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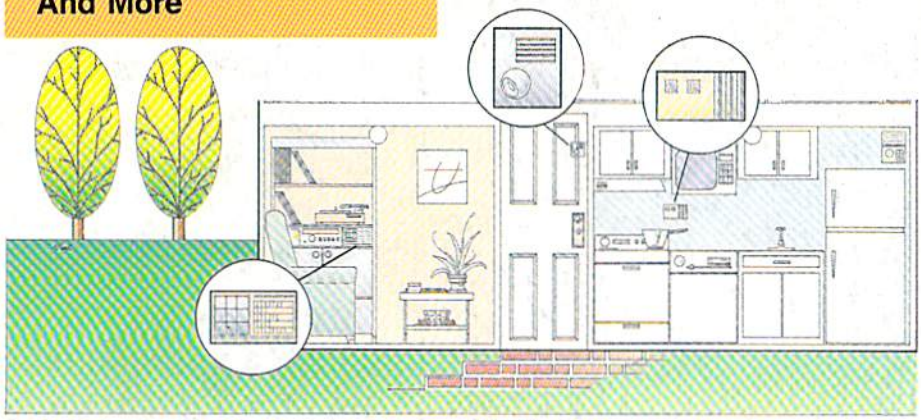

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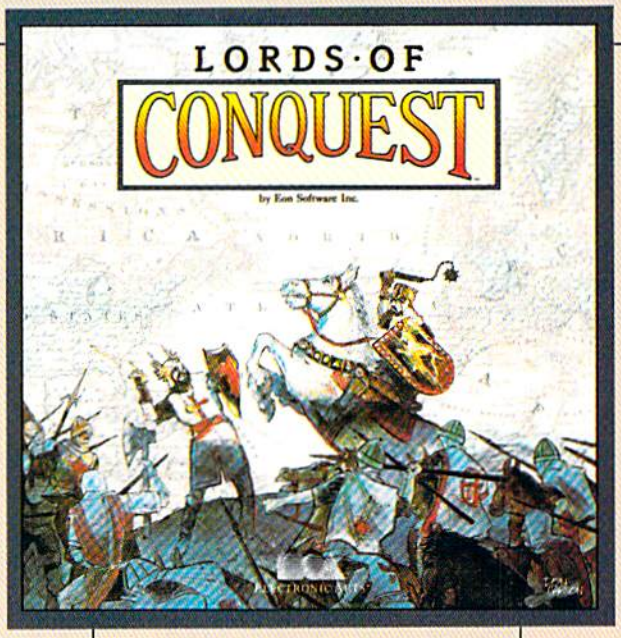

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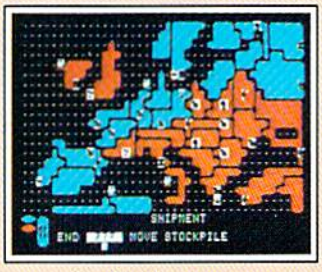

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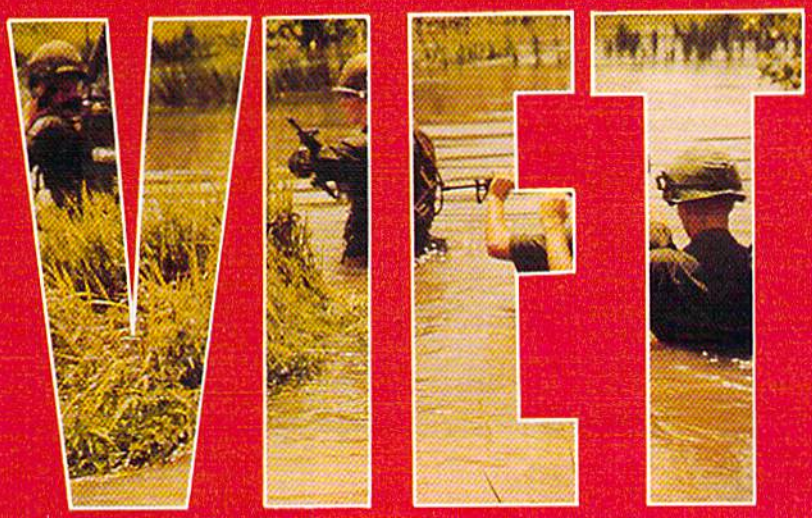

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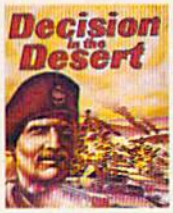

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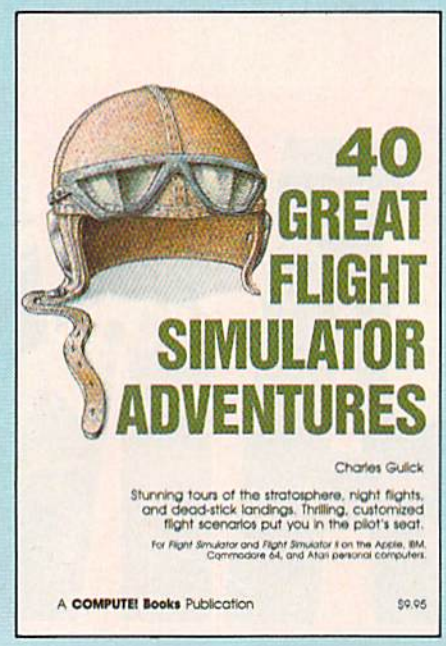

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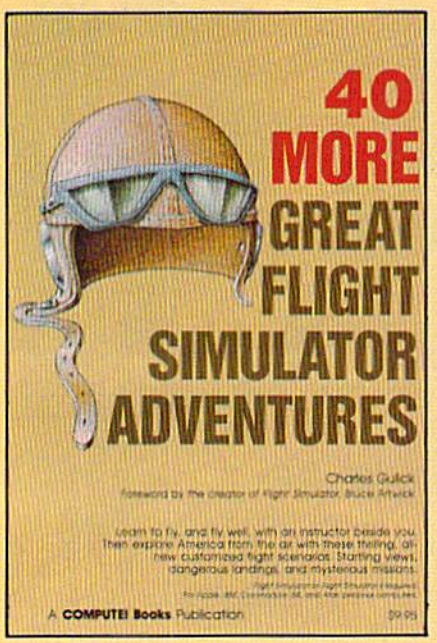

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editor's notes

Why does the Commodore 64 continue to sell so well? In the April issue, we reported that Commodore had repeatedly resurrected "the Lazarus machine" in late 1985 because of unexpected demand. Four months later, the same is true. Both the 64 and 128 continue to sell strongly and to generate much new—and significant—software. In view of the excitement created by the new 16/32-bit computers, the Amiga and the Atari ST, the performance of these low-end machines has surprised industry observers and the executives at Commodore.

In response to this, we strongly believe that the 64 and 128 will continue to spur new hardware and software support from third-party companies and from Commodore. A letter just received from Commodore's public relations firm notes that several new products for these computers will be shown at the Summer Consumer Electronics Show (June 1–4), including 3½-inch disk drives and a new dot-matrix printer and color monitor. (It appears that Commodore will also announce the debut of two IBM PC compatibles—apparently these are the PC10 and PC20, which have been sold only in Europe and Canada for over a year.) We've also heard that Commodore is considering the development of an affordable hard disk drive for the 64 and 128, but it will be a surprise if this is announced at the show. Look for a full report on CES in the September issue.

While 64 and 128 sales continue to bolster Commodore, the performance of the Amiga has been a disappointment. We had heard that by early this year Commodore had sold 40,000 Amigas, but other sources peg the total closer to 25,000 units—far below Commodore's original projections. The effect of recent price cuts on the Amiga remains to be seen, but it's clear that the Amiga has been wounded by the low pricing of its closest competitor, the Atari ST.

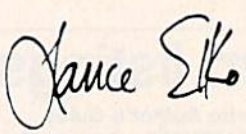
However, at the recent Spring COMDEX computer show—which appeals to the business market rather than the consumer market—both of these machines attracted a lot of attention with their prototype IBM PC emulators. Both emulators are plug-in boxes that contain an 8088 microprocessor and their own internal memory. The Amiga device, called the Sidecar, is particularly interesting. Don't confuse it with the *Transformer*, a PC emulator implemented entirely in software, which is already available for the Amiga. The *Transformer* works, but is slow. The Sidecar is a hardware emulator—the equivalent of a PC-compatible computer in a box that plugs into the Amiga's expansion port. It contains an 8088, an empty socket for an 8087 math coprocessor, 512K of RAM, a 5¼-inch disk drive, and three full-size expansion slots that accept PC-compatible expansion boards. The Sidecar emulates the PC in either monochrome or color/graphics modes. And the PC program runs as a window—from the Amiga's point of view, just another multitasked operation—on the Workbench screen. Commodore says it works at 100 percent IBM PC speed and is nearly 100 percent IBM compatible. The price? Commodore isn't saying, but look for a figure in the ballpark of $650.

We think you'll find this issue of the GAZETTE an especially good one. Our features include a look at some revolutionary new developments with laser technology that promise to give computers a dynamic new dimension, and an article on the new "smart" homes, microprocessor-controlled and automated houses, that are already here.

We've got some good programs appealing to a variety of interests in this issue as well. "Budget Planner" is a mini-spreadsheet that's flexible enough for use by nearly any household, and "Math Worksheet" is for teachers and parents of children in elementary school. Commodore 128 owners who haven't yet taken advantage of their 128's CP/M capability will find a lot of good, helpful information in "A Hands-On Introduction to 128 CP/M" and "CP/M Public Domain Software." Commodore 128 owners will also enjoy "Sound Designer," an interesting studio approach to the sound chip, and "Artimation," a collection of short but dazzling programs that show how efficiently you can access the 128's high-resolution graphics in BASIC. We've had a number of requests from 128 owners for a hi-res graphics dump program, and that, too, is in this issue.

Two programs for the Commodore 64, "Sequential File Editor" and "Power BASIC: RAM Disk," are excellent tools that you'll want to use. If you like arcade-style games, try "Saloon Shootout." It's one of the best—and most difficult—we've published.

We've got some high-quality programs and features slated for upcoming issues, too, so stay tuned. And thanks for your continued support of the No. 1 magazine for Commodore users.



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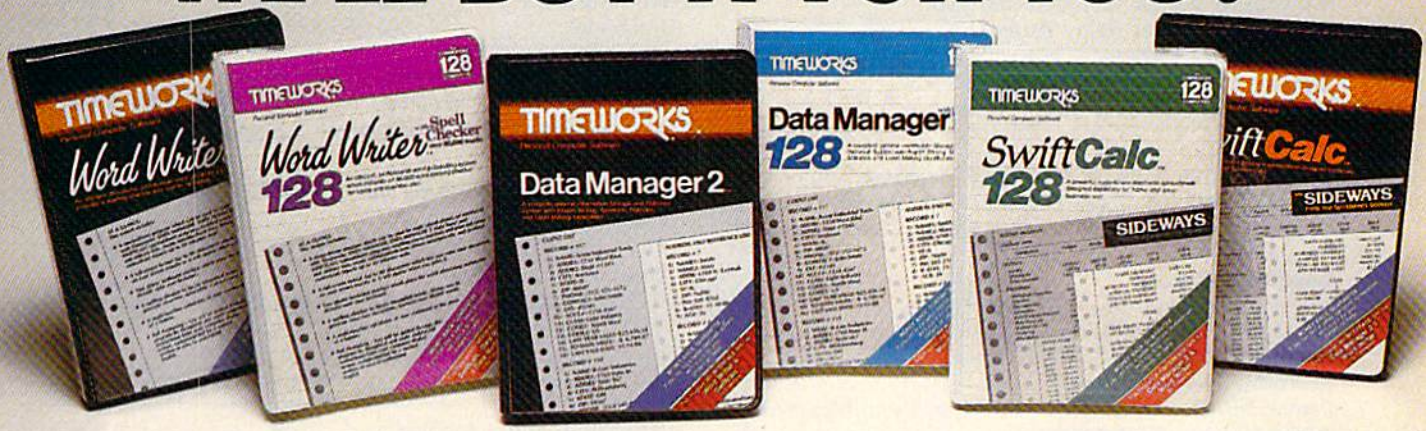

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A Number Processor

What is a spreadsheet? I've seen them advertised and have seen them mentioned in articles, but I still don't know what they do or what they're used for. Can they be used with word processors?

Bob Cairns

The main job of a word processor is to help people put words together into correspondence, stories, or articles. A spreadsheet does something similar for numbers, adding up or performing other calculations on rows and columns of numbers. Thus, a spreadsheet could be described as a number processor.

Spreadsheets are most commonly used in accounting and budgeting applications, although they can be helpful in other areas where numbers are important. You might create a simple spreadsheet that lists the prices of products you sell, for example. If you then kept track of how many of each item you sold each month, the spreadsheet could multiply the numbers by the price and tell you the total sales (in dollars) of each one. It could then add up the monthly columns to tell you the sales for each month. Based on that total, the program could go back and figure out percentages—perhaps 6 percent of sales came from sunglasses, for example. Some spreadsheets have graphics options for displaying bar graphs or pie charts from the numbers you provide.

You could say that a spreadsheet is a specialized programming language. You provide commands (TOTAL COLUMN 5, for example), then the spreadsheet takes over, performing all the necessary calculations. Some numbers you input yourself, while others are inserted by the program from the instructions you write.

Bug-Swatting The GAZETTE DISK

I just started a subscription to the GAZETTE DISK. While reading a recent "Bug-Swatter," I realized I could not make corrections or modifications to my programs. Your disks are write-protected. In some cases, the programs won't work properly without the corrections. How do I change programs on the disks?

K. Harper

First, a little history: Nearly two years ago, we published a program called "Disk Purge," which was designed to help people clean up a disk and scratch multiple disk files. It happened to be first on the list when the menu program was loaded from the GAZETTE DISK.

Some subscribers like to test out the disk when they first receive it by running every program, from first to last. Several hundred people ran the Disk Purge program without first reading the instructions, and scratched one or more files in the process.

Ever since then, the GAZETTE DISK *has been write-protected. In addition, before the menu appears, the first screen reminds users to read the corresponding article before running a program.*

The GAZETTE DISK *is write-protected but not copy-protected, so there's nothing to stop you from making backup copies of the programs on another disk. We encourage users to make archival backups of the* GAZETTE DISK *(note that copyright laws prevent you from selling or distributing copies of the disk, but not from making backup copies for your own use). If a correction is necessary, you can change the backup copy. If you prefer, you could cut a write-enable notch in the* GAZETTE DISK *using a razor or a paperpunch, but we don't recommend this.*

Avoid Save-With-Replace

In your May issue, a reader asked how to resave a program after some lines have been corrected. Your advice was to either scratch the old file and save the revised version, or to save the program under a different name. I've found that when a program is in memory and there's an earlier version on disk, you can correct or change the program and then type SAVE "@0:filename" (this saves the new version under the old name). I haven't had any problems doing this.

Debbie Glenn

It may be true that you've never had any difficulty with SAVE@, usually called "save-with-replace," but that doesn't mean you won't ever encounter the bug in this command. It's like driving a car across a frozen lake; you might succeed on a cold day in the middle of January, or the next day, or the next week, but there will come a day when the ice won't support the car.

Save-with-replace usually does *work correctly. It saves the new copy of the program to disk, scratches the old version, and points the directory entry to the new copy of the program or file.*

But once in a while it fails. Understanding the reasons for the failure would require a knowledge of machine language and a memory map of the ROM routines in the disk drive. You'd have to know how the internal memory buffers are managed and how an incorrect version of the block allocation map (BAM) can be written to the disk. The details can be found in a two-part article published in our sister magazine, COMPUTE! *in October and November 1985.*

When something does go wrong in save-with-replace, the symptoms of the problem can be deceptive. Immediately after the bad save, you can LOAD or VERIFY the program and even list the directory; the program is on the disk and everything looks OK. But the disk sectors to which the program was saved have not been allocated, which means they're not protected from future disk operations. If the save didn't work properly, the only way you could tell something has gone awry is to add up the disk sectors used by the programs, plus the blocks free. If the total (on a 1541) isn't 664, you've got a potential problem.

The very next time you write to the disk, there's an excellent chance that the new program or file will overwrite the previous program (the one on which you used the SAVE@ command) because the sectors it occupied were not protected. Here's what will happen. Say you're working on a program and type SAVE"@0:GROUNDHOG",8 after you finish what you're doing. If conditions on the disk were just right, the SAVE@ didn't work as it should have. The next day, you type in another program and SAVE"ZEBRA",8. Later, if you load ZEBRA, you'll get the right program. But if you load GROUNDHOG, you'll get the program

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called ZEBRA, which overwrote the other program. It's not possible to recover the GROUNDHOG program, unless you have a backup copy on another disk.

Sooner or later, the SAVE@ bug will strike. There are a few ways to avoid the bug: One of the easiest is to turn your disk drive off and then on just before executing the save-with-replace. And always include the zero (SAVE"@0:file",8 instead of SAVE"@:file",8). But rather than trying to avoid the bug, it's best not to use save-with-replace at all.

Looking For A Disk

Is it possible to make a 64 detect if there is a disk in the 1541 disk drive?

Danny Gardner

First, you should have the program check to see if the disk drive is turned on (lines 10–50 below). Then try to initialize the disk, and read the disk error channel (lines 60–110). The following routine can be used as is, or you can renumber it and add a RETURN to use it as a subroutine within your program. It works on all Commodore computers:

```
10 OPEN 15,8,15:CLOSE15
20 IF ST=0 THEN 60
30 PRINT"PLEASE TURN ON THE 1541
   OR 1571 AND PRESS A KEY"
40 GET A$: IFA$="" THEN 40
50 GOTO 10
60 OPEN 15,8,15,"I0"
70 INPUT#15,E:CLOSE 15
80 IF E=0 THEN120
90 PRINT"INSERT A DISK AND PRESS
   A KEY"
100 GET A$:IF A$="" THEN 100
110 GOTO 60
120 REM PROGRAM CONTINUES
```

Three Programs For Three Computers

I recently purchased a Commodore 128, partly because I owned a 64 and already had much software for it. I'm curious to know if I can use my 1660 modem in 128 mode with updated software. Or do I have to stick to 64 mode?

Andrew Fritzinger

Each of the three computers inside the 128 needs different terminal software. We know someone who owns a 128 and a 1660; he has separate terminal programs for 64 mode (40 columns), 128 mode (40 or 80 columns), and CP/M mode (80 columns only). The only problem he reports is trying to remember which commands are used by which programs.

Some very good public domain and freeware terminal programs, for all three modes, are available for downloading on bulletin boards and online services. There aren't currently very many commercial terminal programs for 128 mode, but you should expect some to be announced this summer.

How Do You Underline?

I own a Commodore 64, Cardco +G interface, Star SG10 printer, and *WordPro 3 Plus* word processor. I can't get my system to underline anything. All four products claim to support underlining, so please tell me what to do in this regard. I'm not that knowledgeable about the BASIC programming language or the equipment that I have just purchased. My main desire is to use the equipment for word processing and with *Print Shop*.

Diana Fuson

One of the most common questions we receive is how to get a certain printer to work with a certain interface and a certain software package. Although the questions are similar, there are literally hundreds of answers, depending on what hardware and software are being used. Given three interfaces, five printers, and seven word processors, you could find 105 different ways to hook them up and possibly 105 different answers to the question of underlining. Often we don't have access to all of the equipment mentioned by a reader, so we can't answer the specific question.

There are three routes you could take: First, write or call the manufacturers of your printer, interface, and software. The worst that could happen is that you'd get no reply. If you bought your printer at a local Commodore dealer, someone at the store may be able to help. Second, try contacting a local user group and attending a meeting. You may find someone who has the same (or similar) equipment. Or you may discover someone experienced in programming printers who's willing to help you find the answer through experimentation. Third, you yourself could try to discover the technique.

Check your printer manual for the codes that turn underlining on and off. In your case, the way to enable underlining should be ESC "—" 1, which means send an ESCape character, a minus sign, and a CHR$(1). To disable underlining, you'd send ESC "—" 0. This is often called an escape sequence *because you use the ESC character followed by a sequence of one or more other characters. The ASCII value of ESC is 27, and the ASCII value of "—" is 45. To test this, type in and RUN the following BASIC program:*

```
10 OPEN 4,4
20 PRINT#4,CHR$(27);CHR$(45);
   CHR$(1);
30 PRINT#4,"THIS SHOULD BE
   UNDERLINED.";
40 PRINT#4, CHR$(27);CHR$
   (45);CHR$(0);
50 PRINT#4," AND THIS IS NOT."
60 PRINT#4:CLOSE 4
```

If the printer underlined the first sentence, but not the second, you have the proper codes.

If it didn't work, there could be several things wrong. Here's where it becomes a little complicated. You may have mistyped the program; check the spelling and punctuation. Or the interface may have intercepted the codes before they reached the printer. Escape sequences are used not only to set printer options; they're also sometimes used to program interfaces. If you have such an interface, it may have seen the ESC and thought it was intended to be an interface code and not a printer code. If that's the case, you'll have to send ESC twice. Usually, when a programmable interface receives two ESCapes, it sends the second one on to the printer. Another potential problem is that the DIP switches on the printer or the interface might be in the wrong position. DIP switches control the way an interface or printer acts (check the printer manual and the interface manual for guidance on the proper settings). Finally, it may be that your printer needs a different escape sequence for underlining; again, it's necessary to check your manual.

Before you start experimenting with the word processor, try to underline from a BASIC program. When you know the proper escape sequence for BASIC, you'll be prepared to try it from the word processor.

Some word processors, including PaperClip, *use printer files to keep track of various printer settings. You place a generic underline command in the document and when you print it, the proper escape sequence is sent, as long as you've previously loaded the correct printer file.*

Other word processors, including WordPro *and* SpeedScript, *require you to know in advance the commands to enable or disable underlining and other features. You'll have to check the documentation for your word processor (see the section on special printer functions and special characters on page 8–5 in your* WordPro *manual). You have to define three format keys: CHR$(27), CHR$(0), and CHR$(1). Then, whenever you want to underline, place the defined key for 27, a minus (—), and the key for 1 in the text of your document.*

80 Columns And Sound, Too

I read with interest the information about 128 video displays in the March issue. If you wire your own 80-column monochrome cable, how do you add the audio signal?

Frank M. Castorina

Many monochrome monitors don't have a speaker, so adding sound wouldn't be possible, unless you were to send the audio signal to a stereo or set up a separate amplifier and speaker. If your monitor does have a speaker, it is possible to have 80 columns and sound. There's no audio output on the RGBI port, however, because

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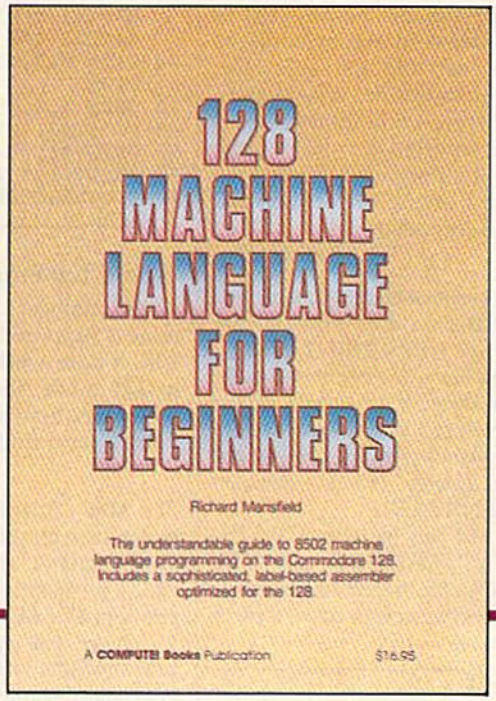

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the 80-column chip is built for video only. You'll have to get sound from the 40-column video port (the audio signal there is still active when you go into 80 columns). If you plan to build your own cable, see the pinout diagram in the 128 System Guide.

Keyword Abbreviations

When I write programs, I always use as many of the keyword abbreviations as possible. I've been told this saves valuable space in memory. But when I make corrections, listing a line shows the unabbreviated, spelled-out keywords. When I save the program after making a change, am I saving the abbreviated keywords as I intended?

Tom Hedges

Abbreviating commands doesn't save any memory. It makes no difference whether you type the five letters PRINT *or use a single question mark (the abbreviation for PRINT). The keyword is turned into a one-byte token—153 in this case—before it's stored in memory. When you list the program, the number 153 is translated into the full word PRINT.*

You can test this by typing 10 ? followed by PRINT FRE(0). Next, type NEW and 10 PRINT—the free memory available will be the same in both cases, with or without the abbreviation.

Recovering From A Short Format

I have a serious problem. I was trying to scratch a file and instead of typing OPEN 15,8,15,"S0:FILENAME", I put by mistake OPEN 15,8,15,"N0:FILENAME" and it wiped out my entire disk. How do I get them back?

Corey Vogel

If you had used an ID, all the programs would be erased. But formatting a disk without an ID (short formatting) doesn't actually erase any programs from the disk, so your programs are still there. Unfortunately, the short format command does erase sector 1 of track 18, which contains information on where the first eight files are located on the disk. If you have a disk editor, you may be able to search through every track and sector and find the programs you lost. Programs are generally saved closer to the center, so start by checking tracks 17 and 19, then 16 and 20, and so on.

The reason that the directory is apparently wiped out is because the pointer to the next sector of the directory is erased. The following program fixes this link, thereby restoring all but the first eight programs on the disk. The first program on the disk may also be restored and will appear on the directory under the name ZZ.

This is only a temporary fix, however. Once the directory has been partially restored, you should copy any programs which you may need to another disk and reformat the disk.

The program should only be used on disks which have been accidentally short formatted. It does not work on a disk which has been full formatted (with an ID).

```
10 FOR A=1 TO 10:READB:A$=A$+C
   HR$(B):NEXT:FORA=1TO14:A$=A
   $+CHR$(160):NEXT
20 DATA 0,3,21,18,4,130,17,0,9
   0,90
30 OPEN 1,8,15:OPEN 2,8,2,"#0"
40 PRINT#1,"U1 2 0 18 1"
50 PRINT#1,"M-W"A$
60 PRINT#1,"U2 2 0 18 1"
70 CLOSE2:CLOSE1
```

Typing 128 Programs In 64 Mode

The "Cataloger" program in the March issue is supposed to work on the 64 and 128. It does work fine in 64 mode, but in 128 mode, the computer tells me I have an error in line 40. So far, I haven't been able to find the error.

Charles W. Graham

The May "Bug-Swatter" contains some minor corrections for that program, but they shouldn't affect line 40. You may have a problem in that line if the program was typed in 64 mode, however.

When you type in a program line, your computer analyzes it before storing it in memory, searching through the line for keywords *(BASIC commands). Keywords are turned into* tokens, *one- or two-byte abbreviations for the command, before the program line is actually put in memory.*

Letters and numbers which are not part of a BASIC command are stored unchanged in memory, exactly as they were typed.

The beginning of line 40 in the "Cataloger" program looks like this:

COLOR 0,16: COLOR 4,16

In BASIC 7.0, the COLOR command changes various color sources in both 40- and 80-column modes, including the screen, border, and character colors. To change colors on a 64 requires POKEs to various video registers; COLOR is not a valid command in 64 mode.

So to a 64, COLOR looks like the letters C-O-L plus the OR command.

A 128 takes the command COLOR and tokenizes it to one number (231), which stands for that keyword. But if you typed the program in 64 mode, the computer would store the letters C, O, and L in memory, followed by the number 176, which is the token for the OR operator. If you then tried to run the program in 128 mode, you'd get an error in line 40. And if you listed the line, it would look fine because COL followed by OR is spelled just like the 128's COLOR keyword.

The problem is subtle, because the listed line seems to be correct. Once you recognize the source of the problem, the solution is simple. Load the program in 128 mode, list the line, put the cursor on the line, and press RETURN. This forces the 128 to tokenize the line, and it will handle the COLOR command properly.

The same situation can occur when you type a 64 program in 128 mode. Say you enter the following line from a 64 program into the 128:

60 Z=XOR15

The intention of the 64 program is to perform the OR operation between the variable X and the number 15. But on a 128, XOR is the logical exclusive-or function. It's a keyword, so the 128 tokenizes it. When the program is loaded into a 64, the computer will find the 128-mode token for XOR, and will recognize that it's a command (because all tokens are numbers above 127), but the 64 won't know what to do with it. On a 64 (or in 64 mode), line 60 would list this way:

60 Z=NEXT15

There are some advantages to typing 64 programs in 128 mode. You can use the RENUMBER, AUTO, DELETE, and other built-in utilities, for example. But once in a while you'll run into a problem with keywords that exist on the 128 but not the 64. If you're aware of the differences, you can head off errors by carefully proofreading the line and watching for commands that aren't available on the 64.

Sprites On The 128

I've been working on a Civil War game for the 64 for about a year. Recently I purchased a 128 and decided to rewrite the program using BASIC 7.0 commands. I have a hi-res map created with *Doodle* for the 64. When I BLOAD it to P7168 in bank 0, the map works fine. When I try to use sprites, they appear, but the correct shape is not there, just garbage. The sprite is created with DATA statements and POKEd into memory starting at 3584.

Robert Boyer

When the 40-column text screen is active, the pointers to sprite shapes follow screen memory. Screen memory on both the 64 and 128 starts at 1024 and ends at 2023. The eight sprite pointers occupy locations 2040–2047.

When you've got a hi-res screen in force, the sprite pointers follow hi-res color memory. It's fairly common to put the 64's bitmap color memory at 1024–2023 (the same locations used by the 40-column text screen), so the 64's sprite pointers often stay in the same place, 2040–2047. But when you issue a GRAPHIC statement to select a bit-mapped mode (1–4) on the 128, hi-res color memory is found at 7168–8167, with

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sprite pointers at 8184–8191.

So if you're using POKEs to set up sprites on the hi-res screen, remember to POKE to 8184–8191 instead of 2040–2047.

But POKEs shouldn't be necessary when you're in 128 mode. As long as the shapes are in locations 3584–4095, you should be able to issue the SPRITE and MOVSPR commands to turn sprites on and position them on the screen. Several other commands make sprites easy to use, including SPRSAV, SPRDEF, SPRCOLOR, RSPCOLOR, RSPPOS, RSPRITE, COLLISION, and BUMP. If you stick to the BASIC commands, you don't need to know which memory locations are responsible for sprite pointers and the like. Remember that these BASIC commands use 1–8 as the sprite numbers, unlike the 64, where they're numbered 0–7.

Here's another tip: As long as you're BLOADING the hi-res screen, why not BLOAD the sprite shapes to P3584? After the sprites have been created, BSAVE the memory between 3584–4095. Then you wouldn't have to read the numbers from DATA statements, which would simplify (and speed up) your program.

Disable Commodore-Shift

Programmers who don't want users tampering with the Commodore-SHIFT keys can place PRINT CHR$(8) at the start of the program. To reenable, PRINT CHR$(9). This only stops the keyboard use of the Commodore-SHIFT keys on the 64; you can still POKE 53272,21 for uppercase/graphics or POKE 53272,23 for upper-/lowercase.

Adam Bonney

A program is usually designed to run in one mode or the other: uppercase/graphics or upper-/lowercase. If a user accidentally holds down the Commodore and SHIFT keys, the screen display changes. For the Commodore 64 (and 128 in 64 mode), VIC-20, Plus/4, and 16, printing CHR$(8) prevents this from happening, leaving the screen display in whichever of the two modes was previously selected. Printing CHR$(9) reenables the switching. For the 128 (in 128 mode), the characters are CHR$(11) to disable Commodore-SHIFT switching, and CHR$(12) to reenable it. These characters only disable Commodore-SHIFT case changing; you can still change character sets on a Commodore 64 with the POKEs you mention. In addition, you can always switch character sets on any Commodore computer by printing CHR$(14) for upper-/lowercase or CHR$(142) for uppercase/graphics.

Tapping RESTORE

On every 64 I've used, I've noticed that holding down RUN/STOP and just pressing RESTORE doesn't work. The RESTORE key has to be tapped quickly and sharply. It doesn't seem to be how hard you press, holding RESTORE firmly doesn't work either. The quick and sharp method seems to be the key. What is the reason for this?

Brian Witowski

The RUN/STOP–RESTORE sequence generates a nonmaskable interrupt (NMI) signal which should stop whatever program is running and exit to BASIC. Briefly toggling the NMI line with a short pulse causes the reset to occur. There's a capacitor on the line for collecting the charge and then releasing it as a pulse. To make it all work properly, the RESTORE key must be pressed and released within a very short period of time.

What all of this means is that you must push RESTORE down and then quickly let go of it. The pressure doesn't matter, although if you're fast you're likely to be firm, so it might seem that it's necessary to be "quick and sharp." The important thing is that your keypress be quick. This advice applies only to the 64. The circuitry in the 128 seems to be different; a light press of the RESTORE key suffices in both 128 and 64 mode.

Calculated GOTOs

I've been working on translating a program from another computer to the 64. The other computer allows you to GOTO a variable, GOTO LN, for example, where the variable LN is predefined to be a certain line number in the program. Is there any way to get the same effect in Commodore BASIC?

Larry Knox

Some BASICs permit calculated GOTOs and GOSUBs, as you've noted. Some other versions of BASIC and other languages allow labels; you might name a certain routine DRAWSCREEN and then GOSUB DRAWSCREEN, for example. Neither of these options is available in the various Commodore BASICs, although there are language utilities that add this capability.

You can simulate calculated branches with the ON-GOTO and ON-GOSUB constructions. The target line numbers follow the GOTO or GOSUB and the variable after ON determines which line is chosen. For example, **ON LN GOTO 400, 110, 30, 1000** *branches according to the value of LN. If LN equals 1, the program goes to 400; if it's 2, the program goes to 110; and so on.*

You could also insert several IF-THENs:

```
620 IF LN=930 THEN 930
630 IF LN=1052 THEN 1052
640 IF LN=5 THEN 5
```

If the program you're translating won't work without calculated jumps, you may use the following short machine language program. It copies the Commodore 64's BASIC from ROM into underlying RAM and then changes the part of the GOTO and GOSUB statement that evaluates a line number. As long as this modified BASIC is active, any formula or variable will be considered an acceptable argument for GOTO and GOSUB.

```
AM 10 C=0:FORA=828TO885:READB:
      C=C+B:POKEA,B:NEXT:IFC<>
      6599THENPRINT"DATA ERROR
      "
RX 20 SYS 828:PRINT "{CLR}ACTI
      VATED"
KA 30 DATA 169,0,133,95,133,90
      ,133,88,169,160,133,96,1
      69,192,133,91,133,89,32
FB 40 DATA 191,163,160,1,185,1
      10,3,153,161,168,136,16,
      247,160,5,185,112,3,153
BJ 50 DATA 52,3,136,16,247,165
      ,1,41,254,133,1,96,52,3,
      32,138,173,76,247,183
```

Delete A Mass Of Lines

Is there an easy way to erase several BASIC program lines at once? For example, how would I delete lines 109–385 without typing each line number individually?

John Turton

The 128, Plus/4, and 16 have a DELETE command. To get rid of lines 109–385, simply enter DELETE 109–385.

It's not as easy on the VIC and 64. There are a number of programming utilities available that include a command for deleting a block of lines. If you don't have such a program, here are two suggestions.

Instead of typing the line numbers yourself, use a FOR–NEXT loop. Clear the screen and type ***FORJ=109TO119: PRINTJ: NEXT****. After the numbers have been printed, press the HOME key move to the top of the screen and then cursor down to the first line number. Keep pressing RETURN until the cursor reaches the bottom of the list of numbers. Now go back to the top of the screen and change the numbers in the FOR-NEXT loop. Continue until all the lines you didn't want have been deleted.*

If you need to delete a very large section of the program, try this program:

```
60000 SL=100
60010 EL=200:IN=10
60020 IF SL>EL THEN END
60030 PRINT"{CLR}";
60040 TL=SL+IN*6:IFTL>EL THEN
   {SPACE}TL=EL
60050 FOR J= SL TO TL STEP IN:
    PRINT J:NEXT
60060 PRINT"60000 SL=";TL+IN:P
   RINT"GOTO 60000"
60070 POKE198,10:POKE631,19:FO
   RJ=632TO640:POKEJ,13:NEXT:E
   ND
```

Before you type GOTO 60000, change the variable SL to the first line number you want deleted, EL to the ending line, and IN to the increment. The program as it appears here will delete lines 100–200 in steps of ten. The key to this routine is

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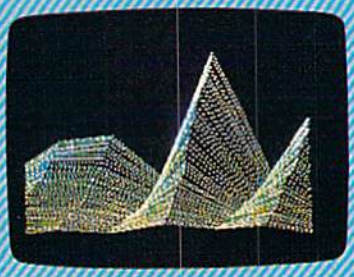

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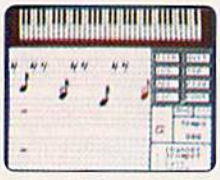

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the dynamic keyboard technique in line 60070. The POKE to 198 tells the computer that ten keys have been pressed. POKE 631,19 puts a HOME character, CHR$(19), into the first position of the keyboard buffer. The rest of the buffer is filled with 13's (RETURNs). When the program ends, it moves the cursor to the top line and simulates presseing RETURN nine times, on top of the empty lines that were printed to the screen. Then it enters a new line 60000, with a new value for SL, and executes the GOTO 60000 on the screen. It continues deleting lines until it reaches the value in EL.

Erasing Hi-Res Shapes

I'd like to ask if you could write a program that adds a few more commands to the Commodore 128. The commands would be UNPAINT, UNDRAW, UNCIRCLE, and UNBOX. These commands should erase various shapes from the graphics screen.

Celso A. Duran

A program for erasing shapes isn't necessary; the PAINT, DRAW, CIRCLE, and BOX commands already have the ability to erase. For example, here's one way of using DRAW:

```
DRAW 1,50,60 TO 80,40
```

This translates to "draw a line in color 1 from x/y coordinates 50,60 to coordinates 80,40." Color source number one is the current foreground color, which you set with the COLOR command. COLOR 1,5 would set the current color to purple. In multicolor mode, there are two additional colors available (color sources two and three).

Don't forget that there's one more color source. Color zero is the background color. To erase the line just drawn, enter this line:

```
DRAW 0,50,60 TO 80,40
```

This technique of using color zero also works for BOX, CIRCLE, and PAINT. Of course, you must know the size and location of the shapes before you can erase them.

Machine Language Listings

Are there functions in the 128's machine language monitor that aren't listed in the manual? What I need to know is how to send a section of memory to the printer.

Patric Reysen

There are two ways to look at a section of memory from the 128's ML monitor. The D (disassemble) command lists a machine language program using the standard three-letter mnemonics. If D is followed by a single memory address, the disassembly prints enough to fill the screen (you can then type D by itself to look at another

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screen). If you follow the D with two addresses separated by a space, everything between the two addresses is disassembled.

The second method to look at memory is the M (memory dump) command. It too can be followed by one or two addresses. The contents of memory will list as hexadecimal numbers on the left, ASCII characters on the right.

Both of these commands default to the screen. If you'd like a printout, start from 128 mode (in BASIC) and type the following line (assuming your printer is device 4, as is most often the case):

OPEN 4,4: CMD4: MONITOR

Now you can disassemble or display memory and the results will be sent to the printer. When you've finished, type X (to eXit to BASIC) and enter ***PRINT #4: CLOSE4****.*

This method for printing from the monitor will also work on the Plus/4 and 16, and with add-on monitors for the VIC and 64—including Micromon *or* Supermon*—if you substitute the appropriate SYS in place of the MONITOR command.*

Trouble With BOOT On The 128

I'm having a perplexing problem with my 128 and 1571 disk drive. When I try to scratch a program on certain disks, I get a 71,DIR ERROR,36,13 message, although the file is properly scratched. Also, sometimes errors happen in DSAVEs, occasionally leaving a splat file, but usually the file is saved correctly.

The hitch is that it always seems to happen on autoboot disks. Is there something about a boot sector that confuses the BAM of a disk? Is there a way to avoid this problem?

F. Alexander Jackson

Several problems can result from the use of autoboot sectors on the 128. First some details about how 1571 disks are organized:

Although the 1571 is a double-sided drive, it always tries to write to side 1 before using side 2. Filling up side 1 first makes 1571 disks at least partially compatible with the single-sided 1541 drive. There are 35 tracks on each side of the disk, numbered 1–35 on the front, 36–70 on the back. Track 18, in the middle of side 1 of the disk, is reserved for use by the directory. The first of its 19 sectors (track 18, sector 0) contains the block allocation map (BAM), which keeps track of which blocks are currently used by a program or file and which blocks are free for use in the future. The other 18 sectors can hold up to eight directory entries each for a maximum of 144 files on a disk.

When you ask the disk drive to scratch a file, it has to do two things. First, it searches through the directory for the filename. If nothing matches, the scratch operation is aborted. But if the correct file is

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found, that particular directory entry is marked as a scratched file. Next, the disk drive traces through the disk sectors holding the file, and marks them as free for future use by writing a new BAM, which is then copied to track 18, sector 0. The program or file on the disk is not actually erased, but its spot in the directory is marked as available and the BAM is changed to indicate that new programs can be stored there.

The two numbers following the Directory Error message you encountered mean that something went wrong on track 36, sector 13 on the second side of the disk. If the 1571 was in single-sided 1541 mode at the time you tried to scratch the program, it wouldn't know what to do with track 36; a 1541 is limited to tracks 1–35. A 1571 defaults to 1541 mode when first powered on. The first time you access a 1571 from 128 mode, it switches over to being double-sided. If you go directly in 64 mode, the 1571 acts like a single-sided 1541. So if you use a lot of two-sided disks, you might want to limit your SCRATCH operations to 128 mode. To scratch while the computer is in 64 mode, make sure the drive is in 1571 mode by entering **OPEN 15,8,15: PRINT#15, "U0>M1": CLOSE15**. Or, more simply, press f3 after you first turn on your computer to print a disk directory while you're in 128 mode. Do this before going into 64 mode.

Most of the problems with autoboot sectors can be solved, but whenever you solve one problem, there's another around the corner.

When you turn on the 128 or press the reset button, the computer reads track 1, sector 0 of the disk currently in the drive. If it finds the letters CBM (ASCII values 63, 62, and 109), it loads that sector into memory at 2816 ($0B00) and follows the machine language instructions there. These instructions can do a variety of things: load and run a program, load CP/M, change the screen color, and so on. Another way to run an autoboot disk is to enter the BOOT command.

To create an autoboot disk, you must write the CBM and some other information to track 1, sector 0. If the disk is nearly full when you write this sector, you could overwrite a program or file already there, irretrievably scrambling it. Thus, the first rule of autobooting is to start with a newly formatted disk, just to be safe.

This leads to the second question. When you save programs or otherwise write to an autoboot disk, can you prevent them from overwriting track 1, sector 0? If the sector is not allocated in the BAM, there's always a chance that your autoboot sector will be overwritten sometime later. In theory, the answer would be to use the Block-Allocate (B-A) command. But that command is known to have some bugs; telling the disk drive to allocate an already allocated sector causes the whole track to be allocated. The answer is to read the BAM into memory from track 18, sector 0, modify it to protect your autoboot sector, and write it back to disk.

With the autoboot sector allocated in the BAM, it's safe from future disk operations. It's safe, that is, until you clean up the disk with the 128's COLLECT command (also called the disk Validate operation). COLLECT makes the disk check every file in the directory against the BAM, to make sure the proper sectors are marked as allocated. The autoboot sector may be allocated, but if there's no corresponding directory listing, COLLECT will de-allocate the sector, leading to the possibility that it will be overwritten in the future. To prevent this from happening, you could write a false name in the directory and point it to track 1, sector 0.

Now a new problem arises. When COLLECT finds your false file, it will go to the first two bytes of track 1, sector 0, to find the link to the next sector. Recall that an autoboot sector's "signature" is the three letters CBM. The disk drive may interpret the numbers 99 and 98 as pointers to track 99, sector 98, neither of which is legal on the 1541 or 1571. This could then lead to the Directory Error.

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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.

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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.

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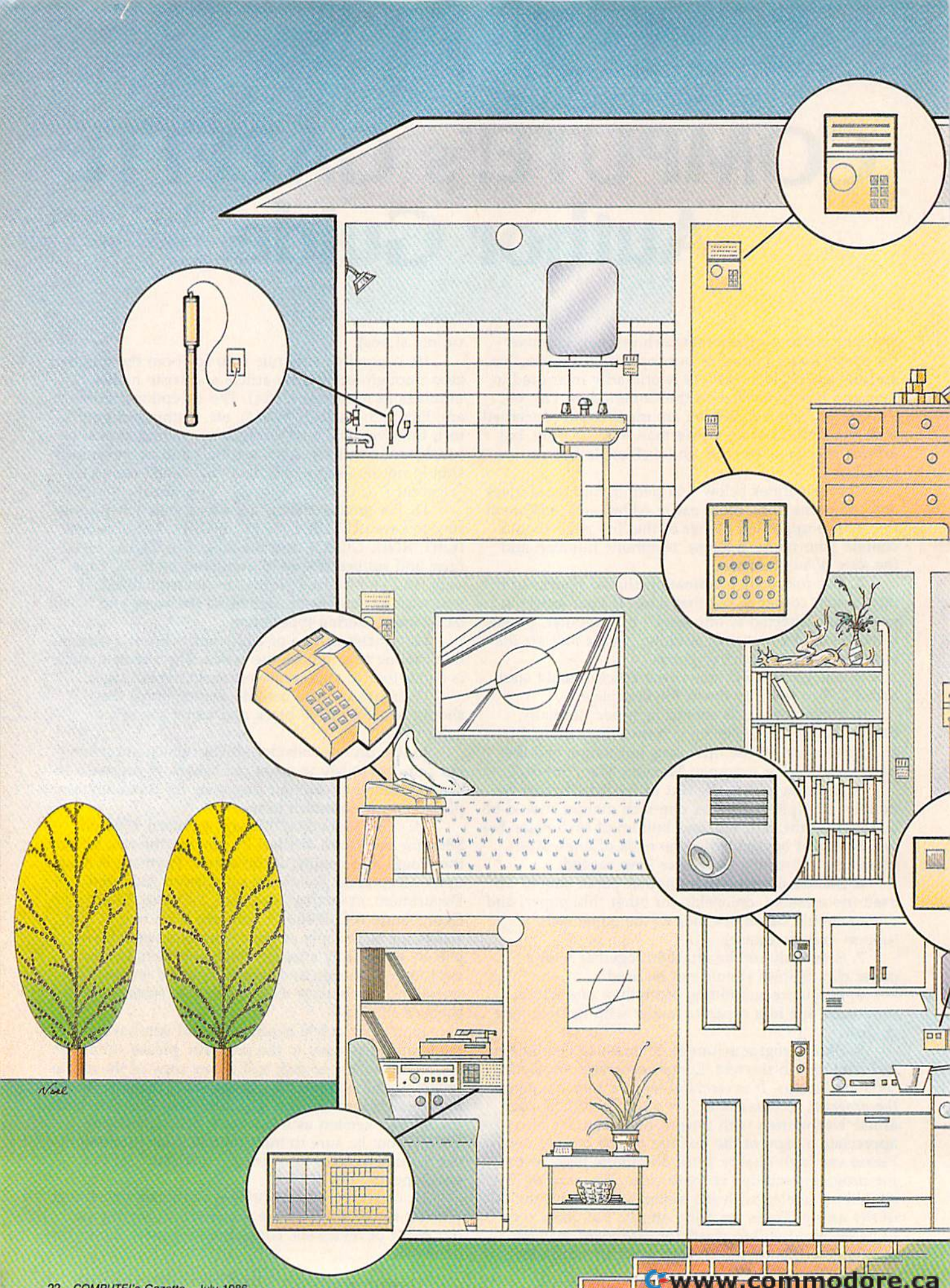

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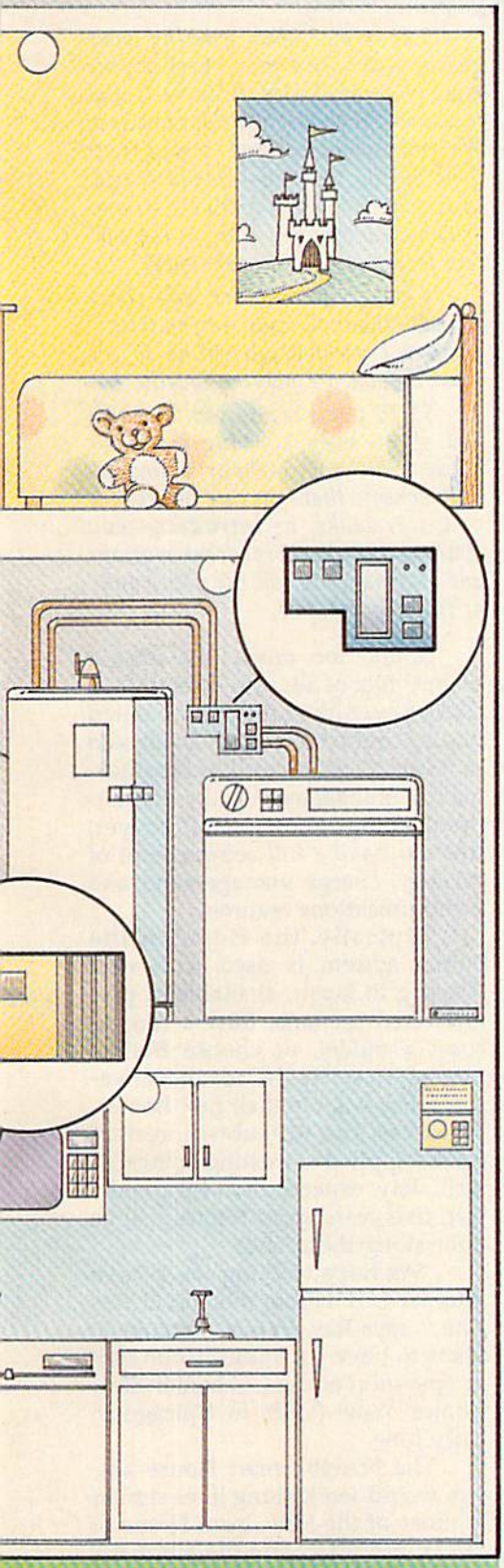

THE SMART HOME

Selby Bateman, Features Editor

The typical American home—with its antiquated electrical wiring and separate power, appliance, and entertainment devices—may soon be a relic of the past. Newer, smarter, automated houses are being developed here in the United States and in Japan that promise to permanently change the ways we interact with our home environments. In the meantime, a number of home control products are already available to Commodore computer owners.

The emerging electronic home goes by a variety of names:

• The giant Japanese electronics firm, Mitsubishi, has developed an Invisible Silent Robot (ISR) that controls the Home of the Future.

• The U.S. National Association of Home Builders (NAHB) and some 30 American electronic companies call their concept the Smart House.

• In Europe and Japan, the concept of Home Bus is used to describe the integration of a wide range of consumer appliance and entertainment products interconnected by a "bus" wiring system that carries power, communication, and signal distribution throughout the home.

Whatever the name—home automation, electronic house, and the like—the effect is the same. The advancing microprocessor-based technology that has fueled the computer industry is now causing a massive rethinking of how we can wire, illuminate, safeguard, heat and cool, and even *communicate with* our homes.

Although the specific electronic protocols and electrical standards vary, there are more similarities than differences among the various

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initiatives. At the heart of tomorrow's electronic house is a standardized wiring system that carries digital data from either a central controller or a family of interconnected mini-controllers. The electrical outlets will feed different types of information to computers, audio-video systems, appliances, heating and cooling systems, and virtually anything else plugged into the home. The system will not only be easy to run while you're in the house, but also accessible—and controllable—by telephone when you're away.

Standards for the electronic house of the future will probably be adopted within the next two or three years, either by common consensus or a more formally adopted plan, says Dany Ray, director of marketing for Mitsubishi Electric's U.S. operations. A common bus protocol has already been informally adopted by several Japanese companies, and almost a thousand high-tech homes have been built in that country, he adds.

In the U.S., the NAHB, along with such companies as Apple Computer, Whirlpool, Philips, AT&T, Carrier Corporation, and others, have been lobbying for a new home electrical standard as part of the foundation for its Smart House planning. The National Electrical Code—the agency that regulates wiring standards in the U.S.—has already given preliminary approval for the NAHB group to proceed with plans for a different wiring system. And the same collection of companies has asked the Justice Department and the Federal Trade Commission for the right to work together on more plans, under the 1984 National Cooperative Research Act.

Our homes today actually contain wiring systems that are little changed from the turn of the 20th century. What's being proposed now is a central wiring system that uses tiny microprocessors in everything from microwave ovens and television sets to the electrical wall outlets into which you plug lamps, stereo sets, refrigerators, computers—virtually anything electrical.

In the Mitsubishi plan, the Home of the Future revolves around the Invisible Silent Robot (ISR), the brains behind the company's home automation system. The ISR is not a robot in the sense familiar to most of us—such as C3PO and R2D2 of *Star Wars* fame. Rather, it's a centrally located monitor and control system, or one of several remote controllers, which coordinates an army of sensors throughout the home.

To better visualize how such a system might interact with you, Mitsubishi offers the following "typical" day in a Home of the Future:

7 a.m.: Tumble out of bed and enjoy a cup of coffee that's been brewed while you slept; read your online newspaper that's been delivered to your computer or television set electronically. Then, before work, quickly check the stock market reports by electronic data link.

9 a.m.: Shortly after your arrival at the office, you get the uneasy feeling you forgot to lock the back door. Reach for the telephone. By punching in a code, your door is now locked and that's confirmed by synthesized speech via the phone line. If a security breach had occurred, your automated home would have automatically notified the police, again using synthesized speech to report to them the location and nature of the disturbance.

10 a.m.: A sudden rain storm threatens, so a quick phone call home cancels the automatic sprinklers in the garden. At the same time, you realize your utility bill is due. You instruct your "home" to deliver the check electronically.

1 p.m.: The sun is now shining, so you tell your ISR to close the curtains on the west side of the house to block out the heat.

5:20 p.m.: Stuck in rush-hour traffic, with guests due at your home soon, you use your car phone to activate the air conditioner, turn on the lights, and unlock the doors for your guests.

5:45 p.m.: After greeting your guests, you make a quick check of your mail (electronically delivered) and look over the hard-copy color prints of everyone who has come to your front door during the day—an old friend, your neighbor, and a complete stranger (whose photo you store in the system for possible later reference).

8 p.m.: After dinner, you check your 90-channel, multi-screen television, and possibly go online to see what movies are playing locally.

11:30 p.m.: Lights out, and you nod off to sleep knowing that your house gives you 24-hour protection with sensors that—in case of fire, gas or water leaks, or intruders—can warn you with a broadcast message and automatically call the police and/or fire departments.

