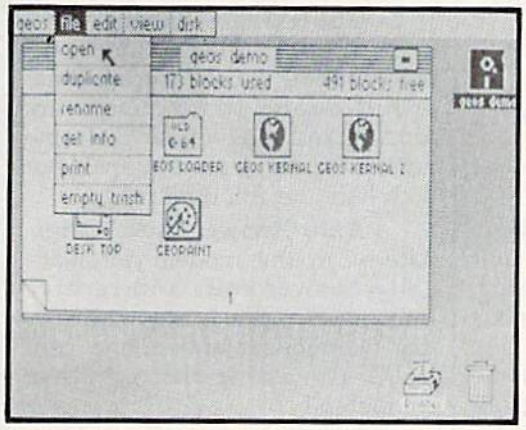

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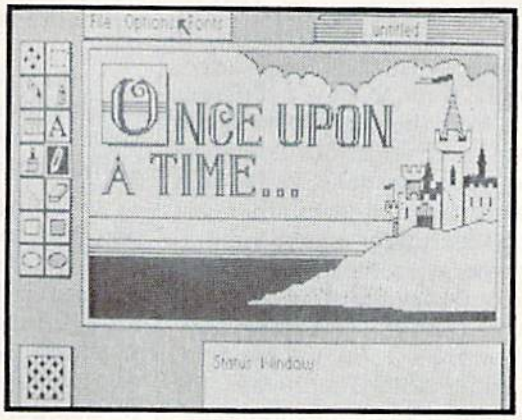

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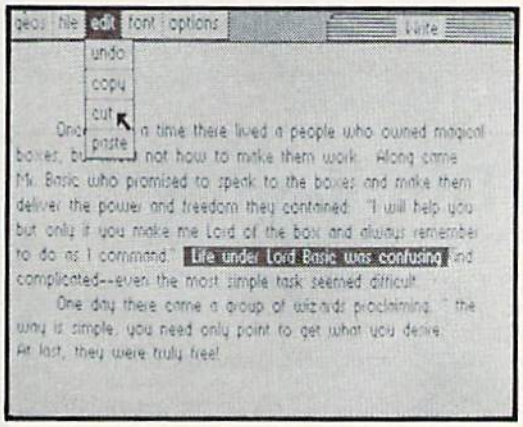

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A Buyer's Guide To Modems

Telecommunications is one of the fastest growing areas of computer use for Commodore owners. All you need to get started are your computer, a terminal program, and the right modem. Here's a look at the range of inexpensive modems currently on the market.

Online services, bulletin boards, home banking, and a host of other telecommunications opportunities are currently available to Commodore owners. And the list is growing all the time. (See "What's New Online For Commodore" in this issue.)

Thousands of Commodore computer owners have already added telecommunications to their regular computing activities. If you're interested in getting started, or simply want to buy a different modem from the one you have, the following chart should answer most of your questions. We've kept our list to those modems that cost under $300. But for many Commodore owners, a satisfactory modem can be purchased for less than half that price. And the least expensive, Commodore's 1600 VICModem, costs under $50. The higher the price of the modem, the more capabilities you'll get. Features such as auto-answer and auto-originate can give you flexibility and speed, especially important if you're online extensively.

For those unfamiliar with computer telecommunications, a modem (MOdulator-DEModulator) is simply a device that translates your computer's digital data into analog, or continuous-tone, transmissions carried by telephone lines. The computer at the other end of the telephone line uses its modem to alter the transmission back to digital form.

We've listed the most important features you should consider. Here's a brief explanation of some of the categories:

• **Compatibility**—Commodore 64- and 128-compatible modems usually connect directly to the computer through the user port; RS-232 modems require an interface adapter since Commodore computers don't have a standard RS-232 port.

• **Baud Rate**—The speed at which bits of data are transmitted. The bulk of the low-cost modems carry data at 300 baud, although an increasing number of modems are capable of faster 1200 bits per second speed.

• **Duplexing**—Modems communicate at half-duplex (one computer sending or receiving at a time) or full-duplex (both computers sending and receiving at the same time). Most modems are capable of both half and full duplexing.

• **Auto-Answer/Auto-Originate**—Can the modem automatically answer calls and receive information; can it automatically dial telephone numbers and connect your computer to other computers?

• **Self-Test**—A modem's ability to check itself to determine if everything is working, and is connected correctly.

• **Carrier Detection Indicator**—A light—usually a light-emitting diode (LED)—a sound, or a screen message that indicates that your computer has connected and disconnected with another computer.

• **Terminal Software Included?**—Many modems are sold with a telecommunications program included in the package. If not, you'll need to purchase your own terminal software.

Modem Manufacturers And Distributors

Listed below are the manufacturers and distributors of the modems included in this buyer's guide.

Anchor Automation, Inc., 6624 Valjean Avenue, Van Nuys, CA 91406, 818-997-6493

Commodore Business Machines, 1200 Wilson Drive, Westchester, PA 19380, 215-431-9100

Computer Devices International, 1345-A2 Doolittle Drive, San Leandro, CA 94577, 415-633-1899

E & E DataComm, 2115 Ringwood Avenue, San Jose, CA 95131-1725, 408-288-8880

Hayes Microcomputer Products, 5923 Peachtree Industrial Boulevard, Norcross, GA 30092, 404-449-8791

Inmac, 2465 Augustine Drive, Santa Clara, CA 95051, 408-727-1970

Intec Corp., 21751 West Nine Mile Road, Southfield, MI 48075, 313-352-0066

MFJ Enterprises Inc., 921 Louisville Road, Starkville, MS 39759, 601-323-5869

The Microperipheral Corp., 2565 152nd Avenue NE, Redmond, WA 98052, 206-881-7544

Mitsuba, (US Distributor: Everett/Charles Marketing Services, Inc.), 6101 Cherry Avenue, Fontana, CA 92335, 714-899-2521

Novation, Inc., 20409 Prarie Street, Chatsworth, CA 91311, 818-996-5060

Qubie, 4809 Calle Alto, Camarillo, CA 93010, 805-987-9741

TNW Corp., 3444 Hancock Street, San Diego, CA 92110, 619-296-2115

Tandata Marketing Ltd., Albert Road North, Malvern, Worcs WR14 2TL, England (US Agent: US Telecom Inc., 315 Greenwich Street, New York, NY 10013, 212-608-1419)

Touchbase Design, 1447 South Crest Drive, Los Angeles, CA 90035, 213-277-1208,

US Robotics, Inc., 1123 West Washington, Chicago, IL 60607, 312-733-0497

Universal Data Systems, 5000 Bradford Drive, Huntsville, AL 35805, 205-837-8100

1-800-FLOPPYS, 22255 Greenfield, Southfield, MI 48075, 800-356-7797

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A Buyer's Guide to Modems

Modem	Manufacturer	Compatibility	Interface Required?	Baud Rate	Duplexing	Auto-Answer	Auto-Originate	Self-Test	Carrier Detection Indicator	Power Supply	Cables/ Connectors Included?	Terminal Software Included?	Warranty	Price	Comments
Volks 6420	Anchor Automation, Inc.	64, 128 (in 64 mode)	no	0-300	full/half	yes	yes	no	screen	host computer	yes	yes	2 years	$ 99	
Volks 6470	Anchor Automation, Inc.	64, 128 (in 64 mode)	no	0-300 & 1200	full/half	yes	yes	no	screen	host computer	yes	yes	2 years	199	
1660 Modem	Commodore Business Machines, Inc.	64, 128	no	0-300	full/half	yes	yes	no		host computer	plugs into computer	yes	90 days	129.95	
1670 Modem	Commodore Business Machines, Inc.	64, 128	no	0-300 & 1200	full/half	yes	yes	no		host computer	plugs into computer	yes	90 days	199.95	
1600 Modem	Commodore Business Machines, Inc.	VIC-20, 64	no	0-300	full	no	no	no	LED	host computer	plugs into computer	yes	90 days	49	
Mitey Mo	Computer Devices International	RS-232	no	300	full/half	yes	yes	yes	screen	host computer	yes	yes	3 years	99.95	
Avatex 300	E & E DataComm	VIC-20, 64, 128	yes	0-300	full	no	no	no	LED	AC	no	no	3 years	64.95	
Avatex 600	E & E DataComm	VIC-20, 64, 128	yes	0-600	full	yes	no	no	LED	AC	no	no	3 years	99.95	
Avatex 1200	E & E DataComm	VIC-20, 64, 128	yes	0-600 & 1200	full	yes	yes	yes	LED	AC	no	no	3 years	199.95	
Smartmodem 300	Hayes Microcomputer Products	RS-232	yes	0-300	full/half	yes	yes	yes	LED	AC	no	no	2 years	199	
Password 212A	Inmac	RS-232	yes	300 & 1200	full/half	yes	yes	yes	screen	AC	some	no	1 year	299	
Clear Signal 1200 Baud Modem	Inmac	RS-232	yes	1200	full/half	no	no	no	LED	AC	some	no	1 year	259	
Smart 300 Baud Modem	Inmac	RS-232	yes	0-300	full	yes	yes	no	LED	AC	some	no	1 year	229	
Clear Signal 300 Baud Modem	Inmac	RS-232	yes	300	full	no	no	yes	LED	AC	some	no	1 year	99	
Intec 1200	Intec Corp.	RS-232	no	300/1200	full/half	yes	yes	no	screen	AC	yes	yes	1 year	199	
Intec 300	Intec Corp.	RS-232	no	0-300	full/half	yes	yes	no	LED & screen	AC	yes	yes	1 year	109	
MFJ-1237	MFJ Enterprises	VIC-20, 64	no	300	full	no	no	no	LED	host computer	yes	program listing in manual	1 year	49.95	limited supply
Microconnection Auto-Print	The Microperipheral Corp.	RS-232	no	300	full/half	yes	yes	no	LED	host computer	yes	yes	90 days	69.95	
Super Modem 1200	Mitsuba	RS-232	yes	0-300 & 1200	full/half	yes	yes	yes	LED	AC	yes	no	1 year	299	
Cat	Novation, Inc.	RS-232	yes	0-300	full/half	no	no	yes	LED	AC	yes	no	1 year	169	
D-Cat	Novation, Inc.	RS-232	yes	0-300	full/half	no	no	yes	LED	AC	yes	no	1 year	199	
J-Cat	Novation, Inc.	RS-232	yes	0-300	full/half	yes	yes	yes	LED	AC	yes	no	1 year	149	
PC 212/1200	Qubie	RS-232	yes	0-300	full	yes	yes	no	LED	AC	no	no	1 year		
Operator 103	TNW Corp.	RS-232	yes	0-300	full/half	yes	yes	yes	beep	AC	yes	no	90 days	129	
Tm 110	Tandata Marketing, Inc.	VIC-20, 64, 128 (in 64 mode)	yes	300	full	no	yes	no	screen	AC	yes, w/ROM cartridge	yes, w/ROM cartridge	90 days	199	separate ROM cartridge required
Travelcomm 1200	Touchbase Design	RS-232	yes	300/1200	full/half	no	yes	no	LED	battery	no	no	1 year	249	
Password 300	US Robotics, Inc.	RS-232	yes	300	full/half	yes	yes	no	none	AC	yes	no	2 years	199	
UDS-103JLP	Universal Data Systems	RS-232	yes	0-300	full	yes	no	no	light	telephone line	phone cable included	no	1 year	165	
UDS-103LP	Universal Data Systems	RS-232	yes	0-300	full	no	no	no	light	telephone line	phone cable included	no	1 year	125	
UDS-212LP	Universal Data Systems	RS-232	yes	0-300 & 1200	full	no	no	no	LED	telephone line	phone cable included	no	1 year	295	
300 Baud Smart Communications System	1-800-FLOPPYS	64, 128	no	0-300	full/half	yes	yes	no	LED & screen	AC	yes	yes	1 year	69.90	
1200 Baud Smart Communications System	1-800-FLOPPYS	64, 128	no	300 & 1200	full/half	no	yes	no	LED & screen	AC	yes	yes	1 year	99.90	

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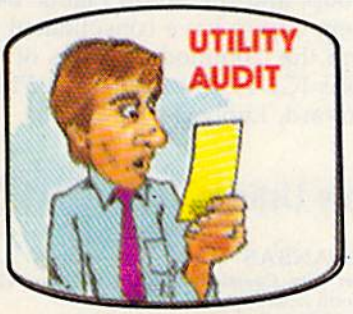

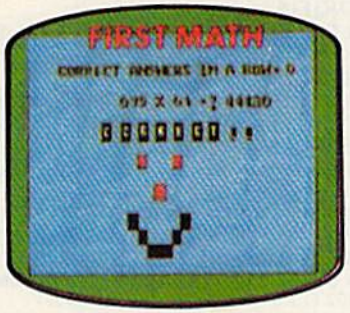

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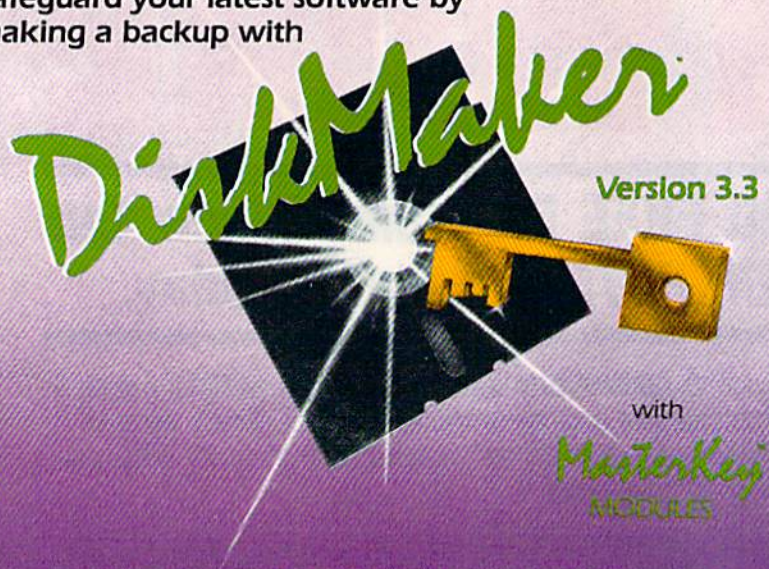

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The Capital Region Commodore Computer Club (CRCCC) has a new address: P.O. Box 2372, Vernon, CT 06066.

Also listing a new address is the Jumpers 64 Users Group: P.O. Box 224, Glen Burnie, MD 21061.

The Carolina Commodore Computer Club, formerly the Raleigh VIC/C64 Users Group, can be reached at P.O. Box 2664, Raleigh, NC 27602-2664.

The Lubbock Commodore Users Group, the VIC Users Group, and the South Plains '64 Users Group have consolidated to form the Commodore Users of Texas (CUT). The address is 5509 Harvard, Lubbock, TX 79416.

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ARKANSAS

River City Commodore Club, P.O. Box 4298, North Little Rock, AR 72116

FLORIDA

Gulf Coast Computer Club, P.O. Box 1104, Port Richey, FL 34288-1104

GEORGIA

Griffin Commodore Program Exchange (GCPE), Jeff Lee, 1820 Hallmark Dr., Griffin, GA 30223

LOUISIANA

Page User Group For C-64, 403 19th St., Alexandria, LA 71301

Sixty Four'Um User Group, 4317 Stockton St., Metairie, LA 70001

MARYLAND

C-16 & Plus/4 Users Group, Michael Kaszubski, 8202 Edwill Ave., Baltimore, MD 21237

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Duluth Commodore Users Group, Allen Lehrke, 1502 Fairview, Cloquet, MN 55720

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Commodore 64 Users Group of America, 114 Lake Ave., Clifton, NJ 07011

Commodore User Group of Hillsdale (CUGOH), 22 Palm St., Hillsdale, NJ 07642

PENNSYLVANIA

Ingersol Rand Commodore Computer Users Group (IRCCUG), 402 S. Keyston Ave, Sayre, PA 18840

Commodore Users of Berks (CUB), Dan Schein, 2455 McKinley Ave., West Lawn, PA 19609

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Hedland Commodore Computer Group, John Noblet, 10 Barker Court, Port Hedland 6721, Western Australia

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Diskmaster Club, Michael Lalonde, 1326 Hastings Crescent, Sudbury, Ontario, Canada P3A-2R5

Anthrax Commodore Users Group, 2360 Weston Rd., Suite 102, Toronto, Ontario, Canada M9N 1Y9

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Anthon's 64 User Group, Box 1346, 6401 Molde, Norway

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

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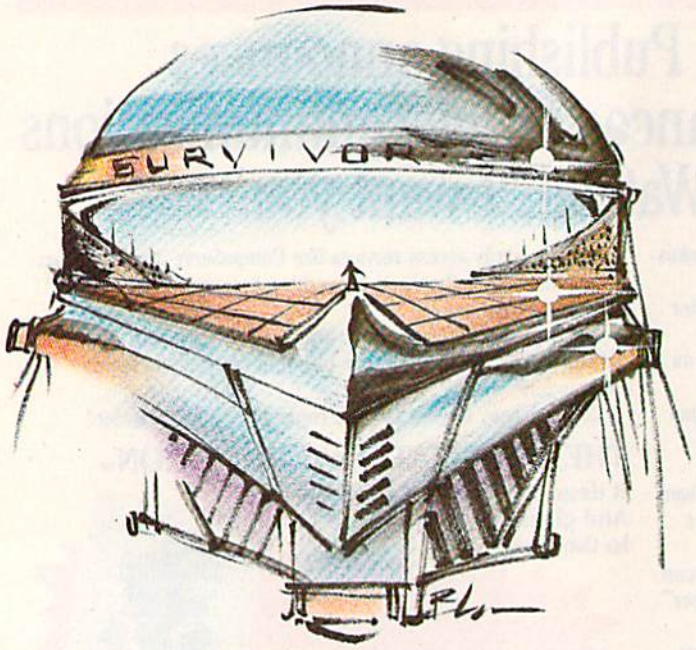

Survivor

Kevin Mykytyn and Mark Tuttle

This game should be played only when you're at your best: quick of eye, quick of mind, and quick of hand. A two-player contest that allows only one "survivor." For the Commodore 64, 128 (in 64 mode), Plus/4, and 16. Two joysticks are required.

It's late in the twenty-third century, a time when Earth's space colonies have expanded into new galaxies, and humans have developed strange new powers and abilities. One of these, genetic restructuring, has been responsible for much of the recent increase in colonization. The process allows colonists to adapt their physical form to suit conditions on any planet.

In the newest colony, Galactica Temporan #1, the metamorphosis has been taken to an extreme. The people of this outpost have been forced to assume a new robot-like bodily identity in order to subsist and to survive the bizarre climate. These colonists are at the vanguard of twenty-third century technology, but, as in many new colonies far removed from their mother country, the social environment is highly unstable. Pyrian, the colony's leader, is stern and demands dedication and hard work to keep Galactica Temporan #1 the leader in the latest phase of the colonization program.

But the colonists, some of the best researchers available, are, despite their crablike appearance, only human. And arguments, fights, and rivalries have been cropping up. Not surprisingly, conflict between the armored, robotized humans tends to lead to a serious and irreversible outcome. Colony population has been suffering. Pyrian's initial disciplinary efforts were to little avail. Now a new law is effected, a law that Pyrian hopes will eliminate all disorder—and terminate all troublemakers.

He has devised an enclosed, gridlike arena in which two agitators fight until one is destroyed. The only way out is to survive the duel. Pyrian has employed many of modern science's most impressive discoveries in the operation of the arena. The resulting pyrotechnics are quite entertaining, and the watching crowd enjoys the temporary diversion, but is also reminded of the penalty for serious disorder.

Pyrian's arena includes energy and matter transmission, the ability to spontaneously generate simple life forms, and even an ingenious method of sustaining the life of a combatant through five lethal exchanges. After all, the effect of the spectacle is much reduced if it ends too soon, if the combat is not hard and long and bitter. For the fighter who emerges from Pyrian's arena must be seen to transcend the pain and terror of the punishment. Only then is the former agitator seen as a survivor, and surely now a worthy member of Galactica Temporan #1.

Getting Into The Arena

"Survivor" is a two-part program. Program 1 is a BASIC loader which automatically loads Program 2, a larger machine language program. As listed, it runs on the Commodore 64. If you have a Plus/4 or 16, substitute these lines in Program 1:

```
QK 130 A$=CHR$(129):COLOR 0,1:
       COLOR 4,1:POKE2025,255:
       BC=685:BK=685
BA 230 IFJOY(1)>127ORJOY(2)>12
       7THENPOKE1352,255:COLOR
       4,2,4:GOTO250
RQ 350 COLOR 1,2,4:RETURN
JH 390 FORI=1TO9:COLOR 0,T2:FO
       RJ=1TO50:NEXTJ:COLOR 0,
       1:FORJ=1TO50:NEXTJ,I
MD 410 IFJOY(1)>127ORJOY(2)>12
       7THEN330
```

After typing in Program 1, save a copy. To enter program 2 on a 64, you'll need MLX, found elsewhere in this issue. (If you have a Plus/4 or 16, see the instructions below.) After loading and running MLX, respond to the starting and ending address prompts with **2800** and **32C7**, respectively. When you've finished, be sure to save it with the filename "SURVIVOR 2". Tape users should save Program 2 immediately following Program 1. Program 1 will automatically load Program 2.

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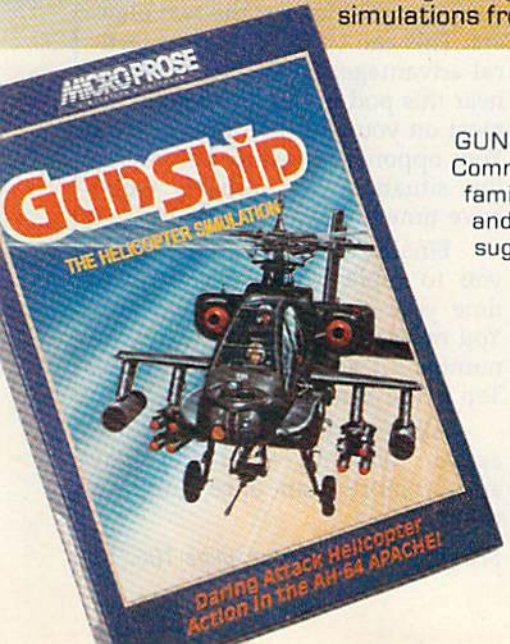

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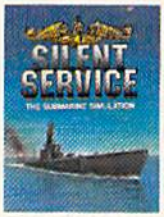

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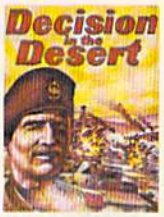

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If you own a Plus/4 or 16, you don't need MLX to enter the machine language portion. You can use the built-in machine language monitor. First, enter MONITOR to exit BASIC. Type **F 2800 32C7 00** to fill that section of memory with zeros. You could skip this step if you wish, but when locations 2800–32C7 are initialized to zero, it makes it easier to see how far you've come. Next, type **M 2800**, which displays the contents of a section of memory. Now enter Program 2, *ignoring the last number on each line of the program listing.* The final number is a checksum used by MLX; it's not necessary when you're entering numbers into the monitor. Make sure you press RETURN after each line has been typed. When you finish a section of memory, type M and the next section of memory will be displayed. To save to disk, enter **S "SURVIVOR 2",8,2800,32C8** (tape users should change the 8 to a 1 immediately after the program name).

128 owners have two choices. Either go into 64 mode and enter Program 2 with MLX, or stay in 128 mode and use the built-in monitor as described above.

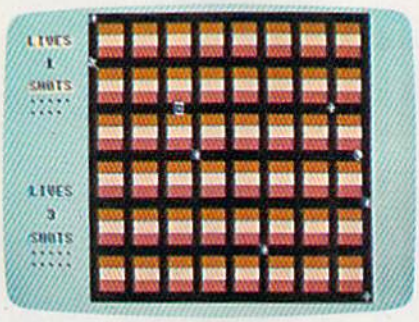
To play Survivor, just load Program 1. Be sure to have two joysticks plugged in. When you're ready to begin, type RUN.

Player 1 controls the joystick plugged into port 1, and is represented by the green character found at the lower right when the game begins. Player 2 uses the joystick in port 2, and is represented by the yellow character found at the top left corner. To the left of the playing area is the number of lives and shots remaining displayed in the color corresponding to each player.

The Basics

The object of the game is, as the title implies, to survive. The unfortunate consequence is that your opponent must not survive. As you may recall, Pyrian has devised a method whereby each player can absorb five lethal hits (or "lives," as displayed on the screen). The first player to lose all five loses the game.

Using a joystick, each player maneuvers through the grid. Each has ten shots at the start. To fire, press the fire button. The shot will travel in the same direction as you are moving (or, if you're firing while stationary, the shot will travel in the direction you were last moving). You can fire rapidly, but remember that your shot supply is limited; you'll notice the number of available shots being reduced in the player's statistics area to the left of the playing field.



The green player (lower right) and yellow player (upper right) at a strategic point of play. (See the Game Elements figure.)

When a life is lost by either player, provided it's not the last one, the screen is cleared. A timer located between the two groups of player statistics will count down. When it reaches 0, each player's shot total is restored to 10, and a new round begins. When a champion is determined, the color of the winning player (green or yellow) is flashed, and a prompt to play again is offered.

Squiggles And Pods

Besides contending with a wily human opponent, you must be constantly aware of a number of other game elements. The five Squiggles roaming the grid are to be avoided at all times. Contact with one of these will result in the loss of a life. These creatures randomly move about the grid and can be destroyed only by being shot. (Note: One shot may not always be sufficient.) Each time a Squiggle is destroyed, a new one evolves from the center of the screen, so there will always be five to contend with. Although their movement is random, you can sometimes use them to your advantage while trying to outwit your opponent.

Besides the Squiggles, there are four "pods," some of which can work for or against you. Appearing randomly are the Elemental, Speed, Transpositional, and Shot pods. Each of these represents a type of action that will occur if a player moves over the pod. (See the Game Elements figure.)

The Elemental pod is probably the most desirable of all. Passing over it releases the Creature, who chases your opponent. Although the lifespan of a Creature is limited, he's indestructible. But if the Creature is chasing you and the elemental pod reappears, you can pass over it and the Creature will chase the other player. The Creature is extremely intelligent and will stop at nothing to destroy the one it pursues.

The Speed pod temporarily doubles your speed. This helps your evasion ability and allows you to reach other pods more swiftly.

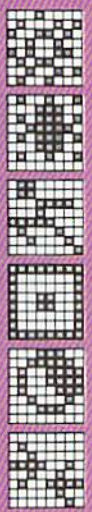
The Transpositional pod will swap the positions of the two players. This can be used to great tactical advantage. For example, hover near this pod until a Squiggle is almost on you and then pass over it. Your opponent is nearly helpless in this situation. He probably won't have time to react.

Finally, the Shot pod will allow you to replenish your shots any time your supply falls below ten. You must sit on this pod while the number of shots slowly rebuilds. Ten is the maximum you can get.

All of the pods appear and disappear randomly—and they may appear more than once during a round.

See program listing on page 106.

Game Elements



Creature

Squiggle

Speed pod

Shot pod

Elemental pod

Transpositional pod

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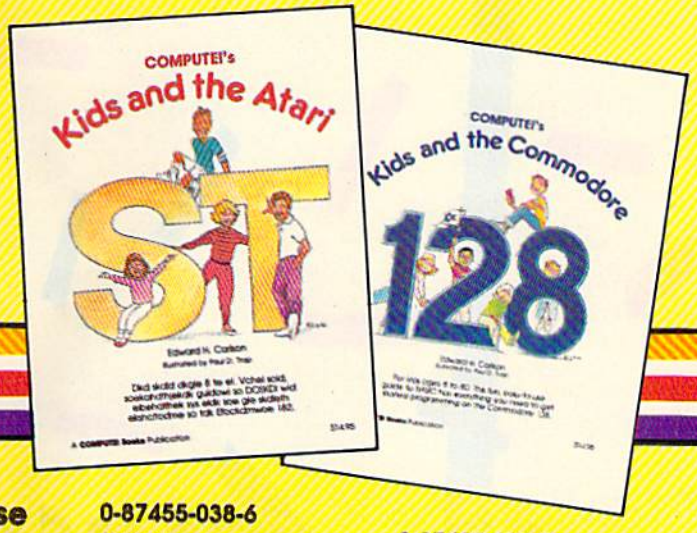

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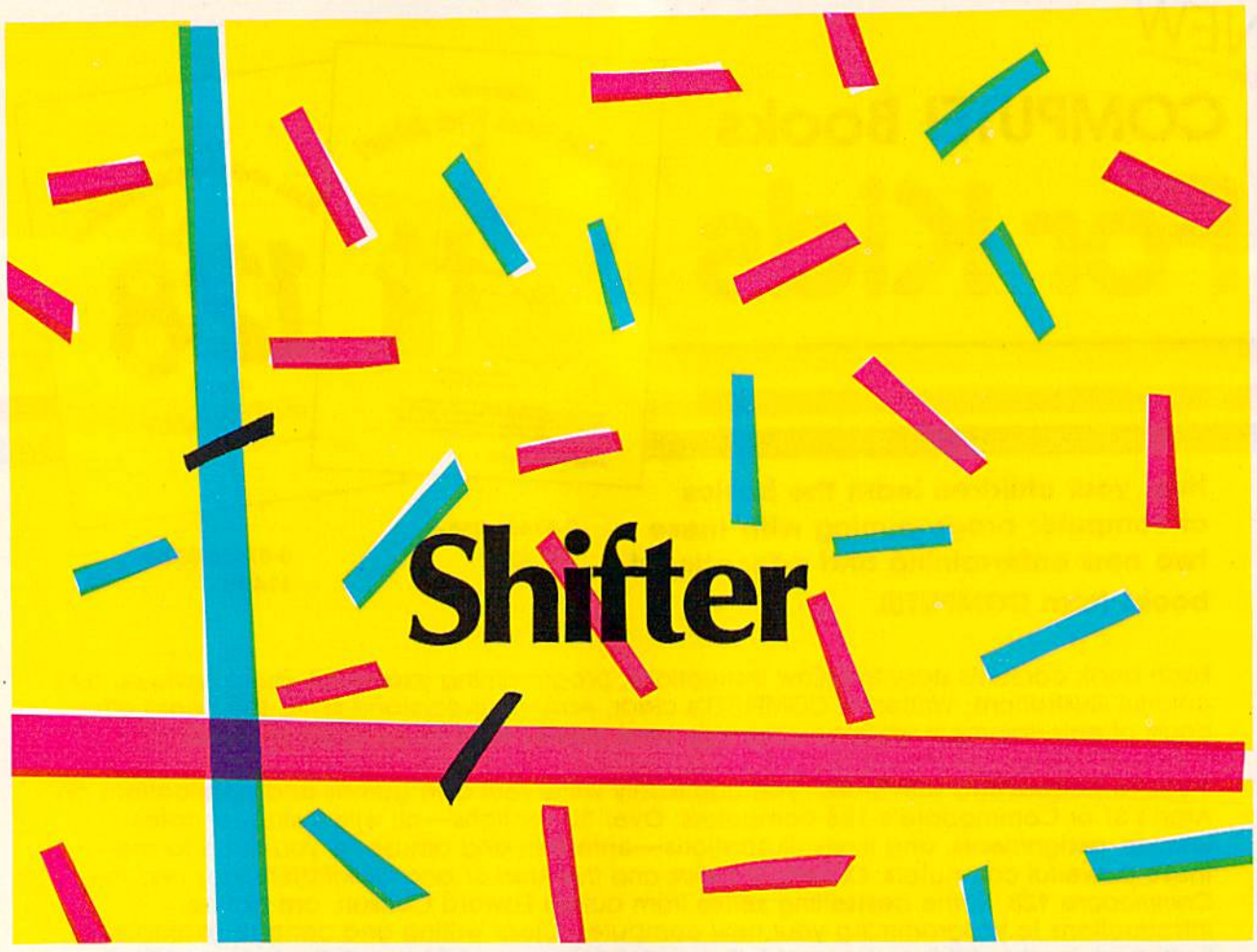


Kevin Mykytyn and Mark Tuttle

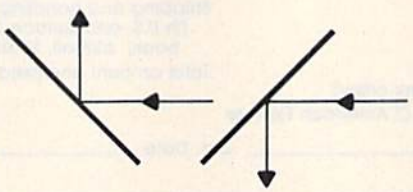
Fast reflexes are the key ingredient for success in this action game for two players. For the Commodore 64, 128 (in 64 mode), Plus/4, or 16. Two joysticks are required.

There's little time to think once the zorba disk hits the playing field in "Shifter." The field is covered with small white bars—shifters—that can change the direction in which the disk is moving. Your job is to prevent the zorba disk from passing through your scoring zones, while trying to steer the disk through your opponent's.

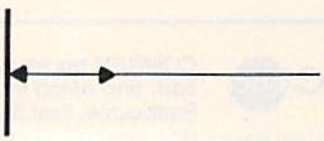
The game begins with your selection of a skill level from one to three; one is the most difficult, so beginners will probably want to select level three. Once you've made your selection, the zorba disk appears in the center of the field and moves in a random direction. It continues moving in that direction until it hits one of the shifters.

Shifty Characters

If the disk hits a diagonal shifter, it changes its direction by 90 degrees:



If the disk hits a shifter which is perpendicular to the direction it's moving, it reverses course:



The movement of the disk isn't affected if it hits a shifter that's parallel to its course:

Player 1 defends the vertical sides of the field, and controls a red vertical shifter beam. Moving the joystick left or right moves the beam horizontally; moving the joystick up or down rotates all the shifters vertically within the beam. The shifters can't be rotated, though, if the zorba disk is in the beam.

Player 2 defends the horizontal sides of the field, and controls a yellow horizontal shifter beam. Moving the joystick up or down moves the beam vertically; moving the joystick left or right rotates all the shifters within the beam horizontally. Again, the shifters can't be rotated if the zorba disk is in the beam.

Each time the zorba disk enters

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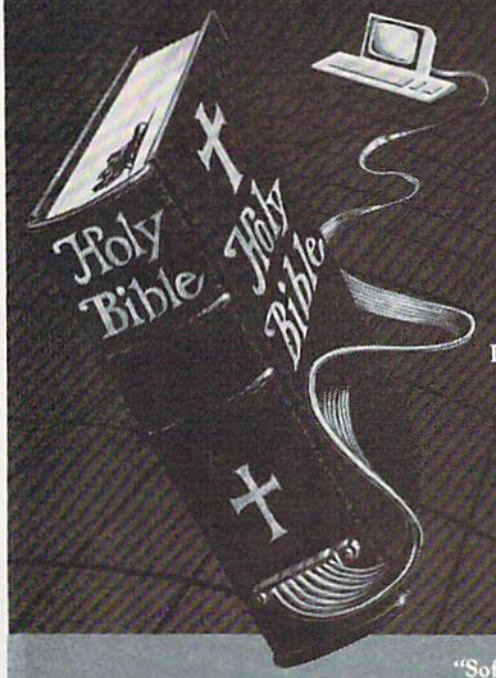

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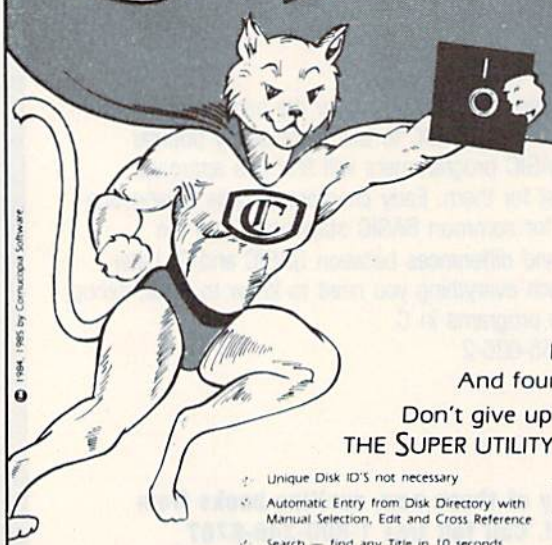

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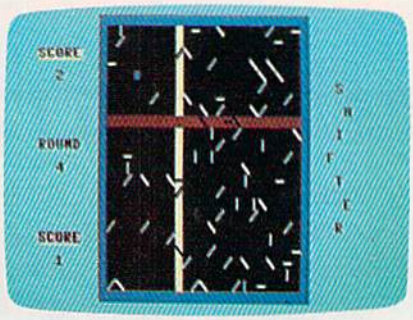
the top or bottom side of the field, player 1 scores a point; if the disk enters the left or right side, player 2 scores. Each time a point is scored, a round is finished; the game ends after five rounds.



The blue zorba disk careens toward a shifter.

Typing It In

Type in Shifter using "The Automatic Proofreader," elsewhere in this issue. If you have a Commodore 64 or 128, type in Program 1. (The program runs in 64 mode on the 128.) If you're using a Plus/4 or 16, delete lines 30 and 550 from Program 1, and insert the replacement lines in Program 2.

Shifter is written in BASIC and machine language. The machine language is in DATA statements at the end of the program. Since even a small error in typing in this data can cause the computer to lock up, be sure to save a copy before running it.

See program listing on page 99.

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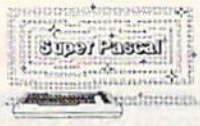

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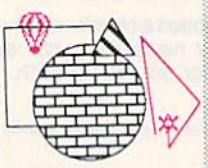

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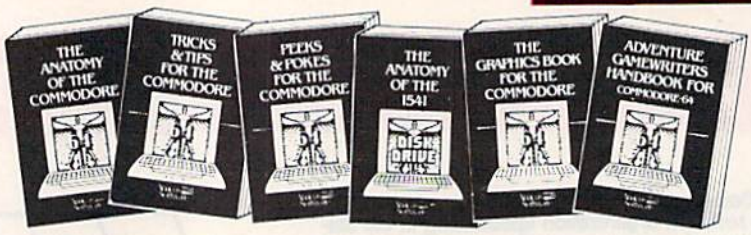

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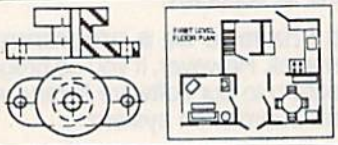

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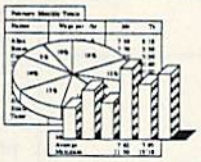

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Perry Mason: The Case Of The Mandarin Murder

"A solution of any crime which doesn't account for all the various factors involved is no solution at all."—Perry Mason.

