COMPUTE!'s GAZETTE

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February 1984
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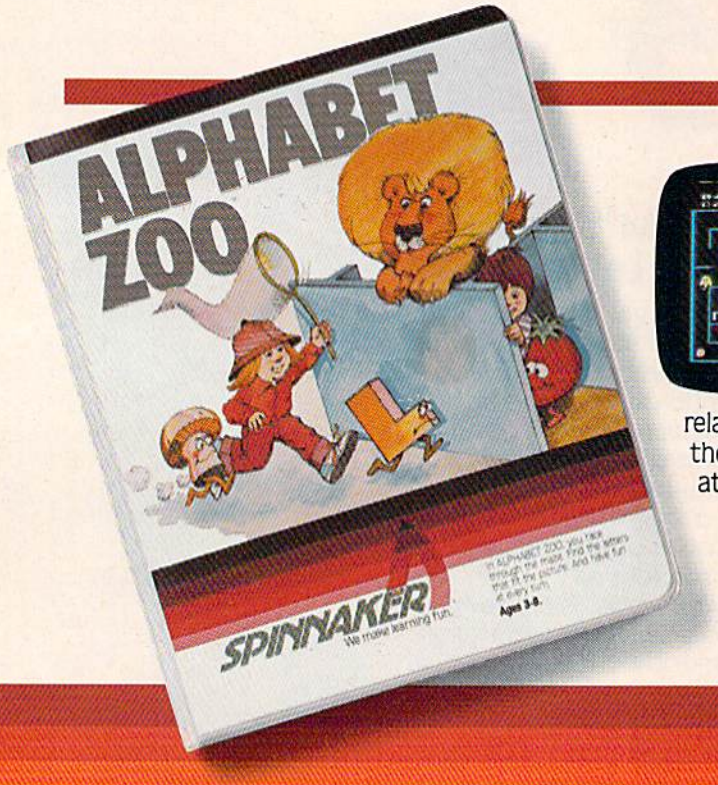

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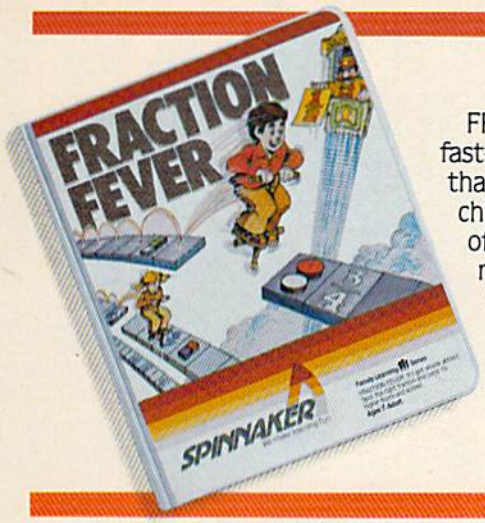

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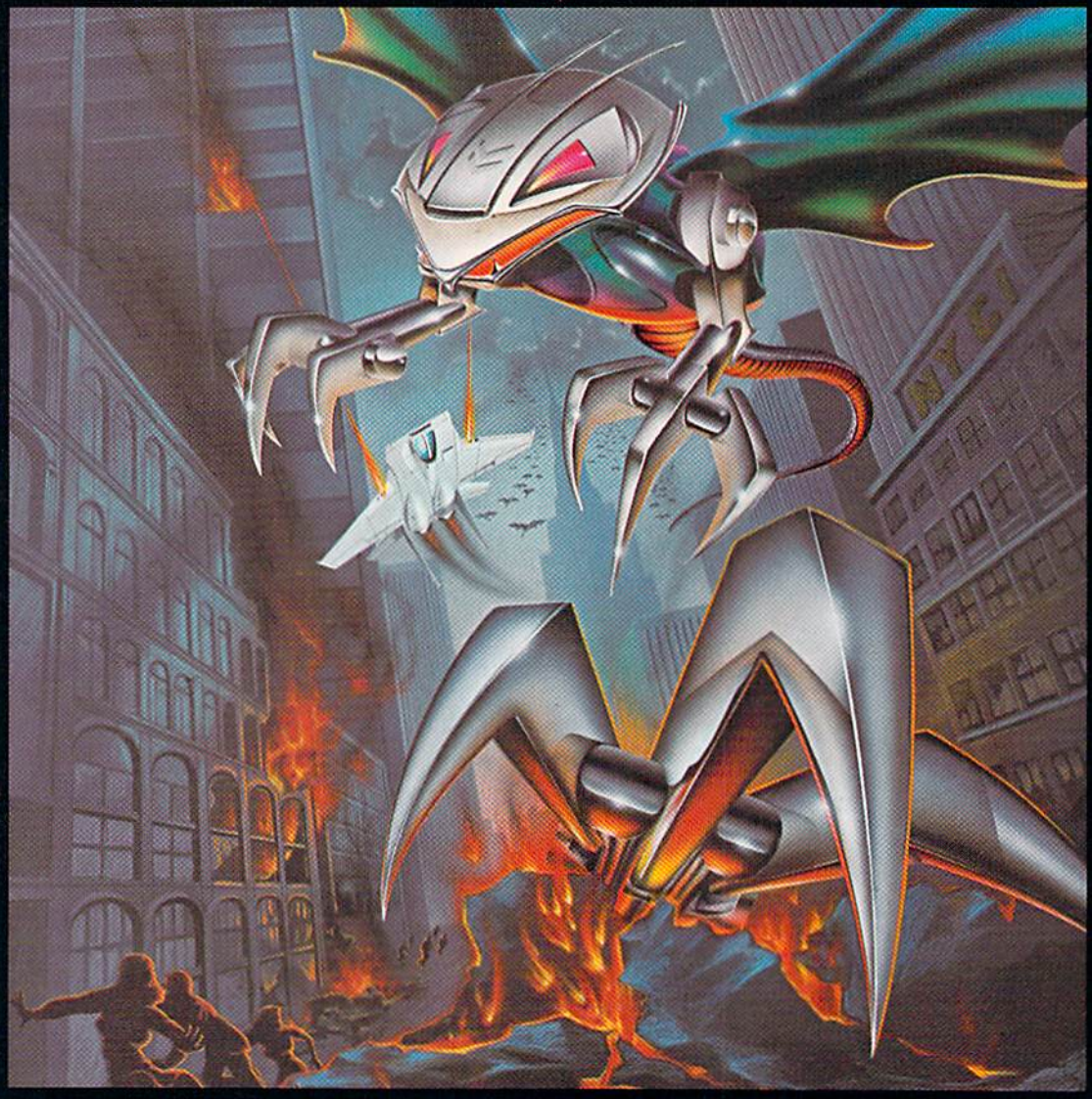

It was as peaceful a day as New York ever gets, when suddenly the sky went dark and a monstrous droning noise filled the air. Hordes of grotesque aliens were swooping down from all sides, biting into the Big Apple as if they hadn't eaten for days. They were laying eggs, too. Horrible slimy things that got down into the subway tunnels and began clawing their way up. If anyone was going to save the city, it would have to be me. I leapt into my rocket and began blasting away. I thought I stood a fighting chance, but fuel's running low... another wave of invaders on the horizon... signing off...

SAVE NEW YORK.™ For the Commodore 64.

C R E A T I V E S O F T W A R E

February 1984 Vol. 2, No. 2

FEATURES

GAMES

REVIEWS

EDUCATION/HOME APPLICATIONS

PROGRAMMING

DEPARTMENTS

PROGRAM LISTINGS

* = General, **V** = VIC-20, **64** = Commodore 64.

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THE EDITOR'S *notes*

We welcome Lance Elko as editor of COMPUTE!'s GAZETTE. Tom Halfhill, former editor of the GAZETTE, has moved into the position of editor of our newest magazine, COMPUTE!'s PC & PCjr. Lance, a native of Philadelphia, joined us last May as an assistant editor in the magazine division, eventually becoming assistant editor of the GAZETTE. As editor of the GAZETTE, Lance will continue to bring you the same clarity of style and solid content that you expect in the GAZETTE.

Exciting news for those of you who've grown tired of typing in our extensive applications and games software. Beginning with the April issue of the GAZETTE, we'll have monthly disks available that contain all of the software printed in each issue of the magazine. We've been working on this task for some months now, with two primary goals in mind. First, we knew we had to insure the quality of the disk that's delivered to you each month, and second, we wanted to find a way to do this as inexpensively as possible. Our goal was to make it so easy to accomplish that it would become a truly broad-based method of distribution of our highly useful software.

We'll give you full details in the March issue of the magazine, but for now here's where we are. Subscribers will be able to enter a six or twelve month subscription to the disk series. The disk corresponding to each issue of the magazine will be released in time to arrive by first class mail as close as possible to the arrival date of your magazine. The magazine will contain all of the descriptive information and articles as well as the documentation for each program. Full listings will, of course, continue to appear in the magazine. The magazine itself *will not change*; we'll simply have all of the monthly software available on disk as well. For those of you who wish the convenience of not having to enter programs, we'll have the solution.

You regular newsstand buyers will have the option of ordering each month's disk when you purchase the magazine. Individually ordered disks will be available for shipment to individual orderers approximately one week after the magazines arrive at dealers and newsstands. Disks will not be available for sale at retail outlets.

Here's how the disk subscription will work. If you wish to start with the April disk, you'll need to send in the special renewal card that will be bound in the March issue. You will have to do this *as soon as you receive* your March issue of the magazine. This card will do two things. It will extend your subscription period to coincide with the disk subscription period. Also, it will activate your disk subscription to insure that you receive the first disk issue. Currently, the "alternate media" subscription will be available *only* on disk. Note that if you order a one year disk subscription, and have only eight months left on your magazine subscription, it will be necessary to extend your magazine subscription by four months to match the twelve month disk subscription. The cost of the magazine subscription is not included in the cost of the disk subscription.

We'll have all the final details in the March issue. Remember, it will be very important (if you wish to be included in the first run of April disks) to complete and return the appropriate card immediately upon receipt of your March issue. We're certain that you'll find the disks quite convenient.

Robert Lock

Editor In Chief

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Do you have a question or a problem? Have you discovered something that could help other VIC-20 and Commodore 64 users? Do you have a comment about something you've read in COMPUTE!'s GAZETTE? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403.

Limiting Memory

I would like to know why some of your programs limit the top of memory (with a POKE 56,xx). It seems to me that these POKEs could be left out of the program.

Mike Carroll

In both the VIC and 64, memory locations 55 and 56 are used as a pointer *to the top of BASIC memory. This means that they contain the address (plus one) of the highest memory location that can be used by BASIC. There is an equivalent pointer to the bottom of memory (locations 43 and 44). You can find out where BASIC begins and ends with these formulas:*

```
PRINT PEEK(44)*256+PEEK(43): REM BOTTOM OF
  MEMORY
PRINT PEEK(56)*256+PEEK(55): REM TOP OF
  MEMORY
```

The reason for changing one of these pointers is fairly straightforward. When you write a BASIC program, the computer stores it in Random Access Memory (RAM) beginning at the address in the bottom of memory pointer. Sometimes you need to create a safe area of memory which BASIC cannot disturb, as, for example, when you want to include a machine language subroutine or a redefined character set with your BASIC program. You could create this safe area by raising the bottom of memory (increasing the value of the pointer in locations 43 and 44), but it is far more common to lower the top of memory by changing the values in locations 55 and 56. If you want to reserve some even multiple of 256 bytes (called a page *of memory), you need POKE only location 56. The POKE to location 56 works by fooling BASIC into thinking that RAM ends before it really does.*

Actually, VIC and 64 programs which limit the amount of memory available to BASIC with a POKE to location 56 should also POKE location 52 with the same value. The reason for POKEing location 52 is more subtle, and requires an understanding of how Commodore BASIC manipulates variables. Briefly, as a BASIC program runs, it tends to put variable values into the area of memory starting at the end of the program and ending with the address contained in locations 51 and 52. The address in locations 51 and 52 can be thought of as the "top of memory for variable storage" pointer. If you don't want BASIC variables to destroy the data you store at the top of memory, you must POKE location 52 along with 56.

An example of this is the "Spike" game (COMPUTE!'s GAZETTE, December 1983). That machine language program resides at the top of the BASIC memory area, but no POKEs were made to protect it. As you type in the numbers for Spike, the variables for the BASIC "MLX" program overwrite your typing. Spike can be protected from BASIC by moving the top of memory and the top of variable storage to below the start of the machine language. Do this by typing POKE 56,128:POKE 52,158:CLR before running MLX.

Note that memory restrictions created by POKEing locations 52 and 56 remain in force even after you type NEW or hit the RUN/STOP and RESTORE keys. Turning the computer off and back on will restore the normal values.

How The Computer Stores Data

I'm confused about how the computer stores DATA statements for machine language programs. You published a program with DATA 157, 0, 4 (STA 1024,X). Does the computer store in hex? I know STA uses a 16-bit address and that 1024 (decimal) = $0400 (hexadecimal).

Kenneth L. Marvin

The computer stores numbers only in binary. When you POKE a number into memory, you use decimal, but the number is stored as binary (base two); the bits are on or off. At the lowest level, everything is either a one or a zero.

Random Access Memory (RAM) contains many on-off switches, which by themselves do nothing. The computer also contains a Central Processing Unit (CPU) which interprets certain bit patterns as machine language instructions. This is what gives it the power to compute.

When the CPU sees 10011101, it interprets it as the instruction STore Accumulator. The computer only cares about the binary number. It's up to us whether we want to interpret the number as 10011101 (binary) or as $9D (hexadecimal) or as 157 (decimal).

See the series of articles "The Inner World Of Com-

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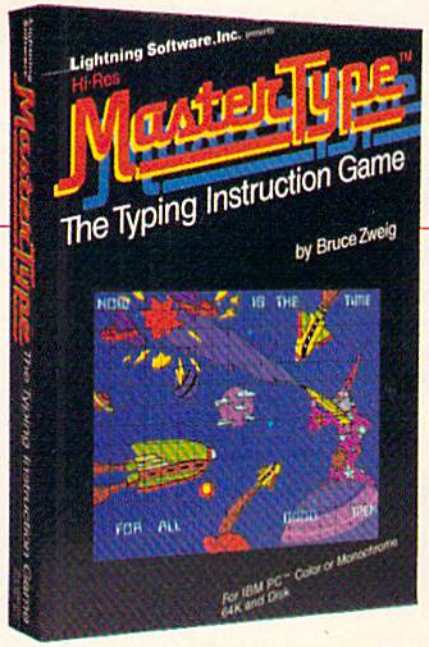

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puters," which began with the November 1983 issue of GAZETTE, *for more information on how the computer stores numbers.*

Abbreviating The IF-THEN Statement

I have run into what seems to be incomplete IF-THEN statements like this:

```
20 IF A THEN 100
```

I don't understand what the IF is checking. I have seen this in more than one program, but I can't figure it out.

Guy Richards

IF-THEN statements are used to test for a certain condition and to take action only if the condition is true. They operate logically: IF (something is true) THEN (do something). When you use IF-THEN, you are checking the truth *of an expression (a variable or equation). IF the condition is true, THEN the program executes a command.*

```
IF X=5 THEN Y=15
IF X=5 THEN PRINT "GAME OVER"
IF X=5 THEN 200
```

The three examples above check the value of variable X. If X equals 5, different actions are taken. In the first example, if X=5, then the value of Y is set to 15. In the second example, the line performs a BASIC command (PRINT) if X=5. The third example could have been written IF X=5 THEN GOTO 200, but it works just the same without the GOTO.

In the line mentioned in your question, the IF statement is checking the variable A. IF A (is true) THEN (GOTO) 100.

How can a variable be true or false? The computer decides that if a variable has a value of zero, it is false. If the variable has any other value, it is true. When the BASIC interpreter sees IF A (without an equation), it checks to see if A is zero or nonzero. When you see a line like IF A THEN 100, you can read it as IF A (does not equal zero) THEN (GOTO) 100.

Some beginning programmers inadvertently make mistakes when they use IF-THEN as part of a multiple-statement line. When an IF-THEN is followed by a colon and another BASIC statement, the BASIC statement becomes part of the THEN section. Watch out for lines like this:

```
10 IF A<15 THEN 100: PRINT"YOU HAVE A VERY
   GOOD SCORE!"
```

The computer checks to see if variable A is less than 15. If it is, it goes to line 100. If it is not less than 15, it will skip the rest of the line. The program will never get to the second part of the line (the PRINT command). If an IF-THEN statement is not true, the program moves on to the next line.

A Different Kind Of GET?

I can't seem to use GET statements in my Commodore 64 programs. I used the following line in a program on the Apple: 210 IF I=15 THEN GET W$. This line causes the Apple to wait until a key is pressed. But the 64 does not wait. What's going on?

Anthony Perry

Apple BASIC and Commodore BASIC are two dialects of the same programming language. There are a few commands and statements that seem to do the same thing, but don't. The GET statement is a good example.

On the Apple, GET will wait until a key is pressed. On the 64, GET checks to see if a key is pressed, but it won't wait. If you don't type anything, the program continues.

If you want your 64 to wait, use the following line:

```
10 GET G$: IF G$="" THEN 10
```

Make sure you use two double quotes, with no space between them. The two adjacent quotes represent a "null" character, meaning that nothing was typed in. As you can see, if no keys were pressed, the line repeats over and over again. When you type something, the program continues.

When you learn one version of BASIC and then use a different brand of computer, it is a good idea to read the programming manual to find differences in the BASIC dialects. If you compare Apple and Commodore, you will find that most of the commands are exactly the same. But there are a few that can fool you.

Mixing Uppercase And Lowercase Letters

How do you get capital letters on the same screen with small letters?

Shane Genis

Capital (uppercase) letters and small (lowercase) letters are found in different modes on the VIC and 64. When you first turn on your computer, it is in uppercase/graphics mode. Any letter you type will be in uppercase, and when you press SHIFT and a letter, you'll see the graphics character assigned to that key.

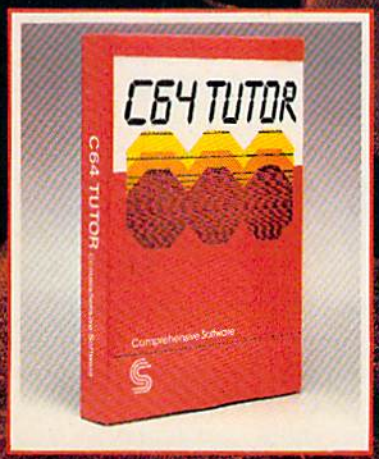
The simplest way to get into lowercase mode is to hold down the Commodore key (on the bottom left of the keyboard) and press SHIFT at the same time. Now, all the letters you type are lowercase. To get capital letters in this mode, just hold down SHIFT and type a letter. To get back to uppercase/graphics mode, just press the Commodore key and SHIFT again.

Although this is the simplest method, it won't work while a program is running. If you're writing a program in which you want to include a switch to uppercase or lowercase mode, you must use these statements:

```
PRINT CHR$(14):REM SWITCHES TO UPPERCASE/
  LOWERCASE
PRINT CHR$(142):REM SWITCHES TO UPPERCASE/
  GRAPHICS
```

There are times, too, when you might want to

BREATHE LIFE INTO YOUR C64



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disable this mode-switching function. For example, if you're writing an educational game for small children, you wouldn't want a child to accidentally press the Commodore key and SHIFT and see all your graphics characters change to letters. To prevent this, use these statements in your program:

```
PRINT CHR$(8):REM DISABLES CHARACTER
  SHIFT
PRINT CHR$(9):REM ENABLES CHARACTER SHIFT
```

CHR$(8) disables the Commodore/SHIFT function, but it also prevents any further use of PRINT CHR$(14) and PRINT CHR$(142) until a CHR$(9) is PRINTed. Many programmers make it a practice to include a line at the beginning of their programs to disable character shifts—a good safeguarding technique.

A Computer Rounding Error

When I tell my VIC-20 to PRINT 158.41–50, it answers 108.41. But when I tell it PRINT 158.41–150, it answers 8.40999997. What is the malfunction?

Peter Buyaki

Computers never make mistakes; only people do. Right? Wrong.

You are the victim of a rounding error. The VIC-20 and most other computers use the binary system for mathematical calculations. While some numbers translate easily to binary, some do not. The same is true of decimal (the numbering system we're used to). The fraction ⅓ translates into 33 percent (after rounding off all those extra threes). And three times 33 percent comes to 99 percent. The result is off by 1 percent.

Assuming you were performing a financial calculation, your result was off by only three millionths of a penny, which should be accurate enough for most purposes.

You will never be able to translate ⅓ into a perfect percentage (in decimal). And your VIC will never be exactly accurate when it uses certain fractions.