Sound too much like science fiction? Not at all, says Mitsubishi's Dany Ray. Although the automated houses that have already been sold in Japan don't have all of the information management and entertainment components installed yet, they do have a full complement of security, energy management, and communications features.

Typically, the Home of the Future system is used with new housing in Japan, available in prefabricated sections. Buyers can inspect a model, or choose from a catalog, to select the advanced features they want in their new homes. However, the Mitsubishi system can be applied to existing homes, as well. Ray expects that within the next five years, most homes will be built along these lines.

"We hope to bring the system into the U.S. before the end of this year," says Ray. In fact, Mitsubishi plans to have a demonstration unit in operation at the Consumer Electronics Show (CES) in Chicago in early June.

The NAHB Smart House system would work along lines similar to those of the Mitsubishi Home of the Future plan. And the emphasis in both concepts is on ease of use,

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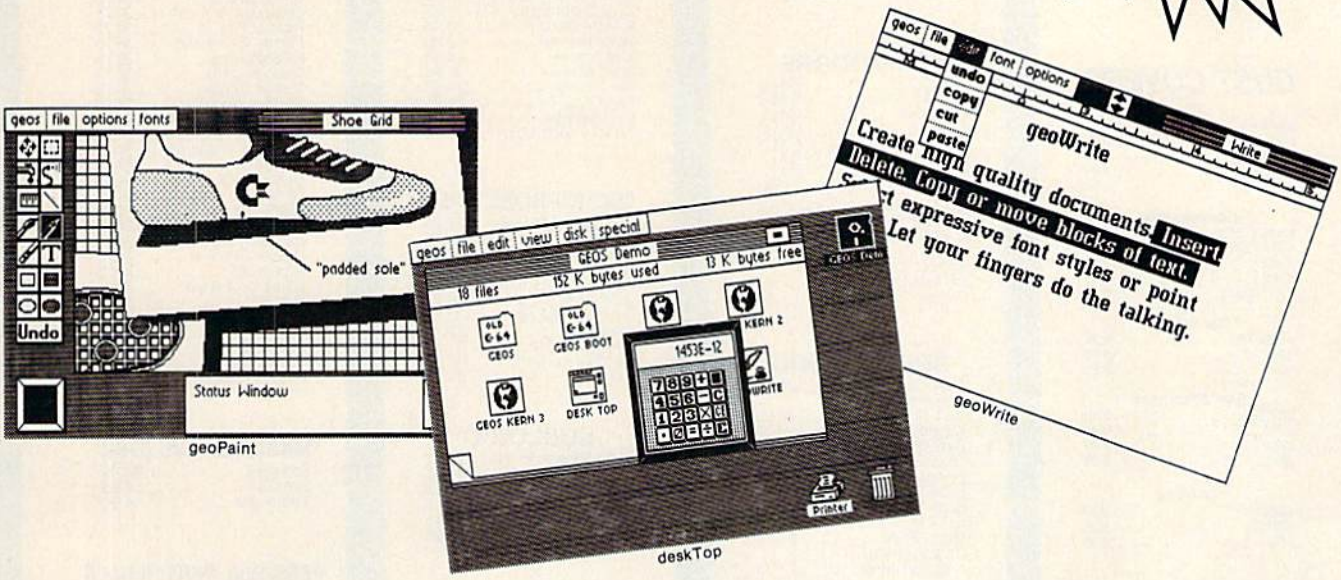

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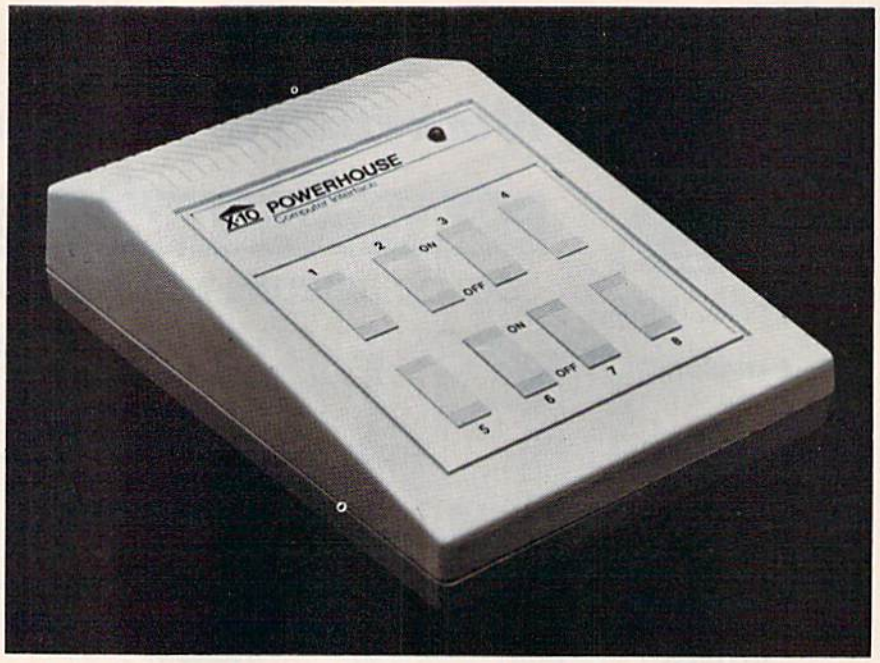
says Ken Geremia of the NAHB.

"The range of appliances that are in the house—whether it be a dishwasher, a washing machine, a dryer, a microwave oven, a VCR, or just a plain alarm clock—every one of these is now addressed differently in order to set them. With a Smart House system, you have one common way to set all of these," he says.

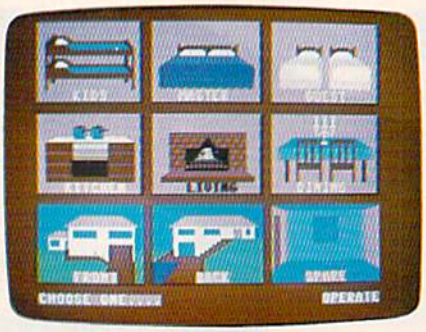
The NAHB estimates that the Smart House concept will be on the market by early 1988. The group's market projections, supported by independent market research firms, call for a half-million Smart House construction starts per year by 1991. That number will grow to more than a million annual housing starts by 1995, says Geremia. And retrofitting of existing homes and commercial properties is expected to be economically feasible by the end of this decade.

As with the Mitsubishi home automation system, the Smart House depends on a system of wiring that is *intelligent* enough to distinguish among the many different kinds of signals that run through the same cables. There are basically three different electrical distribution functions that the Smart House will handle: power signals, control and data signals, and audio-video signals. The common two- or three-pronged electrical outlets found in today's homes will be superseded by an outlet system that will more closely resemble a typical computer interface. The system will be able to determine what kind of product is being plugged in, and react accordingly. That means, for example, that electrical outlets will also be safer. Since power will only be sent when a legitimate device is plugged into the outlet, the dangers of accidental short circuits and electrocutions will be virtually eliminated.

One of the most remarkable aspects of the electronic home idea is that very little of what's planned is new. As the NAHB's Geremia says, "We're not reinventing the wheel, just making it roll more smoothly."



The X-10 Powerhouse computer interface plugs into your Commodore computer to allow you to easily program lamps, appliances, thermostats, and many other items—but, it doesn't tie up your computer when in use.



With the X-10 system, you choose from among different pictures, or icons, to select which rooms and electric items you want to program.

Already a number of companies are involved in a variety of ways with the movement toward the Home of the Future and Smart House concepts. Sala Communications in Holland has published issues of a magazine called *Home Bus Info*, a publication about residential control and monitoring (U.S. office, 159 Calumet Street, Boston, MA 02120), that tracks the latest news about this quickly evolving industry. Another publication, *Electronic House—The Journal of Home Automation* (524 E. McKinley Ave., Mishawaka, IN 46545) also offers news and feature articles on electronic homes. Several large mail-order electronics companies, such as DAK industries (8200 Remmet Ave., Canoga Park, CA 91304) and JS&A (One JS&A Plaza, Northbrook, IL 60062), have already begun offering home control products. Another mail-order house, SmartHome Shopper (274 E. Hamilton Ave., Suite B, Campbell, CA 95008), offers a *Home of the Future Design Kit*, a free 24-page catalog that also includes basic information on the fundamentals of home control.

For those interested in immediately gaining some of the benefits of a home of the future, there are several companies that sell home control packages at affordable prices. One of the most popular of these is the $69.99 X-10 Powerhouse system (X-10 USA, Inc., 185A Legrand Ave., Northvale, NJ 07647), an easy-to-use package that includes a controller interface that plugs into the 64 or 128 as well as a software program that lets you control up to eight different items: appliances, lamps, wall switches, and thermostats, for example. There's even a separate mini-controller available that lets you manually control lights and appliances from your bedside, or other locations in the house. Every item that you want to preset must be plugged into separate X-10 modules ($16.95) or BSR modules.

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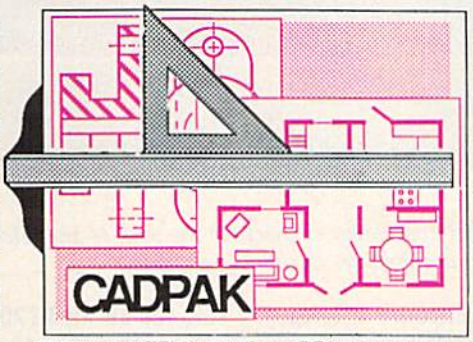

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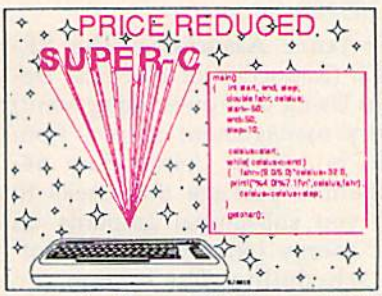

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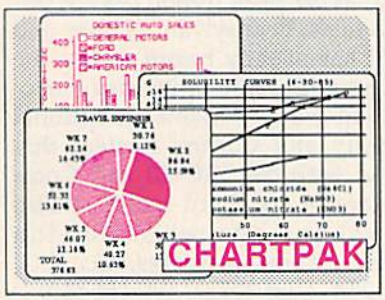

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The HomeMinder main controller connects to the back of any television set and is programmed with the hand-held programmer. The TV screen generates displays to simplify programming.

disconnect the controller interface, and your computer is freed. The interface itself controls the modules. An easy to follow system of pictures, or *icons*, is used during setup. You don't need to know how to program and you don't need a degree in electrical engineering. The system lets you preset items anywhere in the house. Do you want to tell your television set to come on first thing in the morning? Do you want your coffee brewed and hot when you awaken? How about having the heater or air conditioner automatically activate before you arise, shut down when you leave for work, and come on again before you return home? The system allows all of that and much more. Additionally, you can install a burglar alarm, a remote-controlled telephone responder, and several other controllers that work with the basic X-10 package.

A similar approach is taken with the $500 GE HomeMinder system from General Electric, a stand-alone home control package that doesn't use a computer as a part of the setup process. (General Electric Consumer Electronics Business Operations, Portsmouth, VA 23705.) The system's controller is plugged into a television set for programming, rather than through a computer. Users then interact with the system in much the same way that they do with the X-10 package. The HomeMinder even uses many of the same modules that work with the X-10 Powerhouse. The HomeMinder can also be purchased as a built-in part of one of GE's 25-inch color television sets for about $1200.

Although the X-10 Powerhouse and HomeMinder systems offer especially easy to use and comprehensive features that don't tie up your computer, they're by no means the only home control products available. Among those that work with your Commodore computer are the following:

• **Genesis Computer Corporation:** Genesis markets the $69.95 VIController, which plugs into the user port on either the Commodore 64 or VIC-20 computer, letting you automate lights and most appliances. The controller works with remote switches from BSR, Leviton, Sears, and Radio Shack. Three software programs come with the VIController—*Manual*, *Time Control*, and *Super Schedule*—that allow you to get started with different home control functions right away.

Although this type of system does require the use of your computer as a dedicated controller, remember that the discontinued VIC costs less than a hundred dollars and the 64 less than $150. Those aren't bad prices for smart controllers.

Genesis also offers the COMsense input device ($69.95) that plugs into the VIC or 64's joystick port, providing four open-close inputs and two analog-to-digital inputs. When used with the VIController, additional security and control systems can be developed.

The $19.95 *Super Schedule Plus*, also from Genesis, is an integrated control program that lets you use any combination of Genesis home control products. It contains an expanded seven-day and 700-event scheduler. (Genesis Computer Corporation, 1444 Linden St., P.O. Box 1143, Bethlehem, PA 18018.)

• **Jance Associates:** The REDUCE (Reduction of Electrical Demand Using Computer Equipment) energy management system from Jance is a $250 Commodore 64-compatible package that seeks to save you substantial amounts on your energy bill through time-of-day scheduling. The system can automatically send signals to different appliances and other devices, so that you can program their work to occur at off-peak hours, paying off-peak rates. Pennsylvania Power and Light has already begun testing the system with some of its customers.

Jance also markets an optional Security and Control System that works with the VIC-20 and Commodore 64, in a hard-wired version ($195) and a wireless version ($349). (Jance Associates, Inc., P.O. Box 234, East Texas, PA 18046.)

• **Proteus Electronics:** The Simple Interface Analog Data Acquisition System for the VIC-20, 64, and 128 computers consists of Proteus Electronics' $34.95 Simple IF interface card that plugs into the computer's expansion port and the $64.95 analog data acquisition conditioner (ADAC), which plugs into the input connector of the Simple IF card.

With this combination, you can digitize 16 channels of analog signals, using the computer for tasks such as heating, cooling, and solar control; voltage measurements; robotics; weather station monitoring;

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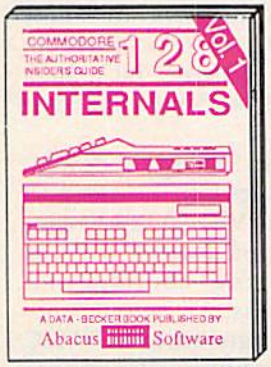

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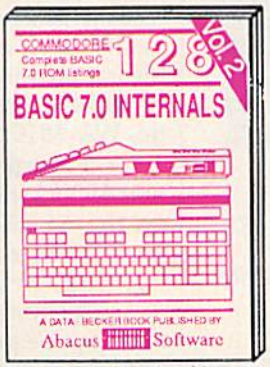

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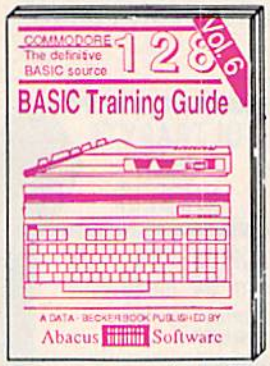

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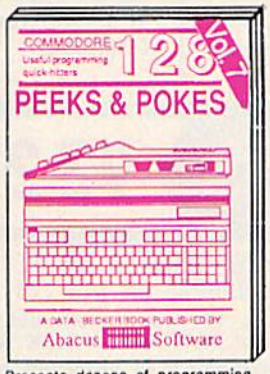

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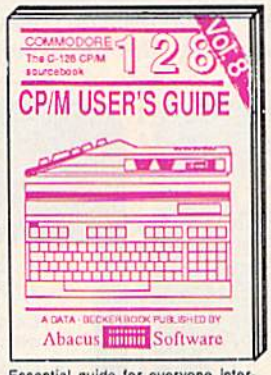

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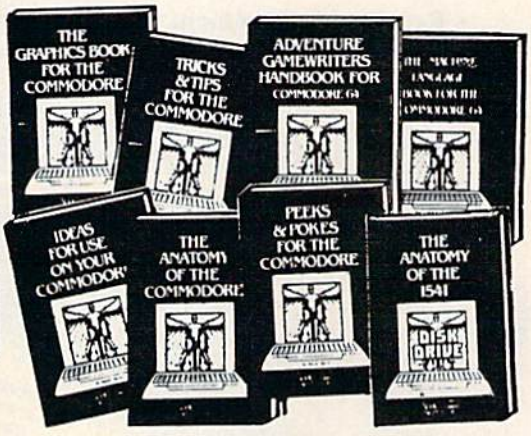

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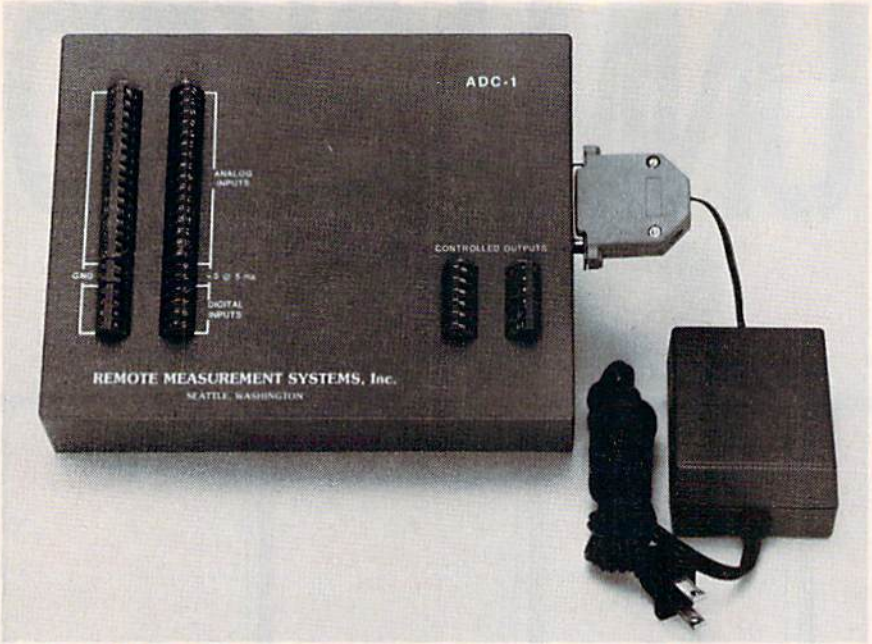

The ADC-1 from Remote Measurement Systems is a sophisticated analog-to-digital data acquisition and control system that plugs into the 64 or 128.

and similar control applications. (Proteus Electronics, Inc., RD #2, Spayde Rd., P.O. Box 693, Bellville, OH 44813.)

• **Remote Measurement Systems:** The ADC-1 is a $449 analog-to-digital data acquisition and control system that will work with the Commodore 64 and 128, as well as any RS-232-compatible computers. The system lets you collect analog data from the environment—such as temperatures, energy consumption, and light intensity—and then translate that into digital data. The ADC-1 is already being used with Commodore computers for a variety of control and monitoring needs in scientific research, product testing, meteorological measurements, and other areas. (Remote Measurement Systems, Inc., 2633 Eastlake Ave. East, Suite 206, Seattle, WA 98102.)

• **Savergy:** Savergy's Powerport $99.95) plugs into the user port on the 64 and VIC-20, and regulates up to eight devices, such as lighting, heating, cooling, and sprinkler systems. All output functions can be programmed in BASIC and stored in memory. The company also offers the $479 CIM 112 for the 64, which can be used to control heavier appliances. (Savergy, Inc., 1404 Webster Ave., Fort Collins, CO 80524.)

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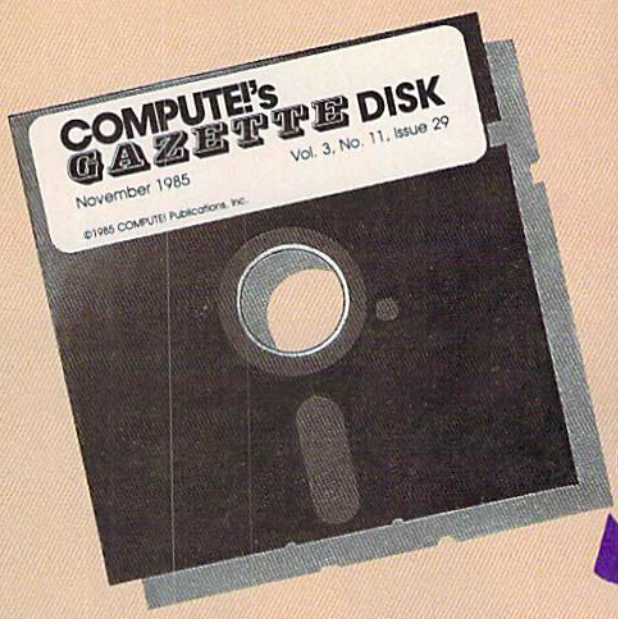

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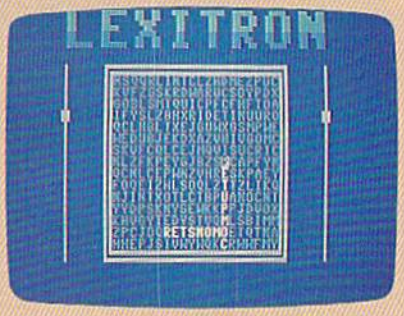

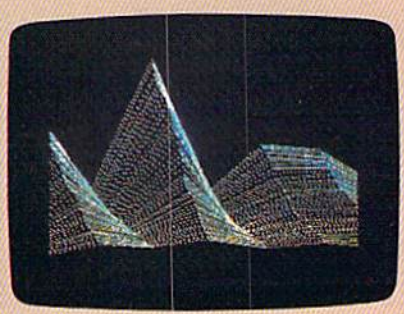

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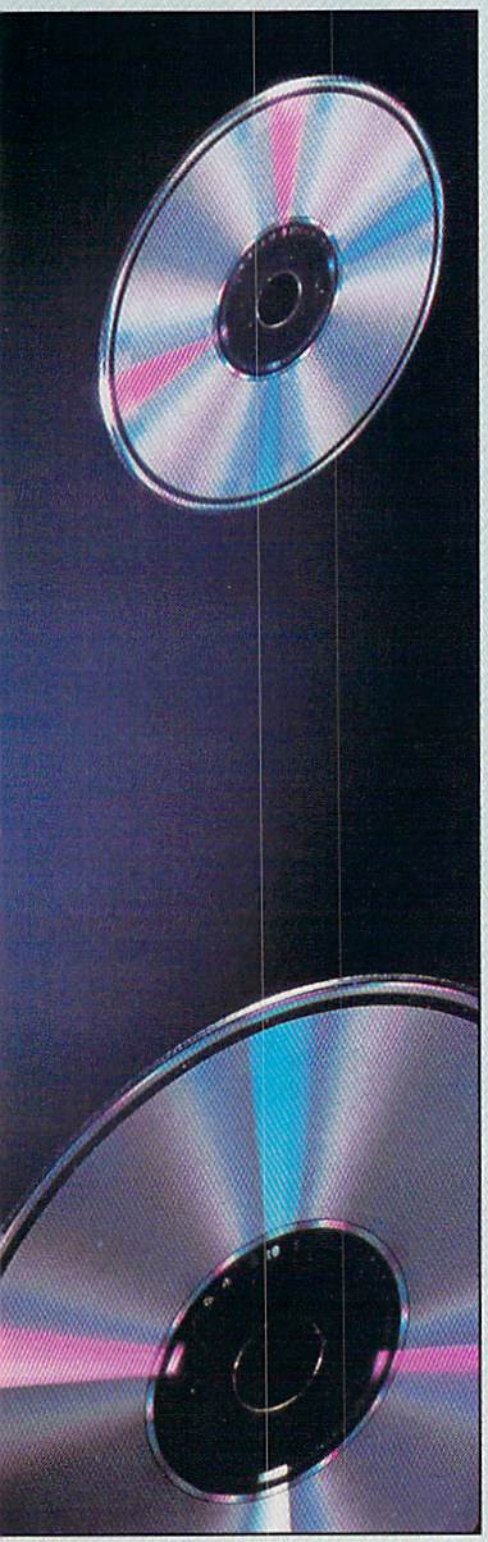

LASER TECHNOLOGY MOVES INTO THE HOME

Kathy Yakal, Assistant Features Editor

Our traditional notions of education, entertainment, and information retrieval are in a state of change. Personal computers have been instrumental in that process for many people. Now the marriage of microprocessors and laser disc technology is creating an even greater uproar in the consumer electronics market worldwide. Familiar hardware manufacturers, software and information publishers—as well as some major players previously unassociated with the computer industry in this country—are scrambling to deliver some exciting new products.

Every major invention is greeted with skepticism. When Thomas Edison invented the light bulb, people thought: *That's an interesting way to get light, but who needs it?* Though they were amazed at this magical light source, their homes were already illuminated with gas lamps or fireplaces or candles. Changing over to electricity would mean wiring their homes, involving a lot of time and expense. And who was going to manufacture these little glass bulbs? How much would they cost?

When the first automobiles stalled in the middle of town, their proud owners were told, *"Get a horse!"* Everyone already had horses and buggies, so why would they need these big clunky metal contraptions that made a lot of noise and often didn't start? Besides, the roads weren't good enough for cars. And where would all that fuel come from? Would you have a gas tank in your back yard? Buy it at a store?

The number of applications made possible by a new technology—and the inventions that follow it—depends on the magnitude of the technology. The early pioneers who explored the possible applications of electricity probably didn't imagine things like automatic car washes and electric toothbrushes and ceiling fans. But along the way, many major inventions have been accepted by the mass market, creating new industries and supporting dozens of smaller spin-off industries.

The discovery of laser technology 25 years ago was a similar phenomenon, the creation of a force that would have astounding impact in many areas which were as yet unknown. Though its inception was quite a breakthrough, laser technology as pure science may not be that interesting to the average consumer. But its applications have

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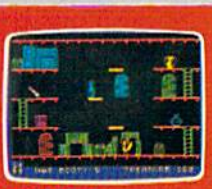

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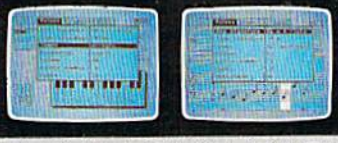

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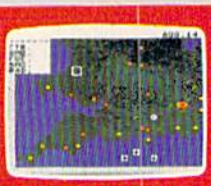

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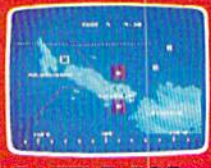

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COMMODORE 64/128K

had, and will continue to have, great impact on how you work and spend your leisure time.

Compact disc (CD) technology—using miniature lasers to read digitally encoded sound and data stored on small plastic-coated aluminum discs—is entering its third stage of development for the consumer and business markets. *CD-audio* players offer incredibly pure sound quality in affordable home stereo systems. *CD-ROM* (Read-Only Memory) players, which are capable of reading the megabytes of data that can be stored on a compact disc, may soon become a familiar part of your workplace or school. And the recently proposed specifications for *CD-Interactive* (CD-I) suggest an environment that will allow the mixing of sound, text, and graphics on one disc, read by a laser-driven player that can understand all three. We're only beginning to sense the breadth of applications which will be made possible by this powerful combination.

If you think about it, most inventions just provide a better way to do things that we can already do. We've always been able to move from one place to another, but cars let us do it faster. We've had light since fire was discovered, but light bulbs are more convenient than campfires.

People have always made music of one kind or another, but it's only been in the last century that we've been able to record it and play it back. And until a couple of years ago, vinyl records and magnetic tape have been the only physical media capable of delivering recorded music. And they have two shortcomings: poor durability and limited sound quality. Even the most expensive stereo system can't correct hisses and pops and other distortions on a recording. Vinyl records scratch and break; tapes can degrade over time, melt, or get jammed; and even a diamond stylus wears out.

In 1980, Japanese electronics manufacturer Sony and N.V. Philips of The Netherlands jointly announced specifications for a home stereo system that would get around both problems: compact disc audio. The system consisted of a small aluminum disc on which music could be digitally encoded, and a player that used a low-power laser to read the microscopic pits and change them back to analog sounds. The result is impeccable sound quality with virtually no wear on the disc, since nothing actually touches it during the playing process.

The specifications were accepted, meaning that every electronics company that started manufacturing units built them to the standard, insuring that every compact disc player would be able to play any CD. The first systems started appearing in 1983, and now in 1986, you can buy a CD player for as litle as $200, and choose from hundreds of CD titles.

In the same year that the proposed audio players became a reality, Sony and Philips again announced tentative specifications for another way to use CD technology: Compact Disc Read-Only Memory (CD-ROM). Slightly modified CD players, interfaced with personal computers, could be used to read digitally-encoded data off discs. Though you can only get about an hour of music on a compact disk, you can store about 550 megabytes of data. That's about a quarter of a million pages of text. And with the right software, you can retrieve any information stored there in seconds.

The first and most logical application for CD-ROM is reference material. Grolier Electronic Publishing, in tandem with Knowledge Set (formerly Activenture), the company that developed the retrieval software, has, since last June, been shipping a CD-ROM package that consists of a Philips player, an interface board for the IBM-PC, the *Knowledge Retrieval System* on a floppy disk for the IBM, and a CD that contains the complete text of the *Academic American Encyclopedia* (which only uses about a fourth of the disc). The package retails for $1,495. By the time you read this, Sony and Knowledge Set should be shipping a similar configuration called *ROMULUS*, using a Sony drive, for $995. Beyond reference material, CD-ROM is an exciting alternative for any business that needs to have fast access to the mountains of records that most companies

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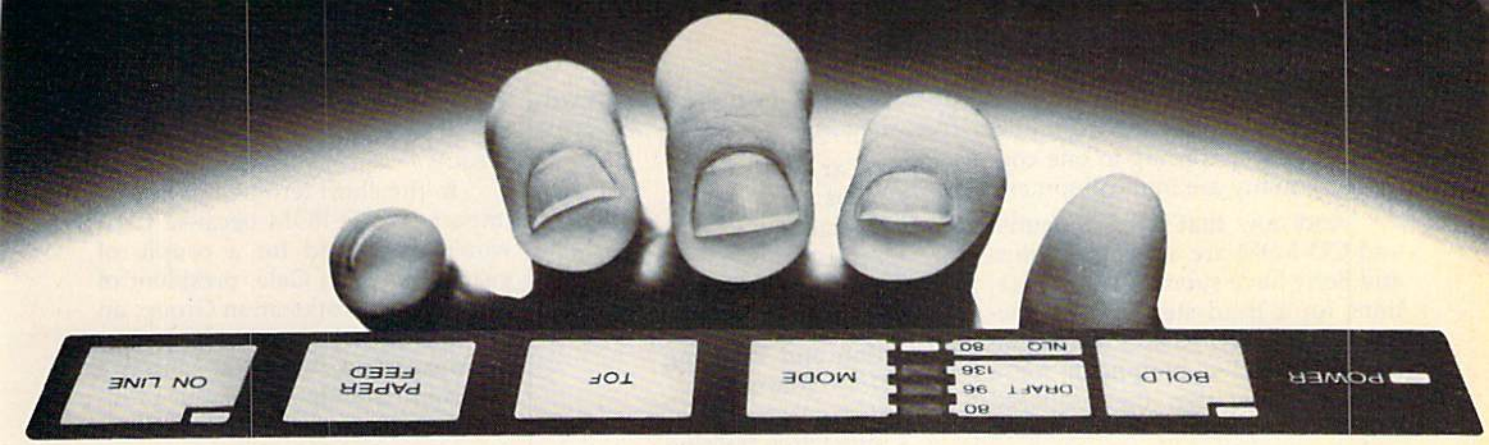

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have. Though few systems are actually operating at this writing (about three dozen, according to one consultant), many are in development.

And now that both CD-audio and CD-ROM are a reality, Philips and Sony have submitted specifications for a third step: CD-Interactive. Unlike CD-ROM, which can be considered a peripheral for a personal computer, the proposed CD-I is a system: a 68000-based microcomputer system which includes a CD-ROM drive. If all goes well in the current compatibility negotiations, by early 1988 you should be able to buy a CD-I system that will play audio discs, CD-ROM discs, and CD-I specific discs. Since the specifications allow for tremendous graphics capabilities, that could mean some pretty exciting applications. Philips has divided potential CD-I applications into five categories:

In The Car
- Maps
- Navigation
- Tourist information
- Real-time animation
- Diagnostics

Education and Training
- Do-it-yourself
- Home learning
- Interactive training
- Reference books
- Albums
- Talking books

Entertainment
- "Music Plus" (music with text, notes, pictures, etc.)
- Action games
- Strategy games
- Adventure games
- Activity simulation
- "Edutainment"

Creative Leisure
- Drawing/painting
- Filming
- Composing

Work At Home/While Traveling
- Document processing
- Information retrieval and analysis

Since the February CD-I announcement, there's been widespread discussion about how CD-I will affect CD-ROM. If CD-I players can play CD-ROM discs and there's not a significant price difference between the two, will there be a need for CD-ROM-specific players in two years? Opinions vary greatly.

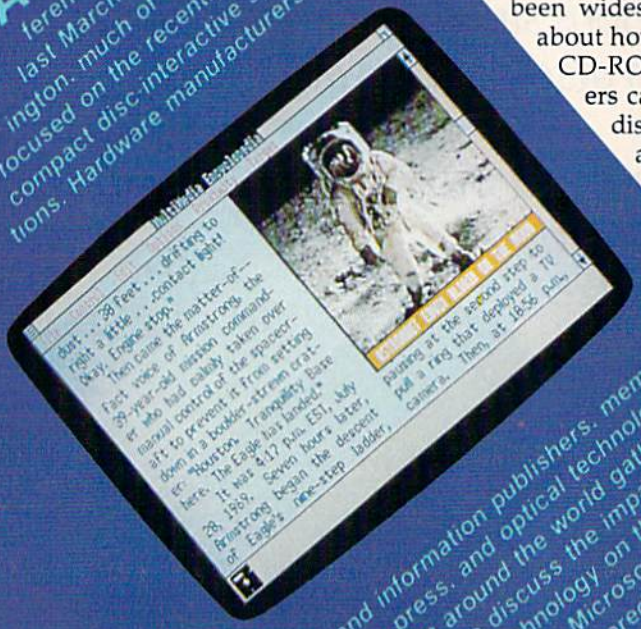
In the short term, CD-I has no impact on CD-ROM because CD-I won't be around for a couple of years, says John Gale, president of Information Workstation Group, an optical technology consulting firm in Alexandria, Virginia. "From a long-term standpoint, if the product is actually available in hardware form in early 1988, then we would theoretically start getting some impact nine months to a year after that. One of the reasons the impact would be relatively fast is that information processors have had two years to fool around with CD-ROM. That could mean they could more quickly move into using CD-I."

Representatives of North American Philips, as well as many observers, maintain that CD-I is a subset of CD-ROM, an implementation of what CD-ROM offers. That is, CD-ROM is the trunk of a tree, and CD-I one of its branches.

In reality, all three steps have been planned since 1969, when Philips engineers first started working with optical disc technology. Whether there will be a market for all three, say, four or five years down the road, seems to depend on three as yet unknown factors. First, pricing. CD-audio is now within the range of the average consumer. CD-ROM is still a bit pricey for the home, but very economical for any business that spends thousands of dollars a year retrieving information.

"I read somewhere that large banks in New York City spend millions of dollars a year calling 411 (local telephone information)," says Rob Van Eijk, marketing support manager for North American Philips. And many businesses spend hundreds of thousands of dollars every year getting information from online databases. The type of information typically stored there is easily transferred to a format that can be read by a CD-ROM player and updated occasionally as necessary. The savings, even the first year, would be

At the First Annual Conference on CD-ROM, held last March in Seattle, Washington, much of the discussion focused on the recently proposed compact disc-interactive specifications. Hardware manufacturers, software and information publishers, members of the press, and optical technology experts from around the world gathered for several days to discuss the impact of compact disc technology on the home and business markets. Microsoft Corporation, which sponsored the conference, showed a prototype of a product for CDI: The Multimedia Encyclopedia. As shown above, the product would allow access to both text and graphics, as well as sound and limited animation.



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quite substantial.

Though CD-I will likely enter the marketplace at a high price and then drop, as most home electronics products do, where it eventually settles will be important for the consumer market. For a business trying to decide whether to buy CD-I or CD-ROM, its need for extensive graphics will likely play a major role.

Second, it's still unclear whether or not CD-I discs will easily play on CD-ROM players. That may not be extremely important, say many observers. For one thing, CD-ROM players cannot access the high-level graphics supported by CD-I. And not many people will own both players. Still the market perception, the idea that you *could* play it on either one, is key.

Will this mean the end of support for the existing installed base of home computers? That remains to be seen.

"The market is not as black and white as some people think," says Anne Armstrong, managing editor of CD Data Report. "There are a lot of gray areas where it's not clear which machine would be best, like library markets. Some could be CD-I, some CD-ROM. But if you tell people that anything you buy today you'll be able to play tomorrow, they'll be more willing to make a committment."

Which isn't even a problem yet. There are only about 30 stores in this country that you could walk into and buy a CD-ROM disc and player. And the only disc you can buy is the Grolier package.

And that leads to the third and probably most important factor in the whole CD-ROM vs. CD-I debate. Who is developing software, and how much will be available how soon? Some major recording and film studios, as well as home computer software publishers, have made commitments to developing for CD-I. But that's a tall order. "They have some really complex work ahead of them," says Maureen Fleming, Editor of *Information Industry Bulletin*. "When you start doing the level of branching that CD-I involves, it's very complex. Writing a 500-megabyte program is not trivial."

And at this early stage, when most people outside of the home computer industry (and some *in* the industry) haven't even heard about CD-ROM, let alone CD-I, market acceptance is hard to gauge. Even those insiders who have been playing with the machines for months are still experimenting. "People don't know a lot yet about what this will do," says Armstrong. "They're trying all kinds of things, some of which will work and some of which won't. Like an automatic cherry pitter—it's terrific, it works, but who needs it? Still, there will be a lot of creative energy and imagination, which is bound to produce some really good products."

Though CD-I is considered a system, there may be several different configuration options that will evolve in the first year or two of its life. Initially, it may appear as a "black box" that can be interfaced with a CD-audio player and a television set. The price may be as low as $200. Some companies may package all the necessary components so that you don't have to use any of the hardware you already own. Some may decide to add a floppy or hard disk drive to the system, making it a powerful 68000-based home computer system.

Sony and Philips have spearheaded the drive of CD technology into the home, but they will probably not be the only ones manufacturing CD-I hardware. U.S. consumer electronics companies may get involved, maybe even our major home computer manufacturers—

This is the opening work screen of the *Knowledge Retrieval System*, Knowledge Set's software for the *Academic American Encyclopedia* on a compact disc, published by Grolier Electronic Publishing. After a request for a list of references to the phrase *Indo-European*, the software found, in just a few seconds, that there are 162 occurrences in 65 articles.

After getting a list of the articles, the user has asked to see the text of one of them.

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Commodore, Atari, Apple, and IBM. Hopefully, all involved will choose to build to the specified standard, meaning all CD-I software will run on all CD-I hardware, no matter what brand.

Will this mean the end of support for the existing installed base of home computers? That remains to be seen. "People originally said, *This is going to have a home computer inside and it's going to wipe out all the people who have home computers,*" says Anne Armstrong. "I don't think that's true. It will open up new possibilities of different ways of doing things. We might see some new imaginative software.

"Look what's happened in the record industry. People thought CD-audio would wipe out traditional stereos. People have bought the players and the music is so good they've gone out and bought new speakers and amplifiers. Far from killing everything off, it's caused the biggest boom this industry has ever had. The same kind of thing could happen in the home computer industry. People will see what can be done and they'll go out and buy printers and modems and stuff."

The ways in which laser technology in the home will alter peoples' lives may not bring changes of the same magnitude that electricity and automobiles brought, but doubtless the same kinds of questions will be asked. Widespread acceptance of CD-I and its descendants will depend on the answers.

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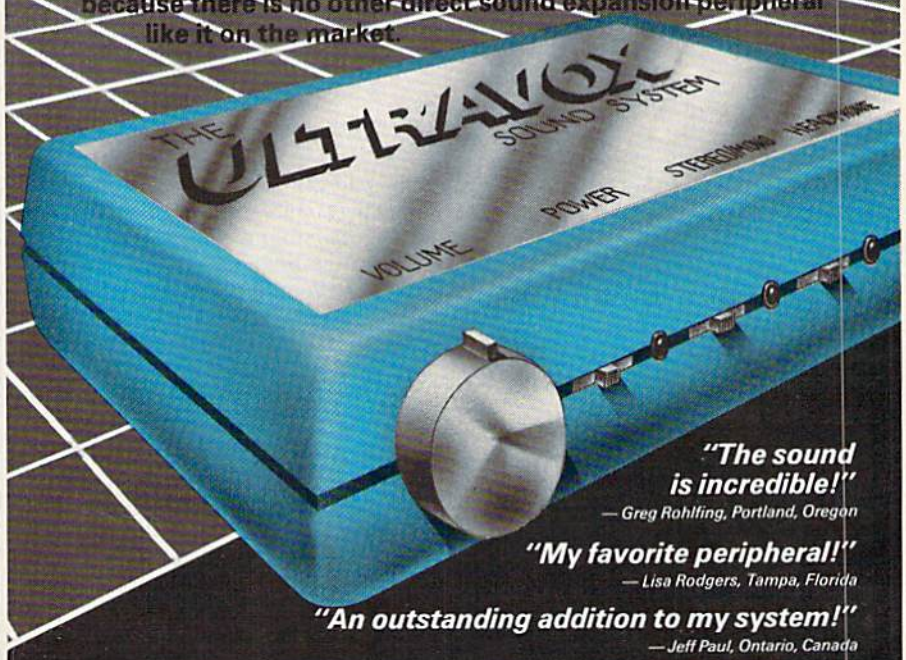

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Out-Think

A few years ago, you could classify serious applications software into three categories: word processors, spreadsheets, and database managers. These types of software take care of three basic tasks: handling words, handling numbers, and handling information.

These three applications continue to grow and evolve. The new field of personal publishing, for example, offers option-rich word processing with graphics and typeset-quality text. The technology of compact disc players—including CD-ROM and CDI—is a promising new enhancement for database management. But these and other new fields are really just variations on the big three computer applications: word processing, spreadsheets, and databases.

A fourth category of software has recently arrived, one that's not just a new way of organizing words, numbers, or information. It's a whole new category of software, usually called either a *thought processor* or an *outline processor*. Most such programs run only on the IBM or MacIntosh. *Out-Think* by KAMASOFT is the first that's available to Commodore 128 owners.

It runs under CP/M and requires at least one disk drive with 200K of storage space, so you must use a Commodore 128 in CP/M mode and a 1571 drive. An 80-column monitor, either monochrome or RGBI, is also highly recommended. It does work in 40 columns, but you must continually scroll back and forth using the CONTROL key and the gray cursor keys, which is irritating to say the least.

Two images may help explain a thought—or outline—processor. You can think of the outline as a tree with a trunk that splits into one or more branches. The branches are part of a single stem (a level back), and can have several branches of their own (on the next level forward). At any time, you can add a *leaf*, a text area of about 2K, to a branch. The second model is a family tree, where a parent can have one or more children, the children have children of their own, and so on.

An outline of this review (so far) might look like this:

1 Three applications: Word Processing, Spreadsheets, DB
  1.1 Personal publishing (wp)
  1.2 CD-ROM (db)
2 Outline processors: A fourth category
  2.1 Out-Think is first for 128
3 System requirements (CP/M etc.)
4 What is an outline?
  4.1 Tree model (stems & branches)
  4.2 Family (parents & children)
  4.3 Example so far

Editing the outline is quite simple; press U to move up to the stem above (the parent), D to move down to a branch (a child), N to go to the next branch (a sibling topic), and P to go back to the previous sibling. There are two ways to add a new branch: insert-next, for a branch on the same level, or insert-down, to add a subtopic. For example, if the cursor is on 1.2, the insert-next command would add a sibling topic 1.3, while insert-down would give you subtopic 1.2.1 (a child of topic 1.2). To start editing a text leaf, just press RETURN. There are several dozen other commands, for moving ideas around and managing topics, but these are the ones you use most. The leaf editor, which is basically a limited word processor, also has its own set of commands.

Out-Think is a writing tool, a way to organize your ideas into an outline before you run your favorite word processor (it's able to create text files which can then be loaded into *WordStar* or other CP/M word processors). But there are many other uses for this versatile program.

Out-Think is ideal for making lists. You can create a weekly calendar with seven topics (Sunday – Saturday). In the morning, you would move the cursor to the appropriate day and expand the entry to see your appointments and meetings scheduled for that day. This ability to expand and collapse parts of an outline makes *Out-Think* superior to a typical word processor, where you'd have to scroll forward through Sunday, Monday, Tuesday, and Wednesday to reach the itinerary for Thursday. Collapsing an outline allows you to see "the big picture," the main branches of the topic, all on one screen. To focus on a certain idea, you can expand selected branches. *Out-Think* can also search for keywords, so if John Doe calls to reschedule an appointment, you would go into the weekly or monthly calendar and search for "Doe."

Another application is keeping track of names and addresses. You could organize the list alphabetically with 26 categories labeled A-Z, or split the list into categories of personal friends, customers, suppliers, and so on.

It would also be useful in project management and scheduling. A six-month project could be split into separate tasks assigned to individuals, or you could organize the outline by deadlines which must be met. It's very flexible: You create new categories however it suits you.

Preparing notes for meetings is one more application, as is writing notes for a presentation or speech. If you use form letters or "boilerplate" paragraphs, they can be saved as templates for fill-in-the-blanks correspondence. Lawyers might find *Out-Think* handy for putting together standard contracts or other legal documents.

Programmers who like to plan ahead might choose to write an outline listing the major routines and subroutines of a program on which they're working. It has a flash-card quiz option as well, which means students could use *Out-Think* to prepare for a test.

Before you can actually use the program, you must install it on your 128. This involves going through a few menus and telling the program that you're using a 128, how many disk drives you have, and any special printer codes you might want to use (depending on your printer and interface). You also indicate whether you prefer *WordStar*-like commands or *Perfect Writer*-like commands in the leaf editor, which is handy if you're accustomed to one of these programs. The process of installation is mostly painless, although it requires that you know how to format a double-sided CP/M disk and how to copy (PIP) the files from the main disk to the newly formatted disk. *Out-Think* is not copy-protected, so you can make as many archival backups as you wish. Once you've installed the program, you should put the master disk away in a safe place and use the copy you've created.

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In addition to the extensive manual, which has an excellent introduction to the various commands and step-by-step examples, there are a variety of built-in help files that are just a keypress away. If you can't remember a certain command, you can either check the documentation or call up the appropriate help screen.

Many printing options are offered: lines per page, left/right margins, justification, line spacing, indentation of subtopics, section numbers on or off, output depth (how many subtopics or sub-subtopics are printed), page breaks (if you're using single sheets instead of continuous paper), number of copies, *WordStar*-compatible output, headers, footers, page numbers, starting page. You can print all or part of an outline, with or without the text leafs. And when the final document is printed, you can even ask for a table of contents, with topics listed by page number.

Out-Think can't replace a good word processor or database management program, but then it isn't meant to. It's a powerful and flexible tool for organizing your thoughts. And the documentation is superb. It can't be compared to other software in its category, because so far there is no other thought processor available for the 128. When you're asked what can be done in CP/M mode on the 128, here's a good answer.

—Todd Heimarck

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The Information Connection

Telecommunications—the act of hooking a modem to a computer and sending and receiving data over telephone lines—has grown tremendously over the last few years. Literally hundreds of bulletin board systems (BBS's) and several major online information services are available for computer users to exchange information, get technical help, and just chat with other people around the country. However, successfully getting online, finding the information you want and leaving some of your own, and logging off is sometimes complicated by bad phone lines, faulty hardware (on either end), and poorly written or buggy system software.

Given all the potential problems, you don't need to add the possible aggravation caused by bad terminal software. Most modems come with their own software, some of which is quite good, and may be fine for your needs. However, there are many third-party programs available that offer greater sophistication and flexibility.

The Information Connection, written by Ken Skier and published by Grolier Electronic Publishing, is just such a program. Skier's previous program of this kind, *SkiWriter*, is a powerful, easy-to-use word processor with telecommunications abilities built in. (*Skiwriter* is now available through MasterTronic without the terminal program—see page 64 of the May GAZETTE.) *The Information Connection* is primarily a multi-featured terminal program with some word processing capabilities, and its integrity and ease-of-use are up to Skier's usual high standards.

The program consists of three main sections: a tutorial, an online practice area, and an actual online tool. The tutorial explains the basics of telecommunications: how it works, what hardware and software are necessary, and what actually happens in the process. If you know anything about telecommunications, you can easily skip over this

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whole section. It's meant for the absolute beginner. The practice area gives you the opportunity to go through the steps necessary to access an information service without actually going online, which is extremely helpful for someone who's never done it. It also explains the basics of retrieving information from online reference works, like Grolier's *Academic American Encyclopedia*, which is available on several services. And the online tool is a sophisticated terminal program.

Though Skier does a fine job of gently guiding the novice through the process of getting online and getting around once there, it's the online tool that's really the heart of the program. Two features here make it much more than a terminal program. First, the editor. It's not a terribly sophisticated word processing program (and it's not meant to be), but it offers enough features to be adequate for your purposes here. The editor is used for two primary functions: creating files that you can later upload when you're online, and editing material that you've captured (downloaded). Moving back and forth between the terminal screen and the editor while online is a bit confusing at first; you'll have to jump back and forth between different menus. It's advisable to practice going through the menus several times before actually trying to do work online, to avoid wasting money.

The second notable feature of the online tool is its ability to use macro files. A macro is a miniature program that carries out a set of user-defined commands. You don't need to know anything about programming to create or use one, though. You tell the program in English what you want it to do, creating a kind of script. In *The Information Connection*, macros can be created to automatically log you on to information services or BBS's. In the following example, the words in caps in the left column are the commands given to the program; the right column contains the actual prompts and responses that will occur online:

DIAL	"555-1234
PAUSE	"15 (seconds)
TYPE	"
EXPECT	"Host Name:
TYPE	"CPS
EXPECT	"User ID:
TYPE	"00000,000
EXPECT	"Password:
TYPE	"Blank

And you're on. It's not necessary to use macros to log on; the program functions fine as a regular terminal program.

Be very careful when typing in macros. Like any computer program, the tiniest typing error or incorrect punctuation will prevent it from running correctly. You may also have to play around with the PAUSE command, depending on how long each service generally takes to answer.

A word of warning here: If you save macros to disk with personal passwords and IDs on it, be very careful that no one else can get access to the disk. Someone could run up quite a bill for you in the time it would take you to change all your passwords.

Onscreen help is available, supplemented by clearly written documentation. For the novice who is just entering the world of telecommunications, or the well-versed individual who spends a lot of time online, *The Information Connection* is well worth the investment.

—*Kathy Yakal*

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Superscript

This new word processor was created by Precision Software, the same group that brought us the popular *Easy Script* (distributed by Commodore) and the *Superbase* database program. The program is available in the U.S. from Progressive Peripherals for both the Commodore 128 and the 64, which is the version reviewed here. The word processor I normally used, prior to *Superscript*, was *Easy Script*, and while it lacked certain features, I was never really tempted by the features of other programs to go through the ordeal of "relearning" a new word processor. So, I was a bit skeptical when I opened the *Superscript* package and started to read the instruction manual.

The 200-page manual is comprehensive and well-done. There are two tutorials with exercises in the beginning section, followed by more detailed explanations about using the program. The 97-page reference section comes next and provides a detailed, easy-to-use reference to all the features of the program. The manual is clearly written, the tutorials are short but adequate, and the excellent index and reference section allow you to look up features easily and quickly as you need them.

When you load *Superscript* and insert your work disk, the program automatically searches for a "defaults file" and if found loads it into memory. This file is a most convenient and powerful feature, and is of particular importance: It may contain all the necessary information for your interface and printer as well as other text layout options, such

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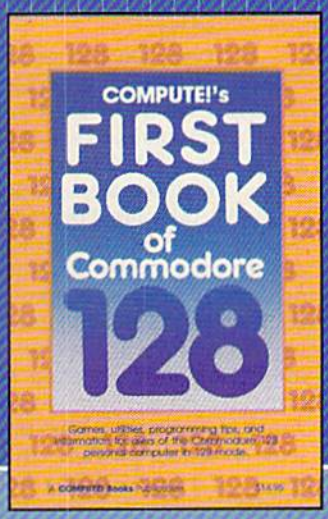

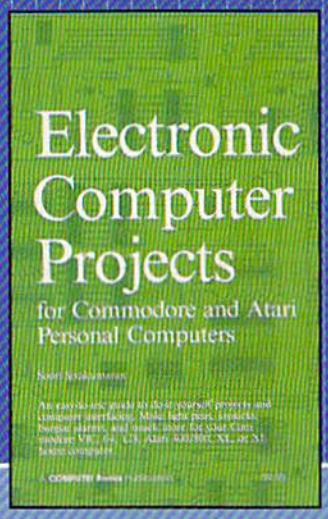

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as page length, margins, and so on. With this feature, you can print the same document on any printer with any interface without altering the document in any way. You can also set up your own default values for many of the text layout parameters without having to type them at the top of each document. In addition, the defaults file will automatically set the screen, border, and text colors, and provide the user with another important feature: the ability to create single key commands (which we'll look at a bit later). You can load in different default files at any time, and these may change some or all of the previous parameters. For instance, I have different files for use with a monochrome screen, color monitor, three different printers, for general writing, letter writing, and screenplay writing. Loading these default files means I can instantly tailor my working environment to any combination of monitor, printer, and writing format that I want. No other 64 word processor I know of has this flexibility.

In regular use, *Superscript* should appeal to most any user. For those who like to work from menus, all the options in *Superscript* may be reached via this method. Pressing f1 brings into view the main menu. Selecting one of the options brings into view a sub-menu. And selection of some of these brings up further sub-menus, so nearly everything this program can do may be menu selected. You may choose any option on any menu either by typing the first letter for that option or by moving a highlighted cursor to that option and pressing RETURN. In addition, several of the most common functions may be chosen by holding the CONTROL key while pressing a letter key.

There is yet another way to access the many functions of this program. You can set up "command keys," which may be defined as part of the defaults file. Almost everything this program can do may be accomplished by pressing RUN/STOP followed by any other key which you've established as a command key. You can define command keys at any time while using the program, but it makes more sense to define them as part of your defaults file and have them autoload when you start using the program.

For instance, I've set up the z key so that when I press RUN/STOP followed by a z, my name, address, and phone number are automatically typed in over four lines, with a carriage return at the end of each line. If I type RUN/STOP then a capital R, the document in memory is automatically saved to disk with the proper name, replacing the previous copy of that document. RUN/STOP followed by a capital C automatically types in the proper sequence of characters to center the text that follows. I find this to be one of *Superscript*'s most useful features. With it you can tailor your working environment to your own personal preferences.