Erle Stanley Gardner fans will really enjoy this game for the Commodore 64 from Spinnaker Software's Telarium Series. You're cast in the role of the legendary defense attorney, Perry Mason, and prepare to defend your client, Laura Kapp, on trial for the murder of her husband, Victor, in what appears to be an open and shut case. All the evidence points to her guilt, and only your sharp legal mind and investigative skills can save her and bring the real murderer to justice. But there are plenty of other suspects, each with motives of one kind or another.

You conduct a preliminary investigation, with the help of assistants Della Street, your legal secretary, and Paul Drake, a highly-skilled private detective who has assisted you in the past. Your primary objective is to gain acquittal for your client. Before you're really ready, it's time for Laura's court appearance.

Perry Mason: The Case Of The Mandarin Murder is an interactive-fiction game, combining text and graphics. You type in your actions, and the computer responds. The parser, that part of the program which interprets your commands and questions, is rather slow for this type of game. But you'll quickly feel the sense of adventure and mystery of an Erle Stanley Gardner novel, the only difference being that *you* are part of the mystery. Your courtroom actions and decisions will determine the fate of your client.

As in other packages in the Telarium series, you may feel controlled by the program at times. Many possible avenues of investigation are blocked. Occasionally you may feel the real battle is you against the computer, rather than against the D.A. in court. Most of the investigation must be conducted by Paul, while you stay occupied with the defense in court. Often you'll find that paths of questioning you'd like to follow are blocked by seemingly pointless

objections raised by District Attorney Hamilton Burger. Even trying to establish a simple relationship between characters can be quite difficult, and sometimes your questions will evoke an unexpected and unrelated response from the character.

No opportunity is given to present a defense, so you must prove the innocence of your client through careful cross-examination, and establish the guilt of the real murderer.

Most players will be able to complete this game in about four hours, with options to save and restore a game at various points along the way. After cross-examining the final witness, the jury will return a verdict: innocent, guilty, or hung jury. Arm-chair detectives will thoroughly enjoy this mystery.

—George Miller

Telarium
One Kendall Square
Cambridge, MA 02139
$32.95

Movie Maker

Have you ever wondered why Mickey Mouse wears white gloves? One story says the animated rodent was closely based on Charlie Chaplin, who was sometimes similarly attired. Another tells that Ub Iwerks, the artist who drew the mouse for Walt Disney, was inspired by the gloves worn by the painters at the animation studio who worked on the acetate cartoon cels. (A cel is the name given to each of the many transparent pictures that make up an animated cartoon.) Regardless of the legends, the mouse continues to sport his gloves. So, too, do many of the people involved in the painstaking process of conventional animation.

But as *Tron* and other movies with sophisticated animation and digitized graphics have shown, computers are having a significant impact on the traditional animation process. *Movie Maker*, a powerful animation program from Interactive Picture Systems, brings some of those computer capabilities to the Commodore 64 user. With it, the aspiring film-maker can bypass the classic method of painting and photographing thousands of cartoon cels. Instead, a finished movie of considerable length can be drawn, animated, enlivened with sound, synchronized, and recorded—all with just your computer and one disk drive.

Although *Movie Maker* has been around for some time, early copies didn't perform consistently on the 64. An enhanced version of the program is now being distributed by Electronic Arts, and it works perfectly. *Movie Maker* also contains three animated movies created by cartoonist Gahan Wilson, and a selection of art works.

Your initial point of contact is the library of effective demonstration films on the two-disk set. With these and the tutorials described in the limited documentation, it's possible to gain a bare familiarity with the program.

Beyond that, you're on your own. This is a serious product, and it's for people who really want to make animated films. Mix *Movie Maker* and your imagination, and wonders can evolve. Otherwise, it has no entertainment value. The program is an advanced animation processor, and its operation is correspondingly complex. Unless you have an understanding of how animation works, or the perseverence to grapple for a time with *Movie Maker*, think twice before buying it. For those not put off by these warnings, here's a brief look at what you can do with this excellent program.

An individual *Movie Maker* movie can have up to six video tracks and three sound tracks, all synchronized and playing concurrently. The maximum length

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Start your lesson with **RhythmMaster** Software. With its built-in metronome, RhythmMaster will display the treble and bass musical staffs and a picture of a piano keyboard. RhythmMaster will then play a measure of music and you must try to play the same measure back on the Melodian keyboard. You're not familiar with the keyboard or can't read music? No problem. RhythmMaster displays the notes you are to play on the musical staff and on the keyboard pictured on the monitor. If you strike the wrong key the note on the musical staff turns red and shows you which key you played wrong, making it ever so easy to correct what you played.

If you should hold a key too long a turtle runs across the screen. Inversely if you should release a key too quickly a rabbit scurries by. If you don't play it correctly RhythmMaster knows it and repeats the measure for you to play.

ConcertMaster teaches you how to play 35 pre-recorded songs from Bach to Rock. With ConcertMaster you can analyze music note by note, instrument by instrument and learn how a music composition is put together. Then you can compose your own music and record it right onto your floppy disks.

There are nineteen different instrument sounds to choose from in over a seven octave range giving you a wide choice of instruments to suit your musical taste and expression. You can also create your own instrument sounds.

ScoreMaster enables you to print out your music in standard music notation for other musicians to play, or for yourself.

New York Times Says . . .

Erik Sandberg-Diment of the New York Times states "really useful and instructive item ... Tanya, our 10 year old beginner quickly caught the spirit of matching the dance of her fingers to the measured metronome." "One piece of educational software that, unlike most of its kinfolk, actually delivers. These software-hardware combinations offer a lot of entertainment to the Commodore owner."

RUN Magazine Says . . .

Tom Benford of RUN notes "Whenever a selection of products of the same genre is available, one among the bunch rises head and shoulders above the rest. Such is the case with Melodian ConcertMaster keyboard and software. The combined features of RhythmMaster and ConcertMaster give you a complete music tutorial."

AHOY! Magazine Says . . .

Peggy Herrington of AHOY! said "The system is so easy to use that I didn't need the documentation". "It's fun, challenging, and educational, and for playability and ease of use it is nothing short of spectacular."

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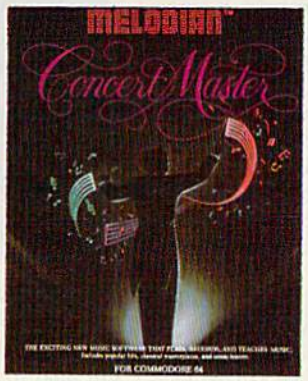

RhythmMaster Software rm-01 — $29.95

RhythmMaster teaches a beginner how to read music and play it correctly and in rhythm on the musical keyboard.

RhythmMaster will have you reading and playing musical notes in minutes with fun and excitement.

RhythmMaster Features:

Trumpet, organ, violin, and synthesizer instrument sounds. Built in metronome. Pause/Play control. Set-up menu for customizing RhythmMaster.

RhythmMaster Teaches:

How to read notes on the treble and bass musical staffs,the names of the notes, where the notes are on the keyboard how to play whole notes, half notes, quarter notes, eighth notes and sixteenth notes in combinations, in both 3/4 and 4/4 time. How to play in different tempos.

RhythmMaster Requires:

A Commodore 64 or Commodore 128 with disk drive. Melodian Musical Keyboard kb-01 is required to study the reading and playing of musical notes.

Melodian Musical Keyboard kb-01 — $99.95

40 Keys (A-C) in professional gauge spring loaded to give the feel and response of a real keyboard instrument. Polyphonic.

Registers (with ConcertMaster)
Organ, Trumpet, Flute, Clarinet, Piano, Harpsicord, Violin, Cello, Bass, Banjo, Mandolin, Calliope, Concertino, Bagpipe, Synthesizer 1, Synthesizer 2, Clavier 1, Clavier 2, which can be played over a 7 octave range. Programmable sounds as well.

Recording (with ConcertMaster)
Three track sequencer (recorder) with overdubbing and multitimbral (different instrument sounds at the same time) effects.

Interface
Built in interface for Commodore 64, Commodore 128, plugs right in to joystick port no. 2 and user port.

Power Supply
Powered direct by the computer, no batteries and cords required.

Finish
Table Model in white high-impact material, with carrying handle, protective key cover, and built in music stand. Size 29 -1/8 X 9-9/16 X 3-11/16, weighs 9 pounds.

Programmer's Tool Kit pt-01 — $29.95

Contains programs, and BASIC source listings for reading the Melodian Musical Keyboard, and for reading and creating music files for Melodian ConcertMaster.

ConcertMaster Software cm-01 — $29.95

ConcertMaster teaches how a composition is put together, note by note, instrument by instrument. You learn to play 35 pre-recorded songs from Bach to Rock. Then you can compose your own songs and record them right onto your floppy disk.

ConcertMaster Teaches:

Scales, Bass lines, Familiar Beginner Songs such as "Jingle Bells", Easy classical songs such as "Bach Minuet" and Ravel's "Bolero", Advanced classics like "A Midsummer's Night Dream" by Mendelssohn, Popular hits such as "Thriller"

Instruments Sounds

Organ, Trumpet, Flute, Clarinet, Piano, Harpsicord, Violin, Cello, Bass, Banjo, Mandolin, Calliope, Concertina, Bagpipe, Synthesizer 1, Synthesizer 2, Clavier 1, Clavier 22, which can be played over a 7octave range. Programmable sounds as well.

Recording Functions:

Three track sequencer (recorder) with overdubbing and multitimbral (different instrument sounds at the same time) effects.
Each track can be set to one of seven different functions:

- **Monitor:** Lets you use a track to play music live, without recording it.
- **Record:** Records a track as you play.
- **Playback:** Lets you hear whatever has been recorded or loaded into the track. You may playback one track while recording another to build layers of instruments.
- **Mute:** Turns a track off. This is useful when you want to listen to or record one or two tracks at a time.
- **Save:** Stores a track to the disk.
- **Load:** Loads a track from the disk.
- **Protect:** Write protects a track.

Create New Instrument Sounds

Choose from pulse, sawtooth, triangle and noise sound sources. Control the sound envelope with attack, decay, sustain, and release times. Ring Modulation and Syncronization effects. Set Low pass, band pass, and high pass filter frequencies.

ConcertMaster Requires:

A Commodore 64 or Commodore 128 with disk drive. Melodian Musical Keyboard kb-01 is required to study the reading and playing of musical notes.

Melodian ScoreMaster sm-01 — $29.95

With the ScoreMaster program your music can be printed out in music notation, which other musicians can read and play. Any music recorded with the ConcertMaster program can be printed by ScoreMaster.

ScoreMaster Requires:

A Commodore 64 or Commodore 128 with disk drive and printer compatible with the Commodore graphics mode such as the Commodore MPS 803, 1515, and 1525.
Melodian ConcertMaster program.

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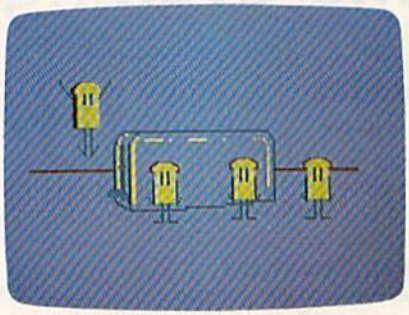

of a movie is 300 frames, and the maximum size of a character is one-eighth of the screen. The video tracks can each display one character at a time, but that character can be pulled off the screen and replaced with another at any point. Lower numbered tracks pass behind higher numbered ones. All tracks play over a static background page. Recording is simple and easy—once you've found your own method—and adding great sound effects is a snap. But doing all of this effectively is far from easy, and you'll need to experiment with the program to find a consistently successful approach.

You start in the Compose option, selected from an integrated system of menus like the other features of the program. Here you'll work on a shape page and a background page. The former carries all the drawings of your characters, the latter just what you'd expect. In both, three different colors can be selected and drawn on a fourth. Your drawing tools aren't fancy by comparison to specialized graphics programs, but they are adequate. The duplicate, zoom, and mirror commands are good— and essential, since you must draw every frame of every character's movement.

You work with the program via a system of windows, borders, outlines, numerous keypresses, and a joystick. Frankly, this can be quite confusing until you realize that only those items outlined by narrow boxes are really "seen" by *Movie Maker*. You set up these boxes yourself; and you can toggle them on and off by pressing the letter V on the keyboard. Anything you dump into such a box is manageable by one command or another. Since the commands are accessed by varied keypresses, it's quite easy to lose your place. Above all, remember that pressing the space bar in Compose will eventually return you to a stable situation—you'll see a character outlined by one thin box, and you can begin manipulating your drawings again. Eventually, you combine your figures into an animation sequence by merely surrounding them with a box and pressing the joystick fire button. These sequences are held in memory, and can be put in motion and perfected. The shape and background pages are then stored to disk.

From the creative stage of Compose, you move to Record. Here, you recall your shape and background files and record the sequences as a movie. It's not easy at first, but eventually you'll be mixing tracks and characters, sound and special effects with little effort. Program operation is much like that in Compose. Again the object is to produce a disk file, this time an animation file.

Next you'll go to Smooth. This is an automatic section of the program which melds all your files into a smooth-running short film.

The final stage of the program, Play, plays your completed movie. Again, this is a largely automatic process.

There are numerous specialized features packed into *Movie Maker*, but they won't mean much until you use them. Of special interest, though, is the ability to make auto-run disks that will play your movie on any 64. You can, of course, splice your short films into a long videotape, and perhaps rival those early productions of Disney and Iwerks.

Indeed, for anyone wanting to make good quality animation without a studio laden with equipment, *Movie Maker* offers plenty of scope. The program's complexities can be overcome, leaving you with an effective and useful tool for what is, after all, a very involved process. Now you can throw away the white gloves and get to grips directly with the film making.

—Lee Noel, Jr.

Electronic Arts
(Designed by Interactive Picture Systems)
2755 Campus Drive
San Mateo, CA 94403
$32.95

Dambusters

It's World War II, and the German war machine is in high gear, providing Hitler with the tanks, boats, and planes needed to carry out his plans for world domination. The power source for virtually all of Germany's industry comes from three huge dams in the Ruhr Valley—the Moehne, the Sorpe, and the Eder. Destroy these dams, and the German war machine will be crippled. Your mission is as obvious as it is vital, and as vital as it is dangerous: destroy the dams.

That's the scenario, based upon the actual raid carried out during WWII, that serves as the basis for Accolade's new war/flight simulator, *Dambusters*. Accolade is a relatively new software company, and its products stress realism, stunning graphics, innovative concepts, and enjoyment: *Dambusters*, at least the Commodore 64 version, fits the bill.

Dambusters is a combination flight

simulator/wargame. It requires you to not only recreate the bombing raid on the great dams inside Nazi Germany but also to pilot the Lancaster Bomber while doing so. Using realistic joystick control, you must learn to read and respond to various pilot screens and indicators, navigational maps, and engineer's indicators. At the same time, you control the front and rear gunners, and—of course—the bomb sights. After all, you didn't think the Germans were going to just let you walk in and destroy their dams, did you?

Flying at low level (you've got to drop your 10,000 pound package from no more than 60 feet above the water), be prepared for a deadly greeting party made up of German ME-110 night fighters. They'll show up at about the same time you're dodging or shooting down barrage balloons and spotlights. Of course, you're going to get some flak from the Germans on the ground, too.

As a flight simulator, *Dambusters* isn't as complicated as *Flight Simulator II* or *Stunt Pilot*, two advanced computer flight simulators; however, it does require an understanding and constant awareness of booster gauges, throttles, RPM gauges and the altimeter gauge. As a game, *Dambusters* doesn't contain as much variety as, say, *Fifty Mission Crush*, another flight-based contest. Nevertheless, when you combine the two aspects and throw in a very demanding final bombing run, you have an excellent game.

Graphics are very well done. It's a visual reward to see your bomb skipping along the water's surface, disappearing from sight, and then blowing a huge hole in one of the dams, releasing a cascade of water. (It probably should be mentioned, even though this is a Commodore review, that while the game play is the same on the Apple II version, the graphics are not nearly as good).

All in all, this product offers good play value for the dollar, and its approach is different enough to make it more than just another flight simulator or WWII flying game.

—James Trunzo

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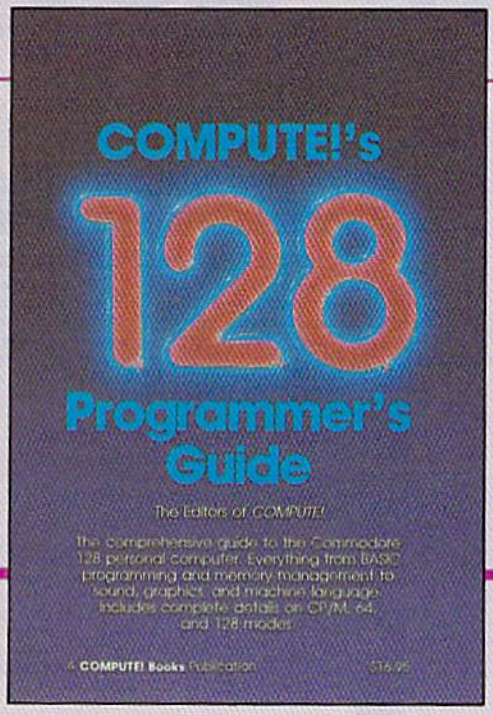

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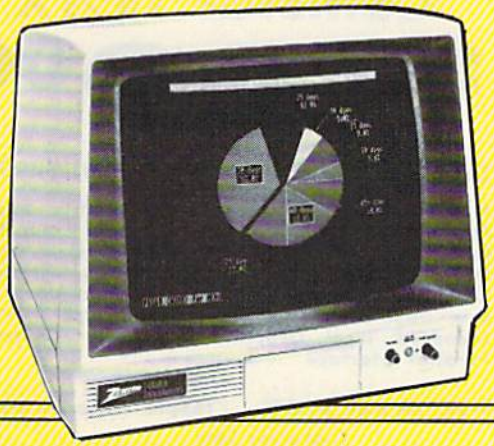

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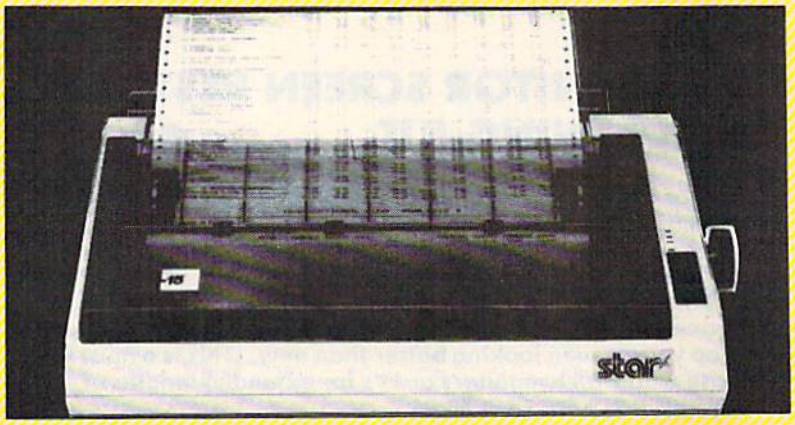

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Fighter Command

The date is August 13, 1940, a day referred to in the intercepted German messages as *Adlertag*, or Eagle Day. German forces occupy France. The RAF is still recovering from several weeks of air battles over Dunkirk as British land and sea forces withdrew from the advancing German forces. Intelligence reports indicate that the Luftwaffe is preparing a major air offensive against English targets. To win the Battle of Britain, the Luftwaffe must gain control of the air over the English Channel and Southern England. As long as England controls the sky, an invasion by sea would be extremely difficult. British naval forces still maintain supremacy on the seas, and air support from nearby RAF bases could turn back any assault. It's up to the RAF Fighter Command, under your direction, to stop the anticipated waves of German bombers and prevent an invasion.

Although many strategy war games are quite difficult, and SSI does rate *Fighter Command* as an intermediate level game, beginning war gamers will enjoy this historic defense of Britain. Choose one of the five levels of difficulty to suit your skill, from beginner to the full historic simulation for advanced players. You may choose to assume the role of commander of the RAF Fighter Command, and plan your strategy to win the Battle of Britain, while your computer controls the German Luftwaffe, or you and a friend may match wits, as one of you commands the RAF, while the other directs the Luftwaffe offensive.

Fighter Command allows you to direct the RAF through several scenerios in the Battle of Britain. I recommend that you try the Eagle Day Scenerio until you gain experience in directing your defense. Eagle Day covers only the first day of the battle and takes about an hour to play. When you've gained experience and confidence, direct the air defense of Britain through any of five scenerios, including the entire campaign for air supremacy over Britain.

You'll find the colorful maps included with the package very useful as the pace of the game increases. Follow your progress and plan your daily activities from the daily Intelligence reports, then issue orders to the squadrons under your command. For added realism, you'll occasionally be informed of probable targets of Luftwaffe bombers for that day's raids. This simulates the decoding of intercepted enemy communications. Your fighter squadrons will suffer losses, and morale will increase or decrease as the tides of the battle flow. You must rotate the front line squadrons efficiently to maintain a high degree of effectiveness against the seemingly endless stream of Luftwaffe bombers attacking across the channel and out of the North Sea. But rotation of too many of your key squadrons could weaken your defense in a critical area.

Don't plan on spending just one evening with the longer scenerios, which cover several days of battle. However, you may save your progress in the game before and after each day's activity. The entire campaign took me almost two weeks to complete, but without distraction, the campaign could be completed in a weekend. Each day's action can take up to an hour.

After a campaign is completed, the day-to-day attrition rates are displayed, and you can see where your strategy might have best been revised. This helps as you begin to plan your next defense.

One option I would have liked is a printout of the daily status reports. In all fairness, however, it should be noted that most games in this genre don't include this option. Also, it would be interesting to control the Luftwaffe and direct raids on British targets, while the computer controlled the defense. In the player versus computer mode, the computer controls the Luftwaffe.

If computer war gaming is one of your interests, *Fighter Command* is a must for your collection.

—*George Miller*

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Spellbreaker

You are the enchanter. You are the wizard.

You've grown from apprentice to master sorcerer to the leader of the Circle of Enchanters. After years of study, discipline, and hard work, you're at the peak of your magical powers. And now, all around you, the magic is failing.

This is *Spellbreaker*, the final installment in Infocom's *Enchanter* fantasy trilogy. For those who've struggled happily through the first two programs, *Enchanter* and *Sorcerer*, *Spellbreaker* is a fitting climax. It's an expert-level game for the Commodore 64, tougher than both previous adventures. Those new to Infocom's brand of interactive fiction would be well advised to start elsewhere—perhaps with the original *Enchanter*, a standard-level fantasy game—then work their way up to this. In the future, Infocom's designers will have to go a long way to create a more difficult and intriguing text adventure.

Spellbreaker opens with you standing amidst a congregation of Guildmasters in the Council Chamber of the Guild Hall at Borphee. All of the Guildmasters are looking to you to explain why the magic of the land has begun to fail. *Gloth* spells won't fold baker's dough for pastries anymore. *Fripple* spells fail to contain wild animals. And even the locally brewed beer, without benefit of magic, tastes more like cherry soda. But before you can begin to ask your questions, everyone in the crowd except you and a sinister cloaked figure is turned into a frog, toad, salamander, or newt. Good luck. You're on your own.

As with Infocom's other adventures, *Spellbreaker* uses a very sophisticated *parser*, the portion of the program that breaks down your English commands and questions into components that the game can process. You can communicate with the program in complete sentences, even stringing together more than one action as long as the command is no longer than two lines of text. The game's puzzles—the heart of the action—are complex, making previous experience in the *Enchanter* trilogy a definite plus.

You're in possession of a magical spell book that's been a source of great power. Belboz the Necromancer gave it to you years ago in a previous adventure. But now, with the magic failing, many of the spells have faded from the pages. And those that remain you must relearn before using. Even the remaining spells frequently short circuit: Instead of writing a magic spell, your fingers simply grow numb; smoke clouds mushroom as another spell fizzles in the air.

There are other items of importance as well. Extremely rare spell scrolls dot the kingdom, giving you the power to use new spells or add them to your spell book for continued use. A magic burin lets you inscribe objects with words or runes that have magical power. And of course there are the spells themselves: *lesoch*, to generate a gust of wind; *jindak*, to detect magic; *yomin*, to probe someone's mind; and a variety of other incantations, some useful and some not. Learning how and when to cast spells is one of the keys to proceeding through the kingdom to find out who's stealing the magic.

Spellbreaker is the work of Dave Lebling, co-author of the popular ZORK series of adventures and of *Enchanter*. He also created the *Starcross* and *Suspect* Infocom adventures. With *Spellbreaker*, Lebling has written his

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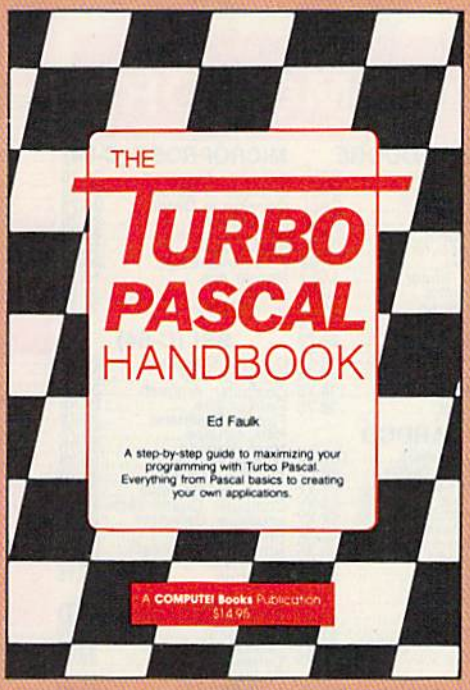

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—*Selby Bateman*

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Touchdown Football

More than a year ago, Imagic released an action-strategy sports game for the Commodore 64 called *Touchdown Football.* Unfortunately, the game—which happens to be very good—did not get a great deal of national distribution. Now, Electronic Arts, through its affiliated distribution label, is making the game available once again.

What makes *Touchdown Football* well worth recommending is its mixture of play elements. The graphics are colorful and crisp; sound effects, such as crowd noise and music, are good; game play is handled easily with a joystick; and there are enough options to make the game a real contest whether you're playing against the computer or another player. In short, the action is fast and fun.

There are six players to a side, with a total of nine offensive formations (strong left and right, slot left and right, I-left and right, split, shotgun, and kick) and nine defensive formations (monster left and right, tight left and right, prevent left and right, blitz, zone, and goal line). The two receivers have nine patterns, including buttonhook, streak, flag post left and right, side line left and right, safety valve left and right, and block/no pass. There are also different kicking offensive and defensive options, and the linemen can block left, right, and straight.

The simulation includes timeouts, a real-time clock, penalties, and blocked kicks. It's even possible to call an "audible" from the line of scrimmage. With the joystick, you control one player at a time, while the computer handles the other five men on your team. The program dynamics here make computer control a complement to the game rather than a hindrance. For example, when you pass the ball, as quarterback, control passes automatically to your receivers after the ball is released.

Touchdown Football doesn't weigh you down with too much strategy, although there are hundreds of play options. They're quickly and easily accessible, even for younger players. The emphasis is on action, and in that you'll find *Touchdown Football* a game you'll enjoy.

—*Selby Bateman*

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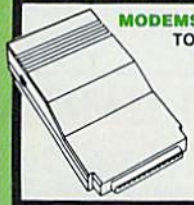

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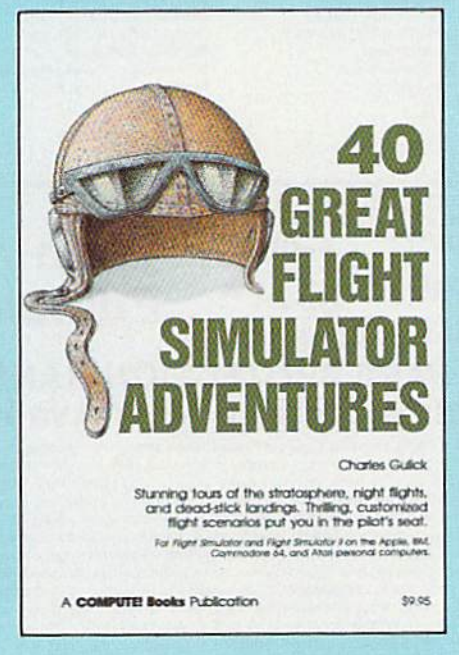

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Internal Files

Daniel E. Shamo

Serious application programs that handle a lot of information often store the data in sequential files. But while you're working on a program, it can be frustrating to wait for it to reread the data file every time you make a change to the program, especially if the information is on tape. Here's a shortcut that can save a lot of time.

During the programming process, set up a representative sample of the variables in the form of DATA statements. Then, instead of OPENing the file and INPUTting the variables, you simply READ them directly from the DATA statements. Setting up "internal files" is considerably faster than reading a file from tape or disk. And it allows you plenty of opportunity to experiment with the screen displays, prompts, menus, and other subroutines.

When you're satisfied with the routines that work with the data, replace the READ with the usual OPEN/INPUT# combination and delete the DATA statements. If you don't have a utility for deleting lines, and they're numbered in a regular order, here's an easy way to get rid of them. Let's say lines 2100–2210 contain the DATA statements you want to excise, and they're numbered by tens. Enter this line in direct mode:

```
FOR J=2100 TO 2210 STEP 10:PRINT
 J:NEXT
```

The blank lines are printed to the screen. Now cursor up to the first number and press RETURN several times. The lines are instantly deleted from the program.

When you're testing a section that writes to a file, you can't easily reroute output to the internal file of DATA statements. But the screen can be addressed as device number three. So, if your program includes a line like **OPEN 1,8,2, "DATA-FILE,S,W"** (to open a disk file for writing), you can temporarily substitute **OPEN 1,3**. Any subsequent PRINT#1 will write to device 3, the screen, instead of device 8, the disk drive. This has the added bonus of allowing you to view the results. Again, when the write-to-file routine is debugged and working, you would go back in and change it back to the original form.

A Flexible Rounding Function

David C. McKenzie

A programmer's nightmare might go something like this: You've volunteered to keep the statistics for a local bowling league. There are eight teams of five players, plus some substitutes. So you write a program that calculates handicaps, keeps scores, figures out best game and best series, and writes everything to data files. The program works perfectly and everyone is pleased with the results. Eventually, the season ends and a new one begins. But this time there are twelve teams of four players each.

As the team statistician and resident programmer, you find yourself faced with the awesome task of rewriting the whole program. You didn't write a "Bowling Stats" program, you created "Bowling Stats For Eight Teams Of Five Players." To modify it for the new season would require going in and changing all fives to fours, all eights to twelves. You realize you should have assigned a variable to number of players per team (NP=5) and another to number of teams (NT=8). Within the program, you could have looped FOR J=1 TO NP instead of FOR J=1 TO 5. You could have used DIM SC(NP,NT) instead of DIM SC(5,8), and so on.

The point is that using variables makes a program more general and easier to modify (this is called "soft coding," as opposed to "hard coding," which locks you into a certain value). Take rounding to the nearest penny, for example. The following line would suffice:

```
50 N=48.527616: PRINT INT(N*100+.5)
 /100
```

The expression within parentheses is evaluated first, and multiplication always happens before addition. So the value of N is first multiplied by 100, to get 4852.7616. Then 0.5 is added (for 4853.2616). INT turns it into the integer 4853. Finally, we divide by 100, resulting in 48.53.

What if you decide to change the program to round to the nearest dollar? You'd have to go to line 50 and change the formula, of course. And if your program does a lot of rounding, you'd have to change many different lines. A better way of handling rounding is to make the function into a subroutine:

```
600 NR=INT(NR*100+.5)/100: RETURN
```

Now, anytime you want to round to the nearest penny, you assign a value to NR (number to be rounded) and GOSUB 600. The program has become a little more general. To make it even more general, replace the subroutine:

```
600 PR=10↑DP: NR=INT(NR*PR+.5)
 /PR: RETURN
```

Before calling this subroutine, put the number to be rounded into NR and the precision (numbers to

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the right of the decimal point) into DP. Enter the following program to see how it works:

```
10 FOR J=-2 TO 5: NR=48.527616:
   DP=J: GOSUB 600
20 PRINT J,NR: NEXT
30 END
600 PR=10↑DP: NR=INT(NR*PR+.5)
   /PR: RETURN
```

Note that when DP is −2, the subroutine rounds to the nearest hundred, and when DP is 2, it rounds to the nearest hundredth. If DP equals zero, the nearest integer is returned. By including general subroutines like this, you make it easier to make later modifications to the program.

Convert Sequential Files To BASIC On The 128

Mike Tavis

It takes but a few commands to create an ASCII listing file on disk. While a BASIC program is in memory, enter the following line:

OPEN 2,8,2,"*filename*,S,W": CMD2: LIST

After the cursor reappears, enter **PRINT#2: CLOSE 2**. Elsewhere in this issue is a utility that allows you to convert the Commodore ASCII file into true ASCII and vice versa.

The big advantage of ASCII files is that they allow you to use a modem to transfer programs between computers. (Sending a program to another computer is called *uploading*, while receiving a program is *downloading*.)

Up to now, conversion of such a file back into a tokenized program, a program you could RUN, required a machine language utility. On the VIC and 64, for example, you would have to read the file, print it to the screen, and use the dynamic keyboard technique to simulate pressing RETURN over the lines, to add them to memory.

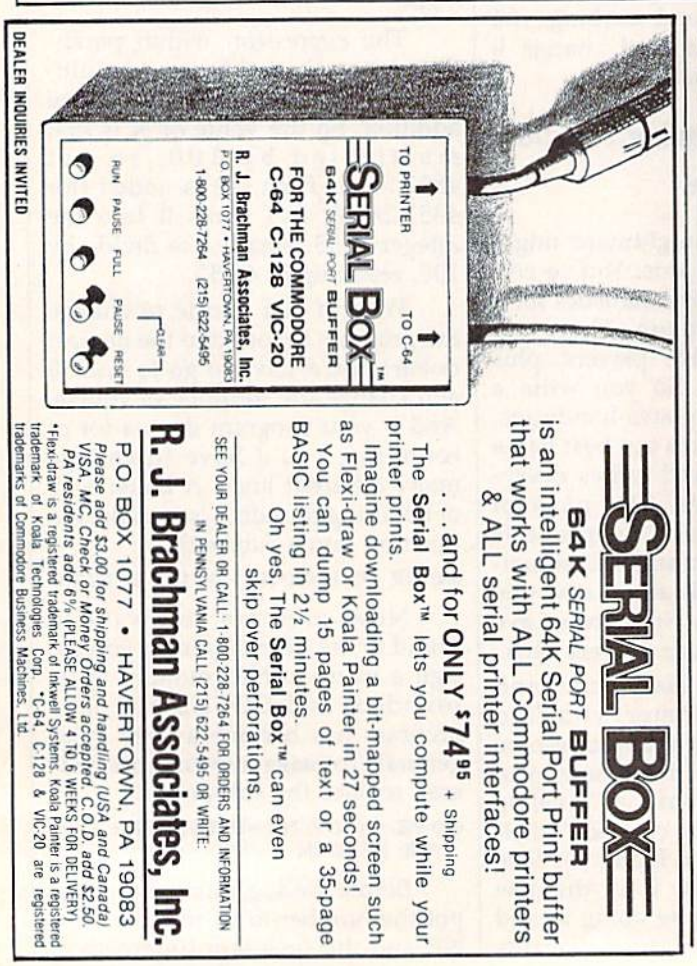
But the new operating system of the 128 makes tokenization very simple. On previous Commodores, pressing RETURN over a line caused the computer to close all open files. That's not true for the 128. So if you open the sequential file and perform a machine language CHKIN, the program is read directly into memory as if you were typing each of the characters. Here's what you enter (type NEW if you already have a program in memory):

```
BANK 15: OPEN 2,8,2,"asciifilename,S,R":
   SYS 65478,0,2,0,0
```

That's it. When the 128 comes to the end of the file, you'll see a SYNTAX ERROR message. Ignore the error and enter **CLOSE 2**. You can now type LIST to verify that the program is in memory. Before you run it, DSAVE the program.

You may occasionally receive a STRING TOO LONG error message, especially if one of the lines is longer than 160 characters, the size of the input buffer. If this happens, just enter **SYS 65478,0,2,0,0** again.

This method is also useful for merging two programs. Create an ASCII file of the first program, load the second program, and then enter the OPEN and SYS listed above. The lines from the sequential disk file will be added to the program in memory. If the two programs happen to share some line numbers (if both contain a line 60, for example), the line from the disk file will replace the line in memory.



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Storytelling To Read

Fred D'Ignazio
Associate Editor

My six-year-old son Eric is struggling to learn how to read. But until recently he hasn't been making much progress. His teacher has set a goal for each first-grader to read 100 books by the end of the school year. Some of the kids are already halfway through, but Eric has hardly started.

Part of the problem is that Eric is bored with the books he's supposed to be reading. Most of them are in the Dick, Jane, and Spot category, written 30 years ago for an earlier pre–Star Wars, pre-GoBots generation of children. The story lines are thin, and the characters are not realistic or contemporary.

One evening while giving Eric a bath, he proudly showed me a range of mountains built out of soap bubbles. "This is Mount Everest," he said. "And this is Mount St. Helens." Suddenly, he lifted his hands, and shouted, "BOOM!," and Mount St. Helens erupted water and soap bubbles.

As I wiped the bubbles out of my ear, I marvelled at how good Eric was at creating verbal stories of his own. Maybe, I thought, he'd be more interested in learning to read if he were reading stories *he* had created. This reminded me of IBM's national "Writing to Read" project in schools, where kindergarten and first-grade children learned to read by first learning to write. Most of these kids learned faster than those who learned to read by traditional methods. IBM's "Writing to Read" is an expensive, schoolwide project. I decided to begin a low-budget home version of the project for Eric: "Storytelling to Read."

We began the project with *The Hobbit* text-and-graphics adventure game from Addison-Wesley (Consumer Software Division, Reading, MA 01867—$24.95, Commodore 64 version). Every night before bedtime, I accompanied Eric and his sister Catie up to their room. I turned off the lights, turned on a flashlight, and read J.R.R. Tolkien's book *The Hobbit* to them (the book comes with the software). One evening, we checked out *The Hobbit* on videotape and watched it at home. And each day, after school, we played *The Hobbit* game on the computer.

The game was an excellent choice. The program uses 900 words and "understands" 400 words. Many of the words in the game were words he was learning in school. And he was discovering new words—imaginative ones like *dwarf*, *cave*, and *dragon*.