If you would like your program to round to the nearest penny, use this formula:

```
X=INT(X*100+.5)/100
```

Or, if you want to use this often in your program, you can define a function that does it for you. It will save some memory if you use it frequently.

```
DEFFNR(X)=INT(X*100+.5)/100
```

If you DEFine the function at the beginning of a program, anytime you want to round a number, use FNR. For example, if the variable you want rounded is QP, you would use QP=FNR(QP).

The RND Function

I see the functions RND(0) and RND(1) in many programs. What is the difference between the two?

David Jennings

RND(0) will generate a random number directly from the jiffy clock (an interval timer built into your computer). RND(1) will create a random number based on the last number generated by RND. If you use a negative number in parentheses, the computer will give you a predetermined (not really random) number.

Because computers are designed to be logical, they cannot make up truly random numbers. When you use the RND (RaNDom) function, a number is generated by a mathematical formula which starts with one number and gives back another. The number in parentheses is called the seed. *The value and sign of the seed affect what kind of random number you get.*

If the seed is a positive number, the value will not matter. A positive seed will make up a random number from the last value. Try typing in the following program line:

```
10 FORX=1TO5:Y=RND(1):PRINTY:NEXT
```

When you type RUN, it will print five random numbers on the screen. If you RUN it again, you'll see a different set of random numbers.

Using a negative number as the seed will result in the same number every time. Add this line to the above program:

```
5 S=RND(-1)
```

Now when you RUN the program, you'll still get a list of five numbers. But RUN it again and you'll see the same five numbers. Using a negative number predetermines the series of random numbers. Your computer uses a formula to create random numbers (which is why they are sometimes called "pseudo-random").

A negative seed is sometimes handy when you are debugging a program or running a benchmark test. If you want random numbers, but always want them to appear in the same order, use a negative number the first time you use the RND function, and a positive seed in subsequent lines.

When the seed is zero, the computer uses the current value of the jiffy clock, which is updated 60 times every second. This gives you a way of randomly seeding the RND function.

Merging Two Programs

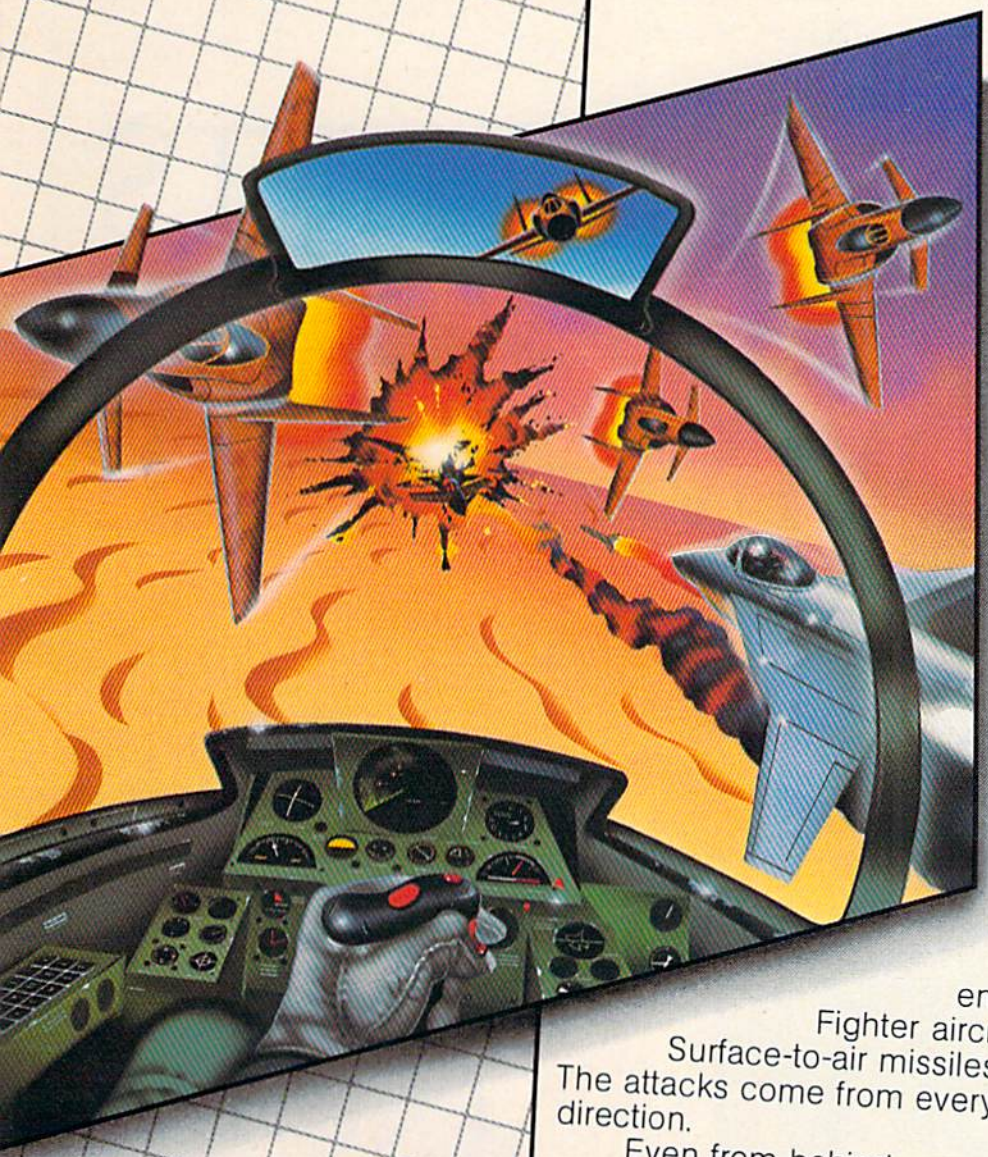
How can I merge two programs to use as a single program on my Commodore 64?

Khodadad Naimi

A program which will truly merge *two other programs must be quite sophisticated. It must collect all the lines from both programs in the proper order. It must also decide what to do if it finds the same line number in both programs. For an example of how this can be done with a VIC or 64 and disk drive, see the article on page 144 of the October 1983 issue of* COMPUTE!, *the* GAZETTE*'s sister magazine.*

If you simply want to tack the lines from one program onto the end of another program (called appending), that's a considerably simpler process. The following short program, from COMPUTE!'s First Book of VIC, *will append programs, providing the*

Dead end.



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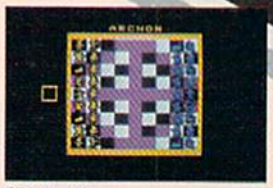

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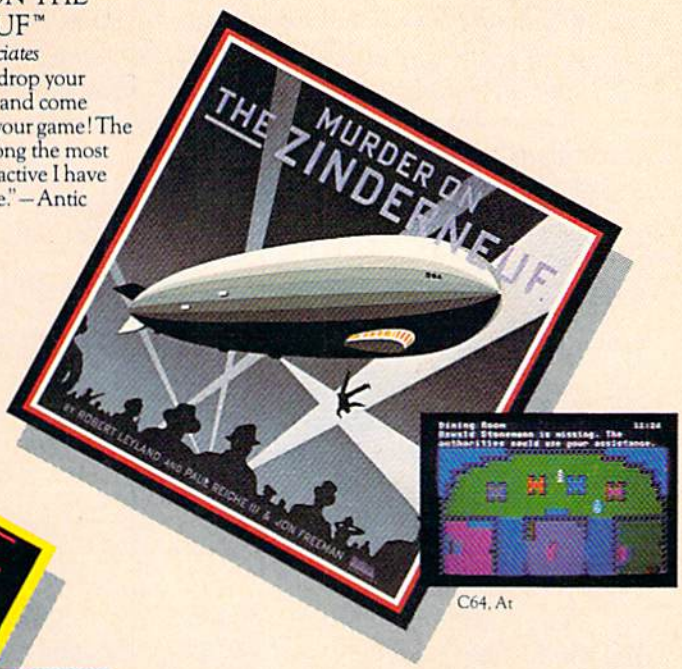

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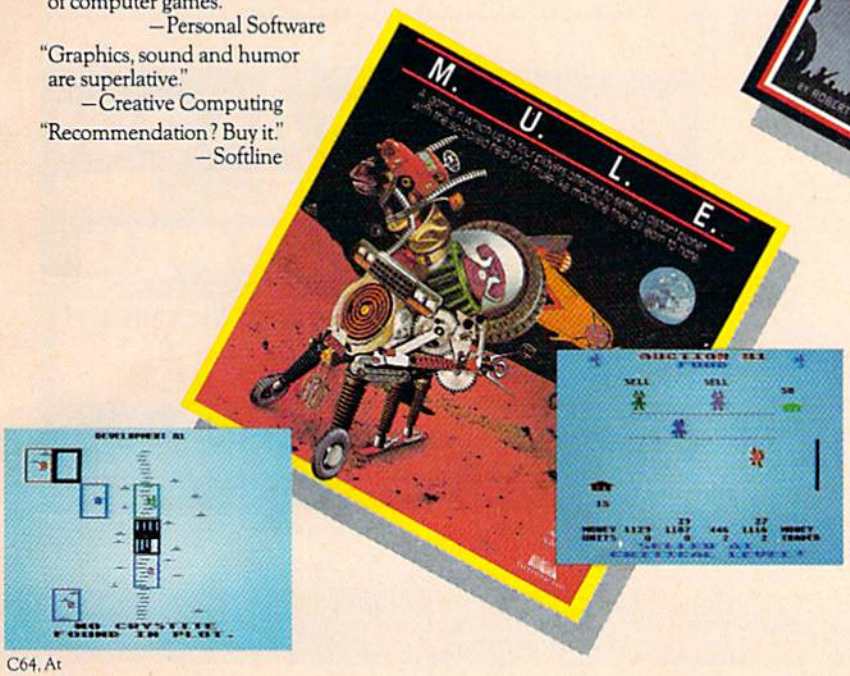

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following restrictions are met:

- *None of the programs may use line numbers 1–5.*
- *All lines in the program to be appended must have line numbers which are higher than the highest line number of the program in memory.*

```
1 A=PEEK(44)
2 PRINT"{CLR}{3 DOWN}LOAD{10 DOWN}
  {4 LEFT}POKE43,1:POKE44,";A;"{HOME}"
3 FOR I=631TO636:POKE I,13:NEXT:POKE 198,
  6
4 IF PEEK(45)<2 THEN POKE 43,PEEK(45)-2+2
  55:POKE 44,PEEK(46)-1:END
5 POKE 43,PEEK(45)-2:POKE 44,PEEK(46):END
```

This program will work on both the VIC and 64 if you are using a Datassette. If you have a disk drive, make the following changes:

```
1 A=PEEK(44):Q$=CHR$(34):R$=CHR$(141)
2 PRINT"{CLR}{3 DOWN}LOAD";Q$;"PROG1";Q$;
  ",8";R$;"{8 DOWN}POKE43,1:POKE44,";A;"
  {HOME}"
```

To use this program, type it in and SAVE it. When you want to append programs, first LOAD this program. Tape users should next insert the tape containing the first program to be LOADed and type RUN. Then insert the tape containing the first program to be appended and RUN again. Continue until all programs have been appended, then delete lines 1–5. Disk users should change the program name in line 2 to that of the first program to be LOADed, then RUN. Next, change the program name in line 2 to that of the first program to be appended and RUN again. Repeat until all programs have been appended, then delete lines 1–5.

The program works by changing the address for the beginning of BASIC to the address of the end of the program currently in memory (minus two bytes). The program then uses the dynamic keyboard technique to fool the computer into thinking that you typed in the LOAD and POKEs in line 2. These bring in the new program, then restore the address for the start of BASIC to its original value.

The END of DINKETY-DINK.

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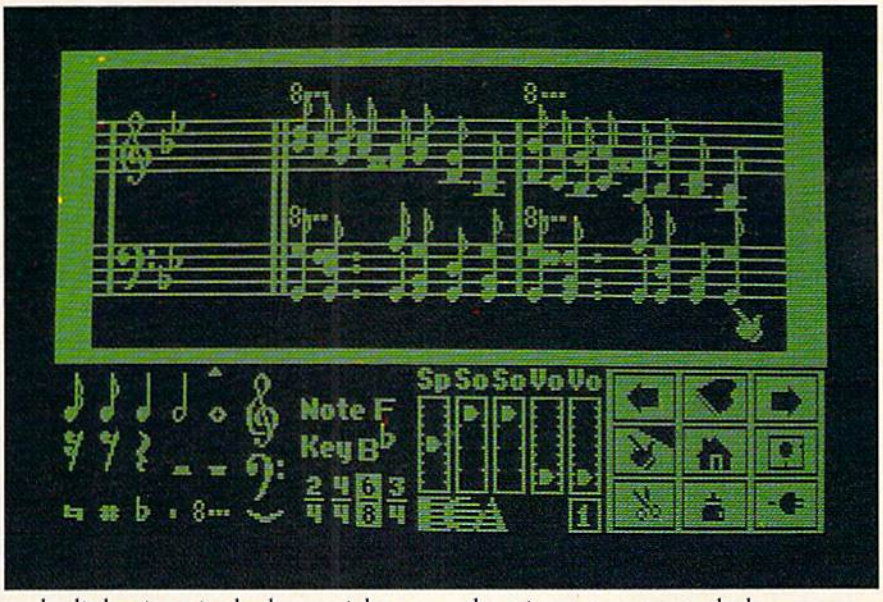

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That's you at the right end of the staff of notes — the little hand. Move the joystick, and you move the hand. Use it to carry notes up to the staff. Lay in rests, signatures, clefs, then point to the little piano in the lower right and listen, because you'll hear the whole thing played back.

Move those little scales in the middle up and down to vary the music's speed, sound quality, and volume. Use the scissors to cut out whole measures, then use the glue pot to paste them in somewhere else. Got a printer? Great. Print the score out and show it off to your friends.

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SIMPLE ANSWERS TO COMMON QUESTIONS

TOM R. HALFHILL, EDITOR

Q A

Each month, COMPUTE!'s GAZETTE *will tackle some questions commonly asked by new VIC-20/Commodore 64 users and by people shopping for their first home computer.*

Q. I've seen advertisements for "printer buffers" and have read many references to "cassette buffers," "keyboard buffers," "input/output buffers," and so on. Exactly what is a buffer?

A. Generally speaking, a buffer is a reserved area of memory which holds information until it is ready to be processed.

Buffers are most often employed in situations where the computer is too fast for its peripheral devices (such as printers, disk drives, tape drives, etc.). The speed disparity between computers and their peripherals has shackled computers ever since they were invented. The problem is that computers, electronic devices which operate almost at the speed of light, can easily outrun mechanical devices. No machine which depends on pulleys, rollers, gears, levers, and electric motors can keep up with a computer.

Let's look at printers, for example. A typical home computer hooked up to a printer is capable of sending many thousands of characters per second to the printer. But not many home computer printers can print more than 100 or 200 characters per second. Like a harried factory worker stationed on a lightning-fast assembly line, the printer can't keep up. If nothing were done to remedy the situation, maybe one of every ten or 100 characters would be printed. The rest would be lost in the shuffle.

One solution, in effect, is to slow down the computer so it doesn't send characters faster than the printer can take them. Although this restores the balance, it also drastically reduces the computer system's efficiency. When printing out a long program listing or text file, you have to wait until the printer is finished before the computer is available for another task.

A better solution is to set aside (or add) some memory for a buffer. Let's say we reserve 8K—enough to hold 8000 characters. Now, whenever we want to print a file, the computer sends the characters to the buffer at top speed until the buffer is filled. The buffer then sends the characters to the printer at whatever speed the printer can handle. As long as the file we're printing is not larger than the buffer, the computer is freed for other work while the buffer and printer chug away at their own pace. The computer's time (and your time) is not wasted.

Printer buffers are a commonly available accessory for most computers. (Some printers have built-in buffers.) But buffers aren't always outboard accessories. Computers, by necessity, have several internal buffers. One is the keyboard buffer. This is a very small buffer (usually one to ten bytes) which holds characters typed on the keyboard. To keep very fast touch-typists from outrunning the keyboard, the keyboard buffer stores keystrokes and then passes them along to the computer for processing. (On the VIC-20 and Commodore 64, the keyboard buffer is normally ten bytes long and is found at memory addresses 631 to 640.)

Similarly, a cassette buffer temporarily stores data on its way to or from the tape drive. There are also buffers for disk drive input/output.

Sometimes programmers—especially machine language programmers—take advantage of buffer memory space for their own purposes. On Commodore computers, for instance, the cassette buffer is a popular place to store short machine language routines. If the program is not using cassette input/output, the cassette buffer is idle and is a reasonably safe place to hide the machine language. The cassette buffer on the VIC and 64 is 192 bytes long, found at memory addresses 828 to 1019.

Q. What do the terms "coldstart" and "warmstart" mean?

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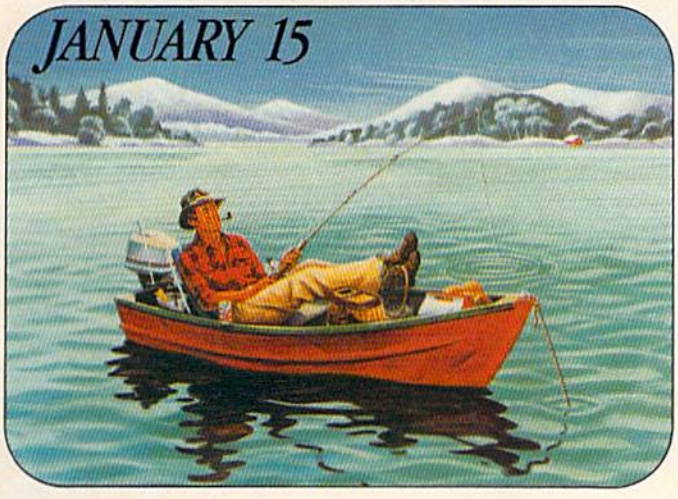

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A. They refer to two different ways of resetting a computer. Resets are generally necessary for programmers; sometimes a programming mistake (particularly in machine language) "locks up" the computer. That is, the computer no longer responds to commands typed on the keyboard. It just sits there as if paralyzed. At other times, a programming error scrambles a program or its data so hopelessly that the only way out is to reset the whole computer.

A coldstart is the most drastic type of reset. The ultimate coldstart is to switch off the computer's power and then switch it on again ("start it cold"). Of course, since Random Access Memory (RAM) requires constant power to hold its information, this kind of coldstart completely wipes out the program and all its data—perhaps irretrievably, if a copy was not saved on tape or disk.

Sometimes a less drastic type of coldstart is possible. For example, if you enter SYS 64802 on the VIC or SYS 64738 on the 64, the computer seems to perform a power-off/on reset. Default screen colors and internal pointers are restored, the initial power-up screen appears, and any BASIC program present before the reset seems to be gone. However, the program is still in memory and can be recovered with a utility such as "VIC/64 Program Lifesaver" (COMPUTE!'s GAZETTE, November 1983). Another way to simulate a coldstart is to short together certain pins on the VIC or 64 user port (see "Horizons: 64," December 1983). Some plug-in memory expanders and motherboards use a similar technique to add a real reset button.

A warmstart is a less destructive type of reset. It resets the computer without erasing valuable programs or data. To prevent accidental resets, the VIC and 64 require a two-keystroke sequence: hold down RUN/STOP and slap RESTORE (merely pressing RESTORE doesn't work; it takes a somewhat sharp—but not savage—slap). This clears the screen, restores original colors and some internal pointers, and preserves your program.

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"Bits And Bytes"

PBS's New Computer Series

Kathy Yakal, Editorial Assistant

Once you get started with personal computers, there are many ways you can learn about them. Schools offer computer literacy courses. Books and magazines publish information. User groups offer first-hand help with fellow hobbyists. Now television is starting to show some interest in computer education. Here's a look at a Public Broadcasting System show that is receiving a very favorable response: "Bits and Bytes."

Frances Seidenberg wanted to learn about computers. Knowing how to use one, she thought, would be helpful in her job as a freelance editor for a Toronto publishing company. She did have access to personal computers at work, and was learning a lot by editing books on educational software, but she felt that more personalized instruction was necessary. So she and her husband enrolled in "Bits and Bytes," a 12-week introduction to microcomputers that was being offered through TV Ontario, a public television station.

"It was absolutely perfect," says Seidenberg. "There was something in every program that I found useful."

"Bits and Bytes," just completing its second run on Canadian stations, is scheduled to be introduced to U.S. audiences in January 1984, under a different name: "Academy On Computers." The original course material, written by Jim Butterfield, has been substantially updated for its U.S. debut.

Initially, the show will originate from ten stations: KCET (Los Angeles); KPBS (San Diego); the Kentucky Educational Network; the Nebraska Educational Television Network; WNED (Buffalo); WNET (New York City); WXXI (Rochester, New York); WMHT (Schenectady, New York); WGTE (Toledo, Ohio); and WHA-TV (Madison, Wisconsin). A second run is already being planned beginning in mid-April, with several more stations participating. (Interested readers should contact their local PBS stations for more information.)