Superscript also allows you to select the number of columns for text width on screen. For normal text entry, it's probably most sensible to stick with 40 columns. (And the program allows for you to work with word wrap on or off.) If, however, you're working with columns of numbers spread across the page, you may select a screen text width of up to 240 columns. There is a built-in calculator that may be used to add, subtract, multiply, and divide, as well as figure percentages. The result may be placed anywhere in text. You may also use the calculator function to add columns and lines of numbers that have been entered in the text.

In addition to providing for standard tabs, you may also set up numeric tabs. Pressing f7 takes you to the next tab—and if it happens to be numeric, you're at the exact position where the decimal point will be placed. Numbers are then entered "calculator" style, and you may even use the dollar sign and commas for numerical entry. For instance, when you tab over to a numeric tab and want to enter one thousand two hundred twenty three dollars and fifty two cents, you enter the number as follows: $1,223.52. The decimal point will remain right at the set position for the numeric tab, while the dollar sign, comma, and numbers to the left of the decimal point will be pushed left as you enter them. This feature makes it particularly easy to set up columns of numbers—they'll all be aligned at the decimal point. If you use the calculator function to add a numeric column, this result will also align and may include the dollar sign and commas as well. All tabs set up with your document are retained when you save it on disk.

For form letters and multiple mailings, *Superscript* has several interesting merge features. You may define three different types of merge fields anywhere within your document. You may select a variable field, a fixed field, or a conditional field. The variable field will take the corresponding field in your merge file and properly insert the data in your document while moving the following text to accommodate it. A fixed field does not move the remaining text after the field and this makes it a feature that's ideal for filling in fixed forms. The conditional field is like the variable field except the line will not be printed at all if there is no data in this field in the merge file. The scope of merge functions available with this program is very comprehensive.

There's also a built-in spelling checker with a 30,000 word dictionary. It's very easy to use and may be accessed at any time. To look up words, you can use the disk pattern matching characters—the ? for individual characters and the * for any characters that follow. For poor spellers like myself, this feature has been a big help. Also, you may add your own words to the dictionary. The spelling checker works directly on the current document and doesn't require a lot of disk swapping and reloading.

I haven't touched on all the standard word processing features, but *Superscript* has them all. Functions like block manipulations, insertion and deletion, appending to and from disk, and so on, are all handled simply and logically. All disk functions are easily accessed from the program without affecting the current document. There's room to type in a document of about 20,000 characters—500 lines when typing on a 40-character screen. Documents are easily linked though, so actual length is virtually without limit. Auto page numbering, headers and footers, screen preview of the printed page, and many other features are available in this program. You can even print out only odd or even numbered pages, a feature that allows you to automatically print long documents on both sides of the paper if you reload the paper fresh side up after the first run through. And you may have different headers or footers for the odd and even pages if you like.

The copyright date on *Superscript* is October 1985, and, in my opinion, it was the next logical step in the evolution of word processors for the 64. I had been using *Easy Script* and was quite content. Other word processors had a few features that were nice, but I didn't think any of them offered enough to justify learning a new system. *Superscript* changed my mind. It's that good. I plan to purchase a 128 and I'll undoubtedly get the *Superscript* version for this machine as well.

—Howard Parnes

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The Body In Focus

Did you know that the working area of your lungs is the size of a tennis court? Or that your tongue is covered with 10,000 taste buds? Or that blood moves through your arteries at a rate of one foot per second? *The Body In Focus*, a new anatomy learning program for the Commodore 64 from CBS Interactive Learning, has a wealth of interesting

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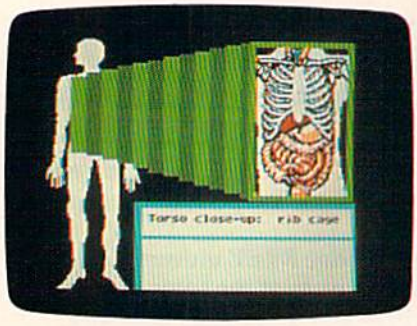

facts about the human body and colorful illustrations of how it works.

The Body In Focus is divided into three sections: Body Systems, Body Close-Ups, and Body IQ. Moving from one section to the next is very easily done with the program's EasyKey keyboard overlay, a piece of soft plastic that fits over the 64's keyboard. The various sections of the program are labeled on color-coded squares on the overlay.

In the first section, the major body systems are discussed and illustrated (except the reproductive system). With a single keypress, you can begin a tour of the circulatory, integumentary (skin), muscular, digestive, skeletal, nervous, respiratory, or endocrine system. Each body system is described through a series of brief facts and enlivened with an animated segment or special feature. In the Respiratory section, for example, you can press the Sneeze button to see a slowed simulation of the complete sneezing process; in the Nervous System section, there's a demonstration of how the ear responds to high-pitched and low-pitched sounds.

The Body Close-Ups section provides detailed illustrations of three parts of the body: the head, torso, and arm. By pressing the Reveal key, you can peel away layers of organs to uncover what's beneath. The Torso segment, for instance, begins with an illustration of the muscles from the neck to the groin; pressing Reveal displays the ribs and intestines beneath; then the lungs; then the trachea and liver; then the heart; then the pancreas, spleen, and kidneys; and finally, the spine. To reverse this sequence, you simply press the Conceal key. By toggling between the Reveal and Conceal keys, you can quickly compare the positions of two organs.

You can see how well your anatomy lessons are progressing at any time by pressing the Body IQ key. Each test consists of 20 randomly-generated questions, and draws from all areas of the program. Some of the questions are multiple-choice; others require you to point out certain parts of the body. The program is friendly and encouraging throughout, rewarding correct answers and gently helping you out when you get a question wrong. You might want to test your knowledge before you begin using the Body Systems and Body Close-Ups sections, so you'll have a basis for comparison with your later scores.

The Body In Focus comes with a book which ably explains the program and its many features, and includes detailed diagrams of various anatomical systems and a selected bibliography.

My only frustration with the *The Body In Focus* (other than the fact that it names the liver as the largest organ, instead of the skin) is simply that the graphic and memory parameters of the Commodore 64 don't allow for more detailed drawings or more elaborate explanations. Nonetheless, CBS has done a commendable job of presenting the extremely complex mechanisms of the human body in terms that are understandable to children but not unpalatable to adults. *The Body In Focus* is an excellent starting point for anyone who wishes to learn or review the rudiments of anatomy.

—Joan Rouleau

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Paul Whitehead Teaches Chess

For many of us who play chess, learning the rules of the royal game occurred long before the advent of computer chess programs. Once we picked up the rudiments, we searched among our friends, relatives, and acquaintances for those we could play against. All too often, however, lining up competition on a regular basis was frustrating. It takes time, effort, and luck to find a group of opponents. But how do you improve and enjoy your game if you can't play regularly?

Playing against yourself is one way, even with the obvious limitations. And studying the many chess books—great games, classic maneuvers, and positional problems—still remains an enjoyable and valuable process.

But today, chess players who own personal computers have it made. There are a variety of good computer chess programs available, with differing levels of play, and that certainly holds true for the Commodore market. These programs are tireless opponents. They allow you to set up different positions, to switch sides, to replay before your eyes the great games of chess history, and to experience so many other

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special options that the old frustrations of the lonely chess player have become extinct.

But do we need another computer chess program? In the case of *Paul Whitehead Teaches Chess*, the answer is an unequivocal yes.

For the most part, software manufacturers have paid less attention to the *instructional* end of chess programs than to the quality of the opponent programs for players who already know the rules. *Paul Whitehead Teaches Chess* solves that problem in an engaging and comprehensive manner.

The package is actually two different programs in one. There's a very good chess opponent program called the *Coffeehouse Chess Monster* that's on one of the three disks that come with the Commodore version. But the real innovation of this product is an interactive chess instructional program on two disks. If you know nothing about the game of chess, this tutorial guides you gently and easily with interactive explanations of the layout of the board, the movement of each piece, basic tactics associated with the pieces, opening principles, and much more. If you're a novice-to-middle-level player, *Paul Whitehead* has plenty to offer as well—attack and defense tactics such as pins, counterpins, forks, skewers, in-between moves, sacrifices, and many others. There's also extensive information on openings that starts with basic strategies on King Pawn and Queen Pawn openings and proceeds into the fundamentals of many others.

The tutorial was written by Paul Whitehead, former U.S. Junior and American Open chess champion. His commentary is succinct and informative, and the amount of material covered is amazing.

The instructional part of *Paul Whitehead Teaches Chess* is a huge branching database—a *decision tree*. The volume of information is so great that the program comes with two maps that show the branching structure and the progression of topics covered. By marking the maps, you can see what you've covered, remind yourself of weak points you need to work on, and jump from topic to topic. You advance screens by pressing a cursor key. The display shows a chess board that takes up about two-thirds of the screen, with the remaining space allotted to movement cues and instructional commentary by Whitehead. The screens are quickly drawn and the pieces clearly marked. One tutorial disk includes major headings on the Rules of Chess, Tactics for Each Piece, Opening Principles, and the Endgame (Part 1). The second tutorial disk covers the Middlegame, the Openings, and the Endgame (Part 2).

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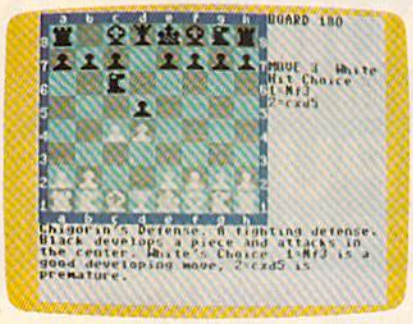


Two new features have been added to the Commodore version that substantially improve the package. First, you can now save your games to disk, giving you the ability to create a library of games. Not only can you review them, but you can give the *Coffeehouse Chess Monster* any position from any of your games and let the program show you how you *should* have played the move or moves. Secondly, working with the tutorial is much faster now than in the original version of the package, thanks to the addition of what's called *accelerator links*—routines that let you move to different screens without a lot of backing up in the database.

Paul Whitehead Teaches Chess uses the algebraic notation system of board movement rather than a joystick. That is, each of the 64 squares is assigned a number and a letter. Horizontal rows (or ranks) are made up of the numbers one through eight, while vertical rows (or files) are labeled with the letters A through H. For example, the White King stands on E1, while the Black King is located at E8. Some players might consider using the notation system a liability, since moving pieces around by joystick or mouse is much easier and more common in many computer chess programs. I believe it's actually a plus. Beginners need to grow comfortable with a chess notation system, if they're ever to be able to study games in books, magazines, and newspapers, or especially if they want to record their own games for later study. Using a joystick or mouse, while admittedly easy (and preferable for the experienced player), would circumvent a valuable part of the learning process if used in *Paul Whitehead*.

The *Coffeehouse Chess Monster* also uses the algebraic notation system. Written by international chess master Julio Kaplan, this chess opponent program has nine playing levels; modes that let you play against the computer, the computer against itself, or two human players against each other. Game scores can be printed out. And you can move from the tutorial to the opponent program and back again easily, even marking your place in the tutorial for quick return.

Enlightenment Software also offers versions of *Paul Whitehead* for Apple II and IBM PC/PCjr computers, in addition to the Commodore 64. For experienced players, the company markets several chess programs that go into even greater depth. And each of them contains the *Coffeehouse Chess Monster*, as well. The disks are copyrighted, but the manufacturer states that the protection scheme will not damage the drive. There's a three-month warranty for replacement of disks for a $5 processing fee. Backup copies are available for $25 (with a coupon enclosed in the package). And that copy will also include instructions and maps.

If space allowed, there's much more that could be said about *Paul Whitehead Teaches Chess*. For the beginner, the program offers both clear information and well carried out interactivity. There's plenty going on, and the result is much more attractive (especially for youngsters) than staring at static diagrams in a book. Even for the experienced player who considers his or her game to be fairly solid, there's a tremendous amount of information. Unless you're a remarkably gifted and practiced player, you'll quickly discover just how uneven your game play can be.

Paul Whitehead Teaches Chess is an exceptionally good program that fills an important niche in the computer chess marketplace.

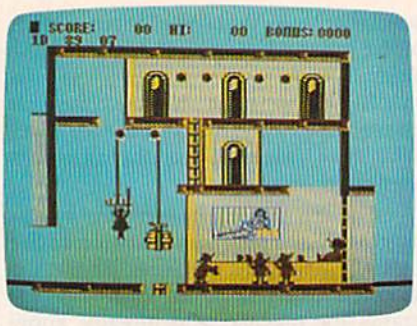
—Selby Bateman

Enlightenment, Inc.
1240 Sanchez St.
San Francisco, CA 94114
$49.95

also worth noting

The Goonies And Zorro

The Commodore 64's excellent graphics and sound have made it a very popular computer for colorful, arcade-style action games. Two recent releases, created under the Datasoft label by IntelliCreations, are very much in this tradition. *The Goonies*, based on the Steven Spielberg movie of the same name, presents a series of eight screens through which you must navigate two characters in search of One-Eyed Willy's Pirate Ship. Each screen is a puzzle which can be solved only by using the two characters to support each other. The solutions always involve humorous Rube Goldberg-style cause-and-effect chains of action. A Hint Sheet helps you figure out what you're supposed to do, and you'll need it since the



mazes are by no means easy to solve. One false step by either character and you're back at the start of the game.

In *Zorro*, based on the exploits of the famous fictional masked swordsman, you attempt to rescue a senorita kidnapped by the evil Sergeant Garcia. Before you can accomplish that, however, you have to move your character through 20 different screens, dueling with guards, finding and correctly using a variety of items you'll discover, and solving puzzles. You'll need to make a map to remember where you are, and to successfully use the items you find.

Both *Zorro* and *The Goonies* offer first-rate graphics and sound, plus an intriguing mixture of strategy and action. A joystick is required in each game.

IntelliCreations, Inc.
(formerly Datasoft)
19808 Nordhoff Pl.
Chatsworth, CA 91311-9969
$29.95 each

Super BoulderDash

Grab the diamonds as you move from cave to cave, but watch out for exploding fireflies, dangerous butterflies, and falling boulders. As the packaging says, *A boulder on your head can ruin your whole day!*

This is *BoulderDash*, a classic action-strategy game developed by First Star Software and now marketed in this new edition by Electronic Arts. The original *BoulderDash* features 16 different caves with five levels of difficulty. Your screen character, Rockford, progresses from cave to cave as he collects the diamonds and avoids the many dangers. It takes skill and determination to complete all the caves on each level. Few have tasted victory.

BoulderDash II offers 16 new caves to explore, each more difficult than those you've seen before. Combine *BoulderDash* and *BoulderDash II*, and you've got *Super BoulderDash*, two of the best arcade-style action games ever developed. This package is definitely worth a spot in your collection of classic computer games. A joystick is required.

Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404
$22.95

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"If you know BASIC and want to learn machine language, this is the place to start . . . . Building on your experience as a BASIC programmer, Mansfield very gently takes you through the fundamentals of machine language."

—Whole Earth Software Catalog

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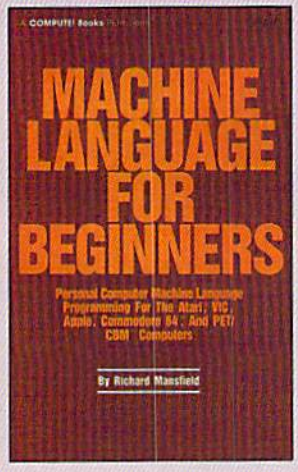
The LADS Disk

LADS, the assembler used in *The Second Book of Machine Language*, is available on disk for only $12.95. This is a great accompaniment to the book, saving you hours of typing time by providing the complete source and object programs for all versions of the assembler, and more. And LADS disks are specific to your Apple, Atari, or Commodore computers.



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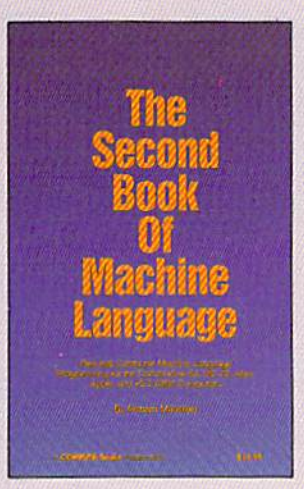
Richard Mansfield

Most commercial software is written in machine language because it's far faster and more versatile than BASIC. *Machine Language for Beginners* is a step-by-step introduction. Includes a simple assembler, a disassembler, and utilities, to help beginners write programs more quickly and easily.

$14.95

ISBN 0-942386-11-6



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Richard Mansfield

The follow-up to the best-selling *Machine Language for Beginners*, this book leads the programmer deeper into the most powerful and efficient programming techniques available for personal computers. Fully tutorial, with easy step-by-step explanations, the book shows how to construct significant, effective machine language programs. Included is a high-speed, professional-quality, label-based assembler. Everything that's needed for optimized programming on the Commodore 64, Apple, Atari, VIC-20, and PET/CBM computers.

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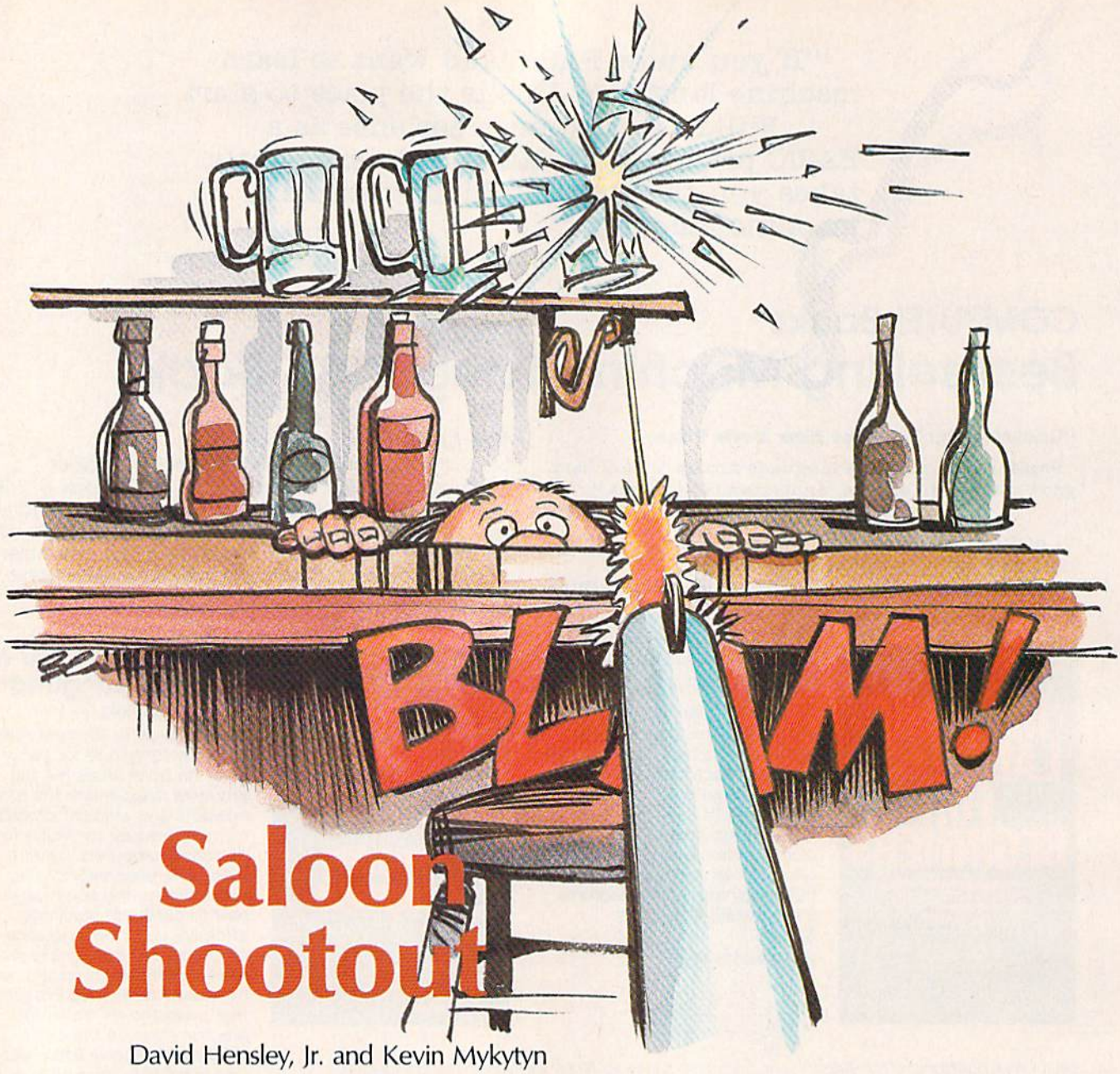

Saloon Shootout

David Hensley, Jr. and Kevin Mykytyn

You'll have your hands full in this action-packed, arcade-style game. It's one of the most challenging and graphically charming games we've published. For the Commodore 64, Plus/4, and 16. A joystick is required.

If you're a sure-shot, dead-eye, trigger-happy gunslinger, you'll be suited to this wild and woolly action game. In "Saloon Shootout," the pace is frantic and it never slows up. The object of the game is to accumulate the highest number of points before time runs out or before you run out of bullets.

Of Mice And Mugs

There's a lot to contend with in Saloon Shootout. A gun, which appears on the bar, is your weapon. It's controlled by your joystick (plugged into port 2). By moving the joystick up and down, you control the distance your bullet travels. You'll notice the gun barrel shift up and down as you move the joystick. Also, an arrow on the right of the screen will help you gauge the distance your shot will fire.

A main objective of the game is to shoot as many mugs as you can before they fall off the bar. For every ten of these you shoot, a running mouse appears. Each time you shoot this critter, you receive a bonus score and it reverses direction and speeds up. Every time you hit him, the point total escalates and so does his speed. (This is where you can get a lot of points for those potential high scores.)

This may sound pretty easy so far, but your job at the saloon is much more complicated. You must also keep your eye on the three windows on the back wall of the saloon. They're sometimes opened by a masked desperado who will steal ten of your bullets unless you shoot him before he disappears. But don't be too hasty—sometimes good guys appear (the good guys smile), and shooting them results in a stiff

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penalty—100 points subtracted from your score. If your supply of bullets is running low, you can replenish them by shooting the cards that appear on top of the player piano. However, you must shoot the cards in order: 10, J, Q, K, and A. Be careful here—one card hit out of order will reshuffle the deck and you'll have to start over. Now you can see that this is no simple task.

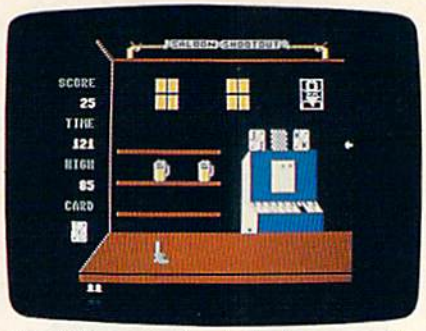
There are a few features that help to calm your nerves, however. If you reach a score of 500, you receive a bonus time of 50 seconds. To help you keep track of the time remaining, the screen flashes when there are 25 seconds left. As noted above, the arrow on the right side of the screen helps make sure that those valuable bullets you're shooting are not wasted. And finally, the player piano cranks out ragtime tunes to help relieve the tension. To change the tune, shoot one of the white keys on the player piano. To turn the music off, shoot a white key twice.

Game Strategy

When the game first runs, you have a few seconds before the mugs start to appear. It's wise to use this time to shoot a few of the cards (in order, as we mentioned) in case your bullets run low during the game. Try to make the mouse appear as many times as possible to receive higher scores. When it appears, try to shoot it as many times as possible. Unless your bullet count is high, it's a good idea to set your sights on the windows as they start to open. And remember to keep an eye on your bullet supply and the time remaining.

Typing Instructions

Saloon Shootout is written entirely in machine language, so it can't be typed in the same manner as a normal BASIC program. If you have a 64, you'll need to type in the data from Program 1 with the "MLX" machine language entry program, found elsewhere in this issue. Be sure you read and understand the MLX instructions before you begin entering the data. After loading and running MLX, respond to the starting and ending address prompts with 2800 and 3BC7, respectively. When you've finished typing, be sure to save a copy of the data



Shoot the mugs, the deck of cards, or the desperado in the window? The right decision must be made—there are only two bullets left.

before you exit MLX. To play Saloon Shootout, load the data you entered with MLX using the format LOAD *"filename"*,8,1 (tape users should LOAD *"filename"*,1,1). Start the game by typing SYS 10240 and pressing RETURN.

If you own a Plus/4 or 16, you don't need MLX to enter the program. You can use the built-in machine language monitor instead. Refer to the user's guide that came with your computer for more information on using the monitor. To leave BASIC and enter the monitor, type MONITOR and press RETURN. Next, type F 2800 3BC7 00 (again, follow with RETURN). This fills that section of memory with zeros. (You can skip this step if you wish, but when locations 2800–3BC7 are initialized to 0, it makes it easier to see how far you've typed.) Next, type M 2800, which displays the contents of a section of memory. Now you can begin to enter the program. Replace the numbers in each line of the display with the first eight two-digit numbers from the corresponding line in Program 1. Ignore the last two-digit number on each line of the program listing. (The final number is a checksum used by the 64 MLX program.) Check your typing carefully; a single mistyped number may prevent the game from functioning properly. Be sure to press RETURN after each line has been entered. When you finish a section of memory, type M and the next section of memory will be displayed. To save your work to disk, enter S *"filename"*,8,2800,3BC7. (Tape users should change the ,8 to a ,1.) When you're finished using the monitor, return to BASIC by typing X and pressing RETURN.

Reload the finished game with a command of the form LOAD *"filename"*,8,1 (tape users should LOAD "filename",1,1). Start the game by typing SYS 10240 and pressing RETURN.

Since Saloon Shootout is rather long (over 5300 bytes), it's quite possible that you may make typing errors while entering the data using the Plus/4 or 16 monitor. Since it's often difficult to find errors in long machine language programs entered via the monitor, we've included a BASIC program to help you find any typing mistakes. If your Plus/4 or 16 version of Saloon Shootout doesn't seem to be working properly, follow these steps to check your typing:

1. Enter GRAPHIC CLR:NEW (and press RETURN).

2. Reload the Saloon Shootout data using a command of the form LOAD *"filename"*,8,1 (or ,1,1 for tape).

3. Enter NEW (and press RETURN).

4. Load (or type in) Program 2. Be sure to enter this program carefully. A proofreading program can't help you if it contains mistakes itself.

5. Run Program 2. It will check the Saloon Shootout data in 512-byte blocks. Make a note of the blocks in which errors are found, then use the monitor to examine the data between the specified addresses. Compare your entry carefully against the published listing to find your mistakes.

6. When you have corrected all the errors you can find, run Program 2 again to check for any remaining problems. When Program 2 reports all is correct, be sure to save a new copy of the data using the monitor save command given above.

Statistics And Point Totals

Time:	**2 minutes**
Bullets:	**35**
Scoring	
Mugs:	**10**
Missed mugs:	**−5**
Cards:	**10**
Back of card:	**−10**
Good guy:	**−100**
Bad guy:	**25**
Mouse:	**20,40,60,80,100**

See program listings on page 105.

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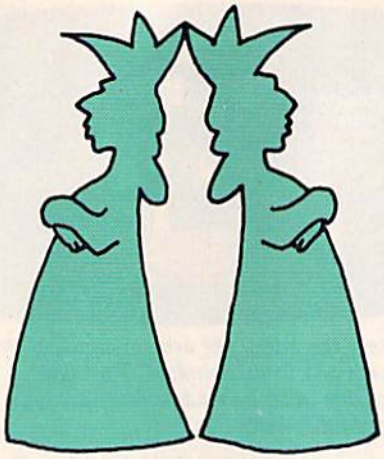

Queens' Quarrel

Barry L. Ives

Here's a brainteaser that's not as easy as it seems. You must place eight queens on a chessboard in a position where no queen is lined up with any other. If you can't do it, your 64 will show you an answer to the puzzle.

Eight haughty queens have quarreled, and now each one refuses to speak with any of the other seven. The question is, how do you place the queens on an 8 × 8 chessboard to give each queen sole possession of her row, column, and two diagonals?

Based on a puzzle originally devised in the mid-1800s by the great mathematician, Karl Friedrich Gauss, "Queens' Quarrel" invites you to place the eight queens on the chessboard so that no queen can capture any of the other seven. Those of you familiar with the game of chess will realize this means that no two of the pieces on the board can be in line horizontally, vertically, or diagonally.

Queens' Quarrel is written in BASIC and runs on the Commodore 64. If the puzzle sounds easy, load and run the program, and try it yourself. As prompted, type the number of the column in which you would like to place a queen in the first row, and press RETURN. You'll then be prompted to place a queen on the second row, and so on.

If you attempt to place one in a column or diagonal that is already occupied, a buzzer will sound and you'll be requested to try again, or to enter C, R, or E. Typing R causes the last-placed queen to be removed from the board, allowing you to place it in a different column. Any number of pieces can be removed this way, by entering R as many times as necessary.

The E command ends the program, returning your screen to normal. The computer's power comes into play when C (Computer) is entered and your 64 takes over. Trying every possible position, based on what's already on the screen, the program places a queen on a likely square in the row following your last successful move. It then scans the next row for a safe square. If it finds none, the queen in the previous row is moved up one square. If no further safe squares are found in that row, the queen in the next previous row is moved up, and so on, until a solution is found. When you see the program in action, you can watch the computer thinking, patiently trying every move until it finds eight positions that work.

This player has three more queens to place in trying to solve the puzzle.

When either you or the computer finds a solution, it is announced with a gong and displayed on the screen until you press the space bar to play again. Pressing any key while the computer is searching for a solution will clear the chessboard and return control to you. Don't try to type your moves in advance; keypresses aren't accepted until after the prompt has appeared.

How many solutions can you find? There's at least one solution to every attempt starting with a queen in each respective square of the first row, but I've only begun to list the number of combinations possible with each. I would suggest, however, that you don't make your first attempt by entering C with a queen in the first column of the first row. It takes the 64 a full eight minutes to solve that one. Instead, you might want to start with row one, column two or five. It might also be a good idea to keep paper and a pencil handy to keep track of each solution you find, for future reference.

See program listing on page 108.

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Meteor Strike

Mike Sedore

Your spacecraft is caught in the middle of a beautiful but deadly meteor shower. As ship commander, can you survive? A challenging space game with outstanding graphics. For the 64; a joystick is required.

As you glide through outer space, meteors of many colors swirl past your spaceship. You'd like to stop and watch the display, but you better keep moving—a collision with a meteor means the end of your ship. If you act fast, you can dodge the meteors and ward them off with your ship's photon gun.

Typing It In

"Meteor Strike" is written entirely in machine language, so it must be typed in using "MLX," the machine language entry program which appears elsewhere in this issue. Be sure you read and understand the instructions for using MLX before you begin entering the data for Meteor Strike. After loading and running MLX, respond to the prompts for starting and ending addresses with 0801 and 12A8 respectively. When you finish entering the data, be sure to save at least one copy before leaving MLX. Although the game is written entirely in machine language, you start Meteor Strike by loading the program, typing RUN, and pressing RETURN, just as you would for a BASIC program.

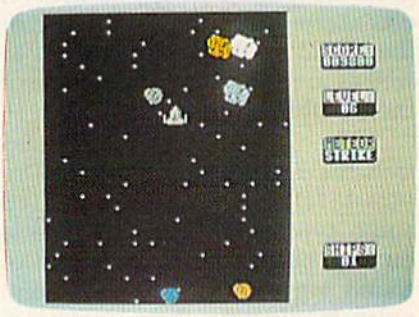
Plug your joystick into port 2, and press the fire button to begin play. Your spaceship is in the center of the screen, and the meteors move toward you from all sides. To the right of the play area are listed your score, current level of play, and number of ships you have left.

You can get around a meteor by pushing the joystick in the direction you wish to move. If you go to the edge of the screen, your ship will "wrap around" and reappear on the opposite side.

If you want to pause during the game, press the SHIFT-LOCK key. To resume play, press SHIFT-LOCK once more.

Becoming An Ace

To fire your photon gun at a meteor, point your spaceship toward the meteor and press the fire button. For each large meteor you hit, you get 100 points; for each small meteor, you get 200 points.



This player must act quickly—several meteors are about to collide with the ship.

You start the game with five ships; the game ends when all of your ships have been hit. Every 30 seconds of play, you move to a higher level, and the meteors move faster. If you reach level 9, you're designated an ace space pilot and receive a bonus ship.

See program listing on page 108.

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Sound Designer For The 128

Mark W. Pemburn

Here's an easy way to experiment with sound on your 128 and instantly save anything you like. Menus and a simulated audio control board make this an especially efficient program.

If you've spent any time experimenting with the 128's BASIC 7.0, you've probably noticed how easy it's become to use graphics and sound with commands like DRAW, CIRCLE, BOX, PLAY, FILTER, and so on. "Sound Designer," the program accompanying this article, was written to illustrate the use of these and other 7.0 commands as well as to further simplify the use of the SOUND command.

The SOUND command controls the 128's Sound Interface Device (SID) chip, a sophisticated audio synthesizer circuit which is capable of generating a variety of sound waveforms, filtering them, pulse modulating them, jamming, squeezing, and otherwise manipulating them into all kinds of sounds.

SOUND has eight variable parameters, three of them essential (Voice, Frequency, and Duration) and the rest optional (Direction of Sweep, Minimum Sweep Frequency, Waveform, and Pulse Width). In the program accompanying this article, they're abbreviated VO, FR, DU, DI, MN, SP, WF, and PW. Here are the ranges for each of these parameters:

VO: 1-3
FR: 0-65535 Hz
DU: 0-32767 jiffies (a jiffy = 1/60 second)
DI: up (0), down (1) or oscillate (2)
MN: 0-65535 Hz
SP: any value not larger than the main frequency minus the minimum frequency (see "Sound Parameters")
WF: 0 (triangle), 1 (sawtooth), 2 (square), and 3 (noise)
PW: 0-4095 (for use with square waves only)

This program was spawned when I was attempting to generate a specific sound by moving these parameters up and down using the examples found in the 128 user's manual and elsewhere. It turned out to be a tedious trial and error process. Numbers alone do not reflect the nature of a sound. What's needed is a analog-type display that can be tested until the desired sound is achieved. This is where the graphics commands come in handy.

To use Sound Designer, type it in, save a copy to disk, then type RUN.

The main menu presents the options:

+ TO VIEW THE BOARD
– TO VIEW TEXT
V TO VIEW VARIABLES
↑ TO VIEW CATALOG
• TO SAVE SOUND
£ TO LOAD SOUND
Q TO QUIT
CLR/HOME TO VIEW THIS MENU
PRESS SPACE BAR TO HEAR SOUND

Press V to view the variables you can use to create the sound in your program. You may use any of these options at any time, but bear in mind that SAVE and LOAD will prompt you for a filename. If you decide not to enter a filename, the RETURN key will take you back to the main menu. If you wish to save a sound, use any valid filename and the variables will be saved to disk as a sequential file.

The Control Board

Pressing the + key whisks the menu away and displays the control board. On the far left is a box containing a 1 with the word VOICE displayed beneath. This is the default voice number, but it can be changed to 2 or 3. The other seven controls allow you to change the sound parameters within the ranges described above. Use the left and right cursor keys to position the green pointer over each control, and the up and down cursor keys to change each of the parameters. To test each change, press the space bar. (Note that you'll not hear any sound when all controls are at 0, and you'll get only a feeble sound

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when the marker for Waveform is on the symbol for square wave and the value of PW is 0. Other than this, you have a broad palette of sounds from which to choose.)

Saving and Loading Sounds

Once you have a sound you wish to save, press the minus (−) key to return to the text screen and * to get the input screen. Enter an appropriate filename for the sound, press RETURN, and that's it. To verify your save, press the up-arrow key (↑) and the catalog screen will appear and display the filename. Note that the area containing the catalog titles is a "window," a special screen area made possible by the WINDOW command. This command defines a special area of the screen within which all printing and scrolling will take place after the command is given. If you were to halt the program at this point, the window would remain in place and the text would stay within its borders. To return to the main screen and erase the window, press the unshifted CLR/HOME key twice.

You may call a saved sound by pressing the British pound (£) key and entering a filename. (A misspelled filename will return the message FILE NOT FOUND ON THIS DISK and return you to the menu. Check the catalog for spelling and try again.)

Remember that values saved by the SOUND program are stored in a sequential file and, true to its name, can only be retrieved in the same order that they went in.

By studying the listing, which is mostly in BASIC, you can see how useful the 128's sound and graphics commands can be.

See program listing on page 99.

Sound Parameters

Philip Nelson, Assistant Editor

The 128's SOUND statement is extremely versatile. But its versatility can make it look intimidating at first, since SOUND can take as few as three or as many as eight different parameters (controlling values). Here's a brief explanation of what each SOUND parameter does.

Every SOUND statement must be followed by at least three parameters: a *voice* value that picks one of the 128's three voices, a *frequency* value that chooses a pitch for the sound (whether it sounds high or low) and a *duration* value that controls how long the sound lasts. Since the duration represents sixtieths of a second, a duration of 60 lasts for one second, a duration of 3600 lasts one minute, and so on. Here's a simple SOUND statement that uses only three parameters:

```
SOUND 1, 2000, 10
```

This example uses voice 1, sets the frequency to 2000 and chooses a duration of 10 jiffies (1/6 second). By including extra parameters, you can make the sound move up or down automatically and also select different waveforms for greater variety. All of the additional parameters are optional: If you leave them out, the 128 won't signal an error of any kind.

The fourth value in a SOUND statement represents the sound's *sweep direction*. You have three choices for the sweep: The sound can sweep upward from a low pitch to a high one, it can sweep downward from a high pitch to a low one, or it can oscillate, meaning that it sweeps up, then down, then back up, and so on (like a police or ambulance siren).

Whenever you specify a sweep direction, the 128 uses the main frequency value (the second parameter) as the upper limit of the sound sweep. To set the minimum or bottom limit for the sweep, you must supply a fifth parameter, the *minimum frequency*. The sound sweeps up or down between this frequency and the main frequency. Since it sets the bottom limit, the minimum frequency must always be smaller than the value you choose for the main frequency.

The sixth parameter, *step*, is very important when sound sweeps are involved. Like the STEP number in a FOR-NEXT loop, this value controls the size of the steps in a sound sweep. Larger values make the sweep move faster and smaller ones make the sweep more gradual. Watch out for the "impossible step" error, which applies here just as it does in FOR-NEXT loops. In order for the sweep to work correctly, the step value must be smaller than the difference between the main frequency and the minimum frequency. For instance, if the main frequency is 6000 and the minimum is 2000 the largest sensible step value is 4000 (6000−2000).

Thus, to set up a sound sweep, you must supply three extra values: a direction for the sweep, a minimum frequency to set the sweep's lower limit, and a step value to control how fast the sound warbles between the upper and lower frequencies.

The seventh parameter, *waveform*, chooses one of the 128's four basic waveforms: triangle, sawtooth, pulse, and noise. Don't confuse waveforms with voices. Since the SID chip has three separate voices (tone generators), the 128 can make as many as three different sounds at once, like a three-fingered piano chord. If you don't want to produce simultaneous sounds, you don't need to use more than one voice. The waveform determines what *kind* of sound a given voice makes—its *timbre*. If you don't specify a waveform, the 128 chooses one for you automatically. By supplying a waveform value, you can change the character of the sound.

The pulse wave (often called a square wave) is different from the other three waveforms. By changing the width of the pulse wave, you can make it sound thin and hollow, strong and full, or anything in between those two extremes. The eighth parameter, *pulsewidth*, controls the width of the pulse wave, and is meaningful only when you choose the pulse waveform.

Though SOUND statements are very flexible, there are certain things they can't do. For instance, SOUND has no built-in means for using the SID filter, controlling ring modulation or synchronization, or creating advanced effects such as envelope following. You can learn more about those subjects in *COMPUTE!'s 128 Programmer's Guide*, available from COMPUTE! Books.

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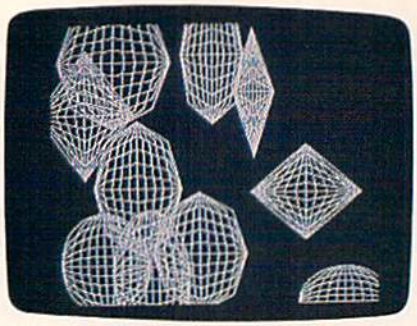
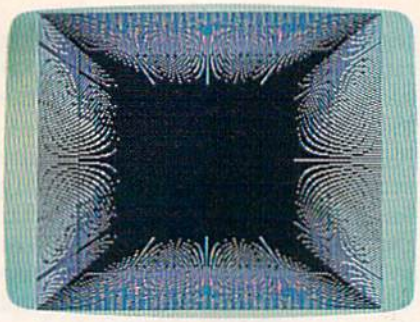
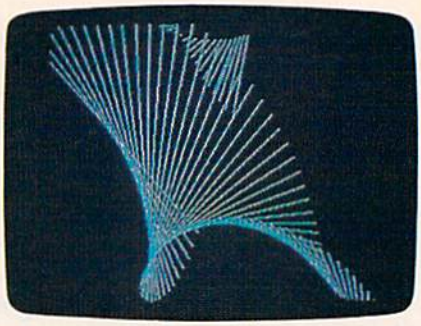

The three short programs comprising "Artimation" show off the animated high-resolution graphics that can be generated with the 128's powerful BASIC 7.0. Above are "Cosmic Objects," "The Pit," and "String Art."

Artimation

Jerry Crisci

The high-resolution graphics commands of the Commodore 128 can work wonders on your screen. Here are three short programs that create some interesting art in motion.

One of the many impressive features of the Commodore 64 is its ability to create beautiful high-resolution graphics. Unfortunately, the 64's BASIC 2.0 doesn't allow the programmer to access high-resolution mode very easily; you have to perform hundreds of PEEKs and POKEs to draw a picture. When the 128 was released, several useful high-resolution graphics commands were included with BASIC 7.0.

"Artimation" is a term I coined to describe the process of creating kinetic computer art by "animating" circles, lines, and boxes on the screen, and allowing them to leave their image behind. And it's done with just a few lines in BASIC.

In traditional animation, an image is drawn on the screen, then erased, then drawn again in a different location. When this process is repeated very quickly, the image appears to move smoothly across the screen. If the same process is done without erasing the image after it is drawn, the image will leave its trail on the screen. If we also manipulate the object as it's moved (change its size or rotate it), the resulting process usually creates an impressive piece of computer art.

I've included three short programs here: "Cosmic Objects," "The Pit," and "String Art." Program 1, Cosmic Objects, creates ten three-dimensional objects on the screen in less than a minute. The images are created using the CIRCLE command. Each random-sized image is placed on a random part of the screen, creating the effect of objects floating in space. After the program draws ten objects, it stops. Pressing RUN–STOP/RESTORE (or typing, blindly, GRAPHIC0) brings you back to the text screen, where you can run the program again to create another picture.

Unlike Cosmic Objects and String Art, The Pit (Program 2) creates the same picture every time it is run. The DRAW command is used to draw a series of lines radiating from the center of the screen. As a result of their varying proximity to each other (as the lines travel to the edge of the screen), "interference patterns" develop, creating an ornate design which appears to be disappearing into a black abyss in the center of the screen. Variations on the design can be created by changing the STEP values in lines 30 through 60 (changing 2 to a 4 or 5 creates a slightly different texture).

String Art (Program 3) is the most exciting program to watch. It runs in an infinite loop—creating a pattern, displaying it for three seconds, then creating a new pattern in a different color. The lines on the screen are made with the BOX command. Each box has no width, so the two sides overlap to form a line. The angle of the box changes as it is drawn, creating a pattern which gives the illusion of a line rotating in three dimensions. RUN–STOP/RESTORE halts the program and returns you to the text screen.

Notes On The Programs

After you press RUN–STOP/RESTORE, the last high-resolution screen created will still be in memory. Just type GRAPHIC 1 and press RETURN to view it. Since the f1 key is preset to print GRAPHIC, you can also use it for a shortcut, to switch back and forth between GRAPHIC0 (text) and GRAPHIC1 (hi-res). You can save the screen to disk with:

```
BSAVE "filename",B0,P7168 TO P16383
```

To reload a previously saved screen, type GRAPHIC 1:GRAPHIC 0 and press RETURN to make sure that the hi-res screen memory area has been allocated, then enter:

```
BLOAD "filename"
```

Typing GRAPHIC 1 and pressing RETURN will now display the newly loaded screen.

If you have the program *Doodle*, published by Crystal Rose Software, you can print out your artimation on your printer. Just follow the above procedure for saving the screen to disk, but use a filename which starts with the letters DD. For example:

```
BSAVE "DDfilename",B0,P7168 TO
P16383
```

You can now load your picture into *Doodle* (remember to go into 64 mode first), and modify or print it.

See program listing on page 103.

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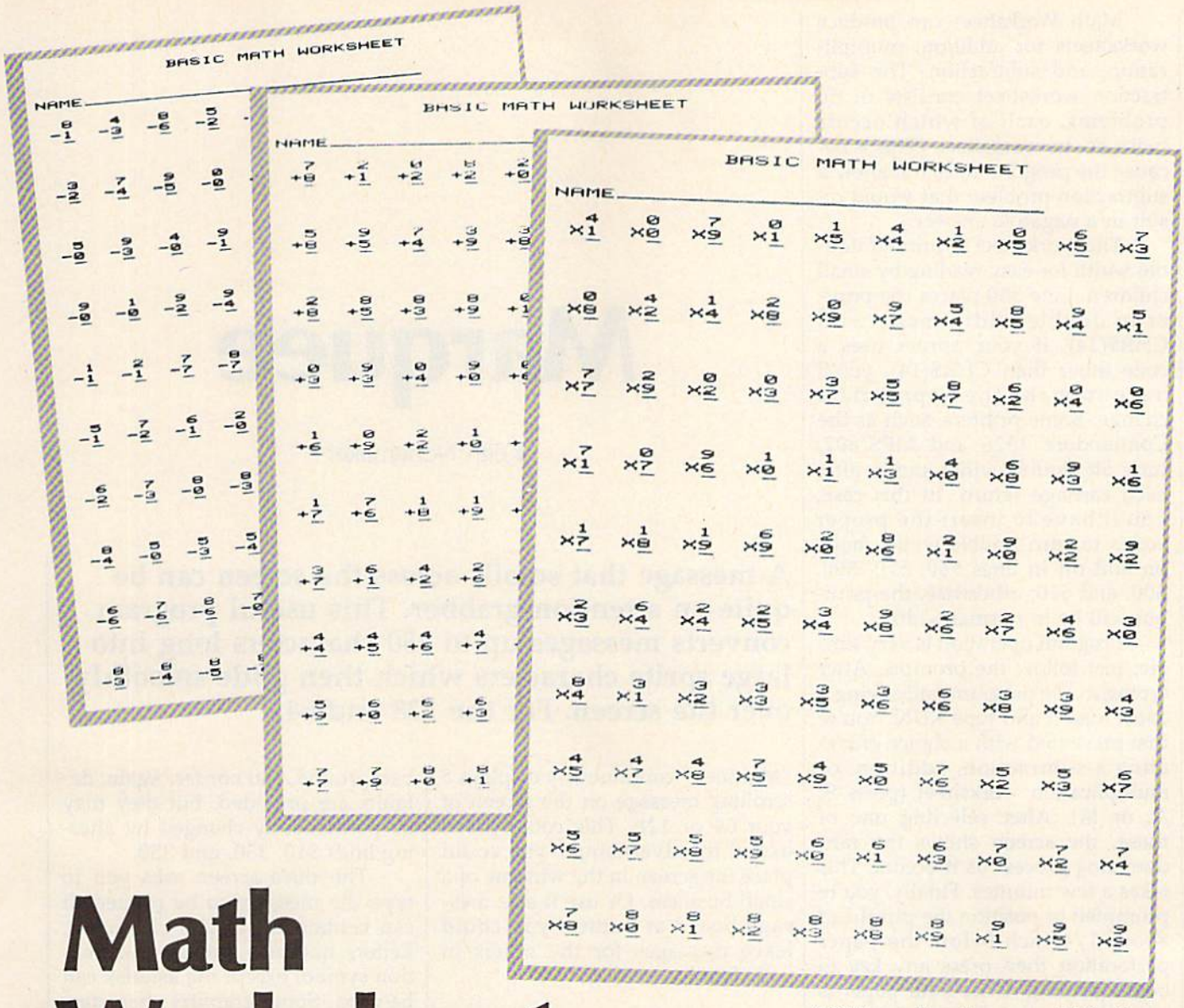

Math Worksheet

Addition, subtraction, or multiplication worksheets can be generated with only two keypresses. The program's randomizing feature insures that each worksheet will be different each time.

Kenneth Marineau

Here's a quick and easy way to generate printed worksheets with math problems for children. Each worksheet is different every time it's printed out. For the Commodore 128, 64, Plus/4, and 16. The program works with any Commodore or compatible printer.

There are any number of ways to teach children basic math skills. One of the traditional methods is the worksheet. A worksheet has several advantages over a computer game or drill type of program. It can be photocopied and used by many children at the same time. There are no commands or keypresses to learn, and it can be used most any time or any place. A worksheet assures that the desired problems are covered, and, if desired, the child can be timed for completion.

A major disadvantage of the worksheet, however, is that the student soon begins to memorize the sequence of answers. "Math Worksheet" solves this problem by first creating 100 problems using numbers 0 through 9, randomizing the problems, and then printing a worksheet consisting of ten rows of ten problems each. Each of the problems is different from the others, covering all 100 possible combinations, and each worksheet printed out is different from previous versions, preventing memorization of the order of the answers.

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Math Worksheet can produce worksheets for addition, multiplication, and subtraction. The subtraction worksheet consists of 50 problems, each of which occurs twice on the worksheet. (This is because the program does not allow a subtraction problem that would result in a negative answer.)

The worksheet is printed double width for easy reading by small children. Line 550 places the printer in double-width mode with CHR$(14). If your printer uses a code other than CHR$(14), you'll have to make the appropriate change. Some printers, such as the Commodore 1526 and MPS-802, turn off double-width mode after each carriage return. In this case, you'll have to insert the proper codes to turn double-width mode on and off in lines 560, 570, 590, 600, and 610; otherwise, the printout will be in normal width.

Program operation is very simple; just follow the prompts. After typing in the program and saving a copy, load it and type RUN. You're first presented with a choice of creating a subtraction, addition, or multiplication worksheet (press S, A, or M). After selecting one of these, the screen shows the randomizing process as it occurs. This takes a few minutes. Finally, you're prompted to position the printhead about 1/4-inch below the paper perforation then press any key to begin printing. Once your paper is adjusted for the first printout, no further adjustment should be needed if you're using standard size paper. The printout can be aborted by pressing down and holding the Q (Quit) key.

As listed, the program runs on the Commodore 64. If you're using a 128, replace line 40 with the following:

```
SG 40 POKE 7,R:POKE 8,C:POKE 9
      ,0:SYS 65520:RETURN
```

If you're using a Plus/4 or 16, replace lines 20 and 40 with the following:

```
GA 20 COLOR 4,1:COLOR 0,1:POKE
      2025,255:GOTO50
AH 40 POKE 2035,R:POKE 2036,C:
      POKE 2037,0:SYS 65520:RE
      TURN
```

See program listing on page 107.

Marquee

Keith Nonemaker

A message that scrolls across the screen can be quite an attention-grabber. This useful program converts messages up to 250 characters long into large sprite characters which then glide smoothly over the screen. For the 128 and 64.

"Marquee" continuously displays a scrolling message on the screen of your 64 or 128. This could prove useful in advertising—you could place the screen in the window of a small business. Or use it as a message board at home—you could leave messages for the others in your family.

Typing It In

The 128 version is written entirely in BASIC; type it in and DSAVE it before running it. The 64 version is also a BASIC program, but it uses a short machine language routine (stored in DATA statements) which goes into memory at 49152, so you shouldn't have any other machine language programs in that part of memory when you run Marquee. After typing the 64 version, save it and then type RUN.

First you're asked where you want the message to appear on the screen, how far from the top of the screen. You're also prompted to input the scrolling speed. To use the default values, simply press RETURN. Defaults may be changed permanently by altering lines 140 and 180.

The second screen allows you to choose colors for the message, background, and border. Again, defaults are provided, but they may be permanently changed by altering lines 310, 330, and 350.

The third screen asks you to type the message to be printed. It can contain up to 250 characters. Letters, numbers, and any punctuation symbol except the asterisk can be used. Some graphics characters will display properly, but avoid characters that require the bottom line of the character matrix.

Next, as the sprite data is calculated, you'll see a timer count down to 0. Data creation requires about four seconds for each unique character, which is rather time-consuming. However, duplicate characters are created almost instantaneously, so don't be surprised if the timer seems to suddenly jump ahead now and then.

Finally, the screen is cleared and the scrolling message begins. The message will continue until the RUN/STOP key is depressed. Even then, about five characters can be "caught" and will continue to move even as you proceed with other programming. If you want to eliminate those characters, use the RUN/STOP and RESTORE combination.

See program listings on page 98.

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Sequential File Editor

Paul Piciocchi

This menu-based program makes modifying sequential files easy, with options for editing, inserting, deleting, resaving, and printing out sequential files. For the Commodore 64, Plus/4, and 16. A disk drive is required.

Sequential files can hold a wide variety of information. When a game saves the all-time high score, chances are it puts the information in a sequential file. When you save an adventure game position to disk, the data probably goes into a sequential file. Programs that include filenames and addresses often store the data in sequential files.

Modifying a sequential file can often be a tedious chore. Sometimes you can load and run a word processor to do the job. But the file might not conform to the word processor's format (some use ASCII characters stored in sequential files, others might use screen codes in program files). Or you might not own a word processor. You're not left with much of a choice if that's the case: Either you'll have to retype the contents of the whole file or you'll have to write a program that can read the file into memory for you to make modifications—not an easy task. This program, "Sequential File Editor," provides a simple solution—it reads a sequential file into memory and then offers a menu with several editing options. It runs on the Commodore 64, Plus/4, and 16.

Using The Editor

After typing in the program, save a copy to disk. To use it, load it and type RUN.

You're first asked for a filename and disk device number (which should be 8, unless you have multiple drives). Next you're asked if what you typed is correct. If you reply Y, the program starts to read in the file (if that file is not on the disk, you'll be told). While the program reads the file, the contents are displayed as individual lines, along with assigned line numbers. (A carriage return in the sequential file determines the end of each line.) If you plan to do complex editing, you may want to write down the line numbers you plan to modify.

Once the file is read, you're given a simple menu. The commands include the following:

1. List File. You're asked if you wish to see the file with line numbers (so you can find the line you wish to edit) or without line numbers (to see the final product). Press either W or O. While listing, you can pause the output by pressing the space bar or abort the output by typing A. Resume the listing by pressing the space bar again.