Reading the book, watching the movie, and playing the game was a successful combination. Eric's reading improved dramatically. But we didn't stop there. To help him create his own stories, we tried three new Commodore 64 programs: *Build a Book About You!* ($24.95—Scarborough Systems, Inc., 55 South Broadway, Tarrytown, NY 10591, $24.95); *The Snoopy Word Processor* ($29.95—Random House, 400 Hahn Rd., Westminster, MD 21157); and *Bank Street Storybook* ($39.95—Mindscape, 3444 Dundee Rd., Northbrook, IL 60062).

Build a Book comes with two 30-page book "skeletons"—pages with color pictures but no story. You load the pages into your printer, then run the software. The program asks you questions about your child. Eric ran the program himself, and he told the computer his name, where he lived, where he liked to play, his best friends, his pets, and so on. When he finished answering, the computer printed two personalized stories with Eric, his pals, and pets playing the leading roles.

Then came the good part. When the computer finished printing, Eric took the pages, lined them up and stitched them together using a needle and thread that came in the package. Then he attached the pages to the spine of the book's hard cover with adhesive. With only minor aid from his parents, Eric made his own book in less than an hour.

Eric was now excited about books. But he still hadn't created his own stories from scratch. The last two programs we used allowed him to do this. *The Snoopy Word Processor* and *Bank Street StoryBook* are word processors (or "story processors") designed for younger children.

The Snoopy program came with a "Story Starter" and a "Picture Starter." The Picture Starter showed an animation of the Snoopy comic strip characters; and the Story Starter began with text, such as "Lucy said," or "Snoopy said," designed to stimulate an imaginative response from children. Eric loved these pictures and words, and he had no trouble creating stories around the pictures and words.

Bank Street Storyteller was the biggest hit of all—and the biggest challenge for Eric. Now he had to build his own stories completely from scratch. And he had to create illustrations, too.

The illustrations were the key. Eric loves to draw, and he often creates elaborate pictures which are really stories. We began each story by having him illustrate it completely. Eric's visual imagination is highly developed, so this was no problem. He created page after page of illustrations on the screen and saved them. Then he went back and created words to go along with the pictures.

At last all the stories were done. And they were successful, since Eric quickly learned to read each story by himself.

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BASIC magic

String Variables In READ And DATA Statements

Michael S. Tomczyk

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

READ and DATA are two BASIC commands that go hand in hand and are used for a variety of purposes. This month, we'll look at some of the fundamentals which you should know before you begin using these commands. All of these examples use "string information" as data. Strings include letters, words, graphics symbols, and numbers not used in math calculations.

To start with, try thinking of the word DATA as representing a list. When you READ DATA in a BASIC program, you're actually reading a list or sequence of information. The READ command tells your computer to read the list in order, one item at a time. It can be a long list of DATA, or a short list. Even one item.

In our first example, our DATA is a list of words which we're going to use in a sentence. Type the program as shown and run it:

```
10 DATA CATS,DOGS,BIRDS,MICE,
   FERRETS
100 PRINT CHR$(147)
200 READ W$
300 PRINT W$
```

We begin by putting our DATA in the first line, with the items separated by commas. DATA can be put anywhere in your program, but it's usually placed either at the beginning or end of your program. This program will work exactly the same if you change line 10 to line 1000, putting the DATA at the end of the program.

Line 10 contains the list of information we want to include—in this case, a list or sequence of words.

Line 100 uses CHR$(147) to clear the screen.

Line 200 contains the READ statement. READ W$ tells the computer to go to the list of DATA and READ one item in the sequence. We use a string variable (W$) after the READ command because we're READing *string* information, but the name of the variable—W—is purely arbitrary. You could just as easily use another variable, X$ or R6$, for example. At this point the computer has read only one item in the DATA list.

Line 300 tells the computer to PRINT the DATA item on the screen, so the first word, CATS, appears on the screen. PRINTing the variable W$ is the same as PRINTing the first item from the DATA list.

What if you want to print the entire list? In this case, you can use a FOR-NEXT loop to read and print each item in order. To do this, delete line 300 and change line 200 as shown below (just type in the new line 200 and press RETURN—it will automatically replace the previous line 200).

```
200 FOR X=1 TO 4:READ W$:PRINT
   W$:NEXT
```

Now run the program to see the full list on your screen.

In Sequence

You can also use the DATA in various ways in your program after you read it. For example, let's take the first word in the list, which is CATS, and use it in a PRINT statement. To do this, change line 200 again, to the following, then run the program:

```
200 READ W$:PRINT W$" ARE VERY
   NICE."
```

Run the program. Again, using the variable W$ is the same as using the first item from the list. Now we come to something important: *Each time you read data from the data list using the same variable—such as W$—the computer reads the next item in sequence from the list.*

To see how this works, type in and run the following program:

```
10 DATA CATS,DOGS,BIRDS
100 PRINT CHR$(147)
200 READ W$:PRINT W$
300 READ W$:PRINT W$
400 READ W$:PRINT W$
```

When you tell the computer to READ W$ in line 200, it reads the *first item* in the DATA list, but when you do the same thing in line 300, it reads the second item, and in line 400 it reads the third item—and so on through the entire DATA list, however long that might be. The READ command always takes the DATA from the list in the sequence that the DATA appears.

Type the word NEW and press RETURN to erase the program, and type in this next variation:

```
10 DATA CATS,DOGS,BIRDS
100 PRINT CHR$(147)
200 FOR X=1 TO 3:READ W$:PRINT"I
   LIKE "W$:NEXT
```

Line 10 contains the DATA, which includes three items. Line 100 clears the screen. Line 200 contains the FOR-NEXT loop. FOR-NEXT loops are used to repeat actions in a BASIC program, as you may already know. Everything *between* the FOR command and the NEXT command will be *repeated* the specified number of times. We're using three repetitions in this loop. In this case, the action we're repeating is to read from the DATA list, then print a sentence using the item from the DATA at the end of the sentence. The variable W$ is the same as the DATA item. The W$ is outside quotation marks in the PRINT statement because variables must always go outside quotation marks.

The result is that the sentence is repeated three times, each time drawing a different item from the DATA list, in the order that the items appear in the list. It doesn't matter if the DATA is all on the

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same program line or on different lines. The items will always be read in order, which is why the following program works exactly like the previous one:

```
10 DATA CATS
20 DATA DOGS
30 DATA BIRDS
100 PRINT CHR$(147)
200 FOR X=1 TO 3:READ W$:PRINT"I
  LIKE "W$:NEXT
```

Note that when you include DATA on different program lines, or if you have a lot of DATA and spill over to the next line, you must always begin the new DATA line with the DATA command, as shown.

Here's another quick example, just to show that you can include spaces in your DATA statements. Type in this program and run it, making sure to include one blank space immediately after the words CATS and LIKE.

```
10 DATA CATS ,LIKE ,PEOPLE
100 PRINT CHR$(147)
200 FOR X=1 TO 3:READ W$:PRINT
  W$;:NEXT
```

Spaces can be included as DATA like other string information. In this case, we put spaces after two items so they look better when printed in a sentence.

Note the semicolon in line 200. The semicolon holds things together. Because we're actually using three separate PRINT statements here, each PRINT statement—and each word from the DATA list—would normally appear on different lines on your screen. By cementing them together with a semicolon, we cause all three PRINT statements to be displayed immediately next to each other, on the same line. Many of the spacing problems experienced by beginning programmers can be solved by using a semicolon.

So far, we've been putting string information in DATA statements without using quotation marks. We've all learned that string information usually has to go inside quotation marks. String information in DATA lines is one of those rare exceptions where string information is used without quotes. You *can* put quotes around string information in a DATA line if you want and it won't affect your program—but, in at least one case, you *need* to use quotation marks.

Graphics As DATA

Some string information which you want to use as DATA must go inside quotation marks. The best example of this are graphics symbols. You can include graphics symbols in DATA statements, but to use them as DATA items, you have to place each symbol inside quotation marks. Try this example:

```
10 DATA"—"
200 READ G$
300 FOR X=1 TO 40:PRINT G$;:NEXT
```

Line 10 contains our one and only DATA item, which is a horizontal line graphics symbol, enclosed in quotation marks. To type the horizontal line, hold down SHIFT and press the * key.

Line 200 reads the DATA.

Line 300 contains a FOR-NEXT loop. Again, the computer does everything between the FOR and NEXT, which in this case means it will print the item from the DATA statement 40 times. The semicolon glues the graphics symbols together so they appear on the same line. (If you have a VIC-20, you may want to change the number 40 to 22 so the symbols stay on one screen line.)

You can use string information and graphics in the same DATA list, as in this example:

```
100 DATA 22 LINES,"—"
200 READ G$:PRINT G$
300 READ G$:FOR X=1 TO 22:PRINT
  G$;:NEXT
```

In this example, line 100 contains two items of DATA, the phrase 22 LINES, and the horizontal line graphics symbol. The symbol is enclosed in quotes, and both items still have to be separated by commas.

Line 200 reads the first item of DATA and prints it on the screen. Note that we used a phrase here instead of a word. The computer sees this phrase as a string of eight characters: two 2s, a space, and the five letters.

Line 300 reads the next item in sequence from the DATA list, and the FOR-NEXT loop prints 22 horizontal lines across the screen, which appear as a solid unbroken line.

REM: *Numbers such as 5, 22, or 265 are called "numeric" information when used for calculation purposes in your program, and are typically represented by a numeric variable, such as X or G3. Numbers can also be used as string information and represented by a string variable such as X$ or G3$. That's why the number 22 can be used in a phrase like "22 LINES" and represented by the string variable G$ instead of a numeric variable like G.*

If you want to experiment, try this example with different graphics symbols, or try mixing up several different symbols and displaying them in various ways on the screen. Something else to try is to put the phrase "22 LINES" inside quotation marks in line 100—you'll see that the program still works the same. Try putting color changes and other editing commands in a DATA statement (hint: put them inside quotation marks).

Finally, you can transfer DATA to your Commodore printer by OPENing the printer channel and using PRINT# to send the DATA to the printer. Here's how to modify the previous program to do that:

```
100 DATA 22 LINES,"—"
150 OPEN 4,4
200 READ G$:PRINT#4,G$
300 READ G$:FOR X=1 TO 22:PRINT
  #4,G$;:NEXT
400 PRINT#4:CLOSE 4
```

Everything remains pretty much the same, except in line 150 we have to OPEN the channel to the printer, which is always device number 4.

In lines 200 and 300 we change the PRINT commands to PRINT#4 followed by a comma to tell the computer to send information to the printer instead of the screen.

Finally, in line 400, we CLOSE the printer channel.

Next month, we'll continue our look at READ and DATA, and see how to find DATA in the middle of a DATA list.

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machine language for beginners

Richard Mansfield
Senior Editor

If you're going to be programming in machine language beyond the very early (and generally brief) novice phase, you'll want to write some fairly lengthy and sophisticated programs. Perhaps you'll custom design a word processor or try your hand at creating a video game. When you get to this point, a map of your computer will be one of the most important tools at your disposal. It serves several useful purposes and can offer you invaluable shortcuts, particularly if you need to access peripherals.

Last month we published a map of the Commodore 128. Maps of the VIC and 64 have been published over the years and are available in a number of books. Especially useful are maps which go into detail about how the ROM routines work. However, this sort of thing fills a book: See COMPUTE!'s *Mapping the VIC* or *Mapping the 64*. And even with such books, you'll still also want to have a shorthand map like the one published last month for quick reference.

Finding Safe Zones

How can you best use a map? First, it tells you where you can safely store your programs and variables without interfering with space used by the computer itself. For example, assume that you're writing a program which needs to access the disk drive. To complicate things, you want to use about six, two-byte spaces in zero page (the lowest 256 bytes in memory) for your own program. ROM routines also make heavy use of zero page, but you can't use bytes they will be using since the ROM routines would then interfere with your data and mess up your pointers. The solution is to look at the map.

To solve the above problem, you'd notice that addresses 251–254 are unused by ROM on the 64 and VIC. On the 128, addresses 250–254 are safe. But we need more than this. Looking at the 64 map, you can see that addresses 163–177 are used for cassette tape work, so they're safe too. We'll be accessing the disk drive, but the cassette won't be involved in this program. That solves our problem.

On the 128, the cassette zero page usage is not as conveniently contiguous, but you can still find two-byte pairs which are safe. Also, if you're not using other ROM routines in your program, look for their zero page areas. For example, the floating point accumulators can often be used if you're not accessing math routines in ROM.

You'll also be able to stash things on the 64 (though not for zero page access) between addresses 49152–53247, a full 4K. On the 128, you can look at its map and safely store in places where your ML program won't be in the way. If you're not using sprites, you can put your program or variables between addresses 3584–4095. Also free for ML use is the foreign language and function key area between 4864–7167 or the section reserved for a BASIC program even when Bank 15 is operative (7168–16384). The 128 is a very RAM-rich machine, though, so you'll also be able to use most of Banks 0 and 1 even if you do require ROM routines. Just switch them in and out as necessary, or invoke the special long-distance LDA, STA, CMP, JSR, and JMP Kernal routines.

Calling ROM

The other main value of maps for the ML programmer is the access to ROM routines. It would be unnecessary—not to mention extremely time-consuming—to do *everything* yourself. Even the most fanatical cook, when claiming to have baked a cake from scratch, doesn't mean that he or she harvested the wheat and churned the butter.

It is both practical and quite common for ML programs to use the built-in routines, especially for complex tasks such as access to the disk drive and printer; for floating point arithmetic; or for common techniques such as transforming a two-byte integer (most ML work is done with integers) into ASCII characters (that can be printed to the screen as characters for, say, the score in a game).

Here is a 128 ROM routine you might want to experiment with. It allows you to control the screen just as if you'd typed the ESC key followed by one of the other keys. On page 370 of your *System Guide*, you'll find a list of codes which control the screen and cursor in a variety of ways. From within ML, all you have to do is be in Bank 15, put the character of choice into the accumulator, and JSR $C01E:

```
10 *= $B00;      start at address 2816
20 .O;           store bytes during
                 assembly
30 ;
40 LDA #0;       set Bank 15
50 STA $FF00
60 LDA #"@;      load the blank-to-end
                 escape code character
70 JSR $C01E
80 RTS
```

When you SYS 2816 after assembling this routine, the screen will blank from where the cursor is currently positioned to the bottom of the screen. There are 26 other escape codes, so, just by knowing about address $C01E, you considerably amplify your ML programming capabilities. Via this simple JSR you can freeze the cursor, change its shape, move it around quickly, and delete lines or whole sections, and a lot more. Next month we'll explore how to use jump tables and the Kernal.

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Keyboard To Joystick Converter

David A. Dunn

Did you ever play a good game that could have been even better if it had joystick instead of keyboard control? Here's a solution. For the Commodore 64 and 128 (in 64 mode).

Back in the days of the PET/CBM there was no way to hook up a joystick, so we all got pretty good at playing games using the keyboard. But it often became confusing: One game's controlling keys were different from another's. The addition of a joystick port on the VIC-20 and 64 was more than welcome. I still play some of the older games that require keyboard control and occasionally still find a program or two which insists that you use the keyboard.

I wrote "Keyboard To Joystick Converter" as a solution. It allows you to use a joystick with Commodore 64 programs that don't provide for joystick control.

Plan A Or Plan B?

Type in Program 1 and save a copy before running it. Although it's written in BASIC, it includes a machine language routine in the form of DATA statements. When you run the program, it asks you to choose plan A or plan B. This selects where in memory to put the machine language to avoid interference with the main program. Plan A uses the cassette buffer. Plan B uses the free area at 758–767. For most programs, plan A works fine, although you should avoid this option if you're using a Datassette. If plan A doesn't work, rerun the program and select plan B.

You're next asked to enter the keys corresponding to each direction and the fire button for each joystick port. Let's say a program requires you to press the J key to move left and the K key to move right. When Keyboard Converter asks you to press the key for left, press J. Next you're asked to press the key for right. Press K. If there's no need for the joystick to move in a particular direction, just press any key.

The Breaks

After you've done this for both joystick ports, the program asks for the maximum break length. Joysticks vary not only in size, shape, and price, but also in quality. Many joysticks make good, solid contact between the wires inside. But some do not. Some lesser quality joysticks will make contact one moment, break contact for a fraction of a second, then make good contact again. This makes the computer think the joystick was moved twice in that direction. In some programs this causes no problem. But in others it may.

Keyboard Converter can make up for this by distinguishing between a break in the contacts and the true release of the joystick. It does so by sensing how long the contacts are broken. Generally a period of three jiffies (one jiffy equals one-sixtieth of a second) or less is a result of a break in the contacts. Any longer than that usually indicates a true release of the joystick.

When Keyboard Converter asks for maximum break length, press RETURN to indicate 3 jiffies. If you have any problems with repeating movements, you can increase the break length by typing a higher number.

Now move the joystick around. You should see the corresponding letters on the screen. Now you can now load and run a game, and use the joystick instead of the keyboard. Be sure not to press RUN/STOP–RESTORE after running Keyboard Converter as this will disable the joystick.

This program works by modifying the IRQ routine which is executed 60 times per second. It normally scans the keyboard and increments the internal clock. When Keyboard Converter goes into effect, however, the computer scans not only the keyboard, but also the joystick ports. If the joystick has been moved, the code for the corresponding key is placed in the keyboard buffer to simulate a keypress.

A Sample Program

For demonstration purposes, type in Program 2. It's a fast action game (based on "Worm of Bemer," which appeared in the April 1984 issue of COMPUTE!) that uses keyboard control. After using Keyboard Converter, you'll be able to control it with a joystick.

After typing in "Worm," save a copy. Run Keyboard Converter and select plan A. The controls are:

I — up
M — down
J — left
K — right

Now load and run Worm. In this game you control a worm and gain points by eating mushrooms which are placed randomly on the screen. The game ends when the worm runs over its own tail or into a wall. Sounds easy, but there's a catch. Your worm grows every time it eats a mushroom. This makes it increasingly difficult to keep from running over your own tail.

Lines 160 to 190 determine the direction keys. By modifying the number 25 in line 260, you can change the speed of the game.

See program listing on page 106.

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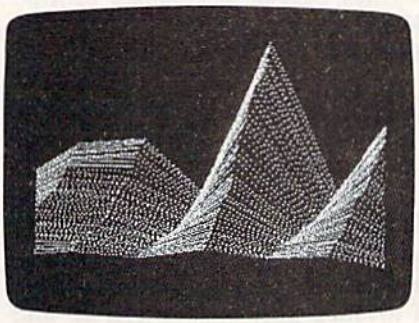
The Coordinator

Lee Noel, Jr., Assistant Editor

This unusual program unlocks the creative potential of full hi-res on the 64. Convenient color control, straightforward syntax, and numerous other carefully designed features make it a particularly effective tool for the BASIC programmer.



Hi-res mountains created with "The Coordinator." (See Program 4.)

Colorful, detailed design work and the charting of math equations are two obvious uses for the 64's full hi-res display. Unfortunately, BASIC is poorly suited to these tasks. As a result, a large number of machine language aids have been developed to help the graphics programmer.

While they're all good, they tend to force the programmer into a restricted environment. "The Coordinator" is designed to preserve the entire range and flexibility of the BASIC programmer, and at the same time provide the ML speed and efficiency so useful in hi-res operations.

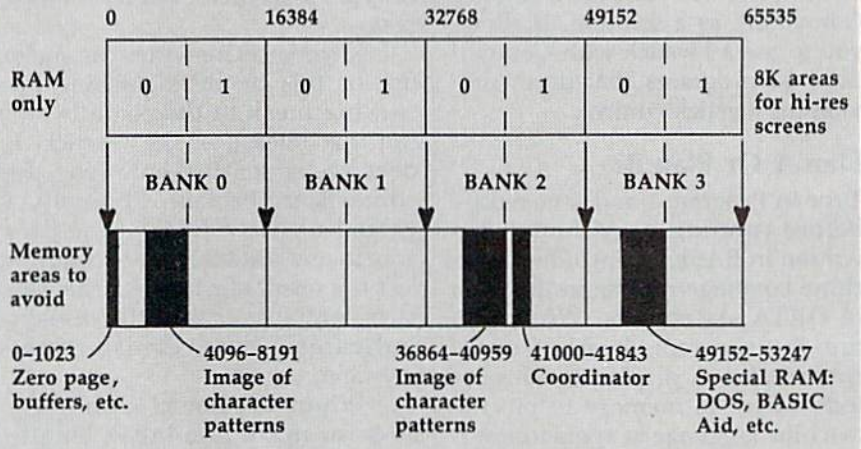
True hi-res is often neglected on the 64—its color system is hard to understand and difficult to master, but the results are well worth the effort. With The Coordinator, the effort is less and the understanding easier.

Getting Started

Start by typing in Program 1, a BASIC loader that POKEs The Coordinator into memory. It uses a special code to reduce your typing time. When you've typed in and run the loader without error messages, save a copy and then type **SYS 707** as shown on the screen. You should see a CAN'T CONTINUE error message. Try again. This time, there should be just the familiar READY prompt. Now, for one final check, type **POKE 1020,0:SYS 707**. The original error message should reappear. If you pass all these checks, there is almost certainly a working version of The Coordinator in memory.

Now you're ready to create a fast-loading version of the program.

Figure 1a. Commodore 64 Memory Map



The Coordinator is located at 681–767, 1020–1023, and 41000–41843.

Figure 1b.
The two possible 8K hi-res screen locations

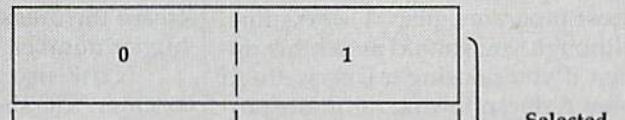
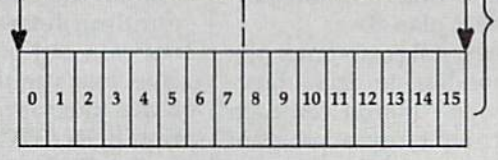


Figure 1c.
The 16 possible 1K color memory locations



The position of any hi-res combination can be described by three locations—Bank, Screen, and Color memory. The Demo uses 1, 1, 7 (See line 55).

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Type NEW to clear out the loader. (Don't worry, neither NEW nor RUN/STOP-RESTORE ever has any harmful effect on The Coordinator.) Enter Program 2, Object Maker, and save a copy. It's set up for disk users; those using tape should change the 8 to 1 in line 30.

Now type RUN. The program creates two short files: A COORD .OBJ and B COORD.OBJ. When the READY prompt appears again, your files are done. Disk files are one and three blocks long, respectively. (Disk users should note that this short program does not read the error channel. Make sure you're properly prepared before running it.) Tape files have a combined save time of about a minute.

The two files make up the whole of The Coordinator. You no longer need the BASIC loader (Program 1). From now on, whenever you want to use The Coordinator, type:

```
LOAD"A COORD.OBJ",8,1 (for disk)
LOAD"A COORD.OBJ",1,1 (for tape)
NEW
LOAD"B COORD.OBJ",8,1 (for disk)
LOAD"B COORD.OBJ",1,1 (for tape)
NEW
```

(Tape users can generally ignore LOAD ERROR messages when loading B COORD.OBJ.) You're now ready to begin your BASIC program.

Since The Coordinator is tucked into out-of-the-way places, you can just forget about it now. All of BASIC memory is free, as are the cassette buffer and the overworked 4K of RAM at 49152–53247. (See Figure 1a.)

To make things clearer, type in Program 3, Demo. It's of general interest since it can be used as a framework for all your hi-res work. Line 10 contains the device variable D. Set it to 1 if you're using tape. Although the program is filled with REMarks, they are there for your convenience. They may be omitted if you wish. When you've finished typing it in, save a copy, but don't run it yet.

One Giant Programmable Character

Full hi-res turns your 64's display into one giant programmable character, 320 pixels across and 200 pixels high. The Coordinator treats this like a piece of graph paper, although there are no visible features. There's an X-axis on the bottom, running horizontally from 0 to 319, and a Y-axis on the left, running vertically from 0 to 199. The origin—the 0,0 start point—is at the lower left-hand corner. Thus, the graph is set up on a standard Cartesian system, the same kind you may have used to study coordinate geometry.

Any point can be described in terms of one X value combined with one Y value. For example, X=160 and Y=100 is a point at the center of the display. All your BASIC program has to do is generate some X and Y values. The Coordinator takes care of everything else.

Demo will show you how this works in practice. Lines 10 and 15 are merely for convenience. If you haven't already loaded your Coordinator files, they will. Make sure you have the disk containing A COORD.OBJ and B COORD.OBJ in the drive, or the tape rewound to the right place before running the Demo. (This step is skipped if the program is run more than once.)

Since it does most of its work automatically, The Coordinator has only four simple commands. These are:

1. **SYS 686** clears hi-res screen and color memory, and then plots the current values your BASIC program has specified for variables X and Y.
2. **SYS 707** plots X and Y.
3. **SYS 714** erases X and Y.
4. **SYS 681** resets The Coordinator if you change your hi-res setup. This means you can have several hi-res displays in memory at the same time.

There are two additional features. After using one of the above commands, you can PEEK(767) to see if the point was set (turned on) before the SYS. Any non-zero result from PEEK(767) indicates that the point *was* on. You can use this to avoid erasing points, or you may wish to detect collisions between certain points. The final feature enables you to determine if The Coordinator has initialized itself. If PEEK(1020) returns 64, it probably has. This can be useful in certain situations that crop up when you use the program in complex ways.

Lines 25 and 30 simply assign meaningful variable names to these addresses. You can, of course, use any names you like.

How It Works

How can The Coordinator do anything significant with these minimal commands? Run the Demo and watch.

Briefly, here's how The Coordinator works. Any time you SYS to it, it looks for and stores the current values of variables X and Y. If X and Y are not defined, they are treated as if they're zero. Remember, SYS CLEAR plots after it clears. You can avoid plotting a point by setting X and Y to values that don't appear on the screen. X=−1:Y=−1 work fine.

Offscreen quantities cause no trouble. If you tried to plot them with most utilities, there would be a chance that you'd corrupt your BASIC program or even lock up your computer. This can't happen with The Coordinator because it deals only with reasonable values. All others are rejected. Good values are automatically converted into integers for display purposes. As a result, you have complete freedom to plot experimentally. After all, you may be graphing X and Y to see what their values are: It would be a shame if out-of-range quantities

Figure 2. Coordinator Color Sources

	Color	Source	Notes
Full Hi-res	Background	53281	Can be set for each 8 × 8 cell.
	Plotting	646	Any bit on (set to 1) shows in this color. Only one color per cell.
Multicolor	Background	53281	Affects entire screen.
	First Plotting	646	Set for each 8 × 8 cell. Given by bit pattern 0, 1.
	Second Plotting	53282	Set for each 8 × 8 cell. Given by bit pattern 1, 0.
	Third Plotting	53283	Set for each 8 × 8 cell. Given by bit pattern 1, 1.

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couldn't be accommodated safely. You're protected with The Coordinator.

Every time you use the program, it checks the color information stored at certain addresses of your 64. These addresses are assigned to variables in lines 40 and 45 of Demo. You'll notice that they represent the normal foreground (text) and background color registers on the 64. Why learn special new commands for color? Just use the familiar registers; The Coordinator gets all its color information from them. Figure 2 lists the important color registers.

In true hi-res, background and foreground colors are set individually for each 8 × 8 character-sized block of the display. This gives 1000 possible differently colored background areas, each of which can contain one contrasting plotting color. SYS CLEAR applies the colors in the registers to color memory, as well as clearing all lit pixels from the screen. As a consequence, a uniform background color is displayed. The other commands apply color information to whatever 8 × 8 cell a point is in. This explains the small rectangles and vari-colored lines you see as the demo runs. With a little thought, this type of screen can be beautifully colored, and can display a subtlety and fineness of detail not possible with the more popular four-color multicolor hi-res.

The truly observant will notice MFLAG in line 30 of the Demo. The Coordinator also works in multicolor hi-res. MFLAG is a flag used by Demo to turn multicolor mode on or off.

Look at line 55 and the subroutine at 185. These set up the locations of the hi-res screen and color memory. You do this from BASIC, so that you're in control. Full

What Good Is It If You Can't Save It?

A lot of thought and dogged programming may be required to produce successful hi-res screens. The effort is wasted if you can't save and reload them for future display or fine tuning. Luckily, there is a way to save and load hi-res screens from within your BASIC programs.

Begin by loading Demo and deleting lines 65–145. Then type in Mountain Demo, Program 4, and Save/Load Subroutine, Program 5, to form one combined program. Again, be sure to set D to 1 in line 220 if you're using tape. Also, tape users—and disk users who dislike Save with Replace—should change line 295 to:

```
295 SYSPCHR$(E)+SN$,D,1:POKE193,0
  :POKE194,B(OK)
```

(Disk users who leave the line intact will have the option of updating their work while keeping filenames constant.) Now save the combined program.

This larger program was used to create, save, and reload the colorful mountain at the beginning of this article. When run, the routine plots one of several kinds of mountain formations, and then offers you the chance to save the current formation or reload an earlier design. If you get something you like, save it by following the prompts. Filenames may be up to fifteen characters long. Otherwise, press RUN/STOP–RESTORE and rerun the program until satisfied.

You'll note that the mountains are drawn quite slowly. The Coordinator is very fast, but BASIC is lazily providing it with X/Y values for shading, rock formation, jaggedness, and several other factors.

When you save a mountain, make sure that you've got plenty of room on your disk or tape. A minimum of about 10K is stored by this system. The information is contained in three files (four for multicolor), denoted by your filename with a prefix of 1, 2, 3, or 4.

You can juggle the combined program around to suit almost any hi-res need. However, screens that lie under the ROM areas cannot be saved by this method.

Multicolor experimenters should note two things. Mountain Demo was written for true hi-res and may surprise you. More importantly, the multicolor mode 11 bit pair gets its color information from color memory, which starts at 55296. This area is affected any time the screen is cleared, as the Save/Load Subroutine does by printing E$ in lines 230, 290, and 345. Hence, one-third of the color information available in this mode may be scrambled. Adapting the Save/Load Subroutine to sidestep this problem can teach you a lot about hi-res graphics.

How It Works

Every BASIC programmer is familiar with saving and loading programs. This feature of the computer is built in, and is usually limited to the storage and retrieval of BASIC programs. But the Kernal routines that perform save and load, can be used anywhere in memory. All it takes is an adjustment of pointers that normally keep track of where your BASIC program is.

The method used here, and in Object Maker, and at the beginning of Demo, is an adaptation of that used by Raeto West in chapter 6 of his reference, *Programming the Commodore 64* from COMPUTE! Books. The programs below show how the system works. Note that any address on the 64 can be represented in the following way:

```
Address = Low Byte + (256 * High
  Byte)
```

A byte can have any whole number value in the range 0–255.

To Save:

```
10 SYS 57812"FILENAME",D,1 :REM
   SET FILENAME
20 POKE 193,low byte of start address
   :POKE 194,high byte of start
30 POKE 174,low byte+1 of end address
   :POKE 175,high byte of end
40 SYS 62957 :REM SAVE
```

To Load:

```
10 POKE 147,0 :REM SET LOAD FLAG
20 SYS 57812"FILENAME",D,1 :REM
   SET FILENAME
30 SYS 62631 :REM LOAD
```

Lines 295–330 of the Save/Load Subroutine show the method in action.

As you can see, there's no interference with normal program flow, and the routines are fast and flexible. Try them, and they'll soon become indispensable.

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memory flexibility is still available. The Coordinator's CLEAR and RESET functions, or an initial PLOT or ERASE examine the necessary registers and adjust themselves accordingly. Figure 1 explains the possible arrangements graphically.

By this stage, you'll probably have a good idea of what's going on as Demo runs. When it's over, one of the three sine waves disappears; and you can press any key to return to a normal display. (This is the function of the remaining lines of the program, 155–175.) You can also use the RUN/STOP–RESTORE combination at any stage. Now rerun the program with MFLAG set to one. You'll see that the differences are sweeping, but Figure 2 should help you out.

Multicolor works by having only 160 double-wide (two pixel) X values. These fat coordinates give extra color information to the computer. Since The Coordinator is mainly for use in true hi-res, you must specify both pixels yourself.

In essence, it's easy. The first pixel of a pair must have 0 or an even number as X coordinate. (Coordinator X coordinates are always 0–319.) Keeping that in mind, here's how to obtain the different colors:

(X starts as an even coordinate, Y has no effect on color.)

1. Bit pattern 01 gives color in address 646. SYS ERASE:X=X+1 :SYS PLOT

2. Bit pattern 10 gives color in address 53282. SYS PLOT:X=X+1 :SYS ERASE

3. Bit pattern 11 gives color in address 53283. SYS PLOT:X=X+1 :SYS PLOT

You may want to assign priorities by skipping the erase function or checking for previously set points. The need for this will become obvious as you use the program. Where X values are out of your control, you'll want to use a function like that defined in line 125. This will ensure that the X coordinates are even.

A few final notes may be useful. The Coordinator can plot under ROM, so no BASIC memory need be sacrificed to the display. If you set the variables in line 55 to 3, 1, and 5, respectively, The Coordinator will plot your screen under the Kernal and color under the SID registers.

While displays located under ROM are always safe from interference from BASIC, those in BASIC RAM may need to be protected, depending on the length of your program and the amount of memory it uses for variables. Another point—if you reset your computer using a cold start, SYS 64738, you'll wipe out the low portion of the program, and you'll need to reload A COORD.OBJ.

Finally, no matter how helpful a utility is, bugs will still creep into your hi-res programming. You may need to check the normal screen for error messages, so you'll want to avoid the RUN/STOP–RESTORE combination, which clears the screen. If you use the Demo framework, just press RUN/STOP, and type GOTO 170. You'll instantly flip back to the normal display and be able to read the error message. The Coordinator should help make this procedure a rare one.

See program listing on page 103.

Storage And Display:
Using Peripherals With The 128

The two most important peripherals you'll use with your 128 are a disk drive and monitor. Here's some helpful information on the 1571 drive and what video display options are available. An excerpt from Chapter 4 of the newly released *COMPUTE!'s 128 Programmer's Guide*.

Split Personality

As you probably know, the 1571 drive has two separate operating modes. It can be either a fast, double-sided drive (1571 mode) or a slower single-sided drive (1541 mode). In ordinary circumstances, DOS automatically uses 1571 mode when the computer is in 128 mode, and 1541 mode when you switch the computer to 64 mode with GO 64. However, it's possible to switch the drive from one mode to another under program control. The following program switches from 1571 mode to 1541 mode.

```
10 OPEN 15,8,15
20 PRINT#15,"U0>M0"
30 CLOSE 15
```

After you run the program, the drive will read and write to the top side of the disk alone, just like a 1541. To return to 1571 mode, replace line 20 as shown here and rerun the program:

```
20 PRINT#15,"U0>M1"
```

You can also switch from one read/write head to another in a program. Switch your drive to 1541 mode, then format a new disk using the disk name SIDE ZERO. Now replace line 20 as shown here and rerun the program:

```
20 PRINT#15,"U0>H1"
```

Now format the disk again using the disk name SIDE ONE, then read the disk directory.

Replace line 20 with this line and rerun the program:

```
20 PRINT#15,"U0>H0"
```


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At this point, the disk directory should show SIDE ZERO. You now have a disk formatted on both sides in 1541 mode. Either side may be accessed by changing disk heads as shown above. If you have old single-sided disks around, this is one way to extend their usefulness. Note, however, that the second side cannot be read in a 1541 drive. It is only readable by a 1571 drive, which has two read/write heads rather than one.

Why the 1571 Is Faster

A 1541 disk drive can read a disk pretty quickly. That is, it can copy data from the surface of the disk to its internal memory fast enough. But it transfers data to the computer at a much slower rate. The problem lies in the 1541's communication protocol, which Commodore has fittingly dubbed "slow mode." There are now an abundance of Commodore 64 programs which increase the speed of the 1541 drive. Such utilities reprogram both the drive and the computer to accelerate the data transfer rate, at the risk of less reliable communications. The 1571 offers much faster transfer modes, and we'll show you how to access them under program control. But you first need to understand some simple facts about serial data transfer.

Most Commodore peripherals, including 1541 and 1571 drives, attach to the computer through a serial communication bus. The term *bus* is a jargon name for "group of wires," and *serial* means that only one bit (logical 1 or 0) of data can move along the bus at a time. To send a byte of data over the serial bus, a device first has to break the data down into its eight component bits. This sounds slower than it really is. Some serial communication systems—the Ethernet local-area network, for instance—are very fast. But there's one reason why Commodore's serial bus is so slow. Commodore computers built before the 128 don't use any special-purpose hardware for serial bus communications. Instead, the computer's microprocessor executes a program to convert a byte to bits and send both the data and associated control signals (like "Here's another bit" and "I'm done, now it's your turn to talk") down the bus. Since the microprocessor isn't specifically designed for such operations, it can't do them as fast as a special-purpose serial device.

The 128 and 1571 use a new system called *fast serial mode* to relieve the microprocessor of most serial communication chores. In the original serial protocol, one wire in the serial bus cable was named—Service Request (SRQ)—but never used. Now this wire has been put to work carrying a high-speed clock signal to accompany data sent at a faster rate. Since the clock signal and the data move faster than the microprocessor can follow, the Complex Interface Adapter chip at location $DC00 (CIA #1) assumes more responsibility for communications. The CIA's serial data register (SDR) at location $DC0C was unused on the 64. But in the 128 it reads and writes to the serial bus's data line. Thus, in the 128's fast serial mode the most speed-critical tasks are done by hardware that was unused (or underused) on the 64.

Why Learn About Fast Mode?

Some people—Commodore's programmers, for instance—have to know the details of serial communication backward and forward, but you can ignore all the bits and bytes and three-letter words and still benefit from fast serial mode. Every serial input/output routine in the 128's operating system has been written to use fast mode whenever it can. Whenever a serial device is active, the 128 checks to see if it can handle fast mode. Whether you access the device from BASIC or machine language, fast mode will be used if you have a 1571 connected to your 128.

For some disk operations, the 1571 is even faster because of new *burst mode* disk access commands. In conventional disk access, each request for data from the drive only returns one byte. When you're loading a large file, the computer spends most of its time saying "next byte, please" over and over again. Burst commands, on the other hand, tell the disk drive to pass many *blocks* (256-byte packages) of data without any further instruction. These commands can operate on as many as 256 blocks of disk data at a time. There is also a new fastload command that reads a complete disk file in one operation. As CP/M users will be glad to learn, burst mode is also available with any command that relates to MFM-formatted (non-Commodore CP/M) disks.