Of course, anyone within range of these PBS stations can watch the show for free. But those who sign up for the course and pay the registration fee of about $70 (this figure may be set by individual stations) will receive special courseware. The courseware includes text written to accompany the show, individual advice and instruction via periodic quizzes and evaluation sheets, a newsletter, and access to a special hotline staffed by local computer experts.

The creators of "Academy On Computers" say they designed the series for people who are interested in computers but who are bewildered by high-tech jargon, fuzzy computer manuals,

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"A PERFECT '10'!"

"...MY HUSBAND
WON'T COME TO DINNER."

"I NAMED MY DOG SHAMUS..."

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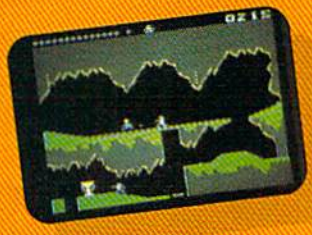

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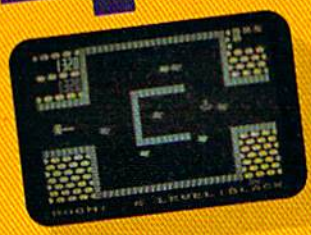

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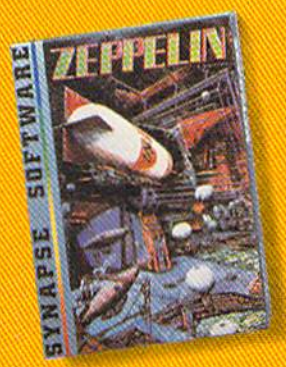
Into this miniature land comes the evil Trollaboars, determined to take over. Their screwhead tanks will surely crush the peaceful Drelbs, unless you can defeat them on the atomic flip grid. **DRELBS.***



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Hosts Luba Goy and Billy Van do the teaching and demonstrating in the television series "Bits and Bytes," one component of the ACADEMY ON COMPUTERS, a comprehensive educational package which provides computer training via television. The twelve-part television series premieres over ten public television stations the week of January 22, 1984.

and the flood of available hardware and software. During the course, viewers will be briefed on basic computer technology and will be introduced to sources of further information, such as software, books, magazines, and organizations. They will learn about the types of computer programs in use today, how to evaluate and select software, how to operate a personal computer, and even how to develop one or more simple computer programs.

"The handbooks and newsletters that accompanied the show were very helpful," says Frances Seidenberg. "But perhaps more important than that was the resources they pointed me to, like publications and user groups. I was able to visit computer stores while shopping for a micro and know what I was talking about."

The *Montreal Gazette* described the series as "the most intelligent, useful, and timely educational program on television today." Each half-hour show uses a variety of teaching techniques. Practice portions are interspersed with theory. There are explanations with computer and cell animation, interviews with experts, and visits to places such as Silicon Valley in California and a computer time-sharing service.

"Everything was very understandable," says Seidenberg. "When they came across a topic that was difficult to understand, they had little animated characters that simplified the explanation. It was informative without being too easy."

Canadian actors Luba Goy and Billy Van host the show. "She acted as the teacher, he the student," says Seidenberg. "He started out as the audience did, knowing nothing, and learned along with the audience. It was very effective."

Several factors make "Academy On Computers" unique. First, it allows viewers to set their own learning paces at home, unlike traditional TV courses which require enrollment through a local school. Second, it is a participative learning experience, thanks to the computer-managed evaluation system, consulting experts, and telephone hotline. Third, the show has the potential to reach the broadest audience of any computer instruction course ever taught: 13,000 people signed up for the first run in Canada, and many more are expected to enroll for the U.S. premiere.

It's not necessary to own a computer to benefit from the series. Seidenberg didn't have one. "We had planned to purchase an Apple IIe, but didn't get it until after the course was over," she says. "I think the course was still as effective."

George Rose, a Toronto resident who signed up for "Bits & Bytes," also didn't have a personal computer when he enrolled in the course. He still doesn't have one. "I think the course is very beneficial to someone who is interested in buying a computer," he says. "I'm still watching the marketplace and asking myself, 'What am I getting from my dollar?'."

Rose, the marketing director for a Toronto manufacturing company, says that years of working with business computers sparked his interest in home computers. Though he was very familiar with the workings of larger computers, he found "Bits and Bytes" a challenge. "The course material was very good, and the presentation was quite clear," he says. "But home computers are a lot different than the ones I was used to. I had to really think about the questions before I could come up with an answer."

The show does not focus on one specific brand of hardware or software, though the low end of the market is well represented by companies such as Radio Shack, Apple, and Commodore. Each program covers general information that applies to most computers, though specific models are used for demonstration purposes.

Here are examples of topics covered in some of the installments:

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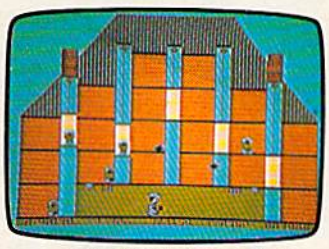

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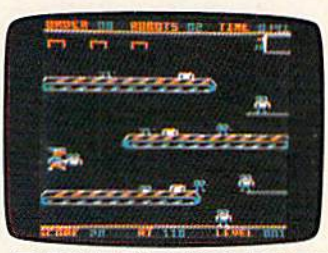

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Program 1: Getting Started

- Explanation of basic computer terms: bits, bytes, chips, disks, CPU, etc.
- How to load disks and cassettes.
- A Hewlett-Packard representative takes a disk and disk drive apart and explains how they function.
- A discussion of artificial intelligence.

Program 3: How Programs Work

- An introduction to different computer languages.
- How to set up simple computer programs using GOTO and IF-THEN.
- An animated sequence explains the interaction between the CPU, RAM, and ROM, and what happens in the computer during input/output.
- A visit to Computertown USA in Menlo Park, California, a grassroots computer literacy organization.

Program 5: Communication Between Computers

- How modems work.
- How a personal computer can be linked through a modem to other micro-, mini-, and mainframe computers for sharing information.
- How to use a modem to contact bulletin boards systems (BBS) and data bases.
- A visit to The Source in McLean, Virginia, to show how an information service works.

Program 8: Simulations and Games

- Explanation of the concept of computer simulations, and how paddles and joysticks work.
- A survey of popular computer games.
- The difference between analog and digital.
- A visit with an Atari game designer who tells how simulations and games are being used in schools.

Program 10: "Computer Music"

- How to turn a computer keyboard into a musical keyboard.
- How to use music and voice synthesizers.
- A visit to Scarborough High School, the University of Toronto, and York University to show how music is taught with computers and synthesizers.

Program 11: Computers At Work

- How to use a word processor and other text-editing systems.
- How to use electronic spreadsheets such as *VisiCalc*.
- How printers and plotters work.
- A visit to an Ontario school which uses word processing in the classroom.

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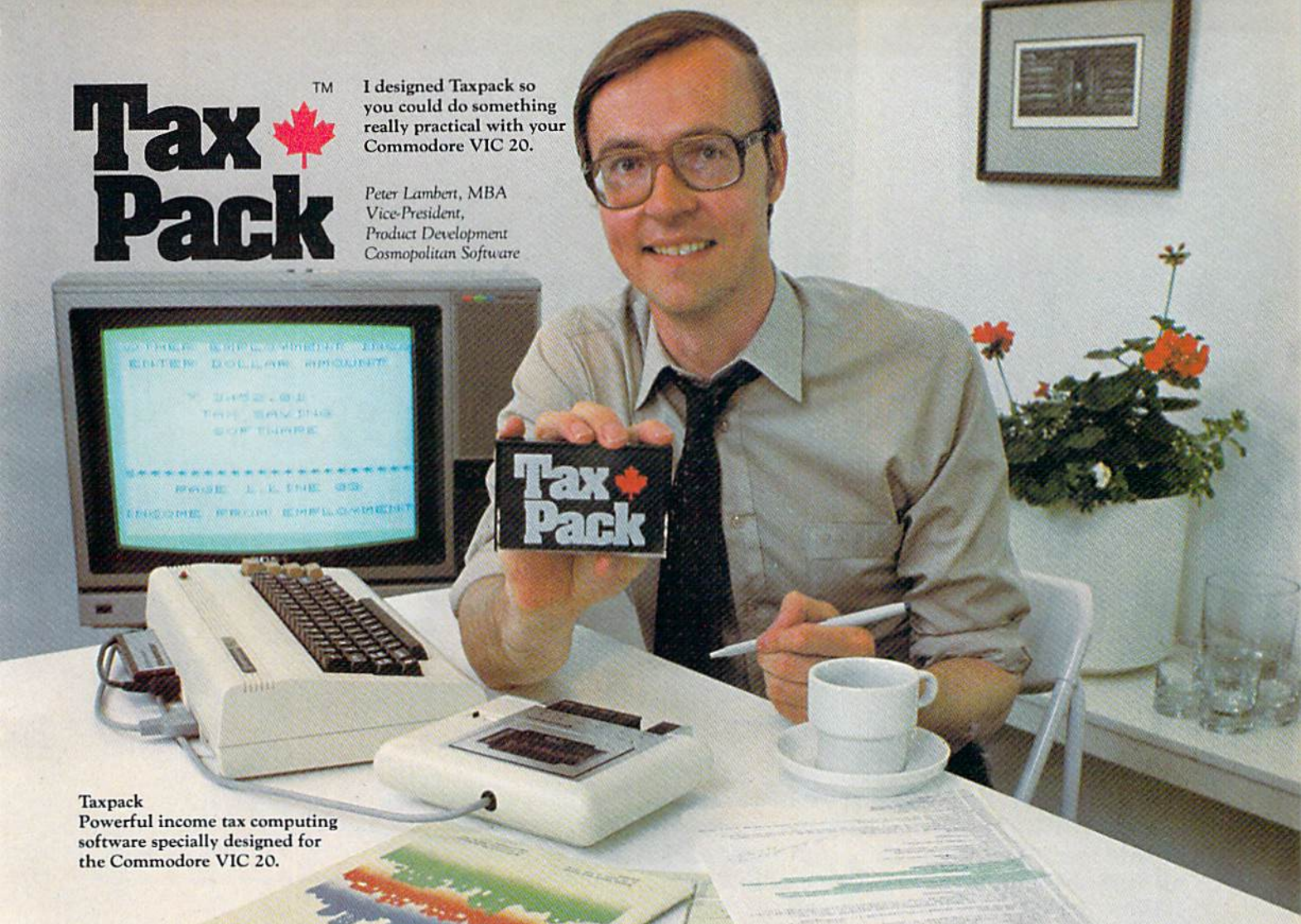

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The Inner World Of Computers

Part 4: The Inside Story

Tom Prendergast

In the first three installments, we discovered the on-off switches in the computer, as well as how to control logic and store information by turning switches on or off. This month's installment explains binary arithmetic—the numbering system your computer understands.

When Snow White's seven dwarfs went whistling off to work, it wasn't to do computing—because seven's not a power of two. But if she'd been a liberated woman and gone to work with them, it would've made eight. Eight is a power of two, and the powers of two are what give computers their computing power.

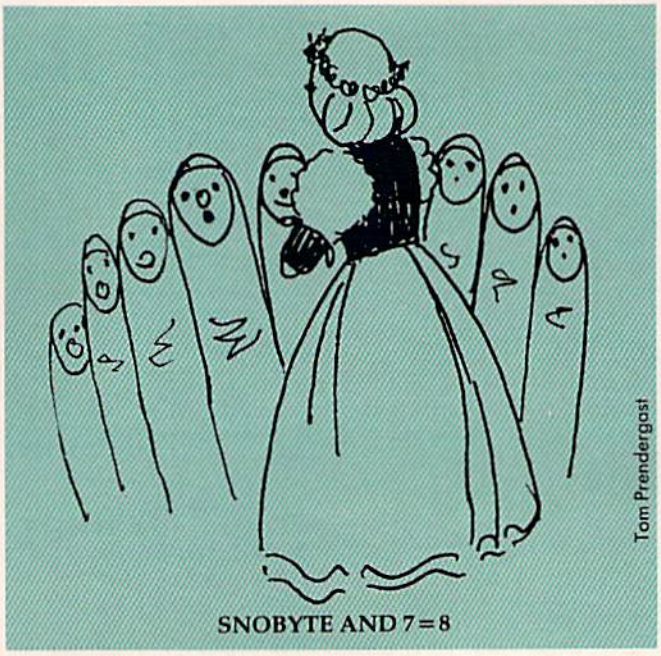
Decimal (base 10) has been our way of writing and thinking about numbers for thousands of years, and as long as humans have ten fingers and toes, we'll be using decimal for thousands of years more.

Computers, though, are binary. Everything you type into a computer ends up turning tiny microswitches ON or OFF: binary.

It doesn't make any difference whether you think of binary as sequences of 1's and 0's, as heads or tails, as hot or cold, even/odd, yes/no—the computer doesn't know, or care. So if computers think—and you can get into a big argument on this—they think in binary terms: on/off, yes/no.

But people don't think in binary. It's always "yes, maybe," or "no, but...." That's OK, though. Who wants a computer that gives you a lot of ifs and maybes when all you want is a simple answer?

The powers of two, if you remember from our previous articles, are multiples of two: 1, 2, 4, 8, 16, 32, 64, 128...and so on to infinity, which is one of those mythical places like ELFdom that you can never quite get to.



SNOBYTE AND 7 = 8

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*1983 C.E.S. award winner.

Here are the powers of a byte in "exponential notation":

$2^7\ 2^6\ 2^5\ 2^4\ 2^3\ 2^2\ 2^1\ 2^0$

The little, raised numbers (the *exponents*) tell you how many times the base (in this case, 2) is multiplied to give you the power of that position. Starting from the right, 2^0 is two multiplied zero times (in other words, it's not multiplied at all). Next is 2^1, "two to the first power": two multiplied once, or 2*1. 2^2 is two multiplied twice, 2*2, two squared; and 2^3 is 2*2*2, and so on. Home computers, though, don't have the little exponent numbers, so you have to use the up-arrow (↑) key above RETURN on the VIC and 64 keyboard.

If you want to find out what 2 to any power is, ask your trusty VIC or 64. (I always use a question mark—the abbreviation for PRINT—when I'm asking my computer a question.) Try this:

```
?2↑7
```

Did you get 128 for an answer? Now, try 2^0:

```
?2↑0
```

Surprised? You'd think that the zero power would be a 0, wouldn't you? The zero power of any base—binary, trinary, quartal, octal, decimal, hexadecimal—is always one, or "unity." Try the zero power in decimal (base 10):

```
?10↑0
```

Still got a 1, right? Now ask for 10 to the first power:

```
?10↑1
```

Did you get 10? Switch over to hex (base 16):

```
?16↑1
```

You should get 16. Switch back to binary (base 2):

```
?2↑1
```

and you get 2! The first power of any base is always the base itself—2 for binary, 8 for octal, 10 for decimal, 16 for hexadecimal, and so on.

Hexadecimal is a very close relation of binary. You might even call her Auntie Hex, because 16 is a power of two (2^4), and as we know from previous articles in this series, hex is shorthand for binary. That is, every four-bit segment of binary (a *nybble*) can be directly translated into hex:

Hex: $	**9**	**0**	**0**	**F**
Binary:	**1001**	**0000**	**0000**	**1111**

It also works the other way around, as you can see in the above example: Every hex digit can be directly translated into four binary digits.

This can get a little confusing, so let's look at a program that illustrates the similarities and the differences between binary and hex:

```
10 POKE=0                              :rem 91
20 PRINT" 2↑"PO"=" 2↑POWER              :rem 0
30 PRINT"16↑"PO"="16↑POWER             :rem 107
40 POWER=POWER+1                       :rem 23
50 GET G$:IF G$=""THEN 50              :rem 249
60 PRINT:IF POWER<=4 THEN 20           :rem 135
```

When you type RUN and RETURN, the zero power of 2 (binary) and 16 (hex) both appear. Press the space bar, or any key, to get the next power of 2 and 16. If you want to go off into never-never land—close to infinity—or at least until you get an ?ILLEGAL QUANTITY ERROR, change line 60 to:

```
60 PRINT:GOTO 20
```

Neither hex nor binary, though, can be directly translated into or from decimal. How do you figure out the decimal?

It's tough enough figuring out the binary for nybbles and bytes, but what about those really big numbers?

Now for the good news: You need binary only for manipulating DATA—when you're ANDing and ORing and doing those other fancy tricks we touched on earlier in our series. And since DATA is never bigger than a byte, that means you'll never have to know binary beyond 255 (11111111).

This is because the VIC and 64 (and Apples and Ataris) are 8-bit computers, and 11111111—a full byte—is the limit of "on" bits you can pack or POKE into a memory cell. Each memory cell is also known as a *memory location* or a *memory address*—a place where a byte is stored.

Oftentimes, though, the computer needs to deal with numbers bigger than a byte—greater than 255.

But how do you pack 16 bits into 8 bits in an 8-bit computer? You don't. The computer hitches two bytes together to form a two-byte address. With 16 bits to play with, you can have an address as high as 65535 (1111111111111111 in binary). There's a "zero" address, too, but since addresses are always two bytes long, its binary form is all zeros: 0000000000000000 ($0000 in hex).

Of course, the computer uses binary for addresses, too, but when you're programming in BASIC, your computer handles that automatically.

Suppose, though, that you're looking at a memory map showing where certain color or sound operations are located, and you'd like to POKE different values into these locations (addresses). Sometimes the addresses are given only in hex.

You could rush out and buy one of those calculators that translate decimal to hex, or hex to decimal, even octal. They cost $20 to $100. Another way is to multiply each hex digit by its hexadecimal

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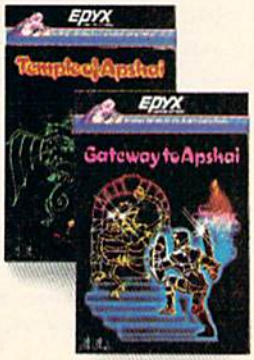

EPYX COMPUTER SOFTWARE

STRATEGY GAMES FOR THE ACTION-GAME PLAYER.

*Game Manufacturers Association, 1981

power, add them all together, and—if you haven't made any mistakes—you've got your decimal. Gulp!

If you're going to do many of these conversions, or if you're as bad at figures as I am, it'll be worth your while to type in the utility programs which let you input any hex or decimal number and get the conversion. (See Programs 2 and 3 at the end of the article.) They're not as much fun as "Binary Castle" a few months ago, but based on the same idea.

The Commodore 64 has 65536 byte-sized memory cells—0 to 65535—which you can address. Approximately 27,000 of these are ROM (Read Only Memory). You can address any memory cell, RAM (Random Access Memory) or ROM, or PEEK to find out what value is stored there, but you can only POKE a new value into a RAM cell. The big difference—and it's huge—between the 64 and the VIC is the amount of RAM memory cells. You can still address 65536 memory cells on a VIC, but that doesn't mean there's anyone at that address to receive it: it's like mailing a letter to a vacant lot.

Think of your computer as a giant warehouse—shrunk down to ELF size—where they store *Whatsits*. Whatsits have all sorts of uses, some that haven't even been thought of yet—which is why they're called Whatsits. Like automobiles, Whatsits come in all shapes and sizes, but, unlike automobiles, they never wear out. Another thing, if you don't like the way they run, you can take them apart and reassemble them because all the parts of a Whatsit are interchangeable—like programs. In fact, Whatsits are program bytes.

Now imagine an army of ELFS grabbing the Whatsits off the conveyer belt (as you type in your program), climbing up ladders, and storing the Whatsits on the shelves so they'll be ready when the program is run.

The Whatsits for PRINT and GOTO and other operations go on the bottom shelves where they'll be handiest, and those for the variables and strings are stored up top.

This is OK if you have enough shelves. But if you have only a few thousand shelves, like an unexpanded VIC, the variables and strings begin to fall down from the top and meet the program parts coming up. What do you do then? You just can't pile the new parts coming in all over the place. How would you ever find them when the program needed them? So the ELF in charge of storing things blows the panic whistle and ? OUT OF MEMORY ERROR flashes on your screen. No more storage space, no program.

There's another thing that can go wrong, too. (Isn't there always?) Even if you have enough storage space, the data bytes have to be in the right place (address) on the shelves. As the ELFS say: "Without the right address, a byte is a blyte."

For instance, if you want to turn the VIC screen black with white letters at a certain point in your program, the data byte "8" has to be in address 36879 when the program calls for it.

But let's say your program is just the right size for the amount of memory. You might even have a few empty shelves for data bytes created later on in the program. Things are running as smooth as silk and all you can hear are little clicks of ELF talk (ELFin) as your program starts its run. But ELFin has a lot of uses aside from running the system inside the computer. There's a technique called "bit indexing," which I plan to have ready for demonstration next month. This allows for quick and easy handling of thousands of data items, without using thousands and thousands of bytes of memory. This means you can run a huge "professional" data bank system on an unexpanded VIC!