2. Edit Line, and **3. Insert Line.** If you select either of these, you're asked for a line number. If you choose to edit, you're shown the line as it is. Otherwise, the program will make space within the file to insert that line. Next you're asked to change or write the line. In either case, pressing RETURN keeps the line as it is. (When editing or inserting lines, you can enter up to 254 characters. The program will prevent you from going beyond this limit. Control characters are not allowed as input, except for DEL—CHR$(20)—which deletes single characters, and CTRL-X, which erases an entire line.) The program works with sequential files as large as 3000 lines. On the Commodore 16, however, the limit is 100 lines, due to limited memory.

4. Delete Line. This allows you to remove a line from the file. After specifying the line number, you're shown the line and asked if you are certain you wish to delete it.

5. Re-Run Program. If you finish with a file and wish to edit another, you can re-run Sequential File Editor. Make sure to use the next command (resave file) if you want the changes you've made to be written to disk. The re-run option starts over with the initial filename prompt.

6. ReSave File After Editing. It's important that you remember to do this. When you finish editing a file, you must resave the file to disk to make the changes permanent. Should you forget, the file will remain as it was before editing. When prompted for a name to resave the file, you can type an asterisk (*) to resave with the original filename. This command doesn't use the sometimes unreliable save-with-replace function, it actually scratches the old file before the new information is written out.

7. Print File To Printer. If you wish to have a printout of the file, choose this option. You're asked for the number of lines per page (this number is usually 66). The program will format the file into pages, and leave five blank lines on the top and bottom of each sheet. If you do not want the file formatted into pages, enter 0 as the number of lines per page on your paper.

8. Exit Program. Once you've finished editing and have resaved the file to disk (option 6), you can exit the program.

See program listing on page 101.

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Budget Planner

Gregory L. Smith

Managing your budget doesn't have to be a chore with this program. It totals your income and bills week by week, allowing you to plan your expenses in advance and make adjustments for special occasions like vacations or birthdays. For the 64, 128, and Plus/4.

Have you ever wondered if you can afford additional monthly expenses—like a mortgage or additional credit cards? Or how much "discretionary income" (money left after paying bills) you might have around Christmastime? I used to manage all the details in my head, but usually had little or no idea as to how much money there actually was (or where it all went).

"Budget Planner" is a mini-spreadsheet written in BASIC. It's designed specifically to handle weekly and monthly income/expenses for an entire year. Budget Planner will sum a column (a week of income and expenses) and present a total. The total is then carried over into the next week as a previous balance.

Typing It In

The program listing is the 64 version. Minor changes will allow it to run on the 128 or Plus/4 (as written, the program and variables take up more memory than is available on the Commodore 16, although it might be possible to modify Budget Planner for that machine by cutting back on the size of the arrays). If you own a Plus/4, type in the listing for the 64 and then add the following two lines:

```
EX 90 FORI=1TO8:READ A:KEYI,CH
      R$(A):NEXT:DATA 133,137,
      134,138,135,139,136,140
RS 1890 COLOR 0,4,0:COLOR 4,4,
        7
```

Commodore 128 owners should add line 90 above (line 1890 is optional on the 128, but if you use it, remove the third number after each of the COLOR statements).

When you first run it, Budget Planner asks for a filename of the information to be loaded. Once you've set up your yearly finances, you can save the data to disk or tape. Since you're just getting started, simply press RETURN and you'll be prompted for the date. This is the date you want to start budgeting. (I like to set my budget up based on Friday as the end of the week. For 1986, 3-JAN-1986 is the first Friday of the year.) Enter the day as a number, the month as a three-character abbreviation, and the year as a four-digit value. You're not required to use the beginning of the year. You may start in the middle or at the end if you like. The program is even smart enough to handle leap years.

The screen then displays four columns of information. The first column holds the labels for each row. The only two rows available when you first start are the "PREVBAL" (previous balance) and "TOTAL."

The other three columns are the budget data. The week number is shown on the left side. The date of each week is above the corresponding column. When you use the left/right cursor keys to scroll around the budget, the week number will change.

You enter income and expenses by typing the amount (which appears on line 2 of the screen) and pressing RETURN. Only numbers and the "+", "−", and "." keys will work here. Use the delete key to remove the last character typed.

The arrow keys are used to move the reverse-video cursor around the screen. You cannot alter the TOTAL row since that is controlled by the computer. You can see the next week by scrolling off the edge of the screen. This is allowed in both directions. The up/down arrow keys work after more expenses have been added. However, you cannot scroll vertically as only 18 rows (one screenful) are allowed.

The Function Keys

The function keys trigger the various options. Pressing f1 causes the help menu to appear. It draws a window in the top left corner of the screen with a reminder as to which key does what.

To go to a specific week, press f2. You may jump to any week you like by entering its week number (week 1 is the start of the budget and week 52 is the end.) You can also do a "relative jump" by using a plus or minus sign (−3 means go back 3 weeks and +3 means go forward 3 weeks). This is faster than pressing the right-arrow key many times. Also, SHIFT-E will jump to the end of the next month. This is handy since most of us pay bills at the end of the month.

F3 is the LOAD key. You may load a new budget (data from the disk) at any time. You'll be asked to supply a filename. If you pressed f3 accidentally, just press RETURN in response to the filename prompt. You'll be returned to your original budget. Likewise, f4 (SHIFT-f3) is the SAVE key. You might want to

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BUDGET PLANNER 1986

	1-MAY	8-MAY	15-MAY	22-MAY	29-MAY
PREVBAL	0.00	428.00	620.50	952.32	1110.32
PAYROLL	638.00	238.00	638.00	238.00	638.00
HOUSE PMT	0.00	0.00	0.00	0.00	-650.00
ELECTRIC	0.00	0.00	-69.74	0.00	0.00
TELEPHONE	0.00	0.00	-17.36	0.00	0.00
CABLE	0.00	0.00	-9.08	0.00	0.00
CAR PMT	0.00	0.00	0.00	0.00	-208.12
GROCERIES	-50.00	0.00	-50.00	0.00	-50.00
GAS	-20.00	0.00	-20.00	0.00	-20.00
CHARGE CRD	0.00	0.00	0.00	0.00	-25.57
INSURANCE	0.00	0.00	0.00	0.00	0.00
SAVINGS	0.00	0.00	0.00	0.00	-650.00
MISC.	-140.00	-45.50	-140.00	-80.00	-140.00
TOTAL	428.00	620.50	952.32	1110.32	4.63

This sample printout shows how "Budget Planner" has been set up for a five-week month. Note that the first Previous Balance (PREVBAL) entry is 0, indicating that this is when the program was first put in use. Also note that decimal mode was selected.

BUDGET PLANNER 1986

	5-JUN	12-JUN	19-JUN	26-JUN
PREVBAL	5	3	381	394
PAYROLL	238	638	238	638
HOUSE PMT	0	0	0	-650
ELECTRIC	0	-61	0	0
TELEPHONE	0	-19	0	0
CABLE	0	-9	0	0
CAR PMT	0	0	0	-208
GROCERIES	0	-50	0	-50
GAS	0	-20	0	-20
CHARGE CRD	0	0	0	-112
INSURANCE	0	0	0	0
SAVINGS	-240	0	-225	0
MISC.	0	-100	0	0
[redacted]	3	381	394	[redacted]

In this example, we see a four-week month and decimal rounding. Also note the highlighted (reverse field) negative balance.

use the year of the budget as the filename. Again, if you decide not to save the budget, simply press RETURN.

To add a new row, use f5 (labeled +ROW in the help menu). It inserts a row below the cursor for new expenses (or new income). You'll be prompted for a name, which can be up to ten characters long. As with the other options, pressing RETURN cancels the operation. Once a name has been assigned, you must specify whether it is a source of income (I) or an expense (E). Pressing any key other than "I" defaults to an expense. This is important: Every value you enter in this field will be negative if it is an expense and positive if it is income. (You don't need to place a minus sign in front of an expense). Likewise, f6 deletes the row the cursor is on. You must verify by entering YES (or the letter Y) when asked. If you enter anything else, you'll be returned to the current budget.

The f7 key causes a new balance to be computed. Balances are *not* recalculated after each new amount is entered. Since the program is written in BASIC, it takes several seconds to recompute the array and display the results. This delay would be annoying if the program made all the computations every time you added another number.

Pressing f8 makes the results print out. (Be sure your printer is turned on.) You may specify a range of months to print. Pressing RETURN in response to the FROM? prompt returns you to the budget, without printing. Enter a valid 3-character abbreviation (JAN or AUG, for example). When prompted to enter TO?, you may press RETURN to print only one month. To print several months, use the appropriate three-character abbreviation.

Special Keys

There are five *SHIFT* functions in addition to the function keys. One has already been mentioned, the SHIFT-E key, which jumps to the end of the next month.

SHIFT-D switches between showing and not showing the decimals (pennies). Budget Planner defaults to showing the decimals. (The variable DP is initialized in line 1950. Simply change it to DP=0 to change the default.) When decimals aren't being displayed, you see the rounded amount on-screen.

SHIFT-F finds the next negative value in the TOTAL row. If you ever "go negative," the TOTAL value and the offending value will turn red. In such a case, you don't have enough income to cover expenses and it may be necessary to juggle some bills. SHIFT-F saves you from trying to find these trouble spots manually.

Use SHIFT-M to flag monthly expenses. If your rent is $500, for example, you would type in 500 in that row and then, instead of RETURN, press SHIFT-M. The $500 expense will be added to the end of every month. Note that this value is placed only on the same row as the cursor. Also, only the months AFTER the cursor position are affected. (For example, if you are on week 26, only weeks 26–52 are affected. The other 25 weeks will not be changed.) Naturally, this key works for income as well.

SHIFT-W is the weekly expense key (groceries, for example). Pressing it places the line 2 value in each week after the cursor position. Again, you use it in place of RETURN after entering a value. It works much like the monthly expense key and also works for the income fields.

Press SHIFT-T if you use a Datassette. It directs data storage and retrieval (f3 and f4) to the tape drive.

The SHIFT-Q key is the Disk Select key. It causes data to be saved to and loaded from a disk drive. (Note: Disk is the default. Changing DEV=8 to DEV=1 in line 100 will change the default device to tape.)

See program listings on page 103.

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A Hands-On Introduction To 128 CP/M

Todd Heimarck, Assistant Editor

If you regard the 128's CP/M mode as a somewhat forbidding new territory, this article is for you. It explains some common CP/M commands, with examples to try out, and concludes with a simple application you can use.

Do you own a Commodore 128? If so, there's a good chance that you previously owned a 64. You may regard 64 mode as "an old friend" and 128 mode as a welcome upgrade—with the commands you already know, more memory, and some amazing new keywords for making sound, music, graphics, and disk operations easier.

You might see CP/M as the foreign mode of this three-headed computer. There's a lot of software available, but how do you use it? How do you load and run programs? How do you format a disk and copy a program over? How does CP/M work?

Booting CP/M

Getting into CP/M mode is relatively easy. Turn on your disk drive and insert the CP/M disk that came with your 128. Then turn on the television or monitor. Finally, power on the 128, which should check the disk drive for a boot sector and follow the instructions there. The boot sector on the CP/M disk causes the 128 to give control over to the Z80 chip and load CP/M. If you turn on the computer first, it defaults to 128 mode. When 128 mode is active, you can type BOOT to move into CP/M mode, assuming the disk drive is turned on with the CP/M disk inside.

If booting doesn't seem to work, try turning the disk over. The label that says "System Disk," with a serial number, should be facing up.

Before reading any further, boot CP/M, whether you do it by typing BOOT in 128 mode or by turning on the computer last. The CP/M disk is formatted as a single-sided 1541 disk, so you should be able to use either a 1541 or a 1571 (or compatible third-party drives). Pay attention to the 40/80 DISPLAY switch. Working in 80 columns (with the button down and an 80-column monitor) is much easier, although 40 columns is marginally acceptable.

Your First Command: DIR

If everything works right, you should see the BOOTING CP/M message and some miscellaneous information about what's being loaded. When everything's ready and running, the A> prompt should appear. This means CP/M is waiting for a command and disk drive A is the default drive. If you try to run a program, it will load from drive A. If you own a second drive, which is device 9 in 64/128 mode, you can switch to it by typing B: (the prompt should change to B>). A third drive (device 10) would be drive C:, and so on. If you wanted to leave drive A: as the default, but temporarily use a program from B:, you would precede the program name with a "B:" (B:HELP, for example), and if you want a command to act on the second drive, you would put the "B:" *after* the command (DIR B:, for example).

Type DIR, an abbreviation for DIRectory, and the screen will display the names of the files found on drive A. Equally acceptable is DIR A:. Those of you accustomed to pressing f3 in 128 mode to see the directory will be pleasantly surprised to find that f3 is preset to print DIR. It displays the directory of the current drive.

Press f3 or type DIR to see the directory. The 80-column screen shows everything. But if you're using a television or a 40-column display, you'll only see part of the directory. Hold down the CONTROL key and press the right arrow key (above INST/DEL) to scroll the screen to the right. To move back, hold CONTROL and the left-arrow key. Even when you're working in 40 columns, the screen is 80 characters wide. You must scroll back and forth to see the whole thing. The constant shifting back and forth can become annoying after a while, which is why the 80-column screen is preferable in CP/M.

Ask For HELP

Leave the main CP/M disk in the drive and type HELP DIR and you'll be treated to an explanation of the DIR command. The detailed HELP files can explain a lot when you're new to CP/M. If you wish, enter .BUILT-IN or .WITHOPTIONS for more details about DIR (note the period in front of the subtopics). From the HELP> prompt, you can also type DIR BUILT-IN or DIR WITHOPTIONS. (Be sure to place a space between DIR and BUILT-IN—the space is a separator that divides the main topic and a subtopic.)

If you look at the directory, you'll see a file called HELP.COM, which is the HELP command (or

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HELP program). Typing HELP starts the program running. You don't have to type LOAD or RUN, just the name of a program that ends with the .COM extension. When you entered HELP DIR, you effectively told CP/M to run the HELP program and act on the input "DIR". Some programs take optional information like this; you might run across a sort program that requires the following syntax: A:SORT B:NAMES.ASC A:INORDER.ASC;DIAMOND (which means use the SORT program from drive A:, make it read the file NAMES.ASC from B:, and send the alphabetized output to a file called INORDER.ASC on drive A:. The semicolon and a password are sometimes required to run a program—type HELP SET for more about passwords).

A complete list of HELP topics is at your fingertips. Just type ? or HELP at the HELP> prompt. Or type HELP HELP at the A> prompt. Many of these topics have subordinate subtopics and subtopics underneath subtopics. To print out the various help files, turn on your printer and press CONTROL-P. The files will not only print to the screen, they'll also be sent to the printer. You could also use the DEVICE.COM program to set the console out device (CONOUT:) to both screen and printer. Type HELP DEVICE to find out more about this program. It sometimes helps to add a space and [NOPAGE] after the topic name, to prevent the PRESS RETURN TO CONTINUE prompt.

The Other Side Of The Disk

Remove the CP/M disk, turn it over, and place it in your disk drive. There's information on both sides and you have to flip the disk to read the other side. It's a good idea to press CONTROL-C before typing DIR. CONTROL-C "logs out" a disk; it tells the system that you're planning to switch disks. If you don't CONTROL-C first, CP/M sometimes thinks you're working with the same disk that was previously in the drive.

Type DIR (or press f3) and the directory of the other side lists on the screen. Now try the unshifted CRSR-down key (under the RETURN key) and DIR appears again. The CRSR-down key, which is not the same as the gray down-arrow key on the top row, allows you to repeat the last command—a sort of do-it-again key.

While the flip-side of the disk is in the drive, try HELP DIR again. The computer prints your command followed by a question mark, because it doesn't know how to HELP you.

Built-In Versus Transient: Commands And Programs

The first side of the CP/M disk contains a file called HELP.COM, the second side doesn't have this file. So the HELP command works when the first side is in the 1541 or 1571, but it's not a legitimate command when the disk is turned over.

HELP is a command (the .COM extension means COMmand), but it's on the disk, it's not part of the operating system.

In 64 or 128 mode, there's a definite distinction between *files*, programs or data on a disk, and *commands*, keywords that cause the computer to do something. A 64 or 128 file is on the disk, but a command is inside the computer. To run a program from 64/128 mode, you must first use the LOAD or DLOAD command (LOAD is built into the computer) to move the program from disk into memory. When the program has been transferred into the computer's RAM, you type RUN (another built-in command) to make the program start up. The BASIC program, in turn, contains additional commands your 64 or 128 recognizes.

CP/M does things differently. Almost always, a command is also a program. In CP/M, you can run the HELP program, which could be called the HELP.COM command, or a BACKGAMMON program (the BACKGAM.COM command), or the ALIEN INVADERS game (the ALINV.COM command), or the *WordStar* word processor program (the WS.COM command). A program is a disk-based command. They're the same thing in CP/M.

To use a CP/M command, it must be on the current disk and it must have a .COM extension. 128 mode has nearly 200 commands built in, but CP/M mode offers only six: DIR, DIRSYS, ERASE, RENAME, TYPE, and USER. DIR prints the directory (remember to press CTRL-P if you want it sent to the printer). DIRSYS tells you if there are non-system files on the disk. ERASE scratches a file, and RENAME changes the name of a file. TYPE prints out the contents of a data file; you can try to TYPE a .COM file, but you won't see much that makes sense. USER changes the user area, which allows you to break up a disk into up to 16 separate areas which act like subdirectories. These six built-in commands are exceptions to the rule that commands are disk-based. All commands other than these six are "transient."

Transient commands are loaded from disk and executed, and then they disappear. Transient commands take up memory, in the Transient Program Area (TPA), while they're being executed—but when they're done, they're gone.

Here's something that might be a little confusing: DIR is a built-in command, but if you look at your CP/M disk on side two, you'll see a DIR.COM file. This second DIR command is a transient program with more features than the built-in DIR. If you type DIR, CP/M uses the built-in command. But A:DIR makes CP/M go to disk A: for the command.

If you'd like to look at another disk, type A:DIR E:—the DIR command is read from disk A: and then you're prompted to insert another disk (press RETURN when the second disk is in the drive).

Drive E: is a *virtual* drive, very useful when you own only one disk drive. If you have a command on one disk and want it to work on another disk, tell it to load from drive A: but operate on E: and CP/M will prompt you to switch disks at the appropriate time.

A Vulnerable Operating System

Like the disk-based commands, the entire CP/M operating system is on a disk. If you spill a cup of hot coffee on your system disk, you've lost CP/M. It's not part of your computer like 64-mode or 128-mode is. If you lose or ruin the disk, you no longer have CP/M.

Thus, it's very important to make a backup copy as soon as possible. Then, store the original

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CP/M disk in a very safe place. Without the CP/M operating system, the Z80 chip might as well be deaf, dumb, and blind—unable to read the keyboard, unable to print to the screen, unable to recognize any peripherals. If the Z80 is the brain of the computer, CP/M is the eyes, ears, and mouth.

Before you do anything else, copy both sides of the CP/M disk to a new double-sided disk if you own a 1571, or to two single-sided disks if you have a 1541. Contrary to what the System Guide says, you can't use COPYSYS to back up CP/M. You have to run a program called PIP.

First you'll need the FORMAT.COM program. Use the DIR command to find the FORMAT command on one side or the other of your CP/M disk. If you don't want to look at the whole directory, type DIR FORMAT.* to look for any files called FORMAT.

When the proper disk is in the 1541 or 1571, type FORMAT (don't include the .COM, CP/M already knows that it's a command). If you have two drives (with the second set up as device 9), you can put the disk containing FORMAT.COM in drive A (device 8) and type A:FORMAT B:, which means use the FORMAT command from drive A: and make it work on drive B:. If the format program is in drive B: (device 9) and you want it to the disk in drive A:, type B:FORMAT A:, which means "take FORMAT from drive B: and apply it to drive A:."

The FORMAT program can tell whether you've got a single- or double-sided drive. If you're using a 1541, you'll have two choices of disk format: *C128 single sided* or *C64 single sided*.

Use the gray cursor keys to select one or the other and then press RETURN. The only reason you'd ever choose the C64 option is if you're planning to use the disk with a 64 and the discontinued CP/M 2.2 cartridge. You should always choose the first (C128) option—it gives you more disk space (only if you happen to know someone with the 64 CP/M cartridge and want to send him or her some files, would you pick the 64 format).

1571 users have one more option: *C128 double sided*. Always choose this format for disks you'll be using yourself—it gives you double the disk space. Of course, if you plan to give a CP/M disk to someone who owns a 1541, you would choose one of the other options.

After formatting the disks, try to get a directory by pressing f3 (or typing DIR). You should see the message NO FILE, which means there's nothing on the disk (yet).

PIP Means Copy

Now that the disks are formatted, you can begin to make the backup copies. Use DIR to find a program called PIP.COM and type PIP. You'll see an asterisk (*) prompt. To escape the program, just press RETURN. But to use PIP, insert the source disk, which you're copying *from* and type the following line without any spaces:

```
e:=a:*.*
```

Knowing that drive E: is a virtual drive, you might be able to figure out how this works. It tells PIP to copy to drive E: everything from drive A: (the destination drive is always listed first). The asterisks are wildcards meaning every filename and every extension—in other words, everything on the disk. You copy a single file like DIR by typing PIP E:=A:DIR.COM.

You'll be prompted to switch disks several times. Remember that the source disk is drive A: and the destination disk is drive E:. Press RETURN each time you swap disks. It will take some time if you're working with a single drive.

If you have two drives, you can PIP a lot faster by typing PIP B:=A:*.* (PIP to B: everything from A:). You won't have to change disks, which saves a lot of time.

After copying the first side of the CP/M disk, flip it over and copy everything on the second side. When you're done, store the master disk in a safe place.

PIP is more than just a copy program, it allows you to read from one device and write to another. You can PIP a disk file to the printer, PIP from a modem to the screen, or PIP from the keyboard to a disk file.

An Introduction To Submit Files

In 64 mode, a common series of commands for loading a machine language program would go something like this:

```
LOAD "UTILITY",8,1
NEW
SYS 49152
```

The three commands have to be typed on separate lines, and you generally have to wait for the computer to finish executing the previous command before you type the next one.

Now imagine using a word processor to type the three lines and then creating a disk data file that contained these commands. If you could somehow tell the computer to execute all three commands, you wouldn't have to type each line. You'd just type something like EXECUTE "BUNCHOFCOMMANDS" and the three lines would be read from disk and executed, one by one. Many computers have this ability to do "batch processing," to perform a series of commands stored in a file.

And this is exactly what the CP/M SUBMIT program does. Before going any further, you might want to use the HELP program to read more about SUBMIT and the editor program called ED (type HELP SUBMIT or HELP ED).

Creating A PROFILE Program

We're now going to create a special kind of submit file named PROFILE, which runs immediately after CP/M is booted (if you've used an IBM, CP/M's PROFILE.SUB can be compared to an AUTOEXEC.BAT file on an IBM).

Format a disk and copy (PIP) the following files to it:

```
CPM+.SYS
CCP.COM
ED.COM
SUBMIT.COM
DIR.COM
```

At the A> prompt, type ED PROFILE.SUB, which means edit a file called PROFILE.SUB. The ED.COM program will load and then print NEW FILE, because there's currently no file called PROFILE.SUB on the disk. A new file will be created. Enter the following lines at the given prompts:

```
:* i
1 a:dir{CONTROL-Z}
:* e
```

The initial asterisk (*) prompt indicates ED is ready for a command. Typing "i" means insert a

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line and since it's a new file, the first line is number one, which is why a "1" appears on the next line. The text we're adding is "a:dir" because we're going to make the PROFILE file automatically run the DIR.COM program. Don't press RETURN (if you do, it will go on to line 2, which would be OK if we wanted a second command in our file, but we don't). The {CONTROL–Z} marks the end of the file. The asterisk acts as a reminder that we're back at the command level, where typing "e" means "exit and write the file to disk."

When you return to the A> prompt, type DIR to verify that a file called PROFILE.SUB has been created. If you'd like to read this file, enter the following line (remember, TYPE is one of the six built-in commands):

```
type profile.sub
```

Now we're ready to test it out. Hold down the CONTROL key and press ENTER (on the numeric keypad). CONTROL–ENTER works a lot like RUN/STOP–RESTORE in 64 or 128 mode. It forces CP/M to reboot. After CP/M loads, it will find the PROFILE.SUB file (which requires SUBMIT.COM to work). The text in the file (A:DIR) is printed on the screen and the DIR.COM program runs. An alphabetized directory of the disk is then printed on the screen.

To run the commands in PROFILE again, type SUBMIT PROFILE. This is just a simple example; you could add several more commands to the PROFILE.SUB file. Or you could make PROFILE automatically load and run a game or other program. If you decide to start time-stamping your files, you could create a PROFILE.SUB routine that asks you for the date and time when you first turn on CP/M. For more about time-stamps, see the HELP files on INITDIR, SET, and DATE.

If you'd like to get rid of the ED file, type ERASE ED.COM. ERASE can be shortened to ERA.

Experimenting With CP/M

There's a lot more you can do with CP/M. Many languages are available, including BASIC, C, Cobol, Forth, Turbo Pascal, and many others. If you plan to write programs, you'll need a language (CP/M is an *operating system*, not a language). To write actual .COM files such as we've been using requires either a Z80 machine language assembler or a compiler package for the language you're using.

In addition, there are a lot of good public domain programs available, if you can find a local CP/M user group (usually Kaypro or Osborne) or a local bulletin board. For more about public domain programs, see the following article, "CP/M Public Domain Software." To use a modem to download programs, you'll need the December 6 (or later) version of CP/M, which is being shipped with the most recent 128s. If your version date is earlier (June or August), you can download the upgrade program in 64 or 128 mode, transfer it from a Commodore disk to a CP/M disk, and then use this program to modify CPM+.SYS. (Instructions for upgrading to the new version of CP/M are available on CompuServe and QuantumLink.)

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CP/M Public Domain Software

James Adams

If you're not currently using CP/M on your 128, there's a whole new world of software waiting for you—and a lot of it is available at little or no cost.

One evening last fall, I turned on my Commodore 128 and dialed the bulletin board sponsored by my user group. The public messages had been scrolling past when suddenly there was one that piqued my curiosity: the latest of many messages concerning the availability of the mysterious CP/M.

TO: ALL
SUBJECT: CP/M on 128

HELP, I REALLY LIKE MY 128 BUT WHERE CAN I GET SOFTWARE FOR THE CP/M MODE? PLEASE LEAVE E-MAIL IF YOU CAN HELP!

One of the attractive features of the 128 is its compatibility with the 64 and the large base of existing 64 software. Another selling point is 128 mode with its large and expandable memory, the fast disk drive, and a new BASIC with a wealth of new commands. But probably only a minority of 128 buyers were charmed by the 128's compatibility with CP/M. Living on the trailing edge of technology (CP/M is anything but new) has its advantages, however. There are thousands of CP/M programs, ready to run and waiting for the 128 user.

Free Programs

For those readers who might be first-time users of computers, *public domain software* means programs you can acquire at no cost—you don't pay anything. Here's how it works: whenever you write something original, a poem, a song, a story, or a computer program, you own the copyright to that original work. This is true whether or not you actually register the copyright with the government. If you then sell it to a publishing company, either you or the publisher will then own the copyright (the right to make copies) and you're paid a royalty fee based on sales of your work. After a certain period of time, the copyright expires and the artistic work passes into the public domain. All songs written before 1900, for example, are in the public domain; they can be performed without paying a fee to the composer.

So if you write a program, you own the copyright to it, unless you choose to voluntarily put it in the public domain, meaning anybody can use it and distribute copies. User groups are often an excellent source of public domain software.

Sometimes you'll pay a few dollars for postage, the cost of the disk, or the time it takes to copy the program. And, of course, if you download from a bulletin board system that qualifies as a long-distance call, you'll pay the usual long-distance charges.

Commodore computer owners are used to having a large base of public domain software as well as reasonably priced commercial programs from which to choose. Many Commodore business application programs are under $50 with only a few topping out above $100. The cost of a good CP/M program may run as much as four times more than its top-of-the-line Commodore counterpart. Commodore owners may balk at the thought of paying these prices for their software. Fortunately, there's an alternative for the new CP/M user: Public domain and "freeware" or "shareware" programs are abundant.

Freeware and shareware are terms for copyrighted software that the author distributes free. Often, there's a notice included in the program or documentation that if you enjoy the program, you can send a small donation to the author. Often, you receive more detailed instructions or a chance to find out about bugs or upgrades when you send the money. Freeware and shareware are copyrighted software for which you don't have to pay if you don't want to.

Kaypro And Osborne Programs

When the 128 was first announced, reviewers noted that the new 1571

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disk drive would be able to read disks formatted for several different computers. These included the Kaypro and Osborne computers. There's a lot of public domain software available for these two computers. Find software for them, and your 128 is in business. It should be noted that the 1571 disk drive is a *must* because of CP/M's unique DOS format; a 1541 won't read Kaypro or Osborne disks. An 80-column display monitor, like the Commodore 1902, is also a practical necessity. CP/M uses 80-column display, and while the 128 has the ability to run your programs with a 40-column screen using the window feature and right or left scrolling, you won't want to do this for very long.

There are several ways to get inexpensive or free CP/M programs. Seek out computer stores in your area which carry Kaypro equipment. Kaypro is an active company and there's a lot of support for their machines. Keep your eyes open for Kaypro literature. Books and magazines may provide valuable hints, tips, CP/M information, and software advertisements.

If you live in or near a larger city, you'll probably be close to a Kaypro users group. Many of these groups have a public domain library which should be a wonderful source of material. They may also have literature available or sponsor lectures on CP/M. Also, a FOG (First Osborne Group) chapter may be in your area. FOG is a user group which began with the Osborne 1 computer in 1981. The group has expanded and now boasts a very loyal following of over 15,000 members who use or are interested in CP/M. They have a large library and disks are available by mail.

While looking through CP/M specific magazines, you'll come across many advertisements for public domain software collections. Many of these programs will run "as is" on your 128. Some of the public domain material is excellent and often supported by well written, yet inexpensive books.

If several disk formats are offered, choose Osborne double density (Osborne DD). Your second choice should be Kaypro II or Kaypro IV. If it's necessary to "install" the software and you're given a choice of terminal types, it's usually safe to say you have either an ADM-3A or an ADM-31.

Other Sources Of Public Domain Software

Here are a couple of sources of public domain software you'll want to contact:

Peopletalk Associates, Inc. has put together a series of public domain disks formatted for the Kaypro. Utilities, useful business programs, games, and lots of documentation files are included. The "Free Software Handbook" is a valuable companion to the disks, providing documentation and advice on how to use the programs.

Micro Cornucopia also has several public domain disks—some with the dedicated programmer in mind.

Highly Recommended

As you build your CP/M library, here are some public domain titles I recommend:

VDO. This is an acronym for Video Display Oriented text editor. This is a very basic word processing program in the public domain that only takes up 8K. It could be a good educational tool for getting the feel of CP/M commands. The commands are similar to *WordStar*'s (a commercial word-processing program for CP/M).

PC FILE—This is a "freeware" program. If you like it, you can send the author a fee. Distribution is encouraged. This program will handle many of your database needs.

Adventure—This is a great down-in-the-cave adventure game which will access 192K at one time or another. This 500+ point version will keep you going for years as you discover new twists. The author's humor is refreshing in frustrating situations. *Adventure* is available in the "Peopletalk" series.

NSWP—This stands for "New Sweep". It may turn out to be the most valuable utility you'll ever own for your CP/M system. It replaces other utilities that would normally take up 100K of space with a single program of only 11K. *NSWP* lets you copy, rename, delete, view, print, alphabetize, count, and size up your files. Put a copy on every disk you own. You'll use it in every session at your computer. There are several versions of this program in the public domain. I prefer *NSWP.205*. *NSWP.207* offers the disk label, while *NSWP.208* offers the directory listing in alpha order.

D—This is a directory program that's almost as fast as the DIR command. *D* will list the contents of your directory along with the number of bytes used for each file and a brief summary of your used and unused disk space. When you begin to work with CP/M's "user areas," *D* can also give you directories of the hidden areas on your disk with a single command.

Dirf—CP/M has an abundance of directory programs. This one will allow you to add a short description to each directory entry. This might be indispensable if you find yourself creating a lot of text files with a program such as *VDO*.

NULU—This is short for "New Library Utility". *NULU* is a utility program very similar to *NSWP*. It's used with special files called *libraries*. Although libraries may be new even if you're a veteran Commodore user, you'll want to explore this form of disk management.

Handy System 200—This series of files is excellent if you have a computer on your desk at work. It's a calendar, memo pad, appointment book, phone book, decision support system, and more.

There are a few words of caution about CP/M software. Your 128, running in CP/M mode, may do strange things, depending on the setup of the computer your software was originally configured to run on. The first version of *VDO* that I tried was patched for a 1984 Kaypro. It barely ran on my 128. Luckily, *VDO* and many other CP/M programs can be patched or configured for different machines and printers. I was able to get a version which had been patched for a 1983 Kaypro. This version was much better but still a bit erratic on the 128. Later, I tried many of the two dozen patches for other computers. Several of these worked

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very well. Always try to get the most generic version available. Try to avoid versions which use graphics or unique screen displays.

Utility programs seem to be the most reliable on the 128. *Adventure, NSWP, D, Dirf,* and *NULU* all ran as is on my 128. *Handy System 200* (or *Handy Version #2*) still has some problems clearing the screen. To my surprise, PC File, originally for the Osborne 1, did not run on a friend's 1984 Kaypro, but runs perfectly on my 128.

Programs which require a bit of explanation usually come with a "doc" file which can be viewed easily with a *NSWEEP*-type program. In a pinch, you can use the built-in TYPE command. Many programs will contain options which will allow you to configure the program to your individual likes and dislikes. Be sure to copy all of the files associated with a program. You may need several files just to run a single program.

In addition to the "Free Software Handbook" by Peopletalk Associates, I should also mention one other helpful book: *Free Software* by Tony Bove, Cheryl Rhodes and Kelly Smith. It's available at many computer stores. It contains a lot of CP/M specific information about public domain programs. The first half of the book discusses modems, communications programs, and downloading programs from various user groups. The rest of the book consists of valuable information about using the public domain programs you've obtained.

Where To Write

Here are a few contacts you may wish to make to start building your CP/M library (as with most publishing companies, you're more likely to get a reply if you include a self-addressed stamped envelope):

Peopletalk Associates, Inc.
P.O. Box 863652
Plano, TX 75086

Micro Cornucopia
P.O. Box 233
Bend, Oregon 97709

FOG
P.O. Box 3474
Daly City, CA 94015

Peter C. Hawxhurst
(author of Handy System 200*)*
705 Bayside Court
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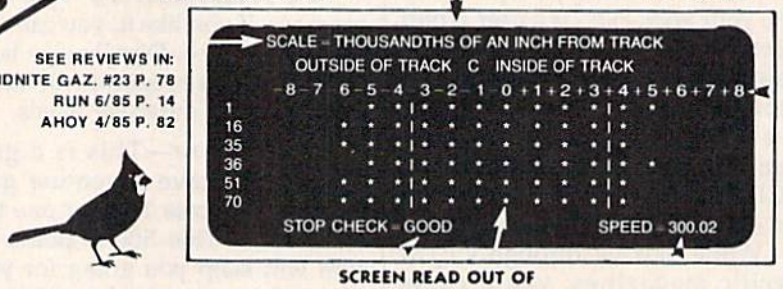

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64 Mode Speed-Up For The 128

Gary Lamon

Once you get used to the 128's fast mode, 64 mode seems especially slow. This short program offers a way to significantly speed things up. For the 128 in 64 mode only; the program doesn't work on a standard 64.

The more you use a computer, the more you wonder if it couldn't be just a bit faster—especially when it's in the middle of a time-consuming task like alphabetizing a list of 800 names. If you own a Commodore 128, you can use the FAST command to double the speed of programs running in 80 columns. Although it also works in 40 columns, the screen goes blank. When you type GO 64, you give up access to the FAST command, but you don't have to give up fast mode. There are several interesting ways to squeeze more speed out of the Commodore 128's 64 mode. First, let's look at some background information.

Every computer has an internal clock which paces the processor. The faster the clock's speed, the more instructions the computer can execute in a given time. A Commodore 64 contains a 6510 microprocessor with a clock speed of about 1 megahertz (MHz), one million cycles per second. On the other hand, the Commodore 128 uses an 8502 microprocessor that's compatible with the 6510 but can run at a speed of either 1 or 2 MHz. When you're using the 64 mode on your 128, the system automatically sets the speed of the 8502 so that the machine performs exactly like a Commodore 64.

It seems a waste that 128 users cannot make use of this additional speed when running their old 64 programs in 64 mode. But there is a way. We *can* double the computer's speed in 64 mode with a few simple POKEs:

POKE 53296,1 (double speed)
POKE 53296,0 (normal speed)
POKE 53296,3 (double speed and screen off)

If you try the first or third of these POKEs in 64 mode, you'll indeed find that your programs run at twice normal speed; but there's a problem. The screen fills with a flashing checkerboard pattern (if you use the first POKE) or goes completely blank (if you use the second). The regular screen is still there, but it cannot be read. The problem is that the 40-column video chip (the VIC II) cannot keep up with the 8502 when the 8502 is running at 2 MHz. The third POKE works well on a 64 program that does, say, a great deal of number crunching. With this kind of program, it's probably not important to have video for part of the program's execution.

There's another way of achieving a significant speed increase while retaining an almost normal picture. The program accompanying this article—"64 Mode Speed Up"—provides approximately a 20 percent speed increase and leaves the screen readable. After typing in the program, save a copy. While in 64 mode, load and run the program and then type NEW. Your machine is now 20 percent faster. To return to normal speed, type SYS 49236 or press RUN/STOP-RESTORE. To get back to fast speed, type SYS 49152. If you'd like to check this, write a short BASIC program with a large loop (such as: 10 FOR I = 1 TO 30000:NEXT) and time it to measure the speed increase. (*Note: You should return to regular speed before all disk or tape operations).*

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How It Works

You may have noticed a flash at the top of the screen while at fast speed. This is normal. But what causes this flash and how does the program work?

The program works by using a machine language *raster interrupt* routine in locations 49152–49258. The raster can be thought of as a sort of paintbrush that paints the picture on the video screen. The raster paints one line at a time across the screen starting at the top left and then moves down one line at a time. The program takes advantage of the fact that we can see only raster lines 51 to 251. The computer is interrupted when the raster is at line 251 (the last visible line) and told to speed up to 2 MHz. This speed is maintained until the raster reaches line 51 (the first line we can see) and then reduced to 1 MHz. While the screen is "painted," the computer is running at regular speed. The result is a computer that runs faster, and you don't have to sacrifice the screen.

But what causes the flash at the top of the screen? Occasionally the computer is performing a task and does not want to be interrupted quite yet, so a few raster lines are done at the 2 MHz speed. (Remember what happened when you typed POKE 53296,1?)

Two memory locations within the interrupt program can be used to speed up the system even more:

POKE 49257, top raster line
POKE 49258, bottom raster line

As an example, try this with the fast mode operating (after SYS 49152): **POKE 49257,150**. You'll find that the flashing garbage will expand to fill the upper half of the screen, but the lower half will remain normal. The computer will now run about 1.6 times faster than a normal 64. You can expand or contract the screen any way you like with the two POKEs above. The more "garbage" visible, the faster the computer. One good way to visibly check the speed of the computer is to load a BASIC program and LIST it at the fast speed and at regular speed. The listing will scroll by considerably faster with the interrupt operating.

See program listing on page 101.

Keyload

Art Hunkins

Now it's easy to display your disk directory and immediately load or run any BASIC or machine language program. For the 64, 128, Plus/4, and 16.

You might find these short disk management programs quite useful. There's even a version for those who use Epyx' *FastLoad* cartridge. There are two 128 versions: one is similar to the 64 version; the other shows how to creatively program the 128 function keys for easy disk access.

After you run any of the versions, you'll first see the disk directory displayed. Move the cursor to the desired program and press RETURN to make your choice. If you want to load the program without running it, press L before RETURN. That causes a *nonrelocating* load using the format ",8,1" which puts machine language programs where they're supposed to go in memory instead of relocating them to the area used by BASIC. If you decide to exit without choosing a program from the directory, you can either cursor to a blank line and press RETURN, or press the RUN/STOP–RESTORE key combination.

"Keyload" stays in memory when you load machine language programs and can be rerun if you need to load multiple programs. BASIC programs, however, will load in on top of Keyload.

A Dynamic Technique

If you're interested in the programming which supports and automates Keyload, you'll notice that a fair amount of keyboard buffer POKEing, often called the *dynamic keyboard* method, is involved in all these programs. This technique allows us to issue the direct mode directory display commands (or multiple LOADs that include the directory), and to format the screen. The display is especially active during the normal 64 version, where a total of 15 keyboard buffer strokes are POKEd.

The *FastLoad* Version

The *FastLoad* cartridge version (Program 5) is 13 lines long. Placed as the first program on a disk, it is loaded and run by the Commodore key–RUN/STOP combination. Through keyboard buffer POKEs, the direct-mode "$" directory listing is invoked, then the program is rerun from line 4. When you cursor to the desired program line and press RETURN, you are actually responding to an invisible INPUT statement with the prompt deleted. Your RETURN signals the program to search for the final quote mark of

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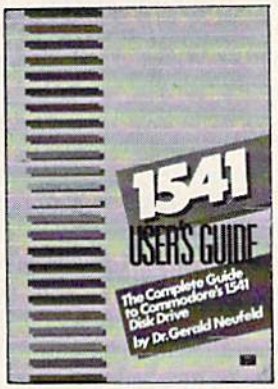

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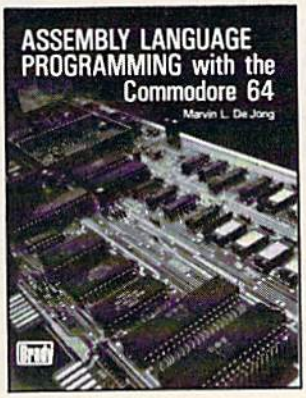

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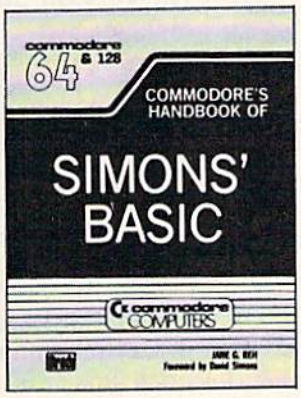

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one of the program names in the directory. That name is printed on-screen and a load or load/run sequence is activated by keyboard buffer POKEs. Disk contents are limited to a display of 20 programs by the size of the screen.

128 And 64 Loaders

The 128 version (Program 2) is a simple variant on the above, loading with the SHIFT–RUN/STOP combination, and calling the disk contents with a direct-mode DIRECTORY command (equivalent to *FastLoad*'s $). Here, 18 programs plus the loader are permitted on disk.

The 64 version (Program 1) is the trickiest. Even though it must also be the first program on disk, you cannot load and run it with a two-key combination. You must do it the long way: LOAD"0:*",8 and RETURN, then RUN and RETURN. This does, however, relieve you from having to type out the program name, or add ",1" after ",8".

Once into the loader, however, things pick up speed. The 15-stroke keyboard buffer loads then lists the directory program. The buffer continues by reloading the original program with a name of "*" which is why it *must* be the first program on the disk and running it from line 7. Some fairly fancy screen formatting is needed to clean up after all the "dynamic keyboard" action. When the dust clears, we're left with the on-screen directory and only a few telltale asterisks in place of the first two programs' file lengths. Otherwise, the 64 version of Keyload functions like the other versions. It permits 18 programs plus itself on a disk.

Keys 128

Program 4, "Keys 128", uses a unique approach. It must be the first program on disk. But, since Keys 128 redefines the function keys, once run, it allows for loading, running, and scratching directly from the displayed directory. And all this works without Keys 128 resident in memory (it deletes itself after running). Keys 128 first redefines the function keys, including a more elaborate version of DIRECTORY (f3), then calls up disk contents.

Keys 128 lists up to 18 programs plus Keyload on the screen when the f3 (DIRECTORY) key is pressed. The DIRECTORY key is redefined to first clear the screen (you can press f3 anywhere, even in the midst of a jungle of text), then it lists the directory and positions the cursor at the first directory entry. After you've moved the cursor to the target program, pressing one of the other function keys (f1, 2, 4, or 7) will activate the desired disk command: DLOAD (BASIC load), RUN (BASIC load/run), BLOAD (nonrelocating load for ML programs), or SCRATCH. After properly formatting the screen line, the cursor returns to column 1 on the line, where you can visually check whether or not you issued the command you wanted. Pressing RETURN completes the action. (If you made a mistake, simply press *another* function key.) At the end, the display is left on the screen so that you may work with the same directory as many times as you like, including filenames already accessed. The f5 and f6 keys are redefined as SAVEs to supplement the other new keys: f5 now displays *DSA-(SHIFT-V)"*, and f6 displays *BSA-(SHIFT-V)"*, at the top of the screen after clearing.

All-Version Summary

Here are some important points to remember when using the various versions of Keyload. 1. Place each loader at the *beginning* of a disk (you must determine whether you want to use the *FastLoad* cartridge with the disk or not). 2. Load each loader (except the 64 version) by using the appropriate two-key LOAD/RUN combination. 3. Make separate disks for 64 and 128 (128 mode) programs, with the appropriate loader on each; mixing them can cause problems, particularly when using the nonrelocating LOAD (,8,1) or BLOAD commands. 4. Observe the maximum number of programs that each loader program can accommodate. 5. To load only, instead of running the program, press L before RETURN when making your selection (except with program 4, where instead you select a different function key).

See program listings on page 102.

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Hi-Res Dump

James R. Schwartz

Did you ever create a masterpiece on your high-resolution screen and wish you could print it out? Here's a utility that lets you do just that. It works with the Commodore 128, 64, or Plus/4 with a Commodore 1525, MPS-801, or MPS-803 printer.

"Hi-Res Dump" was originally designed for use with the Commodore 128, although it also works as is with the Plus/4. With a simple modification, it runs on the Commodore 64 as well. It works with the Commodore 1525, MPS-801, MPS-803, and compatible printers. If you own a third-party (non-Commodore) printer, it may be necessary to adjust the interface to emulate Commodore printer commands. [*Editor's note:* Hi-Res Dump does *not* support the 1526 or MPS-802 printers, which handle graphics in a different manner from the odd-numbered Commodore printers. A screen dump program for these two printers, with *Print Shop* and *Doodle* compatibility, is scheduled for an upcoming issue.]

One problem I encountered in designing this program is that while the graphics mode of the 1525/801/803 is limited to a height of seven pixels, the hi-res screen of the 128 is composed of eight-by-eight matrices. For this reason, one out of eight vertical lines is "merged" with its neighbor. (This merging takes place in lines 60130 and 60140.) The effect is barely noticeable.

The program works by transferring single eight-bit lines of the screen into a line of a graphics characters for the printer. However, the bytes of the hi-res screen are eight bits *wide*, while the printer codes are seven bits *high*. It's more convenient to PEEK the hi-res screen a byte at a time, so for simplicity's sake, the program prints the image on the paper sideways.

Another problem is caused by the fact that, if the eight-bit lines of the hi-res screen were transferred directly to the printer, the lines would be printed upside-down. To rectify this problem, the binary bits must be turned into their mirror-image. The DATA statements in lines 60030–60100 accomplish this by setting up an array of equivalent codes.