Since the computer's LOAD routine knows about fastload, ordinary BASIC commands like LOAD, DLOAD, and BLOAD (as well as ML routines which call Kernal LOAD) use burst mode if it's available. Unfortunately, since there is no corresponding fastsave command, all save operations transfer data at the normal byte-by-byte rate.

Video Displays

Like virtually every other microcomputer, the Commodore 128 communicates with you, the programmer, chiefly through a *monitor* or some type of display screen. Several options are available to accommodate a wide variety of needs. (The use of the term *monitor* to describe a dedicated video display should not be confused with the use of the same word to describe the built-in machine language control program. It's an unfortunate quirk of computerese that monitor has two different uses, but both stem from the same idea: Video monitors let you monitor (watch) the output of your programs, while machine language monitor programs let you "see" machine language.)

The least expensive alternative is to connect the computer to an ordinary TV, using the cable and switch box supplied by the manufacturer. The RF (Radio Frequency) modulated output of the computer contains both audio and video signals, which the TV receives through its antenna input like an ordinary broadcast signal. Though it has the advantage of low cost, a TV hookup rarely provides as clear a display as using a dedicated monitor. The RF cable acts as an antenna of sorts, picking up stray signals from the general vicinity—including the radio frequency waves generated by the chips in your computer and associated peripherals. In the past few years, an increasing number of combination

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TV/monitor devices have appeared on the market. These are essentially televisions with extra connections for direct input from a home computer or video-recording device. In monitor mode, the device bypasses the TV circuits that receive broadcast signals, usually providing a display equal to that of a dedicated monitor.

If you have owned or used another Commodore computer before purchasing your 128, chances are good that you're familiar with the most popular type of dedicated monitor—the *composite* monitor. This type includes the Commodore 1701 and 1702 monitors (and many similar non-Commodore devices), which display an excellent image in 40-column mode. These monitors are connected to the computer through the eight-pin video connector at the computer's rear. Commodore composite monitors usually produce the best picture through the rear connectors, which split the color portion of the signal into separate chroma (color) and luma (brightness) signals, rather than those in the front of the device.

A monochrome monitor, though it provides no color (and often no sound), offers another inexpensive alternative. For a 40-column display, simply connect the luma output plug of the video output cable to the monitor's input (luma is essentially the video signal stripped of its color information). A diagram of the pins in the video output appears in your *128 System Guide*. If you're not sure which plug is luma, go ahead and experiment. You can't harm either device by momentarily connecting the wrong plug to the monitor. Monochrome displays are usually very sharp—more distinct than the best display produced by a composite monitor.

The third major type of monitor is the RGBI (Red/Green/Blue/Intensity), in which a separate signal is provided for each of the three primary video colors—red, green, and blue. The 128's 80-column display is in RGBI format. Since the nine-pin RGBI connector at the rear of the 128 is much like that on an IBM PC or PCjr, you should be able to use any color monitor compatible with those machines. Besides providing an extremely clear image, an RGBI monitor gives you 80 columns of characters on the screen—ideal for word processing, spreadsheets, and so on. The Commodore 1902 monitor, designed expressly for the 128, is a dual monitor: You can switch it from 40-column composite mode to 80-column RGBI mode simply by pressing a switch.

Though it requires making your own connector cable, you can get an acceptable 80-column monochrome display on a Commodore 1701 or 1702 monitor. The first step is to purchase a standard male nine-pin D connector (Radio Shack part #276-1537 is acceptable), a length of shielded coaxial cable and an ordinary RCA phono plug. As shown on page 352 of the *Commodore 128 System Guide*, pin 1 of the RGBI connector is ground, and pin 7 is monochrome output. (Note that the diagram on page 352 shows the pins as if you are *inside the computer looking out*. The pins of the plug you buy should be numbered; just look for pins 1 and 7.) To make an 80-column cable, you need only connect pin 7 of the D connector to the signal (inner) portion of the RCA plug and connect pin 1 to the ground (outer) portion of the plug (via the coaxial cable, of course). If you don't know how to do this yourself, any friend with a soldering iron and some electronics experience should be able to do it for you.

A homebrew cable of this type produces an excellent 80-column image on any monochrome monitor that accepts composite output, and an acceptable display on a Commodore 1701 or 1702 monitor. To use it with a Commodore composite monitor, turn the contrast down and plug the RCA connector end of the cable into the VIDEO connector on the front or the LUMA connector on the back. The ordinary light-on-dark display will probably not be very readable: Press ESC-R to switch to dark characters on a light background. Though it's not quite RGBI quality, the image is definitely usable, and gives you access to 80 columns at a cost of only a few dollars.

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ASCII Teleconverter

Ken Stange

If you'd like to telecommunicate with a non-Commodore computer user, here's a short, easy-to-use program. It converts sequential files from standard ASCII to Commodore ASCII and vice versa. For the 128, 64, VIC and Plus/4.

Commodore ASCII codes are slightly different from standard, true ASCII. (ASCII—American Standard Code for Information Interchange—is a group of numeric codes designed to represent numbers, letters, punctuation marks, and control codes, such as carriage returns, linefeed, backspace, end text, and so on. This standardized code was developed so that various machines—originally teletypes—could communicate.) Although most computers use standard ASCII, Commodore computers do not. As long as you don't attempt to communicate with a non-Commodore computer, this difference is inconsequential. However, telecommunications permits you to transfer files from non-Commodore computers to your own disk, and standard ASCII is, logically enough, the standard format. This is where a problem arises.

Apple To Commodore And Vice Versa

Let's say a friend who owns an Apple wants to send a sequential file listing of a program he wrote (so you can translate it), or even an ordinary text file. Unless your terminal software automatically translates standard ASCII into Commodore ASCII, you'll find that your word processor or text editor doesn't work properly. That's where this short utility program can help.

"ASCII Teleconverter" converts a standard ASCII file to Commodore ASCII for reading by your text editor. It also converts a Commodore ASCII file to standard ASCII for uploading to another type of computer. Note that *SpeedScript*, *WordPro*, and some other word processors cannot be used to read the converted files because they use program files instead of sequential files, and screen codes instead of ASCII.

Easy To Use

After typing in the program, save a copy. To use it, load it and type RUN. You're first reminded that you need to have room on your original disk for the converted file. Next you're asked to choose if you want the converted file to be standard ASCII or Commodore ASCII. Press S or C. Another prompt asks you for the name of the file you wish to convert. This must be a sequential file. After entering the filename, you're asked to insert the disk that contains the file to be converted and press R when ready. A message will inform you when the conversion is complete. Last, you're offered a chance to convert another file. It's a simple process that involves only a few keypresses.

The filename of the converted file is the name of the original file with .S or .C added. For example, if the original filename is MENU, the name of the converted file is MENU.S if you selected standard ASCII format, or MENU.C for Commodore ASCII.

ASCII Teleconverter works only with sequential files. If you want to transfer a Commodore BASIC program to another brand of computer, you must first convert the program file to a sequential file. To do this, load the program and type:

```
OPEN 8,8,8,"0:filename,S,W": CMD 8:
  LIST
```

This LISTs the program to disk under the name you provide in place of *filename*. Remember, this name must be different than the program filename if you're writing to the same disk. When the cursor reappears, type:

```
PRINT#8: CLOSE 8
```

When the disk drive stops spinning, load and list the directory. You should see the sequential file you created. Now run ASCII Teleconverter to convert this Commodore ASCII file to standard ASCII. Then use your terminal program to transfer the converted file to the other computer via modem.

See program listing on page 101.

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Cataloger

Kevin Mykytyn, Editorial Programmer

This program helps you organize your disk library by making it easy to find any program on any disk. Included are options to print out a master directory and alphabetically sort all filenames. For the Commodore 128, 64, Plus/4, and 16.

After owning a computer and disk drive for a while, it doesn't take long before you find yourself inundated by programs and disks. No matter how well your disks are organized, you may still find yourself loading several directories searching for that one program. Cataloger offers a practical solution. It's a straightforward, menu-based program that creates a master directory for all your disk-based programs. Several extra features make it especially useful.

Managing Hundreds Of Files

Cataloger is written entirely in BASIC and runs on the 128 (either 64 or 128 mode), 64, Plus/4, and Commodore 16. As listed, Cataloger can handle up to 800 filenames. If you're using a 128 in 128 mode, it can handle up to 2000 filenames. On a Commodore 16, only 400 filenames can be managed. To change the number of filenames for either of these computers, replace the 800 in lines 10 and 370 with the appropriate number. (Commodore 64 and Plus/4 owners should type in the program—with the 800 filename capability—as listed.)

After you've typed in the program, save a copy. To use it, type RUN. A menu of nine choices is displayed:

1. CATALOG A SET OF DISKS
2. SEE ALL FILE NAMES
3. PRINT ALL FILE NAMES
4. SORT NAMES ALPHABETICALLY
5. CREATE A SEQUENTIAL FILE
6. CREATE A PROGRAM FILE
7. LOAD AN OLD FILE
8. DELETE A DISK
9. START NEW FILE

If you're using the program for the first time, choose option 1, Catalog A Set Of Disks. You'll then be asked for a disk name up to 16 characters long. This should be the name on the label of the disk you wish to catalog. Put the disk in the drive and press RETURN. The directory of the disk is displayed on the screen and the filenames are entered into the master directory. Next, you're asked whether you want to continue or quit. If you have more disks to catalog, press any key. Otherwise, type Q to go back to the main menu.

After entering all the disks you wish to catalog, you can view the master directory. Option 2, See All File Names, displays the master directory on the screen. You can also print it out on any Commodore printer using option 3. Make sure the printer is turned on before you choose this option.

The filenames are stored in a format slightly different from a standard disk directory. The filename is followed by the number of blocks used then the disk name.

Once you've viewed the directory, use option 5, Create A Sequential File, to save it. Choose this option if you wish to make changes later to the master directory. (The READ command of "MetaBASIC" or "BASIC Aid" allows you to view the master directory in this format.)

Option 6 also saves your master directory to disk, but instead of creating a sequential file, it creates a program beginning at line 100. Whenever you wish to view the master directory, you can load the program created. (With the FIND command of "MetaBASIC" or "BASIC Aid," you can search the directory for a specific program.)

Adding, Deleting, And Sorting

At some point you'll want to add or delete disks from your master directory. Options 7 and 8 are used for this purpose. Option 7 is used to load any directory stored in sequential file format (with option 5). After loading a file, you can choose option 1 and all new filenames will be appended to the old directory. Make sure you save your changes to disk when you're through.

To delete a disk from the master directory, choose option 8. In order for this option to work correctly, the directory must be *unsorted*. If you wish to have a sorted master directory on disk, you should first save it unsorted.

The delete option removes all filenames from the disk name specified. Therefore it's important that all disks have a unique name. If you've made changes to a disk and wish to enter the changes in the master directory, use option 8 to delete that disk, then use option 1 to enter the newer disk version.

You'll find it easier to locate a specific file if the master directory has been sorted. Once the file has been saved in sequential file format, use option 4 to sort the names.

To delete the directory in memory and start a new directory, use option 9.

See program listing on page 101.

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VIC Dump

Screen Dump To Printer

Henk de Bruyn

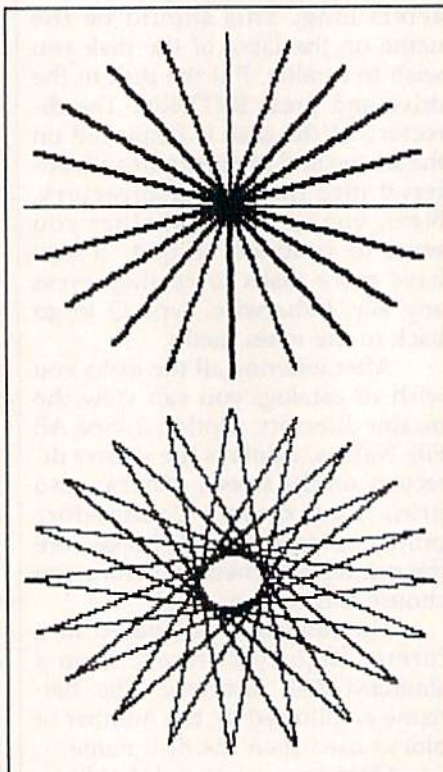
This short machine language program, only 251 bytes long, hides itself in memory and lets you dump any screen from your VIC-20 to your Commodore printer—even screens with custom characters and Super Expander graphics. It works on the unexpanded VIC with a Commodore 1525 or MPS-801 printer.

"VIC Dump" enables you to make an exact replica of the computer screen on your Commodore printer. You can make printouts of games, graphics, program output, almost anything.

It's designed to work with the unexpanded VIC-20 and either the VIC-1525 or MPS-801 printer. In their normal mode, neither of these printers prints true VIC characters because they have a 6 × 7 character matrix and the VIC has an 8 × 8 matrix. Therefore, to get true VIC characters and graphics, the printers must be used in their graphics modes.

That's how VIC Dump works. It generates a 100 percent resolution screen dump in just under two minutes.

VIC Dump is a semi-intelligent program. Characters which are invisible (same foreground and background color) will not be printed. VIC Dump automatically finds the number of screen columns and rows (normally 22 × 23) and the character matrix size (the normal 8 × 8 or extra-large 8 x 16). It works with user-defined custom characters and any video matrix address.



There are only two defects—some garbage is printed at the end of the printout, and multicolored characters are not reproduced well. (The multicolor bit of the color code is simply ignored, so the character appears in high resolution.)

Activating The Program

Follow these instructions carefully when using VIC Dump.

VIC Dump is written as a BASIC loader, a BASIC program which creates the machine language program in memory. Be especially careful when typing the DATA statements because these are the machine language codes. A mistyped number could lock up the computer, so be sure to use the "Automatic Proofreader" and to save VIC Dump on tape or disk before running it for the first time.

Here's the general procedure to follow:

1. Load VIC Dump, but do not RUN yet.

2. Type **POKE 55,0:POKE 56, 28:CLR**

3. Press RETURN.

4. Type RUN. After a few moments, the message SYS 6917 appears. This is the command to activate VIC Dump. Whenever you type SYS 6917 and press RETURN, whatever is on the screen will be dumped to your printer.

5. Load and run the program you want to dump to the printer. Use SYS 6917 to start the dump.

A slightly different procedure must be followed when using VIC Dump with the Super Expander cartridge:

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1. Load VIC Dump, but don't run it yet.

2. Type **GRAPHIC2:CLR:GRAPHIC0**

3. Press RETURN.

4. Type RUN. After a few moments, the message SYS 3845 appears. This is the command for activating VIC Dump with the Super Expander.

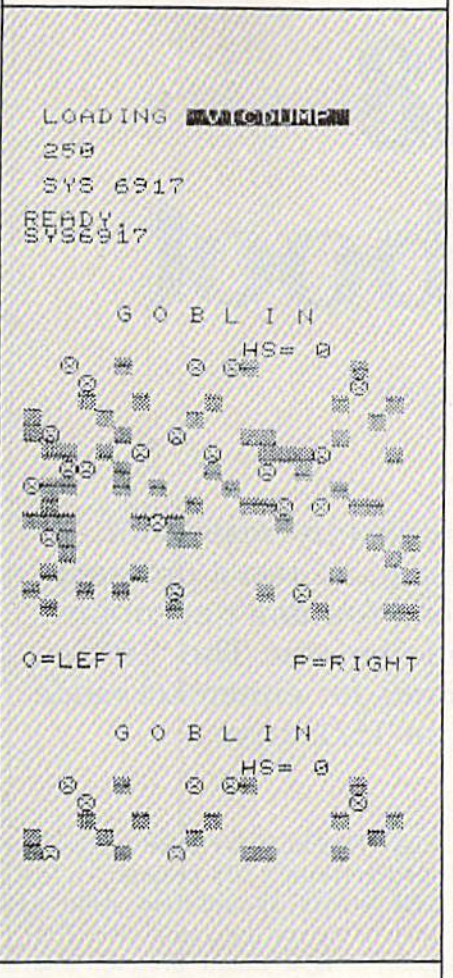
Tips On Using VIC Dump

One problem might have occurred to you already: If you must type a SYS command to activate VIC Dump, how can you enter the command while the program you want to dump is running? Also, won't the SYS command itself be dumped to the printer if you type it on the screen?

To answer the second question first: Yes, the SYS command will be dumped to the printer if you type it on the screen. VIC Dump captures *everything* on paper. But don't worry, there's a way around this, and it solves the first problem, too.

The trick is to embed the SYS command within the program you want to dump. Then when you run the program, it dumps itself to the printer when the appropriate image is on the screen.

For example, look at this game-screen figure.



This is a screen dump of a BASIC game which appeared in the GAZETTE's sister publication, COMPUTE! magazine. Notice that even the custom characters were reproduced by the printer. Here's how the dump was made:

First the game program was loaded, run briefly, and stopped with RUN/STOP–RESTORE. Then we entered PRINT FRE (0). The resulting number tells how much free memory (in bytes) remains in the computer when the game is running. Remember, the machine language portion of VIC Dump must coexist in memory with the program you're dumping, so you have to make sure there's room for it. In this case, there was well over the 251 bytes necessary for VIC Dump.

Next we turned the computer off, then on again to be certain all memory was cleared out.

The third step was to follow the procedure outlined above. Load VIC Dump, enter **POKE 55,0:POKE 56,28:CLR** and then type RUN. The message SYS 6917 appears.

Fourth, we again loaded the game program. This automatically erases the VIC Dump BASIC loader, but remember, the machine language portion remains in memory. Even typing NEW does not wipe it out.

Next we had to determine where to embed the SYS command in the game program in order to dump the screen. To do this, we ran the game. When the screen was drawn, we pressed the RUN/STOP key. When you stop a program this way, the computer always tells you where the program was interrupted. Let's say the screen says BREAK IN 300. This would mean the program was interrupted at line number 300. Therefore, the SYS command should be inserted somewhere near this line. Assume the next line after 300 is 310. You could safely insert the command in between, like this:

```
305 SYS 6917
```

The sixth step is to make sure the printer is plugged in and switched on.

Finally, run the program. The screen sets up, the game starts, and then the program reaches the SYS command that was inserted. VIC Dump is activated and the printer goes to work. In about two minutes the screen dump is done.

With The Super Expander

The same steps would be followed, with a few differences, when using VIC Dump with the Super Expander cartridge. Remember to enter **GRAPHIC2:CLR:GRAPHIC0** after loading VIC Dump, and that the SYS command is SYS 3845 instead of 6917.

The Super Expander cartridge changes the top-of-memory pointer after each GRAPHIC statement, except GRAPHIC0. Fix this by using **GRAPHIC2:POKE 55,5:POKE 56,15:POKE 51,5:POKE 52,15** instead of just GRAPHIC2 in the program you want to dump. By making this change and embedding the SYS 3845 command, we produced the screen dumps of the Super Expander designs accompanying this article.

See program listing on page 101.

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128 Autoboot

Steve Stiglich

These four programs allow you to create boot disks that automatically load and run a program when your 128 is turned on. You don't even have to type LOAD—it's all done for you. The "autorun" disks can boot programs for either 128 mode or 64 mode from the 1541 or 1571 drive.

For many Commodore users, the idea of a *boot disk* is brand new. But if you've done much work with an Apple, IBM, or Atari, you know how convenient it is to insert a disk, turn on the system, and see a program automatically load and run. When a Commodore 128 is turned on (or when it's reset with SYS 65341), it checks for the presence of a disk drive. If the drive is turned on and contains a disk, the 128 checks track 1, sector 0, for an *autoboot sector*. Upon finding one, it follows the instructions there for loading and running a program.

The programs presented here allow you to write an autoboot sector to any disk. In addition, you can create a disk that makes the 128 go into 64 mode and automatically load and run your favorite program for the 64. You could make a *SpeedScript* boot disk, for example. All you'd have to do is turn on the drive, insert the disk, and power on the 128.

All four programs are written in BASIC, although some contain short machine language routines inside DATA statements. Program 1 writes an autoboot sector to a disk. The boot sector attempts to load and run a 128 program called "HI" so you should have a file by that name on the same disk. Program 2 is a menu program that gives you five choices. If you want this to be your boot program, save it to disk under the name "HI". Program 3 creates a machine language autorun 64 program file that causes another 64 program to load and run automatically after going into 64 mode. Program 4 uses the dynamic keyboard technique to load and run a BASIC or machine language program for the 64.

Special Typing Instructions

Programs 1, 2, and 3 should be typed in and saved from 128 mode. *You must not have a graphics area allocated when these programs are saved.* If you've been working with hi-res graphics, enter GRAPHIC CLR before saving the programs. The name given to Program 2 should be "HI" if you want the menu to automatically come up when you turn on the system (if you plan to boot any other 128 program, you can skip Program 2). It's of no importance which names you use for Program 1 or Program 3.

Program 4 is written for 64 mode, so you should enter GO 64 before beginning to type it in. *This program must be saved from 64 mode.* Be very careful with lines 10 and 20; type them exactly as listed. Save this program (from 64 mode) under the name "PROGRAM 4". It should be on the same disk as Programs 2 and 3.

Creating An Autoboot Sector For 128 Programs

Program 1, "Create 128 Boot Sector," is fairly straightforward. It writes an autoboot sector to track 1, sector 0, of a disk. Load Program 1, insert a disk into your 1541 or 1571, and type RUN.

It first prompts you for a screen color. Enter a number in the range 0–15. If you want the screen to be white, for example, enter 1. Next, you're asked for a border color. The default values (if you don't answer the questions) are a blue screen with a light gray border. The screen and border will take on these colors when the disk is booted.

When you've set the screen and border colors, Program 1 writes the autoboot sector to disk. If you reset your 128 by turning it off and then on, it will read the sector and try to load a file called "HI". The HI file can be any valid program saved from 128 mode. It will load and automatically run. If you should want to load and run a machine language program, use these two lines, substituting the filename and SYS address of your ML (machine language) program:

```
10 BLOAD "filename"
20 SYS xxxxx
```

DSAVE this short program as "HI" and when it boots, it will load the ML and start it running.

Using The Menu From Program 2

If you load and run Program 2, you'll see a menu with five options:

```
64 MODE—BASIC
64 MODE—RUN FILE
BOOT CP/M DISK
128 MODE—BASIC
128 MODE—RUN FILE
```

Use the cursor keys to select one of the options, then press RETURN. If you should choose 128 MODE—BASIC, the program

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NEWs itself and exits to BASIC. 128 MODE—RUN FILE prompts you for the program name and then loads and runs that file.

If you opt for CP/M, it asks you to insert a CP/M disk. After doing so, press RETURN and CP/M will boot.

Choose 64 MODE—BASIC to go directly to 64 mode without loading a program. The second choice, 64 MODE—RUN FILE, leads into several questions. First, you're asked DOES FILE CONTAIN AUTORUN CODE (Y/N)? If you've used Program 3 to create an autorun file (see below), you should answer yes and provide a filename. Program 2 then BLOADs the autorun file and executes the GO 64 command.

If you answer no to the prompt, then there must be a copy of the "AUTORUN.C64" file on the disk (see the description of Program 3 below for instructions on how to create this file). The program loads AUTORUN.C64, and inserts the name of your program. Next you're asked "IS THIS A SELF-STARTING FILE (Y/N)?" If the 64 program to be loaded is in BASIC, answer yes. If not, you'll have to provide a SYS address. Finally, the 128 goes into 64 mode and runs the program you've requested.

A Memory-Based Cartridge For The 64?

We've already seen that the 128 checks for an autoboot disk sector when power is first turned on. But how does this program go into 64 mode and, in the process, cause the 64 to load and run a program? The answer can be found in the 64's own power-up routine. When you turn on a 64 (or GO 64 on the 128), the computer doesn't access the disk drive, but it *does* look for a cartridge. If it finds a certain sequence of letters and numbers at location 32768 (hexadecimal $8000), it does not enable BASIC, but instead surrenders control to the program in the cartridge.

All three modes of the 128 (128, 64, and CP/M) share certain areas of memory. So, if we write a cartridge-emulator, it can be BLOADed into location 32768 (in 128 mode). With that special program in place, the GO 64 command makes the computer turn into a 64 and begin the reset routine. As 64 mode is initializing itself, it finds something that looks like a cartridge at 32768. The memory-based cartridge tells it to load and run a program from disk.

In order to get this to work, we have to create the cartridge-emulator with Programs 3 and 4.

First enter Program 4 (remember, *this must be typed and saved from 64 mode*). Let's say you call it "PROGRAM 4". Now turn the 128 off and back on, and enter Program 3 (from 128 mode). Now we can begin.

Run Program 3. Answer the first prompt with "PROGRAM 4" (which must be on the disk currently in the drive). The disk drive light will turn on while the program is read into memory. When it's finished, it will ask for a filename. Answer "AUTORUN.C64". It will create the generic cartridge emulator used by Program 2. If this emulator is on a disk, Program 2 will be able to put the 128 into 64 mode and run any BASIC or ML program.

You can also generate a cartridge emulator for running a specific program. Let's say you want to create an autorun file for a game called SPACEGAME (saved as a BASIC program from 64 mode). Load and run Program 3. When it asks for the program name, answer "SPACEGAME". After reading the file, it will ask for a filename. Call it something like "SPACE.BOOT".

With a specific boot program in place, you can go into 64 mode and run it with the following sequence of events:

1. Insert the disk in the drive and turn on your 128.

2. The boot sector (which was created by Program 1) is loaded. It, in turn, loads the "HI" program (Program 2, saved under the name HI) from the disk.

3. Program 2 presents you with the menu of choices. Cursor down to 64 MODE—RUN PROGRAM and press RETURN.

4. Answer yes to DOES FILE CONTAIN AUTORUN CODE? and enter SPACE.BOOT as the name of the program. The computer then goes into 64 mode. The boot program, acting like a cartridge, then loads and runs the 64 program SPACEGAME.

Bypassing The Menu

There's one final option. Let's say you want to set up a boot disk that goes into 64 mode and loads (and runs) *SpeedScript*. You don't need Program 2, because you don't want the menu to appear—you just want *SpeedScript* to load and run. Follow these steps:

1. Load *SpeedScript* (from 64 mode) and save it to a freshly formatted disk.

2. Load Program 4 (again from 64 mode) and change lines 10–20. The first line should say **A$="SPEEDSCRIPT"** and line 20 should read **B$="RUN:"**. (If this were a machine language program stored at 49152, you would substitute SYS 49152 in line 20). Save this under the name "SSLOADER" as the second program on the disk containing *SpeedScript*.

3. Go into 128 mode by pressing the reset switch, or turning it off and then back on. Load Program 3 and insert the disk containing the two programs. Run Program 3 and answer SSLOADER for the program name. Then answer SS.BOOT for the name of the boot program. There are now three programs on the disk.

4. While still in 128 mode, type NEW. Enter this one-line program:

```
10 BLOAD"SS.BOOT":GO 64
```

Save this to the disk as "HI"—the fourth program on the disk.

5. Finally, load Program 1. Switch disks, inserting the dedicated *SpeedScript* disk. Run the program and an autoboot sector will be created. Now you have a disk which contains four programs and a boot sector.

Turn everything off. Turn on the disk drive and insert the *SpeedScript* disk. Turn on the 128. You don't need to do anything else. The boot sector loads the program called "HI". It loads the cartridge emulator and goes into 64 mode. The code at 32768 makes the 64 think a cartridge is in place, so SSLOADER is run. It, in turn, loads and runs *SpeedScript*.

It may seem like a lot of work, but the results are worth it. To load and run a 64 program, just turn on your 128. Everything is handled by the boot sector (and the related files).

See program listings on page 108.

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Clavier 64

Peter Sribniak

This small but efficient three-voice music player will be useful to music students or those interested in composing on the 64. It uses machine language routines for accuracy at fast tempos. Another valuable feature for serious music programmers is the large amount of memory available—over 35K of music data can be handled easily.

All Commodore 64 music and sound is handled by a computer chip called the Sound Interface Device, usually referred to as the SID chip. Its three independent voices can combine to provide polyphonic (multi-voice) harmonies. At any time, you can do one of three things to a voice: 1) stop the previous note to begin a new one, 2) silence the voice, or 3) allow the sound to continue as it is (active or silent) by doing nothing.

To play a single note requires several POKEs to SID chip registers, and to play a chord requires many more POKEs. Writing a song with polyphonic harmony can be a daunting chore. "Clavier 64" lets you concentrate on composing the music, freeing you from the tedium of looking up hundreds of POKEs.

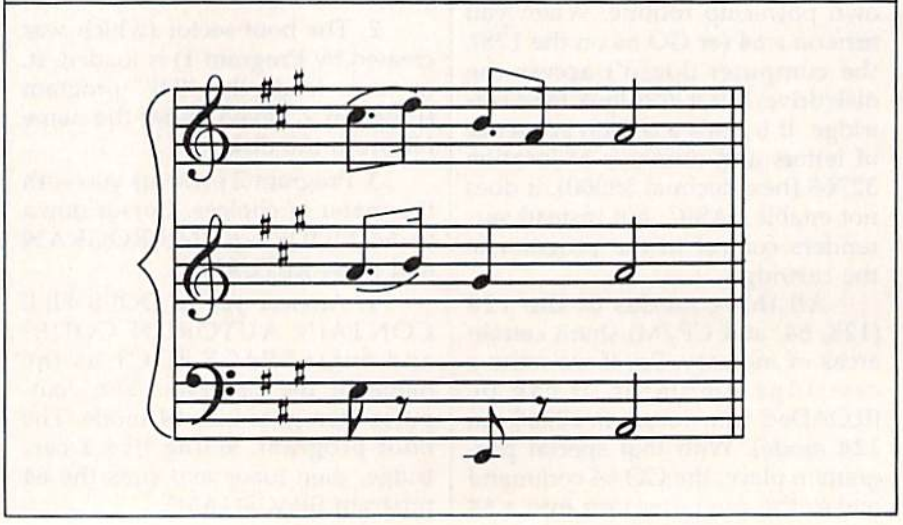
You begin composing a song by breaking it into a series of *events*. An event is the shortest time period in the melody, an eighth note, a sixteenth, and so on. At the beginning of each event, the three voices are changed, silenced, or left alone. If you chose a sixteenth note as the smallest time period, for example, you would allow four events to pass to play a quarter note. Eight events would be a half note, sixteen a whole note, and so on. Clavier 64 has the capability of changing a note's pitch without cutting off the previous note. This produces an excellent legato effect.

The necessity of rapidly turning each voice on or off in succession could produce problems if you try to play rapid music using BASIC. The fast machine language routines in Clavier 64 solve this problem by greatly reducing the time required to decode data successively for each voice. The result is virtually instantaneous gating of all three voices.

Notes Into Data

The figure below shows a brief musical excerpt which will illustrate most of the coding principles of Clavier 64.

The first step is to determine the basic unit, or event, of the music since this unit will be in effect for the duration of the composition. The unit is usually the shortest note value in the composition. (In the figure above, that unit is a sixteenth note.) To make sure, check to see



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that every note in the composition is a multiple of the basic event. If a note isn't, see the section below on complex rhythms.

Having established the unit event, use the Clavier 64 Note Values table to look up the value for each note. Following each note is the frequency (Hz) and two codes. Choose the higher or lower code value according to these rules:

1. The higher value is used if the note is tied to the note in the same voice in the next event.

2. The lower value is used if the note is detached from the note in the same voice in the next event, or if the note is followed by a rest.

3. A silence or rest in any voice always has a value of 192.

4. The final event contains either 192 or values less than 64.

Let's look at the DATA statements corresponding to the musical excerpt in the figure above. These are found in lines 350–500 of the program.

```
350 DATA 102, 98, 81
360 DATA 102, 98, 17
370 DATA 102, 98, 192
380 DATA 39, 36, 192
390 DATA 100, 97, 69
400 DATA 100, 97, 5
410 DATA 36, 97, 192
420 DATA 34, 33, 192
430 DATA 98, 98, 74
440 DATA 98, 98, 74
450 DATA 98, 98, 74
460 DATA 98, 98, 74
470 DATA 98, 98, 74
480 DATA 98, 98, 74
490 DATA 98, 98, 74
500 DATA 34, 34, 10
```

Each line is one event, while each value in the line corresponds to one voice. Thus you can consider the data values as a matrix with three columns representing the three voices and any number of rows representing successive events in time.

The first data line must be numbered starting at 350 for any composition using Clavier 64. Using the matrix concept, we'll start with the first note of the first voice (the top staff in the figure) and continue down the first column of successive rows with the first voice to the end of the bar (line 500). Then we'll repeat the process for each of the other two voices (columns two and three).

The first note in the top voice, a dotted eighth C#, is three events long, equivalent to three sixteenth C#'s tied together. Since this note is tied to the following note, the higher C# value is used for all three events. Therefore the first data value in each of the first three events (lines 350–370) is 102. The sixteenth D which follows the C# is detached from the note that follows (a B). Therefore the first value in the fourth event (line 380) is 39. The following dotted eighth B is detached from the next note (an A). So the first two events of its duration will use the higher value while the third uses the lower value.

Lines 390 and 400 have 100 as their first value while line 410 has 36. The detached A sixteenth note is one event and is represented by the 34 in line 420. The final A half note is 8 events long. Since it ends the music, the first seven are high values and the last event is low. Therefore lines 430–490 have 98 and line 500 has 34 as the first value.

Proceeding to voice two (the middle staff), we go back to the first data statement (line 350) and move downward filling in the second value of each data statement. The first two notes of the second voice have the same rhythm and articulation as the first voice, only differing in pitch. Using the same reasoning, high values for A (three events at 98) and one low value for B (36) are in the second position of lines 350–380. Then follows a detached G# quarter note. This is equivalent to four tied sixteenth notes, the last being the low value because the A is detached. Therefore lines 390–420 have 97, 97, 97, and 33, respectively. The final A of the second voice is identical to the first voice and is coded the same way.

The third voice opens with an E eighth note followed by a rest. The first event uses the high value for the E and the second uses the low one, hence 81 and 17 in the third position of lines 350 and 360, respectively. The eighth rest is coded as 192 in the following two events in the third voice (position three in lines 370 and 380). The eighth E that follows is coded again, as a high E value followed by a low one (69 and 5 in lines 390 and 400). The second eighth rest is 192 in lines 410 and 420. The final A half note is eight events long with the first seven values high and the last low. The reasoning is the same as for the final A in voices 1 and 2.

Complex Rhythms

Complex rhythms are those which contain note values which are not simple multiples of the shortest note, rhythms containing both normal and triplet eighth notes, for example. (A normal eighth is not a multiple of a triplet eighth). The event is calculated using the lowest common denominator (LCD)—the triplet eighth is 1/3 of a beat while the normal eighth is 1/2 beat. The LCD—1/6 of a beat—is the unit event. A normal eighth therefore is three events, a triplet eighth two events, a quarter six events, and so on.

Using The Program

Clavier 64 consists of two parts. The first part (lines 10–220) is a BASIC loader for the frequencies and routines, while the second part (230–340) sets up the SID chip, reads the code, and calls the machine language routines.

Modifications and DATA statement editing are done by listing the appropriate DATA statements and using the screen editor as in any other BASIC program. As mentioned earlier, over 35K of data can be handled with no problem (approximately 17K of data equals 1,000 events and if you're using sixteenth notes as the event period, 17K is equivalent to about 64 measures). The SID values have been chosen to provide an "all purpose" sound so that usually only the tempo would need adjusting. This is done by changing the value of V in line 300. Increasing the value of V decreases the tempo and vice versa. ADSR and waveform values can easily be changed by substituting new values in the appropriate POKE commands in lines 240–250.

When the composition is to your liking, put in your own DATA statements from line 350 on, with the last being DATA 0,0,0 and save the program with these DATA statements.

Advanced BASIC programmers can easily modify the program to read more than three values for each event. These additional values could then be used to POKE new

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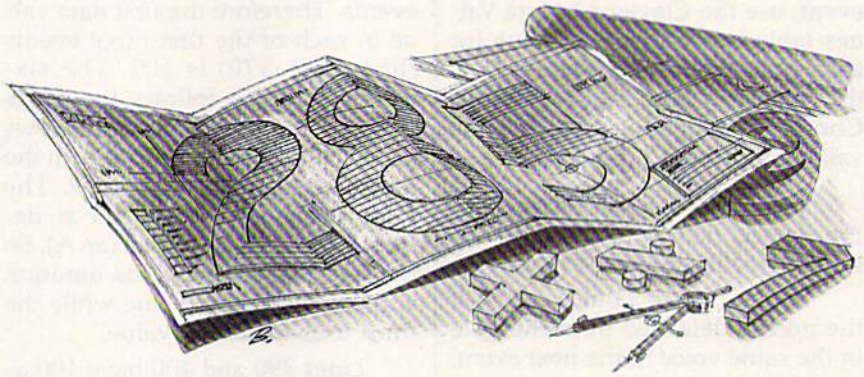
ADSR or waveform values or to vary the duration of the main loop to produce swing, rubato, and various other tempos.

See program listing on page 102.

Clavier 64 Note Values

Note	Frequency (HZ)	Code	
C	65	1	65
C#	69	2	61
D	73	3	67
D#	78	4	68
E	82	5	69
F	87	6	70
F#	93	7	71
G	98	8	72
G#	104	9	73
A	110	10	74
A#	117	11	75
B	123	12	76
C	131	13	77
C#	139	14	78
D	147	15	79
D#	157	16	80
E	165	17	81
F	175	18	82
F#	185	19	83
G	196	20	84
G#	208	21	85
A	220	22	86
A#	233	23	87
B	246	24	88
*C	262	25	89
C#	277	26	90
D	294	27	91
D#	311	28	92
E	330	29	93
F	349	30	94
F#	370	31	95
G	392	32	96
G#	415	33	97
A	440	34	98
A#	466	35	99
B	494	36	100
C	523	37	101
C#	554	38	102
D	587	39	103
D#	622	40	104
E	659	41	105
F	698	42	106
F#	740	43	107
G	784	44	108
G#	831	45	109
A	880	46	110
A#	932	47	111
B	988	48	112
C	1047	49	113
C#	1109	50	114
D	1175	51	115
D#	1246	52	116
E	1319	53	117
F	1397	54	118
F#	1480	55	119
G	1568	56	120
G#	1661	57	121
A	1760	58	122
A#	1865	59	123
B	1976	60	124
C	2093	61	125

*middle C



Number Construction Kit

Gerald W. Rightmer

You've got the tools, materials, and a goal in this construction project. All you have to do is think hard and work fast. For children, an excellent program for practicing math skills; for adults, a real brain teaser. Designed for the Commodore 64, Plus/4, and 16.