In the meantime, if you have trouble figuring out binary above 1111 (15), use Program 5.

If you're like me, though, you've always got a program running when you need a quick conversion. If you don't have another computer to run one of the conversion programs at the end of the article, you'll have to do it the old-fashioned way, with pencil and paper.

Fear not, though. There's an easy, if somewhat slow, way of converting decimal to binary. The trick is to keep dividing by 2.

To start off, we jot down a 1 if the decimal number we're converting is an odd number, or a 0 if the decimal is even. Then we divide the number by two—ignoring any remainder—and put down a 1 if the result is odd, or a zero if it's even. We keep dividing each result by two until the division results in 1.

To convert 16 to binary, for instance, we start by putting down a zero because 16 is an even number:

```
16    0
```

Sixteen divided by two is eight—another even number—so we jot down another zero. Eight divided by two is four, still even and another zero. Two divided by two is one, an odd number, finally, and we jot down a one. We can't divide one, so we write our four zeros and the one down in a row starting from the right, and see that 16 is 10000 in binary. The complete operation should look like this:

```
16 (even) =          0
16½ = 8              0
8½ = 4               0
4½ = 2               0
2½ = 1               1
16 =                 10000
```

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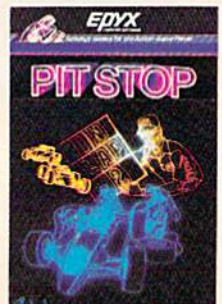

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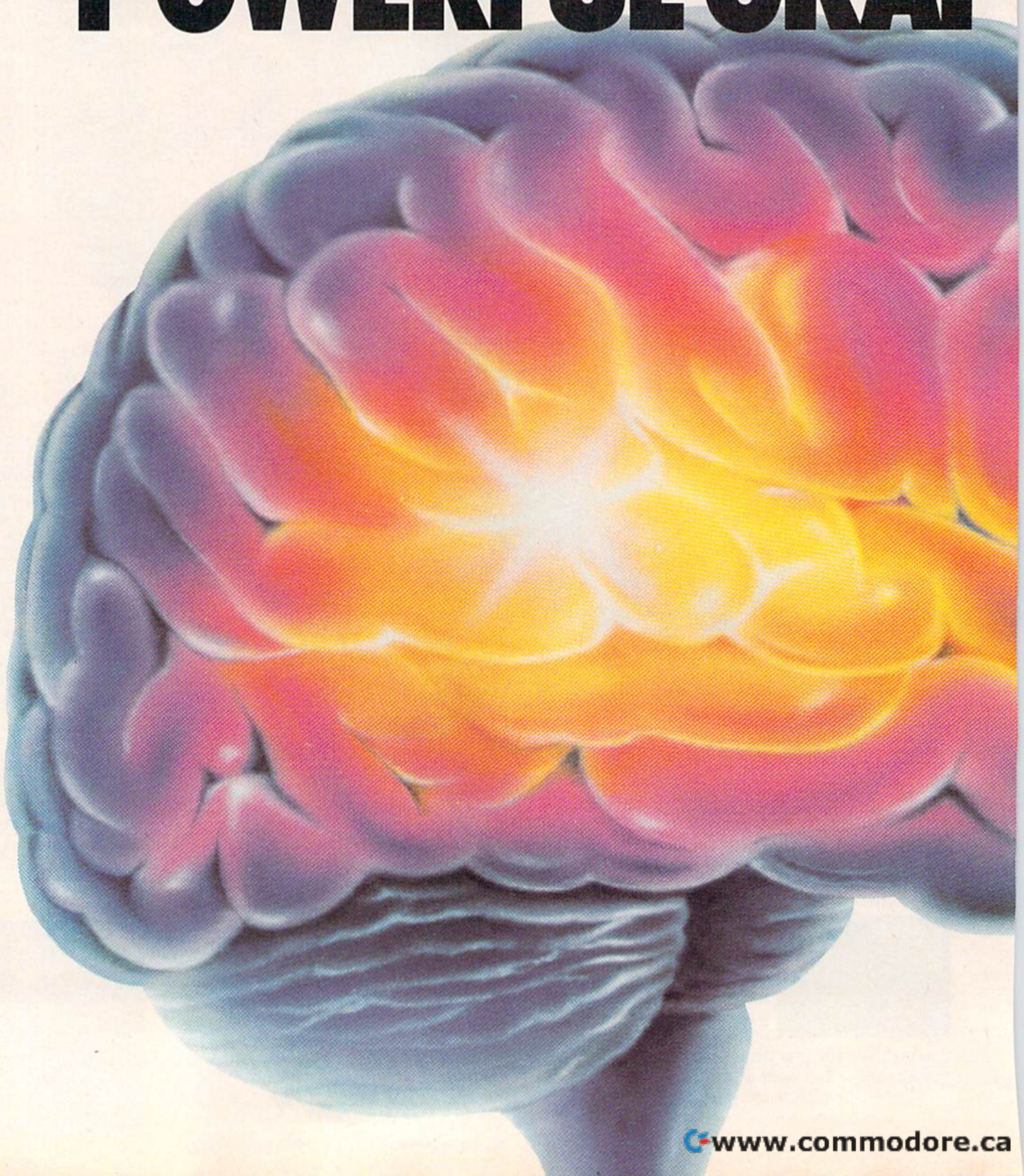

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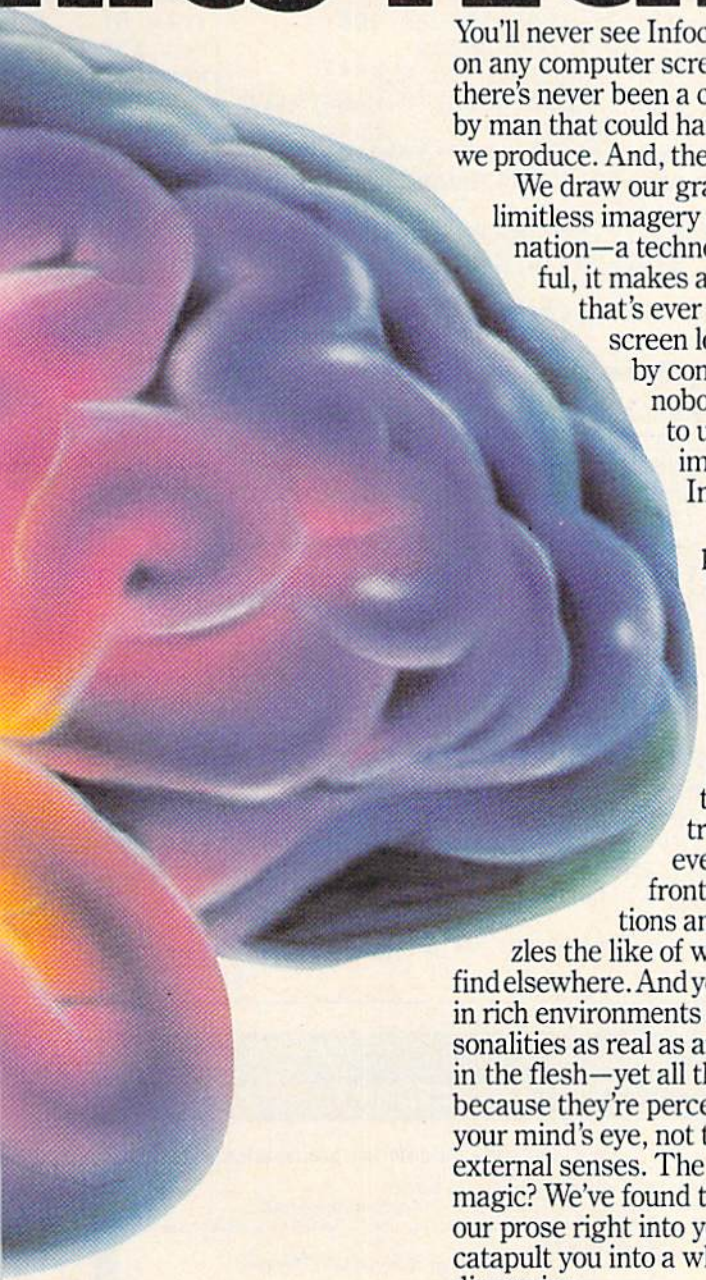

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We add three leading zeros to make the full byte of eight bits and get:

```
binary 16=00010000
hex 16=$1  0
```

You'll get to be an expert so fast you'll be able to do this in your head and not have to write anything down. And since you can convert each binary nybble to hex, it's a faster way of converting decimal to hex than dividing by a lot of 16s. More trustworthy, too.

Let's do another decimal-to-binary—with a number that's bigger and not a "power of two" like 16—so you'll get the hang of it. Let's convert 171 to binary. Since 171 is odd, we jot down a 1:

```
171  1
```

Dividing 171 by two gives us 85 (forgetting the remainder), and this is odd so we jot down another one. 85 divided by two is 42—an even number—so we jot down a zero. 42 divided by two is 21—odd—so we jot down a one; 21 divided by two is ten—even—so we jot down a zero; 10 divided by two is five—odd—so we jot down a one; five divided by two is two—even—so that's a zero; and two divided by two is one—odd—and that's a one.

We don't need leading zeros this time because we have a full byte, so our binary looks like this:

```
binary 171=10101011
hex 171=$A  B
```

Powers Of 2 And 16

```
5 REM POWERS OF 2 AND 16          :rem 250
9 PRINTCHR$(147);CHR$(18);"TOUCH SPACEBAR
  "                               :rem 237
10 PRINTCHR$(18);" TO CONTINUE{2 SPACES}"
   :POWER=0                       :rem 100
20 PRINT" 2 ↑"PO"="2↑PO            :rem 18
30 PRINT"16 ↑"PO"="16↑PO           :rem 125
40 PO=PO+1                         :rem 59
50 GET G$:IFG$=""THEN50            :rem 249
60 PRINT:IF PO<=4 THEN 20          :rem 153
70 PRINT" 65535 IS THE HIGHEST"    :rem 201
80 PRINT"{4 SPACES}ADDRESS ON THE"
                                   :rem 189
90 PRINT"{6 SPACES}VIC OR 64"      :rem 39
```

Hex To Decimal Conversion

```
10 REM HEX TO DECIMAL              :rem 188
20 PRINT:PRINT"HEX NUMBER:"        :rem 226
30 INPUT H$                        :rem 95
40 L=LEN(H$):XP=L-1:FORI=1TOL:DM$=MID$(H$
   ,I,1)                           :rem 210
50 IFDM$<="9"THEN DM$=STR$(VAL(MID$(H$,I,
   1)))                            :rem 239
60 IFDM$=>"A"THEN DM$=STR$(ASC(DM$)-55)
                                   :rem 173
70 D=D+(VAL(DM$))*16↑XP:XP=XP-1    :rem 77
80 NEXT:PRINT:PRINT"{3 SPACES}$"H$" ="D"D
   ECIMAL":PRINT:RUN               :rem 247
```

Hex To Decimal/Decimal To Hex

```
10 REM HEX TO DECIMAL              :rem 188
20 PRINT:PRINT"HEX NUMBER:"        :rem 226
30 INPUT H$                        :rem 95
40 L=LEN(H$):XP=L-1:FORI=1TOL:DM$=MID$(H$
   ,I,1)                           :rem 210
50 IFDM$<="9"THEN DM$=STR$(VAL(MID$(H$,I,
   1)))                            :rem 239
60 IFDM$=>"A"THEN DM$=STR$(ASC(DM$)-55)
                                   :rem 173
70 D=D+(VAL(DM$))*16↑XP:XP=XP-1    :rem 77
80 NEXT:PRINT:PRINT"{3 SPACES}$"H$" ="D"D
   ECIMAL":PRINT                   :rem 200
90 PRINTCHR$(18);"{2 SPACES}TYPE'D'FOR
   {2 SPACES}":PRINTCHR$(18)"DECIMAL TO H
   EX"                             :rem 40
100 GET G$:IFG$=""THEN 100         :rem 81
110 IF G$<>"D"THENRUN              :rem 178
111 REM***DECIMAL TO HEX***        :rem 234
112 REM*{2 SPACES}BY R.MANSFIELD
    {2 SPACES}*                    :rem 122
113 REM********************        :rem 193
120 HE$="0123456789ABCDEF":INPUTD:DE=D
                                   :rem 185
130 H$="":FOR M=3TO0STEP-1:N%=DE/(16↑M):D
    E=DE-N%*16↑M:H$=H$+MID$(HE$,N%+1,1)
                                   :rem 8
140 NEXT:PRINTD"= $"H$" HEX":RUN   :rem 72
```

Any Base To Decimal Conversion

```
10 REM ANY BASE TO DECIMAL         :rem 218
20 PRINT:INPUT"BASE ";B            :rem 149
30 INPUT"NUMBER";B$                :rem 161
40 L=LEN(B$):XP=L-1:FORI=1TOL:DM$=MID$(B$
   ,I,1)                           :rem 198
50 IFDM$<="9"THEN DM$=STR$(VAL(MID$(B$,I,
   1)))                            :rem 233
60 IFDM$=>"A"THEN DM$=STR$(ASC(DM$)-55)
                                   :rem 173
70 D=D+(VAL(DM$))*B↑XP:XP=XP-1     :rem 40
80 NEXT:PRINT:PRINT"{3 SPACES}"B$" ="D"DE
   CIMAL":PRINT:RUN                :rem 205
```

Binary To Decimal Conversion

```
10 REM BINARY TO DECIMAL           :rem 156
20 PRINT"{CLR}"                    :rem 198
30 INPUT"BINARY";B$                :rem 157
40 L=LEN(B$):XP=L-1:FORI=1TOL:DM$=MID$(B$
   ,I,1):D=D+(VAL(DM$))*2↑XP:XP=XP-1
                                   :rem 177
50 NEXT:PRINTB$" ="D;:B$="":D=0:PRINT:GOT
   O30                             :rem 122
```

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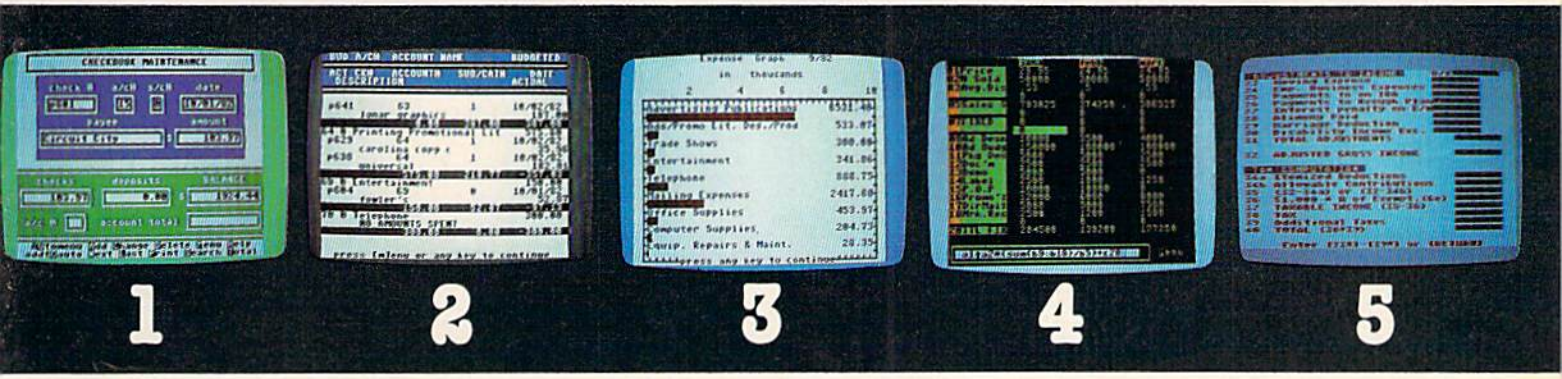

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Getting Started With A Disk Drive

Part 4: Data Files

Charles Brannon, Program Editor

This month, we'll see how to use disk data files and look at some useful techniques when reading and writing to data files.

You save your programs because you know that Random Access Memory (RAM) is transient. Turn your machine off, and it forgets everything you taught it. This is because RAM (specifically, dynamic RAM) is a bunch of little capacitors that need to be constantly recharged (technically, refreshed) in order to hold their ones and zeros.

Incidentally, Read Only Memory (ROM) is made of tiny fuses that have been permanently blown (a rough analogy). Normally, a ROM chip would be full of ones (so electricity can flow), but holes (zeros, areas where current does not flow) are burned into it by selectively blowing the tiny fuses. ROMs are usually created with the fuses "preblown" on the chip. ROMs are used to store information which must not be forgotten, such as the operating system, the BASIC language, and your favorite game cartridge.

By now you understand how to save programs stored in RAM onto disks. But what about your variables, such as arrays, values, and strings? After someone goes to the trouble to enter his name, social security number, today's date, and a slew of other information, the program does its task, then ends. When you run the program again, the variables are cleared. Even if it didn't clear the variables, you might want to enter new data into the program. What if you wanted to reference the old data, though?

If the information could be saved like a program, a whole new world of information-processing opens up. You could search the data for patterns, compute tax, interest, or whatever you dream up. The data could be reused at a later date by another program. If you had some way to preserve your data, you could keep cumulative values such as year-to-date, accrued interest, high scores, etc.

One solution is to enter the information right into the program with DATA statements. It would then be saved with the program. These aren't truly variables, though, since your program can only read them, not change them. DATA statements can be thought of as read-only variables.

What we need is a way to save variables, as we do programs. Actually, all we really want to do is save the values of the variables. And we don't need to save all the variables, so we'd like to be selective. That way, another program can read the values into variables with different names.

Writing data files is fairly easy. You just OPEN a file for write, PRINT all the variables to the file, then CLOSE the file. You use PRINT because it sends out the value of a variable. If A=5 and X$="HELLO", then PRINT A will display 5 and PRINT X$ will display HELLO. That's what you want to do with the file. It should hold a list of all the values you want to save. That way, you can OPEN a file to read, INPUT the values into vari-

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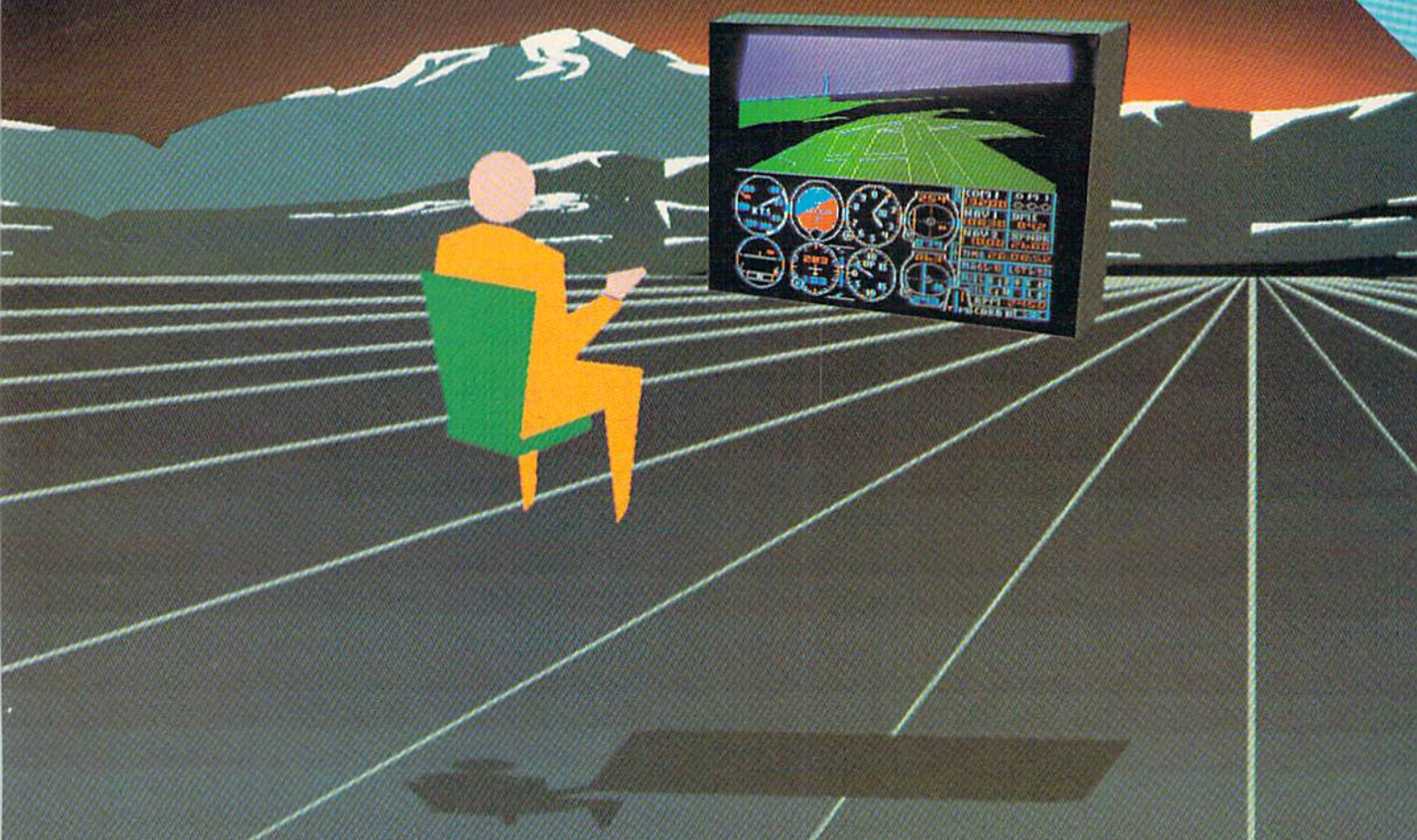

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ables, then CLOSE the file.