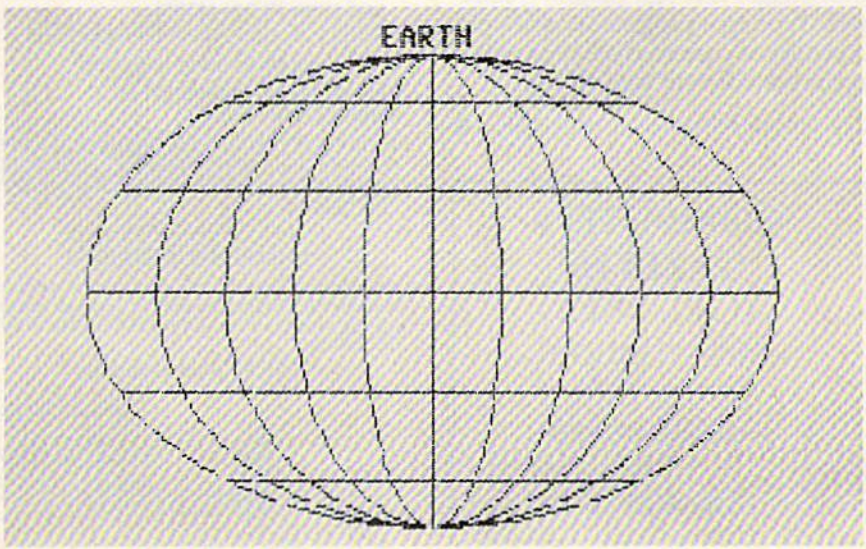
Hi-Res Dump is intended to be a subroutine of your own, larger program. Lines 60010–60100, then, should be in a beginning section of your program, since they're an initialization routine. If you do, indeed, use this screen dump as a subroutine, add a RETURN at the end of the program (after line 60170, or as a separate line 60180). You would then insert GOSUB 60110 at the appropriate place in the main program. Also, if your program uses this screen dump more than once, you must clear out the A$() array by inserting this line somewhere before the screen dump:

```
FOR I = 1 TO 25: FOR J = 1TO40:
  A$(I,J) = "": NEXT: NEXT
```

In the 128's FAST mode, this screen dump takes about six minutes to copy the entire screen to your printer. FAST mode has the somewhat annoying effect of causing the image on your screen to disappear, but the savings in time is dramatic, as opposed to the SLOW mode. Insert the following lines (for the 128 only) to go into FAST mode just before the program starts running and to return to SLOW mode when it's finished:

```
EE 60105 FAST
RF 60175 SLOW
```

If you want a quick sample of what Hi-Res Dump can do (in 128 mode), add these lines which draw the stylized globe seen below:



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```
1000 GRAPHIC 1,1: FORJ = 150 TO 20
     STEP-30: CIRCLE 1,158,100,J,75:
     NEXT
1010 DRAW 1,158,25 TO 158,175: DRAW
     1,70,40 TO 246,40: DRAW 1,23,68 TO
     292,68
1020 DRAW 1,8,100 TO 308,100: DRAW
     1,23,132 TO 292,132: DRAW 1,70,160
     TO 246,160
1030 CHAR 1,17,2, "EARTH"
```

Note To 64 Users

If you run this program on a Commodore 64, you should omit **GRAPHIC0:** in line 60020. Also, 64 owners may need to protect the hi-res screen from interference by BASIC variables. Note that the starting address for GRAPHIC 1 screens on both the 128 and Plus/4 is 8192, which is the value of the variable SL in line 6005. This portion of memory is often, but not always, used for hi-res screens on the 64 as well. If your hi-res screen is located somewhere else in memory, you'll have to change the value of SL in this line. To use it with the demo programs from "The Coordinator" (March 1986), for example, SL would have to equal 24576.

There's an important distinction between true hi-res screens and graphics programs which use custom characters. A hi-res screen uses 8000 memory locations for the picture and 1000 bytes for color memory. Custom characters need only 2048 bytes for the new character set, which is then printed or POKEd in various combinations to the 40-column text screen. Hi-Res Dump prints only hi-res screens. This means it would not work on a program like "The Construction Set" (December 1985), which creates images through custom characters. Writing a program to print out a picture of custom characters would require a different sort of logic.

See program listing on page 110.

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An "Adventurous" Array

Michael S. Tomczyk

In the past two columns, we've looked at the use of arrays in BASIC programming. This month, we'll go step by step through some simple examples of using arrays so that you can apply these techniques to your own programs. We'll start by developing a very small piece of an adventure game.

Let's begin by making a chart showing three different categories of words which we'll use:

Attributes	Treasures	Heroes
X$(1,1) enchanted	X$(2,1) frog	X$(3,1) warrior
X$(1,2) invincible	X$(2,2) sword	X$(3,2) wizard
X$(1,3) valuable	X$(2,3) jewel	X$(3,3) merchant
X$(1,4) poison	X$(2,4) toothpick	X$(3,4) author

We'll place the entire group of words into an array named X$. This example uses a two-dimensional array because it can be "cut" or "sliced" in two directions (that is, "up and down" in columns or "across" in rows). By putting a group of words or numbers into an array, you can use individual items, rows of information, or columns of information. Start by typing in this short program, which sets up a two-dimensional array that holds three sets of words with four words in each set:

```
10 DIM X$(3,4): PRINT CHR$(147):
   P$=" "
20 DATA ENCHANTED, INVINCIBLE,
   VALUABLE, POISON, FROG,
   SWORD, JEWEL, TOOTHPICK
30 DATA WARRIOR, WIZARD,
   MERCHANT, AUTHOR
40 FOR A=1 TO 3: FOR B=1 TO 4:
   READ X$(A,B): NEXT: NEXT
50 FOR A=1 TO 3: FOR B=1 TO 4:
   PRINT "X$(";A;",";B;")";X$(A,B):
   NEXT: NEXT
60 END
```

Line 10 uses the DIMension statement to set up a two-dimensional array, X$(3,4), consisting of three columns and four rows. (To be technically accurate, the array is really four by five, because arrays start their numbering at zero. But it's a common practice to ignore the zero element.) PRINT CHR$(147) clears the screen. We also defined the string variable P$ as a blank space, which we'll use later (and discuss below).

Lines 20–30 are DATA lists. Note that we had to continue the list of items on line 30, so we began this line with the DATA command. There are 12 items in the list—we've bunched together our heroes, treasures, and attributes—and in a moment we'll see how to separate them.

Line 40 uses two FOR-NEXT loops to read the DATA items into the X$ array. The reading occurs more or less automatically since the READ statement always sends the computer to the DATA statements to get the items. It doesn't matter where the DATA is located in your program, but usually it's grouped at the very beginning or very end of the program.

The numbering of the X$ array is determined by the two loops (A and B) we've set up. The first item in the array is X$(1,1), and is the first word in the DATA list (ENCHANTED). As the DATA is read into the array, the computer automatically substitutes the numbers 1 to 3 where the letter A is, and substitutes the numbers 1 to 4 where the B is—with the result that the array items are defined as 1,1...1,2...1,3...1,4...2,1...2,2...2,3...and so on in order.

Line 50 uses a similiar double-loop technique to print the individual array items on the screen. Be very careful where you place the quotation marks—variables like A, B, and X$(A,B) go outside quotation marks, which is why you have to keep hopping in and out of quotes in this line.

So far, we've created a list of adventure game words, set up a two-dimensional 12-item array named X$, read the adventure words from a DATA list into the array, and printed the list with the array notation on the screen.

REM: *If you're printing a lot of words and variables together in long sentences, it may help to define a string variable—like P$, for example—as a blank space (P$=" "). Then you can print several variables/words together and separate them with spaces by using the P$ variable. You could also use the SPC(1) function or print a space (PRINT" "), but that takes a bit more space than the P$ technique. Try this example (just type it and press RETURN):*

```
P$=" ":C$="COMPUTERS":A$=
"ARE":F$="FUN":PRINT C$; P$;
A$; P$; F$;
```

Slicing Through An Adventure Game

So now let's see if arrays really work. Say we want to use three items from the list in a PRINT statement. All we need to use is the array notation. With the six-line program we first typed in still in memory, type this line (without a line number) and press RETURN:

```
PRINT"THE ";X$(3,2);" HAS
  A";X$(1,4);P$;X$(2,1)
```

What happens? The words from the array are substituted where the array notation appears. The P$ variable inserts a space between the last two words.

Now let's try it *inside* our program. Add the following new lines to the program. (Just type new lines 50 and 60. Press RETURN after typing each line, and the new line

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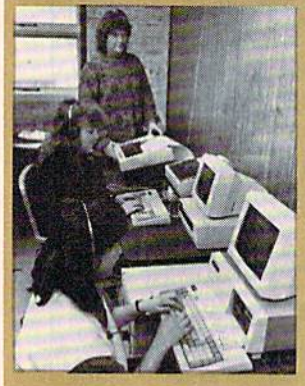

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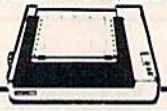

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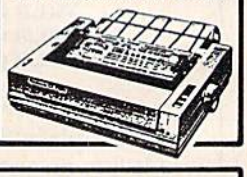

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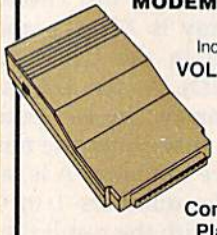

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automatically replaces the old one):

```
50 PRINT CHR$(147);"THERE IS AN
   ";X$(1,1);P$;X$(2,1);" IN THIS GAME,"
60 PRINT"BUT ONLY THE ";X$(3,2);"
   CAN FIND IT.": FOR T=1 TO 1500:
   NEXT
```

Now type RUN and press RETURN.

Line 50 clears the screen and prints: THERE IS AN ENCHANTED FROG IN THIS GAME, BUT ONLY THE WIZARD CAN FIND IT.

We put the words to be displayed inside quotation marks and the array variables outside quotes. We put the P$ variable—a space—between the two X$ variables so the words don't run together. We also left spaces inside quotation marks so those words don't collide.

Line 60 completes the sentence, and the FOR-NEXT loop is a time delay loop which causes the computer to pause and leave the message on the screen for a few seconds before continuing.

Now add these lines:

```
70 PRINT CHR$(147): PRINT"THE
   FOUR HEROES ARE:": PRINT:
   PRINT X$(3,1)
80 PRINT X$(3,2): PRINT X$(3,3): PRINT
   X$(3,4)
```

Run the program. What did we do? We *sliced* some of the words out of the array and used them in a PRINT statement. In this case, we did it by printing each item from the array. Notice that the number 3 is the first number in the array notation for all of the heroes. We can use this information to streamline lines 70 and 80 like this:

```
70 PRINT CHR$(147): A=3: PRINT"THE
   FOUR HEROES ARE:": PRINT
80 FOR B= 1 TO 4: PRINT X$(A,B):
   NEXT
```

This technique is a bit more complex, but it shortens the line and is extremely useful if you have a very large array. (Imagine if we had 100 heroes to choose from.)

Line 70 clears the screen and defines the variable A as the number 3. Next, we print our message, use a solitary PRINT statement to insert a blank line on the screen, then—the secret—a FOR-NEXT loop in line 80 which prints the names of the four heroes by looping through the B variable. On the first loop, B is 1, so X$(A,B) becomes X$(3,1). On the second loop, B is 2, so X$(A,B) becomes X$(3,2), and so on.

In case you forgot how a FOR-NEXT loop works, everything between the FOR and NEXT statements is repeated a specified number of times. You can also use the loop variable (we used B here) in your program as a counter. In this example, when the loop counts number 1, B equals 1, and we use it to print X$(3,1). When the loop counts to number 2, B equals 2 and we use it to PRINT X$(3,2).

Last, try adding these lines and run the program again:

```
90 FOR T= 1 TO 1500: NEXT
100 PRINT CHR$(147): A=2: PRINT
   "THE FOUR TREASURES ARE:"
110 PRINT: FOR B=1 TO 4: PRINT
   X$(A,B): NEXT
120 FOR T= 1 TO 1500: NEXT
130 PRINT CHR$(147): A=1: PRINT
   "THE FOUR ATTRIBUTES ARE:"
140 PRINT: FOR B=1 TO 4: PRINT
   X$(A,B): NEXT
```

Randomizing Array Variables

By now, you probably have some interesting programming ideas of your own to experiment with, using the array techniques discussed so far. You'll want to be able do at least one more thing with your array, and that's to *randomize* the variables. This allows the computer to choose from the list, so the items in your adventure game will come up at random.

Try adding these lines to your program:

```
160 PRINT: PRINT "-PRESS ANY KEY
   TO CONTINUE-"
170 GET K$: IF K$=""THEN 170
180 PRINT CHR$(147)
190 GOSUB 1000: PRINT "YOU ARE
   NOW THE ";X$(3,H)
200 GOSUB 1000: PRINT "YOU ARE
   CARRYING THE ";X$(1,H);P$;
210 GOSUB 1000: PRINT X$(2,H)
500 END
1000 H=INT(4*RND(1)+1): RETURN
```

Now run the new program.

Line 160 prints a blank line and then prompts the user to press any key to continue.

Line 170 uses GET K$ to scan the computer keyboard to see if a key is being pressed. If no key is being pressed (two quote marks with nothing in between means "no key" here), then the computer keeps going back to the same line, 170, to check the keyboard.

Line 180 clears the screen.

Line 190 uses the GOSUB statement to jump down to line 1000 and get a random number. Each time the computer executes the GOSUB statement the variable H is defined as a number from 1 to 4 in line 1000. This number is chosen at random by the computer.

The RETURN statement at the end of line 1000 sends the computer back to the main program, and the program continues.

The PRINT statement in line 190 uses the value of H to display a word from the HERO column in our array. We use the number 3 (HEROES) from the X$ array, and the H variable as a random number from 1 to 4. If you think of the array as rows and columns, you can say we're choosing a random item from row 1 to 4 in column 3 (the HERO column.)

Lines 200 and 210 uses the same technique to select items from the Attribute and Treasures columns in the array.

Line 500 ends the program. Putting the END statement here lets us put the GOSUB line "outside" the main body of the program.

Line 1000 defines H as a random number. In the formula, 4 is the upper limit and 1 is the lower limit. The INT function confines the random numbers to whole numbers instead of decimal fractions.

This column was written in response to a reader's request. If you have a topic you'd like covered in a future column, drop me a line and let me know. In the meantime, have fun adventuring.

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machine language for beginners

Richard Mansfield
Senior Editor

As you've probably discovered, in BASIC it's quite difficult, usually impossible, to design an attractive game which has a variety of objects in motion simultaneously. BASIC is just too slow for complex animations. So virtually all commercial action games are written entirely in machine language (ML). By using ML you have far more time between events and, thus, can enrich your game with many additional variables and visuals without retarding the action.

Games often require a special kind of animation: a hostile mothership, assorted lesser attack aliens, and the player, *each in motion at all times*. To make such motion smooth you need to carefully structure the innermost loop in your program and weave together all the moving objects within that loop.

The game writer insures that movement appears natural by making certain that no one object causes an interruption or a delay in the motion of the other objects. For example, you don't want everything to slow up or even freeze on the screen simply because the player is holding down the joystick button and you've structured your program so that it is forced to respond exclusively to this joystick input until the player releases the button. Also, if one object does too many things at once, it will take more time to compute than the others and will create universal delay or discontinuous motions whenever it makes its move. Imagine a complicated mothership which glides into view, lights flashing, antennae flailing, and aliens disgorging. Unless you weave the elements of this alien display of force into the other events of the game, the appearance of the mothership, however dazzling in its own right, will degrade the overall animation and realism.

Other game considerations involve border conditions (how do you know when your moving object has gone off the screen or has hit another object?); timing (how fast should things move? Should there be various skill levels?); scoring (how do you put numbers on a graphics game screen?); and reversals (how can you reverse direction by using a *toggle variable* that switches back and forth between two states?). Let's design a simple game in BASIC to sketch in our ideas and illustrate some general techniques involved in creating arcade games. Then we'll translate the game into ML to demonstrate how the same techniques are accomplished in ML. As you'll see, this game has only two elementary objects in motion and so BASIC is fast enough. But when we get to the ML version, we'll need to insert a delay loop because no human could possibly play the game at the highest speeds achieved therein.

```
100 PRINT"{CLR}"
110 PLR = 1054:ENY = 1034:X =
   {SPACE}-1:KE = 212:REM USE
   {SPACE}KE = 203 FOR 64
120 FOR I = 1 TO 24
130 GOSUB 1000:GOSUB 2000
140 NEXT I
150 X = NOT X
160 GOTO 120
1000 POKE PLR,32
1010 IF PEEK(KE)=47 AND PLR<19
   84 THEN PLR = PLR+40
1020 IF PEEK(KE)=44 AND PLR>10
   54 THEN PLR = PLR-40
1030 POKEPLR,219:IFPEEK(PLR-20
   )=209THENPRINTCHR$(7):COUNT
   =COUNT+1:PRINT"{HOME}";CO
1040 RETURN
2000 POKE ENY,32
2010 IF X THEN ENY = ENY+40:GO
   TO 2030
2020 ENY = ENY-40
2030 POKE ENY,209
2040 RETURN
```

First we clear the screen and then, in line 110, we define the location of our player (PLR) and our enemy (ENY) objects. Since these objects will be in motion, we need a variable for each which will be constantly updated to reflect its current position on screen. (Commodore 64 users should make the substitution listed in line 110 for the keypress (KEY) variable. 128 users should switch to the 40-column screen mode since this program depends on direct screen POKEs to achieve its animation and the 80-column mode doesn't support direct access to screen RAM.)

Then we set up our main loop, which will have 24 iterations. This allows us to move the enemy object continuously between the top to the bottom of the screen without checking for border conditions. Unlike the player object which is controlled by a human, enemy objects frequently have predetermined pathways and cannot move otherwise. This is particularly true of lesser, drone aliens which function as random barrier elements in the game: Sometimes they prevent you from a direct shot at the mothership, sometimes they don't. So, after moving down 24 lines on the screen, our drone enemy will reverse itself and move up 24 to the top.

So far, so good. Next month we'll finish our examination of the BASIC game and then turn the whole thing into a blazingly fast ML version. We'll also explore some alternative designs which can make the game both more complex and more challenging.

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hints & tips

Saving Disk Directories

Demian Neidetcher

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

People who own printers have it easy. They can load a disk directory, list it to the printer, and store the directory listing with the disk for easy reference. They can also print one directory after another for a master list of what's on the various disks.

Those of us without printers are stuck with the LOAD "$0",8 command, followed by LIST, just to see what's on a single disk. If you own 50 disks and don't know how to find a favorite program, you might have to LOAD "$0",8 up to 50 times before you find it. If you own hundreds of disks, things could easily get out of control. You might keep a notebook with information about which disks contain which programs, but that seems inefficient. Shouldn't your computer be able to keep track of where the programs are?

A Mistake Leads To An Idea

I used to have a hard time filing and organizing my disks. But one morning I loaded a directory (to see what was there) and then, without typing NEW, typed in a short program. The program was saved to disk. But the disk directory listing was mixed in with the program.

It was a mistake, and the program didn't run, but it made me think. Could you load disk directories and then save them to one disk? The answer is yes.

If you'd like to organize your disks and you don't have a printer, here's a practical and easy filer. First, format a brand new disk and label it as the "master directory."

Insert a disk in your drive and type LOAD "$0", 8. After the directory is loaded, remove the disk and insert your master disk. Type SAVE "0:diskname", 8. The name of the file could be the actual disk name (when you LOAD"$0"), but it's better to use the name you've put on the disk label. Disk directories can not only be loaded, they can also be saved, as long as you don't save them with the filename $.

When you're trying to find a certain program, insert your master disk and type LOAD"0:*diskname*",8 and LIST to see what's on the disk. Even though you'll still have to load several files, you don't have to switch disks. If you have a word processing program, however, you can make things even easier.

Using A Word Processor

SpeedScript and *WordPro* save and load text as PRG (PRoGram) files. If you've saved a directory listing—a PRG file—you should be able to load the listing into such a word processor. You'll find that some miscellaneous characters are mixed in, but you should be able to edit them out (if you wish) or you can just ignore them.

Other word processors, including *EasyScript*, save text as SEQ (SEQuential) files. To create a readable/loadable program listing for such a word processor, follow these steps:

1. Insert the disk to be cataloged.
2. Type LOAD "$0", 8
3. Insert the master (catalog) disk.
4. Type OPEN 1,8,2,"0:*diskname*,S,W": CMD1: LIST
5. When the disk drive stops, type PRINT#1: CLOSE1

These steps create a sequential file which you should be able to load into a word processor that reads sequential files. Each listing will include the READY prompt, but you can delete this if it annoys you.

(Editor's note: If you create a sequential file using the commands above, you can edit the file(s) with "Sequential File Editor," found elsewhere in this issue.)

Manipulating The Directory Files

If you want to create a single large list of programs, you can use the DOS Copy command:

```
OPEN15,8,15, "C0:newfile=0:fileone,
  0:filetwo, 0:filethree"
```

The C0: command copies to a new file the contents of one or more other files on the same disk.

Or, if your word processor allows it, you could merge one or more files in memory and save the new combined listing to disk as a single file. ■

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

www.commodore.ca

MiAngelo Moore

This short utility is an excellent programming development tool for the Commodore 64. It's like having instant access to an 8K disk drive.

Some computers have a very useful feature called a *RAM disk*—an area of memory used for temporary program or data storage. Although it basically works like a tape or disk drive for program storage, this area is not permanent. Anything stored there is erased when you turn the computer off. The advantage of a RAM disk is that you can have almost instant access to the information stored there—without waiting for data to be loaded from or saved to an external storage device. For this reason, it provides an excellent program development tool. The Commodore 64's operating system does not directly support a RAM disk, but this machine language program, "64 RAM Disk," provides one. A maximum of 8K is available for program storage. This RAM disk can hold only one program at a time, even if the program is less than 8K long.

A Development Tool

There are several uses for a RAM disk. Suppose you need a quick disk directory, but you have a program in memory and no DOS Wedge. You can save your program to RAM disk, LOAD"$0",8, and then retrieve the program after viewing the directory. Or, if you want to append a subroutine to a program, you can save the subroutine to RAM disk, load the main program, change the start-of-BASIC-program pointer, retrieve the program from RAM disk, and change the start-of-BASIC-program pointer back to 2049, and your program is appended. There are numerous uses for 64 RAM Disk as a development tool.

In order to make the program easy to use, three new commands are wedged into BASIC. Note that these commands should be used only in immediate mode.

← — save program currently in memory to RAM disk.

↑ — retrieve program in RAM disk and transfer to memory.

< — clear RAM disk memory. *Be extremely careful when using this command.* It completely erases the contents of the RAM disk.

The RAM disk is designed for use with BASIC programs. The block of memory saved is the area between the address in the start-of-BASIC-program pointer (contained in locations 43–44) and the address in the end-of-BASIC-program pointer (contained in locations 45–46). Data from the RAM disk is always reloaded beginning at the address in the start-of-BASIC-program pointer. Thus, the RAM disk is not suitable for storing machine language routines from other areas of memory.

Before you save a program to the RAM disk, be sure it's no longer than 8K. If it's longer, it will not be placed in the RAM disk, and a message will appear. The reason we have an 8K restriction is because the memory area used for 64 RAM Disk is located in the 8K RAM area under BASIC ROM. This means programs which copy BASIC to RAM for modification or programs which place high-resolution graphics under the BASIC ROM will not work with 64 RAM Disk. Also, 64 RAM Disk will not work with any program which uses memory locations 49152–49416, since this is where the machine language for 64 RAM Disk is located.

Typing It In

As you're typing in the program, be especially careful with the numbers in the DATA statements. After you've finished, save a copy. To use it, load it and type RUN. A message will tell you to enter SYS 49152 to activate and SYS 64738 to deactivate. The latter SYS resets the computer just as if you had turned it on. (Unlike most wedge routines, 64 RAM Disk is *not* disabled when you press RUN/STOP–RESTORE.) The three commands discussed above are now at your disposal.

Memory Locations Used:

2–3 and 251–254	**Temporary storage**
40960–49151	**64 RAM Disk storage area**
49152–49416	**64 RAM Disk machine language**

See program listing on page 110.

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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 have a few questions about compatibility in the Commodore line of computers. First, will the Amiga run all my Commodore 64 programs if used with a 5¼-inch drive? If so, could I copy my 64 programs to the Amiga's 3½-inch disks? Does the Amiga run Commodore 128 software? Can the Amiga use a 1571 or 1541 disk drive? Does the Commodore Executive 64 run all 64 programs? What about the Plus/4? Can the Executive 64 be hooked up to a larger monitor?

A. We've been receiving quite a few letters in this vein since the Amiga was introduced, and also a number of inquiries lately about the Executive 64 and Plus/4—two computers no longer made by Commodore, but which are being closed out at sale prices by discount merchants. Let's tackle these subjects one at a time.

First off, the Amiga is a completely different computer than the Commodore 64 and all other Commodore computers. In fact, it wasn't even designed by Commodore. If the Amiga is related to anything, it's a descendant of the Atari 800, since the custom graphics chips in both machines were designed by the same engineer, Jay Miner. The Amiga has nothing in common with earlier Commodores and isn't compatible with any other software. The only exception is that some IBM PC programs will work at reduced speed when the Amiga is equipped with a special 5¼-inch disk drive and a software emulator called the *Transformer*. At this writing (early April), however, a finished version of the *Transformer* was not available.

Likewise, the Amiga does not work with the 1541, 1571, or any other Commodore peripherals built for earlier Commodore computers. The 5¼-inch drive used with the *Transformer* resembles a 1571, but is a special drive intended only for use with the Amiga.

Although a Commodore 64/128 software emulator could be written for the Amiga, it's hard to think of a good reason to do so. Not many people would spend $1,000 to $2,000 to buy an Amiga to run 64 software when they could buy a complete 64 system for under $500. And people with a lot of 64 software who buy an Amiga don't need a 64 emulator, either, because presumably they already have a 64. Besides, turning the Amiga into a 64 or 128 would negate the advantages of owning an Amiga in the first place.

The Commodore Executive 64, also known as the SX-64, is a transportable computer designed to run all Commodore 64 software. Essentially, the Executive 64 is a Commodore 64, 1541 disk drive, and three-inch color monitor built into a compact suitcase. Unlike true portables, it is not battery powered. Although we've heard that a few Commodore 64 programs required slight modification to run on the Executive 64, it's basically 99 percent software compatible.

The Executive 64 has video, expansion, serial, controller, and user ports that are identical to those on the standard 64, so it can use any monitor, cartridge, disk drive, printer, joystick, or modem that works on the 64. Note, however, that it lacks a cassette port; cassette-based software must be transferred to disk before it can be run on the Executive 64. (The missing cassette port may cause another small problem: many printer interfaces use the cassette port as a power source.) This computer is no longer manufactured by Commodore, but surplus and reconditioned units are still being sold.

The Plus/4 is the oddball of the Commodore family. Originally announced as the Commodore 264, it's not software compatible with any other Commodore computers except the Commodore 16 (although its BASIC is similar enough to the 128's that some 128 programs written entirely in BASIC will run on the Plus/4). The Plus/4 has 64K of Random Access Memory (RAM) and four application programs built into Read Only Memory (ROM): a word processor, spreadsheet, database filer, and chart plotter. The Commodore 16 is basically a 16K RAM version of the Plus/4 without the built-in software or a user port. Neither computer is still being manufactured, though again, surplus units are still available.

The Plus/4 and 16 have standard video and serial ports, so they can use standard monitors, printers, and 1541 disk drives (1571 drives can be connected, but operate in 1541 mode only). The Plus/4's user port is identical, but the casing surrounding it is smaller, so early Commodore modems like the 1600 and 1650 don't fit. The cassette and joystick ports use nonstandard connectors; Commodore 64 joysticks and Datassette recorders cannot be used.

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computing for families

When High Tech Talks Back

Fred D'Ignazio
Associate Editor

What do you say to your watch when it unexpectedly talks back to you in front of a live TV audience?

I had this experience recently on Tom York's Morning Show, here in Birmingham, Alabama. I appear on the show every Tuesday morning in a spot called "Friendly Tech with Fred." Each week I bring in a carload of new high-tech gadgets—stereo TVs, cellular phones, computer touch screens, and the like. I try to talk in plain English and give viewers a feel for how the products really work when they're in the hands of an average consumer.

This week I borrowed some fancy new high-tech clocks and watches. My daughter Catie pitched in, too, and loaned me her Swiss Swatch watch and her musical clock-ruler. She programmed the ruler to play "Dixie" and sent me on the show with a note-by-note program of five other songs I could play, too, if I had the time.

My host, Tom York, gave a nice introduction and turned to me to begin my demonstration. I picked up Catie's musical ruler and began pushing buttons, when, suddenly, the Seiko Datagraph RC-4400, over on the other side of the table, began talking to me. "Please make your entry," it said in a loud voice.

It was my own fault. I had gotten the watch in the mail the day before, and I had been fascinated with it. I had plugged it into our Commodore 128 computer and stayed up until two in the morning programming it with addresses, notes, and appointments. It began talking on the show because I had told it to sound an alarm midway through my segment. I did this for dramatic effect, but I had thought the alarm would be a simple beep or chime. I hadn't realized the watch would actually start talking!

But I should have been prepared. After all, it was not the first time a clock or watch had talked back. The night before, I had gathered all the high-tech time pieces on the kitchen table and programmed them for the show the following day. Then my kids and I left the house and headed for the local science museum to get help sighting Halley's comet.

An hour later, my wife returned from a business meeting. When she turned off the car motor, she heard voices in the kitchen and

became frightened. "Oh, no— burglars!" she thought. She didn't know whether to back out of the driveway quietly or bolt from the car and flee to the nearest neighbor's for help. Fortunately, she stayed in the car another minute trying to make up her mind. This was just enough time for her to hear what the voices were saying.

"It's four fifty-three A.M," said one voice. "It's nine P.M," said another. "At the beep the time is two oh-six." "Nine...eight...seven-...six...." "Today's date is May 18th."

In total bewilderment Janet got out of the car and crept over to the kitchen window and peered inside. She didn't see any burglars. Instead, all she saw were six little boxes chatting nonsensically to each other in the darkened room.

She was waiting for me when I showed up with the kids fifteen minutes later. And was she angry. But I really couldn't blame her. And it wasn't the first time this sort of thing had happened either. In my zeal to try out the latest in high-tech it seems I am forever turning our domestic life upside down.

Just a couple weeks ago, for example, I was in my basement study when I heard this loud cry, "Freddie! Come up here!" I rushed upstairs into the living room and found Janet and Catie in the midst of a giant tangle of coaxial cables. "Janet," I said without thinking, "you told me you knew how to operate the VCR."

From the look on Janet's face I knew instantly that I had said the wrong thing. "I did!" she shouted. "But that was before you went and rewired everything again. We've been fussing with this mess for a half hour, and I still can't figure out how to turn on *The Cosby Show*!"

It seems that I have a knack for turning "high tech" into "high hassle." I'm afraid that I'm like the guy who gets hold of a TV remote control and begins pushing the channel selection buttons a mile a minute. I can't just sit down and watch a program like a normal person. I have to be fiddling with the wires or trying to plug the VCR into our stereo amplifier, or the TV cable into the back of a computer monitor. And, all the while, my family sits patiently wondering, "Why is Daddy doing this to us?"

The moral of my story is that high-tech will talk back if you coax it, as I do. But it also talks back when you least expect it, too. It doesn't always use a human voice, but it gets your attention very fast.

If you've had experiences similar to mine, please write me, care of COMPUTE!'S GAZETTE, and tell me about them. I'll pick the funniest and most insightful experiences and share them with everyone in an upcoming column.

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Putting On A Good Face

Todd Heimarck
Assistant Editor

When you're shopping for a clock, the kind you'd hang on the kitchen wall, you probably look for one with a suitable color, a nice shape, and readable numbers on the clockface. You judge it by how it looks and how well it might fit into the kitchen decor.

Unless you're a clockmaker, you probably don't peek inside a clock at the gears and springs—or digital circuits—to see how it runs. You hope (or trust) that the people who designed and built it knew what they were doing.

Taking A Program Public

If you write programs, the time may come when you'll give a copy to a friend. Or perhaps you'll donate a program to your local user group or send it to the GAZETTE for possible publication.

Some of the audience you reach, your customers, will take apart your program to see how it works. They're like clockmakers who disassemble clocks to see what's inside. But many computer users care only about what your program can do for them, not how it's put together. The only part of the program they'll see is the computer screen—the face of the clock.

Here are some things to think about if you're designing programs for other people to use, ways to put a good face on your programs.

Put Yourself In The User's Place

Most users appreciate courtesy on the programmer's part. However, some user-friendly programmers ask ARE YOU SURE (Y/N)? as often as possible, which can become too much of a good thing. On the Commodore 128, for example, every time you try to SCRATCH a program, you have to say yes. If I'm cleaning up a disk directory and have to scratch a good number of files, I prefer the 64's traditional OPEN 15,8,15 syntax; it's more direct and it doesn't require continual reassurances to the 128 that it's OK, yes, that program should be scratched. The command GO 64 also asks for confirmation, but that's different because the consequences to a program in memory are dire and you need answer only once.

Unavoidable instructions at the start of a program are also bothersome. People eventually learn the commands associated with a piece of software, so it's not usually necessary for them to read multiple instruction screens before getting to the main program. Offer multiple help screens if that's what it takes to explain the ins and outs of your handiwork, but make them optional: "INSTRUCTIONS (Y/N)" does it nicely. Even better, put the instructions into one or more help screens, available from anywhere within the program.

Be explicit when prompting the user. It might be patently obvious to you that N/A/C/S means Name/Address/City/State, but to most users it means NACS, which is to say it means nothing at all. Some people may recognize it as the backwards spelling of SCAN, but that doesn't help. Try to maintain a balance between a program that's too friendly and one that's too cryptic.

Keep Them Informed

When nothing visible is happening, people often think either something has gone wrong or that the computer is waiting for them to do something. Programs which use custom characters sometimes blank the screen before copying the character set down to RAM. On the 64, it takes BASIC perhaps 30 seconds to move character ROM into memory. But if the screen is blank, they're 30 tense seconds during which the user doesn't know what's going on. Telling the user what's happening obviates this anxiety (the message PLEASE WAIT 30 SECONDS would suffice). People can be jittery about computers which seem to be maliciously idle.

Another way to disconcert a user is to cause something to happen without an explanation. The old spin-the-disk trick is always unnerving. It works like this: You load and run a program. Suddenly the disk drive starts spinning and the drive-busy light turns on. There's no clue why. The program might be doing something simple like initializing the disk or opening a help file. Or maybe it's erasing every program or formatting the disk. The user is trapped in a dilemma: Should the disk be left in the drive (maybe ruining it) or should it be removed (maybe ruining it)? The solution, again, is to communicate directly with the user. If you write a program that's going to spin the disk, it's a good idea to first print a short message like READING DISK DATA.

Documentation

Even though you're a programmer, try to avoid writing the instructions from a programmer's point of view. Include simple things like how to load and run the program. An ordinary user wants to know what a Sort option means (it puts information in alphabetical or numeric order), not which sorting algorithm you employed. Picture the person who doesn't want to look inside the clock and write your documentation for him or her. If you can find some friends to test out your program, they can probably give you some good advice on how to improve the documentation. ■

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bug-swatter

• "Vampyre Hunter" (May) contains several errors. The CTRL-O character in lines 525 and 1420 should have been listed as {O}, not as {TOP}. The CTRL-O character should be typed in quote mode, which means you should retype everything inside quotes in those lines, including the opening quotation marks. In addition, a comma is missing from the end of each of the following lines: 2875, 3320, and 3345. Without the comma at the end of 2875, you'll receive a syntax error in the next line (2880).

Finally, there are several spelling mistakes which don't affect the running of the program, but may be corrected if you wish: the word *through* in lines 3240 and 3530, and the words *cellar, accessible,* and *blocked* in lines 3050, 3900, and 3990. Also, *are* should be deleted from line 3700 and *extismut* in line 2865 should be changed to *extismot* (extinguish and smother).

• The MLX ending addresses for "SpeedScript-80" (June) are wrong. The program that creates MLX listings formats the numbers in ten columns (the address, eight machine language bytes, and a checksum). If the final line contains fewer than eight data bytes, it's padded out with 0s. For most programs, these additional 0s are inconsequential, but because the first four SpeedScript-80 patches are overlaid onto *SpeedScript*, some important routines in the program are overwritten by 0s.

If you've not yet typed in the programs, substitute the following starting and ending addresses for the first four patches:

Patch 1: **289E, 2934**
Patch 2: **2A4E, 2A5B**
Patch 3: **315D, 31A0**
Patch 4: **3445, 346B**

The instructions for creating SpeedScript-80 are otherwise correct.

If you've already typed all the patches and generated a copy of SpeedScript-80 according to the instructions in the June issue, you can fix that copy as follows. Starting in 128 mode, type MONITOR and then load the flawed copy of SpeedScript-80 by typing **L "SPEEDSCRIPT80" ,8,02801**. Change the contents of the following addresses by typing over the 0s with the correct values:

```
M 02935: 20
M 02A5C: FF 48
M 031A1: 4C 31 EA AD
M 0346C: 20
```

After the changes have been made, save the revised program by typing **S "SS80",08,02801,04009**. This corrected version should perform as described in the June issue. Thanks to reader Dave Mackey for discovering this flaw in the instructions.

• The correction for "List Pager" (December 1985) given in the April Bug-Swatter was slightly wrong. It's important to type **POKE56, PEEK(56)−1: NEW** after loading the program, as mentioned in the article and the Bug-Swatter item, but the commands should be on a separate line from the LOAD command. If they're on the same line as the LOAD command, they won't be executed.

• Tape users who typed in "Kicker" (February) may notice that the sprites used for the red player don't look right. Some of the sprites are stored in the cassette buffer, which is not properly cleared by the program after a tape load. To fix it, load Kicker, then enter the following POKEs in immediate mode (without line numbers):

```
POKE 2320,160:POKE 2321,195
POKE 2322,169:POKE 2323,0
POKE 2324,141:POKE 2325,38
POKE 2326,208:POKE 2327,145
POKE 2328,178:POKE 2329,136
POKE 2330,208:POKE 2331,251
```

When this is complete, save the corrected copy of the program.

• The instructions for "Lexitron" (February) include information for adding your own words. Some readers have had trouble including the letter Z in their coded words. Words are supposed to be shifted one letter higher than their normal spelling; CATCH would be spelled DBUDI, for example. Because of the way characters are organized into ASCII codes, the letter Z should be typed as a left bracket (the [character).

• The early version of the new "MLX" may signal LOAD errors even when data is loaded without problems. This has been fixed in the newest versions. The problem is in line 950, which should read **950 POKE 147,0:SYS 63562:IF ST>0 THEN 970**.

• "Custom Labels" (February) has two minor errors. The final command in line 250 should read GOTO 290, not GOTO 250. This affects only the Commodore-B graphics character. Thanks to reader Robert J. Murrell for catching this. Also, if your printer performs a linefeed when the program is run, delete the CHR$(12) from line 190.

• "Power BASIC: Blick" (May) uses a wedge to add a blink and a click to the PRINT command. Since the PRINT routine is also used for listing programs to a printer and writing to peripherals, Blick will interfere with various operations involving printers, modems, tape drives, and disk drives. It should be disabled before you use a peripheral.

• The March GAZETTE DISK will not load the "Clavier" program because of a misspelling in the contents file. The MENU program searches for CALVIER, while the program is named CLAVIER in the directory. To access the program, you may load it directly (LOAD "CLAVIER",8) without going through the menu. If you prefer, you may rename it by cutting a write-enable notch and entering **OPEN 15,8,15,"R0:CALVIER=0:CLAVIER":CLOSE15**. After doing this, cover up the notch with opaque tape.

• The May article "Musicians Meet Computers" should have included the information that composer and musician Ron Bienstock is also an attorney and general counsel for Hoshino USA, Inc., whose products include the Ibanez and Tama musical instruments.

• In "Computers and MIDI" (May), we inadvertently omitted the address for Passport Designs. Inquiries about their music hardware and software should be directed to:

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

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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

When You Read:	Press:	See:
[1]	COMMODORE + 1	
[2]	COMMODORE + 2	
[3]	COMMODORE + 3	
[4]	COMMODORE + 4	
[5]	COMMODORE + 5	
[6]	COMMODORE + 6	
[7]	COMMODORE + 7	
[8]	COMMODORE + 8	

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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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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$,I):GOSUB320:IF
       I<25 THEN GOSUB380:A(I
      /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
      B1060:PRINT"{BLK}{RVS}
      {SPACE}ERROR: REENTER L
      INE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
      R I=0 TO 7:POKE B+I,A(I
      ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
      LOSE3:PRINT"{DOWN}{BLU}
      ** END OF ENTRY **{BLK}
      {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
      {SPACE}DISPLAY DATA ":G
      OSUB400:IF IN$=N$ THEN2
      20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
       {RVS}SPACE{OFF} TO PAU
      SE, {RVS}RETURN{OFF} TO
       BREAK[4]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
      I=BTO B+7:A=PEEK(I):GOS
      UB350:GOSUB380:PRINT S$
      ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
      :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
      ENPRINT"{DOWN}{BLU}** E
      ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
      SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
      UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
      {SPACE}DATA ":OP=1:GOTO
      710
PC 700 PRINT"{DOWN}{RVS} SAVE
      {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
      NAME[4]";IN$:IF IN$=N$
      {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
      {RVS}T{OFF}APE OR {RVS}
      D{OFF}ISK: [4]";
FP 730 GET A$:IF A$="T"THEN PR
      INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
      ,15,"I0:":B=EA-SA:IN$="
      0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
      OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
      H*256):PRINT#1,CHR$(AL)
      ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
      R$(PEEK(BS+I));:IF ST T
      HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
      O940
GS 800 GOSUB1060:PRINT"{DOWN}
      {BLK}ERROR DURING SAVE:
      [4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
      OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
      $)+256*ASC(B$+Z$):IF AD
      <>SA THEN F=1:GOTO850
KH 830 FOR I=0 TO B:GET#1,A$: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}[4]":ON F GOSUB98
      0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
      G ADDRESS (";:GOSUB360:
      PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
      AD=SA+AD:GOSUB360:PRINT
      D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
      ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
      *256):POKE193,AL:POKE1
      94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
      *256):POKE174,AL:POKE1
      75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
      1050
HA 1040 IF(AD>511 AND AD<40960
      )OR(AD>49151 AND AD<53
      248)THEN GOSUB1080:F=0
      :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
      {SPACE}INVALID ADDRESS
       {DOWN}{BLK}":F=1:RETU
      RN
AR 1060 POKE SD+5,31:POKE SD+6
      ,208:POKE SD,240:POKE
      {SPACE}SD+1,4:POKE SD+
      4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
      TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
      240:POKE SD,0:POKE SD+
      1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
      KE SD+4,0:POKE SD,0:PO
      KE SD+1,0:RETURN
```


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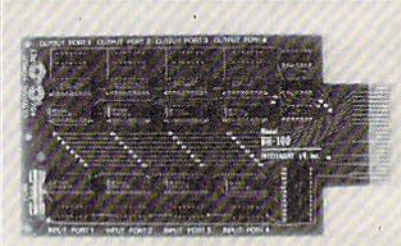

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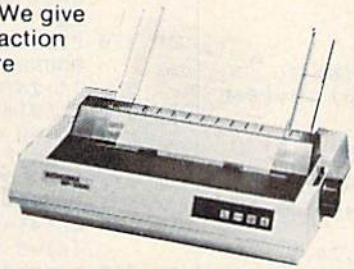

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Marquee

(Article on page 64.)

Program 1: Marquee—128 Version

```
QX 100 DIM C1$(256),G$(256),J(
       256)
QM 110 PRINT"{CLR}{3 DOWN}
       {16 SPACES}MARQUEE"
SA 120 PRINT:PRINT:PRINT:PRINT
       :PRINT
SD 130 INPUT"ENTER DISTANCE OF
        DISPLAY FROM TOP
       {6 SPACES}(RANGE: 50-20
       0; DEFAULT: 100)";H$
BM 140 H=VAL(H$):IF H=0 THEN H
       =100
CM 150 IF H<50 THEN H=50
BX 160 IF H>200 THEN H=200
EC 170 PRINT:INPUT"ENTER SPEED
       {29 SPACES}(RANGE: 4-7;
        DEFAULT: 5)";SP$
DS 180 SP=VAL(SP$):IF SP=0 THE
       N SP=5
DH 190 IF SP<4 THEN SP=4
MK 200 IF SP>7 THEN SP=7
XE 210 PRINT"{CLR}{8 SPACES}CO
       LOR MENU"
HX 220 PRINT"{3 SPACES}1) BLAC
       K{4 SPACES}9) ORANGE"
JM 230 PRINT"{3 SPACES}2) WHIT
       E{3 SPACES}10) BROWN"
AK 240 PRINT"{3 SPACES}3) RED
       {5 SPACES}11) LIGHT RED
       "
EA 250 PRINT"{3 SPACES}4) CYAN
       {4 SPACES}12) DARK GRAY
       "
JJ 260 PRINT"{3 SPACES}5) PURP
       LE{2 SPACES}13) MEDIUM
       {SPACE}GRAY"
RQ 270 PRINT"{3 SPACES}6) GREE
       N{3 SPACES}14) LIGHT GR
       EEN"
RC 280 PRINT"{3 SPACES}7) BLUE
       {4 SPACES}15) LIGHT BLU
       E"
QJ 290 PRINT"{3 SPACES}8) YELL
       OW{2 SPACES}16) LIGHT G
       RAY "
RK 300 PRINT:INPUT"ENTER BACKG
       ROUND COLOR{18 SPACES}(
       DEFAULT 12)";CL$(0)
QS 310 CL(0)=VAL(CL$(0)):IF CL
       (0)=0 THEN CL(0)=12
HD 320 PRINT:INPUT"ENTER BORDE
       R COLOR{22 SPACES}(DEFA
       ULT 14)";CL$(4)
PD 330 CL(4)=VAL(CL$(4)):IF CL
       (4)=0 THEN CL(4)=14
QM 340 PRINT:INPUT"ENTER MARQU
       EE COLOR{21 SPACES}(DEF
       AULT 1)";CL$(2)
EB 350 CL(2)=VAL(CL$(2)):IF CL
       (2)=0 THEN CL(2)=1
DJ 360 PRINT"{CLR}ENTER YOUR M
       ESSAGE:"
QB 370 PRINT "{RVS} {OFF}";
AJ 380 GETKEY B$
BK 390 IF B$=CHR$(17) OR B$=CH
       R$(145) OR{7 SPACES}B$=
       CHR$(157) OR B$=CHR$(29
       )THEN 380
PH 400 PRINT "{LEFT}";B$;
JD 410 IF B$=CHR$(34) THEN PRI
       NT CHR$(34)CHR$(20);
MR 420 IF B$=CHR$(13) AND A$<>
       "" THEN 460
RC 430 IF B$=CHR$(13) THEN 360
SH 440 IF B$<>CHR$(20) THEN A$
       =A$+B$:GOTO370
GC 450 L=LEN(A$):A$=LEFT$(A$,L
       -1):GOTO 370
KM 460 PRINT "{CLR}{2 DOWN}";A
       $:A$=A$+"{5 SPACES}"
KB 470 WINDOW 0,0,39,1,1:L=LEN
       (A$):BANK 14
RJ 480 A=A+1
DF 490 PRINT "{CLR}COUNTDOWN .
       .";4*L-4*A+4
QA 500 C$=MID$(A$,A,1)
SM 510 N=ASC(C$):IF N>64 THEN
       {SPACE}N=N-64
BA 520 IF J(N)=1 THEN 750
GK 530 CM=0:J(N)=1
QH 540 IF N=44 OR N=59 THEN CM
       =1
MM 550 FOR F=1 TO 8
ME 560 B=PEEK(53247+8*N+F):R$=
       CHR$(B)
GB 570 C1$(N)=C1$(N)+R$
MK 580 NEXT F
RP 590 D$=""
AM 600 FOR D=1+CM TO 21+CM
JD 610 C2=ASC(MID$(C1$(N),D,1)
       )
GE 620 C6=(C2 AND 1)*7+(C2 AND
        2)*56/2+(C2 AND 4)*192
       /4
GJ 630 IF D=6 THEN{2 SPACES}PR
       INT "{CLR}COUNTDOWN . .
       ";4*L-4*A+3
FD 640 IF D=12 THEN{2 SPACES}P
       RINT "{CLR}COUNTDOWN .
       {SPACE}.";4*L-4*A+2
XB 650 IF D=18 THEN{2 SPACES}P
       RINT "{CLR}COUNTDOWN .
       {SPACE}.";4*L-4*A+1
RA 660 C5=(C2 AND 4)*1/4+(C2 A
       ND 8)*14/8+(C2 AND 16)*
       112/16+(C2 AND 32)*128/
       32
JX 670 C4=(C2 AND 32)*3/32+(C2
        AND 64)*28/64+(C2 AND
       {SPACE}128)*224/128
QK 680 D$=D$+CHR$(C4)+CHR$(C5)
       +CHR$(C6)
PX 690 NEXT D
SQ 700 E$="":F$=""
KB 710 FOR D=1TO21 STEP 3
RC 720 E$=MID$(D$,D,3):F$=F$+E
       $+E$+E$
KB 730 NEXT D
MP 740 G$(N)=F$
DD 750 IF A<L THEN 480
QB 760 COLOR 0,CL(0):COLOR 4,C
       L(4)
FE 770 WINDOW 0,0,39,24,1
XF 780 FOR K=1TO8:MOVSPR K,270
       #SP:NEXT K
KX 790 SN=0:Q=L-3
BS 800 Q=Q+1:IF Q>L THEN Q=1
BD 810 N=ASC(MID$(A$,Q,1))
JS 820 IF N>64 THEN N=N-64
DX 830 SN=SN+1:IF SN>8 THEN SN
       =1
SX 840 SO=SN-6:IF SO<1 THEN SO
       =SO+8
JG 850 MOVSPR SN,320,H
KC 860 SPRSAV G$(N),SN
HS 870 IF MID$(A$,Q,1)="," OR
       {SPACE}MID$(A$,Q,1)=";"
       {2 SPACES}THEN MOVSPR S
       N,+0,+6
SR 880 SPRITE SN,1,CL(2),1,1,1
       :SPRITE SO,0
FC 890 FOR CT=1 TO (7-SP)*15:N
       EXT CT
FR 900 GOTO 800
```

Program 2: Marquee—64 Version

```
QB 100 PRINT"{CLR}{7 DOWN}"SPC
       (14)"PLEASE WAIT":GOSUB
       910
AS 110 DIM C1$(256),G$(256),J(
       256)
JP 120 PRINT"{CLR}{3 DOWN}
       {16 SPACES}MARQUEE"
CK 130 PRINT"{5 DOWN}ENTER DIS
       TANCE OF DISPLAY FROM T
       OP"
FF 140 INPUT"(RANGE:50-200; DE
       FAULT:100)";H$
MF 150 H=VAL(H$):IF H=0 THEN H
       =100
GP 160 IF H<50 THEN H=50
FQ 170 IF H>200 THEN H=200
XB 180 PRINT"{DOWN}ENTER SPEED
       ":INPUT"(RANGE:1-9; DEF
       AULT:5)";SP$
HR 190 SP=VAL(SP$):IF SP=0 THE
       N SP=5
SC 200 IF SP<1 THEN SP=1
MR 210 IF SP>9 THEN SP=9
DF 220 PRINT"{CLR}{8 SPACES}CO
       LOR MENU"
DA 230 PRINT"{3 SPACES}1) BLAC
       K{4 SPACES}9) ORANGE"
QK 240 PRINT"{3 SPACES}2) WHIT
       E{3 SPACES}10) BROWN"
EJ 250 PRINT"{3 SPACES}3) RED
       {5 SPACES}11) LIGHT RED
       "
AD 260 PRINT"{3 SPACES}4) CYAN
       {4 SPACES}12) DARK GRAY
       "
EJ 270 PRINT"{3 SPACES}5) PURP
       LE{2 SPACES}13) MEDIUM
       {SPACE}GRAY"
BD 280 PRINT"{3 SPACES}6) GREE
       N{3 SPACES}14) LIGHT GR
       EEN"
BD 290 PRINT"{3 SPACES}7) BLUE
       {4 SPACES}15) LIGHT BLU
       E"
FJ 300 PRINT"{3 SPACES}8) YELL
       OW{2 SPACES}16) LIGHT G
       RAY "
JB 310 PRINT"{DOWN}ENTER BACKG
       ROUND COLOR (DEFAULT 12
       )":INPUTCL$(0)
AS 320 CL(0)=VAL(CL$(0)):IF CL
       (0)=0 THEN CL(0)=12
MJ 330 PRINT"{DOWN}ENTER BORDE
       R COLOR (DEFAULT 14)":I
       NPUTCL$(4)
SQ 340 CL(4)=VAL(CL$(4)):IF CL
       (4)=0 THEN CL(4)=14
GP 350 PRINT"{DOWN}ENTER MARQU
       EE COLOR (DEFAULT 1)":I
       NPUTCL$(2)
JB 360 CL(2)=VAL(CL$(2)):IF CL
       (2)=0 THEN CL(2)=1
XJ 370 PRINT"{CLR}ENTER YOUR M
       ESSAGE:"
JA 380 PRINT "{RVS} {OFF}";
FX 390 POKE198,0:WAIT198,1:GET
       B$
KE 400 IF B$=CHR$(17) OR B$=CH
       R$(145) OR{7 SPACES}B$=
       CHR$(157) OR B$=CHR$(29
       )THEN390
HE 410 PRINT "{LEFT}";B$;
EC 420 IF B$=CHR$(34) THEN PRI
       NT CHR$(34)CHR$(20);
HP 430 IF B$=CHR$(13) AND A$<>
       "" THEN470
XQ 440 IF B$=CHR$(13) THEN370
RM 450 IF B$<>CHR$(20) THEN A$
       =A$+B$:GOTO380
GB 460 L=LEN(A$):A$=LEFT$(A$,L
```


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```
      -1):GOTO380
MD 470 A$=A$+"{5 SPACES}"
RC 480 L=LEN(A$):A=0
KK 490 A=A+1
MF 500 PRINT "{CLR}COUNTDOWN .
       .";4*L-4*A+4
AB 510 C$=MID$(A$,A,1)
CM 520 N=ASC(C$):IF N>64 THEN
       {SPACE}N=N-64
QG 530 IF J(N)=1 THEN760
CJ 540 CM=0:J(N)=1
JA 550 IF N=44 OR N=59 THEN CM
       =1
DE 560 POKE56334,0:POKE1,51:FO
       R F=1 TO 8
SD 570 B=PEEK(53247+8*N+F):R$=
       CHR$(B)
CG 580 C1$(N)=C1$(N)+R$
XF 590 NEXT F:POKE1,55:POKE563
       34,129
GM 600 D$=""
QM 610 FOR D=1+CM TO 21+CM
KS 620 C2=ASC(MID$(C1$(N),D,1)
       +CHR$(0))
CH 630 C6=(C2 AND 1)*7+(C2 AND
        2)*56/2+(C2 AND 4)*192
       /4
MJ 640 IF D=6 THEN{2 SPACES}PR
       INT "{CLR}COUNTDOWN . .
       ";4*L-4*A+3
KA 650 IF D=12 THEN{2 SPACES}P
       RINT "{CLR}COUNTDOWN .
       {SPACE}.";4*L-4*A+2
DB 660 IF D=18 THEN{2 SPACES}P
       RINT "{CLR}COUNTDOWN .
       {SPACE}.";4*L-4*A+1
KB 670 C5=(C2 AND 4)*1/4+(C2 A
       ND 8)*14/8+(C2 AND 16)*
       112/16+(C2 AND 32)*128/
       32
EJ 680 C4=(C2 AND 32)*3/32+(C2
        AND 64)*28/64+(C2 AND
       {SPACE}128)*224/128
JM 690 D$=D$+CHR$(C4)+CHR$(C5)
       +CHR$(C6)
QX 700 NEXT D
CX 710 E$="":F$=""
FA 720 FOR D=1TO21 STEP 3
KB 730 E$=MID$(D$,D,3):F$=F$+E
       $+E$+E$
RC 740 NEXT D
GM 750 G$(N)=F$
RA 760 IF A<L THEN490
AM 770 POKE53281,CL(0)-1:POKE5
       3280,CL(4)-1
PP 780 PRINT"{CLR}":B=248:FORA
       =2040TO2047:POKEA,B:B=B
       +1:NEXT:POKE53271,255
CX 790 POKE53277,255:FORA=858T
       O867:POKEA,110+SP*15:NE
       XT:SYS 49158
CQ 800 SN=0:Q=L-3
RS 810 Q=Q+1:IF Q>L THEN Q=1
RC 820 N=ASC(MID$(A$,Q,1))
ER 830 IF N>64 THEN N=N-64
XS 840 SN=SN+1:IF SN>8 THEN SN
       =1
MS 850 SO=SN-6:IF SO<1 THEN SO
       =SO+8
DQ 860 SYS49155,SN-1,340,H
PM 870 SYS49152,G$(N),SN-1
PC 880 POKE53269,PEEK(53269)AN
       D(255-2↑(SO-1))OR2↑(SN-
       1):POKE53287+SN-1,CL(2)
       -1
BD 890 FOR CT=1 TO (7-SP)*25:N
       EXT CT
SR 900 GOTO810
FD 910 C=0:FORA=49152TO49363:R
       EADB:POKEA,B:C=C+B:NEXT
       A:IFC=25321THENRETURN
GX 920 PRINT"ERROR IN DATA":ST
       OP
JR 930 DATA 76,125,192,76,187,
       192,169,27,141,17,208,1
       69,127,141,13,220,169,3
       2,141
PJ 940 DATA 20,3,169,192,141,2
       1,3,169,129,141,26,208,
       96,169,1,141,25,208,162
CS 950 DATA 3,32,93,192,202,16
       ,250,162,14,160,7,169,0
       ,133,2,185,70,3,157
BB 960 DATA 0,208,165,3,157,1,
       208,185,80,3,74,38,2,20
       2,202,136,16,234,165
SF 970 DATA 2,141,16,208,173,1
       3,220,41,1,240,3,76,49,
       234,76,188,254,160,7
GE 980 DATA 185,60,3,56,237,90
       ,3,153,60,3,185,70,3,23
       3,0,153,70,3,185
DJ 990 DATA 80,3,233,0,153,80,
       3,136,16,227,96,32,253,
       174,32,139,176,160,1
EM 1000 DATA 177,71,153,250,0,
        200,192,3,208,246,32,1
        78,192,169,0,133,254,1
        32,253
BB 1010 DATA 162,5,6,253,38,25
        4,202,16,249,165,254,2
        4,105,62,133,254,160,6
        3,177
SA 1020 DATA 251,145,253,136,1
        6,249,96,32,253,174,32
        ,158,173,76,170,177,32
        ,178,192
DP 1030 DATA 132,253,32,178,19
        2,166,253,157,80,3,152
        ,157,70,3,32,178,192,1
        66,253
SS 1040 DATA 132,3,96
```

Sound Designer For The 128

(Article on page 60.)