Your bid has just been accepted for a new construction project—to build a three-digit number between 100 and 999. Fortunately you have your number construction kit, which includes everything you need for the task. Your tools are the four basic arithmetic operators: +, −, *, and /. Your building materials are single digit integers, three, four, or five of them, depending on the level of play you choose. And, as with all construction projects, there is a deadline: one, two, or three minutes, depending on your level of expertise.

Getting Started

"Number Construction Kit" is written entirely in BASIC for the Commodore 64. Type in the program and save a copy. If you have a Plus/4 or Commodore 16, substitute this line:

```
QF 20 COLOR0,1,1:COLOR4,1,1:CC
      =202:Q=205:Y=239:C0=2608
      :SC=3670:B$=CHR$(159)
```

To play, load the program and type RUN. First, you're asked for the number of players. Press 1 or 2. Then you're asked to choose one of three difficulty levels: 1. Beginner,

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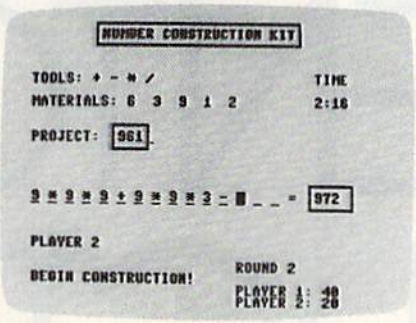
2. Intermediate, or 3. Advanced. Press the number key which corresponds to your choice. At the beginner level, you're given five numbers for materials and three minutes to complete the construction project. At the intermediate level, there are four numbers to build with and two minutes to finish. And, if you're up to it, the advanced level offers only one minute and three numbers to work with.

After selecting the number of players and a difficulty level, you're ready to begin. The project total (your goal) and materials (the numbers you're given to work with) are presented and you're prompted to press any key to begin. As soon as the game begins, the timer starts counting down. First select one of the numbers from the materials listed. Then choose one of the operators: the plus or minus sign (on the top row of the keyboard), the multiplication sign (on the second row beneath the minus sign), or the division sign (at the bottom row next to the right SHIFT key).

Begin building toward your project goal without hesitation. If you reach the project goal before time runs out, press RETURN. Each game consists of five rounds. In the two-player game, one round consists of one turn for each player. After five rounds, the game ends, and you're asked if you'd like to play again. At this point, you can change the number of players and the difficulty level.



This player is about to successfully complete a "project."

Staying In Bounds

Like any construction project, there are constraints. First, there are only 15 spaces with which to work. This means that you can use only eight numbers and seven operators to complete the project. You're allowed to move across the computation line using the cursor keys, and change numbers or operators simply by typing over the existing characters. A running total is displayed to the right of the equation, allowing you to instantly monitor your progress. Since the target number is positive and greater than 100, the program does not allow numbers less than 0 in the target number. Also, numbers greater than 9,999 cannot be created during the construction process. Error messages will appear, and the game will pause if the running total is greater than 999 or less than 0.

Scoring is based on how close you are to the target, the difficulty level, and how quickly you respond. If your total at the point when time expires is greater than 200 from the proposed project total, then no score is awarded for the round. A round is terminated either by the clock or by pressing the RETURN key.

The program randomly generates numbers for the project goal and materials, excluding duplicates and zeros. The only keys that work are the designated materials (numbers) keys, the four operators, left and right cursor keys, DELete, and RETURN. The DELete key deletes only from the end of the line and removes only the character under the cursor. This means that no gaps can be created in the middle of a computation line (this would result in a meaningless arithmetic expression).

Number Construction Kit is a challenge to any age, and it can be an entertaining way to reinforce basic arithmetic skills in children. Since immediate feedback is given throughout the game, a child can learn much by trial and error.

For those simply looking to win the game, a few strategy tips might be helpful. The first step is to study the project number and the materials before pressing a key to start construction. For larger, more difficult numbers, it's usually easier to get within range of the project as fast as possible and to fine tune your answer with the remaining time and space. Remember, the materials may be used as often as necessary—you have an unlimited supply.

See program listing on page 105.

All programs listed in this magazine are available on the GAZETTE Disk. See elsewhere in this issue for details.

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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. I recently purchased a piece of software that would not load or run properly on my Commodore 64 and 1541 disk drive, but it ran fine on the store's computer system. The dealer said my problem is a misaligned disk drive. I am skeptical, since all of my other software runs properly and the performance test on the 1541 Demo Disk does not indicate any problems. What exactly is disk drive misalignment? What causes it and how do I fix it? If the problem exists, shouldn't the performance test program identify it?

A. Since the commercial software disk loads and runs on the dealer's disk drive but not yours, it's probably true that your drive is misaligned. This can be true even though your drive passes the performance test program on the 1541 Demo Disk with flying colors, and even though your own disks load without trouble.

Why? The performance test doesn't measure your drive's alignment relative to other drives; it only measures how well your drive maintains alignment relative to itself. Similarly, your own disks presumably were initialized on your drive; a misaligned disk drive will produce misaligned disks. The drive may be perfectly capable of reading its own disks, but not anyone else's. Conversely, other people's drives may not be able to read *your* disks. And since there's a degree of tolerance for misalignment in both disks and disk drives, certain disks will load while others won't. This can even change over time: You may find that disks which loaded fine a few months ago suddenly don't work today. Also, commercial disks sometimes have less tolerance for misalignment because of their copy-protection schemes.

Misalignment means that the drive's read/write head is having trouble locating tracks on the disk. A track is an invisible ring of data recorded on the disk's magnetic surface. Data is recorded on a Commodore 1541 disk in 40 tracks of concentric rings. You can get a rough idea of how narrow these tracks are by examining the access window on a floppy disk; all 40 tracks must be squeezed into the space where the magnetic surface is visible.

A very precise electric motor slides the read/write head along guide rails over this access window. (If you listen closely in a quiet room, you can hear the head moving from track to track, especially when formatting a blank disk.) When the correct track is located, the head stops and begins reading or writing. A misaligned head has difficulty finding the correct track, so errors result. Often this happens when the head tries to access an innermost or outermost track which is beyond its range of movement.

Read/write heads can become misaligned due to wear or rough handling, particularly during shipment. You can get test programs to detect this misalignment and help you (or a repair person) realign the head. It's a good idea to test your drive periodically even if it's not having problems, because a drive which slowly slips out of alignment might have trouble reading its own disks after it is readjusted. Several of these test programs are advertised and have been reviewed in COMPUTE!'s GAZETTE. If you aren't handy with a screwdriver, we recommend taking your drive to a Commodore dealer for alignment.

Q. I have a Commodore 64 and an Amdek Color 300 monitor with separate inputs for chroma/luma and NTSC. I was told to use the NTSC input by the salesman and the cable he sold me only works with this input. I have seen references to chroma/luma inputs in your column and would like to know if using these will improve the resolution. Also, what kind of cable would I need, and where could I purchase it?

A. Hooking up your 64 to the separate chroma/luma inputs will indeed yield a much sharper picture with considerably less color smearing. These are the same separated video inputs found on the rear of the Commodore 1701/1702/1902 monitors. The improvement can be startling.

It's not unusual that your salesman was unaware of this. Not many non-Commodore monitors even have separate chroma/luma inputs, because only a few computers have chroma/luma outputs: the Commodore 64, 128, Plus/4, and 16; and the Atari 800 and 130XE. Most computers have only regular composite video output, sometimes called NTSC (because the standard was established by the National Television Standards Committee).

The cable you need should be available from a Commodore dealer. It comes packed with 1702/1902 monitors and is available separately. You might also have some luck at electronics parts stores. Ask for an "octopus cable" with a DIN plug at one end (some 64s have five-pin DINs while others have eight-pin DINs) and four phono plugs at the other end. You may have to experiment to discover which two of these four phono plugs match the chroma/luma inputs on your monitor, but don't worry—you can't cause any damage by momentarily plugging them into the wrong jacks.

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news & products

BASIC Toolkit For 64

Epyx has introduced the *Programmer's BASIC Toolkit*, a programming utility package which adds more than 100 new BASIC commands for assembly language operations with the Commodore 64 and 128 (in 64 mode). The program uses Macintosh-style sprite and font editors, and boosts the Commodore operating system with such features as a directory listing command, easy to use disk command syntax, and a load/save function for graphics, sprites, and character sets. The *BASIC Toolkit* also allows you to print disk catalogs, text files, and program listings easily in BASIC.

The program, which includes a built-in fast-load feature, is priced between $34.95 and $44.95.

Epyx, Inc., 1043 Kiel Court, Sunnyvale, CA 94089.

Circle Reader Service Number 241.

Low-Priced Commodore Games

The Last V8 and *Hero Of The Golden Talisman* are two of the newest releases in Mastertronic International's line of low-priced game software for the Commodore 64 and 128 (in 64 mode). The two new disk-based games sell for $9.95 each, and are among more than two-dozen inexpensive arcade-style or strategy games offered by the company at that price. *Golden Talisman* is an action adventure game set in an intricate labyrinth. *The Last V8* is an arcade-style car race against time that includes voice synthesis and 360-degree scrolling.

Mastertronic International, Inc., 7311B Grove Road, Frederick, MD 21701.

Circle Reader Service Number 242.

1541 Controller

Micro Fabrication Systems has released 1541 Control, a hardware controller for the 1541 disk drive. The unit, which mounts on top of the drive, gives you the ability to change the drive's device number, to double the disk storage with a flip of a switch, and to reset the computer or drive independently of each other. The entire system can also be reset. An illustrated manual accompanies the package.

Suggested retail price is $34.95.

Micro Fabrication Systems, P.O. Box 1114, Delaware, OH 43015.

Circle Reader Service Number 243.

The 1541 Control disk drive controller.

Homework Helpers

Spinnaker Software has released two new educational programs for students in grades 7 through 12. In *Homework Helper: Math Word Problems*, a tutorial section leads students through a step-by-step process to build a correct equation. The Solver Section then provides practice in solving actual homework problems through the use of prompts and the program's built-in calculator.

Essays and book reports are the focus of *Homework Helper: Writing*. Using a series of prompts and questions supplemented by help files, the program guides the student through three stages of writing: forming ideas, organizing the ideas into an outline, and writing the text from the outline. The program includes full word processing, editing, and printing capabilities.

Homework Helpers are available for the Commodore 64/128 for $32.95.

Spinnaker Software, One Kendall Square, Cambridge, MA 02139.

Circle Reader Service Number 244.

Superman: The Game

It's up to Superman to save Metropolis from the evil forces of D.C. Comics's villain, Darkseid, in First Star Software's new release *Superman: The Game*. Players can choose to control either Superman or Darkseid, and can play against one another or against the computer. As Darkseid tries to wrest the secret of the Anti-Life formula from the citizens, Superman struggles to foil him using his heat vision, super breath, and his powers of flight and strength.

Several playing screens are included, among them mazes and arcade-style games requiring both strategy and fast action. There are three levels of play; the easier levels have fewer citizens to save. *Superman: The Game* is available for the Commodore 64 and 128 at a list price of $29.95.

First Star Software, 18 East 41st St., New York, NY 10017.

Circle Reader Service Number 245.

High-Performance Flight Simulator

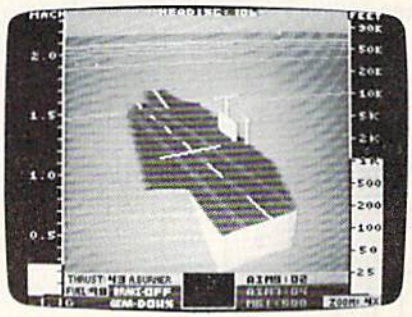
SubLOGIC Corporation has introduced a Commodore 64/128 version of *JET*, a program that simulates the flight of two supersonic jet fighters: a land-based F-16 Fighting Falcon or a carrier-based F-18 Hornet.

JET tests your pilot's skills under a variety of land/sea strike or dogfight combat conditions. It also offers a free-flight non-combat mode. Using the program's "Heads Up Display," you can monitor instruments and environment simultaneously. The display also provides a full-screen view out the window. Either aircraft can be fitted with a variety of weapon types (air-to-air missiles, AGM missiles, or smart bombs) depending on the mission selected.

JET is compatible with all subLOGIC Scenery Disks, and retails for $39.95.

SubLOGIC Corporation, 713 Edgebrook Dr., Champaign, IL 61820.

Circle Reader Service Number 246.



Cockpit view of an F-18 on carrier-landing approach in subLOGIC's JET *for the Commodore 64 and 128.*

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bug-swatter

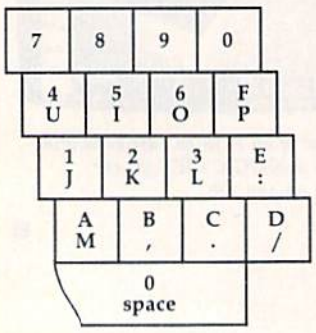
Modifications And Corrections

• The "New Automatic Proofreader" (February) will not work as listed on a Plus/4, 16, or 128 (in 128 mode). In lines 40 and 50, the statement **GRAPHIC CLR** should replace **WAIT CLR**. GRAPHIC CLR is necessary to eliminate any graphics area that may have been allocated prior to loading the Proofreader, to ensure that the ML portion of the program is stored in the correct area of memory. GRAPHIC is a command available in BASIC 3.5 and 7.0, but not in BASIC 2.0. The program on the GAZETTE Disk was correct, but the listing was made on a Commodore 64, which cannot properly interpret the token for the GRAPHIC command and substituted the WAIT command in its place. The listing has been corrected in this issue. We regret any inconvenience this may have caused our readers.

• Many readers have written to say that although the new version of "MLX" (first published in January 1986) requires fewer keystrokes, it takes longer to enter a program because the keys 0–9 and A–F are not centrally located. To create a numeric keypad, add the following lines:

```
485 A=-(A$="M")-2*(A$=",")-3*(
    A$=".")-4*(A$="/")-5*(A$=
    "J")-6*(A$="K")
486 A=A-7*(A$="L")-8*(A$=":")-
    9*(A$="U")-10*(A$="I")-11
    *(A$="O")-12*(A$="P")
487 A=A-13*(A$=S$):IF A THEN A
    $=MID$("ABCD123E456F0",A,
    1):GOTO 540
```

Numeric Keypad For MLX



In addition, readers who have encountered an error in line 830 should check the spacing. There must be a space between **ST** and **AND** in that line. If the space is left out, the BASIC interpreter is confused by the presence of the embedded keyword TAN.

• A similar caveat applies to line 350 of Program 1, Dictionary Manager, from "SpeedCheck" (December 1985). There must be a space between **ST** and **OR**. If the space is left out, the 64 sees the keyword TO in the line.

• Spacing is also very important in line 340 of the 64 version of "Banners" (December 1985). We received several program listings from readers who did not type the space between quotation marks in the statement **PR$=PR$+" "**. Without that space, the letters printed out will look like they collapsed. If the crossbar on a capital H has fallen to the baseline making it resemble a capital U, the problem is most likely in line 340. If problems persist, carefully check lines 280–290 and make sure you did not substitute a less-than sign for a left parenthesis or a B for an 8.

• Reader John F. Howard has discovered a bug in the routine that reads the disk directory in Program 1, File Protector, from "Soft Write Protector For Disks" (December 1985). If a program name containing exactly 16 characters is found, no more files from that sector will be listed to the screen. To correct this, change line 270 from **IF C<17** to **IF C<16**. He also notes that using this utility to protect a file does not hamper the operation of save-with-replace command. Also, if the program skips over a number or two, it's bypassing a directory entry of a previously scratched file. You'll sometimes see less than eight file names per sector.

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MLX Machine Language Editor For The Commodore 64

Ottis Cowper
Technical Editor

"MLX" is a labor-saving utility that will help you enter machine language program listings without error. MLX is required to enter all Commodore 64 machine language programs published in COMPUTE!'s GAZETTE. This version of MLX was first published in the January 1986 issue; it cannot be used to enter MLX programs published prior to that date, nor can earlier versions of MLX be used to enter the listings in this issue.

Type in and save a copy of MLX. You'll need it for all future machine language programs in COMPUTE!'s GAZETTE, as well as machine language (ML) programs in our companion magazine, COMPUTE!, and COMPUTE! books. When you're ready to enter an ML program, load and run MLX. It asks you for a starting and ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing. If you're unfamiliar with ML, 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 even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, MLX offers the option of clearing the workspace. The data you enter with MLX is kept in a special reserved area of memory; clearing this workspace area fills the reserved area with zeros, which will make it easier to find where you left off typing if you enter the listing in several sessions. 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 there's no point in clearing the workspace, since the data you load in will fill the area with whatever values were in workspace memory at the time of the last Save.

At this point, MLX presents a menu of commands:

```
Enter data
Display data
Load data
Save file
Quit
```

Press the corresponding key to select a menu option. These commands are available only while the menu is displayed. You can get back to the menu from most options by pressing RETURN.

Entering A Listing

To begin entering data, press E. You'll be asked for the address at which you wish to begin. (If you pressed E by mistake, you can return to the command menu by pressing RETURN.) When you begin typing a listing, enter the starting address here. If you're typing in a long listing in several sessions, you should enter the address where you left off typing at the end of the previous session. In any case, make sure the address you enter corresponds to the address of a line in the MLX listing. Otherwise, you'll be unable to enter the data correctly.

After you enter the address, you'll see that address appear as a prompt with a nonblinking cursor. Now you're ready to enter data. To help prevent typing mistakes, only a few keys are active, so you may have to unlearn some habits. MLX listings consist of nine columns of two-digit numbers—eight bytes of data and a checksum. You *do not* type spaces between the columns; the new MLX automatically inserts these for you. Nor do you press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit. The only keys needed for data entry are 0–9 and A–F. Pressing most of the other keys produces a warning buzz.

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 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, 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.

Beep Or Buzz?

After you type the last digit in a line, MLX calculates a checksum from the line number and the first eight columns of data, then compares it with the value in the ninth column. The formula (found in lines 370–390 of the MLX program) catches almost every conceivable typing error, including the transposition of numbers. If the values match, you'll hear a pleasant beep, the data is added to the workspace area, and the prompt for the next line of data appears (unless the line just entered was the last line of the listing—in which case you'll automatically advance to the Save option). But if MLX detects a typing error, you'll hear a low buzz and see an error message. Then MLX redisplays the line for editing.

To edit a line, move the cursor left and right using the cursor keys. (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. To make corrections in a mistyped line, 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. 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.

Other MLX Functions

The Display data option lets you review your work. When you select D, you'll be asked for a starting address. (As with the other menu options, pressing RETURN at this point takes you back to the command menu.) Make sure the address corresponds to a line from the listing. You can pause the scrolling display by pressing the space bar. (MLX finishes printing the current line before halting.) To resume scrolling, press the space bar again. The display continues to scroll until the ending address is reached, then the menu reappears. To break out of the display and return to the menu before the ending address is reached, press RETURN. A quick way to check your typing is to compare the reverse video checksums on the screen with the data in the rightmost column of the printed listing. If the values match, you can be sure the line is entered correctly.

The Save and Load menu options are straightforward. First, MLX asks for a filename. (Again, pressing RETURN at this prompt without entering anything returns you to the command menu.) Next, MLX asks you to press either T or D for tape or disk. If you notice the disk drive starting and stopping several times during a load or save,

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don't panic; this behavior is normal because MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. For disk, the drive prefix 0: is automatically added to the filename (line 750), so this should *not* be included when entering the name. (This also precludes the use of @ for Save-with-Replace, so remember to give each version saved a different name.) MLX saves the entire workspace area from the starting to 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 any errors detected during the save or load. (Tape users should bear in mind that the Commodore 64 is never able to detect errors when saving 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 originally specified. If you get one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct ending address.

The Quit menu option has the obvious effect—it stops MLX and enters BASIC at a READY prompt. Since the RUN/STOP key is disabled, Q 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 the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk or LOAD *"filename"* for tape, and then RUN. (Such programs usually have 0801 as their MLX starting address.) Others must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. (On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000.) In any case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

By the time you finish typing in the data for a long ML program, you'll have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type in MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. (Incidentally, MLX is included every month on the GAZETTE DISK.) 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 MLX cost you several nights of hard work.

MLX

For instructions on entering this listing, refer to "How To Type In COMPUTE!'s GAZETTE Programs" elsewhere in this issue.

```
EK 100 POKE 56,50:CLR:DIM IN$,
       I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
       4=254:Z5=255:Z6=256:Z7=
       127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
       :BS=PEEK(55)+Z6*PEEK(56
       ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
       :S$=" ":D$=CHR$(20):Z$=
       CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
       +23:POKE I,0:NEXT:POKE
       {SPACE}SD+24,15:POKE 78
       8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
       R$(8):POKE 53280,15:POK
       E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
       {2 SPACES}{8 @}
       {2 SPACES}"SPC(28)"
       {2 SPACES}{OFF}{BLU} ML
       X II {RED}{RVS}
       {2 SPACES}"SPC(28)"
       {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
       {3 SPACES}COMPUTE!'S MA
       CHINE LANGUAGE EDITOR
       {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
       RESS{4}";:GOSUB300:SA=A
       D:GOSUB1040:IF F THEN18
       0
GF 190 PRINT"{BLK}{2 SPACES}EN
       DING ADDRESS{4}";:GOSUB
       300:EA=AD:GOSUB1030:IF
       {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
       R WORKSPACE [Y/N]{4}";A
       $:IF LEFT$(A$,1)<>"Y"TH
       EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
       ING...";:FORI=BS TO BS+
       EA-SA+7:POKE I,0:NEXT:P
       RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
       {BLK}{RVS} MLX COMMAND
       {SPACE}MENU {DOWN}{4}":
       PRINT T$"{RVS}E{OFF}NTE
       R DATA"
ED 230 PRINT T$"{RVS}D{OFF}ISP
       LAY DATA":PRINT T$"
       {RVS}L{OFF}OAD DATA"
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
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
```


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```
      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$,I):GOSUB320:IF
       I<25 THEN GOSUB380:A(I
      /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
      B1060:PRINT"{BLK}{RVS}
      {SPACE}ERROR: REENTER L
      INE [43]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
      R I=0 TO 7:POKE B+I,A(I
      ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
      LOSE3:PRINT"{DOWN}{BLU}
      ** END OF ENTRY **{BLK}
      {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
      {SPACE}DISPLAY DATA ":G
      OSUB400:IF IN$=N$ THEN2
      20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
       {RVS}SPACE{OFF} TO PAU
      SE, {RVS}RETURN{OFF} TO
       BREAK[43]{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[43]";IN$:IF IN$=N$
      {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
      {RVS}T{OFF}APE OR {RVS}
      D{OFF}ISK: [43]";
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$(PEEK(BS+I));:IF ST T
      HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
      O940
GS 800 GOSUB1060:PRINT"{DOWN}
      {BLK}ERROR DURING SAVE:
      [43]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
      OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
      $)+256*ASC(B$+Z$):IF AD
      <>SA THEN F=1:GOTO850
KH 830 FOR I=0 TO B:GET#1,A$:P
      OKE BS+I,ASC(A$+Z$):IF
      {SPACE}ST AND(I<>B)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
AX 950 POKE147,0:SYS 63562:IF
      {SPACE}ST<>64 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
       LOAD COMPLETED **":GOT
      O220
DP 970 GOSUB1060:PRINT"{BLK}
      {RVS}ERROR DURING LOAD:
      {DOWN}[43]":ON F GOSUB98
      0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
      G ADDRESS (";:GOSUB360:
      PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
      AD=SA+AD:GOSUB360:PRINT
      D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
      ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
      *256):POKE193,AL:POKE1
      94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
      *256):POKE174,AL:POKE1
      75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
      1050
HA 1040 IF(AD>511 AND AD<40960
      )OR(AD>49151 AND AD<53
      248)THEN GOSUB1080:F=0
      :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
      {SPACE}INVALID ADDRESS
       {DOWN}{BLK}":F=1:RETU
      RN
AR 1060 POKE SD+5,31:POKE SD+6
      ,208:POKE SD,240:POKE
      {SPACE}SD+1,4:POKE SD+
      4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
      TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
      240:POKE SD,0:POKE SD+
      1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
      KE SD+4,0:POKE SD,0:PO
      KE SD+1,0:RETURN
```


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COMPUTE!'s GAZETTE Author Guide

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, 16, and VIC-20. 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 Feature's Editor for details.

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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
```

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How To Type In COMPUTE!'s GAZETTE Programs

Each month, COMPUTE!'s GAZETTE publishes programs for the Commodore 128, 64, Plus/4, 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	

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All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Shifter

Article on page 40.

BEFORE TYPING . . .

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

Program 1: Shifter

```
AD 10 POKE56,60:POKE55,0:CLR:K
      M=15360:RO=1:PRINTCHR$(8
      ):DIMZ$(23)
AF 20 H=54272:FORI=HTOH+24:POK
      EI,0:NEXT:FORI=0TO15:POK
      EH+24,I:NEXT:POKEH+5,200
CS 30 POKEH+6,200:POKEH+4,17
JB 40 BC=53280:BK=53281:POKEBC
      ,6:POKEBK,6:PRINT"{CLR}
      {6 DOWN}{CYN}"SPC(6);
XB 50 PRINT"[D]{RVS}[D][F]
      {OFF}[F]{5 SPACES}{RVS}
      [F][D]{OFF}{5 SPACES}[C]
      {RVS}[F][D]{OFF}[V]
      {4 SPACES}{RVS}[K][D][F]
      {OFF}[F]"SPC(12)"[C]
      {RVS}[C]{OFF}[I]
      {6 SPACES}{RVS}[K]{OFF}
      [K]";
FJ 60 PRINTSPC(6)"{RVS}[K]
      {OFF}[K]{5 SPACES}{RVS}
      [K][C][V]{OFF}[V]"SPC(12
      )"[D][F]{RVS}[K]{OFF}[K]
      {5 SPACES}{RVS}[K]{OFF}
      [K]{6 SPACES}{RVS}[K]
      {OFF}[K]{5 SPACES}{RVS}
      [K][D][C]{OFF}";
CM 70 PRINTSPC(14)"{RVS}[2 I]
      {OFF}{6 SPACES}{RVS}
      [2 I]{OFF}{6 SPACES}[C]
      [V]{5 SPACES}[C][V][C]
      [V]{3 UP}"SPC(16);
MJ 80 PRINT"{RVS}[K]{OFF}[K]
      {RVS}[K]{OFF}[K]"SPC(4)"
      {RVS}[K][D][I]{OFF}[V]"S
      PC(4)"{RVS}[K][D][I]
      {OFF}[V]"SPC(20)"{RVS}
      [K][C][V]{OFF}[K]"SPC(4)
      "{RVS}[K][C]{OFF}[F]";
KQ 90 PRINTSPC(5)"{RVS}[K][C]
      {OFF}[F]"SPC(21)"{RVS}
      [K]{OFF}[K]{RVS}[K]{OFF}
      [K]"SPC(4)"{RVS}[K]{OFF}
      [K]"SPC(6)"{RVS}[K]{OFF}
      [K]"SPC(22)"[C][V][C][V]
      ";
XC 100 PRINTSPC(4)"[C][V]"SPC(
       6)"[C]{RVS}[2 I]{OFF}
       [V]{7 DOWN}":PRINTSPC(1
       4)"{WHT}ENTER LEVEL"
KX 110 PRINTSPC(16)"{DOWN}1
       {2 SPACES}2{2 SPACES}3
       {2 DOWN}{9 LEFT}FAST
       {3 SPACES}SLOW"
DE 120 KT$="":GETKT$:IFKT$<"1"
       ORKT$>"3"THEN120
HE 130 KT=VAL(KT$)+2:POKE850,K
       T
MA 140 PRINTSPC(12)"{5 UP}DESI
       GNING BOARD":PRINT"
       {DOWN}"SPC(14)"PLEASE W
       AIT{DOWN}"
KQ 150 PRINTSPC(14)"
       {11 SPACES}":A$(1)="*":
       A$(2)="B":A$(3)="N":A$(
       4)="M":A$(5)=" "
EA 160 B$="{RVS}{25 SPACES}":C
       $="{RVS} {OFF}":E$="
       {RVS}{CYN}{7 SPACES}":D
       $=E$+" ":GOSUB570
FM 170 FORI=1TO23:MT$=MT$+"
       {DOWN}{LEFT}"+C$:NEXT:M
       T$=MT$+"{HOME}"
FX 180 GOSUB420:PRINT"{CLR}";:
       POKEBC,3:POKEBK,0
AJ 190 PRINTD$"{BLU}"B$"{RVS}
       {CYN}{6 SPACES}":POKE10
       63,160:POKE55335,3
EM 200 FORI=1TO23:PRINTD$"
       {BLU}"C$"[8]"Z$(I)"
       {BLU}"C$E$;:NEXT:PRINTD
       $"{BLU}"B$"{RVS}{CYN}
       {6 SPACES}{HOME}"
QK 210 POKE2023,160:POKE56295,
       3:POKEBK,0
AS 220 PRINT"{HOME}{3 DOWN}
       {RVS}{CYN} {YEL}SCORE
       {2 DOWN}{4 LEFT}{CYN}"S
       1:PRINT"{4 DOWN}{RVS} R
       OUND{2 DOWN}{4 LEFT}"RO
SF 230 PRINT"{4 DOWN}{RVS}
       {CYN} [3]SCORE{2 DOWN}
       {4 LEFT}{CYN}"S2
QH 240 PRINT"{HOME}{6 DOWN}
       {RVS}"SPC(36)"S{2 DOWN}
       H{2 DOWN}{2 LEFT}I
       {2 DOWN}{2 LEFT}F
       {2 DOWN}T{2 DOWN}E
       {2 DOWN}{2 LEFT}R"
RX 250 IFCK=1THENCK=0:S1=0:S2=
       0:RO=1:KC=0:GOTO310
ED 260 POKE831,RND(0)*4:IFKCTH
       EN280
MA 270 GOSUB520
AJ 280 SYS15360:KC=1:SP=PEEK(1
       95)+256*PEEK(196):GOSUB
       430:POKESP,160
RD 290 RO=RO+1:IFS1=5ORS2=5THE
       NCK=1:RO=RO-1
HE 300 GOTO220
XH 310 PRINT"{HOME}{9 DOWN}
       {GRN}"SPC(16)"GAME OVER
       ":PRINT"{3 DOWN}"SPC(12
       )"PRESS FIREBUTTON"
XD 320 IF(PEEK(56320)ANDPEEK(5
       6321))AND16THEN320
SE 330 PRINT"{HOME}":FORI=1TO2
       3:PRINTD$"{BLU}"C$"[8]"
       Z$(I)"{BLU}"C$E$;:NEXT
GB 340 PRINTD$"{BLU}"B$"{RVS}
       {CYN}{6 SPACES}{HOME}
       {10 DOWN}":POKEBK,15
KE 350 PRINTSPC(15)"{BLK}ENTER
        LEVEL":PRINTSPC(18)"(1
       -3)"
PM 360 KT$="":GETKT$:IFKT$<"1"
       ORKT$>"3"THEN360
ME 370 KT=VAL(KT$)+2:POKE850,K
       T
DS 380 PRINT"{4 UP}"SPC(13)"
       {BLK}DESIGNING BOARD":P
       RINTSPC(18)"{5 SPACES}"
CK 390 FORI=1TO23:Z$(I)="":NEX
       T:GOSUB420:PRINT"{HOME}
       ";:GOTO190
CM 400 X=INT(28*RND(1))+1:IFX>
       4THENX=5
EX 410 RETURN
PS 420 FORZ=1TO23:FORI=1TO23:G
       OSUB400:Z$(Z)=Z$(Z)+A$(
       X):NEXTI,Z:RETURN
HX 430 IFSP<1063ORSP>1984THEN4
       70
KJ 440 S1=S1+1:TE=7:GOSUB540:F
       ORQ=1TO8:POKE646,TE:PRI
       NT"{HOME}"SPC(9)MT$"
       {HOME}"SPC(33)MT$
XG 450 IFTE=7THENTE=6:FORE=1TO
       130:NEXTE,Q:RETURN
AK 460 TE=7:NEXTQ:RETURN
QX 470 S2=S2+1:TE=2:GOSUB540:F
       ORQ=1TO8:POKE646,TEMP
PK 480 PRINT"{HOME}"SPC(8)B$:P
       RINT"{HOME}{24 DOWN}"SP
       C(8)B$"{HOME}"
EC 490 FORE=1TO75:NEXTE
GD 500 IFTE=2THENTE=6:NEXTQ:RE
       TURN
MJ 510 TE=2:NEXTQ:RETURN
HD 520 FORI=10TO255STEP20:FORL
       =255TO10STEP-50:POKEH+1
       ,I:POKEH,L:NEXT:NEXT
MC 530 POKEH,0:POKEH+1,0:RETUR
       N
SP 540 FORI=255TO120STEP-30:FO
       RL=10TO255STEP10:POKEH+
       1,L:POKEH,I:NEXT:NEXT
XH 550 GOTO530
QX 560 POKE646,6:RETURN
PQ 570 READA:IFA=256THENRETURN
KE 580 POKEKM,A:KM=KM+1:GOTO57
       0
QG 590 DATA 32,42,60,32,123,60
SK 600 DATA 32,175,60,32,54,61
FC 610 DATA 165,108,32,23,62,1
       65
BR 620 DATA 109,32,75,62,206,6
       5
MD 630 DATA 3,208,9,173,66,3
FF 640 DATA 141,65,3,32,155,62
KJ 650 DATA 32,12,62,76,6,60
RJ 660 DATA 173,27,3,201,243,2
       40
RC 670 DATA 23,169,49,133,100,
       169
SJ 680 DATA 12,133,101,169,0,1
       33
MB 690 DATA 98,169,252,133,99,
       169
FB 700 DATA 1,141,69,3,208,21
AM 710 DATA 169,49,133,100,169
       ,4
FF 720 DATA 133,101,169,0,133,
       98
QR 730 DATA 169,212,133,99,169
       ,0
EH 740 DATA 141,69,3,173,69,3
MD 750 DATA 10,10,24,105,3,170
FP 760 DATA 160,3,189,115,60,1
       53
XX 770 DATA 106,0,202,136,16,2
       46
CM 780 DATA 96,15,5,7,2,81
MH 790 DATA 101,103,66,165,100
       ,133
CK 800 DATA 3,133,5,24,105,195
RP 810 DATA 133,195,165,101,13
       3,4
DK 820 DATA 133,6,105,1,133,19
       6
CF 830 DATA 169,0,141,60,3,141
DE 840 DATA 61,3,169,32,141,64
BB 850 DATA 3,173,82,3,141,65
BC 860 DATA 3,141,66,3,169,11
HH 870 DATA 141,67,3,141,68,3
AM 880 DATA 96,162,0,32,244,61
RD 890 DATA 74,176,29,173,60,3
XM 900 DATA 240,121,206,60,3,1
       65
RK 910 DATA 106,32,23,62,165,3
AE 920 DATA 56,233,40,133,3,16
       5
RM 930 DATA 4,233,0,133,4,76
```

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```
MK 940 DATA 53,61,74,176,31,17
       3
QF 950 DATA 60,3,201,22,240,87
RK 960 DATA 165,106,32,23,62,2
       38
MC 970 DATA 60,3,165,3,24,105
DP 980 DATA 40,133,3,165,4,105
PC 990 DATA 0,133,4,76,53,61
EE 1000 DATA 174,60,3,236,67,3
RE 1010 DATA 240,55,74,176,27,
        160
PC 1020 DATA 0,177,3,72,136,20
        0
JP 1030 DATA 200,192,23,240,8,
        177
PQ 1040 DATA 3,136,145,3,76,7
CQ 1050 DATA 61,104,136,145,3,
        76
XD 1060 DATA 53,61,74,176,22,1
        60
DE 1070 DATA 22,177,3,72,200,1
        36
PH 1080 DATA 136,48,8,177,3,20
        0
BA 1090 DATA 145,3,76,37,61,10
        4
GK 1100 DATA 200,145,3,96,162,
        1
PD 1110 DATA 32,244,61,74,176,
        55
DS 1120 DATA 174,61,3,236,68,3
PG 1130 DATA 240,44,160,0,177,
        5
PD 1140 DATA 72,165,5,133,252,
        165
MC 1150 DATA 6,133,253,162,21,
        160
FK 1160 DATA 40,177,252,160,0,
        145
SG 1170 DATA 252,165,252,24,10
        5,40
SH 1180 DATA 133,252,165,253,1
        05,0
QS 1190 DATA 133,253,202,16,23
        2,104
QC 1200 DATA 160,0,145,252,76,
        243
KC 1210 DATA 61,74,176,60,174,
        61
KQ 1220 DATA 3,236,68,3,240,11
        5
EX 1230 DATA 165,5,24,105,72,1
        33
DQ 1240 DATA 252,165,6,105,3,1
        33
BC 1250 DATA 253,160,40,177,25
        2,72
KB 1260 DATA 162,21,160,0,177,
        252
GE 1270 DATA 160,40,145,252,16
        5,252
QA 1280 DATA 56,233,40,133,252
        ,165
XA 1290 DATA 253,233,0,133,253
        ,202
RR 1300 DATA 16,232,104,160,40
        ,145
EJ 1310 DATA 252,76,243,61,74,
        176
AF 1320 DATA 29,173,61,3,240,5
        5
FP 1330 DATA 206,61,3,165,106,
        32
MJ 1340 DATA 75,62,165,5,56,23
        3
BF 1350 DATA 1,133,5,165,6,233
XB 1360 DATA 0,133,6,76,243,61
PJ 1370 DATA 74,176,28,173,61,
        3
QD 1380 DATA 201,22,240,21,238
        ,61
FS 1390 DATA 3,165,106,32,75,6
        2
BR 1400 DATA 165,5,24,105,1,13
        3
QX 1410 DATA 5,165,6,105,0,133
CC 1420 DATA 6,96,173,69,3,208
DJ 1430 DATA 4,189,0,220,96,18
        9
BP 1440 DATA 10,62,141,8,255,2
        34
RS 1450 DATA 234,234,173,8,255
        ,96
FB 1460 DATA 250,253,162,50,16
        0,0
PB 1470 DATA 136,208,253,202,2
        08,250
CX 1480 DATA 96,141,62,3,165,3
RA 1490 DATA 133,247,24,101,98
        ,133
JS 1500 DATA 252,165,4,133,248
        ,101
PG 1510 DATA 99,133,253,160,22
        ,173
SR 1520 DATA 62,3,145,252,177,
        247
RB 1530 DATA 201,81,240,13,174
        ,62
EK 1540 DATA 3,228,106,240,4,9
PX 1550 DATA 128,208,2,41,127,
        145
HH 1560 DATA 247,136,16,227,96
        ,141
CC 1570 DATA 62,3,165,5,24,101
AX 1580 DATA 98,133,252,165,6,
        101
HK 1590 DATA 99,133,253,162,22
        ,173
HS 1600 DATA 62,3,160,0,145,25
        2
QM 1610 DATA 165,252,56,229,98
        ,133
RK 1620 DATA 247,165,253,229,9
        9,133
DR 1630 DATA 248,160,0,177,247
        ,201
SM 1640 DATA 81,240,13,172,62,
        3
AF 1650 DATA 196,106,240,4,9,1
        28
CQ 1660 DATA 208,2,41,127,160,
        0
KQ 1670 DATA 145,247,165,252,2
        4,105
QB 1680 DATA 40,133,252,165,25
        3,105
EA 1690 DATA 0,133,253,202,16,
        195
CG 1700 DATA 96,173,64,3,160,0
QJ 1710 DATA 145,195,165,195,2
        4,101
GF 1720 DATA 98,133,252,165,19
        6,101
MA 1730 DATA 99,133,253,165,10
        6,145
GQ 1740 DATA 252,173,63,3,170,
        173
CR 1750 DATA 68,3,24,125,78,63
AA 1760 DATA 141,68,3,173,67,3
XX 1770 DATA 24,125,82,63,141,
        67
CA 1780 DATA 3,173,63,3,10,170
SG 1790 DATA 165,195,24,125,62
        ,63
GC 1800 DATA 133,195,165,196,1
        25,63
KQ 1810 DATA 63,133,196,177,19
        5,41
XS 1820 DATA 127,141,64,3,162,
        3
DC 1830 DATA 221,70,63,240,5,2
        02
FQ 1840 DATA 48,35,16,246,201,
        64
MH 1850 DATA 208,9,173,63,3,41
QP 1860 DATA 1,208,22,240,11,2
        01
PS 1870 DATA 66,208,7,173,63,3
DC 1880 DATA 41,1,240,9,173,63
FX 1890 DATA 3,93,74,63,141,63
MD 1900 DATA 3,169,81,145,195,
        165
QF 1910 DATA 195,24,101,98,133
        ,252
XA 1920 DATA 165,196,101,99,13
        3,253
QH 1930 DATA 177,252,41,15,201
        ,6
FS 1940 DATA 208,13,165,106,32
        ,23
GG 1950 DATA 62,165,106,32,75,
        62
MF 1960 DATA 104,104,96,165,10
        7,145
MB 1970 DATA 252,96,216,255,1,
        0
XQ 1980 DATA 40,0,255,255,64,6
        6
DB 1990 DATA 77,78,2,2,3,1
XE 2000 DATA 0,1,0,255,255,0
KD 2010 DATA 1,0,256
```

Program 2: Shifter—Replacement Lines For The Plus/4 And 16