Data files just substitute the disk for the screen in PRINT, and the disk for the keyboard (you) in INPUT. If you keep this in mind, it will all make more sense.

Let's say you wrote a file out that just contained strings:

```
10 OPEN 1,8,8,"0:DATAFILE,S,W"
20 A$="HELLO":B$="GOODBYE":C$="ALOHA"
30 PRINT#1,A$,B$,C$
40 CLOSE 1
```

The biggest problem people seem to have with files is not writing them, but reading them correctly.

Don't worry about the details. Just look at line 30. You know what this would do if you PRINTed to the screen:

```
HELLO        GOODBYE        ALOHA
```

That's right, there would be spaces between the items, due to the commas between them. Now let's say you want to read them back in. You might code: INPUT A$,B$,C$. But would this work? If you manually typed in the three items separated by spaces, it would all go into A$, since you know that you have to end each entry with RETURN, or separate it with a comma. So we need to change line 30 to:

```
30 PRINT#1,A$+","+B$+","+C$
```

This will write the file like so:

```
HELLO,GOODBYE,ALOHA
```

just as you would type it in to an INPUT statement.

We could also separate it with RETURN by PRINTing the values on a separate line:

```
30 PRINT#1,A$:PRINT#1,B$:PRINT#1,C$
```

If PRINTed to the screen, we would get:

```
HELLO
GOODBYE
ALOHA
```

Keeping in mind that CHR$(13) is the same as a RETURN key, we could put it all together like this:

```
30 PRINT#1,A$+CHR$(13)+B$+CHR$(13)+C$
```

We don't end the last variable with a CHR$(13) because it is at the end of the line. Again, keep in mind how the variables would look on the screen. You have to write the data out so that INPUT can read it in properly.

Time for details. You OPEN a file to the disk drive as we did last month, but you give it a filename (like you do with SAVE and LOAD):

```
10 OPEN 1,8,8,"0:DATAFILE,S,W"
```

In the above statement, the 1 is just a number we'll use to refer to the file. The second number, 8, refers to the disk drive. It will always be 8 with the disk, unless you have another drive set up as device 9. The third number is also an 8, and this is somewhat arbitrary.

When you write or read data to or from a file, it isn't stored on the disk (during output) or sent to the computer (during input) until 256 characters have filled a disk buffer. The buffer is then sent to the computer, or written to a sector. This is because a disk sector is 256 bytes long, and you have to read or write a whole sector at a time.

There are 13 of these buffers available for your use, numbered 2–14. The number 15 is reserved for the command channel, and buffers 0 and 1 are used by BASIC for SAVE and LOAD. You can use any number for 2–14, but if you have more than one file open at one time, you have to use a different buffer number for each one.

Finally, we have the filename. It is a string, so it is enclosed in quotes. You could also do something like:

```
10 INPUT "FILENAME";F$
20 OPEN 1,8,8,"0:"+F$+",S,W"
```

The "0:" is used for the same reason we used it with SAVE. It's not strictly necessary, but we've observed occasional problems when it is left out. The suffix ",S,W" can be spelled out:

```
20 OPEN 1,8,8,"0:"+F$+",SEQ,WRITE"
```

SEQ means a sequential file. For our use, SEQ just denotes a data file, as opposed to a PRG (program file). There are a few other file types, REL (relative) and USR, but we won't cover them here. The "W" means write, and is necessary, since the OPEN statement otherwise has no way to tell the disk whether we want to read or write to the file.

If you need to replace an existing file on the disk, you could use "@0:" in place of "0:", or open the command channel and send a SCRATCH command to delete the old file before you write the new one.

After we OPEN a file, we just PRINT# (say "PRINT-file") our values to it, as we discussed above. Here are some examples:

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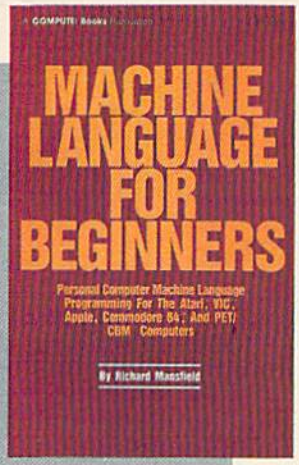

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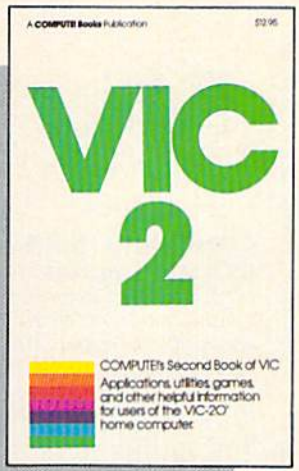

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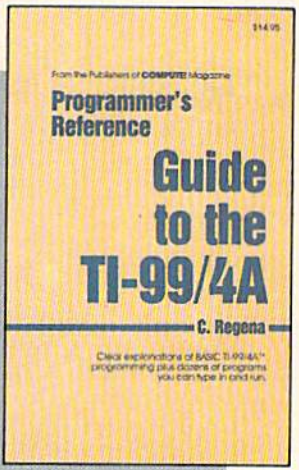

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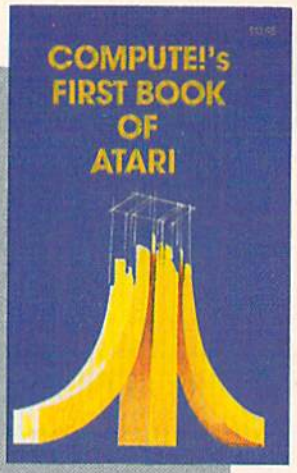

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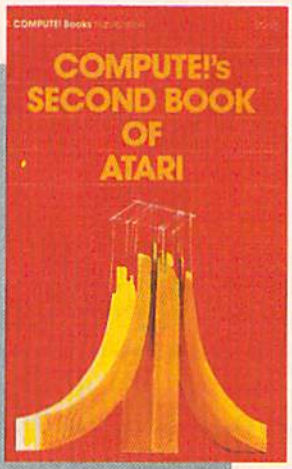

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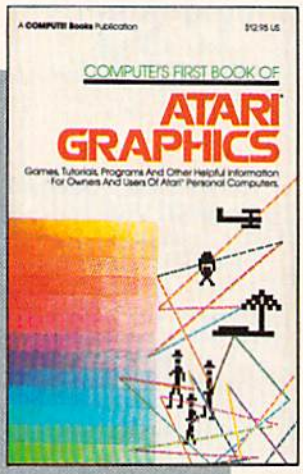

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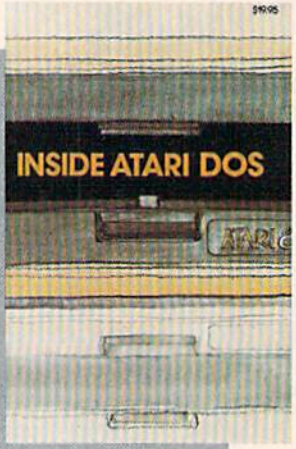

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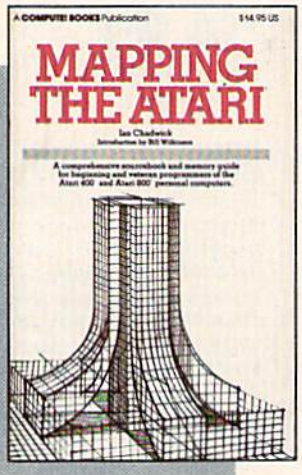

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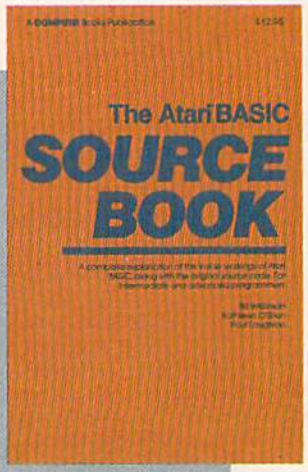

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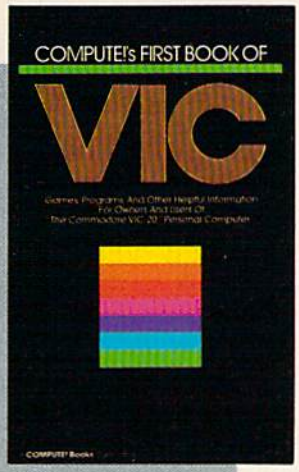

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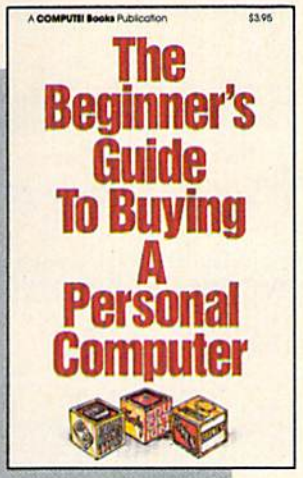

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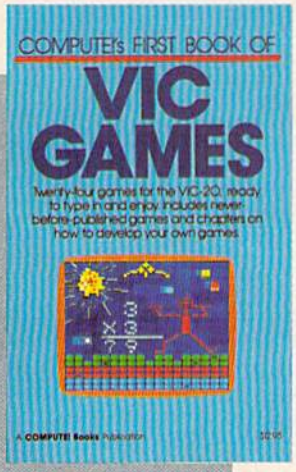

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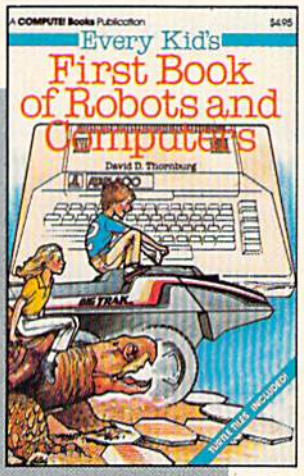

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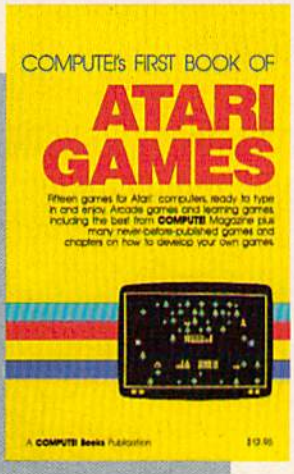

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Save a numeric array:

```
20 FOR I=1 TO 10
30 PRINT#1,A(I)
40 NEXT I
```

Save a two-dimensional string array:

```
20 FOR I=1 TO 3
30 FOR J=1 TO 6
40 PRINT#1,A$(I,J)
50 NEXT J,I
```

Save mixed variables:

```
20 PRINT#1,NAME$;",";AGE;",";DATE$
```

After you PRINT out all the data you want, you have to CLOSE the file, for three reasons. First, you may want to reuse the file number later in the program, and CLOSE makes it available. Second, you can have a maximum of only ten files open at once, so you want to free up a file once you're through. Third, you have to do it anyway. Otherwise, the contents of the last buffer may not be written to the disk. Remember that a buffer will not be written until it fills up with 256 characters. When you are finished sending data, the last buffer might not yet be full. CLOSE makes sure the incomplete buffer is written out.

To use CLOSE, just follow it with the file number: CLOSE 1 will do. You can even CLOSE files which have never been OPENed without causing an error, so some people routinely CLOSE a file before they OPEN it to prevent the ?FILE OPEN ERROR that results when you try to open a file that is already open.

The biggest problem people seem to have with files is not writing them, but reading them correctly. A common mistake is reading the values out of order, or trying to INPUT a string value into a numeric variable. If you remember how the PRINT and INPUT commands work, though, you shouldn't have any problem.

This will open a file named "DATAFILE" which was previously written:

```
100 OPEN 1,8,8,"DATAFILE,S,R"
```

Actually, you can shorten it to:

```
100 OPEN 1,8,8,"DATAFILE"
```

because the disk drive assumes you want to read the file unless you say otherwise, and it will know the file is SEQuential when it finds it.

You can then use the INPUT# command to read the file in the same way it was written:

```
110 INPUT#1,A$
```

Since you are reading values, not variables, you can use any variable name you like.

Here are some examples of INPUT#, following the previous examples. If you parallel your INPUT# to your PRINT#, you can't go wrong:

Read a numeric array:

```
120 FOR I=1 TO 10
130 INPUT#1,A(I)
140 NEXT I
```

Read a two-dimensional string array:

```
120 FOR I=1 TO 3
130 FOR J=1 TO 6
140 INPUT#1,B$(I,J)
150 NEXT J,I
```

Read mixed variables:

```
120 INPUT#1,N$,A,DATE$
```

As shown, you don't have to use the same variable names. Just keep the values in the same order.

After you are finished reading the file, CLOSE it to keep things tidy.

We'll now get into some file techniques. Our examples have been pretty simple, always assuming that the same number of items is always written out. But if you don't know how long the file is, how do you know when to stop reading?

```
10 INPUT "NUMBER OF NAMES";N
20 DIM A$(N)
30 FOR I=1 TO N
40 PRINT "NAME #";I;":";
50 INPUT A$(I)
60 NEXT I
70 OPEN 1,8,8,"0:NAMEFILE,S,W"
80 FOR I=1 TO N
90 PRINT#1,A$(I)
100 NEXT I
110 CLOSE 1
```

This program asks for a list of names, getting the number of names to be entered from the user. It then writes the names to a disk file called "NAMEFILE". Now, if you want to read the names with another program, you don't know how many names were written. The solution: Write N, the number of names, to the file. We can add line 75 to do just that:

```
75 PRINT#1,N
```

We can then easily write a program to read the file:

```
10 OPEN 1,8,8,"NAMEFILE"
20 INPUT#1,N
30 DIM A$(N)
40 FOR I=1 TO N
50 INPUT#1,A$(I)
60 NEXT I
70 CLOSE 1
```

Another method is to write an end-of-file marker, say an asterisk, at the bottom of the file. Then we can read the file until we reach the asterisk. There's another way, too. The computer changes the STATUS variable when it detects an error (STATUS normally equals zero). One such error is end-of-file. If line 75 were not added to the program that writes the file of names, we could still read the file like so:

```
10 OPEN 1,8,8,"NAMEFILE"
20 DIM A$(50):N=1
30 INPUT#1,A$(N)
40 IF ST=0 THEN N=N+1:GOTO 30
50 CLOSE 1
```

By the way, if you want to look at the names as they come in, you could add a line that will PRINT A$(N) after the INPUT#.

You can also open more than one file at once. This program opens the file we created earlier and writes it to a new file. Along the way, it changes every occurrence of "JOE" to "JACK" (don't ask why):

```
10 OPEN 1,8,8,"NAMEFILE"
20 OPEN 2,8,7,"0:NEWFILE,S,W"
30 INPUT#1,A$:S=ST
40 IF A$="JOE" THEN A$="JACK"
50 PRINT#2,A$
60 IF S=0 THEN 30
70 CLOSE 1
```

We save the value of ST in the variable S, since the PRINT#2 in line 50 may reset it, and we don't want to lose the end-of-file indication.

You can also use GET# to read from a file. This program dumps any data file to the screen:

```
10 OPEN 1,8,8,"FILENAME"
20 GET#1,A$:S=ST:PRINT A$;:IFS=0THEN20
30 CLOSE1
```

Now maybe you want to examine the file as a bunch of ASCII numbers. You might type:

```
20 GET#1,A$:S=ST:A=ASC(A$)
```

Stop before you go any further! There is a problem here. If the program contains any imbedded CHR$(0)'s, ASC will cause an ?ILLEGAL QUANTITY ERROR. You see, CHR$(0) is read by GET as the null string, and ASC will not work on a null string. CHR$(0) is not the same as the numeral 0, which has an ASCII value of 48. Instead, use:

```
GET#1,A$:S=ST:A=ASC(A$+CHR$(0))
```

The ASC function gives you the ASCII value of the first character of the string. Unless A$ is a null string, the appended CHR$(0) won't affect anything. But if A$ is null, then ASC will see the CHR$(0) and return 0, which works fine. A confusing situation, to say the least.

Next month, we'll conclude this series with some miscellaneous material, including answers to frequently asked questions about disk drives. I've shown you only a glimpse of the power of data files. Your disk drive expands your computer's memory, as well as its processing capabilities. Don't treat your disk drive as a glorified cassette unit. Its speed, random access, and convenience can really open up a whole new world of computing capability.


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HOTWARE

A Look At This Month's Best Sellers And The Software Industry

Kathy Yakal, Editorial Assistant

Commodore 64 Entertainment

This Month		Last Month
1	*Jumpman* (Epyx)	2
2	*Temple of Apshai* (Epyx)	3
3	*Frogger* (Sierra On-Line)	4
4	*Fort Apocalypse* (Synapse)	1
5	*Choplifter* (Brøderbund)	6
6	*Gridrunner* (HesWare)	7
7	*Neutral Zone* (Access)	8
8	*Planetfall* (Infocom)	5
9	*Telengard* (Avalon Hill)	–
10	*Witness* (Infocom)	–

Commodore 64 Home/Business/Utility

1	*WordPro 3 Plus/64* With *Spell Right* (Professional)	1
2	*Quick Brown Fox* (Quick Brown Fox)	2
3	*Home Accountant* (Continental)	–
4	*Oracle* (Batteries Included)	10
5	*M File* (M Soft)	3
6	*Paper Clip* (Batteries Included)	9
7	*Money Manager* (Timeworks)	4
8	*Management Systems 64* (Entech)	–
9	*Data Base 64* (Entech)	–
10	*HES Mon* (HesWare)	–

Commodore 64 Educational

1	*Dungeons of the Algebra Dragons* (Timeworks)	5
2	*Facemaker* (Spinnaker)	1
3	*Studio 64* (Entech)	–
4	*Fraction Fever* (Spinnaker)	2
5	*Up For Grabs* (Spinnaker)	3
6	*Primary Math Tutor* (Comm*Data)	4
7	*Pipes* (Creative Software)	–
8	*Touch Typing Tutor* (Taylormade)	7

VIC-20 Entertainment

This Month		Last Month
1	*Gridrunner* (HesWare)	1
2	*Shamus* (HesWare)	3
3	*Temple of Apshai* (Epyx)	4
4	*Choplifter* (Creative Software)	3
5	*Crush, Crumble and Chomp* (Epyx)	5
6	*Predator* (HesWare)	7
7	*Attack of the Mutant Camels* (HesWare)	–

VIC-20 Home/Business/Utility

1	*Quick Brown Fox* (Quick Brown Fox)	1
2	*Turtle Graphics* (HesWare)	2
3	*Household Finance* (Creative Software)	5
4	*HES Mon* (HesWare)	4
5	*TOTL Time Manager* (TOTL)	–
6	*TOTL Text* (TOTL)	–

VIC-20 Educational

1	*Touch Typing Tutor* (Taylormade)	1
2	*Type Attack* (Sirius)	3
3	*Word Search* (T & F)	–
4	*Sky Math* (UMI)	–
5	*Primary Math Tutor* (Comm*Data)	2

Top 40

Comparing The Software And Record Industries

Kathy Yakal, Editorial Assistant

This month's HOTWARE examines some of the similarities and differences between the personal-computer software industry and the record industry.

Personal computers, some say, cannot be fairly compared to any other consumer product that has existed up to now. Computers are unique; no other technology allows so many applications for so little money.

But interesting parallels can be drawn between the computer and record industries. You could say that an amplifier/receiver is comparable to a computer; a turntable or tape deck is like a disk drive or tape drive; and that records and tapes are "software," like floppy diskettes and program cassettes.

The analogy is not perfect, of course. A stereo system is useless without software in the form of records, tapes, or radio broadcasts, but a computer can be programmed by the user to perform an infinite number of functions. In that sense a computer is more like a musical instrument, a creative tool.

True, with a stereo cassette deck, you can record off the radio, or make a copy (in violation of copyright laws) of a friend's cherished Beatles album, just as you can copy a spreadsheet program with a computer. But computers are multifunction machines. Some people argue that for a stereo to be comparable to a computer, it would have to be easily convertible into a dishwasher or a microwave oven or a vacuum cleaner. You can play different kinds of music on a stereo, but it's not exactly the same as running different programs on a computer.