```
JR 1 GOTO10:REM FOR THE FIRST
     {SPACE}RUN, REMOVE LINE 1
     TO CREATE A CATALOG FILE
CF 2 DOPEN#1,"CATALOG",D0,U8,W
     :IF DS<>0 THEN STOP
HR 3 PRINT#1,"************":DC
     LOSE#1
DD 10 DIM W$(5),L$(9)
GA 20 X=93:Y=163
GG 30 GOSUB2190:REM LOAD SPRIT
     E DATA
AX 40 FAST:VO=1:FR=0:DU=0:DI=0
     :MN=0:SP=0:WF=0:PW=0
QM 50 GRAPHIC 1,1
QG 60 COLOR 0,1
FK 70 COLOR 1,12
CP 80 COLOR 4,12
KH 90 CIRCLE 1,82,100,2,2,270,
     90:CIRCLE 1,86,100,2,2,9
     0,270:REM * SINE *
BJ 100 DRAW 1,100,100 TO 104,9
       8 TO 104,102 TO 107,100
       :REM * SAWTOOTH *
FA 110 DRAW 1,120,100 TO 120,9
       8 TO 123,98 TO 123,102
       {SPACE}TO 126,102 TO 12
       6,100:REM ****** SQUARE
       *
BQ 120 DRAW 1,140,100 TO 141,1
       02 TO 142,97 TO 143,103
        TO 144,96 TO 145,100:R
       EM ****** NOISE *
MX 130 A=0
XB 140 FOR S=79 TO 139 STEP 20
       :A=A+1:SSHAPE W$(A),S,9
       6,S+10,104:NEXT
KE 150 CHAR 0,9,17,"FR DU DI M
       N SP WF PW"
EC 160 A=0:FOR S=72 TO 216 STE
       P 24:A=A+1:SSHAPE L$(A)
       ,S,134,S+16,144:NEXT
ME 170 GRAPHIC 1,1
RG 180 REM * DRAW BOARD *
FP 190 FOR B=1 TO 37:DRAW 1,0,
       B TO 320,B:NEXT
ED 200 FOR B=154 TO 199:DRAW 1
       ,0,B TO 320,B:NEXT
BD 210 COLOR 1,16
KM 220 DRAW 1,0,38 TO 320,38
MR 230 DRAW 1,0,142 TO 320,142
KA 240 DRAW 1,0,153 TO 320,153
SA 250 CHAR 1,25,18,"SOUND DES
       IGNER"
DD 260 BOX 1,22,78,32,88
GD 270 A=0:FOR S=51 TO 125 STE
       P 20:A=A+1
GK 280 IF A>2 THEN TF=1
JQ 290 GSHAPE W$(A),250+TF,S:N
       EXT
JP 300 FOR SQ=70 TO 286 STEP 3
       6
QQ 310 BOX 1,SQ,50,SQ+11,120
RF 320 NEXT
HM 330 BOX 1,68,42,298,46
RQ 340 FOR J=80 TO 188 STEP 36
RD 350 IF J=152 THEN J=188
HJ 360 FOR F=55 TO 120 STEP 12
AB 370 DRAW 1,J,F TO J+5,F:NEX
       T:NEXT
JG 380 DRAW 1,142,86 TO 152,86
JS 390 CHAR 1,18,8,"↑"
EA 400 DRAW 1,147,101 TO 147,1
       07
HD 410 DRAW 1,148,101 TO 148,1
       07
EK 420 DRAW 1,145,105 TO 150,1
       05
PX 430 DRAW 1,146,106 TO 149,1
       06
MA 440 DRAW 1,250,51 TO 250,11
       9
GH 450 FOR D=224 TO 296 STEP 7
       2
JD 460 FOR E=55 TO 120 STEP 20
AG 470 DRAW 1,D,E TO D+5,E:NEX
       T:NEXT
EG 480 CHAR 1,1,12,"VOICE"
QR 490 CHAR 1,3,10,"1"
GA 500 A=0:FOR S=68 TO 284 STE
       P 36:A=A+1:GSHAPE L$(A)
       ,S,125:NEXT
XM 510 REM * INSTALL MARKERS *
KF 520 SPRITE 1,0,6
DR 530 MOVSPR 1,X+2,92
BS 540 FOR MK=2 TO 8:SPRITE MK
       ,0,11:MOVSPR MK,X+2+((M
       K-2)*36),Y:NEXT MK
AD 550 SPRITE 4,0,7,1:SPRITE 7
       ,0,7,1
DH 560 MOVSPR 4,X+74,Y-49:MOVS
       PR 7,X+182,Y-62
MH 570 SLOW
DX 580 GRAPHIC 0,0
SR 590 GOSUB 1360
DB 600 REM * KEYBOARD INPUT *
FC 610 GETKEY CUR$
EC 620 IF CUR$="+" THEN BEGIN:
       GRAPHIC 1,0:FOR S=1 TO
       {SPACE}8:SPRITE S,1:NEX
       T:BEND
AR 630 IF CUR$="-" THEN GOSUB
       {SPACE}1850
KH 640 IF CUR$="V" THEN GOSUB
       {SPACE}2170
FD 650 IF CUR$="↑" THEN PRINT"
       {CLR}":GOSUB 1930
AB 660 IF CUR$="*" THEN GOSUB
       {SPACE}1850:GOSUB 1530
DG 670 IF CUR$="£" THEN GOSUB
```


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```
        1850:GOSUB 1670
JS 680  IF CUR$="Q" THEN GOSUB
        {SPACE}2130
MD 690  IF CUR$="{HOME}" OR CUR
        $="{CLR}" THEN GOSUB 13
        60
PK 700  IF CUR$="1" THEN CHAR 1
        ,3,10,"1":VO=1
FQ 710  IF CUR$="2" THEN CHAR 1
        ,3,10,"2":VO=2
XC 720  IF CUR$="3" THEN CHAR 1
        ,3,10,"3":VO=3
SQ 730  LIM=(RSPPOS(1,0)-X)/36
BA 740  IF ASC(CUR$)=29 AND LIM
        <6 THEN MOVSPR 1,+36,+0
BQ 750  IF ASC(CUR$)=157 AND LI
        M>1{2 SPACES}THEN MOVSP
        R 1,-36,+0
AH 760  IF ASC(CUR$)=17 THEN IN
        C=1:GOTO 810
DF 770  IF ASC(CUR$)=145 THEN I
        NC=-1:GOTO 810
BK 780  IF CUR$=" " THEN GOSUB
        {SPACE}1500
AH 790  GOTO 610
JS 800  REM * MOVE MARKERS *
XB 810  ON LIM+1 GOSUB 840,910,
        980,1060,1130,1200,1290
BG 820  GOTO 610
FA 830  REM * BASE FREQUENCY *
QQ 840  FY=RSPPOS(2,1)
MQ 850  FR=(FY-Y)*(-1000)
MB 860  IF FR>61500 AND INC=-1
        {SPACE}THEN 610
DD 870  IF FR<=0 AND INC=1 THEN
         610
DK 880  MOVSPR 2,+0,+INC
SX 890  RETURN
XM 900  REM * DURATION *
MB 910  DY=RSPPOS(3,1)
HX 920  DU=(DY-Y)*(-6)
GH 930  IF DU>366 AND INC=-1 TH
        EN 610
FS 940  IF DU<=0 AND INC=1 THEN
         610
HC 950  MOVSPR 3,+0,+INC
SD 960  RETURN
AG 970  REM * SWEEP DIRECTION *
QQ 980  IF INC=-1 AND TY>115 TH
        EN MOVSPR 4,+0,-18
PK 990  IF INC=1 AND TY<150 THE
        N MOVSPR 4,+0,+18
SG 1000 TY=RSPPOS(4,1)
JK 1010 IF TY=114 THEN DI=0
RS 1020 IF TY=132 THEN DI=2
CX 1030 IF TY=150 THEN DI=1
DA 1040 RETURN
QM 1050 REM * MINIMUM SWEEP FR
        EQ *
AF 1060 MY=RSPPOS(5,1)
GP 1070 MN=(MY-Y)*(-1000)
RS 1080 IF MN>61500 AND INC=-1
         THEN 610
GK 1090 IF MN<=0 AND INC=1 THE
        N 610
MA 1100 MOVSPR 5,+0,+INC
CE 1110 RETURN
CC 1120 REM * STEP FREQUENCY *
EQ 1130 SY=RSPPOS(6,1)
GK 1140 SP=(SY-Y)*(-250)
CS 1150 IF SP>15375 AND INC=-1
         THEN 610
SB 1160 IF SP<=0 AND INC=1 THE
        N 610
QM 1170 MOVSPR 6,+0,+INC
FM 1180 RETURN
JD 1190 REM * WAVE FORM *
BR 1200 IF INC=-1 AND WY>102 T
        HEN MOVSPR 7,+0,-20
FE 1210 IF INC=1 AND WY<160 TH
        EN MOVSPR 7,+0,+20
PE 1220 WY=RSPPOS(7,1)
BE 1230 IF WY=101 THEN WF=0
MJ 1240 IF WY=121 THEN WF=1
DR 1250 IF WY=141 THEN WF=2
DC 1260 IF WY=161 THEN WF=3
XB 1270 RETURN
XE 1280 REM * PULSE WIDTH *
CJ 1290 PY=RSPPOS(8,1)
GX 1300 PW=(PY-Y)*(-66)
QE 1310 IF PW>4091 AND INC=-1
        {SPACE}THEN 610
DM 1320 IF PW<=0 AND INC=1 THE
        N 610
XH 1330 MOVSPR 8,+0,+INC
QF 1340 RETURN
MG 1350 REM * MAIN MENU *
DA 1360 PRINT "{CLR}{3 DOWN}
        {CYN}{10 SPACES}SOUND
        {SPACE}DESIGNER"
JH 1370 PRINT SPC(5)"{2 DOWN}P
        RESS:"
CH 1380 PRINT SPC(10)"{DOWN}+
        {SPACE}TO VIEW BOARD"
EF 1390 PRINT SPC(10)"- TO VIE
        W TEXT
GJ 1400 PRINT SPC(10)"V TO VIE
        W VARIABLES
JS 1410 PRINT SPC(10)"↑ TO VIE
        W CATALOG
AE 1420 PRINT SPC(10)"* TO SAV
        E SOUND FILE
MM 1430 PRINT SPC(10)"£ TO LO
        AD SOUND FILE
QD 1440 PRINT SPC(10)"Q TO QUI
        T
EC 1450 PRINT SPC(9)"{RVS}
        {DOWN}CLR {OFF} TO VIE
        W THIS MENU"
SD 1460 PRINT SPC(9)"{RVS}HOME
        {OFF}"
GQ 1470 PRINT SPC(5)"{4 DOWN}P
        RESS {RVS}{YEL}SPACE B
        AR{CYN}{OFF} TO HEAR S
        OUND"
GX 1480 RETURN
BC 1490 REM * PLAY SOUND *
MG 1500 SOUND VO,FR,DU,DI,MN,S
        P,WF,PW
PX 1510 RETURN
HX 1520 REM * SAVE SOUND *
CH 1530 PRINT "{CLR}{DOWN}"SPC
        (12)"* SAVE SOUND *":F
        S$=""
CQ 1540 GOSUB 1880
BQ 1550 APPEND#1,"CATALOG"
RS 1560 GOSUB 2080:IF DS THEN
        {SPACE}2100
EX 1570 PRINT#1,FS$:GOSUB 2080
        :IF DS THEN 2100
CB 1580 DCLOSE#1
RS 1590 OPEN15,8,15,"S0"+FS$:G
        OSUB2080:IF DS THEN DC
        LOSE#15:GOTO 590
JD 1600 DCLOSE#15:DOPEN#2,(FS$
        ),D0,U8,W
DP 1610 GOSUB 2080:IF DS THEN
        {SPACE}2110
MQ 1620 PRINT#2,VO:PRINT#2,FR:
        PRINT#2,DU:PRINT#2,DI:
        PRINT#2,MN
BB 1630 PRINT#2,SP:PRINT#2,WF:
        PRINT#2,PW:GOSUB2080:I
        F DS THEN 2110
AF 1640 DCLOSE#2
SK 1650 RETURN
DJ 1660 REM * LOAD SOUND *
CQ 1670 PRINT "{CLR}"SPC(12)"
        {DOWN}* LOAD SOUND *"
XG 1680 GOSUB 1880
EE 1690 DOPEN#2,(FS$):GOSUB 20
        80:IF DS THEN 2110
QP 1700 INPUT#2,VO,FR,DU,DI,MN
        ,SP,WF,PW
RK 1710 MOVSPR 2,X+2,Y-(FR/100
        0)+1
DP 1720 MOVSPR 3,X+38,Y-(DU/6)
        +1
XF 1730 IF DI=0 THEN TY=114
SP 1740 IF DI=2 THEN TY=132
XP 1750 IF DI=1 THEN TY=150
AA 1760 MOVSPR 4,X+74,TY
ER 1770 MOVSPR 5,X+110,Y-(MN/1
        000)+1
PH 1780 MOVSPR 6,X+146,Y-(SP/2
        50)-1
JP 1790 WY=(WF*20)+101
HJ 1800 MOVSPR 7,X+182,WY
SX 1810 MOVSPR 8,X+218,Y-(PW/6
        7)-1
PX 1820 DCLOSE#2:PRINT TAB(12)
        "{DOWN}{RVS}FILE IS LO
        ADED{OFF}"
RC 1830 RETURN
HG 1840 REM * TEXT SCREEN *
GE 1850 GRAPHIC 0,0:FOR S=1 TO
         8:SPRITE S,0:NEXT
GH 1860 RETURN
RB 1870 REM * INPUT SCREEN *
MK 1880 PRINT "{CYN}{3 DOWN}
        {12 SPACES}INPUT FILEN
        AME:"
JM 1890 INPUT "{DOWN}
        {13 RIGHT}";FS$
XS 1900 IF FS$="" THEN 590
BK 1910 RETURN
JP 1920 REM * DISK CATALOG *
GE 1930 PRINT "{CLR}{CYN}
        {4 DOWN}{11 SPACES}SOU
        ND CATALOG"
FJ 1940 PRINT SPC(7)"{16 DOWN}
        PRESS {RVS}{YEL}SPACE
        {SPACE}BAR{CYN}{OFF} T
        O PAUSE"
EM 1950 WINDOW 12,7,25,19
DJ 1960 DOPEN#1,"CATALOG":GOSU
        B 2080:IF DS THEN DCLO
        SE#1:PRINT"{2 HOME}":G
        OTO 590
KC 1970 INPUT#1,FILE$
SK 1980 RS=ST
JP 1990 PRINT FILE$
BK 2000 GET H$
EF 2010 IF H$<>" " THEN 2030
JB 2020 GET H$:IF H$<>" " THEN
         2020
RQ 2030 IF RS=0 THEN 1970
JR 2040 DCLOSE#1
QJ 2050 PRINT "{2 HOME}"
CA 2060 RETURN
MA 2070 REM * DISK ERROR CHECK
        *
SH 2080 IF DS=62 THEN PRINT"
        {RVS}{DOWN}{YEL}FILE N
        OT FOUND ON THIS DISK
        {OFF}{CYN}":SLEEP 2:PR
        INT"{2 HOME}"
KF 2090 RETURN
BM 2100 DCLOSE#1:GOTO590
MJ 2110 DCLOSE#2:GOTO590
RH 2120 REM * QUIT SCREEN *
HB 2130 PRINT "{CLR}{5 DOWN}
        {4 SPACES}DO YOU WISH
        {SPACE}TO EXIT TO BASI
        C{3 SPACES}Y"
KE 2140 INPUT "{33 RIGHT}{UP}"
        ;AN$
PH 2150 IF ASC(AN$)=78 THEN 59
        0
CC 2160 PRINT"{CLR}":END
FJ 2170 PRINT"{CLR}SOUND VARIA
        BLES:":PRINT"{DOWN}SOU
        ND"VO"{LEFT}","FR"
        {LEFT}","DU"{LEFT}","DI"
        {LEFT}","MN"{LEFT}","SP"
        {LEFT}","WF"{LEFT}","PW
KH 2180 GOTO 610
JK 2190 PRINT"{CLR}LOADING SPR
        ITE DATA...":BANK0:FOR
```


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```
          I=3584TO4095:READA:POK
          EI,A:X1=X1+A:NEXT
AQ 2200   IFX1<>11623THENPRINT"E
          RROR IN DATA STATEMENT
          S.":STOP
RP 2210   RETURN
JF 2220   DATA 255,192,0,127,128
          ,0,63,0,0,30
EC 2230   DATA 0,0,0,0,0,0,0,0,0
          ,0
HD 2240   DATA 0,0,0,0,0,0,0,0,0
          ,0
MQ 2250   DATA 0,0,0,0,0,0,0,0,0
          ,0
RR 2260   DATA 0,0,0,0,0,0,0,0,0
          ,0
AR 2270   DATA 0,0,0,0,0,0,0,0,0
          ,0
HS 2280   DATA 0,0,0,0,12,0,0,30
          ,0,0
KH 2290   DATA 255,192,0,30,0,0,
          12,0,0,0
FS 2300   DATA 0,0,0,0,0,0,0,0,0
          ,0
JX 2310   DATA 0,0,0,0,0,0,0,0,0
          ,0
PJ 2320   DATA 0,0,0,0,0,0,0,0,0
          ,0
SK 2330   DATA 0,0,0,0,0,0,0,0,0
          ,0
CD 2340   DATA 0,0,0,0,0,0,0,0,1
          2,0
JE 2350   DATA 0,30,0,0,255,192,
          0,30,0,0
EG 2360   DATA 12,0,0,0,0,0,0,0,
          0,0
FF 2370   DATA 0,0,0,0,0,0,0,0,0
          ,0
CE 2380   DATA 0,0,0,0,0,0,0,0,0
          ,0
XE 2390   DATA 0,0,0,0,0,0,0,0,0
          ,0
AE 2400   DATA 0,0,0,0,0,0,0,0,0
          ,0
DK 2410   DATA 0,0,255,192,0,255
          ,192,0,255,192
XR 2420   DATA 0,255,192,0,255,1
          92,0,255,192,0
PG 2430   DATA 255,192,0,255,192
          ,0,255,192,0,0
EB 2440   DATA 0,0,0,0,0,0,0,0,0
          ,0
BA 2450   DATA 0,0,0,0,0,0,0,0,0
          ,0
SA 2460   DATA 0,0,0,0,0,0,0,0,0
          ,0
XX 2470   DATA 0,0,0,0,0,0,0,12,0,
          0,30
FA 2480   DATA 0,0,255,192,0,30,
          0,0,12,0
FR 2490   DATA 0,0,0,0,0,0,0,0,0
          ,0
GC 2500   DATA 0,0,0,0,0,0,0,0,0
          ,0
DR 2510   DATA 0,0,0,0,0,0,0,0,0
          ,0
AQ 2520   DATA 0,0,0,0,0,0,0,0,0
          ,0
RQ 2530   DATA 0,0,0,0,0,0,0,0,0
          ,0
GG 2540   DATA 12,0,0,30,0,0,255
          ,192,0,30
CF 2550   DATA 0,0,12,0,0,0,0,0,
          0,0
EK 2560   DATA 0,0,0,0,0,0,0,0,0
          ,0
BJ 2570   DATA 0,0,0,0,0,0,0,0,0
          ,0
SJ 2580   DATA 0,0,0,0,0,0,0,0,0
          ,0
PP 2590   DATA 0,0,0,0,0,0,0,0,0
          ,0
AX 2600   DATA 0,0,0,0,0,255,192,0
          ,255,192,0
CC 2610   DATA 255,192,0,255,192
          ,0,255,192,0,255
KE 2620   DATA 192,0,255,192,0,2
          55,192,0,255,192
CF 2630   DATA 0,0,0,0,0,0,0,0,0
          ,0
BE 2640   DATA 0,0,0,0,0,0,0,0,0
          ,0
QE 2650   DATA 0,0,0,0,0,0,0,0,0
          ,0
FS 2660   DATA 0,0,0,0,0,0,0,0,1
          2,0
RX 2670   DATA 0,30,0,0,255,192,
          0,30,0,0
PC 2680   DATA 12,0,0,0,0,0,0,0,
          0,0
AA 2690   DATA 0,0,0,0,0,0,0,0,0
          ,0
DB 2700   DATA 0,0,0,0,0,0,0,0,0
          ,0
SB 2710   DATA 0,0,0,0,0,0,0,0,0
          ,0
RA 2720   DATA 0,0,0,0,0,0,0,0,0
          ,0
KG 2730   DATA 0,127
```

64 Mode Speed-Up

(Article on page 75.)

```
XB 10  PRINT"{CLR}{WHT}SPEED UP
       - 64 MODE ONLY"
KQ 20  FORI=49152TO49258:READX:
       C=C+X:POKEI,X:NEXT
BQ 30  IFC<>12470THENPRINT"DATA
       ERROR":END
ER 40  SYS 49152
XA 50  DATA 120,173,105,192,141
       ,18,208,173
GX 60  DATA 17,208,41,127,141,1
       7,208,169
RK 70  DATA 129,141,26,208,169,
       192,160,32
QM 80  DATA 141,21,3,140,20,3,8
       8,96
EP 90  DATA 173,25,208,141,25,2
       08,41,1
SQ 100 DATA 208,3,76,49,234,17
       3,18,208
JA 110 DATA 205,106,192,176,14
       ,172,106,192
MX 120 DATA 140,18,208,169,0,1
       41,48,208
XX 130 DATA 76,78,192,172,105,
       192,140,18
HP 140 DATA 208,169,1,141,48,2
       08,104,168
QD 150 DATA 104,170,104,64,120
       ,169,234,141
MB 160 DATA 21,3,169,49,141,20
       ,3,169
EP 170 DATA 0,141,48,208,141,2
       6,208,88
FS 180 DATA 96,50,250
```

Sequential File Editor

(Article on page 65.)

```
RE 10  Z$=CHR$(20):A=3000:IFPEE
       K(56)<64THENA=100
RE 20  DIMA$(A):PRINT"{CLR}"CHR
       $(14)CHR$(8);:OPEN1,0,0:
       V=203:IFPEEK(771)=164THE
       NV=212
FE 30  LI$="[40 T]"
EF 40  PRINT"{8 SPACES}SEQUENTI
       AL FILE EDITOR":PRINTLI$
       "{3 DOWN}"
BA 50  PRINT"ENTER THE NAME OF
       {SPACE}THE FILE YOU WISH
        TO{2 SPACES}EDIT AND PR
       ESS RETURN{2 DOWN}"
CS 60  PRINT">";:INPUT#1,FI$:PR
       INT"{DOWN}":FI$=LEFT$(FI
       $,16)
SC 70  PRINT"FILENAME IS "CHR$(
       34)FI$CHR$(34):PRINT"
       {DOWN}IS THIS CORRECT? (
       Y/N) Y{LEFT}";
RJ 80  INPUT#1,A$:PRINT:IFLEN(A
       $)=0THENPRINT"{UP}":GOTO
       80
DE 90  A$=LEFT$(A$,1):IFA$="Y"T
       HENPRINT:GOTO110
QE 100 RUN
HR 110 PRINT"DISK DRIVE # (8-1
       0) 8{LEFT}";:INPUT#1,A$
       :DR=INT(VAL(A$))
HX 120 IFDR<8ORDR>10THENPRINT:
       PRINTSPC(22)"{UP}
       {7 SPACES}{UP}":GOTO110
KA 130 PRINT"{CLR}{2 SPACES}RE
       ADING "CHR$(34)FI$CHR$(
       34):PRINTLI$
GQ 140 F2$=FI$+",S,R":LN=1:PRI
       NT"{2 SPACES}1 : ";
XQ 150 OPEN8,DR,8,F2$:GET#8,A$
HM 160 IFST<>0THENPRINT"FILE N
       OT FOUND":GOSUB1150:GOS
       UB1140:RUN
EA 170 GOTO190
HM 180 GET#8,A$
MG 190 IFA$<>CHR$(13)THENA$(LN
       )=A$(LN)+A$
AE 200 IFST<>0THENGOSUB1150:GO
       TO260
RG 210 IFA$=CHR$(13)THEN230
AS 220 PRINTA$;:GOTO180
XS 230 B$="":IFLN<9THENB$=" "
GM 240 PRINT:LN=LN+1:PRINTB$;L
       N": ";:IFST<>0THEN260
AE 250 GOTO180
GC 260 CLOSE8:PRINT"{CLR}"SPC(
       13)"MAIN MENU":PRINTLI$
BX 270 PRINT"[1] LIST FILE":PR
       INT"{DOWN}[2] EDIT LINE
       ":PRINT"{DOWN}[3] INSER
       T LINE"
KM 280 PRINT"{DOWN}[4] DELETE
       {SPACE}LINE":PRINT"
       {DOWN}[5] RE-RUN PROGRA
       M"
RS 290 PRINT"{DOWN}[6] RE-SAVE
        FILE AFTER EDITING":PR
       INT"{DOWN}[7] PRINT FIL
       E TO PRINTER"
GF 300 PRINT"{DOWN}[8] EXIT PR
       OGRAM{2 DOWN}"
CM 310 PRINT"ENTER YOUR CHOICE
        AND PRESS RETURN{DOWN}
       "
CB 320 PRINT">";:INPUT#1,A$:A=
       INT(VAL(A$)):IFA<1ORA>8
       THEN260
PG 330 ONAGOTO340,520,600,700,
       800,830,890,1000
HJ 340 PRINT"{CLR}"SPC(13)"LIS
       T FILE":PRINTLI$
QS 350 PRINT"PRESS (A) TO ABOR
       T OR (SPACE) TO PAUSE"
CQ 360 PRINT"{DOWN}({RVS}W
       {OFF})ITH OR WITH({RVS}
       O{OFF})UT LINE NUMBERS?
        W{LEFT}";
XP 370 INPUT#1,A$:A$=LEFT$(A$,
       1):IFA$<>"W"ANDA$<>"O"T
       HEN370
GP 380 PRINT"{DOWN}":FORR=1TOL
```

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```
     N:IFA$="O"THEN410
GR 390 B$="":IFR<10THENB$=" "
AR 400 PRINTB$;R": ";
XH 410 PRINTA$(R)
QM 420 FORT=1TO100:NEXT
AF 430 GETC$:IFC$=""THENNEXT:G
     OTO490
PJ 440 IFC$="A"THENPRINT:PRINT
     "{DOWN}{RVS}* ABORTED *
     ":GOTO490
XD 450 IFC$<>" "THEN430
BM 460 PRINT"{RVS}* PAUSED *"
EM 470 GETC$:IFC$=""THEN470
SD 480 PRINT"{UP}{11 SPACES}":
     PRINT"{UP}";:GOTO430
JR 490 PRINT"{DOWN}{2 SPACES}P
     RESS ANY KEY FOR MAIN M
     ENU"
AD 500 GETC$:IFC$=""THEN500
QE 510 GOTO260
PS 520 PRINT"{CLR}"SPC(13)"EDI
     T LINE":PRINTLI$:PRINT"
     {DOWN}WHICH LINE NUMBER
      TO EDIT? ";
MQ 530 INPUT#1,A$:A=INT(VAL(A$
     )):PRINT
GS 540 IFA>0ANDA<=LNTHEN560
AB 550 PRINT"{DOWN}BAD LINE NU
     MBER":GOSUB1150:GOTO520
CC 560 PRINT"{DOWN} "A$(A):PRI
     NT"{DOWN}RETYPE LINE OR
      PRESS RETURN{DOWN}"
EP 570 PRINT">";:GOSUB1040:PRI
     NT
SC 580 IFT$=CHR$(13)ANDP=0THEN
     PRINT"{DOWN}UN-CHANGED"
     :GOSUB1150:GOTO260
SF 590 PRINT"{DOWN}CHANGED":GO
     SUB1150:A$(A)=A$:GOTO26
     0
DR 600 PRINT"{CLR}"SPC(13)"INS
     ERT A LINE":PRINTLI$
CJ 610 PRINT"{2 DOWN}WHERE SHO
     ULD THE LINE BE INSERTE
     D?{DOWN}"
FF 620 PRINT">";:INPUT#1,A$:A=
     INT(VAL(A$)):PRINT
XE 630 IFA>0ANDA<=LNTHEN650
XX 640 PRINT:PRINT"BAD LINE NU
     MBER":GOSUB1150:GOTO600
AD 650 PRINT"{DOWN}WHAT WOULD
     {SPACE}YOU LIKE THAT LI
     NE TO BE?{4 SPACES}(PRE
     SS RETURN TO ABORT)
     {DOWN}"
MK 660 PRINT">";:GOSUB1040
MQ 670 IFT$=CHR$(13)ANDP=0THEN
     260
FC 680 FORR=LNTOASTEP-1:A$(R+1
     )=A$(R):NEXT:LN=LN+1
JX 690 PRINT:PRINT"{DOWN}DONE"
     :GOSUB1150:A$(A)=A$:GOT
     O260
GX 700 PRINT"{CLR}"SPC(13)"DEL
     ETE LINE":PRINTLI$
FK 710 PRINT"{DOWN}WHICH LINE
     {SPACE}WOULD YOU LIKE T
     O DELETE?{DOWN}"
FM 720 PRINT">";:INPUT#1,A$:A=
     INT(VAL(A$))
FH 730 IFA<1ORA>LNTHEN700
ED 740 PRINT:PRINT:PRINTA$(A):
     PRINT"{DOWN}DELETE THIS
      LINE (Y/N)? Y{LEFT}";
DR 750 INPUT#1,A$:A$=LEFT$(A$,
     1):PRINT
MK 760 IFA$="Y"THEN780
MB 770 PRINT"{DOWN}NOT DELETED
     ":GOSUB1150:GOTO260
BC 780 FORR=ATOLN:A$(R)=A$(R+1
     ):NEXT:LN=LN-1:PRINT"
     {DOWN}DELETED"
KK 790 GOSUB1150:GOTO260
FA 800 PRINT:PRINT"{DOWN}ARE Y
     OU SURE (Y/N)? Y{LEFT}"
     ;:INPUT#1,A$:A$=LEFT$(A
     $,1)
CM 810 IFA$="Y"THENRUN
SG 820 GOTO260
XC 830 PRINT"{CLR}"SPC(12)"RE-
     SAVE FILE":PRINTLI$
DS 840 PRINT"{DOWN}ENTER THE F
     ILE NAME":PRINT"('*' FO
     R SAME NAME AS BEFORE)
     {DOWN}"
DH 850 F3$=FI$:PRINT">";:INPUT
     #1,A$:IFA$<>"*"THENF3$=
     A$
AX 860 OPEN15,DR,15,"S0:"+F3$:
     CLOSE15:F4$="0:"+F3$+",
     S,W":OPEN8,DR,8,F4$
KR 870 PRINT"{2 DOWN}":FORR=1T
     OLN:PRINT"LINE: "R"{UP}
     ":PRINT#8,A$(R):NEXT
JA 880 CLOSE8:PRINT:PRINT:PRIN
     T"DONE":GOSUB1150:GOTO2
     60
HC 890 PRINT"{CLR}"SPC(13)"PRI
     NTING FILE":PRINTLI$
EK 900 PRINT"{DOWN}HOW MANY LI
     NES PER PAGE DOES YOUR
     {SPACE}PAPER"
XG 910 PRINT"HAVE? (0 = CONTIN
     UOUS PRINTING){DOWN}"
JH 920 PRINT">";:INPUT#1,LP:LL
     =0:IFLP<0ORLP<>INT(LP)T
     HEN890
KA 930 PRINT:PRINT:PRINT"PRESS
      (SPACE) TO PRINT OR 'A
     TO ABORT"
EA 940 GETA$:IFA$="A"THEN260
SG 950 IFA$=" "THEN970
JC 960 GOTO940
SA 970 OPEN9,4,7:FORR=1TO5:PRI
     NT#9:NEXT:FORR=1TOLN:PR
     INT#9,A$(R)
MB 980 LL=LL+1:IFLL=LP-10THENF
     ORT=1TO10:PRINT#9:NEXT:
     LL=0
PF 990 NEXT:PRINT#9:CLOSE9:GOT
     O260
EQ 1000 PRINT:PRINT"{DOWN}ARE
     {SPACE}YOU SURE (Y/N)?
      Y{LEFT}";
SJ 1010 INPUT#1,A$:A$=LEFT$(A$
     ,1):IFA$="Y"THENPRINT"
     {CLR}":END
BQ 1020 GOTO260
BX 1030 REM RETURN AS A$
JM 1040 P=0:A$=""
MA 1050 PRINTCHR$(166)CHR$(157
     );
KX 1060 GETT$:IFT$=""OR(T$=CHR
     $(24)ANDA$="")THEN1060
CE 1070 PRINT" "CHR$(157);
ER 1080 IFT$=Z$ANDLEN(A$)>0THE
     NA$=LEFT$(A$,LEN(A$)-1
     ):PRINTT$;:P=P-1:GOTO1
     050
HK 1090 IFT$=CHR$(24)THENFORZ=
     1TOLEN(A$):PRINTZ$;:NE
     XT:GOTO1040
JH 1100 IFT$=CHR$(13)THENPRINT
     T$:RETURN
BH 1110 IF(ASC(T$)AND127)<32TH
     EN1050
KQ 1120 IFP>253THEN1050
FX 1130 PRINTT$;:A$=A$+T$:POKE
     V,0:P=P+1:GOTO1050
JC 1140 OPEN15,8,15:INPUT#15,A
     $,B$,C$,D$:CLOSE15:RET
     URN
EM 1150 FORR=1TO1000:NEXT:RETU
     RN
```

Keyload

(Article on page 76.)

Program 1: Keyload—64 Version

```
SB 1 POKE198,15:POKE631,19:POK
     E632,13:POKE633,19:POKE63
     4,17:POKE635,13:POKE636,1
     9
KJ 2 POKE637,29:POKE638,29:POK
     E639,29:POKE640,42:POKE64
     1,13:POKE642,82
AQ 3 POKE643,213:POKE644,54:PO
     KE645,13
PA 4 PRINT"{CLR}LO"CHR$(34)"$"
     CHR$(34)",8
DG 5 PRINT"LIST1-":END
XD 6 X$="{27 SPACES}"
BF 7 PRINT"{HOME}{RVS}DISK LOA
     DER":PRINTX$
HX 8 PRINT"{RVS}CRSR{OFF} TO D
     ESIRED PROGRAM, PRESS
     {RVS}RETURN{OFF}.
HJ 9 PRINTX$:PRINT"*{4 SPACES}
     "CHR$(34):PRINT"*
     {2 SPACES}{HOME}{2 DOWN}"
KX 10 POKE198,5:POKE631,157:PO
     KE632,157:POKE633,32:POK
     E634,17:POKE635,157
XQ 11 INPUTF$:IFF$=""THENEND
BG 12 IFMID$(F$,7+N,1)=CHR$(34
     )THEN14
FF 13 N=N+1:GOTO12
SX 14 IFLEFT$(F$,1)="L"THENPOK
     E198,2:POKE631,19:POKE63
     2,13:GOTO16
AJ 15 POKE198,6:POKE631,19:POK
     E632,13:POKE633,82:POKE6
     34,85:POKE635,78:POKE636
     ,13
SR 16 PRINT"{CLR}LOAD"CHR$(34)
     "0:"MID$(F$,7,N)CHR$(34)
     ",8,1":END
```

Program 2: Keyload—128 Version

```
GP 1 PRINT"{CLR}DIRECTORY
RG 2 POKE208,7:POKE842,19:POKE
     843,13:POKE844,19:POKE845
     ,82:POKE846,213
BP 3 POKE847,52:POKE848,13:END
XS 4 PRINT"{HOME}{RVS}DISK LOA
     DER
DH 5 PRINT"{2 SPACES}{RVS}CRSR
     {OFF} TO DESIRED PROGRAM,
      PRESS {RVS}RETURN{OFF}.
PP 6 PRINT"{27 SPACES}{UP}"
MP 7 POKE208,5:POKE842,157:POK
     E843,157:POKE844,32:POKE8
     45,17:POKE846,157
HD 8 INPUTF$:IFF$=""THENEND
CX 9 IFMID$(F$,7+N,1)=CHR$(34)
     GOTO11
FS 10 N=N+1:GOTO9
ED 11 IFLEFT$(F$,1)="L"THENPOK
     E208,2:POKE842,19:POKE84
     3,13:GOTO13
XE 12 POKE208,5:POKE842,19:POK
     E843,13:POKE844,82:POKE8
     45,213:POKE846,13
HR 13 PRINT"{CLR}LOAD"CHR$(34)
     "0:"MID$(F$,7,N)CHR$(34)
     ",8,1":END
```

Program 3: Keyload—Plus/4 and 16 Version

```
GP 1 PRINT"{CLR}DIRECTORY
AD 2 POKE239,7:POKE1319,19:POK
     E1320,13:POKE1321,19:POKE
```


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```
     1322,82:POKE1323,213
BR 3 POKE1324,52:POKE1325,13:E
     ND
XS 4 PRINT"{HOME}{RVS}DISK LOA
     DER
DH 5 PRINT"{2 SPACES}{RVS}CRSR
     {OFF} TO DESIRED PROGRAM,
      PRESS {RVS}RETURN{OFF}.
PP 6 PRINT"{27 SPACES}{UP}"
PD 7 POKE239,5:POKE1319,157:PO
     KE1320,157:POKE1321,32:PO
     KE1322,17:POKE1323,157
HD 8 INPUTF$:IFF$=""THENEND
CX 9 IFMID$(F$,7+N,1)=CHR$(34)
     GOTO11
FS 10 N=N+1:GOTO9
JB 11 IFLEFT$(F$,1)="L"THENPOK
      E239,2:POKE1319,19:POKE1
      320,13:GOTO13
QF 12 POKE239,5:POKE1319,19:PO
      KE1320,13:POKE1321,82:PO
      KE1322,213:POKE1323,13
HR 13 PRINT"{CLR}LOAD"CHR$(34)
      "0:"MID$(F$,7,N)CHR$(34)
      ",8,1":END
```

Program 4: Keys 128

```
RS 100 KEY1,"RUN "+CHR$(34)+CH
       R$(34)+"{2 LEFT}
       {19 RIGHT}{3 SPACES}
       {13 RIGHT}{UP}".
MR 110 KEY2,"DLOA"+CHR$(34)+CH
       R$(34)+"{2 LEFT}D
       {19 RIGHT}{3 SPACES}
       {13 RIGHT}{UP}"
BS 120 KEY3,"{CLR}DIR"+CHR$(13
       )+"{HOME}{2 DOWN}"
JQ 130 KEY4,"BLOA"+CHR$(34)+CH
       R$(34)+"{2 LEFT}D
       {19 RIGHT}{3 SPACES}
       {13 RIGHT}{UP}"
EG 140 KEY5,"{CLR}DSAV"+CHR$(3
       4)
PG 150 KEY6,"{CLR}BSAV"+CHR$(3
       4)
AQ 160 KEY7,"SCRA"+CHR$(34)+CH
       R$(34)+"{2 LEFT}T
       {19 RIGHT}{3 SPACES}"+C
       HR$(13)+"Y{LEFT}"
FB 170 PRINT"{CLR}DIRECTORY
PM 180 POKE208,5:POKE842,19:PO
       KE843,13:POKE844,19:POK
       E845,17:POKE846,17:NEW:
       END
```

Program 5: *FastLoad* Version

```
KD 1 PRINT"{CLR}$
AM 2 POKE198,7:POKE631,19:POKE
     632,13:POKE633,19:POKE634
     ,82:POKE635,213
DR 3 POKE636,52:POKE637,13:END
XS 4 PRINT"{HOME}{RVS}DISK LOA
     DER
DH 5 PRINT"{2 SPACES}{RVS}CRSR
     {OFF} TO DESIRED PROGRAM,
      PRESS {RVS}RETURN{OFF}.
PP 6 PRINT"{27 SPACES}{UP}"
BP 7 POKE198,5:POKE631,157:POK
     E632,157:POKE633,32:POKE6
     34,17:POKE635,157
HD 8 INPUTF$:IFF$=""THENEND
CX 9 IFMID$(F$,7+N,1)=CHR$(34)
     GOTO11
FS 10 N=N+1:GOTO9
RP 11 IFLEFT$(F$,1)="L"THENPOK
      E198,2:POKE631,19:POKE63
      2,13:GOTO13
HX 12 POKE198,6:POKE631,19:POK
      E632,13:POKE633,82:POKE6
      34,85:POKE635,78:POKE636
      ,13
JS 13 PRINT"{CLR}@0:"MID$(F$,7
      ,N):END
```

Artimation

(Article on page 62.)

Program 1: Cosmic Objects

```
10 REM COSMIC OBJECTS
20 C=2:COLOR0,1:GRAPHIC1,1:COL
   OR1,5:COLOR4,1
30 FORK=1TO10:CX=INT(RND(0)*32
   0):CY=INT(RND(0)*200)
40 R1=INT(RND(0)*40)+20:R2=INT
   (RND(0)*40)+20
50 IFC=2THENC=45:GOTO80
60 IFC=45THENC=90:GOTO80
70 IFC=90THENC=2
80 FORI=R1TO0STEP-(R1/5):CIRCL
   E1,CX,CY,I,R2,,,,C:NEXT
90 FORI=R2TO0STEP-(R2/5):CIRCL
   E1,CX,CY,R1,I,,,,C:NEXTI,K
```

Program 2: The Pit

```
10 REM THE PIT
20 COLOR0,2:COLOR4,2:GRAPHIC1,
   1:COLOR1,1:DRAW1,160,100
30 FORI=1TO320STEP2:DRAW1,160,
   100TOI,0TO160,100:NEXT
40 FORI=1TO200STEP2:DRAW1,160,
   100TO0,ITO160,100:NEXT
50 FORI=1TO320STEP2:DRAW1,160,
   100TOI,200TO160,100:NEXT
60 FORI=200TO0STEP-2:DRAW1,160
   ,100TO320,ITO160,100:NEXT
```

Program 3: String Art

```
10 REM STRING ART
20 COLOR0,1:C=2:COLOR4,1:GRAPH
   IC1,1:K=50:L=70:P=5
30 COLOR1,5:S=3
40 A=A+5:K=K+P:IFA>=2↑16THENA=
   0:GOTO40
50 IFK>320THENP=-6:GOSUB80:SLE
   EP2:COLOR1,C:C=C+1:GRAPHIC1
   ,1:IFC>15THENC=2
60 BOX1,ABS(K),ABS(K),ABS(K),L
   ,A:IFK<0THENP=5:GOSUB80
70 GOTO40
80 K=INT(RND(0)*320):L=INT(RND
   (1)*200):RETURN
```

Budget Planner

(Article on page 67. 128 and Plus/4 owners: See modifications in the article.)

```
SR 100 DEV=8:GOTO1850
HJ 110 PRINTHM$;LEFT$(X$,X);LE
       FT$(Y$,Y);:RETURN
SD 120 A=ABS(X)+.005-.5*(DP=0)
       :A1=INT(A):A$=MID$(STR$
       (A1),2):IFX<0THENA$="-"
       +A$
AQ 130 IFDPTHEN A2$=MID$(STR$(
       INT((A-A1)*100)),2):IFL
       EN(A2$)<2THENA2$="0"+A2
       $
KX 140 IFDPTHENA$=A$+"."+A2$
JC 150 A$=RIGHT$(SP$+A$,F):RET
       URN
XF 160 A$=LEFT$(SP$,(X-LEN(A$)
       )/2)+A$:RETURN
HC 170 FORI=1TONW:A=0:FORJ=0TO
       NR-1:A=A+TB(J,I):NEXT:T
       B(NR,I)=A:TB(0,I+1)=A:N
       EXT
DQ 180 FORI=1TONW:MM=0:IFTB(NR
       ,I)<0THENMM=-1:I=NW
JG 190 NEXT:RETURN
QM 200 A$=RIGHT$(SP$+"WEEK"+ST
       R$(CW),F-2):X=2:Y=3:GOS
       UB110:PRINT A$;:RETURN
JX 210 A$="BUDGET PLANNER"+STR
       $(YR):X=40:GOSUB160
SG 220 PRINTCL$;FG$;A$:PRINTD$
       :PRINTEA$:EA$=""
BA 230 GOSUB280:FORI=0TONR:IFM
       MANDI=NRTHENPRINTDEBT$;
FF 240 PRINTHM$;LEFT$(Y$,I+5);
       :A$=TB$(I):GOSUB150:PRI
       NTA$;FG$;
SP 250 FORJ=WTOW+2:IFI=NRANDTB
       (I,J)<0THENPRINTDEBT$;
RR 260 X=TB(I,J):GOSUB120:PRIN
       TA$;FG$;
FD 270 NEXT:NEXT:RETURN
KA 280 GOSUB200:A=D:B=M:C=YR
PB 290 FORZ=1TO3
AJ 300 A$=STR$(D)+MNTH$(M):GOS
       UB150:PRINTA$;
GH 310 GOSUB580:NEXT
QR 320 D=A:M=B:YR=C
KX 330 PRINT"CCCCCCCCCCCCCCCCCC
       CCCCCCCCCCCCCCCCCCCCCCC
       "
HP 340 RETURN
RD 350 GOSUB200:X=TB(CR,CW):GO
       SUB120:B$=RV$+A$+NV$:X=
       CC*10:Y=CR+5:GOSUB110
SD 360 PRINTB$;
MC 370 GETC$:IFC$=""THEN370
XE 380 IFC$="+"ORC$="-"ORC$=".
       "OR(C$>="0"ANDC$<="9")T
       HEN740
GG 390 IFC$=UP$THEN610
GS 400 IFC$=DN$THEN640
JR 410 IFC$=LF$THEN660
BE 420 IFC$=RT$THEN700
GR 430 IFC$=CR$THENRETURN
KS 440 IFC$=BK$THENIFLEN(D$)<>
       0THENC$="":D$=LEFT$(D$,
       LEN(D$)-1):GOTO740
XE 450 GOSUB110:PRINTA$;
QA 460 IFASC(C$)>132ANDASC(C$)
       <141THEN760
JP 470 IFC$="M"THEN1650
XA 480 IFC$="D"THENDP=NOTDP:GO
       SUB210:GOTO350
RA 490 IFC$="E"THEN1730
QK 500 IFC$="F"THEN1790
FR 510 IFC$="W"THEN1630
CJ 520 IFC$="T"THENDEV=1:EA$="
       {RVS}TAPE SELECTED{OFF}
       ":GOSUB210:GOTO350
RQ 530 IFC$="Q"THENDEV=8:EA$="
       {RVS}DISK SELECTED{OFF}
       ":GOSUB210:GOTO350
CG 540 GOSUB110:PRINTB$:GOTO37
       0
FC 550 D=D-7:IFD>=1THENRETURN
DE 560 M=M-1:IFM>=1THEND=D+MNT
       H(M):RETURN
QG 570 YR=YR-1:M=12:D=D+MNTH(M
       ):RETURN
CQ 580 D=D+7:IFD<=MNTH(M)THENR
       ETURN
CX 590 D=D-MNTH(M):M=M+1:IFM<1
       3THENRETURN
FB 600 YR=YR+1:M=1:RETURN
RC 610 IFCR=0THEN370
BJ 620 CR=CR-1
CR 630 GOSUB110:PRINTA$;:GOTO3
       50
KH 640 IFCR<>NR-1THENCR=CR+1:G
       OTO630
GS 650 GOTO370
CQ 660 IFCC<>1THENCC=CC-1:CW=C
       W-1:GOTO630
KF 670 IFCW=1THEN370
QC 680 CW=CW-1:W=W-1:GOSUB550
BS 690 GOSUB210:GOTO350
```


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```
BX 700 IFCC<>3THENCC=CC+1:CW=C
       W+1:GOTO630
ES 710 IFCW=NWTHEN370
KX 720 CW=CW+1:W=W+1:GOSUB580
QR 730 GOSUB210:GOTO350
GC 740 IFLEN(D$)<10THEND$=D$+C
       $:PRINTHM$;DN$;D$;LEFT$
       (SP$,10-LEN(D$)):GOTO37
       0
SF 750 GOTO370
AQ 760 PRINT HM$;DN$;SP$:PRINT
       SP$
XD 770 ONASC(C$)-132GOSUB780,8
       70,980,1090,1100,1250,1
       330,1400:GOTO350
DD 780 X=0:Y=0:GOSUB110:PRINTW
       H$;"<F1>HELP{3 SPACES}<
       F2>GOTO{2 SPACES}<E>ND
       {SPACE}OF MONTH "
HD 790 Y=Y+1:GOSUB110:PRINTWH$
       ;"<F3>LOAD{3 SPACES}<F4
       >SAVE{2 SPACES}<F>IND N
       EG{5 SPACES}"
AC 800 Y=Y+1:GOSUB110:PRINTWH$
       ;"<F5>+ROW{3 SPACES}<F6
       >-ROW{2 SPACES}<M>ONTHL
       Y EXP{2 SPACES}"
FB 810 Y=Y+1:GOSUB110:PRINTWH$
       ;"<F7>CALC{3 SPACES}<F8
       >PRNT{2 SPACES}<W>EEKLY
        EXP{3 SPACES}"
CD 820 Y=Y+1:GOSUB110:PRINTWH$
       ;"<Q>DISK{4 SPACES}<T>A
       PE{4 SPACES}<D>ECIMAL
       {6 SPACES}"
EH 830 Y=Y+1:GOSUB110:PRINT"<P
       RESS ANY KEY>{3 SPACES}
       "
CA 840 GETA$:IFA$=""THEN840
FH 850 PRINTFG$;
KC 860 GOSUB210:RETURN
QA 870 X=0:Y=0:GOSUB110:PRINTW
       H$;"{RVS}*LOAD*{OFF}"
HH 880 Y=Y+1:GOSUB110:F$="":IN
       PUT"FILENAME";F$:IFF$="
       "THEN1210
FA 890 IFDE=8THEN910
BG 900 OPEN2,1,0,F$:GOTO920
PM 910 OPEN15,8,15:OPEN2,8,2,F
       $+",S,R":GOSUB2300:IFEA
       THENGOSUB210:GOTO970
XP 920 PRINTCL$;DN$;"LOADING "
       ;F$
BP 930 INPUT#2,NR,NW,D,M,YR:M0
       =M:D0=D:Y0=YR:CC=1:CR=1
       :CW=1:W=1:GOSUB2140
SR 940 IFDE=8THENGOSUB2300:IFE
       ATHEN970
HM 950 FORI=0TONR:INPUT#2,TB$(
       I):FORJ=0TONW:INPUT#2,T
       B(I,J):NEXTJ,I
QQ 960 GOSUB170:GOSUB210
FP 970 CLOSE2:CLOSE15:RETURN
KD 980 X=0:Y=0:GOSUB110:PRINTW
       H$;"{RVS}*+ROW*{OFF}"
AG 990 IFNR=18THENY=Y+1:GOSUB1
       10:PRINT"-NO MORE ROOM-
       ":GOTO830
KA 1000 N$="":Y=Y+1:GOSUB110:I
       NPUT"NAME";N$
GS 1010 IFN$=""THEN1080
BH 1020 Y=Y+1:GOSUB110:I$="E":
       INPUT"(I/E)";I$
SC 1030 A=-1:IFI$="I"THENA=1
FP 1040 CR=CR+1
GD 1050 FORI=NRTOCRSTEP-1:TB$(
       I+1)=TB$(I):FORJ=0TONW
       :TB(I+1,J)=TB(I,J):NEX
       TJ,I
RC 1060 FORI=1TONW:TB(CR,I)=0:
       NEXT:TB$(CR)=LEFT$(N$,
       10)
SF 1070 NR=NR+1:TB(CR,0)=A
AR 1080 GOSUB210:RETURN
XE 1090 GOSUB110:PRINTA$;:GOSU
       B170:GOSUB210:RETURN
FX 1100 X=0:Y=0:GOSUB110:PRINT
       WH$;"{RVS}*GOTO*{OFF}"
JM 1110 Y=Y+1:GOSUB110:W$="":I
       NPUT"WEEK";W$
GJ 1120 A=INT(VAL(W$))
KA 1130 IFLEFT$(W$,1)="-"ORLEF
       T$(W$,1)="+"THENA=CW+A
KP 1140 IFA=WTHEN1200
EB 1150 IFA>50THENA=50
HP 1160 IFA<=0THEN1210
GX 1170 IFA>WTHEN1220
AA 1180 W=W-1:GOSUB550
AB 1190 IFA<WTHEN1180
JC 1200 CW=W:CC=1
AG 1210 GOSUB210:RETURN
FE 1220 W=W+1:GOSUB580
PD 1230 IFA>WTHEN1220
BR 1240 GOTO1200
PK 1250 X=0:Y=0:GOSUB110:PRINT
       WH$;"{RVS}*SAVE*{OFF}"
KC 1260 Y=Y+1:GOSUB110:F$="":I
       NPUT"FILENAME";F$:IFF$
       =""THEN1210
RG 1270 IFDE=8THEN1290
JC 1280 OPEN2,1,2,F$:GOTO1300
XF 1290 OPEN15,8,15:OPEN2,8,2,
       "@0:"+F$+",S,W":GOSUB2
       300:IFEATHEN1320
FJ 1300 PRINT#2,NR;",";NW;",";
       D0;",";M0;",";Y0
DJ 1310- FORI=0TONR:PRINT#2,TB$
       (I):FORJ=0TONW:PRINT#2
       ,TB(I,J):NEXTJ,I
XP 1320 CLOSE15:CLOSE2:GOSUB17
       0:GOSUB210:RETURN
PM 1330 X=0:Y=0:GOSUB110:PRINT
       WH$;"{RVS}*-ROW*{OFF}"
JE 1340 IFCR=0THENY=Y+1:GOSUB1
       10:PRINT"ILLEGAL ROW":
       GOTO830
XB 1350 Y=Y+1:GOSUB110:N$="":I
       NPUT"SURE";N$
RS 1360 IFLEFT$(N$,1)<>"Y"THEN
       1210
HP 1370 NR=NR-1
DJ 1380 FORI=CRTONR:TB$(I)=TB$
       (I+1):FORJ=0TONW:TB(I,
       J)=TB(I+1,J):NEXTJ,I
BS 1390 CR=CR-1:GOTO1210
SA 1400 Q$="":PRINTHM$;WH$;"<P
       RNT>":INPUT"FROM";Q$:I
       FQ$=""THEN1210
AE 1410 Q1$="":INPUT"TO
       {2 SPACES}";Q1$:IFQ1$=
       ""THENQ1$=Q$
BE 1420 Q$="-"+Q$:M1=0:FORI=1T
       O12:IFMNTH$(I)=Q$THENM
       1=I:I=12
XJ 1430 NEXT:M2=0:Q1$="-"+Q1$:
       FORI=1TO12:IFMN$(I)=Q1
       $THENM2=I:I=12
XA 1440 NEXT:IFM1=0ORM2=0THENE
       A$="ILLEGAL MONTH":GOT
       O1210
ED 1450 OPEN4,4:CMD4:X=79:A$="
       BUDGET PLANNER"+STR$(Y
       0)
MQ 1460 PRINT"{20 SPACES}"A$:P
       RINT:M=M0:Y=Y0:D=D0:Q=
       1
AH 1470 M2=M2+1:IFM2=13THENM2=
       1
SG 1480 IFM<>M1THENGOSUB580:Q=
       Q+1:GOTO1480
EP 1490 PRINTTAB(10);:N=1
PC 1500 A$=STR$(D)+MNTH$(M):GO
       SUB150:PRINTA$;
CD 1510 A=M:GOSUB580:IFA=MTHEN
       N=N+1:GOTO1500
DR 1520 PRINT:FORI=0TON:PRINT"
       CCCCCCCCCC";:NEXT:PRIN
       T
PP 1530 FORI=0TONR:A$=TB$(I):G
       OSUB150
GS 1540 IFI=NRANDMMTHENPRINTRV
       $;A$;NV$;:GOTO1560
JR 1550 PRINTA$;
QM 1560 QQ=Q+N-1:IFQQ>52THENQQ
       =52
RM 1570 FORJ=QTOQQ:X=TB(I,J):G
       OSUB120
HG 1580 IFI=NRANDX<0THENPRINTR
       V$;A$;NV$;:GOTO1600
QS 1590 PRINTA$;
PG 1600 NEXTJ:PRINT:NEXTI
FJ 1610 PRINT:PRINT:Q=Q+N:IFQ<
       53ANDM<>M2THEN1490
SH 1620 M=M0:D=D0:YR=Y0:W=1:CW
       =1:CC=1:CR=0:PRINT#4:C
       LOSE4:GOTO1210
XP 1630 IFD$=""THENRETURN
XJ 1640 A=TB(CR,0)*VAL(D$):FOR
       I=CWTONW:TB(CR,I)=A:NE
       XTI:D$="":GOSUB210:GOT
       O350
CF 1650 IFD$=""THENRETURN
FR 1660 A=D:B=M:C=YR:Q=W:X=M
JJ 1670 IFW<>CWTHENGOSUB580:W=
       W+1:GOTO1670
PR 1680 X=M
GH 1690 GOSUB580:W=W+1:IFX=MTH
       EN1690
PP 1700 X=M:W=W-1:GOSUB550:IFW
       >52THEND=A:M=B:YR=C:W=
       Q:D$="":GOTO1720
AG 1710 TB(CR,W)=TB(CR,0)*VAL(
       D$):GOTO1690
PJ 1720 GOSUB210:GOTO350
PE 1730 IFW<>CWTHENW=W+1:GOSUB
       580:GOTO1730
JX 1740 A=D:B=M:C=YR:W=W+1:GOS
       UB580:X=M:FL=0
CE 1750 GOSUB580:W=W+1:IFX=MTH
       EN1750
GF 1760 GOSUB550:W=W-1:IFW>50T
       HENFL=-1:GOTO1760
KQ 1770 CC=1:CW=W:IFFLTHENCC=3
       :CW=52
FQ 1780 GOSUB210:GOTO350
SH 1790 IFW<>CWTHENW=W+1:GOSUB
       580:GOTO1790
GE 1800 A=D:B=M:C=YR:Q=W
MR 1810 GOSUB580:W=W+1:IFTB(NR
       ,W)>=0ANDW<>50THEN1810
MR 1820 IFTB(NR,W)>=0THEND=A:M
       =B:YR=C:W=Q:GOTO350
SX 1830 CC=1:CW=W
MA 1840 GOSUB210:GOTO350
JH 1850 DIMTB(18,53),TB$(18),M
       N$(12),MN(12)
KR 1860 DEBT$=CHR$(28):FG$=CHR
       $(159):HM$=CHR$(19):CL
       $=CHR$(147):UP$=CHR$(1
       45)
AP 1870 DN$=CHR$(17):LF$=CHR$(
       157):RT$=CHR$(29):CR$=
       CHR$(13):BK$=CHR$(20)
QD 1880 RV$=CHR$(18):NV$=CHR$(
       146):WH$=CHR$(5)+RV$
MS 1890 POKE53280,3:POKE53281,
       0:PRINTFG$
HE 1910 PRINTFG$:FORI=1TO12:RE
       ADMNT$(I),MNT(I):NEXT
MP 1920 DATA -JAN,31,-FEB,28,-
       MAR,31,-APR,30
KE 1930 DATA -MAY,31,-JUN,30,-
       JUL,31,-AUG,31
FF 1940 DATA -SEP,30,-OCT,31,-
       NOV,30,-DEC,31
AM 1950 W=1:F=10:DP=-1:NW=52
BJ 1960 SP$="{39 SPACES}"
```