```
MH 20 POKE2025,255
PB 40 COLOR0,7,1:COLOR4,7,1:PR
      INT"{CLR}{6 DOWN}{CYN}"S
      PC(6);
AJ 180 GOSUB420:PRINT"{CLR}";:
       COLOR4,4,6:COLOR 0,1
MP 190 PRINTD$;:GOSUB560:PRINT
       B$"{RVS}{CYN}{6 SPACES}
       ":POKE3111,160:POKE2087
       ,99
JR 200 FORI=1TO23:PRINTD$;:GOS
       UB560:PRINTC$;:COLOR1,2
       ,5:PRINTZ$(I);:GOSUB560
FS 202 PRINTC$E$;:NEXT:PRINTD$
       ;:GOSUB560:PRINTB$"
       {RVS}{CYN}{6 SPACES}
       {HOME}"
JJ 210 POKE4071,160:POKE3047,9
       9:COLOR0,1
DR 230 PRINT"{4 DOWN}{RVS}
       {CYN} ";:COLOR1,3,4:PRI
       NT"SCORE{2 DOWN}
       {4 LEFT}{CYN}"S2
MA 270 GOSUB520
HE 320 IFJOY(1)<128ANDJOY(2)<1
       28THEN320
GM 330 PRINT"{HOME}":FORI=1TO2
       3:PRINTD$;:GOSUB560
SA 332 PRINTC$;:COLOR1,2,5:PRI
       NTZ$(I);:GOSUB560:PRINT
       C$E$;:NEXT
AM 340 PRINTD$;:GOSUB560:PRINT
       B$"{RVS}{CYN}{6 SPACES}
       {HOME}{10 DOWN}":COLOR0
       ,2,5
GM 380 PRINT"{2 UP}"SPC(13)"
       {BLK}DESIGNING BOARD":P
       RINTSPC(18)"{5 SPACES}"
SD 430 IFSP<3111ORSP>4032THEN4
       70
SP 440 S1=S1+1:TE=103:GOSUB530
       :FORQ=1TO8:POKE1339,TE:
       PRINT"{HOME}"SPC(9)MT$"
       {HOME}"SPC(33)MT$
HM 450 IFTE=103THENTE=6:FORE=1
       TO130:NEXTE,Q:RETURN
CR 460 TE=103:NEXTQ:RETURN
BH 470 S2=S2+1:TE=2:GOSUB530:F
       ORQ=1TO8:POKE1339,TEMP
QJ 520 SOUND 1,150,50:FORB=8TO
       0STEP-1:VOLB:FORTD=1TO7
```


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```
        5:NEXT:NEXT:RETURN
ES 530 VOL8:FORI=350TO550STEP2
       0:SOUND1,I,10:SOUND2,I-
       10,10:NEXT
AB 540 FORB=8TO1STEP-1:VOLB:FO
       RTD=1TO20:NEXT:NEXT:RET
       URN
AS 560 COLOR 1,7,1 :RETURN
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

ASCII Teleconverter

Article on page 78.

BEFORE TYPING . . .

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

```
QG 10 A1$="{RVS}ASCII CONVERTE
      R{OFF}":PRINTCHR$(142):T
      $="{CLR}{DOWN}{73}"+A1$+A
      2$+"{2 DOWN}":S$=","
KR 20 PRINTT$:PRINT"THIS PROGR
      AM CONVERTS A CBM 'ASC'
      {SPACE}FILE"
HC 30 PRINT"INTO A STANDARD 'A
      SC' FILE AND -- VICE":PR
      INT"VERSA."
KC 40 PRINT"{2 DOWN}BE SURE YO
      U HAVE ROOM ON YOUR ORIG
      INAL"
HX 50 PRINT"DISK FOR THE CONVE
      RTED FILE.{DOWN}":PRINT:
      GOSUB390:PRINTT$
FA 60 PRINT"WHAT FORMAT DO YOU
      "
RQ 70 PRINT"WANT YOUR CONVERTE
      D"
AS 80 PRINT"SEQUENTIAL FILE TO
       BE?{DOWN}"
FD 90 PRINT"{RVS}S{OFF}TANDARD
       OR {RVS}C{OFF}OMMODORE
      {SPACE}ASCII?"
QH 100 GETFT$:IFFT$<>"S"ANDFT$
      <>"C"THEN100
AP 110 IFFT$="C"THENX1=96:X2=1
      23:X3=-32:X4=64:X5=91:X
      6=128
FD 120 IFFT$="S"THENX1=64:X2=9
      1:X3=32:X4=192:X5=219:X
      6=-128
SB 130 PRINTT$:PRINT"{2 DOWN}W
      HAT IS THE NAME OF"
HR 140 PRINT"THE FILE THAT YOU
      "
FB 150 PRINT"WISH TO CONVERT"
MR 160 INPUTNF$:IFNF$=""THENPR
      INT"{UP}";:GOTO160
CA 170 PRINTT$:PRINT"INSERT DI
      SK WITH"
HF 180 PRINT"ORIGINAL FILE· IN
      {SPACE}DRIVE":GOSUB390
FS 190 PRINTT$:PRINT"CONVERTIN
      G
PM 200 PRINT"'"NF$;"' TO '"NF$
      "."FT$"'"
KD 210 OPEN15,8,15,"I0":OPEN8,
       8,8,"0:"+NF$+",S,R":GOS
       UB360
PH 220 OPEN9,8,9,"0:"+LEFT$(NF
       $,14)+"."+FT$+",S,W":GO
       SUB360
DP 230 GET#8,A$:A$=A$+CHR$(0):
       QP=ST:IFQP=64THEN290
MK 240 IFASC(A$)>X1ANDASC(A$)<
       X2THENB$=CHR$(ASC(A$)+X
       3):GOTO270
JX 250 IFASC(A$)>X4ANDASC(A$)<
       X5THENB$=CHR$(ASC(A$)+X
       6):GOTO270
PE 260 B$=A$
GB 270 PRINT#9,B$;
SK 280 PRINT"*";:GOTO230
KC 290 CLOSE8:CLOSE9:CLOSE15:P
       RINTT$:PRINT"CONVERSION
        COMPLETED!"
XB 300 PRINT"{2 DOWN}DO YOU HA
       VE ANOTHER
FF 310 PRINT"FILE TO CONVERT?"
PR 320 GETA$:IFA$=""THEN320
RK 330 IFA$="Y"THENRUN
HP 340 END
SX 350 REM ERROR CHECKING SUBR
       OUTINE
QM 360 INPUT#15,E$,F$,G$,H$
XK 370 IFVAL(E$)THENPRINTT$"
       {HOME}{6 DOWN}{RVS}
       {BLK}ERROR!{DOWN}":PRIN
       TE$;S$;F$:STOP
HS 380 RETURN
JX 390 PRINT"{DOWN}PRESS 'R' W
       HEN READY."
SJ 400 GETA$:IFA$<>"R"THEN400
EX 410 RETURN
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

VIC Dump

Article on page 80.

```
HF 10 F=0:C=PEEK(55)-251:IFC<0
      THENC=C+256:F=-1
PF 20 D=PEEK(56)+F:POKE55,C:PO
      KE56,D:CLR:PRINT"{CLR}
      {DOWN} LOADING DATA"
EC 30 N=PEEK(55)+256*PEEK(56)
QS 40 F=0:FORD=0TO250:READA$:I
      FASC(A$)<58THENA=VAL(A$)
      :CS=CS+A:GOTO80
DP 50 IFASC(A$)<>76THEN70
PD 60 A=VAL(RIGHT$(A$,LEN(A$)-
      1)):CS=CS+A+1:A=A+PEEK(5
      5):IFA>255THENA=A-256:F=
      1
BC 70 IFASC(A$)=72THENA=PEEK(5
      6)+F:F=0:CS=CS+2
HK 80 POKEN+D,A:PRINT"{HOME}
      {3 DOWN}"D:NEXT
MA 90 IFCS<>26550THENPRINT"
      {DOWN} ERROR IN DATA","
      {SPACE}STATEMENTS
FQ 100 PRINT"{DOWN} SYS"N
QB 110 DATA 173,2,144,41,127,1
       33,91,169,4,32,177,255,
       169,0,133,90
BJ 120 DATA 133,92,133,93,32,1
       47,255,169,8,133,89,32,
       168,255,173,3
KD 130 DATA 144,106,144,2,6,89
       ,41,63,72,169,10,32,168
       ,255,165,91
GR 140 DATA 72,32,L139,H0,160,
       7,162,6,62,218,2,106,20
       2,16,249,56
AP 150 DATA 106,32,168,255,136
       ,16,239,230,92,208,2,23
       0,93,104,56,233
HC 160 DATA 1,208,221,165,90,1
       05,6,133,90,56,229,89,1
       76,13,165,92
HP 170 DATA 56,229,91,133,92,1
       76,194,198,93,144,190,1
       33,90,104,233,1
JB 180 DATA 208,182,169,15,32,
       168,255,169,10,32,168,2
       55,76,174,255,44
FE 190 DATA L49,H0,208,2,9,128
       ,41,159,133,88,96,162,6
       ,165,90,72
SC 200 DATA 169,0,24,101,92,13
       3,87,8,173,5,144,106,10
       6,41,60,44
XQ 210 DATA 2,144,16,2,9,2,40,
       101,93,72,41,3,9,148,13
       3,88
GF 220 DATA 160,0,177,87,41,7,
       141,218,2,104,32,L127,H
       0,177,87,133
JQ 230 DATA 87,132,88,165,89,1
       06,38,87,38,88,106,144,
       249,173,5,144
KR 240 DATA 41,15,10,10,101,88
       ,32,L127,H0,104,168,173
       ,15,144,74,74
CB 250 DATA74,74,77,218,2,240,
       2,177,87,157,218,2,202,
       48,155,200
PK 260 DATA 196,89,144,231,169
       ,0,72,165,91,176,151
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Cataloger

Article on page 79.

```
MS 10 DIMB$(800):IFPEEK(794)<>
      74THEN30
FR 20 POKE53281,15:POKE53280,1
      5:KB=198:RO=214:GOTO60
EJ 30 IFPEEK(794)<>189THEN50
KH 40 COLOR 0,16:COLOR 4,16:KB
      =208:RO=235:PRINTCHR$(27
      )"M":GOTO60
BA 50 RO=205:KB=239:POKE65301,
      241:POKE65305,241:POKE20
      25,255
RE 60 S$="{20 SPACES}":C=0:OPE
      N15,8,15:D$="{9 DOWN}"
GJ 70 PRINT"{CLR}{RVS}{RED}
      {6 SPACES}CHOOSE ONE OF
      {SPACE}THE FOLLOWING
      {7 SPACES}{BLU}{OFF}"
AG 80 PRINTSPC(5)"{2 DOWN}1. C
      ATALOG A SET OF DISKS"
BK 90 PRINTSPC(5)"{DOWN}2. SEE
       ALL FILE NAMES"
JJ 100 PRINTSPC(5)"{DOWN}3. PR
       INT ALL FILE NAMES"
SP 110 PRINTSPC(5)"{DOWN}4. SO
       RT NAMES ALPHABETICALLY
       "
KD 120 PRINTSPC(5)"{DOWN}5. CR
       EATE A SEQUENTIAL FILE"
AR 130 PRINTSPC(5)"{DOWN}6. CR
       EATE A PROGRAM FILE"
SX 140 PRINTSPC(5)"{DOWN}7. LO
       AD AN OLD FILE"
```

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```
SM 150 PRINTSPC(5)"{DOWN}8. DE
       LETE A DISK"
QH 160 PRINTSPC(5)"{DOWN}9. ST
       ART NEW FILE"
MP 170 PRINTSPC(12)"{RED}
       {DOWN}{RVS} PRESS Q TO
       {SPACE}QUIT{BLU}{OFF}"
DD 180 POKEKB,0:WAITKB,1:GETA$
       :IFA$="Q"THENCLOSE15:PR
       INT"{CLR}":END
SP 190 IFA$<"1"ORA$>"9"THEN180
FS 200 ONVAL(A$)GOSUB210,510,5
       20,640,730,740,850,940,
       1040:GOTO70
JK 210 F$="DISK":GOSUB1050:IFD
       N$="Q"THENRETURN
QR 220 PRINT"{CLR}{RVS}{RED}"S
       PC(20-LEN(DN$)/2)DN$"
       {2 DOWN}{BLU}"
CP 230 CLOSE2:OPEN2,8,0,"$":GO
       SUB390:IFA$="Q"THENRETU
       RN
KG 240 X=4:NF=0:IFEXTHEN220
QK 250 B$(C)="":FL=-1:GOSUB310
       :X=2:GET#2,LN$
BJ 260 GET#2,HN$:NM=ASC(LN$+CH
       R$(0))+256*ASC(HN$+CHR$
       (0)):PRINTSPC(5)NM;
PF 270 GET#2,A$:IFA$=""THEN320
XD 280 IFA$=CHR$(34)THENFL=-FL
JJ 290 IFFL=1THENB$(C)=B$(C)+A
       $
RC 300 PRINTA$;:GOTO270
ER 310 FORA=1TOX:GET#2,A$:NEXT
       :RETURN
EQ 320 IFB$(C)=""THENCLOSE2:GO
       SUB480:IFA$<>"Q"THEN210
AC 330 IFB$(C)=""THENRETURN
XQ 340 PRINT:NM$=STR$(NM)
FA 350 B$(C)=RIGHT$(B$(C),LEN(
       B$(C))-1)
SC 360 B$(C)=B$(C)+LEFT$(S$,19
       -LEN(B$(C))-LEN(NM$))+N
       M$+"{2 SPACES}"+DN$
FE 370 IFNF=1THENC=C+1:IFC=800
       THEN1080
BS 380 NF=1:GOTO250
DQ 390 RF=0:EX=0:A$="":INPUT#1
       5,EN,M$,T,S
RC 400 IFEN<20THENRETURN
KQ 410 PRINT"{HOME}"D$:FORA=1T
       O5:PRINT"{35 SPACES}":N
       EXT
HB 420 EX=1:PRINT:PRINT"{HOME}
       {BLU}"D$EN;M$;T;S:IFEN<
       >63THEN470
RD 430 RF=1:PRINT"{DOWN} DO YO
       U WANT TO REPLACE THE F
       ILE? (Y/N)"
AB 440 GETA$:IFA$="N"THENRETUR
       N
CM 450 IFA$<>"Y"THEN440
JA 460 EX=0:PRINT#15,"S"+DN$:R
       ETURN
EK 470 CLOSE2
RS 480 PRINT:PRINT"{DOWN}{BLU}
       {2 SPACES}PRESS ANY KEY
        TO CONTINUE {RVS}Q TO
       {SPACE}QUIT{OFF}":POKEK
       B,0:WAITKB,1
PR 490 GETA$:RETURN
GP 500 PRINT:PRINT"{DOWN}{BLU}
       {6 SPACES}PRESS ANY KEY
        TO CONTINUE":POKEKB,0:
       WAITKB,1:RETURN
BG 510 DV=3:SA=0:SP=1:DN$="":N
       M=0:GOTO550
ER 520 PRINT"{CLR}"D$"PRESS [M
       ] TO RETURN TO THE MENU
        ANY{5 SPACES}OTHER KEY
        TO PRINT"
BF 530 POKEKB,0:WAITKB,1:GETA$
       :IFA$="M"THEN70
JP 540 DV=4:SP=20:SA=0:DN$="":
       NM=0
MB 550 IFC<=0THENPRINT"{CLR}"D
       $SPC(10)"{BLU}NO FILES
       {SPACE}IN MEMORY":GOTO5
       00
AX 560 IFNMTHENGOSUB1050:DN$="
       0:"+DN$+",S,W"
QR 570 CLOSE2:OPEN2,DV,SA,DN$:
       GOSUB390:IFA$="Q"THENRE
       TURN
MJ 580 IFRFANDEX=0THEN570
HX 590 IFRFTHEN560
QD 600 IFEXTHEN570
SP 610 PRINT"{CLR}{DOWN}":FORA
       =0TOC:PRINT#2,SPC(SP)B$
       (A)
FJ 620 IFPEEK(RO)=21THENGOSUB5
       00:PRINT"{CLR}{3 DOWN}"
SS 630 NEXT:CLOSE2:GOSUB500:RE
       TURN
GX 640 IFC<=0THENPRINT"{CLR}"D
       $SPC(10)"{BLU}NO FILES
       {SPACE}IN MEMORY":GOTO5
       00
MG 650 D=C-1:M=D:PRINT"{CLR}"D
       $SPC(15)"SORTING...."
AB 660 M=INT(M/2):IFM=0THENRET
       URN
EJ 670 J=0:K=D-M
JS 680 I=J
RK 690 L=I+M
MR 700 IFB$(I)>B$(L)THENT$=B$(
       I):B$(I)=B$(L):B$(L)=T$
       :I=I-M:IFI>0THEN690
CQ 710 J=J+1:IFJ>KTHEN660
PF 720 GOTO680
PS 730 DV=8:SP=5:SA=2:F$="FILE
       ":NM=1:DN$=DN$+",S,W":G
       OTO550
SX 740 GOSUB1050:DN$="0:"+DN$:
       IFDN$="0:Q"THENRETURN
BS 750 CLOSE2:OPEN2,8,2,DN$+",
       P,W":GOSUB390:IFA$="Q"T
       HENRETURN
KF 760 IFRFANDEX=0THEN750
GJ 770 IFRFTHEN740
KX 780 IFEXTHEN750
MK 790 PRINT#2,CHR$(1)CHR$(8);
       :FORA=0TOC-1
FG 800 PRINT#2,CHR$(4)CHR$(4);
       :LN=100+A
BE 810 HB=INT(LN/256):LB=LN-HB
       *256:PRINT#2,CHR$(LB)CH
       R$(HB);
AJ 820 PRINT#2,CHR$(34)B$(A)CH
       R$(34)CHR$(0);
QG 830 NEXTA:PRINT#2,CHR$(0)CH
       R$(0);
RJ 840 CLOSE2:RETURN
QH 850 F$="FILE":GOSUB1050:IFD
       N$="Q"THENRETURN
EC 860 OPEN2,8,2,"0:"+DN$+",S,
       R":GOSUB390:IFEXTHEN850
XE 870 FL=-1:B$(C)="":FORA=1TO
       5:GET#2,A$:NEXT
SP 880 GET#2,A$:IFA$=CHR$(13)T
       HEN910
BG 890 B$(C)=B$(C)+A$
QB 900 GOTO880
GP 910 IFSTTHENCLOSE2:RETURN
RK 920 C=C+1:IFC=800THEN1080
KD 930 GOTO870
QM 940 F$="DISK":GOSUB1050:IFD
       N$="Q"THENRETURN
DP 950 PRINT"{CLR}"D$SPC(14)"D
       ELETING":EN=0
KD 960 FL=0:FORA=0TOC-1
XH 970 IFMID$(B$(A),22,16)=DN$
       ANDFL=0THENFL=1:SN=A
RE 980 IFMID$(B$(A),22,16)<>DN
       $ANDFL=1THENEN=A:A=C
BP 990 NEXT:IFFL=0THENPRINT"
       {DOWN}"SPC(12)"FILE NOT
        FOUND":GOTO1030
PE 1000 IFEN=0THENEN=C+1:GOTO1
       020
GS 1010 FORA=SNTOC-(EN-SN):B$(
       A)=B$(EN+A-SN):NEXT
QG 1020 C=C-(EN-SN):PRINT"
       {DOWN}"SPC(14)"DELETED
       "
MH 1030 GOSUB500:C=C-(C<0):RET
       URN
FF 1040 C=0:RETURN
BK 1050 PRINT"{CLR}{4 DOWN} PU
       T DISK IN DRIVE AND EN
       TER "F$" NAME"
XG 1060 PRINT" (UP TO 16 CHARA
       CTERS) {RVS}Q TO QUIT
       {OFF}"
RH 1070 POKE19,1:INPUT"{DOWN}
       {RED} ";DN$:POKE19,0:D
       N$=LEFT$(DN$,16):RETUR
       N
HG 1080 PRINT"{CLR}"D$"{RED}TH
       E MASTER DIRECTORY IS
       {SPACE}FULL.{2 SPACES}
       SAVE THE PRESENT FILE
       {SPACE}AND ";
QR 1090 PRINT"START A NEW DIRE
       CTORY.{BLU}":GOSUB500:
       RETURN
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Clavier 64

Article on page 84.

```
EF 10 PRINT"{CLR}{WHT}...PLEAS
      E WAIT":FORI=1TO61:READH
      ,L:POKE49664+I,H:POKE499
      20+I,L:NEXTI
JJ 20 CK=0:FORI=49152TO49252:R
      EADA:POKEI,A:CK=CK+A:NEX
      T
SH 30 IFCK<>11601THENPRINT"ERR
      OR IN DATA STATEMENTS.":
      STOP
XQ 40 PRINT"{3 DOWN}MACHINE CO
      DE LOADED"
PA 50 DATA 4,48, 4,113, 4,180,
       4,252, 5,72, 5,152, 5,2
      37, 6,71, 6,167, 7,12
HF 60 DATA 7,119, 7,233, 8,97,
       8,225, 9,104, 9,247, 10
      ,143, 11,48, 11,218, 12,
      143
HM 70 DATA 13,78, 14,24, 14,23
      9, 15,210, 16,195, 17,19
      4, 18,208, 19,239, 21,30
FC 80 DATA22,96, 23,180, 25,29
      , 26,156, 28,49, 29,222,
       31,164, 33,134, 35,133
DJ 90 DATA 37,161, 39,222, 42,
      61, 44,192, 47,105, 50,5
      9, 53,55, 56,97, 59,188
XA 100 DATA 63,73, 67,13, 71,9
      , 75,66, 79,188, 84,122
      , 89,127, 94,21, 100,11
      7
BR 110 DATA 106,111, 112,195,
      {SPACE}119,119, 126,146
      , 134,24
SD 115 REM ML CODE
SJ 120 DATA 162,0,189,0,193,32
      ,25,192,162
DR 130 DATA 7,189,0,193,32,25,
```


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```
      192,162,14,189
HF 140 DATA 0,193,32,25,192,96
      ,41,128,201
PR 150 DATA128,240,25,189,0,19
      3,41,63,168
MM 160 DATA 185,0,195,157,0,21
      2,185,0,194
AB 170 DATA 157,1,212,189,113,
      192,157,4,212
ME 180 DATA 96,189,112,192,157
      ,4,212,96,162
BS 190 DATA0,189,0,193,32,88,1
      92,162,7
ER 200 DATA 189,0,193,32,88,19
      2,162,14,189
XS 210 DATA 0,193,32,88,192,96
      ,41,64,201,64
FA 220 DATA 240,6,189,114,192,
      157,4,212,96
XP 230 S=54272:FORI=0TO24:POKE
      S+I,0:NEXT
KK 240 POKES+5,35:POKES+6,196:
      POKES+12,35:POKES+13,19
      6:POKES+19,35:POKES+20,
      196
MQ 250 POKES+3,8:POKES+2,0:POK
      ES+10,8:POKES+9,0:POKES
      +17,8:POKES+16,0
JH 260 POKES+24,15
HX 270 W1=64:W2=64:W3=64: POKE
      49264,W1+8:POKE49265,W1
      +1:POKE49266,W1
CR 280 POKE49271,W2+8:POKE4927
      2,W2+1:POKE49273,W2
HP 290 POKE49278,W3+8:POKE4927
      9,W3+1:POKE49280,W3
GQ 300 V=100
CM 310 READN1,N2,N3:POKE49408,
      N1:POKE49415,N2:POKE494
      22,N3:IFN1=0THEN340
HK 320 SYS49152
CM 330 FORT=0TOV:NEXT:SYS49215
      :FORT=0TO50:NEXT:GOTO31
      0
MP 340 POKES+4,W1:POKES+11,W2:
      POKES+18,W3:FORT=0TO50:
      NEXT:POKES+24,0:END
SS 350 DATA102,98,81
PS 360 DATA102,98,17
FF 370 DATA102,98,192
AD 380 DATA39,36,192
MH 390 DATA100,97,69
EM 400 DATA100,97,5
QG 410 DATA36,97,192
HS 420 DATA34,33,192
MR 430 DATA98,98,74
GR 440 DATA98,98,74
CQ 450 DATA98,98,74
SX 460 DATA98,98,74
MS 470 DATA98,98,74
GS 480 DATA98,98,74
FB 490 DATA98,98,74
GP 500 DATA34,34,10
KX 1000 DATA0,0,0
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

The Coordinator

Article on page 72.

Program 1: Loader

```
SS 1 DATA L,1,H,A7,2,L,36,85,1
      ,4C,25
PE 2 DATA 93,A0,T,T,L,37,85,1,
      4C,8B,63
GD 3 DATA E3,L,37,85,1,60,L,0,
      H,2E,29
CC 4 DATA A0,Z,5,L,1,H,2E,A0,L
      ,36,1E
XR 5 DATA 85,1,4C,G,A0,A2,37,8
      6,1,85,1D
MX 6 DATA 45,20,E7,B0,20,A2,BB
      ,A6,61,E0,B9
MM 7 DATA 8A,B0,D,20,9B,BC,A5,
      64,A4,65,2E
SP 8 DATA A6,66,E0,80,K,3,68,6
      8,60,A2,9C
DH 9 DATA 36,86,1,60,P,FC,3,C9
      ,40,Z,BE
BQ 10 DATA 72,L,20,H,FF,3,A,H,
      FC,3,W
AD 11 DATA A0,0,G,FE,3,G,34,A0
      ,L,1,3B
GM 12 DATA H,FD,3,99,44,A0,99,
      4C,A0,C8,4C
AR 13 DATA A,D0,F6,P,0,DD,29,3
      ,H,2A,29
RH 14 DATA A0,L,3,38,W,2A,A0,A
      ,H,2A,5B
HE 15 DATA A0,A,A,A,A,A,H,30,A
      0,P,26
EC 16 DATA 18,D0,48,29,Z,4A,4A
      ,H,35,A0,4E
BM 17 DATA 68,29,8,Z,3,X,2A,A0
      ,P,2A,19
PM 18 DATA A0,C9,6,Z,9,C9,5,Z,
      5,P,23
CB 19 DATA 2A,A0,D0,5,A2,1A,4C
      ,B7,2,A,A8
EQ 20 DATA A,A,A,A,H,2D,A0,L,0
      ,H,2D
GJ 21 DATA 2C,A0,20,B8,A2,L,0,
      85,46,L,9B
HF 22 DATA 59,20,D6,2,C9,0,Z,3
      ,4C,BE,34
RG 23 DATA 2,C0,C8,K,3,4C,BE,2
      ,H,57,45
BB 24 DATA A0,G,56,A0,L,58,20,
      D6,2,C9,13
RH 25 DATA 2,K,3,4C,BE,2,C9,1,
      Z,2,BB
XF 26 DATA D0,7,C0,40,K,3,4C,B
      E,2,H,1A
KM 27 DATA 55,A0,G,54,A0,P,56,
      A0,H,40,3D
JG 28 DATA A0,A0,3,4E,40,A0,88
      ,D0,FA,38,A
AE 29 DATA L,18,W,40,A0,H,40,A
      0,L,7,19
JX 30 DATA 2D,56,A0,H,41,A0,38
      ,L,7,W,P
PR 31 DATA 41,A0,H,41,A0,P,55,
      A0,O,54,37
GM 32 DATA A0,H,43,A0,G,42,A0,
      A0,3,18,A
JX 33 DATA 4E,43,A0,6E,42,A0,8
      8,D0,F7,L,75
FM 34 DATA 7,2D,54,A0,H,43,A0,
      38,L,7,3F
PK 35 DATA W,43,A0,H,43,A0,L,0
      ,H,29,21
JR 36 DATA A0,P,40,A0,A0,6,A,2
      E,29,A0,9D
ES 37 DATA 88,D0,F9,H,28,A0,18
      ,P,40,A0,9B
JC 38 DATA 6D,29,A0,H,29,A0,L,
      0,H,FF,98
KD 39 DATA 2,P,42,A0,A,A,A,K,3
      ,X,Q
EC 40 DATA 29,A0,18,6D,28,A0,H
      ,28,A0,K,10
BK 41 DATA 3,X,29,A0,18,P,41,A
      0,6D,28,3
CR 42 DATA A0,H,28,A0,H,36,A0,
      K,3,X,D6
QD 43 DATA 29,A0,P,29,A0,H,37,
      A0,18,P,52
EQ 44 DATA 2C,A0,6D,28,A0,H,28
      ,A0,P,2D,5
EF 45 DATA A0,6D,29,A0,H,29,A0
      ,P,28,A0,9F
GA 46 DATA H,44,A2,H,79,A2,P,2
      9,A0,H,41
SA 47 DATA 45,A2,H,7A,A2,A0,3,
      4E,37,A0,8A
KA 48 DATA 6E,36,A0,88,D0,F7,P
      ,36,A0,H,2C
SG 49 DATA 4C,A2,H,3E,A2,18,P,
      35,A0,6D,E
XC 50 DATA 37,A0,H,4D,A2,18,L,
      D8,6D,37,23
PM 51 DATA A0,H,3F,A2,20,83,A2
      ,P,23,D0,CF
PQ 52 DATA 29,F,Q,32,A0,Z,3,H,
      0,4,31
XF 53 DATA 20,60,A3,P,0,4,85,2
      ,P,5C,18
AK 54 DATA A0,H,0,4,20,6A,A3,O
      ,43,A0,84
EF 55 DATA B9,44,A0,48,25,2,Z,
      3,H,FF,A7
GC 56 DATA 2,68,Q,2E,A0,D0,A,Q
      ,FF,2,D8
BA 57 DATA D0,11,5,2,18,K,9,Q,
      FF,2,5E
DP 58 DATA Z,7,49,FF,25,2,H,0,
      4,L,J
FP 59 DATA 0,H,2E,A0,4C,BE,2,P
      ,16,D0,BC
JH 60 DATA 29,10,H,32,A0,P,86,
      2,A0,4,6C
JB 61 DATA A,88,D0,FC,H,5C,A0,
      P,32,A0,82
FR 62 DATA Z,F,P,22,D0,29,F,18
      ,6D,5C,5C
JE 63 DATA A0,H,5C,A0,18,K,C,P
      ,21,D0,69
SB 64 DATA 29,F,18,6D,5C,A0,H,
      5C,A0,60,11
HC 65 DATA 20,83,A2,P,30,A0,18
      ,6D,35,A0,82
BF 66 DATA H,35,A0,L,0,H,3C,A0
      ,P,A7,6D
FX 67 DATA 2,Z,8,L,0,H,A7,2,4C
      ,5F,3A
PP 68 DATA A3,P,2D,A0,H,38,A0,
      L,1F,H,84
JH 69 DATA 3A,A0,L,40,H,3B,A0,
      P,38,A0,94
AM 70 DATA H,FB,A2,L,0,H,FA,A2
      ,A8,Q,59
RX 71 DATA 3A,A0,P,3C,A0,99,0,
      4,C8,D0,16
AK 72 DATA FA,X,FB,A2,CA,D0,F4
      ,O,FB,A2,33
HF 73 DATA G,15,A3,O,FA,A2,G,1
      4,A3,A0,55
GS 74 DATA 0,99,0,4,C8,CC,3B,A
      0,D0,F7,B2
GM 75 DATA P,FB,A2,C9,DB,Z,3C,
      P,38,A0,75
SC 76 DATA CD,35,A0,Z,1C,P,5C,
      A0,H,3C,19
KB 77 DATA A0,P,35,A0,H,38,A0,
      L,3,H,6C
SB 78 DATA 3A,A0,L,R,H,3B,A0,2
      0,60,A3,87
BK 79 DATA 18,K,A0,20,6A,A3,P,
      32,A0,Z,5A
PH 80 DATA 10,P,23,D0,29,F,H,3
      C,A0,L,15
HD 81 DATA D8,H,38,A0,4C,E7,A2
      ,60,L,7F,1A
HE 82 DATA H,D,DC,L,34,85,1,60
      ,L,36,6D
FP 83 DATA 85,1,L,81,H,D,DC,60
      ,0,0,6
PC 84 A=681:H=707:U=10:S=1:R=8
      3:R=R-1
SJ 85 D=0:E$=CHR$(147):M$(1)="
```


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```
      LINE # ":M$(2)="DATA ":M
      $(3)=E$+"RECHECK ALL LIN
      ES "
RC 86 PRINTE$" PLEASE WAIT 2 M
      IN. 40 SEC."
BM 87 FORI=STOS+R:E=I:FORJ=1TO
      U:READN$
XC 88 IFJ=1THENM=PEEK(63)+PEEK
      (64)*256:IFM<>ITHENF=1:G
      OTO98
EE 89 GOSUB99
HG 90 ON-(F=2)GOTO98
DJ 91 POKEA,N:A=A+1-(A=764)*40
      335
EM 92 E=E-N-J+U-((N+J-U>E)*(2*
      (N+J-U-E))):D=D+N
FQ 93 NEXT:READN$:GOSUB99
MX 94 IFN<>ETHENF=2:GOTO98
GP 95 NEXT
HM 96 IFD<>94716THENF=3:GOTO98
MA 97 PRINT"OK! SYS"H:END
SJ 98 PRINTE$"LINE"M"HAS "M$(F
      )"ERROR":STOP
GJ 99 L=LEN(N$):C=ASC(N$):ON-(
      L<2ANDC>=71ANDC<=90)GOTO
      104
HG 100 N(1)=0:N(2)=N(1)
AR 101 IFL>2THENF=2:GOTO106
RX 102 FORK=1TOL:H$(K)=MID$(N$
      ,K,1):N(K)=ASC(H$(K)):N
      (K)=N(K)-55-(N(K)<65)*7
BP 103 NEXT:N=N(2)-16*(L=2)*N(
      1)-(L=1)*N(1):GOTO105
MF 104 N=C:N=N+69-(N>=76)*24-(
      N>=82)*57
RA 105 IFN<0ORN>255THENF=2
MR 106 RETURN
```

BEFORE TYPING . . .