Further, the potential of the two industries is very different. Although audio technology is improving rapidly (largely because of computer technology, in fact), stereos will always remain, basically, music-playing machines. But we can hardly imagine what computers will be like someday.

A New Kind Of Software

Kapri International, of Sun Valley, California, has been producing and distributing gospel and classical records for the last 20 years. Its employees have seen incredible growth and myriad changes in the record industry.

Now, in 1984, it's one of the largest distributors of software for Commodore computers in the country, possibly the largest. Kapri carries well over 1000 different titles from about 100 independent software publishers and distributes them to a network of more than 1200 dealers.

Kapri still does some business in record albums, but its primary product these days is software. "We started carrying Atari software in 1980, when we saw that software was going to be a big business," says Kapri president Chris Soular. "Record sales were beginning to drop off on a national level at about that time anyway, due partly to pirating and high prices."

When Commodore announced its VIC-20 in 1981, Kapri took notice. The VIC, at $299, was the cheapest microcomputer available at that time. It was a real computer, not just a game machine. And a number of independent software publishers, responding to the public's quick acceptance, began producing a lot of software for it.

"We saw lots of potential in the VIC-20," says Soular. "And when the 64 came out in 1982, we knew that Commodore was going to be a hit." Kapri dropped its Atari line and concentrated on Commodore software. Soular still doesn't regret that decision. "Commodore is like the Michael Jackson of the computer industry today," he says.

Not So Different

Software publishers view piracy as a growing problem, as do record companies. Most programs have some kind of "copy protection"—a way to keep people from making illegal copies—but clever programmers can often break the protection.

"Pirating is not as big an issue for the software industry as it is for the music business," says Soular. "It is still a lot easier to tape an album or something off the radio than it is to break into a piece of software. But it does cost the industry a lot of money."

Another similarity, says Soular, is the need for industry people to identify with their potential customers. "There can't be a generation gap there. Not only must we be able to evaluate a product and tell whether or not it is good. We have to know what age group is going to be interested in it, and whether they will buy it."

Generally, records are recorded and software written to appeal to one particular age group. There are, of course, exceptions.

The target age group, Soular thinks, is similar in both the software and record industries. It's young.

"In both businesses, you must have a young enough mind to pick the hits," he says.

Even though the product he now delivers to retailers is different, Soular finds he must promote software in some of the same ways he did records. "We still do mailings and print up and distribute newsletters and brochures," he says. "Only now, instead of calling radio stations and record stores, I'm calling computer stores and trade journals."

Price And Support

Support for retailers is one area where Soular sees differences between the two industries. The National Association of Records Merchandisers (NARM) is a kind of support group for people in the industry. Retailers and distributors stay in touch through this national network. They keep each other in touch with what's happening and try to plan for the future.

No such organization exists for Commodore software dealers, says Soular, but he is trying to create one. To be called the Independent Commodore Software Dealers Association, it will set up a network similar to that of NARM's. It plans to work closely with Commodore itself to provide information and resources for dealers. Advertising co-ops (in which dealers receive subsidies for ads) and bulk ordering are expected to give dealers a financial break in the heated price wars with mass merchandisers and discount houses. Soular expects to have 150 dealers involved by Christmas.

But differences between the record and software industries will call for somewhat different strategies. One of the most obvious differences is pricing. "Records started out very cheap and got more and more expensive," says Soular. "When people started selling software for personal computers, there was no industry standard. They could have compared it to software for larger business machines, but that would have looked ridiculous. People wouldn't pay hundreds of dollars for one piece of software they bought to use with a computer that cost $299. So they brought the price down to what they thought was fair.

"So the big guys were charging a lot of money for their software. Along came these little guys who had fairly good packages for a lot less. The big guys had to lower their prices to keep selling. Prices are getting a bit more reasonable, and I think they'll probably come down some more and then stabilize."

The relationship between product development and pricing can also be dissimilar in the two industries, notes Soular. "A band could work on an album for five or six months and spend hundreds of dollars making a record. Then it sells for $6.99. On the other hand, you've got software writers who can write a program in a month or two—spare time, even—and sell it for $89.95. It's a very young industry, though. Things will change."

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Steve Punter
The Programmer Behind *WordPro*

Selby Bateman, Assistant Features Editor

When the conversation among Commodore users turns to word processing, the name of Steve Punter is usually not far behind. Creator of the hugely successful *WordPro* word processing package, Punter is a 25-year-old Canadian-based programmer who has quickly made a name for himself. Here, he offers his comments on the future of *WordPro*, his own approach to writing programs, and the characteristics that separate the top programmers from the crowd.

Steve Punter, author of WordPro.

The data processing teachers who used to shoo young Steve Punter away from his Toronto high school's Wang 2200 computer would today more likely invite him back as a graduation speaker. In those days, every time a data processing class would arrive to use the Wang, there was Punter huddled over the hardware.

"I kept pestering them, so they finally had to stop me from coming into the room," Punter says, laughing. "I was banned from going near it."

That initial experience with computing in 1976 only whetted his appetite. Now, as a seasoned programmer with a proven track record, Punter is exploring the farther reaches of word processing, bulletin board software, and a variety of other programming areas.

WordPro 3 Plus/64, which Punter has been developing and refining in various forms since 1978, has become the top seller among the Commodore 64 home, business, and utility software packages. Its range of features and ease of use account for its popularity and reflect Punter's approach to programming. In addition to his successes with *WordPro*, Punter has written all of the software used by Commodore bulletin board systems in the United States. He has been running his own bulletin board since April 1981.

After finishing grade 13 in high school (Ontario is the only Canadian province that still has a grade 13), Punter jumped into programming rather than college. The results have been electrifying for him. In addition to his heavy programming schedule, Punter also teaches a course in BASIC at the York Main Library in Toronto. Yet, he has never taken a single computer course himself.

Punter first began programming on a Texas Instruments programmable calculator. The experience convinced him of his interest and his talent. "I learned all of the ropes of programming on that," he says, "especially how to get big programs to fit in little spaces."

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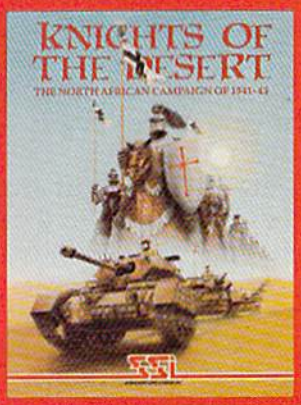

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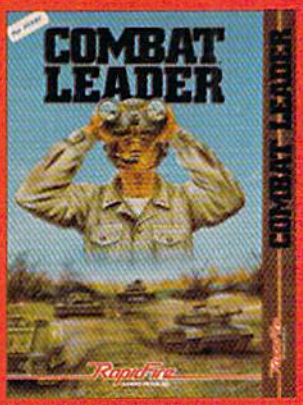

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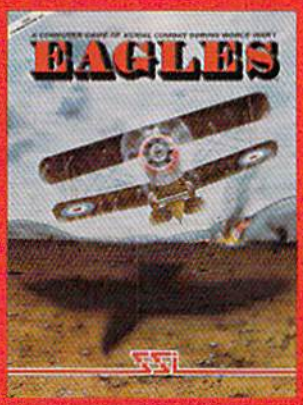

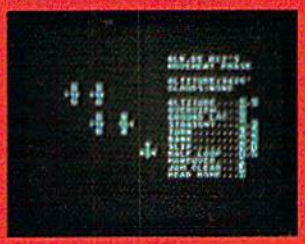

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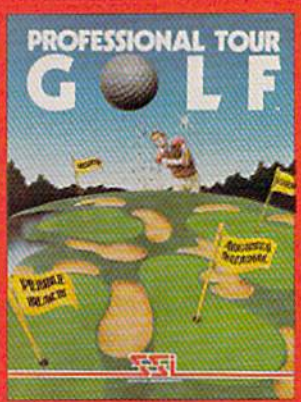

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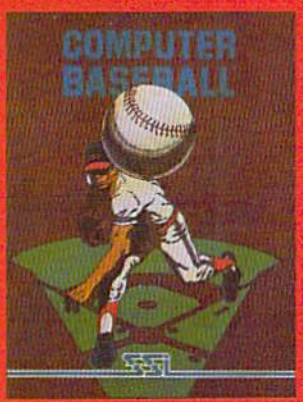

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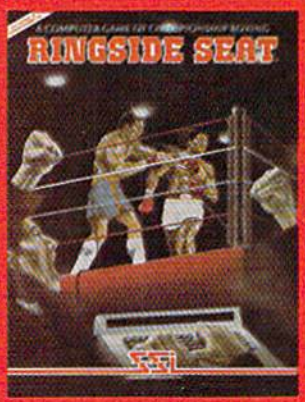

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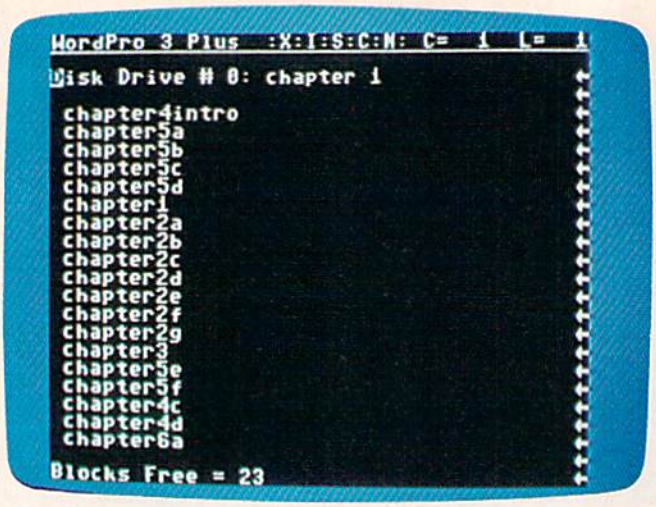


The WordPro 3 Plus *directory displays filenames and blocks free.*

WordPro originated from Punter's attempt to write a text-editing program rather than a full-blown word processor. But feedback from computer users about their word processing needs started him on the trail of something more. With Stuart Martin, who was among the first to recognize *WordPro*'s potential, Punter formed Pro-Micro Software Ltd.

Today, after developing successive forms of the program, Punter is writing *WordPro 64*. This new program, he says, will encompass all the features he believes belong in a word processor. Some examples: truly proportional spacing, with separate printer drivers for printers which need them; double-column printing; and screen formatting that will not break words at ends of lines (*parsing*), a real boon in proofreading.

From his own experiences and observations of other software writers and programs, Punter has some clear thoughts on what separates first-rate programmers from the also-rans: originality, understanding the users' needs and possible mistakes, and taking the care to create speedy, easily handled programs.

"The ones who aren't the top programmers are the ones who can't come up with their own ideas. They copy everyone else, and they're not going to gain the recognition," he says. "Another step is that you have to understand what the user is going to encounter. A lot of programmers I've seen don't really take that into account. Subsequently, those programs are either easy to crash or easy to mix up. It's very important that the programs be bullet-proof—that's a word that's been coined over the years. Besides being bullet-proof, a program must be easy to understand."

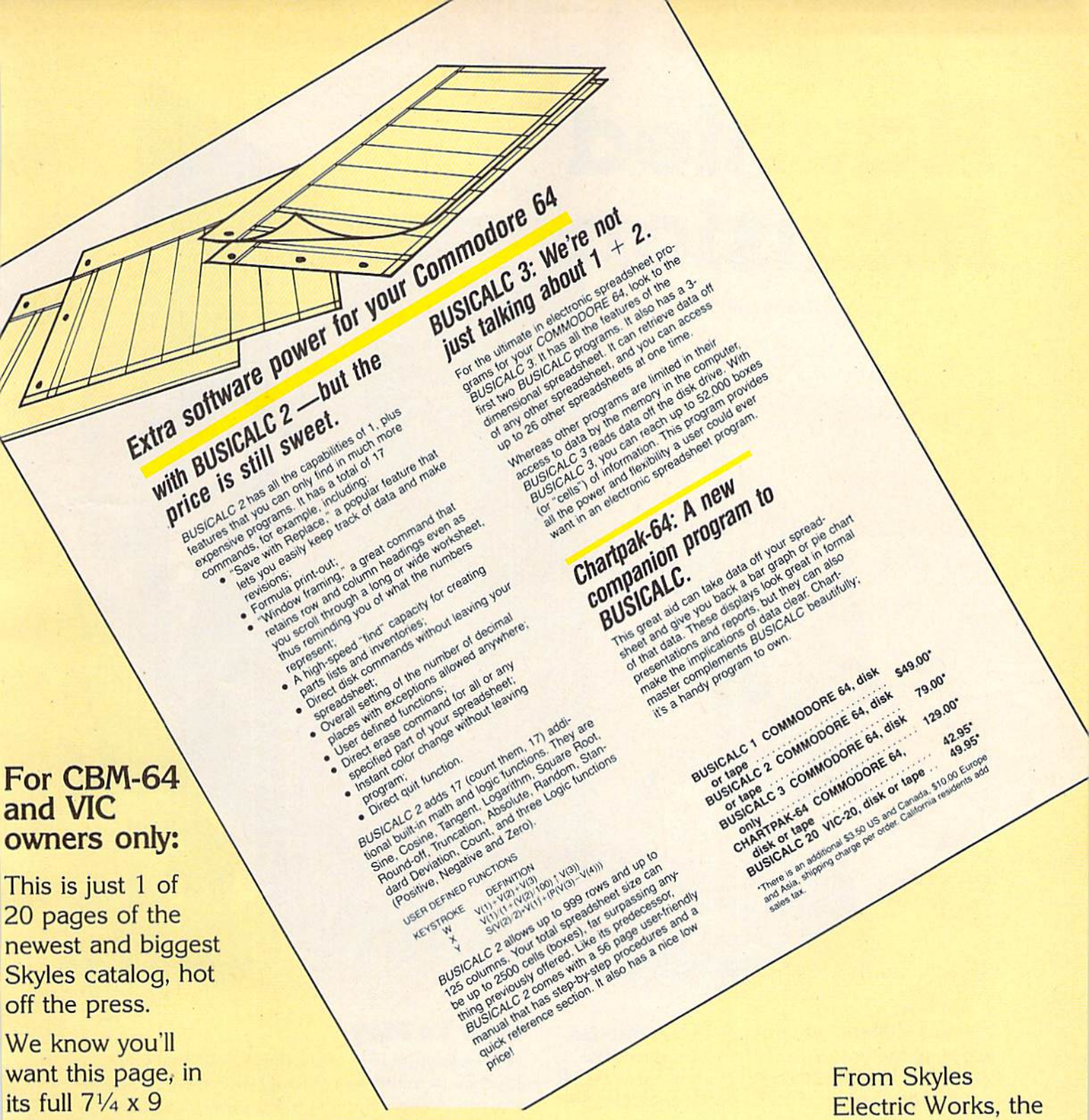
Many programmers today favor a multiple-menu approach to software, and Punter agrees that the concept is valid. But he also thinks that quick and logical keystroke commands make programs even easier to use. Although he admits his approach may require extra effort of the user at first to learn the commands, Punter is convinced that the end result is much faster and simpler handling over the long haul. *WordPro* is based on that principle.

A bachelor who lives in one of North America's most exciting cities, Punter gets away from programming with interests in music and video, science fiction reading and conventions, and occasional long drives.

"Sometimes I go through periods when I don't do a thing because I just can't come up with anything new. Then I get these times when I sit down and program and program. It comes and goes," he says.

"I get people around me who say, 'Oh, you're just being lazy' when I'm not working. And sometimes I do feel guilty for spending, say, a week or two without doing a thing. But occasionally that's good for me. Then it clears up all of the dead ends I've run into."

Punter is less than certain that ten years from now he will still be writing programs with the same zeal. But in the immediate future, at least, Commodore users can expect a few more interesting software products from the author of *WordPro*.



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- User defined functions;
- Direct erase command for all or any specified part of your spreadsheet;
- Instant color change without leaving program;
- Direct quit function.

BUSICALC 2 adds 17 (count them, 17) additional built-in math and logic functions. They are Sine, Cosine, Tangent, Logarithm, Square Root, Round-off, Truncation, Absolute, Random, Standard Deviation, Count, and three Logic functions (Positive, Negative and Zero).

USER DEFINED FUNCTIONS	
KEYSTROKE	DEFINITION
W	V(1)+V(2)*V(3)
X	S(V(2)/2)*V(1)+(P(V(3)-V(4)))
Y	

BUSICALC 2 allows up to 999 rows and up to 125 columns. Your total spreadsheet size can be up to 2500 cells (boxes), far surpassing anything previously offered. Like its predecessor, *BUSICALC 2* comes with a 56 page user-friendly manual that has step-by-step procedures and a quick reference section. It also has a nice low price!

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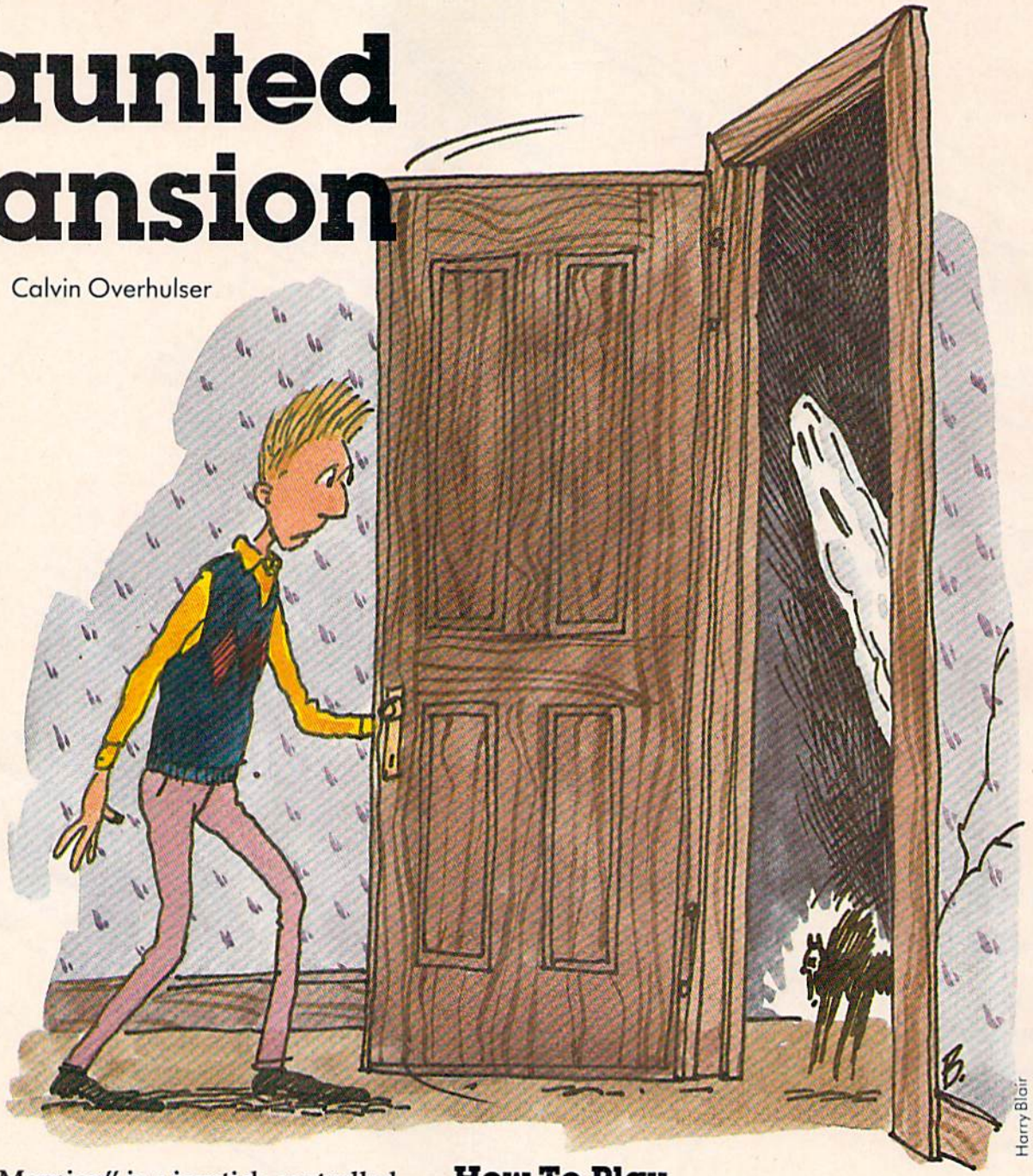
Haunted Mansion

Calvin Overhulser



Harry Blair

"Haunted Mansion" is a joystick-controlled action game with colorful and imaginative graphics. Written for the VIC with at least 3K expansion, we've added a version for the 64.