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```
QX 1970 X$="":FORI=1TO40:X$=X$
        +RT$:NEXT
XC 1980 Y$="":FORI=1TO24:Y$=Y$
        +DN$:NEXT
JM 1990 A=FRE(X)
DC 2000 NR=1:CW=1:CR=0:CC=1
JJ 2010 TB$(0)="PREVBAL":TB(0,
        0)=1
PS 2020 TB$(1)="TOTAL"
AE 2030 GOSUB2070
RX 2040 GOSUB350
FF 2050 IFD$=""THEN2040
AX 2060 TB(CR,CW)=TB(CR,0)*VAL
        (D$):D$="":X=0:Y=1:GOS
        UB110:PRINTSP$:GOTO204
        0
HR 2070 A$="BUDGET PLANNER":X=
        39:GOSUB160:PRINT"
        {CLR}";FG$;A$
GD 2080 PRINT:PRINTEA$:F$="":E
        A$=""
SP 2090 INPUT"ENTER FILENAME";
        F$
DR 2100 IFF$=""THEN2170
XK 2110 GOSUB890
QR 2120 IFEATHEN2070
BE 2130 RETURN
BD 2140 X=Y0:MNTH(2)=28:IFM0>2
        THENX=X+1
PM 2150 IFINT(X/4)=X/4THENMN(2
        )=29
JK 2160 RETURN
SH 2170 A$="BUDGET PLÄNNER":X=
        39:GOSUB160:PRINT "
        {CLR}";FG$;A$
PP 2180 PRINTD$:INPUT"DAY
        {3 SPACES}";DD$:D=VAL(
        DD$)
HC 2190 INPUT"MONTH ";MM$:MM$=
        "-"+MM$
QK 2200 INPUT"YEAR{2 SPACES}";
        YR$:YR=VAL(YR$):Y0=YR
FA 2210 M=0:FORI=1TO12:IFMN$(I
        )=MM$THENM=I
FK 2220 NEXT:IFM=0THEN2280
BM 2230 IFYR<1910ORYR>1999THEN
        2290
DA 2240 GOSUB2140
CD 2250 IFD<1ORD>MNTH(M)THEN22
        70
HH 2260 D$="":GOSUB210:M0=M:D0
        =D:Y0=YR:RETURN
BJ 2270 D$="{RVS}ILLEGAL DAY V
        ALUE TRY AGAIN{OFF}":G
        OTO2170
QA 2280 D$="{RVS}ILLEGAL MONTH
         - USE 3-CHAR ABREVIAT
        ION{OFF}":GOTO2170
QR 2290 D$="{RVS}ILLEGAL YEAR
        {SPACE}- (1910-1999 ON
        LY){OFF}":GOTO2170
XF 2300 INPUT#15,EA,EA$,A,A:EA
        =(EA<>0):RETURN
```

Saloon Shootout

(See instructions in article on page 56 before typing in.)

Program 1: Saloon Shootout

```
2800:4C 1A 28 00 00 00 00 00 02
2808:00 00 00 00 00 00 00 00 58
2810:00 00 00 00 00 00 00 00 60
2818:00 00 A9 00 8D 5C 03 8D 0F
2820:5D 03 A9 93 20 D2 FF 20 BA
2828:B2 33 20 4C 2F 20 5D 34 50
2830:20 AD 2E 20 70 38 20 18 80
2838:2E 20 FC 29 CE 0B 28 D0 9D
2840:0C AD 0C 28 8D 0B 28 20 0F
2848:08 30 20 5F 2A CE 09 28 69
2850:D0 0C AD 0A 28 8D 09 28 14
2858:20 8D 30 20 2D 2A CE 61 35
2860:03 D0 09 AD 62 03 8D 61 FD
2868:03 20 F7 2A CE 0D 28 D0 AF
2870:09 AD 0E 28 8D 0D 28 20 06
2878:F7 30 AD 0D 28 C9 0A B0 84
2880:0F AD 66 03 C9 01 D0 08 BC
2888:AD 11 FF 29 4F 8D 11 FF 59
2890:CE 0F 28 D0 09 AD 10 28 65
2898:8D 0F 28 20 40 2D CE 18 E6
28A0:28 D0 09 AD 19 28 8D 18 D1
28A8:28 20 DD 37 20 EE 28 CE 20
28B0:57 03 D0 88 CE 54 03 20 FD
28B8:6E 29 AD 54 03 F0 08 AD 1F
28C0:58 03 F0 03 4C 3C 28 A9 99
28C8:00 8D 11 FF A2 17 A0 08 59
28D0:18 20 F0 FF A9 BD A0 37 10
28D8:20 08 34 20 2D 2A 20 6E 84
28E0:29 20 FC 29 20 E4 FF C9 5E
28E8:0D D0 F9 4C 22 28 A2 00 EE
28F0:CA D0 FD 60 18 6D 52 03 BE
28F8:8D 52 03 AD 53 03 69 00 59
2900:8D 53 03 AD 63 03 D0 21 13
2908:AD 52 03 38 E9 F4 8D 04 EB
2910:28 AD 53 03 E9 01 0D 04 ED
2918:28 90 0E AD 54 03 18 69 87
2920:32 8D 54 03 A9 01 8D 63 79
2928:03 4C 6E 29 8D 03 28 AD E5
2930:52 03 38 ED 03 28 8D 52 78
2938:03 AD 53 03 E9 00 8D 53 CF
2940:03 B0 08 A9 00 8D 52 03 B9
2948:8D 53 03 4C 6E 29 18 6D 11
2950:58 03 C9 24 90 02 A9 23 0E
2958:8D 58 03 60 8D 04 28 AD 68
2960:58 03 38 ED 04 28 B0 02 A9
2968:A9 00 8D 58 03 60 8A 48 BD
2970:98 48 A9 92 20 D2 FF A9 75
2978:05 20 D2 FF A2 06 A0 00 1E
2980:18 20 F0 FF AE 52 03 AD 77
2988:53 03 20 13 34 A2 0A A0 5B
2990:00 18 20 F0 FF AE 54 03 62
2998:A9 00 20 13 34 A0 00 AD C6
29A0:54 03 C9 19 D0 02 A0 F1 6A
29A8:AE 56 03 D0 05 8C 19 FF E1
29B0:D0 03 8C 20 D0 A9 12 20 31
29B8:D2 FF A2 12 A0 02 18 20 47
29C0:F0 FF AD 46 03 0A 0A 18 12
29C8:69 49 A8 20 D2 FF C8 98 F9
29D0:8D 04 28 20 D2 FF A9 D9 B5
29D8:A0 37 20 08 34 AC 04 28 52
29E0:C8 98 20 D2 FF C8 C0 60 F3
29E8:D0 04 38 E9 3E A8 98 20 30
29F0:D2 FF A9 92 20 D2 FF 68 BF
29F8:A8 68 AA 60 AD 5C 03 38 32
2A00:ED 52 03 8D 03 28 AD 5D 8A
2A08:03 ED 53 03 0D 03 28 B0 69
2A10:0B A0 01 B9 52 03 99 5C FB
2A18:03 88 10 F7 A2 0E A0 00 20
2A20:18 20 F0 FF AE 5C 03 AD 41
2A28:5D 03 4C 13 34 AD 5A 03 B6
2A30:18 69 C4 85 04 AD 5B 03 6C
2A38:69 03 85 05 AE 58 03 E8 C8
2A40:A0 00 A9 BC CA F0 02 10 14
2A48:02 A9 20 91 04 20 30 2D 53
2A50:AD 56 03 D0 02 A9 71 91 A9
2A58:02 C8 C0 23 D0 E4 60 AD B2
2A60:4A 03 D0 3A CE 4E 03 F0 FE
2A68:01 60 20 EC 2A 20 FB 2F 21
2A70:29 07 18 69 07 8D 4C 03 BE
2A78:A9 03 8D 4B 03 EE 4A 03 34
2A80:A2 04 20 FB 2F 29 03 C9 D8
2A88:03 F0 F7 A8 B9 E9 2A A8 96
2A90:8C 4F 03 18 20 F0 FF A9 4F
2A98:38 A0 37 20 08 34 AD 4C D2
2AA0:03 F0 29 CE 4C 03 D0 C1 96
2AA8:A2 04 AC 4F 03 18 20 F0 83
2AB0:FF A9 00 8D 59 03 A2 5A BE
2AB8:A0 37 20 FB 2F 10 09 A9 64
2AC0:01 8D 59 03 A2 76 A0 37 BB
2AC8:8A 20 08 34 CE 4B 03 D0 29
2AD0:98 A9 00 8D 4A 03 A2 04 5C
2AD8:AC 4F 03 20 A7 35 AD 59 80
2AE0:03 F0 05 A9 0A 20 5C 29 E0
2AE8:60 0D 17 21 20 FB 2F 29 1E
2AF0:1F 09 20 8D 4E 03 60 AD E0
2AF8:5E 03 C9 0B F0 17 C9 0A A8
2B00:D0 12 A9 00 8D 5F 03 A9 12
2B08:01 8D 60 03 EE 5E 03 A9 1F
2B10:65 8D 62 03 60 AD 5A 03 6A
2B18:18 69 D8 85 04 AD 5B 03 D8
2B20:69 02 85 05 AC 5F 03 A9 3F
2B28:20 91 04 C8 91 04 AD 5F 57
2B30:03 18 6D 60 03 8D 5F 03 D1
2B38:F0 29 C9 0E F0 25 A2 00 CC
2B40:A8 AD 60 03 10 02 A2 02 62
2B48:BD 69 2B 91 04 C8 BD 6A 7F
2B50:2B 91 04 20 30 2D AD 56 0B
2B58:03 D0 02 A9 71 91 02 88 9D
2B60:91 02 60 A9 00 8D 5E 03 9C
2B68:60 1B 1C 1D 1E AC 47 03 40
2B70:B1 04 C9 85 90 31 C9 89 98
2B78:B0 2D 38 E9 85 AA BD FB 66
2B80:2C 8D 03 28 A5 04 38 ED CE
2B88:03 28 85 04 A5 05 E9 00 70
2B90:85 05 A2 00 20 B0 2C A9 05
2B98:0A 20 F4 28 AD 5E 03 C9 D3
2BA0:0A B0 03 EE 5E 03 60 C9 01
2BA8:84 F0 08 C9 89 90 05 C9 7D
2BB0:8D B0 01 60 C9 A0 F0 4C 1F
2BB8:C9 A2 B0 48 C9 8D 90 44 21
2BC0:AD 47 03 38 E9 13 AA BD 52
2BC8:D2 2C 18 6D 50 03 C9 05 94
2BD0:90 03 38 E9 05 AA BD 3C 60
2BD8:03 29 7F 4A 4A CD 46 03 A8
2BE0:D0 0A CE 46 03 D0 10 A9 85
2BE8:23 20 4E 29 A9 05 8D 46 F7
2BF0:03 20 70 38 4C 75 2C A9 9C
2BF8:0A 20 F4 28 A9 1C 9D 3C B2
2C00:03 4C 75 2C C9 66 D0 08 EF
2C08:A9 0A 20 2C 29 4C 75 2C 10
2C10:C9 A2 90 1A C9 B4 B0 16 42
2C18:C9 AB B0 08 A9 64 20 2C 22
2C20:29 4C 75 2C A9 00 8D 59 53
2C28:03 A9 19 20 F4 28 C9 1B 88
2C30:90 26 C9 1F B0 22 AD 60 4F
2C38:03 49 FF 18 69 01 8D 60 B0
2C40:03 AD 62 03 38 E9 14 30 C3
2C48:03 8D 62 03 A9 65 38 ED 43
2C50:62 03 20 F4 28 4C 75 2C 77
2C58:C9 B6 D0 19 A9 00 8D 65 BC
2C60:03 A9 01 8D 66 03 EE 64 1F
2C68:03 AD 64 03 C9 03 90 05 EA
2C70:A9 00 8D 64 03 AE 16 28 BC
2C78:EE 16 28 A5 04 9D C3 3B 86
2C80:A5 05 9D D7 3B AD 47 03 40
2C88:9D EB 3B B1 04 C9 1B 90 3B
2C90:06 C9 1F B0 02 A9 20 9D E1
2C98:FF 3B 20 30 2D B1 02 9D 98
2CA0:13 3C AD 56 03 D0 02 A9 B5
2CA8:71 91 02 A9 84 91 04 60 CB
2CB0:AC 47 03 BD DB 2C 91 04 24
2CB8:C8 E8 BD DB 2C 91 04 E8 BD
2CC0:98 18 69 27 A8 BD DB 2C 2B
2CC8:91 04 E8 C8 BD DB 2C 91 DB
2CD0:04 60 00 00 00 01 01 01 4A
2CD8:02 02 02 89 8A 8B 8C 8D B4
2CE0:8E 8F 90 91 92 93 94 95 31
2CE8:96 97 98 99 9A 9B 9C 9D 39
2CF0:9E 9F A1 66 66 66 66 20 D4
2CF8:20 20 20 00 01 28 29 AE 17
2D00:16 28 F0 23 CA BD C3 3B CF
2D08:85 04 BD D7 3B 85 05 BC 12
2D10:EB 3B BD FF 3B 91 04 20 2F
2D18:30 2D BD 13 3C 91 02 CA B5
2D20:10 E3 A9 00 8D 16 28 AD 73
2D28:11 FF 29 1F 8D 11 FF 60 33
2D30:A5 04 18 6D 14 28 85 02 86
2D38:A5 05 6D 15 28 85 03 60 63
2D40:20 4C 2E 4A B0 0D AE 11 50
2D48:28 E0 10 F0 06 EE 11 28 36
2D50:20 18 2E 4A B0 0D AE 11 53
2D58:28 E0 02 F0 06 CE 11 28 04
2D60:20 18 2E 4A B0 14 48 AD 4F
2D68:47 03 F0 0D A2 00 20 DB 47
2D70:2D CE 47 03 A2 04 20 DB 6F
2D78:2D 68 4A B0 16 48 AD 47 4C
2D80:03 C9 1F F0 0D A2 00 20 D4
2D88:DB 2D EE 47 03 A2 04 20 39
2D90:DB 2D 68 4A B0 3F AD 17 CA
2D98:28 D0 34 AD 58 03 F0 2F 7C
2DA0:A9 01 20 5C 29 20 33 2E 38
2DA8:AD 5A 03 18 69 57 85 04 0A
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2DB0:AD 5B 03 69 00 85 05 AE 7E
2DB8:11 28 F0 10 A5 04 18 69 9B
2DC0:28 85 04 A5 05 69 00 85 BE
2DC8:05 CA D0 F0 20 6D 2B A9 38
2DD0:01 8D 17 28 60 A9 00 8D AB
2DD8:17 28 60 AD 5A 03 18 69 28
2DE0:FF 85 04 AD 5B 03 69 02 B3
2DE8:85 05 AC 47 03 BD 10 2E AE
2DF0:91 04 E8 98 18 69 28 A8 1B
2DF8:BD 10 2E 91 04 E8 98 18 22
2E00:69 28 A8 BD 10 2E 91 04 6C
2E08:E8 C8 BD 10 2E 91 04 60 E3
2E10:A0 A0 A0 A0 80 81 82 83 95
2E18:48 A9 FF A0 FF 99 FF 23 96
2E20:C8 C0 10 F0 09 CC 11 28 E7
2E28:D0 F3 A9 96 D0 EF 20 6E 7D
2E30:2E 68 60 AD 56 03 D0 09 0E
2E38:AD 11 FF 09 40 8D 11 FF 9A
2E40:60 A9 80 8D 04 D4 A9 81 68
2E48:8D 04 D4 60 AD 56 03 F0 CA
2E50:04 AD 00 DC 60 A9 FD 8D 1B
2E58:08 FF EA EA AD 08 FF 8D DF
2E60:03 28 29 80 08 AD 03 28 9A
2E68:28 D0 02 29 EF 60 AD 5A 96
2E70:03 18 69 77 85 02 AD 5B E3
2E78:03 69 00 85 03 A0 00 A2 46
2E80:00 A9 20 EC 11 28 D0 02 E6
2E88:A9 1F 91 02 A5 02 18 6D A6
2E90:14 28 85 FC A5 03 6D 15 AA
2E98:28 85 FD AD 56 03 D0 02 67
2EA0:A9 71 91 FC 20 E9 30 E8 22
2EA8:E0 11 D0 D5 60 AD 56 03 9A
2EB0:F0 1E A9 00 A0 17 99 00 D6
2EB8:D4 88 10 FA A9 0F 8D 18 10
2EC0:D4 A9 19 8D 13 D4 A9 15 42
2EC8:8D 05 D4 A9 28 8D 01 D4 B0
2ED0:A9 00 8D 08 28 8D 16 28 FF
2ED8:8D 5E 03 A9 7D 8D 0B 28 EE
2EE0:8D 0C 28 A9 05 8D 0A 28 41
2EE8:8D 09 28 8D 46 03 8D 66 EB
2EF0:03 A9 41 8D 0D 28 8D 0E 6C
2EF8:28 A9 0F 8D 0F 28 8D 10 D2
2F00:28 A9 FA 8D 18 28 8D 19 AA
2F08:28 A9 0A 8D 47 03 8D 11 71
2F10:28 A2 04 20 DB 2D A9 FF 94
2F18:8D 50 03 A9 00 8D 4A 03 1A
2F20:8D 52 03 8D 53 03 8D 63 38
2F28:03 A9 00 8D 64 03 A9 FF CD
2F30:8D 65 03 A9 65 8D 61 03 D0
2F38:8D 62 03 A9 C8 8D 54 03 19
2F40:A9 23 8D 58 03 20 EC 2A 10
2F48:20 6E 29 60 AD 56 03 D0 1B
2F50:03 4C D7 2F 78 A9 33 85 87
2F58:01 20 76 2F A9 37 85 01 37
2F60:58 A9 18 8D 18 D0 A9 D8 61
2F68:8D 16 D0 A9 0F 8D 22 D0 8B
2F70:A9 02 8D 23 D0 60 A2 07 5C
2F78:A0 00 A9 00 85 02 85 04 9F
2F80:A9 D0 85 03 A9 20 85 05 A6
2F88:B1 02 8E 03 28 E0 04 B0 BF
2F90:07 AE 56 03 D0 02 49 FF 3A
2F98:AE 03 28 91 04 88 D0 E8 F9
2FA0:E6 03 E6 05 E0 04 D0 09 22
2FA8:AD 56 03 D0 04 A9 D0 85 CE
2FB0:03 CA 10 D4 A0 00 B9 9B A6
2FB8:38 99 00 24 B9 93 39 99 04
2FC0:F8 24 B9 B3 3A 99 D0 21 12
2FC8:88 D0 EB A0 1F B9 93 3A 68
2FD0:99 D8 20 88 10 F7 60 AD 8D
2FD8:12 FF 29 FB 8D 12 FF AD 87
2FE0:13 FF 29 03 09 20 8D 13 15
2FE8:FF A9 D8 8D 07 FF A9 62 93
2FF0:8D 17 FF A9 41 8D 16 FF E2
2FF8:4C 76 2F AD 07 28 0A 0A D2
3000:38 6D 07 28 8D 07 28 60 74
3008:20 FF 2C EE 08 28 AD 5A 83
3010:03 18 69 70 85 02 85 04 6F
3018:AD 5B 03 69 01 85 03 85 C6
3020:05 A9 03 8D 03 28 A2 02 A6
3028:A0 0E B1 02 C9 85 90 04 3C
3030:C9 89 90 02 A9 20 C8 91 FA
3038:02 88 88 10 ED C8 A9 20 D3
3040:91 02 20 E9 30 CA D0 E0 BB
3048:20 E9 30 CE 03 28 D0 D6 57
3050:AD 08 28 4A B0 33 20 FB C1
3058:2F 30 2E 20 FB 2F 29 03 16
3060:C9 03 F0 25 AA A5 04 18 E2
3068:7D 8A 30 85 04 A5 05 69 B2
3070:00 85 05 A0 00 A9 85 91 20
3078:04 C8 A9 86 91 04 A0 28 B0
3080:A9 87 91 04 C8 A9 88 91 99
3088:04 60 00 F0 78 AD 08 28 C4
3090:4A B0 55 A2 09 AD 5A 03 CD
3098:18 69 E6 85 04 AD 5B 03 25
30A0:69 02 85 05 A5 04 38 E9 CE
30A8:28 85 02 A5 05 E9 00 85 6E
30B0:03 A0 01 B1 02 E0 09 D0 6C
30B8:0B C9 85 D0 07 48 A9 05 80
30C0:20 2C 29 68 C9 84 D0 02 EB
30C8:A9 20 91 04 88 10 E4 A5 6C
30D0:04 38 E9 28 85 04 A5 05 8D
30D8:E9 00 85 05 CA D0 C5 A0 F4
30E0:01 A9 20 91 02 88 10 F9 95
30E8:60 A5 02 18 69 28 85 02 9D
30F0:A5 03 69 00 85 03 60 AD B8
30F8:5A 03 18 69 FD 85 02 AD 98
3100:5B 03 69 01 85 03 A9 02 9B
3108:8D 06 28 AD 06 28 8D 03 81
3110:28 A2 02 AD 03 28 18 69 9C
3118:28 A8 8D 04 28 B1 02 AC 63
3120:03 28 91 02 AD 04 28 8D BB
3128:03 28 CA D0 E6 A8 A2 A0 3C
3130:20 FB 2F C9 32 B0 02 A2 1F
3138:B5 8A 91 02 CE 06 28 10 59
3140:CA CE 66 03 F0 01 60 AD B2
3148:64 03 C9 02 D0 03 4C ED 10
3150:31 A8 0A AA BD 7A 32 85 23
3158:04 BD 7B 32 85 05 B9 AF 22
3160:33 CD 65 03 B0 05 A9 FF 99
3168:8D 65 03 EE 65 03 AD 65 32
3170:03 0A A8 B1 04 38 E9 01 DC
3178:0A AE 56 03 D0 1D AA BD 94
3180:F6 31 8D 0E FF AD 12 FF 18
3188:29 FC 1D F7 31 8D 12 FF C5
3190:AD 11 FF 09 10 8D 11 FF 77
3198:4C B6 31 AA BD 39 32 4A 21
31A0:08 8D 0F D4 BD 38 32 28 F4
31A8:6A 8D 0E D4 A9 10 8D 12 6D
31B0:D4 A9 11 8D 12 D4 AD 5A 7C
31B8:03 18 69 9A 85 02 AD 5B 64
31C0:03 69 02 85 03 98 48 A9 4C
31C8:B6 A0 08 91 02 88 10 FB 17
31D0:8A 4A 4A 4A C9 08 90 02 8A
31D8:A9 07 A8 A9 B8 91 02 C8 5A
31E0:A9 B9 91 02 68 A8 C8 B1 02
31E8:04 8D 66 03 60 AD 11 FF 89
31F0:29 4F 8D 11 FF 60 54 02 AA
31F8:6C 02 83 02 98 02 AD 02 CC
3200:C0 02 D2 02 E3 02 F3 02 D0
3208:02 03 10 03 1E 03 2A 03 B4
3210:36 03 42 03 4C 03 56 03 E6
3218:60 03 69 03 71 03 79 03 58
3220:81 03 88 03 8F 03 95 03 FD
3228:9B 03 A1 03 A6 03 AB 03 1B
3230:B0 03 B4 03 B9 03 BD 03 CC
3238:87 21 86 23 A2 25 DF 27 3C
3240:3E 2A C1 2C 6B 2F 3C 32 0C
3248:39 35 63 38 BE 3B 4B 3F 3F
3250:0F 43 0C 47 45 4B BF 4F 29
3258:7D 54 83 59 D6 5E 79 64 1E
3260:73 6A C7 70 7C 77 97 7E 88
3268:1E 86 18 8E 8B 96 7E 9F BC
3270:FA A8 06 B3 AC BD F3 C8 85
3278:E6 D4 80 32 02 33 AE 33 26
3280:19 01 1B 02 19 01 1B 02 3A
3288:19 02 16 01 17 02 16 01 BA
3290:17 02 16 02 14 01 16 02 B6
3298:14 01 16 02 14 02 0F 08 F8
32A0:16 01 14 02 13 01 16 02 BD
32A8:14 02 19 08 12 01 16 02 FD
32B0:19 01 1D 02 1B 02 19 08 C0
32B8:19 01 1B 02 19 01 1B 02 72
32C0:19 02 16 01 17 02 16 01 F2
32C8:17 02 16 02 14 01 16 02 EE
32D0:14 01 16 02 14 02 0F 08 31
32D8:14 01 16 02 14 01 19 02 43
32E0:16 02 14 01 16 02 14 01 45
32E8:19 02 16 02 14 01 16 02 10
32F0:14 01 19 02 14 02 12 02 B1
32F8:0D 01 0F 02 0D 01 0A 02 A8
3300:06 04 09 01 10 01 09 01 33
3308:0D 01 10 02 08 01 10 01 BC
3310:08 01 0B 01 10 05 09 01 D3
3318:10 01 09 01 0D 01 10 02 86
3320:08 01 10 01 08 01 0B 01 38
3328:10 03 04 02 05 04 04 02 3A
3330:04 02 05 04 04 04 09 01 3D
3338:09 01 0C 01 15 01 09 01 B4
3340:09 01 0C 01 15 01 15 01 D4
3348:15 01 18 01 21 01 15 01 C4
3350:15 01 18 01 21 01 21 02 E5
3358:21 02 21 02 21 01 21 02 65
3360:1C 01 1E 01 19 01 1C 01 EE
3368:1E 02 15 02 17 01 19 01 11
3370:15 01 17 01 19 01 15 01 8C
3378:17 01 19 01 15 01 17 02 BA
3380:15 04 15 02 15 02 15 02 12
3388:15 01 15 02 10 01 12 01 26
3390:0D 01 10 01 12 02 09 02 7C
3398:0B 01 0D 01 09 01 0B 01 D9
33A0:0D 01 09 01 0B 01 0D 01 76
33A8:09 01 0B 02 09 05 00 3F F0
33B0:54 00 AD 28 03 C9 ED F0 85
33B8:2B A9 00 8D 12 28 A9 08 84
33C0:8D 13 28 A9 00 8D 14 28 D8
33C8:A9 FC 8D 15 28 A9 03 8D C1
33D0:10 FF A9 C8 8D 0F FF A9 53
33D8:0F 8D 11 FF A9 00 A2 00 DE
33E0:A0 0C D0 1A A9 00 8D 12 D0
33E8:28 A9 D8 8D 13 28 A9 00 4E
33F0:8D 14 28 A9 D4 8D 15 28 F1
33F8:A9 01 A2 00 A0 04 8D 56 4F
3400:03 8E 5A 03 8C 5B 03 60 41
3408:AE 56 03 F0 03 4C 1E AB FD
3410:4C 88 90 8E 03 28 8D 04 93
3418:28 A0 FE C8 C8 AD 03 28 54
3420:38 F9 53 34 AD 04 28 F9 98
3428:54 34 B0 EF 98 4A 8D 05 EA
3430:28 A9 04 38 ED 05 28 AA 99
3438:F0 08 A9 20 20 D2 FF CA 69
3440:D0 F8 AE 03 28 AD 04 28 7D
3448:AC 56 03 F0 03 4C CD BD AE
3450:4C 5F A4 0A 00 64 00 E8 66
3458:03 10 27 FF FF A9 93 20 19
3460:D2 FF AD 12 28 85 04 AD 16
3468:13 28 85 05 A9 0F AE 56 A2
3470:03 D0 02 A9 6F A2 04 A0 18
3478:00 91 04 88 D0 FB E6 05 97
3480:CA D0 F6 A9 00 AE 56 03 66
3488:F0 08 8D 20 D0 8D 21 D0 EE
3490:F0 06 8D 15 FF 8D 19 FF 5E
3498:A9 13 8D 03 28 AE 03 28 A6
34A0:A0 07 18 20 F0 FF A9 CB C6
34A8:A0 35 20 08 34 EE 03 28 BE
34B0:AD 03 28 C9 17 D0 E6 A2 BE
34B8:17 A0 03 18 20 F0 FF A9 25
34C0:EF A0 35 20 08 34 A2 03 4B
34C8:A0 07 18 20 F0 FF A9 10 33
34D0:8D 03 28 A9 16 A0 36 20 20
34D8:08 34 CE 03 28 D0 F4 A2 6D
34E0:00 A0 05 18 20 F0 FF A9 02
34E8:2A A0 36 20 08 34 A9 11 CC
34F0:8D 03 28 AE 03 28 A0 08 D2
34F8:18 20 F0 FF A9 1B A0 36 C4
3500:20 08 34 AD 03 28 38 E9 F0
3508:03 8D 03 28 C9 0A B0 E3 F5
3510:A2 0B A0 19 18 20 F0 FF 57
3518:A9 5C A0 36 20 08 34 A2 12
3520:0B A0 1A 18 20 F0 FF A9 6B
3528:78 A0 36 20 08 34 A2 0C 22
3530:A0 1D 18 20 F0 FF A9 F6 09
3538:A0 36 20 08 34 A9 0D 8D F4
3540:03 28 A2 04 AC 03 28 20 AC
3548:A7 35 AD 03 28 18 69 0A 38
3550:8D 03 28 C9 28 90 EB AD EC
3558:5A 03 85 04 AD 5B 03 85 08
3560:05 A0 09 A2 3A 8A 91 04 E3
3568:C8 E8 E0 56 D0 F7 A0 31 CB
3570:A2 56 8A 91 04 C8 E8 E0 22
3578:58 D0 F7 A0 4B A2 59 8A 6E
3580:91 04 C8 CA E0 57 D0 F7 78
3588:A2 04 A0 00 18 20 F0 FF 7C
3590:A9 92 A0 37 20 08 34 A2 28
```


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```
3598:13 A0 06 18 20 F0 FF A9 65
35A0:B2 A0 35 20 08 34 60 18 1F
35A8:20 F0 FF A9 1C A0 37 4C 18
35B0:08 34 96 12 A9 11 9D 9D 8A
35B8:A9 20 11 9D 9D 9D A9 20 D2
35C0:20 11 9D 9D 9D 9D A9 20 E3
35C8:20 20 00 96 12 20 20 20 26
35D0:20 20 20 20 20 20 20 20 3B
35D8:20 20 20 20 20 20 20 20 43
35E0:20 20 20 20 20 20 20 20 4B
35E8:20 20 20 20 20 20 00 12 05
35F0:B7 B7 B7 B7 B7 B7 B7 B7 5B
35F8:B7 B7 B7 B7 B7 B7 B7 B7 63
3600:B7 B7 B7 B7 B7 B7 B7 B7 6C
3608:B7 B7 B7 B7 B7 B7 B7 B7 74
3610:B7 B7 B7 B7 B7 00 92 A5 41
3618:11 9D 00 B8 B8 B8 B8 B8 D2
3620:B8 B8 B8 B8 B8 B8 B8 B8 8C
3628:B8 00 96 12 3D 3A 11 9D 77
3630:9D 3B 92 12 3D 3A 11 9D 40
3638:9D 3B 3E 92 B7 B7 B7 B7 F6
3640:B7 B7 B7 B7 B7 B7 B7 B7 AC
3648:B7 B7 B7 B7 B7 B7 B7 B7 B4
3650:B7 B7 B7 B7 B7 B7 B7 B7 BC
3658:B7 B7 B7 00 05 12 A9 11 5A
3660:9D 20 11 9D 20 11 9D 20 40
3668:11 9D 20 11 9D 20 11 9D 07
3670:20 20 11 9D 9D 20 20 00 9E
3678:1F 12 20 20 20 20 20 20 E0
3680:20 20 20 11 9D 9D 9D 9D 56
3688:9D 9D 9D 9D 9D 20 20 20 86
3690:20 20 20 20 20 20 11 9D 5C
3698:9D 9D 9D 9D 9D 9D 9D 9D 05
36A0:20 20 20 20 20 20 20 20 0D
36A8:20 11 9D 9D 9D 9D 9D 9D 33
36B0:9D 9D 9D 20 20 20 20 20 EA
36B8:20 20 20 20 11 9D 9D 9D 1B
36C0:9D 9D 9D 9D 9D 9D 20 20 B4
36C8:20 20 20 20 20 20 20 11 26
36D0:11 9D 9D 9D 9D 9D 9D 9D F6
36D8:9D 20 20 20 20 20 20 20 04
36E0:20 20 11 9D 9D 9D 9D 9D 9D
36E8:9D 9D 9D 9D 20 20 20 20 FA
36F0:20 20 20 20 20 00 05 12 98
36F8:20 35 20 11 9D 9D 9D 20 96
3700:20 20 11 9D 9D 9D 35 20 70
3708:20 11 11 9D 9D 9D 9D 9D 03
3710:9D 36 36 36 36 36 36 36 32
3718:36 36 37 00 9E 12 20 C2 56
3720:20 11 9D 9D 9D C3 DB C3 E7
3728:11 9D 9D 9D 20 C2 20 11 71
3730:9D 9D 9D 92 20 20 20 00 73
3738:9E 12 DF 92 20 12 A9 11 4D
3740:9D 9D 9D 20 92 20 12 20 F3
3748:11 9D 9D 9D CD 92 20 12 3F
3750:CE 11 9D 9D 9D 92 DF 20 0F
3758:A9 00 05 12 23 24 25 11 62
3760:9D 9D 9D 26 27 28 11 9D B4
3768:9D 9D 29 2A 2B 11 9D 9D 4B
3770:9D 92 20 20 20 00 05 12 75
3778:2C 2D 2E 11 9D 9D 9D 2F EC
3780:30 31 11 9D 9D 9D 32 33 4A
3788:34 11 9D 9D 9D 92 20 20 7A
3790:20 00 1E 53 43 4F 52 45 49
3798:11 11 11 11 9D 9D 9D 9D 43
37A0:54 49 4D 45 11 11 11 11 89
37A8:9D 9D 9D 9D 48 49 47 48 19
37B0:11 11 11 11 9D 9D 9D 9D 5B
37B8:43 41 52 44 00 05 50 52 AE
37C0:45 53 53 20 52 45 54 55 B8
37C8:52 4E 20 54 4F 20 50 4C 25
37D0:41 59 20 41 47 41 49 4E 6E
37D8:00 11 9D 9D 00 EE 50 03 78
37E0:AD 50 03 C9 05 D0 05 A9 56
37E8:00 8D 50 03 AD 5A 03 18 E9
37F0:69 82 85 04 AD 5B 03 69 EF
37F8:01 85 05 20 30 2D A0 09 6C
3800:AD 56 03 D0 02 A9 71 91 75
3808:02 88 10 FB A0 31 91 02 4C
3810:88 C0 27 D0 F9 A9 00 8D EA
3818:05 28 A9 03 8D 04 28 AD F4
3820:50 03 8D 03 28 AE 03 28 85
3828:BD 3C 03 10 07 29 7F 9D 61
3830:3C 03 A9 18 AA AC 05 28 70
3838:20 B3 2C AD 05 28 18 69 68
3840:03 8D 05 28 EE 03 28 AD 3A
3848:03 28 C9 05 D0 05 A9 00 BB
3850:8D 03 28 CE 04 28 D0 CD 6A
3858:20 FB 2F 29 03 AA BD 3C CA
3860:03 C9 1C F0 05 09 80 9D 42
3868:3C 03 60 04 08 0C 10 14 A8
3870:98 48 8A 48 A0 04 A9 00 7D
3878:99 3C 03 88 10 FA A0 04 5F
3880:20 FB 2F C9 05 B0 F9 AA 0C
3888:BD 3C 03 D0 F3 B9 6B 38 E9
3890:9D 3C 03 88 10 EA 68 AA 6F
3898:68 A8 60 96 96 96 96 96 AF
38A0:96 96 96 96 96 96 96 96 11
38A8:96 96 96 95 55 95 95 95 F7
38B0:55 65 A9 6A 9A 6A AA 6A 3F
38B8:56 55 56 6C FF 7F 7E FE 35
38C0:FF 7F 66 0C 33 C0 4C 73 47
38C8:40 7F 7F C0 30 C0 D4 11 74
38D0:11 D1 D1 7F 7F 7F 7F 7F E8
38D8:7F 7F 15 D1 D1 D5 D4 D0 09
38E0:D0 D0 40 0C 00 C0 0C 43 15
38E8:00 73 43 00 00 C0 C4 01 2C
38F0:11 D1 00 30 40 43 33 4C 23
38F8:0F 3C 15 D1 11 04 C0 D0 AA
3900:10 00 00 7F E7 C3 99 99 8D
3908:81 99 99 FE FB F1 FB EF 54
3910:DF BF 7F FE FD FB F7 DF F1
3918:8F DF 7F E7 C3 99 99 81 F1
3920:99 99 FE 7F 99 93 87 87 4F
3928:93 99 FF FE FB F1 FB EF 4A
3930:DF BF 7F FE FD FB F7 DF 12
3938:8F DF 7F FF 99 93 87 87 0C
3940:93 99 FE 7F 81 9D 9D 9D 16
3948:95 81 FB FE FB F1 FB EF E4
3950:DF BF 7F FE FD FB F7 DF 32
3958:8F DF 7F 7F 81 9D 9D 9D CD
3960:95 81 FB 7F E1 F3 F3 F3 30
3968:F3 B3 83 FE FB F1 FB EF B1
3970:DF BF 7F FE FD FB F7 DF 52
3978:8F DF 7F 7F E1 F3 F3 F3 4D
3980:F3 B3 83 FF 73 6D 6D 6D E3
3988:6D 33 FE FE FB F1 FB EF DD
3990:DF BF 7F FE FD FB F7 DF 72
3998:8F DF 7F FF FF FF FF FF BA
39A0:FF FF FF FF 73 6D 6D 6D AC
39A8:6D 33 FE FF 80 80 80 80 06
39B0:80 80 80 FF 80 80 80 80 1B
39B8:80 80 80 FF 00 63 F7 FF 19
39C0:FF FF FF FF 01 01 81 81 C3
39C8:81 81 81 80 84 83 81 81 4B
39D0:81 81 81 FF FF FF 00 22 B6
39D8:22 08 08 81 91 E1 41 41 4F
39E0:41 41 41 81 81 80 9F BF 91
39E8:FF FF FF 41 3E 80 7F 80 E2
39F0:FF FF FF 41 41 81 79 7D F7
39F8:FF FF FF FF 80 80 81 81 F5
3A00:81 81 81 FF 63 F7 88 80 52
3A08:80 80 80 FF 01 81 C1 C1 40
3A10:C1 C1 C1 91 8F 81 81 81 2E
3A18:81 83 81 FF FF 00 63 42 67
3A20:08 FF FF C5 F9 41 41 41 8D
3A28:51 F9 C1 80 9F A0 C0 C0 C5
3A30:C0 C0 FF FF 7F BE 1C 0C 70
3A38:04 00 FF 81 79 85 03 03 B1
3A40:03 03 FF FF FF FF E7 E7 AE
3A48:FF FF FF 63 B1 D8 EF F7 BB
3A50:FB FD FE 00 80 C0 E0 F0 DB
3A58:F8 FC FE 1C 8E C7 E0 F0 70
3A60:F8 FC FE E3 71 38 1F 0F 68
3A68:07 03 01 00 00 00 00 00 41
3A70:00 00 80 01 00 00 00 00 05
3A78:00 00 00 00 00 18 3C 3C 02
3A80:3C 3C 7E C0 E0 70 38 1C 53
3A88:0E 07 03 FF FF C0 C0 C0 6B
3A90:C0 C0 C0 00 00 00 0F 1F EA
3A98:FF 08 00 00 00 00 90 F8 29
3AA0:FC 20 00 00 00 00 09 1F CC
3AA8:3F 04 00 00 00 00 F0 F8 98
3AB0:FF 10 00 00 00 08 02 02 4F
3AB8:0B 2F BF 00 00 00 02 AA 25
3AC0:FF FE AE 00 00 00 00 AA 75
3AC8:FF AA 00 00 00 00 00 AA 92
3AD0:FF AA 00 00 00 00 00 AA 9A
3AD8:FE AA 00 14 15 15 15 55 35
3AE0:54 50 00 55 40 45 51 54 F6
3AE8:40 15 00 55 51 44 40 44 78
3AF0:44 55 00 55 45 45 45 45 41
3AF8:40 55 00 55 40 44 44 44 18
3B00:40 55 00 55 40 44 44 44 21
3B08:40 55 00 55 45 41 40 44 3D
3B10:45 55 00 50 14 15 15 15 B7
3B18:14 50 00 15 50 51 54 55 C3
3B20:50 15 00 55 11 51 50 11 D8
3B28:11 55 00 55 10 11 11 11 C9
3B30:10 55 00 55 10 11 11 11 51
3B38:10 55 00 55 10 14 14 14 6E
3B40:14 55 00 55 10 51 51 51 25
3B48:50 55 00 55 11 11 11 11 91
3B50:10 55 00 55 10 14 14 14 86
3B58:14 55 00 51 15 55 55 51 3D
3B60:51 40 00 40 50 50 50 56 4E
3B68:56 16 00 00 00 00 00 AA 3A
3B70:FF AA 00 00 00 00 00 AA 3C
3B78:FF AA 00 00 00 00 00 AA 44
3B80:FF AA 00 00 00 00 80 AA 4D
3B88:FF BF BA 00 00 08 20 80 27
3B90:E0 F8 FE BE BE BE BE BE AE
3B98:BE BE AA B8 20 00 00 00 FF
3BA0:00 00 00 BE BE BE BE BE 30
3BA8:BE BE AA 2E 08 00 00 00 A6
3BB0:00 00 00 B8 20 00 00 00 B3
3BB8:00 00 00 BE BE BE BE BE 48
3BC0:BE BE AA 00 00 00 00 00 9B
```

Program 2: Typing Checker for Plus/4 & 16 Saloon Shootout

```
FE 10 POKE 56,40: POKE 55,0: C
      LR: AD=10240
DP 20 FOR X=0 TO 9: CK=0: SA=A
      D+(X*512):EA=SA+511: IF
      {SPACE}X=9 THEN EA=15303
JX 30 PRINT"CHECKING " HEX$(SA
      )" - " HEX$(EA)":";
BA 40 FOR Y=SA TO EA: CK = CK+
      PEEK(Y):NEXT Y:READ CS
CA 50 IF CK=CS THEN PRINT " OK
      ": GOTO 70
RD 60 PRINT "{RVS}ERROR IN THI
      S BLOCK"
PD 70 NEXT X:END
QS 80 DATA 46889,49294,49279,5
      4709,51321
JJ 90 DATA 22816,52857,48647,7
      1926,40099
```

Math Worksheet

(Article on page 63.)

```
DM 10 REM ** MATH WORKSHEET **
MC 20 POKE 53280,0:POKE 53281,
      0:GOTO 50
FR 30 REM ** POSITION CURSOR *
      *
GR 40 POKE 781,R:POKE 782,C:PO
      KE 783,0:SYS 65520:RETUR
      N
RQ 50 PRINT"{CLR}":F$="WORKSHE
      ET":C=8
JS 60 R=2:GOSUB 40:PRINT"{RVS}
      {WHT}S{YEL}{OFF}UBTRACTI
      ON "F$
RS 70 R=4:GOSUB 40:PRINT"{RVS}
      {WHT}A{YEL}{OFF}DDITION
      {SPACE}"F$
HC 80 R=6:GOSUB 40:PRINT"{RVS}
      {WHT}M{YEL}{OFF}ULTIPLIC
      ATION "F$
JK 90 PRINT"{2 DOWN}{2 SPACES}
      PRESS {RVS}{WHT}HIGHLIGH
      TED KEY{YEL}{OFF} OF YOU
      R CHOICE
QQ 100 GET K$:IF K$="S" THEN S
       $="-":GOTO 150
SM 110 IF K$="A" THEN S$="+":G
       OTO 150
MP 120 IF K$="M" THEN S$="X":G
```


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```
      OTO 150
EJ 130 GOTO 100
FE 150 DIM A$(100),P%(100):CR$
       =CHR$(13):J=0:Z=0
DE 170 PRINT"{CLR}"SPC(13)"
       {RVS} MATH WORKSHEET "
PD 180 R=2:C=12:GOSUB 40:PRINT
       "{RVS} CREATING PROBLEM
       S {2 DOWN}{YEL}"
QJ 190 REM ** CREATE 100 STRIN
       GS A$(0)-A$(99) **
CH 200 FOR I=0 TO 9:N$(I)=RIGH
       T$(STR$(I),1):NEXT I
SG 210 I=0
KM 220 FOR K=0 TO 9:FOR L=0 TO
        9
JQ 240 IF S$="-" AND VAL(N$(K)
       ) < VAL(N$(L)) THEN A$(
       I)=N$(L)+N$(K):GOTO 260
QB 250 A$(I) = N$(K)+N$(L)
KB 260 PRINT" "A$(I)" ";:I=I+1
       :NEXT L,K
JM 300 R=2:C=11:GOSUB 40:PRINT
       "{RVS} RANDOMIZE PROBLE
       MS {WHT}{2 DOWN}"
XQ 330 IF J>99 THEN 490
SX 340 X=INT(RND(0)*99):IF J=0
        THEN P%(J)=X:GOSUB 470
       :J=J+1:GOTO 340
MA 360 I=0
GX 370 IF P%(I)=X THEN 420
GG 380 I=I+1
KS 390 IF I=J THEN P%(J)=X:GOS
       UB 470:J=J+1:GOTO 330
RS 400 GOTO 370
JE 410 REM ** FIND UNUSED POIN
       TER **
HE 420 I=0
FC 430 IF P%(I)=Z THEN Z=Z+1:G
       OTO 420
RM 440 I=I+1
GJ 450 IF I=J THEN P%(J)=Z:GOS
       UB 470:J=J+1:GOTO 330
AA 460 GOTO 430
EQ 470 PRINT" "A$(P%(J))" ";:R
       ETURN
AS 480 REM ** PRINT WORKSHEET
       {SPACE}**
MR 490 R=16:C=3:GOSUB 40:PRINT
       "{YEL}POSITION PRINTHEA
       D ABOUT 1/4 INCH"
KR 500 R=17:C=8:GOSUB 40:PRINT
       "BELOW PAPER PERFORATIO
       N."
RK 510 R=18:C=3:GOSUB 40:PRINT
       "PRESS & HOLD {RVS}
       {WHT}Q{OFF}{YEL} TO ABO
       RT PRINTING"
RX 520 R=20:C=8:GOSUB 40:PRINT
       "PRESS {RVS}{WHT}ANY KE
       Y{YEL}{OFF} TO START "
RC 530 GET K$:IF K$="" THEN 53
       0
GA 540 OPEN 4,4
RJ 550 PRINT#4,CHR$(14)
XC 560 PRINT#4,"{13 SPACES}MAT
       H WORKSHEET":PRINT#4,:P
       RINT#4,
RF 570 PRINT#4,"NAME{30 @}":PR
       INT#4,
DP 580 FOR I=0 TO 90 STEP 10
HA 590 FOR J=I TO 9+I:PRINT#4,
       "{2 SPACES}";LEFT$(A$(P
       %(J)),1)" ";:NEXT J:PRI
       NT#4,CR$;
HG 600 FOR J=I TO 9+I:PRINT#4,
       " "S$;RIGHT$(A$(P%(J)),
       1)" ";:NEXT J:PRINT#4,C
       R$;
QM 610 FOR J=I TO 9+I:PRINT#4,
       "{2 SPACES}{T} ";:NEXT
       {SPACE}J
EX 620 FOR L=1 TO 4:PRINT#4,:N
       EXT L
RE 630 GET K$:IF K$="Q" THEN C
       LR:GOTO 50
XS 640 NEXT I
DF 650 CLOSE 4
BK 660 R=20:C=5:GOSUB 40:PRINT
       "PRESS {RVS}{WHT} R
       {OFF}{YEL} TO DO ANOTHE
       R WORKSHEET"
MD 670 R=21:C=5:GOSUB 40:PRINT
       "PRESS {RVS}{WHT} Q
       {OFF}{YEL} TO QUIT
SK 680 GET K$:IF K$="R" THEN C
       LR:GOTO 50
FD 690 IF K$="Q" THEN END
DC 700 GOTO 680
```

Meteor Strike

(See instructions in article on page 59 before typing in.)