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

Program 2: Object Maker

```
KK 10 SA=53239:FORI=0TO8:READM
      L:POKESA+I,ML:NEXT
KQ 20 DATA 32,248,2,32,237,245
      ,76,190,2
EM 30 D=8:E=65
EJ 40 SYS57812CHR$(E)+" COORD.
      OBJ",D,1
GQ 50 POKE193,169:POKE194,2:PO
      KE174,253:POKE175,2
GH 60 SYS62957:E=E+1
DM 70 SYS57812CHR$(E)+" COORD.
      OBJ",D,1
GF 80 POKE193,140:POKE194,160:
      POKE174,116:POKE175,163
AM 90 SYSSA
```

Program 3: Demo

```
GA 5 REM *** LOAD ML FROM DISK
     OR TAPE ***
AP 10 D=8:E=65:A=E:F=147:E$=CH
      R$(F):P=57812:L=62631:S=
      62957:IFPEEK(687)=54THEN
      25
HD 15 POKEF,0:SYSPCHR$(E)+" CO
      ORD.OBJ",D,1:SYSL:E=E+1:
      IFE<A+2THEN15
SG 20 REM *** SET COORDINATOR
      {SPACE}VARIABLES ***
FG 25 RESET=681:CLEAR=686:PLOT
      =707:ERASE=714
HX 30 SETFLAG=767:INIT=1020:MF
      LAG=0:REM MFLAG=1 TURNS
      {SPACE}ON MULTICOLOR, 0
      {SPACE}IS OFF
GX 35 REM *** SET COLOR REGIST
      ERS ***
PB 40 FG=646:BO=53280:BG=BO+1
GE 45 IFMFTHENM2=BO+2:M3=BO+3:
      POKEM2,6:POKEM3,4:REM SE
      T MULTICOLOR REGS. (M1=F
      G)
EH 50 REM *** SET HI-RES VARIA
      BLES ***
GS 55 BANK=1:SCNOFFSET=1:COLOF
      FSET=7:GOSUB185
JB 60 REM *** CREATE DISPLAY (
      FROM LINE 65 TO LINE 145
      ) ***
HB 65 POKEBO,0:POKEBG,0:POKEFG
      ,1:Y=100:X=160:SYSCLEAR:
      O=X:N=Y:REM SET SCREEN
MA 70 FORR=7TO87STEP8:POKEBG,-
      (R/8>7)*R/7:POKEFG,R/7-8
      *(R/8>7):REM RADIUS & CO
      LOR
EG 75 FORA=0TO↑/2STEP2/R:X=R*S
      IN(A)+O:Y=R*COS(A)+N:SYS
      PLOT:REM SWEEP 90 DEGREE
      S
XD 80 X=-X+2*O:SYSPLOT:Y=-Y+2*
      N:SYSPLOT:X=-X+2*O:SYSPL
      OT:REM BUT PLOT 4 QUADRA
      NTS
EG 85 NEXTA
HR 90 NEXTR
FH 95 IFMFTHENPOKEM3,5:REM BIT
      PATTERN 1,1 PLOTS GREEN
      IF MULTICOLOR
EC 100 Y=100:FORX=0TO319:POKEB
      G,X/8:POKEFG,X/8+1:SYSP
      LOT:NEXT:REMDRAW COLORE
      D LINE
RG 105 POKEBG,0:POKEFG,10:FORX
      =0TO319:SYSERASE:NEXT:R
      EM ERASE LINE WITH LT.
      {SPACE}RED
HR 110 Y=95:POKEFG,1:FORX=0TO3
      19:SYSPLOT:IFPEEK(SETFL
      AG)THENSYSPLOT:GOTO120
BB 115 SYSERASE:REM 95-105 MOV
      E A WHITE POINT BUT DON
      'T ERASE
CJ 120 NEXT
CA 125 DEFFNMC(A)=INT(A)-(INT(
      A/2)<>INT(A)/2):SYSCL:R
      =95:POKE646,2
JG 130 FORA=0TO319STEP2.26:X=F
      NMC(A):Y=R+80*SIN(A/20)
      :SYSER:X=X+1:SYSPL:NEXT
RS 135 FORA=0TO319STEP2.26:X=F
      NMC(A):Y=R+60*SIN(A/25)
      :SYSPL:X=X+1:SYSER:NEXT
SD 140 FORA=0TO319STEP2.26:X=F
      NMC(A):Y=R+40*SIN(A/30)
      :SYSPL:X=X+1:SYSPL:NEXT
JS 145 FORA=0TO319STEP2.26:X=F
      NMC(A):Y=R+60*SIN(A/25)
      :SYSER:X=X+1:SYSER:NEXT
JF 150 REM *** RESTORE DEFAULT
       DISPLAY ***
SG 155 IFPEEK(198)=0THEN155:RE
      M WAIT FOR A KEYPRESS T
      O END PROGRAM
JF 160 POKE198,0:REM TIDY UP K
      EYPRESS IF IT COMES
AF 165 POKEFG,PEEK(BG)+1:REM E
      NSURE TEXT COLOR IS DIF
      FERENT FROM BACKGROUND
CR 170 POKE53270,200:POKE56576
      ,151:POKE53265,27:POKE5
      3272,21:IFSFTHENRETURN
KB 175 END
HF 180 REM *** SET UP HI-RES *
      **
MR 185 POKE56576,(PEEK(56576)A
      ND252)OR(3-BANK):REM SE
      T BANK
AC 190 POKE53265,PEEK(53265)OR
      32:REM TURN ON BITMAP
ED 195 IFMFTHENPOKE53270,PEEK(
      53270)OR16:REM SET MULT
      ICOLOR IF DESIRED
PX 200 POKE53272,(COLOFFSET*16
      +SCNOFFSET*8):REM POSIT
      ION HI-RES AND COLOR ME
      MORIES
GD 205 RETURN
```

Program 4: Mountain Demo

```
RG 65 POKE198,0:POKEFG,11:POKE
      BG,0:POKEBO,0:X=-1:Y=-1:
      SYSCL
GE 66 J%=RND(0)*10:J%=-J%*(J%>
      3ANDJ%<7):ON-(J%=0)GOTO6
      6:?J%=J%-4:C=2↑J%
HD 67 J=35-(C=1)*17:V=2:A=-20:
      J%=RND(0)*5:B=-J%*20:Z=1
      :E=0
BA 68 H=INT((320-B)/(J-10)):DI
      M G(H+1):G(0)=B:DEFFNP(M
      )=(-1)↑INT(RND(0)*3)
HS 69 DEFFNM(R)=(N+(N<80)*N*.3
      )/133+(N>180)*(N-180)/79
EM 70 FORQ=1TOH:G(Q)=G(Q-1)+J+
      RND(0)*10:IFG(Q)>=320THE
      NO=Q:Q=H
CF 71 NEXT:DIMR(O+1,2),T(O+1,2
      ),U(O+1),B(O+1):J%=RND(0
      )*5:M=10+(J%+4-C)*5
HM 72 J%=-(C>1):R(0,0)=G(0):T(
      0,0)=RND(0)*3.3-A:U(0)=1
SF 73 FORQ=1TOO:R(Q,0)=G(Q):U(
      Q)=U(Q-1)*(1+2*(Q/C=INT(
      Q/C)))
BC 74 T(Q,0)=T(Q-1,0)+((RND(0)
      *3.3+2)*U(Q)):N=R(Q,0)
JM 75 T(Q,0)=T(Q,0)-(N<=160)*N
      /80+(N>160)*N/120:GOSUB8
      3:B(Q)=-(K>I):NEXT:E=1
QH 76 V=V+.004:M=M+V↑1.0001:R(
      0,1)=R(0,0)+.9+RND(0)*.5
      *FNP(M)
EK 77 T(0,1)=T(0,0)+RND(0)*2:F
      ORQ=1TOO
EM 78 R(Q,1)=R(Q,0)+(1+(B(Q)=0
      ANDB(Q+1)=1)*J%)*(RND(1)
      *(2+C/2)+.3)
KE 79 N=R(Q,1):T(Q,1)=T(Q-1,1)
      +T(Q,0)-T(Q-1,0)+RND(0)*
      2
KF 80 T(Q,1)=T(Q,1)-(B(Q)=1)*R
      ND(1)*M*FNM(R)/20:IFR(Q,
      1)>R(Q-1,1)THEN82
AR 81 R(Q,1)=R(Q-1,1)+.01:IFQ>
      =3THENT(Q,1)=T(Q-1+(C=1)
      *2,1)-6
JR 82 GOSUB83:R(Q,0)=R(Q,1):T(
      Q,0)=T(Q,1):NEXT:R(0,0)=
      R(0,1):T(0,0)=T(0,1):GOT
      O76
HB 83 H=R(Q-1,E):I=T(Q-1,E):J=
      R(Q,E):K=T(Q,E)
FK 84 W=(J-H)*(1.3+RND(0)*.9-(
      K<I)*1.7*(RND(0)+1))/SQR
      ((J-H)↑2+(K-I)↑2)
SS 85 IFK>170ANDJ>0ANDJ<320THE
      NJ=R(Q,0):K=T(Q,0):Z=0
CD 86 FORX=HTOJSTEPW:Y=I+(K-I)
      *(X-H)/(J-H):SYSPL:NEXT:
      IFZTHENRETURN
JX 87 FORY=0TO199STEP8:FORX=0T
      O319STEP8:U=FNP(M)*RND(0
      )*24
CH 88 POKEFG,7+2*(Y>36+U)-9*(Y
```


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```
      >76+U)+13*(Y>114+U):SYSE
      R:IFPEEK(SE)THENSYSPL
JE 89 NEXT:NEXT:POKE49,PEEK(47
      ):POKE50,PEEK(48):GOSUB2
      20
```

Program 5: Save/Load Subroutine

```
HD 210 REM *** SCREEN SAVE/LOA
       D SUBROUTINE ***
JC 215 REM NOTE: IS DEPENDENT
       {SPACE}ON VARIABLES FRO
       M MAIN PROGRAM
XA 220 D=8:E=49:OK=1:B(1)=BA*6
       4+SC*32:T(1)=B(1)+32:B(
       2)=BA*64+CO*4:T(2)=B(2)
       +4
XH 225 B(3)=208:T(3)=B(3)+1:B(
       4)=216:T(4)=B(4)+4:SF=1
       :GOSUB165:SF=0
ME 230 PRINTE$:PRINT
KC 235 PRINTTAB(7)"** SAVE OR
       {SPACE}LOAD SCREEN **":
       PRINT:INPUT"{2 SPACES}S
       CREEN NAME";SN$
CP 240 GV=LEN(SN$):ON-(GV<1ORG
       V>15)GOTO230:PRINT
EE 245 PRINT"> FOR SAVE - PRES
       S {RVS}S{OFF}":PRINT:PR
       INT"> FOR LOAD - PRESS
       {SPACE}{RVS}L{OFF}"
BX 250 GETL$:IFL$=""ORL$<>"S"A
       NDL$<>"L"THEN250
SG 255 PRINT:PRINT:PRINT"
       {RVS}RESULTS{OFF} - NAM
       E IS "SN$:PRINTTAB(11)"
       AND THIS IS A ";
GJ 260 IFL$="S"THENPRINT"SAVE"
       :GOTO270
JK 265 PRINT"LOAD"
FM 270 PRINT:PRINT:PRINTTAB(6)
       ">> IF CORRECT - PRESS
       {SPACE}{RVS}C{OFF} <<"
FH 275 PRINT:PRINTTAB(5)"ANY O
       THER KEY ALLOWS CHANGES
       "
DF 280 GETM$:ON-(M$="")-2*(M$=
       "C")GOTO280,290
XG 285 GOTO230
GK 290 PRINTE$:PRINT" SAVING:"
       SN$:IFL$="L"THENPRINTE$
       :PRINT" LOADING:"SN$:GO
       TO320
KP 295 SYSP"@:"+CHR$(E)+SN$,D,
       1:POKE193,0:POKE194,B(O
       K)
FC 300 POKE174,0:POKE175,T(OK)
       :SYSS
JA 305 E=E+1:OK=OK+1:IFOK<4THE
       N295
BS 310 IFMFANDOK=4THEN295
RJ 315 GOTO340
RS 320 POKEF,0:SYSPCHR$(E)+SN$
       ,D,1:SYSL
MQ 325 E=E+1:IFE<52THEN320
DE 330 IFMFANDE=52THEN320
GR 335 IFD<>8THEN355
XQ 340 QA=0:OPEN15,8,15:INPUT#
       15,QA,QB$,QC,QD:CLOSE15
       :IFQA<20THEN355
GK 345 PRINTE$:PRINT" DISK ERR
       OR!":PRINT:PRINTTAB(13)
       "{RVS} DISK STATUS
       {OFF}"
EF 350 PRINT:PRINTTAB(7)QA;QB$
       ;QC;QD:END
QM 355 GOSUB185:RETURN
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Number Construction Kit

Article on page 86.

```
AF 10 REM{2 SPACES}*NUMBER CON
      STRUCTION KIT*
DG 20 POKE53280,.:POKE53281,.:
      CC=211:Q=214:Y=198:C0=55
      856:SC=1622:B$=CHR$(150)
JB 30 Z=200:F$=CHR$(156):G$=CH
      R$(5):H$=CHR$(98):I$=CHR
      $(99):J$=CHR$(147)
GB 40 K$=CHR$(174):L$=CHR$(173
      ):M$=CHR$(189):N$=CHR$(1
      76):O$=CHR$(32):Q$=CHR$(
      125)
XQ 50 U$=CHR$(157):W$="
      {4 SPACES}":P=1:X=32
EQ 60 PRINTJ$B$SPC(7)N$;:FORI=
      .TO22:PRINTI$;:NEXT:PRIN
      TK$
DX 70 PRINTSPC(7)H$G$"NUMBER C
      ONSTRUCTION KIT"B$H$:PRI
      NTSPC(7)L$;:FORI=.TO22
SK 80 PRINTI$;:NEXT:PRINTM$:PR
      INT:PRINT:PRINTF$"TOOLS:
      "G$" + - * /"SPC(19)B$"T
      IME"
DH 90 PRINT:PRINTF$"MATERIALS:
       "G$"0 0 0 0 0"SPC(13)"0
      :00"
AM 100 PRINT:PRINTSPC(9)F$N$I$
       I$I$K$:PRINT"PROJECT: "
       H$G$"000"F$H$
MP 110 PRINTSPC(9)L$I$I$I$M$:P
       RINT:PRINT:PRINTSPC(X)B
       $N$I$I$I$I$K$
SB 120 PRINTG$"0 ";:FORI=.TO6:
       PRINT"+ 0 ";:NEXT:PRINT
       CHR$(146)B$"= "H$G$"000
       0"B$H$
XA 130 FORI=.TO14:PRINTCHR$(16
       3)" ";:NEXT:PRINTSPC(2)
       L$I$I$I$I$M$:FORI=.TO3:
       PRINT
RR 140 NEXT:PRINTSPC(24)"ROUND
        "G$"0"B$:PRINT:PRINTSP
       C(24)"PLAYER 1: "G$"000
       0"B$
SM 150 PRINTSPC(24)"PLAYER 2:
       {SPACE}"G$"0000";
EE 160 POKEQ,18:PRINT:PRINT"NU
       MBER OF PLAYERS? ";
XC 170 GETP$:IFP$=""THEN170
DE 180 T=ASC(P$)-48:IF(T<>1AND
       T<>2)ORP$=""THEN170
MQ 190 PRINT:PRINT:PRINT"1 - B
       EGINNER":PRINT"2 - INTE
       RMEDIATE":PRINT"3 - ADV
       ANCED"
BC 200 POKEQ,18:PRINT:PRINT"LE
       VEL OF DIFFICULTY? ";
XP 210 GETD$:IFD$<>"1"ANDD$<>"
       2"ANDD$<>"3"THEN210
CF 220 GOSUB610:D=1:L(1)=.:L(2
       )=.:U=.:M=3-(D$<"3")-(D
       $<"2"):LE=4-VAL(D$)
BK 230 POKEQ,20:PRINT:PRINTSPC
       (29)D:R$="000000":K=98+
       (D$>"1")+(D$>"2")
AJ 240 POKEQ,6:PRINT:PRINTSPC(
       X)K-95U$":00":N=1:G=.:F
       ORI=1TO5:M(I)=.:NEXT
FA 250 R=INT(RND(.)*9)+1:IFR=M
       (1)ORR=M(2)ORR=M(3)ORR=
       M(4)ORR=M(5)THEN250
SA 260 FORI=NTO5:M(I)=R:NEXT:P
       OKEQ,6:PRINT:IFN<MTHENN
       =N+1:GOTO250
MS 270 POKEQ,6:PRINT:PRINTSPC(
       11)W$W$" ":POKEQ,6:PRIN
       T:PRINTSPC(10);
FQ 280 N=1:O=1:G=.:T(1)=.:FORI
       =1TOM
DC 290 PRINTM(I);:NEXT:V=INT(R
       ND(.)*900)+100:POKEQ,9:
       PRINT:PRINTSPC(9)V;:POK
       EQ,9
JP 300 PRINT:PRINTSPC(9)F$Q$G$
DX 310 POKEQ,18:PRINT:PRINT"PL
       AYER"P:PRINT:PRINT"PRES
       S ANY KEY TO"
HE 320 PRINT"BEGIN CONSTRUCTIO
       N!":POKEQ,14:PRINT:FORI
       =.TO28:PRINTO$;:NEXT
PR 330 POKEQ,14:PRINT:POKECC,3
       3:PRINTW$
CK 340 WAITY,1:GETA$:POKEQ,20:
       PRINT:FORI=.TO15:PRINTO
       $;
EJ 350 POKEC0+I,7:NEXT:TI$="00
       0000"
HA 360 POKEQ,14:PRINT:PRINTSPC
       (33)W$:FORI=1TO8:B(I)=T
       (I):NEXT:L=G
BS 370 FORI=1TO7:B(I+1)=(O(I)=
       -3)*B(I+1)-(O(I)<>-3)*B
       (I+1):NEXT:M%=.:I=.:F=.
RB 380 I=I+1:IF(O(I)=-6ORO(I)=
       -1)ANDI<L/2THEN440
KA 390 H=M%:IFH+B(I)>9999THENE
       $="TOTAL TOO LARGE - PL
       EASE CORRECT!":F=1:GOTO
       450
QD 400 IFH+B(I)<.THENE$="NEGAT
       IVE TOTAL - PLEASE CORR
       ECT!":F=1:GOTO450
PH 410 M%=M%+B(I):IFI<L/2THEN3
       80
XG 420 POKEQ,14:PRINT:PRINTSPC
       (X)M%;
FK 430 POKEQ,14:PRINT:PRINTSPC
       (X)B$Q$G$:N%=M%:GOTO480
MP 440 B(I+1)=-(B(I)*B(I+1))*(
       O(I)=-6)-(B(I)/B(I+1))*
       (O(I)=-1):GOTO380
BA 450 POKEQ,16:PRINT:PRINTE$:
       POKEB,X:N=N+(N<15):G=G+
       (N=GANDG<>15):O=-O
QK 460 IFN=G+1ANDF=1THENPOKEQ,
       14:PRINT:POKEQ,14:PRINT
       :PRINTSPC(X)N%
PF 470 IFN=G+1ANDF=1THENF=.:PR
       INTCHR$(145)SPC(X)B$Q$G
       $:WAITY,1
FH 480 IFF=.THENPOKEQ,16:PRINT
       :FORI=.TOX:PRINTO$;:NEX
       T:PRINT
JS 490 B=SC+N*2:A=PEEK(B):POKE
       B,A+128:IFNOT((N=15)AND
       (O<.))THENO=-O
XE 500 GETC$:IFASC(MID$(TI$,4,
       1))<K-47THENGOSUB580:IF
       C$=""THEN500
HP 510 C$=C$+"?":C=ASC(C$)-48:
       IFASC(MID$(TI$,4,1))=K-
       47ORC=-35THEN620
RC 520 S=(N+1)/2:IF(C=-6ORC=-5
       ORC=-3ORC=-1)ANDO>.ANDN
       <16THENO(S)=C:GOTO570
KS 530 IF(C=M(1)ORC=M(2)ORC=M(
       3)ORC=M(4)ORC=M(5))ANDO
       <.ANDN<16THENT(S)=C:GOT
       O570
CX 540 IFC=-28ANDN=GANDN>.THEN
       POKEB,X:G=G-1:O=-O:T(S)
       =-T(S)*(N>1):GOTO360
BK 550 IFF=1ORNOT((C=-19AND(N<
       G+1)ANDN<15)OR(C=109AND
       N>1))THEN500
GS 560 IF(C=-19AND(N<G+1)ANDN<
       15)OR(C=109ANDN>1)THENP
```

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```
      OKEB,A:N=N-(C=-19ORl):G
      OTO490
GS 570 POKEB,C+48:G=G-(N>G):N=
      N-(N<15):GOTO360
GX 580 POKEQ,6:PRINT:T$=TI$:IF
      T$=R$THENRETURN
PC 590 R$=T$:V$=CHR$(K-ASC(MID
      $(T$,4,1))):POKECC,33:I
      FV$=J$THENRETURN
CC 600 PRINTV$":"CHR$(101-ASC(
      MID$(T$,5,1)))CHR$(105-
      ASC(MID$(T$,6,1))):RETU
      RN
DX 610 POKEQ,18:PRINT:FORI=.TO
      4:FORJ=.TO21:PRINTO$;:N
      EXT:PRINT:NEXT:RETURN
RX 620 POKEB,A:E=V-M%:E=E+2*E*
      (E<.):E=-E*(E<=Z)-Z*(E>
      Z):U=Z-E
GR 630 TR=LE*60-(60*VAL(MID$(T
      $,4,1))+VAL(RIGHT$(T$,2
      ))):U=INT((Z-E)*(4-LE)*
      TR/10)
AB 640 L(P)=L(P)+U:POKEQ,21+P:
      PRINT:PRINTSPC(34)W$CHR
      $(145)
CX 650 PRINTSPC(33)L(P);:D=D+I
      NT(P/T):P=1-(T=2ANDP=1)
      :IFD<6THEN230
PK 660 GOSUB610:POKEQ,18:PRINT
      :PRINT"GOOD GAME!":PRIN
      T:PRINT"PLAY AGAIN? (Y/
      N) "
PE 670 GETC$:IFC$<>"Y"ANDC$<>"
      N"THEN670
PX 680 PRINTJ$:IFC$="Y"THENRUN
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Power BASIC: Keyboard To Joystick Converter

Article on page 71.

BEFORE TYPING . . .

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

Program 1: Keyboard To Joystick Converter

```
KX 10 FORI=1TO168:READA:X=X+A:
      NEXTI
BC 20 IFX<>23067THENPRINT"
      {CLR}TYPING ERROR IN DAT
      A LINES":STOP
CG 30 RESTORE:TT$=CHR$(142)+CH
      R$(8)+"{CLR}{RVS} KEYBOA
      RD TO JOYSTICK ":PRINTTT
      $
MK 40 FORI=828TO856:READA:POKE
      I,A:NEXT
XC 50 DATA120,169,49,141,20,3,
      169,234,141,21,3,88,96
HD 60 DATA165,1,72,41,254,133,
      1,32
PK 70 DATA27,191,104,133,1,76,
      126,234
KC 80 FORI=758TO767:READA:POKE
      I,A:NEXT
SC 90 DATA198,1,32,27,191,230,
      1,76,126,234
PX 100 PRINT"{DOWN}(IF PLAN A
      {SPACE}DOESN'T WORK, TR
      Y PLAN B){2 UP}"
DM 110 PRINT"PLAN A OR B
      {2 SPACES}A{3 LEFT}";
QD 120 INPUTP$:I=758:IFP$="A"T
      HENI=841
DC 130 POKE835,I/256:POKE830,I
      -PEEK(835)*256
HA 140 FORI=0TO73:POKEI+48923,
      PEEK(I+59953):NEXT
HS 150 FORI=48997TO49125:READA
      :POKEI,A:NEXT
JQ 160 DATA169,255,133,203,141
      ,245,191,169,129
AG 170 DATA133,245,169,235,133
      ,246,162,0,142,141
RG 180 DATA2,142,2,220,160,1,1
      69,16,32,186,191
XS 190 DATA232,74,144,249,136,
      16,244,140
PS 200 DATA2,220,173,245,191,2
      01,16,240,35,165
ED 210 DATA203,162,3,157,230,1
      91,189,230,191
EF 220 DATA201,255,208,6,202,1
      6,246,76
EG 230 DATA135,234,133,203,162
      ,0,189,231
HF 240 DATA191,157,230,191,232
      ,224,3,144
DQ 250 DATA245,76,221,234,72,5
      7
QR 260 DATA0,220,208,15,189,24
      6,191,201
AE 270 DATA65,144,10,41,63,13,
      141,2
QM 280 DATA141,141,2,104,96,19
      7,203,144
XQ 290 DATA7,133,203,104,141,2
      45,191,96,72,165,203
DQ 300 DATA201,255,104,176,241
      ,144,233
GF 310 FORI=49126TO49141:POKEI
      ,255:NEXT:FORA=0TO4:REA
      DA$(A):NEXT
HJ 320 DATAUP,DOWN,LEFT,RIGHT,
      FIRE
EJ 330 FORF=1TO7:READF$(F):NEX
      T
GX 340 DATASHIFT,LOGO,SHIFT+LO
      GO,CTRL,SHIFT+CTRL,LOGO
      +CTRL,SHIFT+LOGO+CTRL
FA 350 POKE808,239:PRINTTT$:FO
      RI=0TO1:PRINT"JOYSTICK
      {SPACE}PORT";I+1
DJ 360 FORA=0TO4:PRINT"PRESS K
      EY FOR ";A$(A);"? ";
QJ 370 K=PEEK(197):F=PEEK(653)
      :IFQTHENIFK<64ORFTHENQ=
      0:GOTO400
CG 380 IFK=64ANDF=0THENQ=1
ES 390 GOTO370
KR 400 IFK=64THENK=K+F:A$=F$(F
      ):POKE198,0
GA 410 POKE49142+I*5+4-A,K
JR 420 GETG$:IFG$>""THENA$=G$:
      GOTO420
QB 430 IFA$=" "THENA$="SPACE"
CG 440 IFA$=CHR$(13)THENA$="RE
      TURN"
MS 450 POKE216,1:PRINTA$:NEXTA
      :PRINT:NEXTI:POKE198,0
QG 460 PRINT"MAXIMUM BREAK LEN
      GTH? 3{LEFT}";:I=3
HP 470 GETA$:IFA$=CHR$(13)THEN
      PRINT:PRINT:GOTO500
JG 480 IFA$<"0"ORA$>"9"THEN470
DS 490 I=VAL(A$):PRINTA$"
      {LEFT}";:GOTO470
RF 500 POKE808,237:POKE49047,I
      :POKE49076,I
QA 510 PRINT"{2 DOWN}ARE YOUR
      {SPACE}CHOICES SATISFAC
      TORY? (Y/N)"
JD 520 GETA$:IFA$="N"THEN350
XB 530 IFA$="Y"THENSYS828:PRIN
      TCHR$(9);:NEW
EF 540 GOTO520
```

Program 2: Worm (Demo)

```
HH 100 POKE53281,6:PRINT"{CLR}
      {CYN}"TAB(13)"*** HUNGR
      Y LIKE A WORM ***":A=RN
      D(0)
HB 110 POKE53280,0:POKE53281,0
      :FORI=0TO19:POKE1083-I,
      160:POKE1084+I,160:NEXT
      I
FR 120 FORI=0TO21:POKE1104+I*4
      0,160:POKE1143+I*40,160
      :NEXTI
FA 130 FORI=0TO19:POKE1984+I,1
      60:POKE2023-I,160:NEXTI
CP 140 DIMS(999):WH=292:WT=WH:
      D=1:POKEWH+1024,81:S(WH
      )=D:GOSUB320:GOSUB350
EC 150 GETA$:D1=D
CG 160 IFA$="J"THEND=-1
AC 170 IFA$="K"THEND=1
HG 180 IFA$="I"THEND=-40
BR 190 IFA$="M"THEND=40
DQ 200 IFD=-D1THEND=D1
BQ 210 S(WH)=D:WH=WH+D
AK 220 IFPEEK(WH+1024)=65THENS
      C=SC+10:GOSUB350:GOSUB3
      20:GOSUB320:L=5:GOTO240
CA 230 IFPEEK(WH+1024)<>32THEN
      270
PG 240 POKEWH+1024,81:IFLTHENL
      =L-1:GOTO260
HH 250 POKEWT+1024,32:WT=WT+S(
      WT)
HM 260 FORT=1TO25:NEXTT:GOTO15
      0
XF 270 P=PEEK(WH+1024):POKEWH+
      1024,86:PRINT:PRINT:PRI
      NTTAB(2)CHR$(18)"YOU RA
      N ";
HC 280 IFP=81THENPRINT"OVER YO
      URSELF"
SX 290 IFP=160THENPRINT"INTO A
       WALL"
KK 300 PRINT:PRINTTAB(2)CHR$(1
      8)"GAME OVER":END
KA 310 REM *** GROW MUSHROOMS
      {SPACE}***
MK 320 R=INT(RND(1)*960)+1064:
      IFPEEK(R)<>32THEN320
FA 330 POKER,65:RETURN
CE 340 REM *** PRINT SCORE ***
RF 350 PRINTCHR$(19)"SCORE: "R
      IGHT$("0000"+MID$(STR$(
      SC),2),5):RETURN
```

Survivor

See instructions in article on page 36 before typing in.

Program 1: Survivor—BASIC Loader

```
AS 100 IFA=0THENA=1:PRINT"
      {CLR}{9 DOWN}{BLK}"SPC(
      14)"LOADING ML":LOAD"SU
      RVIVOR 2",8,1
```


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```
EG 110 POKE56,32:POKE55,0:CLR
FC 120 PRINT"{CLR}":Z=2:BC=532
       80:BK=53281:C$(1)="{2}"
       :C$(2)="{1}":C$(3)="
       {RED}":A$=CHR$(148)
MM 130 T1=0
BX 140 IFA$=CHR$(129)THENA$=CH
       R$(28):GOTO160
AE 150 A$=CHR$(129)
XB 160 PRINTA$:PRINT"{HOME}
       {6 DOWN}{3 SPACES}";
QG 170 POKEBC,0:POKEBK,0:U$="
       {29 SPACES}":M$="{RVS}
       {K}{OFF}{K}{RVS}{K}
       {OFF}{K}"
CC 180 PRINT"{RVS}{4 SPACES}
       {OFF}"SPC(35)"{RVS}
       {2 SPACES}{OFF}
       {2 SPACES}{RVS}
       {2 SPACES}{OFF}"SPC(34)
       "{RVS}{2 SPACES}{OFF}
       {5 SPACES}"M$U$" {RVS}
       {4 SPACES}{OFF}
       {2 SPACES}"M$"{RVS}{K}
       {D}{F}";
RF 190 PRINT"{OFF}{F}"U$"{RVS}
       {2 SPACES}{OFF} "M$"
       {RVS}{K}{C}{V}{OFF}{V}"
       M$SPC(21)"{RVS}
       {2 SPACES}{OFF}
       {2 SPACES}{RVS}
       {2 SPACES}{OFF}
       {2 SPACES}{RVS}{2 I}
       {OFF} {RVS}{K}{D}{C}
       {OFF} "M$" {RVS}{F}{D}
       {OFF}";
DE 200 PRINTSPC(19)"{RVS}
       {4 SPACES}{OFF}
       {6 SPACES}{C}{V}{C}{V}
       {C}{RVS}{C}{V}{OFF}{V}
       {SPACE}{RVS}{K}{OFF}{K}
        "M$U$"{C}{V}{2 SPACES}
       {RVS}{K}{OFF}{K} "M$"
       {D}{RVS}{D}{F}{OFF}{F}"
       U$"{RVS}{2 I}";
XK 210 PRINT"{OFF} {C}{RVS}{C}
       {V}{OFF}{V}{RVS}{K}
       {OFF}{K}{RVS}{K}{OFF}
       {K}{RVS}{K}{D}{F}{OFF}
       {F}"U$"{C}{V} "M$"{RVS}
       {K}{C}{V}{OFF}{V}"SPC(3
       3)"{RVS}{2 I}{OFF}
       {RVS}{K}{D}{C}{OFF}
       {DOWN}{3 LEFT}{C}{V}{C}
       {V}"
QF 220 PRINTSPC(4)"{3 DOWN} PR
       ESS FIRE BUTTON TO PLAY
       "
FB 230 IF((PEEK(56320)ANDPEEK(
       56321))AND16)<>16THENPO
       KEBC,12:GOTO250
AB 240 GOTO140
JP 250 GOSUB350:PRINT"{CLR}";:
       L$=C$+"{RVS}{7 SPACES}
       {OFF}":PRINTL$SPC(33);:
       FORX=1TO5:FORZ=1TO3
KM 260 GOSUB350:PRINTL$"{BLK}
       {SPACE}{RVS}";
MJ 270 PRINTC$(Z)"{3 SPACES}
       {OFF}{BLK} {RVS}"C$(Z)"
       {3 SPACES}{OFF}{BLK}
       {RVS}"C$(Z)"{3 SPACES}
       {OFF}{BLK} {RVS}"C$(Z)"
       {3 SPACES}{OFF}{BLK}
       {RVS}"C$(Z);
SG 280 PRINT"{3 SPACES}{OFF}
       {BLK} {RVS}"C$(Z)"
       {3 SPACES}{OFF}{BLK}
       {RVS}"C$(Z)"{3 SPACES}
       {OFF}{BLK} {RVS}"C$(Z)"
       {3 SPACES}{OFF}{BLK} ";
       :NEXTZ
KK 290 IFMTTHENGOSUB350:PRINTL
       $"{BLK}{32 SPACES}
       {LEFT}"A$" {HOME}";:GOT
       O320
KC 300 GOSUB350
EK 310 PRINTL$"{OFF}{BLK}
       {33 SPACES}";:NEXTX:MT=
       1:FORZ=1TO3:GOTO260
QX 320 C$="{YEL}":GOSUB340:PRI
       NT"{3 DOWN}":C$="{CYN}"
       :GOSUB340
AH 330 SYS10240:GOTO360
AD 340 PRINT"{2 DOWN}{RVS}"C$"
       LIVES{2 DOWN}{3 LEFT}
       {5}5"C$"{2 DOWN}
       {3 LEFT}SHOTS{5}
       {3 DOWN}";:RETURN
XB 350 C$="{5}":RETURN
QM 360 PRINT"{HOME}{12 DOWN}"S
       PC(19)"{WHT}{OFF}GAME O
       VER"
KH 370 IF(PEEK(870)-176)THENT2
       =8+(PEEK(878)=0):GOTO39
       0
KS 380 T2=4+(PEEK(878)=0)
RD 390 FORI=1TO9:POKEBK,T2:FOR
       J=1TO50:NEXTJ:POKEBK,T1
       :FORJ=1TO50:NEXTJ,I
HB 400 PRINT"{7 DOWN}"SPC(8)"P
       RESS FIRE BUTTON TO PLA
       Y AGAIN{HOME}"
PX 410 IF((PEEK(56320)ANDPEEK(
       56321))AND16)<>16THEN33
       0
DQ 420 GOTO410
```

Program 2: Survivor—Machine Language