An evil witch has captured some friendly neighborhood cats and taken them to her haunted mansion, where she will later turn them into "witch cats." She is out flying on her broom in search of more—so now is your chance to enter the mansion and rescue the cats. The witch's mansion is a maze of corridors, and she has placed the cats in various locations throughout the maze. Your goal is to rescue the cats while avoiding ghosts, bats, and evil spirits.

How To Play

After selecting one of six skill levels, use your joystick to maneuver through the maze to one of the cats. When you've got him, return to the bottom row of the maze, the only safe spot for felines in this game. If you run into a ghost or bat on your return, you'll drop the cat and lose points. The frightened cat will then jump to another random location in the maze. The ghosts and bats aren't deadly. When you run into one, you eliminate it, but lose points. At the higher skill levels, you'll have to sacrifice points by deliberately running into the ghosts or bats to clear a path to get to a cat.

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Menacing demons surround the player (right center) in this VIC game of "Haunted Mansion."

lanterns). If you run into one of them, there's no second chance—the game ends, and your final score, skill level, and round are displayed. You will then be given the option to play another game and choose a skill level. The higher skill levels award more points but are more difficult.

For VIC Users

If you have a VIC, you must use a memory expander. If you use a 3K expander, just type in the game (read Typing Tips at the end of the article) and run. If you use 8K or greater expansion, type in the following line before loading or entering the program:

```
POKE 642,32:SYS 58232
```

Be sure to enter this line in immediate mode and press RETURN before loading the program, as it is necessary to move the start of BASIC to the beginning of the first 8K expansion block of memory.

How The VIC Version Works

I have included REMs for the major subroutines to show how the program is logically constructed. The main loop is in lines 210–240. Lines 300–307 are used to update the location of the cat saver (the player) and the selected evil spirit. The ON...GOSUB in line 215 for the cat saver and in line 630 for the selected evil spirit allows the new location for either to be calculated using the same subroutines.

To speed up the joystick response, I used a machine language routine which is READ in line 120 and POKEd into the cassette buffer. The DATA statements are found in lines 9000–9040. The SYS in line 210 calls the routine, which places the value of the joystick reading in location 830 and the fire button reading in location 831.

If you think of the joystick positions as points on a compass, you can see the joystick values in location 830 as follows:

Joystick Position	Value in 830
None	0
N	1
NE	2
E	3
SE	4
S	5
SW	6
W	7
NW	8

The fire button values are contained in location 831 as follows:

Fire Button	Value in 831
ON	16
OFF	0

This routine allows the BASIC program to PEEK(830) or PEEK(831) as needed, and it reads the joystick twice as fast as an equivalent BASIC routine. In this game, the fire button is not used and only joystick positions N,S,E, and W are needed. The beauty of this routine is that it returns all conditions of the joystick and fire button, but you use only the ones you need.

If you've already looked at the game, you've probably noticed the custom characters. The first 64 normal VIC characters are moved by line 110 into Random Access Memory (RAM). Lines 130–150 then READ and POKE the DATA statements (lines 10000–10190) for custom characters into RAM. Line 100 lowers the top of memory (only when running with the 3K expander) to protect the custom character set from being obliterated by BASIC. Incidentally, creating the custom characters was not such a chore because I used David Malmberg's "Custom Characters For The VIC" program from *COMPUTE!'s First Book Of VIC*. Table 1 lists the custom characters and their screen codes.

"Haunted Mansion," 64 version.

TAKE A BREAK!

For Commodore 64

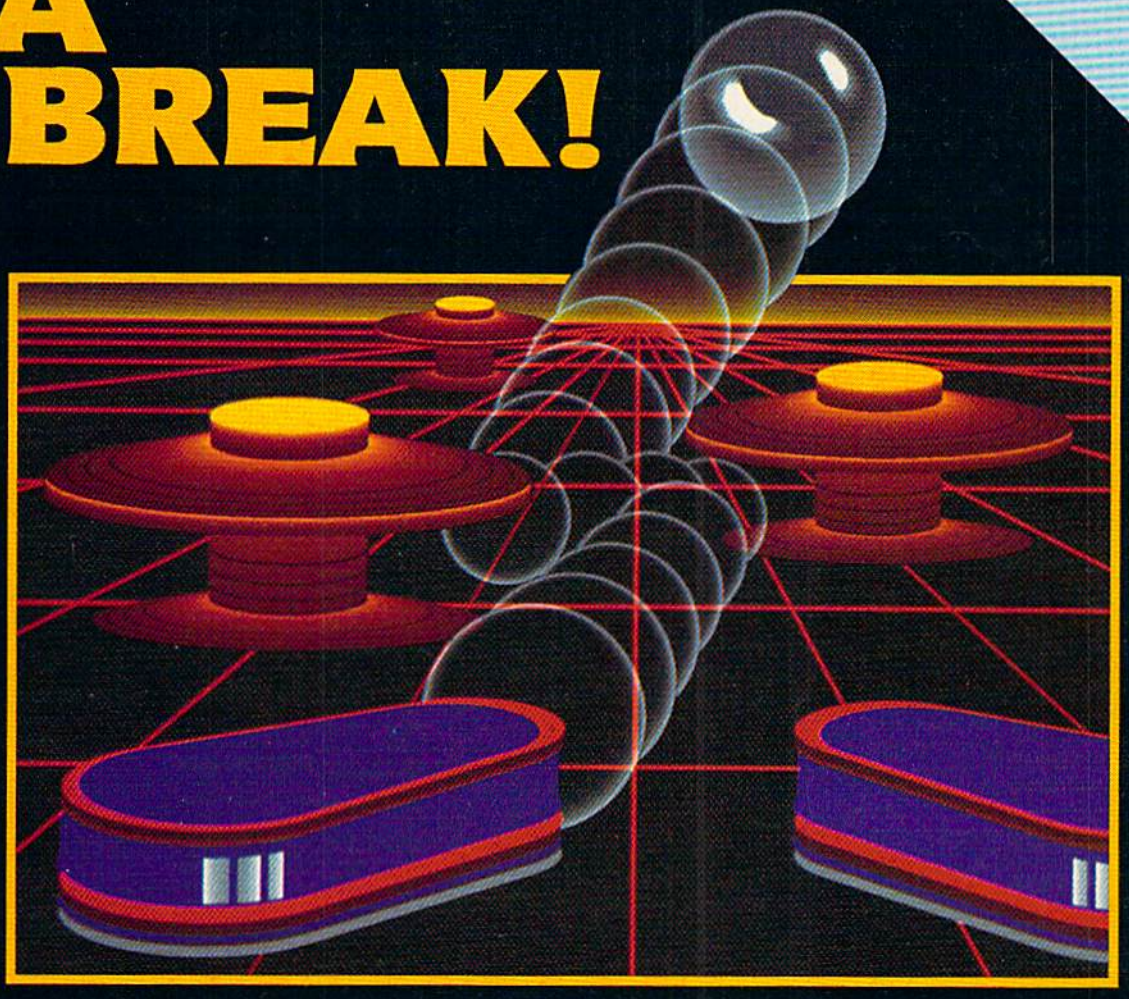

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Table 1: Custom Characters

SCREEN CODE	ORIGINAL CHARACTER	CUSTOM CHARACTER
27	[	Witch
28	pound	Witch
29	]	Witch
30	↑	Witch
31	←	Evil spirit
35	#	Solid block
36	$	Moon
37	%	Moon
38	&	Moon
39	'	Moon
40	(	Moon
41	)	Moon
42	*	Moon
43	+	Moon
44	'	Roof
45	−	Roof
58	:	Cat saver
59	;	Ghost
60	<	Cat
61	=	Bat
62	>	Space (outside house)

Note that there is a custom character "space" (screen code 62) in addition to the normal space (screen code 32). This allows the same character to be displayed on the screen with both codes, but allows the program to tell the difference. The normal space is used inside the mansion, and the custom character space is used outside. This keeps the cats, bats, ghosts, and evil spirits from appearing in the sky since they can be placed only in a location containing a normal space.

The game screen is built in lines 1000–1093, and the maze is generated in lines 1200–1292. Variable names, listed in Table 2, are used more than once where possible to conserve memory.

Table 2: Program Variable Names

VARIABLE	DESCRIPTION
A	Variable in READ statements.
I	Miscellaneous counters in FOR/NEXT loops + random numbers.
J	Random number.
N	Counter in FOR/NEXT loops.
O	Constant = 0.
P	Constant = 1.
Q	Constant = 22.
V	Volume (36878).
X	Counter in FOR/NEXT loops + random numbers.
Z	Current location to be updated in subroutines 300–307.
AA	Skill level.
A$	String for GET statements.
BL	Flag to place character.
CC	Cat counter.
CF	Cat flag CF = 4 means carrying cat.
CL	Current location for cat saver.
CM	Difference between color memory and screen memory.
DF	Dead flag.
HL	Constant = 32.
RN	Number of current round.
SC	Screen RAM location.
SR	Current score.
SH	Sound high (36876).
SL	Sound low (36875).
TL	Temporary storage for CL or A(I) during update.
WL	Constant = 35.
A(0) – A(3)	Variables for maze generator.
A(1) – A(13)	Locations of evil spirits.

Typing Tips

This is a long program to type in, so be sure to use the keyword abbreviations found in Appendix D of *Personal Computing on the VIC-20*, which came with your VIC. *Don't add any spaces*! At certain points in the program, there are only about 100 bytes free when using the 3K expander. If you'd rather not type in the program (VIC version only), send a self-addressed stamped mailer, a blank tape, and $3 to:

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See program listings on page 185.

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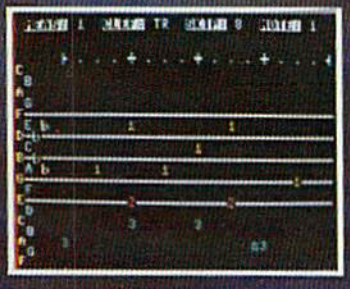

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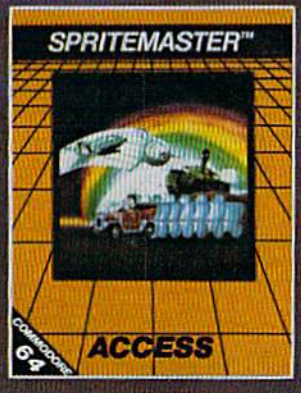
SPRITEMASTER™ is not just another sprite editor. It's the finest utility available for multicolor sprite animation and game programming. It will have you making full color animated objects in just minutes. People running,birds flying or tanks rolling are a snap with Spritemaster. It will automatically append your sprites to other programs. It's easy to use and understand and comes with a full 21 page instruction manual and samples of animated sprites to get your started. (Suggested retail price...$34.95)



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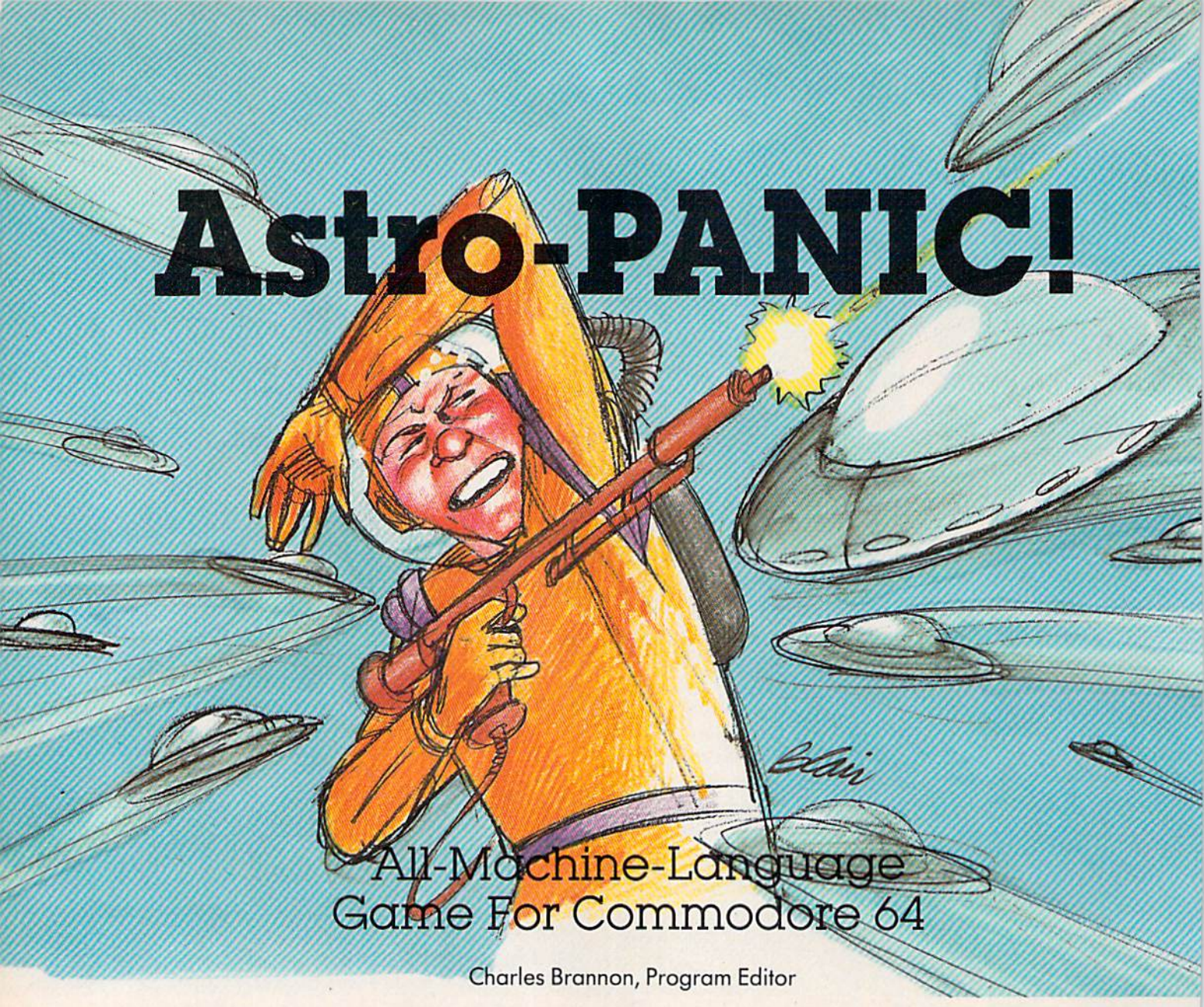
Astro-PANIC!



All-Machine-Language Game For Commodore 64

Charles Brannon, Program Editor

Written entirely in ultra-fast machine language, "Astro-PANIC!" is an arcade-style space game with multicolored sprites and 15 frantic levels of difficulty. Will you be the first human to make it to level 15?

"Astro-PANIC!" is a fast-paced, high-speed, all-machine-language game. The object is to defend your cannon, maneuvering it left and right as alien saucers dodge and dive in a relentless attack.

Plug a joystick into control port two to play. After loading from tape or disk (see special instructions below), enter SYS 49152 to run the program. The screen clears to black with a gray score window at the bottom. Press the f7 function key to begin.

Swooping Saucers

Instantly, seven alien saucers begin to sweep about the screen. Saucers always keep moving in their current direction until they hit a screen boundary, then they rebound, sometimes changing their speed. Meanwhile, you move your cannon left and right to evade the erratic dives and swoops of the saucers. The slightest contact with an alien saucer spells destruction.

Fortunately, you have your Super Weapon, a laser/heat-ray/particle-beam/thermonuclear ray gun. Simply press the trigger button on the joystick to unleash a bolt of this incredible power. The bolt continues until it hits a saucer, atomizing it, or until it reaches the top of the screen. If you hold down the fire button, the bolt continually repeats.

You can pause the game at any time by pressing SHIFT, or freeze it by depressing SHIFT LOCK. Simply press SHIFT LOCK a second time to continue the game.

Scoring is determined by how close you are to the saucer when you hit it. Since the saucers

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SPECIAL FEATURES INCLUDE: incredible graphics and sound; sound on/off option; two player option; joy-stick or keyboard operation; multiple difficulty levels; high scores saved on disk and cassette. These features make J-BIRD enjoyable for everyone.

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To order by mail send $29.95 for J-BIRD to: ORION SOFTWARE, P.O. BOX 2488, Dept. 1283, Auburn, Alabama 36831.

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Enemy saucers (multicolored sprites) hover and dive upon the defending player in this game of "Astro-PANIC!"

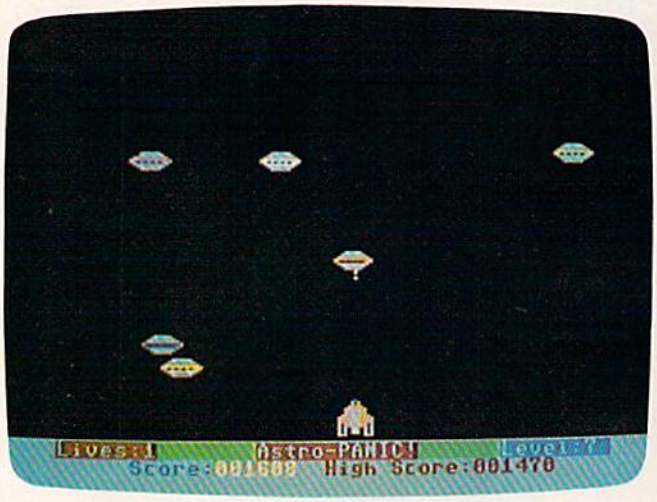
are more dangerous near the bottom of the screen, you get more points for shooting them there. The score is derived from the saucer's position (31 to 210) divided by 8.

If you destroy all seven saucers, you advance to a new screen. Each level is faster than the previous one and is indicated in the score window (1–15). Be warned—levels ten and above are manic!

You lose a cannon whenever a saucer collides with you. The game is over after you lose all three cannons to the marauding saucers. The scoreboard keeps track of the high score during the current session. Press f7 to start another game. Watch the time, though: Some people don't know when to quit!

Playing Tips

Keep moving. It is more important to protect your cannon than to make that tricky shot. Dodge the aliens first, shoot later. You won't always want to hold down the fire button to repeat, since sometimes a shot will be in the air when you'd rather shoot the alien right above you. Keep an eye on the movement of the saucers, so you can sometimes synchronize several wipe-out shots. Watch out for the edges of the screen. Aliens will sometimes bounce off an edge right into you.



An attacking saucer is zapped at midscreen in level 7.

Typing The Program

To type Astro-PANIC!, use MLX, the Machine Language Editor, which virtually guarantees foolproof entry of machine language programs. You'll find a complete description elsewhere in this issue. Here is the information you'll need to enter Astro-PANIC! with MLX:

Starting address—49152
Ending address— 50777

After you are finished typing, MLX will let you save the program to tape or disk. Thereafter, just LOAD "filename",1,1 for tape or LOAD "filename",8,1 for disk, then SYS 49152 to begin.

During our testing of Astro-PANIC!, no one ever made it beyond level 12. Level 15 is waiting for the truly wired. Keep a sharp eye for any strange-looking lights in the sky.

See program listing on page 174.

Sophisticated Software from Britain.

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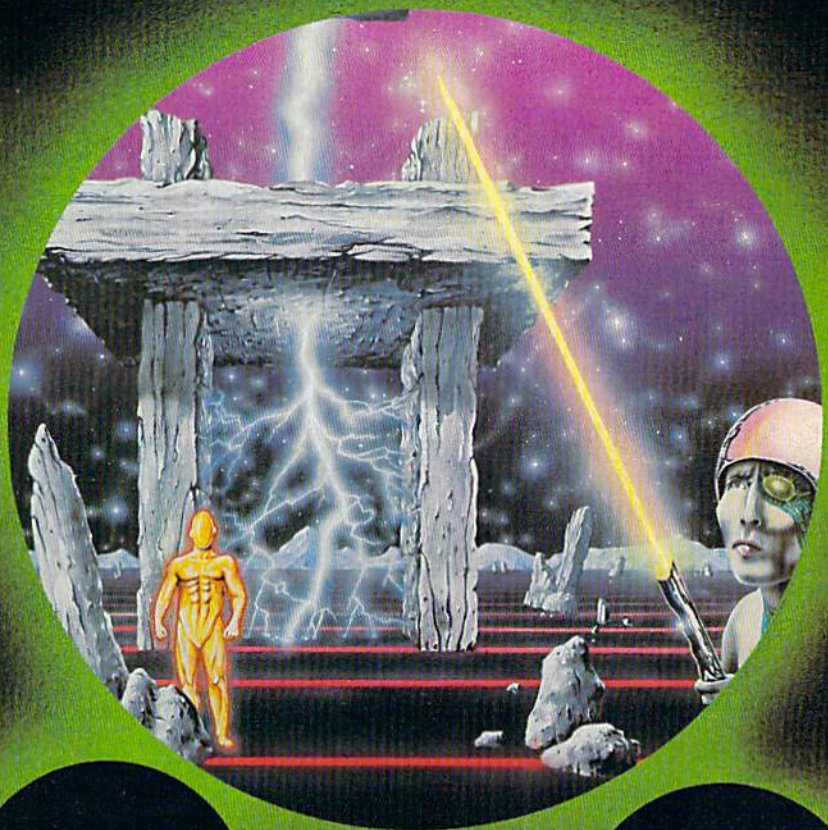

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COMMODORE 64 SOFTWARE

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QUINTIC WARRIOR
COMMODORE 64 SOFTWARE

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RING OF POWER
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The Colorful King has lost his mind and along with it the Crown Jewels! Now whosoever can find the Jewels shall be proclaimed King. Can you? RING OF POWER is a sophisticated adventure with a GRAPHICS or TEXT option.