```
0801:0B 08 00 00 9E 32 30 36 EC
0809:31 00 00 00 A9 FD 8D 15 27
0811:D0 A9 00 8D 27 D0 A9 00 9C
0819:8D 20 D0 8D 21 D0 A9 23 AD
0821:8D F8 07 A9 87 8D 00 D0 F4
0829:8D 02 D0 8D 01 D0 8D 03 DC
0831:D0 4C 57 12 00 00 00 00 C8
0839:00 FF FF FF 00 01 01 01 50
0841:00 00 FF 01 00 00 FF 01 62
0849:00 00 FF 01 00 AD 00 DC FC
0851:29 0F 85 FB A9 10 18 E5 CD
0859:FB AA E0 00 D0 03 4C 56 AF
0861:0E 18 69 22 20 40 09 AD 8F
0869:00 D0
0871:D0 AD 01 D0 18 7D 42 08 C5
0879:8D 01 D0 60 02 A5 02 C9 25
0881:00 D0 F8 A5 A0 85 02 60 BE
0889:00 00 A9 93 20 D2 FF A9 FD
0891:01 8D 1C D0 A9 0C 8D 25 D3
0899:D0 A9 0B 8D 26 D0 A9 2D AB
08A1:8D F9 07 A9 01 8D 28 D0 D1
08A9:A9 00 8D 17 D0 8D 1D D0 79
08B1:A9 01 8D 34 03 A9 00 8D 18
08B9:35 03 4C 4B 09 00 00 00 AB
08C1:00 00 00 00 00 00 30 00 32
08C9:00 DC 00 00 DC 00 03 57 55
08D1:00 03 57 00 03 57 00 C3 C6
08D9:77 0C C3 77 0C CD FD CC F8
08E1:F5 FD 7C D5 55 5C F5 55 B6
08E9:7C 0F FF C0 00 A8 00 00 AA
08F1:A8 00 00 20 00 00 20 00 98
08F9:00 00 00 00 00 00 00 00 0A
0901:00 00 00 20 00 00 20 00 55
0909:00 A8 00 00 A8 00 0F FF A8
0911:C0 F5 55 7C D5 55 5C F5 26
0919:FD 7C CD FD CC C3 77 0C 53
0921:C3 77 0C 03 57 00 03 57 BC
0929:00 03 57 00 00 DC 00 00 5A
0931:DC 00 00 30 00 00 00 00 B4
0939:00 00 00 00 00 00 00 8D D8
0941:F8 07 A9 02 8D 27 D0 8A 1C
0949:A8 60 A9 00 8D 10 D0 A9 F4
0951:9F 20 D2 FF A9 81 8D 12 16
0959:D4 A9 FF 8D 0F D4 A2 FF 2A
0961:AD 1B D4 29 0F 85 FD A9 72
0969:1D 20 D2 FF E8 E4 FD D0 14
0971:F8 A9 2E 20 D2 FF A5 D6 EA
0979:C9 18 D0 E2 4C 40 0A 00 36
0981:00 00 00 00 00 00 00 00 93
0989:00 00 00 00 FF C0 00 0D AB
0991:C0 00 35 70 00 35 70 0F 76
0999:D5 78 35 7D 7A D5 FD 7A D4
09A1:35 7D 78 0F D5 70 00 35 53
09A9:70 00 35 70 00 0D C0 00 57
09B1:FF C0 00 00 00 00 00 00 F3
09B9:00 00 00 00 00 00 00 00 CB
09C1:00 00 00 00 00 00 00 00 D3
09C9:0F C3 00 0D 70 C0 0D 5F 25
09D1:F0 0D D5 70 0D FD 70 03 A5
09D9:75 C0 00 F5 C0 00 D7 A0 8C
09E1:00 D7 A0 0C DE A0 03 F0 2F
09E9:00 00 F0 00 00 00 00 00 1A
09F1:00 00 00 00 00 00 00 00 04
09F9:00 00 00 00 00 00 C9 00 9F
0A01:00 00 00 00 00 00 00 00 15
0A09:00 00 00 00 00 00 00 F0 0E
0A11:00 03 F0 00 0C DE A0 00 21
0A19:D7 A0 00 D7 A0 00 F5 C0 70
0A21:03 75 C0 0D FD 70 0D D5 9E
0A29:70 0D 5F F0 0D 70 C0 0F 6E
0A31:C3 00 00 00 00 00 00 00 27
0A39:00 00 00 00 00 00 C9 A2 83
0A41:00 A9 20 8D 5C 0A A9 04 FE
0A49:8D 5D 0A A9 20 8D 62 0A 5D
0A51:A9 D8 8D 63 0A A0 00 BD E8
0A59:30 0C 99 E0 07 BD F8 0C F6
0A61:99 E0 DB E8 C8 C0 08 D0 AE
0A69:EE E0 C8 F0 03 4C E9 0B 7D
0A71:A0 01 A9 0C 8D 20 D0 A9 44
0A79:0B 8D 78 0E 4C C0 0D 00 E5
0A81:00 00 00 00 00 00 00 00 95
0A89:00 00 00 03 FF 00 03 70 44
0A91:00 0D 5C 00 0D 5C 00 2D 7B
0A99:57 F0 AD 7D 5C AD 7F 57 13
0AA1:2D 7D 5C 0D 57 F0 0D 5C FC
0AA9:00 0D 5C 00 03 70 00 03 69
0AB1:FF 00 00 00 00 00 00 00 C5
0AB9:00 00 00 00 00 00 00 00 CD
0AC1:00 00 00 00 00 00 00 00 D5
0AC9:00 C3 F0 03 0D 70 0F F5 5B
0AD1:70 0D 57 70 0D 7F 70 03 9D
0AD9:5D C0 03 5F 00 0A D7 00 FA
0AE1:0A D7 00 0A B7 30 00 0F 1F
0AE9:C0 00 0F 00 00 00 00 00 40
0AF1:00 00 00 00 00 00 00 00 06
0AF9:00 00 00 00 00 00 C9 00 A1
0B01:00 00 00 00 00 00 00 00 17
0B09:00 00 00 00 00 00 00 0F 2E
0B11:00 00 0F C0 0A B7 30 0A AE
0B19:D7 00 0A D7 00 03 5F 00 A4
0B21:03 5D C0 0D 7F 70 0D 57 28
0B29:70 0F F5 70 03 0D 70 00 2E
0B31:C3 F0 00 00 00 00 00 00 65
0B39:00 00 00 00 00 00 C9 00 E2
0B41:00 00 00 00 00 00 00 00 57
0B49:00 00 00 00 00 00 00 00 5F
0B51:00 00 00 00 00 00 00 00 67
0B59:00 00 00 18 00 00 3C 00 69
0B61:00 18 00 00 00 00 00 00 7D
0B69:00 00 00 00 00 00 00 00 7F
0B71:00 00 00 00 00 00 00 00 87
0B79:00 00 00 00 00 00 30 4C 3C
0B81:00 0E 29 10 C9 00 D0 1E 4F
0B89:B9 36 08 8D 34 03 B9 42 47
0B91:08 8D 35 03 A9 FF 8D 15 63
0B99:D0 AD 00 D0 8D 02 D0 AD 54
0BA1:01 D0 8D 03 D0 EA AD 15 F0
0BA9:D0 C9 FD D0 03 4C DB 0B 73
0BB1:20 C3 11 C9 00 F0 07 AD 07
0BB9:03 D0 C9 00 D0 08 A9 FD B6
0BC1:8D 15 D0 4C DB 0B AD 34 5D
0BC9:03 18 6D 02 D0 8D 02 D0 C6
0BD1:AD 35 03 18 6D 03 D0 8D 94
0BD9:03 D0 60 AD 15 D0 C9 FF 0C
0BE1:F0 C4 AD 00 DC 4C 83 0B 81
0BE9:A9 28 18 6D 5C 0A CD 5C BB
0BF1:0A B0 03 EE 5D 0A 8D 5C 13
0BF9:0A A9 28 18 6D 62 0A CD DC
0C01:62 0A B0 03 EE 63 0A 8D B9
0C09:62 0A A9 3D 8D FA 07 8D D1
0C11:FB 07 8D FC 07 A9 3E 8D 53
0C19:FD 07 8D FE 07 8D FF 07 09
0C21:AD 1E D0 4C 56 0A 00 00 51
0C29:00 00 00 00 00 00 00 A0 E1
0C31:A0 A0 A0 A0 A0 A0 A0 A0 49
0C39:A0 A0 A0 A0 A0 A0 A0 A0 51
0C41:E4 E4 E4 E4 E4 E4 A0 EA D6
0C49:93 83 8F 92 85 BA F4 EA 13
0C51:30 30 30 30 30 30 F4 A0 63
0C59:E3 E3 E3 E3 E3 E3 A0 A0 A7
0C61:E4 E4 E4 E4 E4 E4 A0 EA F6
0C69:8C 85 96 85 8C BA F4 EA 78
0C71:20 20 30 31 20 20 F4 A0 C6
0C79:E3 E3 E3 E3 E3 E3 A0 A0 C7
0C81:E4 E4 E4 E4 E4 E4 A0 EA 17
0C89:8D 85 94 85 8F 92 F4 EA 50
0C91:13 14 12 09 0B 05 F4 A0 02
0C99:E3 E3 E3 E3 E3 E3 A0 A0 E7
0CA1:A0 A0 A0 A0 A0 A0 A0 A0 B9
0CA9:A0 A0 A0 A0 A0 A0 A0 A0 C1
```


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```
0CB1:A0 A0 A0 A0 A0 A0 A0 A0 C9
0CB9:A0 A0 A0 A0 A0 A0 A0 A0 D1
0CC1:A0 A0 A0 A0 A0 A0 A0 A0 D9
0CC9:E4 E4 E4 E4 E4 E4 A0 EA 5F
0CD1:93 88 89 90 93 BA F4 EA 6C
0CD9:20 20 30 35 20 20 F4 A0 6F
0CE1:E3 E3 E3 E3 E3 E3 A0 A0 30
0CE9:A0 A0 A0 A0 A0 A0 A0 A0 02
0CF1:A0 A0 A0 A0 A0 A0 A0 FC 66
0CF9:FC 4C FC 4C 5C FC FC FC D5
0D01:FC FC 5C FC FC 8C EC 4C 74
0D09:FC 6C FC FC FC 6C 2C DC FA
0D11:FF 4F 2F FF FF FF FC FC DB
0D19:F3 F3 F3 03 F3 53 FC FC BC
0D21:FC 0C 4C FC 5C FC EC FC C3
0D29:BC 5C BC FC AC FC FC FC 70
0D31:0F FF FF 7F 2F FF FC FC 3B
0D39:5B FB F3 43 4B FB FC FC F3
0D41:FC FC FC FC BC 5C 2C FC 35
0D49:5C 5C FC CC FC 4C FC DC 05
0D51:F5 B5 55 F5 F5 65 6C FC F8
0D59:FD FD FD FD FD FD FC 6C DF
0D61:FC FC FC FC 2C FC FC FC F4
0D69:5C FC FC FC FC 5C DC DC 50
0D71:1C 5C FC CC FC 4C FC EC 1D
0D79:FC FC 5C FC FC 0C FC FC BB
0D81:FC FC FC FC FC 5C FC FC 19
0D89:4C 4C DC FC FC FC 0C FC 39
0D91:6C 5C FC FC FC FC 5C FC F9
0D99:FF BF FF 5F 5F FF CC CC FA
0DA1:F3 F3 53 53 F3 E3 2C DC B6
0DA9:5C 0C FC AC 5C 2C FC FC E9
0DB1:FC FC FC 0C FC FC FC FC BC
0DB9:FC 0C 0C FC FC FC FC A9 26
0DC1:12 20 D2 FF A9 00 85 D6 76
0DC9:A9 1D 85 D3 20 10 E5 A9 A4
0DD1:0C 8D 86 02 A9 A0 20 D2 29
0DD9:FF 20 D2 FF 20 D2 FF A5 48
0DE1:D6 C9 18 F0 0F A9 11 20 4D
0DE9:D2 FF A9 1D 85 D3 20 10 40
0DF1:E5 4C D5 0D A9 FF 8D 1B 21
0DF9:D0 A0 01 4C 58 11 00 A9 3A
0E01:00 EA 8D 3E 03 A2 0E A9 D5
0E09:80 8D 3F 03 BD 00 D0 C9 3A
0E11:E7 90 09 AD 3E 03 0D 3F 98
0E19:03 8D 3E 03 CA CA 4E 3F 6F
0E21:03 E0 FE D0 E7 AD 3E 03 59
0E29:8D 1B D0 4C F7 10 CE 36 85
0E31:03 AD 36 03 C9 00 D0 08 29
0E39:20 2F 11 A9 80 8D 36 03 97
0E41:CE 37 03 AD 37 03 C9 00 27
0E49:D0 08 20 4D 12 A9 2A 8D C1
0E51:37 03 4C 5E 0E A9 00 8D DD
0E59:27 D0 4C 68 08 CE 02 00 CC
0E61:AD 02 00 C9 00 D0 26 A9 AA
0E69:50 8D 02 00 CE 39 03 AD 60
0E71:39 03 C9 00 D0 17 A9 08 62
0E79:8D 39 03 A2 04 84 FE A0 06
0E81:02 20 0D 0F E8 E8 C8 E0 96
0E89:10 D0 F6 A4 FE AD 15 D0 B4
0E91:C9 FC D0 01 60 4C 2F 0E 9C
0E99:00 00 00 00 00 00 00 BD 73
0EA1:00 D0 C9 00 F0 07 BD 01 4B
0EA9:D0 C9 00 D0 3A A9 00 9D C3
0EB1:00 D0 9D 01 D0 20 7F 12 DD
0EB9:29 01 C9 01 D0 0B AD 1B 1D
0EC1:D4 29 FA 9D 00 D0 4C D2 7A
0EC9:0E AD 1B D4 29 FA 9D 01 7A
0ED1:D0 AD 1B D4 29 07 38 E9 32
0ED9:03 9D 40 03 AD 1B D4 29 C3
0EE1:07 38 E9 03 9D 41 03 BD B2
0EE9:00 D0 18 7D 40 03 9D 00 5E
0EF1:D0 BD 01 D0 18 7D 41 03 4F
0EF9:9D 01 D0 60 00 00 00 AD F2
0F01:1B D4 29 0F C9 00 F0 F7 20
0F09:99 27 D0 60 B9 F8 07 C9 67
0F11:3F F0 03 4C A0 0E 86 FB 76
0F19:98 AA FE 27 D0 DE 60 03 46
0F21:BD 60 03 C9 00 D0 14 A6 45
0F29:FB A9 00 9D 00 D0 AD 1B 43
0F31:D4 29 01 18 69 3D 99 F8 12
0F39:07 EA EA A6 FB 60 00 00 BE
0F41:00 00 00 00 00 00 00 00 5F
0F49:00 00 00 00 00 00 00 00 67
0F51:00 00 00 00 03 3F 00 0F 93
0F59:DF C0 1F FF E0 1E F3 C0 A3
0F61:1D EF F0 0B CF F0 07 FE 28
0F69:E0 07 FC E0 01 FB C0 00 E0
0F71:DF 80 00 EE 00 00 00 00 8E
0F79:00 00 00 00 00 00 00 00 97
0F81:00 00 00 00 00 07 00 00 BB
0F89:0F E0 00 1F FC 00 6F FB 1C
0F91:F0 E7 BF F8 EE 5F E0 FE 5F
0F99:FF 0C FF FE 3E 7F F8 7F 0C
0FA1:1D FF FF 61 EF FF 73 E1 AC
0FA9:EC 7F F2 F4 3F FF F8 07 BE
0FB1:FC F8 00 E3 F0 00 01 E0 35
0FB9:00 00 00 00 00 00 00 00 D7
0FC1:00 00 00 00 00 00 80 00 E0
0FC9:0C 04 00 00 40 48 20 13 65
0FD1:90 13 7E C1 3D 59 C0 39 F2
0FD9:95 4C C5 69 B0 0D AA 74 A8
0FE1:0E 95 60 4D 77 F0 35 59 90
0FE9:C6 18 F9 C0 20 02 70 03 A9
0FF1:42 40 C0 10 00 02 00 30 92
0FF9:00 00 00 00 00 00 00 00 C5
1001:1E D0 8D 3B 03 29 03 C9 56
1009:03 F0 0E 29 01 C9 01 D0 3D
1011:08 A9 3F 20 98 11 4C 23 4E
1019:10 20 80 0B EA EA EA 4C 2F
1021:6B 10 20 29 10 4C 3B 10 C9
1029:E6 FD A5 FD C9 00 D0 F8 B9
1031:E6 FE A5 FE C9 00 D0 F0 0A
1039:60 00 A2 04 9D 00 D0 E8 95
1041:E0 0F D0 F8 A9 23 20 A1 FA
1049:11 A0 01 A9 87 8D 00 D0 18
1051:8D 01 D0 AD 1E D0 CE 6C AB
1059:07 AD 6C 07 C9 30 F0 01 58
1061:60 20 F5 11 8D 18 D4 4C 4C
1069:AA 10 AD 3B 03 29 03 C9 D8
1071:03 F0 32 29 02 C9 02 D0 34
1079:2C 20 89 11 EA A2 02 AD 8D
1081:3B 03 25 FE C5 FE D0 11 71
1089:BD F8 07 C9 3F F0 0A 20 36
1091:DC 11 EA EA A9 05 9D 60 6D
1099:03 06 FE E8 E0 08 D0 DF D3
10A1:A9 FD 8D 15 D0 AD 1E D0 63
10A9:60 20 0A 11 EA EA A9 0B B5
10B1:85 D6 A9 0A 85 D3 20 10 EB
10B9:E5 A9 07 8D 86 02 A2 00 72
10C1:BD DE 10 20 D2 FF E8 E0 C5
10C9:0A D0 F5 20 5E 0E 20 00 4F
10D1:0E AD 00 DC 29 10 C9 00 4F
10D9:D0 F1 4C E8 10 92 47 41 91
10E1:4D 45 20 4F 56 45 52 A2 02
10E9:04 A9 00 9D 00 D0 E8 E0 46
10F1:10 D0 F8 4C 02 11 AD 15 F6
10F9:D0 C9 FC D0 01 60 4C DC A0
1101:0B A9 06 8D 78 0E 4C 0D 4E
1109:08 A9 01 8D 78 0E A9 FC DE
1111:8D 15 D0 60 A2 04 FE C0 43
1119:04 BD C0 04 C9 3A D0 09 E6
1121:A9 30 9D C0 04 CA 4C 17 DE
1129:11 60 00 00 00 00 CE 80 0A
1131:03 AD 80 03 C9 00 D0 1C 8C
1139:CE 81 03 AD 81 03 C9 00 0A
1141:D0 12 A9 0B 8D 81 03 20 CE
1149:D1 11 C9 39 F0 06 20 FE 44
1151:11 CE 78 0E 4C 4E 08 A9 F4
1159:0B 8D 81 03 A9 00 AA 9D 05
1161:00 D4 E8 E0 18 D0 F8 A9 83
1169:FF 8D 0F D4 A9 80 8D 12 9A
1171:D4 A9 8F 8D 18 D4 A9 11 AB
1179:8D 0C D4 A9 B9 8D 0D D4 8D
1181:A9 01 8D 08 D4 4C AC 11 2D
1189:A9 81 8D 0B D4 A9 80 8D 1F
1191:0B D4 A9 04 85 FE 60 8D 5A
1199:F8 07 A9 81 8D 0B D4 60 E9
11A1:8D F8 07 A9 80 8D 0B D4 69
11A9:60 00 00 EA EA EA EA EA 6E
11B1:A9 B9 8D 06 D4 A9 21 8D 46
11B9:05 D4 A9 01 8D 01 D4 4C 3F
11C1:2F 0E A9 21 8D 04 D4 A9 16
11C9:20 8D 04 D4 AD 02 D0 60 A4
11D1:AD 64 05 C9 38 D0 03 EE 1B
11D9:6C 07 60 86 FB BD F8 07 38
11E1:C9 3E F0 03 20 15 11 20 5E
11E9:15 11 A9 3F A6 FB 9D F8 5D
11F1:07 60 D5 00 A9 00 8D 15 E7
11F9:D0 20 29 10 60 A9 08 85 F1
1201:D3 A9 0B 85 D6 84 03 20 22
1209:10 E5 A9 07 8D 86 02 A2 81
1211:00 BD 3E 12 20 D2 FF E8 C2
1219:E0 0F D0 F5 20 29 10 20 D0
1221:29 10 A9 08 85 D3 A9 0B 6D
1229:85 D6 20 10 E5 A9 20 20 01
1231:D2 FF CA E0 FD D0 F8 EE 3A
1239:64 05 4C 74 12 92 4C 45 5A
1241:56 45 4C 20 43 4F 4D 50 AF
1249:4C 45 54 45 AD 8D 02 C9 35
1251:01 F0 F9 4C 00 10 A9 92 5C
1259:20 D2 FF 20 8D 12 EA EA B9
1261:EA EA EA EA A2 00 8A 2E
1269:9D 04 D0 E8 E0 0B D0 F8 D3
1271:4C 8B 08 A9 FF 8D 3B 03 E9
1279:20 7A 10 A4 03 60 AD 1B A8
1281:D4 29 01 18 69 3D 99 F8 68
1289:07 4C 00 0F A2 00 BD 9B 61
1291:12 9D 00 80 E8 E0 0A D0 DD
1299:F5 60 0D 08 0D 08 C3 C2 C5
12A1:CD 38 30 00 00 00 00 00 C0
```

Queens' Quarrel

(Article on page 58.)

```
SJ 10 SC=1063:CS=55336:SI=5427
      2:TR=55296:CC=160:SR=532
      69:BC=53280
EH 20 PRINT"{CLR}"CHR$(14)CHR$
      (158):POKEBC,0:POKEBC+1,
      1
BS 30 MT$="{OFF}{5 SPACES}
      {RVS}{23}{5 SPACES}{OFF}
      {5 SPACES}{RVS}
      {5 SPACES}{OFF}
      {5 SPACES}{RVS}
      {5 SPACES}{OFF}
      {5 SPACES}{RVS}
      {5 SPACES}"
BE 40 TM$="{RVS}{5 SPACES}
      {OFF}{5 SPACES}{RVS}
      {5 SPACES}{OFF}
      {5 SPACES}{RVS}
      {5 SPACES}{OFF}
      {5 SPACES}{RVS}
      {5 SPACES}{OFF}
      {5 SPACES}"
HE 50 FORP=SITOSI+24:POKEP,0:N
      EXT:GOSUB610:GOSUB550:GO
      TO280
HE 60 FORN=R+1TO8:IFBD(N,C)THE
      NFL=1:RETURN
SH 70 NEXT:IFR=1THEN100
KX 80 FORN=1TOR-1:IFBD(N,C)THE
      NFL=1:RETURN
HM 90 NEXT
SH 100 FORN=C+1TO8:IFBD(R,N)TH
       ENFL=1:RETURN
EA 110 NEXT:IFC=1THEN140
QQ 120 FORN=1TOC-1:IFBD(R,N)TH
       ENFL=1:RETURN
SK 130 NEXT
BC 140 J=-1:K=-1:GOSUB180:IFFL
       THENRETURN
XH 150 J=1:K=1:GOSUB180:IFFLTH
       ENRETURN
DG 160 J=-1:K=1:GOSUB180:IFFLT
       HENRETURN
EX 170 J=1:K=-1:GOSUB180:RETUR
       N
FP 180 R1=R:C1=C
EH 190 R1=R1+J:C1=C1+K
RX 200 IFR1<0ORR1>8ORC1<0ORC1>
       8THENRETURN
DA 210 IFBD(R1,C1)THENFL=1:RET
       URN
RD 220 GOTO190
BH 230 FORTT=2040TO2047:POKETT
       ,14:NEXT
JS 240 IFX>255THENPOKE53264,PE
       EK(53264)OR(2↑SP):X=X-2
       55:GOTO260
EQ 250 POKE53264,PEEK(53264)AN
       DNOT(2↑SP)
GK 260 POKE53248+2*SP,X:POKE53
       249+2*SP,Y:POKESR,PEEK(
```


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```
      SR)OR(2↑SP):RETURN
CA 270 POKESR,PEEK(SR)ANDNOT(2
      ↑SP):RETURN
XE 280 PRINTCHR$(154):SR$=CHR$
      (19)+CHR$(18):FORR=1TO8
RC 290 GOSUB530:POKE198,0:IFR=
      0THENR=1
RG 300 PRINTSR$"{RVS}{BLK}COLU
      MN IN ROW"R"*
      {20 SPACES}":POKE19,1
GX 310 INPUT"{HOME}{16 RIGHT}"
      ;C2$:IFC2$=""THEN290
KG 320 C2$=LEFT$(C2$,1):C2=VAL
      (C2$):C3=ASC(C2$):POKE1
      9,0:IFC3=67THENC=1:GOTO
      450
SR 330 IFC3=69THENPOKE198,0:SY
      S198
BM 340 IFC3=82THENR=R-1:SP=R-1
      :FORN=1TO8:BD(R,N)=0:GO
      SUB270:NEXT:GOTO290
JE 350 IFC2>0ANDC2<9THENC=C2:F
      L=0:T2=0:BD(R,C)=1:GOTO
      370
SR 360 GOTO290
MG 370 GOSUB60
RS 380 IFFL=0THENSP=R-1:X=C*40
      -7:Y=R*24+33:GOSUB230:G
      OSUB590:IFR=8THEN420
QR 390 IFFLTHENGOSUB530:PRINTS
      R$"SORRY! TRY AGAIN, OR
       HIT C, R, OR E"
QC 400 IFFLTHENBD(R,C)=0:GOSUB
      570:FORTT=1TO300:NEXT:G
      OTO290
BD 410 NEXTR
JD 420 GOSUB530:PRINTSR$"SOLUT
      ION! PRESS SPACE BAR TO
       PLAY AGAIN":GOSUB550
HK 430 GETA$:IFA$<>" "THEN430
KB 440 GOSUB540:GOTO280
JX 450 GOSUB530:PRINTSR$"WORKI
      NG ON A SOLUTION..."
BP 460 GOSUB60
EH 470 IF(FL=0)AND(T2)THEN T2=
      0:FLAG=1:BD(R,C)=0:SP=R
      -1:GOSUB270:GOSUB590
HE 480 IFFL=0THENSP=R-1:X=C*40
      -7:Y=R*24+33:GOSUB230:G
      OSUB590:IFR=8THEN420
CX 490 IFFL=0THENBD(R,C)=1:R=R
      +1:C=1
JE 500 IFFLTHENC=C+1:FL=0:IFC=
      9THENC=1:R=R-1:T2=1:IFR
      =0THENR=1:T2=0
HD 510 GETA$:IFA$<>""THENGOSUB
      540:GOTO280
AF 520 GOTO460
KQ 530 FORN=1039TO1063:POKEN,1
      60:NEXT:RETURN
DC 540 FORNN=1TO8:FORN=1TO8:BD
      (NN,N)=0:NEXT:NEXT:POKE
      SR,0:RE?TURN
FD 550 POKESI+1,100:POKESI+5,2
      7:POKESI+15,28:POKESI+2
      4,15:POKESI+6,69
CQ 560 POKESI+4,21:FORP=1TO700
      :NEXT:POKESI+4,20:RETUR
      N
MB 570 POKESI+1,10:POKESI+6,24
      0:POKESI+5,0:FORPP=1TO3
      0:POKESI+4,17:FORP=1TO1
      0:NEXT
MB 580 POKESI+4,16:FORP=1TO10:
      NEXT:NEXT:FORP=1TO1000:
      NEXT:RETURN
FR 590 POKESI+1,45:POKESI+5,13
      2:POKESI+6,132:POKESI+1
      5,0
BA 600 POKESI+4,17:FORP=1TO200
      :NEXT:POKESI+4,16:RETUR
      N
XD 610 FORT=0TO63:READD:POKE 1
      4*64+T,D:NEXT:FORT=BC+7
      TOBC+14:POKET,5:NEXT
EM 620 PRINT"{HOME}{RVS}{BLK}
      {40 SPACES}{23}";:FORI=1
      TO3:FORZ=1TO3
AJ 630 PRINTMT$;:NEXTZ:FORQ=1T
      O3:PRINTTM$;:NEXTQ,I:FO
      RI=1TO3:PRINTMT$;:NEXT
CK 640 FORI=1TO2:PRINTTM$;:NEX
      T:PRINTLEFT$(TM$,43)"
      {HOME}"
CF 650 FORRT=1TO7STEP2:POKE944
      +120*RT,48+RT:POKE1059+
      5*RT,48+RT:NEXT
RG 660 FORRT=2TO8STEP2:POKE105
      9+5*RT,176+RT:POKE944+1
      20*RT,176+RT:NEXT:RETUR
      N
DJ 670 DATA 0,0,0,0,0,0,0,0,0,
      0,0,0,0,16,0,0,56,0,1,5
      7,0,3,255,128,1,251,0
AM 680 DATA 0,246,0,0,108,0,0,
      254,0,0,124,0,1,255,0,0
      ,124,0,0,254,0,1,251,0
XJ 690 DATA 7,247,192,15,239,2
      24,7,223,192,31,255,240
      ,0
```

Hi-Res Dump

(Article on page 79.)

```
SR 60000 REM FOR MPS-801, MPS-
      803, 1525 PRINTERS
KC 60005 SL=8192:REM START OF
      {SPACE}HI-RES SCREEN
KX 60010 DIMSC(127),A$(25,40):
      FORI=0TO127:READSC(I)
      :T=T+SC(I):NEXT
PJ 60020 IF T<>24512 THEN GRAP
      HIC0:PRINT"ERROR IN D
      ATA STATEMENTS":STOP
DH 60030 DATA128,192,160,224,1
      44,208,176,240,136,20
      0,168,232,152,216,184
      ,248,132
JK 60040 DATA196,164,228,148,2
      12,180,244,140,204,17
      2,236,156,220,188,252
      ,130,194
XS 60050 DATA162,226,146,210,1
      78,242,138,202,170,23
      4,154,218,186,250,134
      ,198,166
KH 60060 DATA230,150,214,182,2
      46,142,206,174,238,15
      8,222,190,254,129,193
      ,161,225
CH 60070 DATA145,209,177,241,1
      37,201,169,233,153,21
      7,185,249,133,197,165
      ,229,149
DR 60080 DATA213,181,245,141,2
      05,173,237,157,221,18
      9,253,131,195,163,227
      ,147,211
JD 60090 DATA179,243,139,203,1
      71,235,155,219,187,25
      1,135,199,167,231,151
      ,215,183
JA 60100 DATA247,143,207,175,2
      39,159,223,191,255
DG 60110 OPEN4,4:FORI=7680+SLT
      O7992+SLSTEP8:M=(I-76
      80-SL)/8+1
DX 60120 FORJ=I-7680TOISTEP320
      :N=(I-J)/320+1:FORK=J
      +7TOJSTEP-1:X=PEEK(K)
RJ 60130 IFX>127THENX=X-64:GOT
      O60130
KK 60140 IFK=J+7THENA$(N,M)=A$
      (N,M)+CHR$(SC(XANDPEE
      K(K-1)+128)):GOTO6016
      0
QJ 60150 A$(N,M)=A$(N,M)+CHR$(
      SC(X))
MC 60160 NEXT:NEXT:FORL=1TO25:
      PRINT#4,CHR$(8)A$(L,M
      );:NEXT:PRINT#4,CHR$(
      8):NEXT
KJ 60170 PRINT#4:CLOSE4
```

Power BASIC: 64
RAM Disk

(Article on page 87.)

```
RB 10 PRINT"{CLR}{4 DOWN}{WHT}
      "SPC(8)"LOADING MACHINE
      {SPACE}LANGUAGE"
EG 20 FORI=49152TO49416:READA:
      POKEI,A:X=X+A:NEXT
CS 30 IFX<>33629THENPRINT"ERRO
      R IN DATA STATEMENTS.":S
      TOP
FP 40 PRINT"{CLR}{2 DOWN}{RVS}
       SYS 49152 TO ACTIVATE"
ER 50 PRINT"{DOWN}{RVS} SYS 64
      738 TO DEACTIVATE{OFF}
      {16 SPACES}(RESET COMPUT
      ER)"
JP 60 DATA 169,76,133,115,169,
      13,133,116,169,192
BE 70 DATA 133,117,96,230,122,
      208,2,230,123,32
JG 80 DATA 121,0,201,95,208,83
      ,165,43,133,251
GX 90 DATA 165,44,133,252,165,
      45,133,253,165,46
FJ 100 DATA 133,254,56,229,252
      ,201,32,176,44,169
QR 110 DATA 0,133,2,169,160,13
      3,3,160,0,177
XX 120 DATA 251,145,2,230,251,
      208,2,230,252,230
GK 130 DATA 2,208,2,230,3,165,
      251,197,253,208
DF 140 DATA 234,165,252,197,25
      4,208,228,230,122,208
EB 150 DATA 15,230,123,230,122
      ,208,2,230,123,169
FK 160 DATA 226,160,192,32,30,
      171,76,121,0,201
AD 170 DATA 94,208,79,165,43,1
      33,251,165,44,133
JG 180 DATA 252,169,54,133,1,1
      65,2,133,253,165
XQ 190 DATA 3,133,254,169,0,13
      3,2,169,160,133
KM 200 DATA 3,160,0,177,2,145,
      251,230,2,208
QD 210 DATA 2,230,3,230,251,20
      8,2,230,252,165
PH 220 DATA 2,197,253,208,234,
      165,3,197,254,208
RG 230 DATA 228,165,251,133,45
      ,165,252,133,46,230
QE 240 DATA 122,208,2,230,123,
      169,55,133,1,76
XS 250 DATA 121,0,201,60,208,1
      66,169,160,133,3
AG 260 DATA 169,0,133,2,168,16
      9,0,145,2,230
JB 270 DATA 2,165,2,201,3,144,
      244,230,122,208
EC 280 DATA 141,230,123,76,121
      ,0,80,82,79,71
DF 290 DATA 82,65,77,32,73,83,
      32,84,79,79
HP 300 DATA 32,76,79,78,71,32,
      70,79,82,32
JG 310 DATA 84,72,69,32,82,65,
      77,32,68,73
PF 320 DATA 83,75,46,13,0
```


www.commodore.ca

The TCM-1200 is a 300/1200-baud direct-connect modem for the 64 and 128.

300/1200-Baud Modem For 64/128

The TCM-1200 modem for the Commodore 64 and 128 features automatic speed selection of 300- or 1200-baud telecommunication rates, and is compatible with most 1650 Automodem software. The modem permits message review, and the sending and receiving of files at either speed.

Produced by Trans Com, the TCM-1200 connects to the user port, eliminating the need for an RS-232 interface required by most other 1200-baud modems. Telecommunications software is included with the modem, providing up- and downloading with a new Punter protocol, nine-number phone directory, a 16K capture buffer, plus autodial and redial features.

Front-panel LED status indicators show power status, data receive, data send, connection status, baud rate, and phone line connection. An internal speaker gives audible indications of dial tones, ringing, busy signals, and connections.

Suggested retail price is $199.95.

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

Circle Reader Service Number 200.

Hidden Assets Utility Package

Hidden Assets from Cardco for the Commodore 64 and 128 is a new utility package that offers memo pad, calculator, appointments calendar, telephone directory, alarm clock, programmer's utilities, and disk utilities. Similar in scope to Borland's popular *Sidekick* program for the IBM PC and Macintosh computers, *Hidden Assets* resides on a plug-in cartridge and takes up none of the Commodore's random-access memory.

The calculator is a full scientific calculator with complete math functions, and is portable to any other utility or the computer's main program. The memo pad is a small word processor with automatic word wrap, justification, and formatting commands. Data from the main program and the calculator can be used. And its output is compatible with Cardco's *Write Now* word processor.

The appointments calendar has scheduling capability and a free-form to-do list. The telephone directory records name, phone number, zip code, and other information. It's also a mini-database with sorting capability on any field. The alarm clock uses a beeping sound and a flashing screen border. The programmer's utilities include machine language monitor, mini-editor/assembler, hex/decimal/ASCII conversion tables, and seven other utilities. A half-dozen disk utilities include such features as formatting, renaming, initializing, and full implementation of all DOS commands.

The Commodore 64 version has a suggested retail price of $79.95. A 128 version is expected to be available by the time you read this.

Cardco, Inc., 300 S. Topeka, Wichita, KS 67202.

Circle Reader Service Number 201.

Educational Software

Learning Technologies has released a variety of educational software packages for prekindergarten through grade six. All software is compatible with the Commodore 64 and 128.

For preschool through grade two, a half-dozen programs help children with specific recall, visual memory, visual discrimination, analysis of the whole, observation, and deductive reasoning. They include *Animal Hotel, Bike Hike, Lion's Workshop, Same or Different, Shutterbug's Pictures,* and *Shutterbug's Patterns.*

For ages eight and above: *Number Please* develops specific recall and sequential memory. Thinking skills, such as observing details, comparing and contrasting, classifying, defining a problem, determining a solution, and evaluating outcomes, are developed in *Gremlin Hunt. Pipeline* teaches such thinking skills as defining a problem, experimenting with possible solutions, evaluating outcomes, recognizing patterns, and determining part-whole relationships.

For math instruction for preschool through sixth grade: *Math in a Nutshell* helps users develop skills in counting, addition, subtraction, multiplication, and division of single-digit numbers. Each program retails for $19.95 and includes a redemption card for a free Learning Kit. The Learning Kit includes a color poster, a custom lesson plan, worksheets, a progress chart, and award certificates.

Learning Technologies, 4255 LBJ, Ste. 265, Dallas, TX 75244.

Circle Reader Service Number 202.

www.commodore.ca

New Brøderbund Software For Commodore

Brøderbund has announced that *The Print Shop Companion* and *Bank Street Speller*, originally for Apple II computers, are now available for the Commodore 64/128 computers.

The Print Shop Companion lets users create their own signs, letterhead, banners, greeting cards, custom calendars, borders, tile patterns, and other graphic images when used with the popular *Print Shop* program. You can add text to your graphics, edit existing images, and create new graphics.

Bank Street Speller is an addition to the *Bank Street Writer* word processing prgram that finds spelling and typographical errors and suggests correct spellings. It also helps proofread long documents. *Bank Street Speller* includes an electronic dictionary with over 31,000 words. You can also create a customized dictionary.

The Print Shop Companion costs $34.95 and requires *The Print Shop* software, a printer, and a disk drive. *Bank Street Speller* has a suggested retail price of $49.95 and requires *Bank Street Writer* software.

Brøderbund Software, Inc., 17 Paul Dr., San Rafael, CA 94903-2101.

Circle Reader Service Number 203.

1541 Disk Drive Accessory

The Master Control from Synergistic Products is a 1541 disk drive add-on that combines four features in one product. The Master Control includes a fan and air filter to cool your disk drive, a built-in surge protector with a replaceable fuse, a button which neutralizes your body's static electricity, and a power control that allows you to turn the whole system on with one switch. Outlets on the rear of the unit provide power connections for the computer, monitor, and drive. Included are a ten-day money back guarantee and a 90-day warranty.

The Master Control sells for $54.95, plus $3.00 shipping and handling.

Synergistic Products, Inc., P.O. Box 25125, Colorado Springs, CO 80936.

Circle Reader Service Number 204.

Graphics For The Novice

The Graphics Magician Junior from Polarware is a computer graphics program for novice computer artists who do not require animation or 3-D images. This software includes circle, triangle, box, straight line, and color-fill options. There are 256 available colors and patterns, with a variety of brush sizes and shapes. Any creation can be saved to disk. The instructions are on a poster, and you can input using a keyboard, touch tablet, or joystick.

The Graphics Magician Junior is available for the Commodoroe 64/128 for $34.95.

Polarware, Penguin Software, 2600 Keslinger Rd., P.O. Box 311, Geneva, IL 60134.

Circle Reader Service Number 205.

Science Computer Games

The new Science Challenge Series of educational programs from Island Software includes *Chemistry Challenge, Biology Challenge, Physics Challenge,* and *Anatomy Challenge*. This software helps senior high and college students review their knowledge of science. The programs in the series can be used as drills, games, or as a way to initiate a discussion.

Each program in the series is available for the Commodore 64 for $29.95.

Island Software, P.O. Box 300, Lake Grove, NY 11755.

Circle Reader Service Number 206.

Vietnam War Simulation

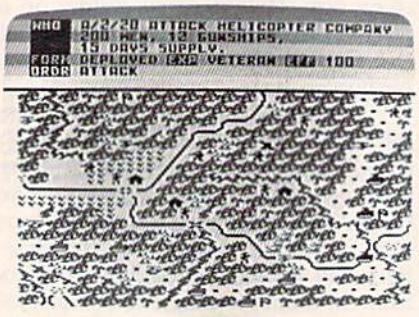
Five game scenarios centered on the Vietnam War, recreating major conflicts from 1954 to 1972, are included in MicroProse Software's *Conflict in Vietnam*. This strategic simulation portrays the U.S. involvement from the end of French rule at Dien Bien Phu, to the major battles at Ia Drang, Khe Sanh, and Cambodia, and through the North Vietnamese assault on Quang Tri. The armies fight across a scrolling map.

The 110-page documentation includes historical background, design notes, play tips, maps, and charts. For the Commodore 64/128 with or without a joystick.

Suggested retail price is $39.95.

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

Circle Reader Service Number 207.



Conflict in Vietnam *simulates five crucial battles from the Vietnam War.*

Playing Aid For *Star Trek: The Kobayashi Alternative*

Simon & Schuster has released The Kobayashi Alternative Procedures Manual, an indepth guide to the popular *Star Trek* computer game for the Commodore 64. The Procedures Manual gives detailed rules of communication and survival, and provides a trial mission to Orna to prepare cadets for the journey into the Trianguli sector.

The manual was developed so that players could get even more experience and challenge from playing the role of Captain Kirk. It will be sent free of charge to dealers and warranty holders of *Star Trek: The Kobayashi Alternative*. All future printngs of the software will include the manual.

The Commodore 64 version of *Star Trek: The Kobayashi Alternative* retails for $39.95.

Simon & Schuster Electronic Publishing Division, Gulf & Western Bldg., One Gulf & Western Plaza, New York, NY 10023.

Circle Reader Service Number 208.

COBOL And CP/M For Commodore

Abacus Software has released two new products for the Commodore 64 and 128. The *Commodore 128 CP/M User's Guide* is from Abacus' 128 Reference Library series of books, and is a guide for using the 128 in CP/M mode.

COBOL-64 is a software package for the Commodore 64 that includes a COBOL editor, compiler, interpreter, and several symbolic debugging aids for using COBOL on the 64.

Commodore 128 CP/M User's Guide retails for $19.95 and *COBOL-64* retails for $39.95.

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

Circle Reader Service Number 209.

Disk Operations Package

Spectrum I Network has released a new utility program for the Commodore 64 that simplifies disk commands. *Disk Assistant* allows the 64 user to perform many disk operations with a single keystroke. This program is menu-driven and offers fifteen disk options, including disk format, validate, erase, and rename. You can view or print sequential data files, and copy on single as well as dual drives. There is also a help file that can be viewed or printed, as well as other features.

Disk Assistant sells for $11.95.

Spectrum 1 Network, 9161 Beachy Ave., Arleta, CA 91331.

Circle Reader Service Number 210.

Speech Editor For *Voice Master*

Covox has introduced a speech editor into the standard driver software supplied with the *Voice Master*, a speech and music processor system capable of voice recognition. The editor allows the user to

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edit and modify the amplitude portions of stored speech templates to improve the quality of digitized speech playback on the Commdore 64. The editing is handled easily by the user. After selecting a voice template, the user modifies the amplitude to get the desired tonal characteristics, then stores the modified version in place of the original. A video display shows the actual voice waveform before, during, and after modification.

You can upgrade your current *Voice Master* package to include the speech editor for a nominal fee by contacting Covox directly. New *Voice Master* packages will include the speech editor, and will retail for $89.95.

Covox, Inc., 675-D Conger St., Eugene, OR 97402.

Circle Reader Service Number 211.

Sight Read Music

MasterSoft has released *Singing Master*, a program in its Mastery in Music software series that contains individualized exercises to help users learn to sight read music. For the Commodore 64 and 128, this software includes scales, thirds, and intervals in all major keys; complete chord analysis; basic music facts; and a special printer option.

The suggested retail price is $49.95.

MasterSoft, P.O. Box 1027, Bend, OR 97709.

Circle Reader Service Number 212.

New Electronic Arts Software

Three new personal computer software packages are now available from Electronic Arts.

Mind Mirror is a mental awareness program designed by Dr. Timothy Leary that lets you test your stereotypes by responding to various situations through the eyes of your chosen subject. You react to situations presented by the program based on your preconceptions and the way you answer preliminary questions about the subject. This philosopher-on-a-disk is designed to let you learn about other people as well as yourself.

The suggested retail price will be available by the time you read this.

Based on the board game *Risk*, the new computer game, *Lords of Conquest*, lets you wage war against the world. The object of this conquer-the-world strategy game is to protect your holdings while trying to take over territories belonging to your opponents. There are four levels of game complexity and an unlimited variety of game maps. *Lords of Conquest* is available for the Commodore 64 and 128 for $32.95.

Super BoulderDash combines the original popular arcade-style game, *BoulderDash*, and its sequel *BoulderDash II*. In these strategic action games, you must maneuver the hero, Rockford, through a series of caves to collect diamonds while avoiding fireflies, butterflies, and falling boulders. *BoulderDash II* adds sixteen new caves, each with five play levels.

The suggested retail price for the Commodore 64/128 is $22.95.

Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404.

Circle Reader Service Number 213.

Computer Baseball

Play any major league baseball team against any other team with *Monday Morning Manager, The Baseball Game*. The 1986 revised version includes 64 major league teams from 1905 through the 1985 playoff teams and over 1,500 players and pitchers. Each play's results are based upon the actual statistics of the players, and each play is graphically displayed on your screen.

Monday Morning Manager is available on the Commodore 64 for $39.95.

TK Computer Products, P.O. Box 9617, Downers Grove, IL 60515; distributed by Computer Software Service, 495A Busse Rd., Elk Grove Village, IL 60007.

Circle Reader Service Number 214.

Mystery And *Intrigue!*

Intrigue! is a new computer mystery game for the Commodore 64. You talk with an assortment of characters to determine who is telling the truth and who can be trusted as well as who is guilty. The action is set in Washington, D. C. There are more than 2000 possible solutions and three experience levels for ages 12 to adult.

Retail price is $39.95.

Kinemation, Four Winds Rd., P.O. Box 3076, Peterborough, NH 03458-3076.

Circle Reader Service Number 215.

Mindscape Games

Mindscape has released three new software packages for the Commodore 64 and 128. Your mission in *Infiltrator* is to fly through hostile enemy airspace and reach strategic targets designed to destroy the Mad Leader's military force. This adventure game combines helicopter flight simulation and military ground action.

Spell of Destruction features over 70 locations with scrolling 3-D graphics and music. To win the game, you must enter the Castle of Illusions, find the Prime Elemental, and destroy it with a single spell.

You'll find three separate games—*Brian Bloodaxe, Revelation*, and *Quo-Vadis*—combined on one disk. With *Brian Bloodaxe*, you can invade Britain and seek the crown jewels. In *Revelation*, you battle the Monster of the Apocalypse. And in *QuoVadis*, your enemy is the Dark Lord. All three are combination strategy-arcade games.

The suggested retail price for *Infiltrator* and *Spell of Destruction* is $29.95 each. The price for the three-game disk is $14.95.

Mindscape, Inc., 3444 Dundee Rd., Northbrook, IL 60062.

Circle Reader Service Number 216.

Commodore 64/128 Football

Football from SubLogic allows you to play and control every aspect of the gridiron game. You choose the players, make substitutions, call the plays, and then go on the field to play either offense or defense or both. Each player has different physical attributes and playing statistics. Offensive and defensive players move individually, so almost anything can happen on the field.

Football is for one or two players on the Commodore 64 or 128 with one disk drive, color or monochrome monitor, and one or two joysticks. Available on disk only for $39.95 plus $2 shipping.

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

Circle Reader Service Number 217.

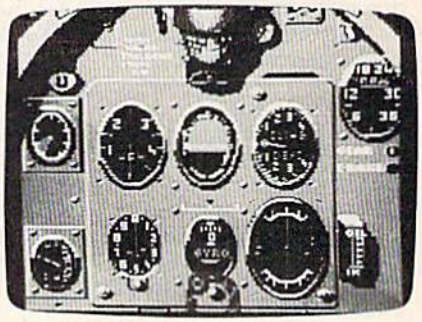
Fly A Spitfire

You can fly a Mark I Supermarine Spitfire, dive over your targets, and shoot down enemy aircraft with Avalon Hill's *Spitfire 40*. This flight simulator puts you in the pilot's seat of a World War II fighter plane. Your cockpit has working dials, gauges, and compasses, and you'll even use pilot's notes like those the RAF gave its own pilots. Be sure to save your log to disk, because each succeeding flight becomes even more difficult. For any number of players on a Commodore 64/128 with a joystick.

Retail price is $35.

Microcomputer Games, Inc., The Avalon Hill Game Company, 4517 Harford Rd., Baltimore, MD 21214.

Circle Reader Service Number 218.



Spitfire 40, *a flight simulation game from Microcomputer Games, for the Commodore 64 computer.*

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C64/128

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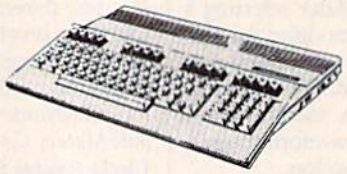
COMMODORE 128



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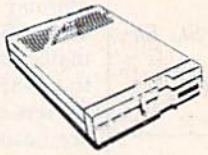

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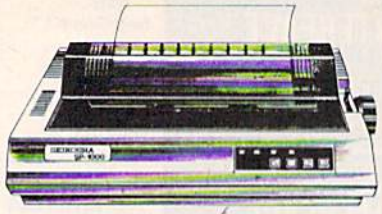

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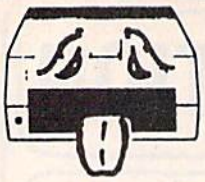

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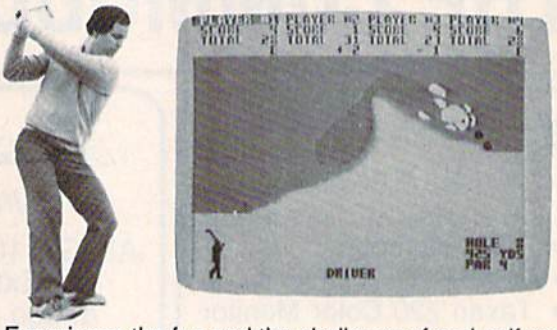

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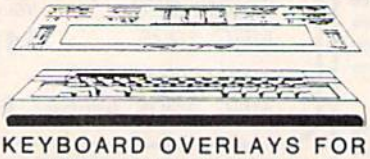

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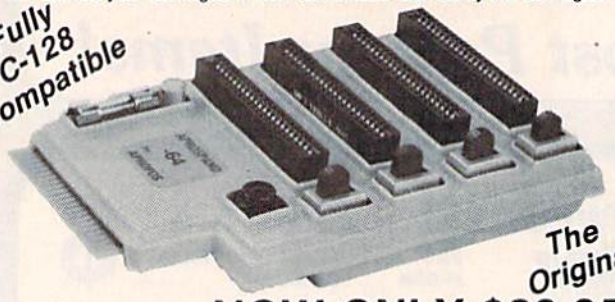

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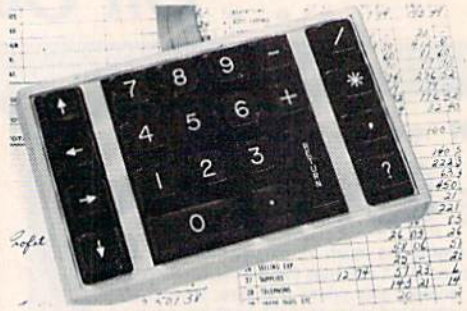

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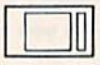 Plus $59.95

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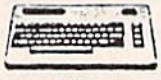

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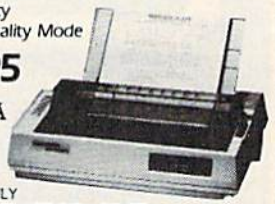

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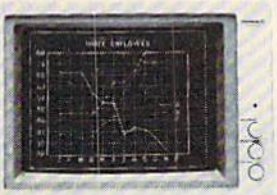

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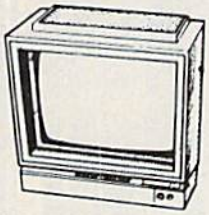

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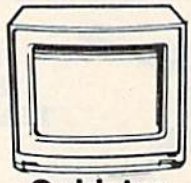

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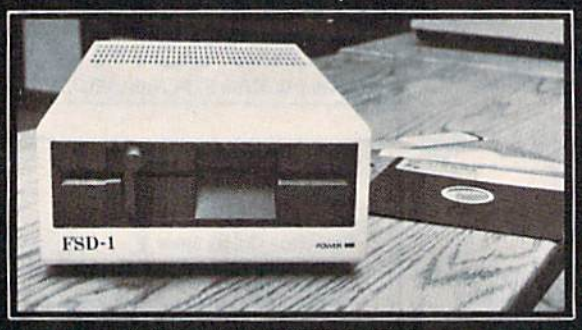

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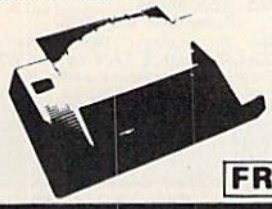

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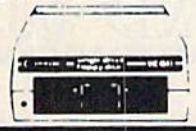

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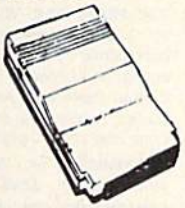

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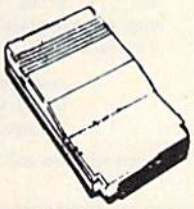

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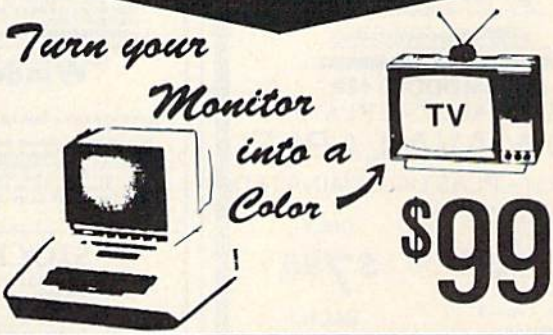

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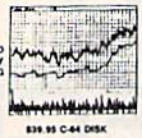

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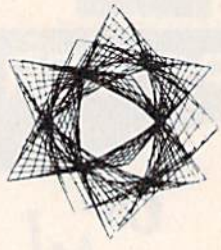

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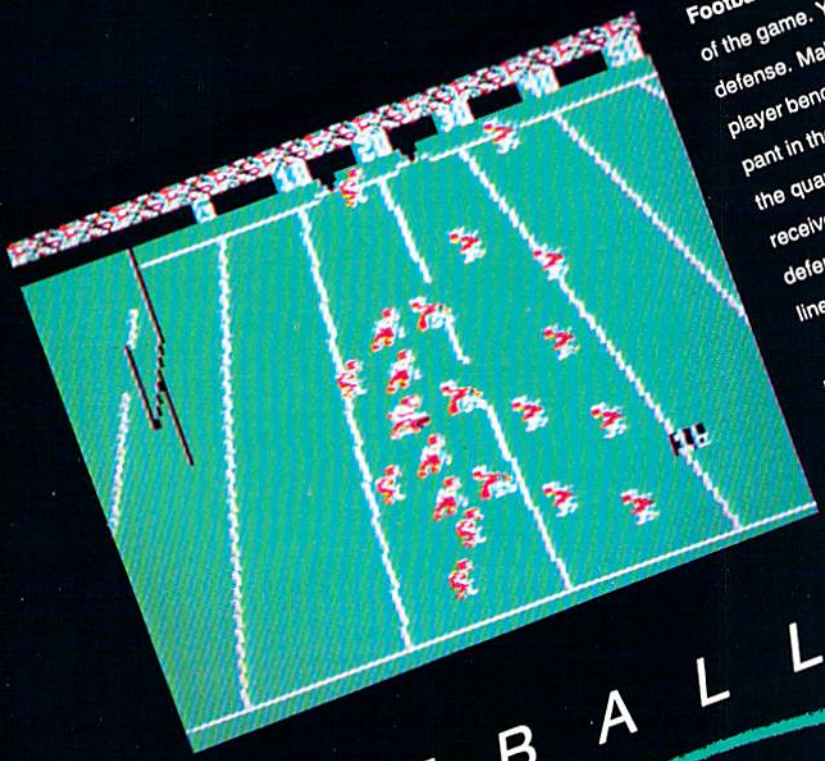

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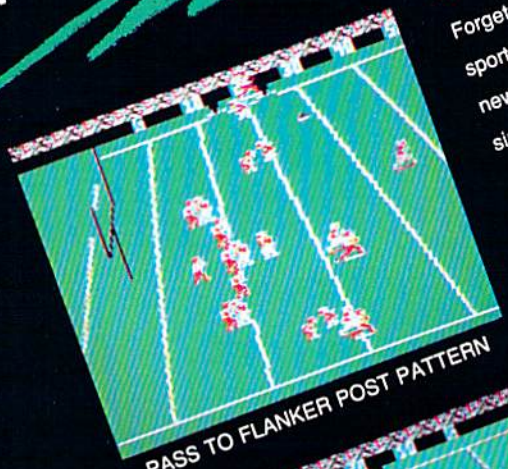

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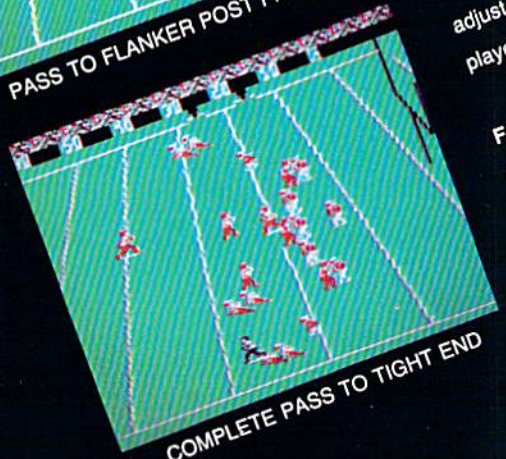

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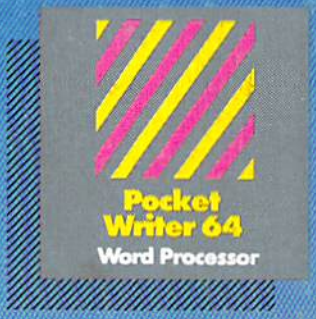

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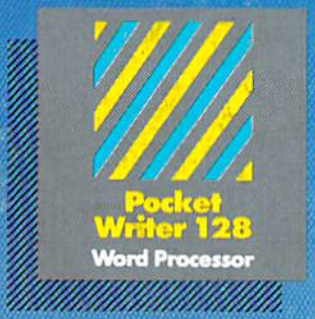

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