```
2800:A9 00 8D 74 03 A2 00 B5 76
2808:00 9D BB 33 CA D0 F8 20 16
2810:DF 28 A5 A5 8D 6F 03 20 B9
2818:C6 2F A9 B5 8D 66 03 8D C1
2820:67 03 AD 6E 03 D0 1F A0 BB
2828:17 99 00 D4 88 10 FA 8D BF
2830:0C D4 A9 05 8D 03 D4 A9 0D
2838:0F 8D 18 D4 A9 81 8D 0F 41
2840:D4 8D 12 D4 D0 12 A9 2F 3F
2848:8D 11 FF A9 03 8D 10 FF AC
2850:AD 12 FF 09 03 8D 12 FF FE
2858:20 71 2C 20 99 30 AD 74 F9
2860:03 D0 71 A9 0A 8D 64 03 81
2868:8D 65 03 20 99 30 20 1D 26
2870:29 20 51 29 20 E1 FF F0 93
2878:FB 20 F1 2D 20 95 2E 20 B3
2880:58 30 20 D9 2B AD 6D 03 98
2888:D0 CE CE 3F 03 D0 09 AD DD
2890:40 03 8D 3F 03 20 06 2A 36
2898:CE 54 03 D0 0D A2 01 BD 85
28A0:50 03 F0 06 DE 50 03 CA 61
28A8:10 F5 CE 46 03 D0 0C AD DD
28B0:47 03 8D 46 03 20 6C 2B 18
28B8:20 99 30 CE 4D 03 D0 0C 96
28C0:AD 4E 03 8D 4D 03 20 98 04
28C8:2C 20 4A 2D A2 00 CA D0 CE
28D0:FD 4C 74 28 A2 00 BD BB 90
28D8:33 95 00 CA D0 F8 60 AD AD
28E0:00 03 C9 8B D0 17 A9 07 21
28E8:85 02 A9 04 85 03 A9 00 7D
28F0:85 04 A9 D4 85 05 A9 00 1B
28F8:8D 6E 03 F0 13 A9 07 85 ED
2900:02 A9 0C 85 03 A9 00 85 DB
2908:04 A9 FC 85 05 8D 6E 03 FC
2910:78 A9 4C 8D 14 03 A9 31 9C
2918:8D 15 03 58 60 A9 B3 8D FA
2920:3E 03 A5 02 18 69 DB 85 CA
2928:F9 A5 03 69 01 85 FA A0 8C
2930:00 AD 3E 03 91 F9 A2 00 9F
2938:A0 00 EA EA 88 D0 FB CA 31
2940:D0 F8 CE 3E 03 AD 3E 03 45
2948:C9 AF D0 D6 A9 A0 91 F9 DF
2950:60 A5 02 85 FC 18 69 E0 D0
2958:85 FE A5 03 85 FD 69 03 0C
2960:85 FF A0 00 8C 43 03 8C 8D
2968:50 03 8C 51 03 8C 5E 03 54
2970:AD F4 31 91 FC AD F5 31 D1
2978:91 FE A9 1E 8D 40 03 8D 6B
2980:3F 03 A9 46 8D 4D 03 8D 02
2988:4E 03 A9 20 8D 3C 03 8D EA
2990:3D 03 20 FB 29 A9 14 8D AB
2998:47 03 8D 46 03 A5 02 18 30
29A0:69 F0 8D 4B 03 A5 03 69 68
29A8:01 8D 4C 03 A9 5A 8D 57 C1
29B0:03 8D 58 03 A2 03 8A 9D F6
29B8:93 33 AD 4B 03 9D 75 33 B8
29C0:AD 4C 03 9D 7F 33 A9 00 53
29C8:9D A7 33 8D 62 03 8D 61 AE
29D0:03 8D 59 03 8D 70 03 8D 25
29D8:72 03 8D 6B 03 8D 6D 03 B9
29E0:CA 10 D3 A5 02 8D 55 03 65
29E8:A5 03 8D 56 03 A9 0F 8D 50
29F0:73 03 8D 6C 03 A9 0A 8D 96
29F8:05 D4 60 A2 1D A9 00 9D 66
2A00:DF 32 CA 10 FA 60 A2 01 CA
2A08:AD 6C 03 C9 0F F0 01 60 E9
2A10:BD 52 03 49 80 9D 52 03 EE
2A18:10 08 BD 50 03 D0 03 4C E0
2A20:47 2B 8A 0A A8 B9 FC 00 FA
2A28:85 F7 B9 FD 00 85 F8 20 7C
2A30:23 31 4A B0 11 48 A9 28 DB
2A38:20 4E 2B A9 D8 8D 41 03 B2
2A40:A9 FF 8D 42 03 68 4A B0 3E
2A48:0F 48 A9 28 8D 41 03 20 85
2A50:60 2B A9 00 8D 42 03 68 B8
2A58:4A B0 0F 48 A9 01 20 4E 44
2A60:2B A9 FF 8D 41 03 8D 42 01
2A68:03 68 4A B0 0F 48 A9 01 9A
2A70:8D 41 03 20 60 2B A9 00 41
2A78:8D 42 03 68 4A B0 78 48 59
2A80:BD 44 03 F0 04 68 4C FC 8B
2A88:2A BD 64 03 D0 04 68 4C D1
2A90:F7 2A DE 64 03 EE 43 03 EA
2A98:AD 43 03 C9 1E D0 05 A9 79
2AA0:00 8D 43 03 A8 A5 F7 18 D4
2AA8:6D 41 03 99 C1 32 85 F9 D9
2AB0:A5 F8 6D 42 03 99 DF 32 58
2AB8:85 FA AD 41 03 99 FD 32 05
2AC0:BD F4 31 AD 42 03 99 1B 9E
2AC8:33 68 FE 44 03 AD 6E 03 A3
2AD0:D0 1B A9 80 8D 0B D4 A9 7D
2AD8:81 8D 0B D4 A9 40 8D 04 6D
2AE0:D4 A9 41 8D 04 D4 A9 14 E5
2AE8:8D 70 03 D0 0F A9 19 8D 6C
2AF0:70 03 A9 5F 8D 11 FF A9 C3
2AF8:00 9D 44 03 A0 00 B1 F7 CD
2B00:C9 80 B0 43 A5 F8 38 E5 0D
2B08:03 30 3C C9 04 B0 38 C9 2D
2B10:03 90 06 A5 F7 C9 E8 B0 90
2B18:2E 8E 3E 03 8A 0A AA 20 13
2B20:D9 2B A9 20 81 FC 8A A8 23
2B28:AE 3E 03 A5 F7 99 FC 00 40
2B30:A5 F8 99 FD 00 A0 00 B1 DE
2B38:F7 9D 3C 03 20 D9 2B BD 26
2B40:F4 31 91 F7 20 22 30 CA C3
2B48:30 03 4C 10 2A 60 8D 3E 2E
2B50:03 A5 F7 38 ED 3E 03 85 08
2B58:F7 A5 F8 E9 00 85 F8 60 3A
2B60:18 65 F7 85 F7 A5 F8 69 25
2B68:00 85 F8 60 A2 1D AD 6C 96
2B70:03 C9 0F F0 01 60 BD DF 90
2B78:32 F0 5A 85 F8 BD C1 32 3C
2B80:85 F7 A0 00 B1 F7 C9 80 2D
2B88:B0 3D 48 A9 20 91 F7 68 C9
2B90:C9 4B D0 09 A9 4D 91 F7 E6
2B98:20 22 30 D0 2A BD C1 32 98
2BA0:18 7D FD 32 9D C1 32 85 23
2BA8:F7 BD DF 32 7D 1B 33 9D E5
2BB0:DF 32 85 F8 38 E5 03 30 53
2BB8:0E C9 04 B0 0A B1 F7 C9 E4
2BC0:4B F0 D1 C9 80 90 07 A9 CD
2BC8:00 9D DF 32 F0 07 A9 4D E9
2BD0:91 F7 20 22 30 CA 10 9E 7F
2BD8:60 8A 48 AD 6C 03 C9 0F F7
2BE0:D0 42 A2 02 A1 FC C9 48 81
2BE8:90 33 C9 4E B0 2F AD 6E 7E
2BF0:03 D0 16 A9 80 8D 04 D4 71
2BF8:A9 81 8D 04 D4 A9 0F 8D 6F
```

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```
2C00:72 03 A9 0F 8D 05 D4 D0 73
2C08:05 A9 4F 8D 72 03 8E 6C 39
2C10:03 A9 4E 8D 6A 03 81 FC 56
2C18:A9 00 8D 6B 03 CA CA 10 96
2C20:C3 68 AA 60 CE 6B 03 D0 CA
2C28:3B AD 6A 03 AE 6C 03 81 B5
2C30:FC B5 FC 85 F7 B5 FD 85 84
2C38:F8 8A 48 18 69 40 20 22 E8
2C40:30 68 AA EE 6A 03 AD 6A 34
2C48:03 C9 51 D0 17 A9 01 8D BA
2C50:6D 03 8A 4A AA DE 66 03 B6
2C58:BD 66 03 48 20 99 30 68 3E
2C60:C9 B0 F0 03 68 AA 60 20 E6
2C68:71 2C 68 A9 01 8D 74 03 56
2C70:60 A5 02 85 F7 A5 03 85 DC
2C78:F8 A2 03 A0 00 B1 F7 30 47
2C80:04 A9 20 91 F7 C8 E0 00 07
2C88:D0 04 C0 E1 F0 09 C0 00 AD
2C90:D0 EB E6 F8 CA 10 E6 60 7D
2C98:A2 03 AD 6C 03 C9 0F F0 CD
2CA0:01 60 BD 75 33 85 F7 BD FD
2CA8:7F 33 85 F8 A0 00 B1 F7 2E
2CB0:A0 01 A0 00 8C 3E 03 C9 DA
2CB8:4D D0 03 EE 3E 03 A9 20 AC
2CC0:91 F7 AD 3E 03 F0 17 BD 41
2CC8:FE 31 9D 93 33 AD 4B 03 C3
2CD0:9D 75 33 AD 4C 03 9D 7F BF
2CD8:33 A9 20 4C 16 2D BD 93 72
2CE0:33 8D 4A 03 20 0D 31 29 70
2CE8:03 49 01 CD 4A 03 F0 05 57
2CF0:49 01 8D 4A 03 AD 4A 03 EA
2CF8:20 1D 2D B0 A5 A0 00 AD B6
2D00:4A 03 9D 93 33 A9 4B 91 95
2D08:F7 20 22 30 A5 F7 9D 75 6B
2D10:33 A5 F8 9D 7F 33 CA 30 F4
2D18:03 4C A2 2C 60 0A A8 B9 54
2D20:F6 31 18 65 F7 85 F7 B9 1B
2D28:F7 31 65 F8 85 F8 38 E5 6D
2D30:03 30 15 C9 04 B0 11 C9 26
2D38:03 90 06 A5 F7 C9 E8 B0 BC
2D40:07 A0 00 B1 F7 C9 80 60 A9
2D48:38 60 A2 03 A0 00 BD A7 83
2D50:33 F0 2A 85 F8 BD 9D 33 4B
2D58:85 F7 B1 F7 C9 20 D0 0D A6
2D60:BD 02 32 91 F7 20 22 30 2E
2D68:CE 4F 03 D0 7D DE B1 33 69
2D70:D0 78 A9 00 9D A7 33 A9 22
2D78:20 91 F7 D0 6D 20 0D 31 8A
2D80:C9 02 B0 66 20 0D 31 09 5D
2D88:80 9D B1 33 A5 02 85 F9 2E
2D90:A5 03 85 FA A0 04 20 0D 41
2D98:31 18 65 F9 85 F9 A5 FA 38
2DA0:69 00 85 FA 88 D0 EF B1 29
2DA8:F9 C9 20 D0 DF BD 02 32 AF
2DB0:48 91 F9 AD 6E 03 D0 16 E4
2DB8:A9 80 8D 04 D4 A9 81 8D D7
2DC0:04 D4 A9 0A 8D 05 D4 A9 FB
2DC8:1E 8D 70 03 D0 0A A9 1E F3
2DD0:8D 70 03 A9 4F 8D 11 FF DB
2DD8:A5 F9 9D 9D 33 85 F7 A5 57
2DE0:FA 9D A7 33 85 F8 68 20 49
2DE8:22 30 CA 30 03 4C 4E 2D CF
2DF0:60 A2 03 BD 9D 33 C5 FC A2
2DF8:D0 0C BD A7 33 C5 FD D0 6E
2E00:05 A0 00 4C 1D 2E BD 9D 86
2E08:33 C5 FE D0 0C BD A7 33 36
2E10:C5 FF D0 05 A0 01 20 1D 20
2E18:2E CA 10 D7 60 E0 00 D0 15
2E20:1B A5 FC 85 F9 A5 FD 85 53
2E28:FA A5 FE 85 FC A5 FF 85 A7
2E30:FD A5 F9 85 FE A5 FA 85 96
2E38:FF 4C 7B 2E E0 01 D0 06 AC
2E40:A9 14 99 50 03 60 E0 03 0D
2E48:D0 1E AD 5E 03 D0 0A A5 45
2E50:02 8D 9D 33 A5 03 8D A7 F3
2E58:33 98 49 01 0A 8D 5F 03 F5
2E60:A9 C8 8D 5E 03 4C 7B 2E C9
2E68:CE 68 03 D0 0D B9 64 03 CE
2E70:C9 0A F0 06 18 69 01 99 B4
2E78:64 03 60 BD A7 33 85 F8 BD
2E80:A9 00 9D A7 33 BD 9D 33 DE
2E88:85 F7 98 48 A0 00 A9 20 B5
2E90:91 F7 68 A8 60 CE 57 03 3B
2E98:F0 03 4C 71 2F AD 58 03 B2
2EA0:8D 57 03 AD 5E 03 F0 F2 A8
2EA8:CE 5E 03 D0 12 AD 55 03 66
2EB0:85 F9 AD 56 03 85 FA A0 2E
2EB8:00 A9 20 91 F9 D0 DB AD 15
2EC0:55 03 85 F9 38 E5 02 85 BB
2EC8:F7 AD 56 03 85 FA E5 03 6E
2ED0:85 F8 A0 00 A9 20 91 F9 2D
2ED8:20 72 2F 8E 5A 03 8C 5B 04
2EE0:03 AC 5F 03 B9 FC 00 38 FF
2EE8:E5 02 85 F7 B9 FD 00 E5 94
2EF0:03 85 F8 20 72 2F 8E 5C 1B
2EF8:03 8C 5D 03 20 0D 31 10 7D
2F00:22 AC 5D 03 CC 5B 03 F0 41
2F08:1A AC 5D 03 CC 5B 03 90 E4
2F10:09 A2 02 20 8B 2F 90 39 51
2F18:B0 23 A2 00 20 8B 2F 90 0A
2F20:30 B0 1A AE 5C 03 EC 5A 14
2F28:03 F0 DE 90 09 A2 04 20 24
2F30:8B 2F 90 1D B0 07 A2 06 F0
2F38:20 8B 2F 90 14 AE 59 03 89
2F40:20 8B 2F 90 0C 20 0D 31 AC
2F48:29 03 0A AA 20 8B 2F B0 26
2F50:F4 8E 59 03 A5 F9 8D 55 AD
2F58:03 A5 FA 8D 56 03 A0 00 D9
2F60:A9 48 48 91 F9 A5 F9 85 A7
2F68:F7 A5 FA 85 F8 68 20 22 AF
2F70:30 60 A0 FF C8 A5 F7 38 18
2F78:E9 28 85 F7 A5 F8 E9 00 EA
2F80:85 F8 10 F0 A5 F7 18 69 97
2F88:28 AA 60 8A 49 02 CD 59 A1
2F90:03 F0 31 98 48 AD 55 03 03
2F98:18 7D F6 31 85 F9 AD 56 1A
2FA0:03 7D F7 31 85 FA 38 E5 60
2FA8:03 30 17 C9 04 B0 13 C9 E6
2FB0:03 90 06 A5 F9 C9 E8 B0 49
2FB8:09 A0 00 B1 F9 C9 80 68 3F
2FC0:A8 60 68 A8 38 60 AD 6E 30
2FC8:03 F0 03 4C 0D 30 78 A9 CD
2FD0:33 85 01 20 E1 2F A9 37 A2
2FD8:85 01 58 A9 18 8D 18 D0 D7
2FE0:60 A2 07 A0 00 A9 00 85 2F
2FE8:F9 85 F7 A9 D0 85 FA A9 7B
2FF0:20 85 F8 B1 F9 91 F7 88 89
2FF8:D0 F9 E6 FA E6 F8 CA 10 8B
3000:F2 A0 9E B9 25 32 99 FF 96
3008:21 88 D0 F7 60 AD 12 FF 92
3010:29 FB 8D 12 FF AD 13 FF B3
3018:29 03 09 20 8D 13 FF 4C F5
3020:E1 2F 48 38 E9 40 8D 60 95
3028:03 98 48 8A 48 A5 F7 18 C2
3030:65 04 85 57 A5 F8 65 05 4B
3038:85 58 AD 6E 03 F0 09 AD A9
3040:60 03 18 69 10 AA D0 03 FA
3048:AE 60 03 BD 06 32 A0 00 8E
3050:91 57 68 AA 68 A8 68 60 1E
3058:CE 63 03 D0 3B EE 61 03 C1
3060:AD 61 03 C9 03 D0 05 A9 FB
3068:00 8D 61 03 0A 0A 0A AA BF
3070:A0 00 BD 66 32 99 40 22 D9
3078:E8 C8 C0 08 D0 F4 AD 62 30
3080:03 49 01 8D 62 03 0A 0A EA
3088:0A AA A0 00 BD 7E 32 99 92
3090:58 22 E8 C8 C0 08 D0 F4 0C
3098:60 A5 02 18 69 9B 85 F9 13
30A0:A5 03 69 00 85 FA A0 00 1B
30A8:AD 66 03 91 F9 A5 02 18 75
30B0:69 A3 85 F9 A5 03 69 02 0D
30B8:85 FA AD 67 03 91 F9 A5 BE
30C0:02 18 69 11 85 F9 A5 03 C8
30C8:69 01 85 FA AE 64 03 20 AB
30D0:E2 30 A5 02 18 69 19 85 A1
30D8:F9 A5 03 69 03 85 FA AE 69
30E0:65 03 8E 3E 03 A0 00 A2 A7
30E8:0E AD 3E 03 F0 06 30 04 B7
30F0:A9 AE D0 02 A9 A0 91 F9 F8
30F8:CE 3E 03 C8 C0 05 F0 04 3D
3100:C0 2D D0 05 98 18 69 23 93
3108:A8 CA 10 DD 60 AD 6E 03 EA
3110:D0 04 AD 1B D4 60 AD 6F 36
3118:03 0A 0A 38 6D 6F 03 8D FF
3120:6F 03 60 AD 6E 03 D0 04 07
3128:BD 00 DC 60 BD 48 31 8D 0A
3130:08 FF EA EA EA AD 08 FF C0
3138:8D 3E 03 3D 4A 31 08 AD F9
3140:3E 03 28 D0 02 29 EF 60 89
3148:FA FD 40 80 AD 6E 03 D0 B5
3150:2D AD 72 03 D0 11 AD 70 C9
3158:03 F0 03 CE 70 03 8D 01 71
3160:D4 8D 08 D4 4C 7B 31 CE 60
3168:73 03 AD 73 03 D0 06 CE 68
3170:72 03 AD 72 03 8D 73 03 E1
3178:8D 01 D4 4C 31 EA AD 72 44
3180:03 D0 1E AD 70 03 F0 05 AD
3188:CE 70 03 D0 0A AD 11 FF 05
3190:29 0F F0 03 CE 11 FF 0A 5E
3198:8D 0F FF 8D 0E FF 4C C5 2D
31A0:31 CE 73 03 AD 73 03 D0 FF
31A8:19 CE 72 03 AD 72 03 C9 D0
31B0:40 D0 05 A9 00 8D 72 03 C0
31B8:8D 11 FF 29 0F 09 10 8D 03
31C0:73 03 8D 0F FF 4C 0E CE 5C
31C8:1C 92 47 41 4D 45 20 4F E9
31D0:56 45 52 11 11 11 11 9D 97
31D8:9D 9D 9D 9D 9D 9D 9D 9D 3B
31E0:9D 9D 9D 50 52 45 53 53 D3
31E8:20 46 49 52 45 42 55 54 6D
31F0:54 4F 4E 00 41 42 D8 FF DF
31F8:28 00 01 00 FF FF 00 01 90
3200:02 03 44 45 46 47 07 07 67
3208:03 00 01 01 01 01 08 08 42
3210:08 04 04 05 05 01 47 47 4C
3218:43 00 71 71 71 71 48 48 8D
3220:48 44 44 45 45 71 00 00 86
3228:00 00 00 00 00 00 10 38 E4
3230:10 FE 10 38 10 00 10 38 BA
3238:10 FE 10 38 10 00 00 00 6A
3240:00 00 00 00 00 00 00 40 E4
3248:20 F2 24 4F 04 02 60 60 3C
3250:3E 10 F8 44 22 01 FF 81 D1
3258:81 99 99 81 81 FF 1C 3E B1
3260:4F 4F 47 22 1C 00 42 28 D8
3268:5A 25 A4 1A 45 28 10 45 A9
3270:9A 24 A6 58 25 48 08 40 20
3278:1A A4 24 58 21 08 49 1C F4
3280:1C 7F 1C 1C 49 00 49 1C 11
3288:5D 3E 5D 1C 49 00 00 00 E2
3290:00 18 18 00 00 00 10 28 46
3298:10 A4 10 28 10 00 00 28 5B
32A0:10 84 10 08 10 00 00 00 31
32A8:10 04 10 08 00 00 00 00 98
32B0:00 00 00 00 00 00 4D 59 09
32B8:4B 54 55 54 54 4C 45 4C 72
32C0:45 00 00 00 00 00 00 00 C7
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

128 Autoboot

Article on page 82.

Program 1: Create 128 Autoboot Sector

```
QF 10 REM ***{2 SPACES}PROGRAM
      CREATES A C-128 BOOT DI
      SK TO LOAD & RUN 'HI' FI
      LE ***
BD 20 DATA67,66,77,0,0,0,0,0,0
      ,120,32,132,255,234,234,
      234,234,234,169,195
HD 30 DATA141,238,255,169,8,14
      1,239,255,169,0,141,240,
      255,169,15,141,32,208,16
      9,6
RQ 40 DATA141,33,208,165,213,2
      01,72,208,1,96,169,72,14
      1,233,7,169,73,141,234,7
      ,169
QA 50 DATA1,162,8,160,255,32,1
      86,255,32,192,255,169,2,
      162,233,160,7
HR 60 DATA32,189,255,169,0,32,
```


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```
      213,255,142,16,18,140,17
      ,18,32,231,255,169,4,133
      ,208
EQ 70 DATA169,82,141,74,3,169,
      85,141,75,3,169,78,141,7
      6,3,169,13,141,77,3,96,-
      1
DS 80 DIMA(121)
CA 90 FORMX=1TO121:READS:X=X+S
      :IFS=-1THEN110
EP 100 A(MX)=S:NEXT
CF 110 IFX<>14733THENPRINT"ERR
      OR IN DATA STATEMENTS."
      :STOP
GA 120 PRINT"{CLR}{6}{2 DOWN}E
      NTER YOUR PREFERRED COL
      OR CHOICES"
SF 130 PRINT"{2 DOWN}# OF SCRE
      EN COLOR";:INPUTA(40):P
      OKE53281,A(40)
EA 140 PRINT"{DOWN}# OF BORDER
       COLOR";:INPUTA(35):POK
      E53280,A(35)
KD 150 PRINT"{DOWN}ARE THESE A
      CCEPTABLE? (Y/N)";:INPU
      TA$:IFA$<>"Y"THEN120
DH 160 POKE53280,15:POKE53281,
      6:PRINT"{CLR}{WHT}"
DR 170 PRINT"{2 DOWN}{RVS}INSE
      RT A FORMATTED DISK TO
      {SPACE}RECEIVE DATA "
QF 180 PRINT"{RVS}{10 SPACES}T
      HEN PRESS [RETURN]
      {11 SPACES}"
FA 190 GETR$:IFR$<>CHR$(13)THE
      N190
FG 200 PRINT"{2 DOWN}WORKING..
      .":OPEN15,8,15:OPEN5,8,
      5,"#":PRINT#15,"B-P:5,0
      "
JM 210 FORD=1TOMX:PRINT#5,CHR$
      (A(D));:NEXTD:PRINT#5
GH 220 PRINT#15,"M-W:"CHR$(0)C
      HR$(5);1;CHR$(67)
KK 230 PRINT#15,"B-P:5,0":PRIN
      T#15,"U2:5,0,1,0":CLOSE
      5:CLOSE15
FH 240 OPEN15,8,15:INPUT#15,A$
      ,B$,C$,D$:CLOSE15
MC 250 IFA$="00"THENPRINT"BOOT
       TRACK WRITTEN":END
MB 260 PRINT"{RVS}AN ERROR HAS
       OCCURRED.":PRINTA$,B$,
      C$,D$
GH 270 END
```

Program 2: Menu

Note: Save as "HI" if you want the menu to boot.

```
HQ 10 REM *** AUTO-BOOT "HI" P
      ROGRAM ***
HP 20 PRINT"{CLR}{2 DOWN}"TAB(
      8)"{5}------------------
      ------"
CS 30 PRINTTAB(11)"{YEL}C-128
      {SPACE}SYSTEM MENU{5}":P
      RINTTAB(8)"-------------
      ---------{6}"
XS 40 DATA64 MODE - BASIC,64 M
      ODE - RUN FILE,BOOT CP/M
       DISK,128 MODE - BASIC
FF 50 DATA128 MODE - RUN FILE
MH 60 MX=5:FORD=1TOMX:READA$(D
      ):NEXT
JE 70 FORD=1TOMX:CHAR0,20-(LEN
      (A$(D))/2),5+D*2,A$(D),0
      :NEXT
FS 80 NW=1:CHAR0,0,20,"USE CUR
      SOR KEYS TO MOVE-RETURN
      {SPACE}TO SELECT"
EQ 90 PRINT"{WHT}":CHAR0,20-(L
      EN(A$(NW))/2),5+NW*2,A$(
      NW),1:PRINT"{6}"
HP 100 GETR$:IFR$="{DOWN}"THEN
       140
HB 110 IFR$="{UP}"THEN170
HQ 120 IFR$=CHR$(13)THEN200
EJ 130 GOTO100
DP 140 CHAR0,20-(LEN(A$(NW))/2
      ),5+NW*2,A$(NW),0
AE 150 NW=NW+1:IFNW=MX+1THENNW
      =1
BA 160 GOTO90
HF 170 CHAR0,20-(LEN(A$(NW))/2
      ),5+NW*2,A$(NW),0
CG 180 NW=NW-1:IFNW=.THENNW=MX
RD 190 GOTO90
QF 200 ONNWGOTO220,290,230,280
      ,260
PR 210 GOTO100
SF 220 GO64
SH 230 PRINT"{CLR}{DOWN}INSERT
       CP/M SYSTEM DISK, PRES
      S [RETURN]"
BH 240 GETR$:IFR$<>CHR$(13)THE
      N240
HR 250 BOOT
JA 260 PRINT"{CLR}{DOWN}FILENA
      ME";:INPUTF$
EC 270 RUN(F$)
RF 280 PRINT"{CLR}{DOWN}THIS D
      ISK CONTAINS:{DOWN}":DI
      RECTORY:NEW
MC 290 PRINT"{CLR}DOES FILE CO
      NTAIN AUTORUN CODE (Y/N
      )";
PK 300 INPUTF$:IFF$<>"Y"ANDF$<
      >"N"THEN290
CM 310 IFF$="Y"THEN440
DQ 320 BLOAD"AUTORUN.C64"
PA 330 PRINT"{CLR}{DOWN}FILE N
      AME";:INPUTF$
KA 340 IF LEN(F$)=.ORLEN(F$)>1
      6THEN290
ER 350 FORD=1TOLEN(F$):POKE328
      88+D,ASC(MID$(F$,D,1)):
      NEXT:POKE32888+D,42
ED 360 PRINT"IS THIS A SELF ST
      ARTING FILE? (Y/N)"
SG 370 GETKEYA$
RS 380 IF A$<>"N"THEN 430
MH 390 PRINT"{DOWN}ENTER FILE
      {SPACE}START ADDRESS";:
      INPUTF$
AJ 400 IFLEN(F$)=.ORLEN(F$)>5T
      HEN390
HQ 410 F$="SYS"+F$
SK 420 FORD=1TOLEN(F$):POKE329
      15+D,ASC(MID$(F$,D,1)):
      NEXT
HC 430 GO64
PP 440 PRINT"{2 DOWN}FILE NAME
      ";:INPUTF$
DQ 450 BLOAD(F$)
PF 460 GO64
```

Program 3: Create 64 Autorun Program

```
CK 10 REM ** CREATES AN AUTO R
      UN FILE WHEN YOU ENTER 6
      4 MODE **
ED 20 REM ** MUST BE RUN IN 12
      8 MODE. THE PBASIC PROGR
      AM MUST BE BASIC 2.0 ! *
      *
JA 30 DATA15,128,9,128,195,194
      ,205,56,48,104,168,104,1
      70
AK 40 DATA104,64,162,255,120,1
      54,216,142,22,208,32,163
      ,253,32,80
DP 50 DATA253,32,21,253,32,24,
      229,88,32,83,228,32,191,
      227,32
JX 60 DATA34,228,162,251,154,1
      69,113,133,43,169,128,13
      3,44,234,234
DQ 70 DATA169,0,133,45,169,0,1
      33,46
JK 80 DATA162,160,134,56,169
GE 90 DATA82,141,119,2,169,213
      ,141,120,2,169,13,141,12
      1,2,169
DQ 100 DATA3,133,198,162,128,1
      38,76,116,164,0,0,0,0,0
      ,0,51,47
FD 110 DATA49,53,22,49,46,49,0
      ,0,0,0
GR 120 PRINTCHR$(147):DN$=CHR$
      (17)
KA 130 PRINTDN$"ENTER FILENAME
       TO AUTORUN";:INPUTF1$
SF 140 OPEN2,8,2,F1$+",P,R":GO
      SUB300:CLOSE2
HH 150 PRINTCHR$(147)DN$DN$"PO
      KE45,113:POKE46,128:DLO
      AD"CHR$(34)F1$CHR$(34)
PJ 160 PRINTDN$DN$DN$DN$"PP=FR
      E(0):POKE45,1:POKE46,28
      :GOTO170{HOME}";
XJ 165 POKE208,2:POKE842,13:PO
      KE843,13:END
XA 170 PRINTCHR$(147)CHR$(17)"
      ENTER AUTORUN FILENAME:
       ";:INPUTF$
ER 180 PRINTCHR$(17)"["F$"] FI
      LESIZE:"118+(32397-PP)"
      BYTES"
QD 190 XX=(32397-PP)+32768+118
MQ 200 BANK0:RESTORE:FORD=.TO1
      12:READS:POKE32768+D,S:
      NEXT
GR 210 HI=INT(XX/256):LO=256*(
      XX/256-INT(XX/256))
QC 220 POKE32827,LO:POKE32831,
      HI
CC 230 BSAVE(F$),B0,P32768TOP(
      XX)
BQ 240 GOSUB300
MX 250 PRINTCHR$(17)"AUTORUN F
      ILE CREATED."
AK 260 PRINTCHR$(17)"CREATE AN
      OTHER? (Y/N)"
FX 270 GETKEYA$:IFA$="Y"THENRU
      N
XR 280 IF A$="N"THENPRINTCHR$(
      147):NEW
DH 290 GOTO270
KE 300 CLOSE15:OPEN15,8,15:INP
      UT#15,A$,B$:IFA$<>"00"T
      HENPRINT"{DOWN}{RIGHT}
      {RVS}ERROR :"B$:END
PK 310 RETURN
```

Program 4: 64 Loader Program

Enter and save from 64 mode.

```
KR 10 A$="................"
DQ 20 B$="RUN:....."
BS 30 PRINT"{CLR}{BLU}{2 DOWN}
      PO43,1:PO44,8:NEW":PRINT
      "{2 DOWN}LOAD"CHR$(34)A$
      CHR$(34)",8,1
EG 40 PRINT"{4 DOWN}?CHR$(5):"
      B$"{HOME}";
SX 50 POKE808,237:POKE809,246
MG 60 POKE198,3:POKE631,13:POK
      E632,13:POKE633,13:END
```

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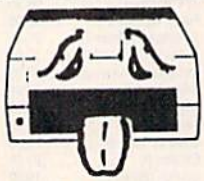

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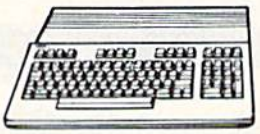

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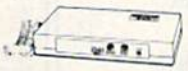

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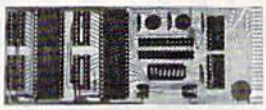

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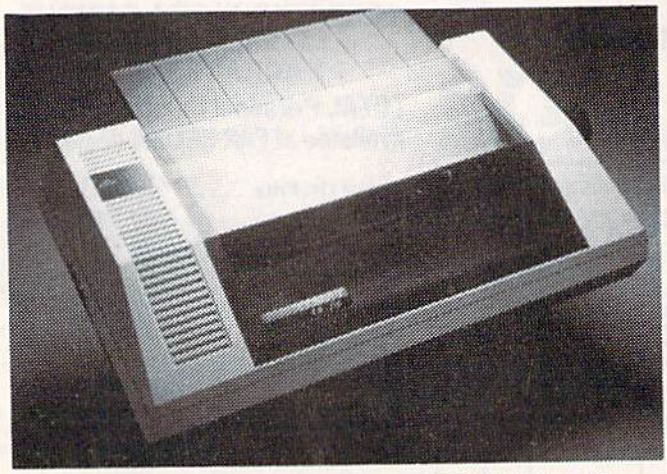

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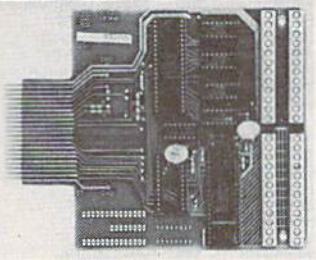

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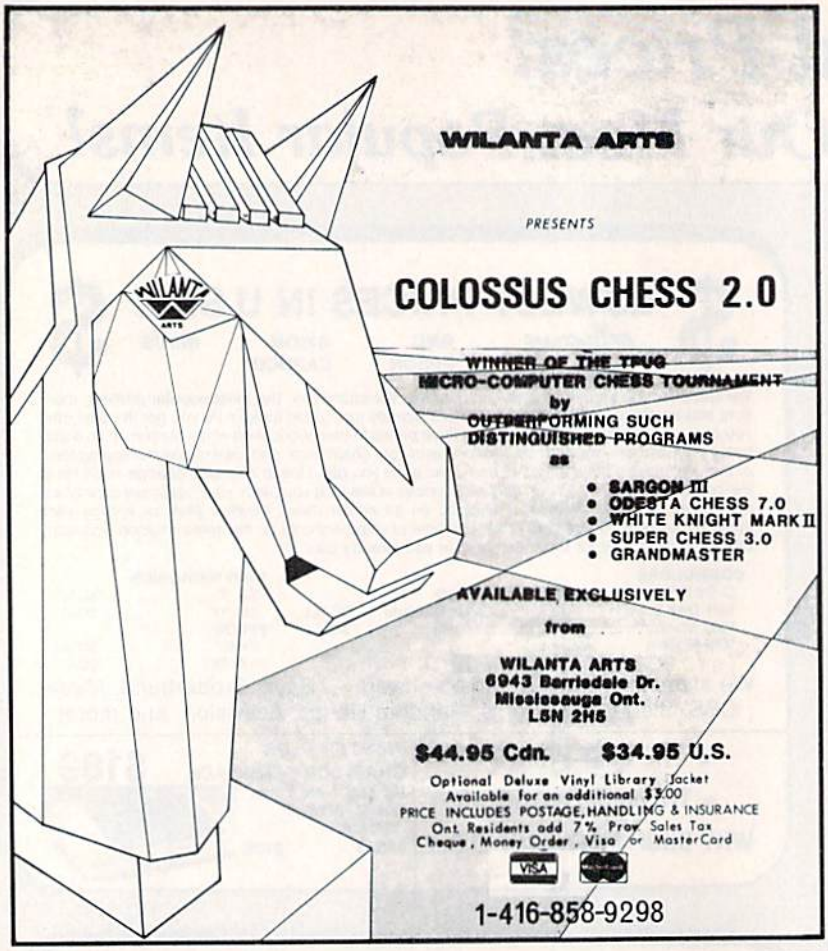

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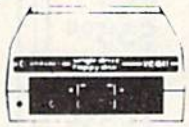

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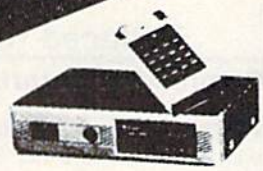

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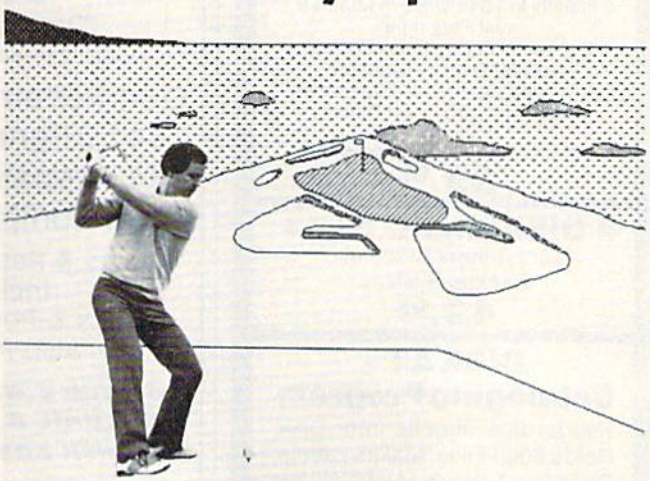

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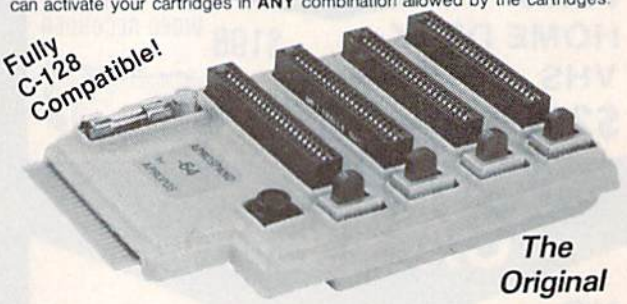

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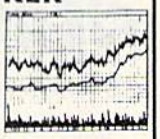

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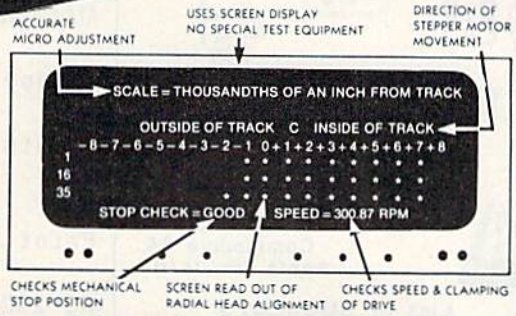

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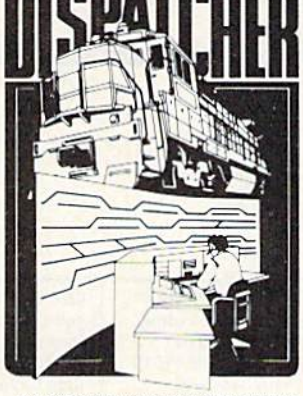

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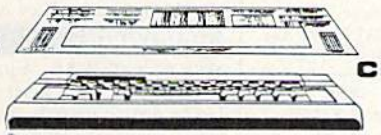

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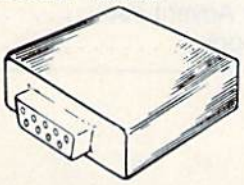

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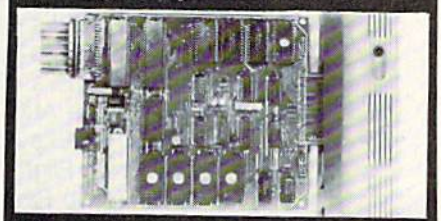

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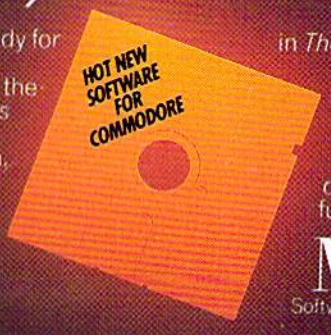

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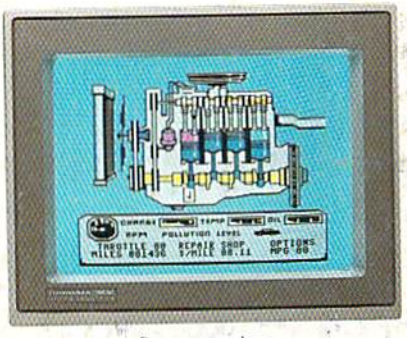
graph a spreadsheet

write a novel



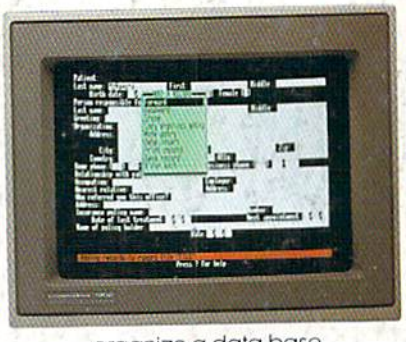
fix an engine

compose a song

paint a picture

ur banking

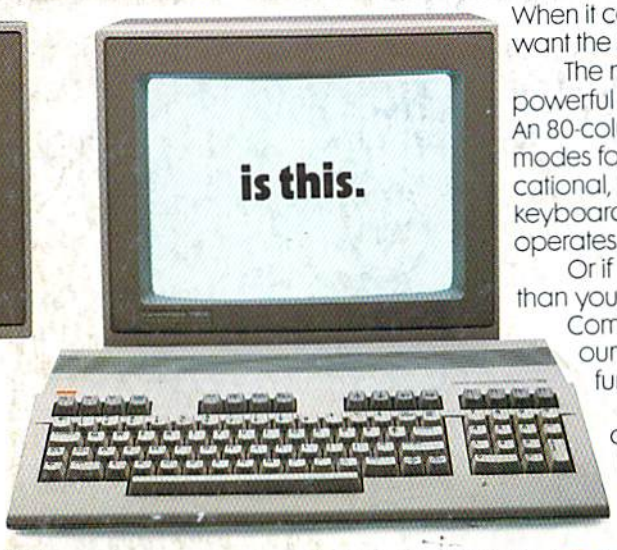
learn to fly



organize a data base

tell a story

forecast sales



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