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SKYHAWK
VIC20 SOFTWARE

Attacking raiders scream out of the sky at you, you check your radar as an explosion blossoms at your side, you return their fire sending one of the attackers plummetting, the fuel gauge flashes a low fuel warning... SKYHAWK runs in 3K or 8K with a Joystick.

TORNADO
VIC20 SOFTWARE

Suddenly attacking Colony Fighters leap at me, I dive into their midst firing and still bombing the ground installations below, the sound of explosions rumbles away over the landscape... TORNADO runs on an unexpanded VIC20 + Joystick.

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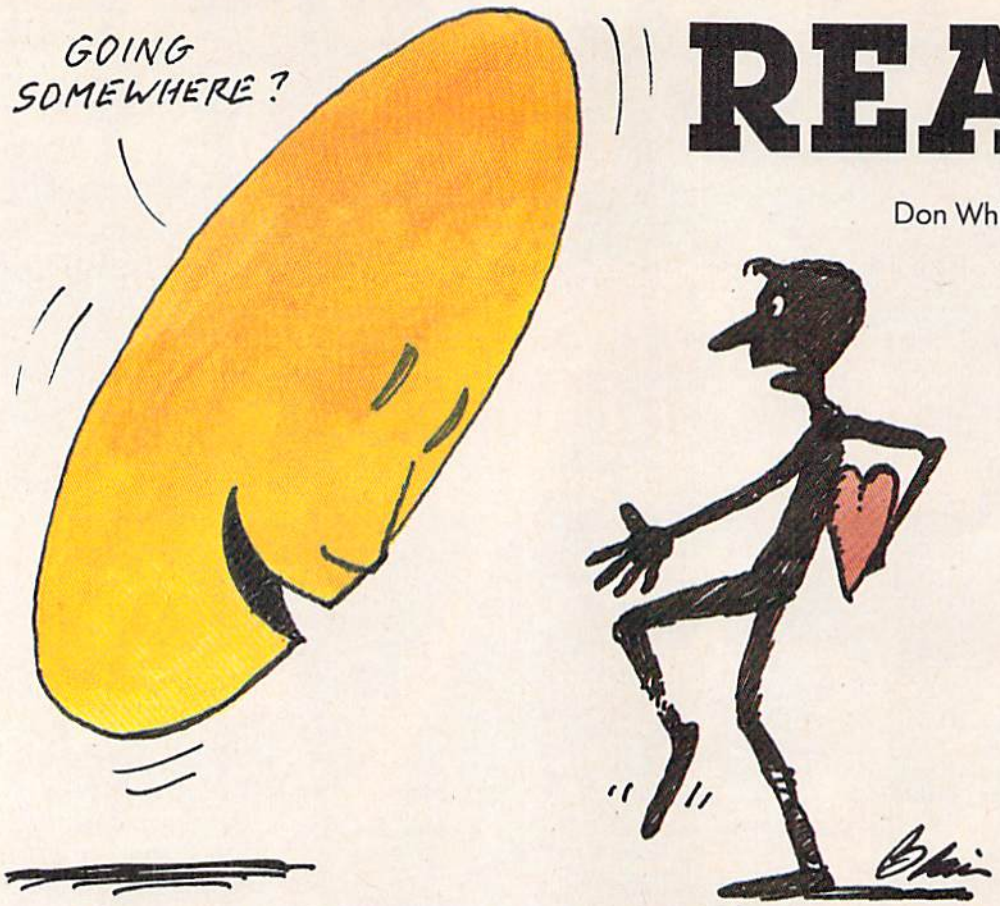
REACT

Don Whitaker



"React" is a fast-action, strategy game for the unexpanded VIC and Commodore 64. A joystick is required.

"React" is a colorful, fast-action game in which your joystick-controlled character, called a "Maynerd," must clear the screen of all the prizes. What's difficult is avoiding the electric fence, the guards (who look like smiling faces, but they're actually leering at you), and your own trail (a solid colored line you leave behind).

How To Play

You begin the game with five Maynerds. Press the fire button to start. After the screen appears, use your joystick to move your Maynerd to one of the colorful prizes. After a few tries, you'll discover that React is not only an action game, but also a strategy game. If you randomly collect prizes, you might find that you've boxed yourself in and can't get to one of the remaining ones.

If you run into the electric fence, a guard, or your own trail, your Maynerd is eliminated. The screen displays your score, the number of Maynerds remaining, and bonus points. Each round gets harder as you have more fences and guards to avoid.

The only real way to amass points or play competitively is to collect bonus points, which are awarded when you clear the screen in less than 60 seconds. There is no clock on the screen, but you do hear the timer ticking away. The faster you are, the higher your bonus.

Typing In The VIC Programs

Programs 1 and 2 are for the VIC (no expansion memory required), and Program 3 is for the 64. VIC users should use keyword abbreviations (such as ? for PRINT). For a complete list of these, see Appendix D of *Personal Computing on the VIC-20* (the manual which comes with the VIC). Also, don't use unnecessary spaces. React uses virtually all of the VIC's memory.

Type in Program 1 and SAVE it twice (just to be safe). Then enter NEW, type in Program 2, and SAVE it twice. Next, LOAD and RUN Program 1. The screen will display "DO YOU WANT TO CENTER THE SCREEN? (Y/N)." If your TV is a little out of adjustment, use the cursor controls to adjust the screen up, down, right, or left. Pressing RETURN will automatically load Program 2 and run React.

If you're using disk, press RUN/STOP after Program 1 has RUN, and LOAD Program 2.

How The VIC Version Works

Program 1 creates the custom character set and allows you to center the screen. Program 2 is the main game. Here's a description of both programs:

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- As many databases as you want – each with up to 15 files
- Learn fast through built-in HELP screens – then add your own notes

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- Keyed records for high speed retrieval – 3 secs for any file size
- Select and search for any name, description, number, date, etc. in multiple combinations
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- Display selections or generate printed reports
- Browse through records matching on any criteria

TOTAL CONTROL
- Links to other programs and EASY SCRIPT for personalised mailings, high-quality letters, quotes, tables, etc.
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Superbase 64™

Precision Software

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NEW YORK
N.Y. 10128
(212) 410 3418

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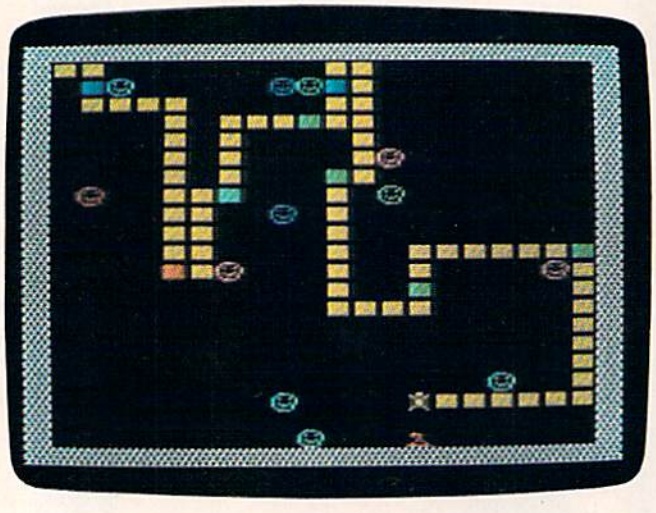
Program 1.

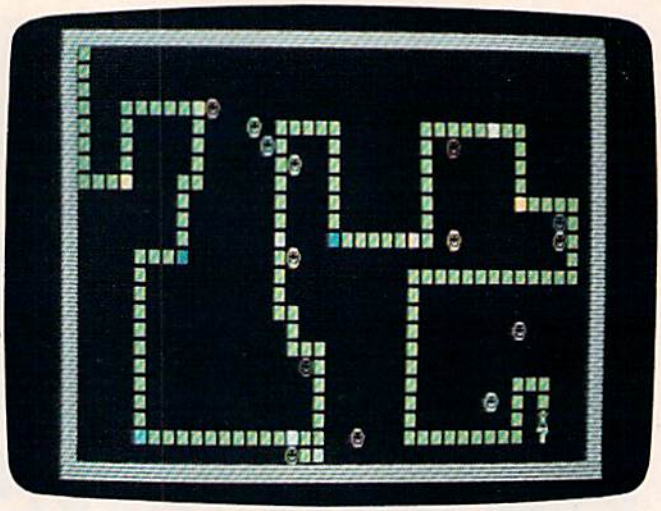
Lines	
10–40	Clear screen, change screen colors, print screen-centering option.
50	Clear screen, change screen color to black.
70	Reserve an area of memory for new character set.
80	Copy characters (uppercase letters and non-graphic symbols) to memory locations 7168–7679.
120–166	Redefine new characters.
170	Delete Program 1, then load and run Program 2.
10000–10009	Screen-centering subroutine.

Program 2.

Lines	
5	Set a maximum volume for game sound.
10	Clear screen, set character color to black, and change screen colors.
20–28	Print title.
30–40	Add sound effects and color to title.
109–130	Define variables.
135–136	Cause delay while waiting for fire button to be pressed.
160	Change screen color to black and switch to alternate character set.
180	Branch to screen-drawing subroutine.
190–210	Randomly color and locate the guards.
220–240	Randomly color and locate the prizes.
249	Set realtime clock to 0.
250	Begin main loop. Place Maynerd in starting position and read joystick.
260	Check for collision with fence, guard, or trail. On collision, branch to "lose Maynerd" subroutine.
270	Check to see if Maynerd has moved.
280	Check to see if Maynerd has collected a prize.
290	Cause "running feet" sound, increment score, update Maynerd's position, and return to line 250.
390	Check to see if fire button was pressed.
400–420	Check joystick position.
440–450	Draw basic game screen.
460–550	Add more fences to screen.
560–580	"Lose a Maynerd" subroutine. Change screen border to yellow, sound explosion, and check to see if any Maynerds are left.
600–610	"You got all the prizes" subroutine. Cause sound and color display, determine bonus, and add it to score.



Maynerd claims prizes while avoiding the smiling guards and his own trail in the VIC version.



This Maynerd has almost completed a successful run in the 64 version.

620–650	Display score, number of Maynerds left, and bonus from previous screen.
660–670	Wait until fire button is pressed.
680–720	"Game over" subroutine. Display high score and most current score. Wait for press of fire button to start new game.

Program Variables

CO	Memory location (36879) for screen and border colors.
SM	Screen code value (28) for a guard.
ML	Number of Maynerds left.
C	Difference between screen memory and screen color memory (30720).
ER	Screen code value (32) for a space.
MA	Screen code value (0) for a Maynerd.
TR	Screen code value (30) for Maynerd's trail.
WA	Screen code value (31) for electric fence.
S	Memory location for voice two (36875).
V	Memory location for volume control (36878).
NE	Constant for adding to score.
SC	Current score.
NM	Number of guards.
NC	Number of prizes.
CL	Current number of prizes still on screen.

JS(X,X) is an array used to translate the joystick position to numbers that correspond to Maynerd's movement.

DD, PA, PB, OP, TF, N1, N2, N3, and N4 are constants used for reading the joystick.

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

Don Whitaker
8200 Pennsylvania Way
Thornton, CO 80229

See program listings on page 181.

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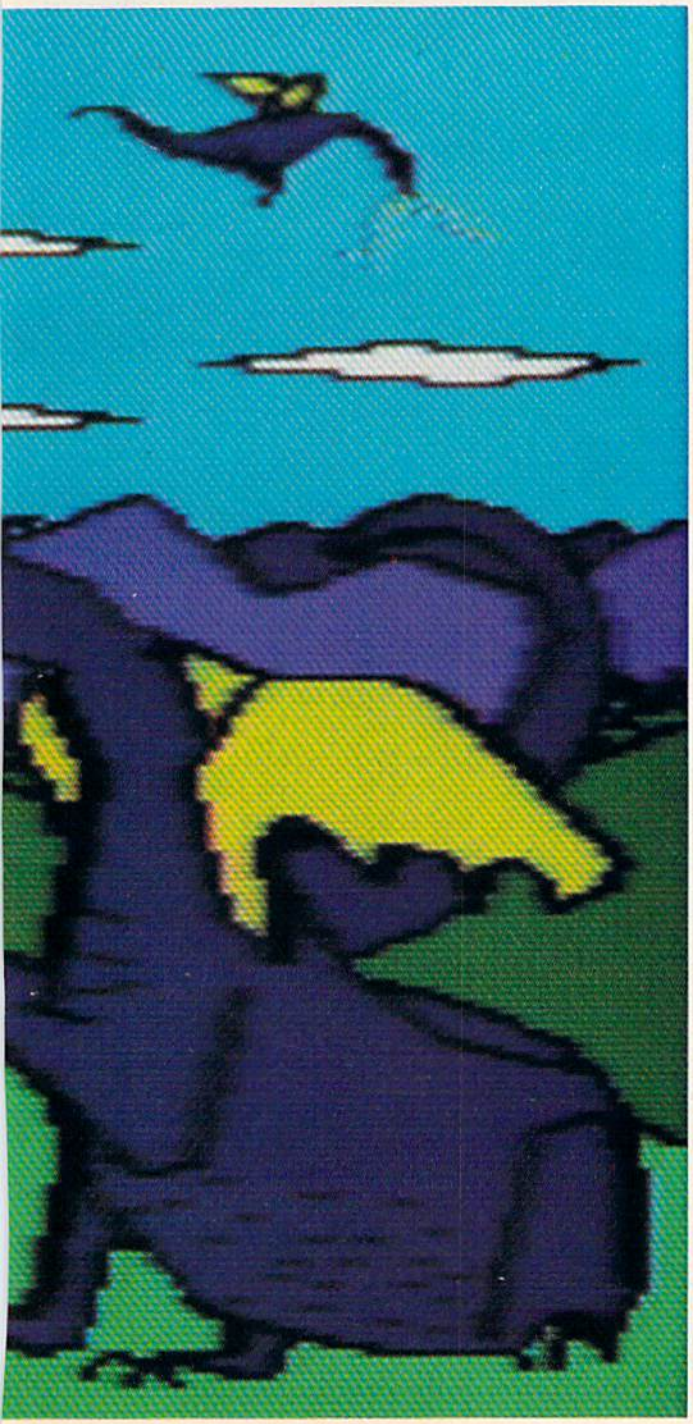
The New King Of The Mountain

Fred D'Ignazio, Associate Editor

My daughter, Catie, was born in December 1975. My son, Eric, came along in April 1979, over three years later. Today Eric is four, and Catie is eight. When I look at Catie, she always looks bigger than I remembered. When I look at Eric, he always looks smaller.

Catie amazes me because she is growing up so fast. Eric amazes me because he is staying little so long.

I don't know how many times I have wished that, somehow, Eric would catch up to Catie. It's not that I wish Eric would physically grow as big as Catie. It's just that I wish he would be as *able* as Catie at lots of different things—things like reading, writing, talking, listening, walking, running, minding his parents, drawing, painting. You name it.



This is a big secret that I'm telling you. I've never even shared it with my wife, Janet.

But I'm not the only one in our family who feels this way. Eric feels this way, too. I can tell just by watching him struggling to keep up with his big sister. No matter what Catie does, Eric is there, too, trying to do it. But he is always a little slower than Catie, a little less able.

That doesn't stop Eric from trying. In fact, I think it makes him try even harder. And it has made him pick up the habit of jumping into any situation, no matter how difficult and complex, with the expression: "I know how to do it. Let *me* do it."

Unfortunately, in most cases Eric *doesn't* know how. But that doesn't stop him from trying.

And it doesn't stop me from admiring him.

Eric makes me think of other four-year-olds, especially four-year-olds with older siblings. They must be a pretty hardy bunch. They are at the bottom of the family totem pole no matter what is going on. They always come in last. Yet they never stop trying. I think that's pretty amazing. I know I couldn't do it. It takes a lot of spunk.

The Great Equalizer

Last week we got a new computer product for our Commodore 64—the KoalaPad from Koala Technologies. The KoalaPad comes with a black plastic stylus (a pencil without a lead) and a software package, *KoalaPainter* from Audio Light, all for $125.

KoalaPainter is a do-it-yourself, create-your-own pictures kit. It is also the great equalizer that has reversed Eric's position in the family. He used to be the least-accomplished artist in the group (with the possible exception of our fat black cat, Mowie). But now he is the best artist in the family (the best *video* artist). He is the king of the mountain. And he's loving his new position.

The Acid Test

The acid test for any new computer product is whether it lets people do something on the computer that either (1) they could not do without the computer, or (2) they could not do as well without the computer.

The KoalaPad and *KoalaPainter* have dramatically passed this test. Eric can do things now on the computer that he could never duplicate on paper. In fact, Eric can do things on the computer that I can't duplicate on paper or the computer. And I'm 34.

For a four-year-old, Eric is a pretty good artist. But, using crayons, magic markers, and paper, he is no match for his big sister or, for that matter,

Janet or me. However, using *KoalaPainter* Eric is more than our match. Eric is now the reigning video-art champ of our family.

When Eric first boots up the *KoalaPainter* disk he sees a bunch of "menu" boxes on the display screen. When he presses the point of the plastic stylus against the KoalaPad, he sees a cross-hairs drawing cursor on the picture screen. By moving the stylus around on the pad, he moves the cursor on the picture screen from box to box.

The boxes let Eric choose the size of his paintbrush, the color of "paint," and the type of drawing he wants to do. Here are some of the boxes that hold Eric's drawing tools. With these tools Eric can:

* DRAW	Draw freehand.
* LINE	Create "rubber band" lines that stretch across the screen.
* LINES	Connect rubber bands, end to end.
* OOPS	Undo his most recent drawing command.
* FRAME	Make rectangular frames.
* BOX	Draw a framed filled in with a particular color.
* RAYS	Draw lines that radiate from a central point.
* XCOLOR	Change one color on the screen to a new color.
* COPY	Copy a picture or portion of a picture onto a new screen location.
* MIRROR	Create mirrored images simultaneously on the picture screen.
* CIRCLE	Draw circles.
* DISC	Draw circles filled with a particular color.
* FILL	Fill in any shape he creates with any color he chooses.
* ZOOM	Magnify a picture for detailed drawing, erasing, or changing.
* SWAP	View two pictures at the same time. Using the COPY command Eric can copy portions of one picture onto the other picture.
* STORAGE	Store his pictures on disk.
* ERASE	Erase the entire drawing area.

This sounds like an overly powerful array of tools for a four-year-old. Don't believe it. They boggle Janet and me, but they do not boggle Eric. He attacks *KoalaPainter* the same way he charges down the street on his Big Wheels bike—ZOOM!

Rough Drafts

Once, a couple of years ago, I had a conversation with Alan Kay, Atari's chief scientist for research and development. Kay is also one of the inventors of Smalltalk.

We were talking about the difference between a novice doing a task and an expert doing the same task. Kay said the key difference was that the novice was happy to do the task once, then go on to something else. The expert, on the other hand, did the task, then did it again and again to do it better. Each time the expert did the task it was like producing a "rough draft" of a writer's manuscript. The expert kept churning out new drafts. Along the way the expert polished, embellished, corrected, adjusted, and fine-tuned the product of his or her labors until it was done right. Then the expert went on to something else.

Why don't novices do rough drafts like experts?

They don't because usually it is too hard. They barely know their craft—of writing, painting, bridge building, cartwheel turning, driving, or whatever—and they usually work with primitive, amateurish tools. The expert, on the other hand, works with the finest tools technology can produce and is competent, disciplined, and experienced in the craft. The mechanical part of the work comes naturally, intuitively, and effortlessly. With the right tools and skill, the expert can reel off several drafts in the time it takes the novice to complete just one.

Computer Elevator Shoes

What happens, though, when you put a tool into a novice's hands that compensates for his lack of experience, his undeveloped motor and cognitive abilities, and his dearth of skill and craft?

KoalaPad's *KoalaPainter* is such a tool, and Eric is such a novice.

When I watch the beautiful pictures that Eric produces on the KoalaPad, it makes me think of a seesaw. Let's say I'm on one side and Eric is on the other. Usually, my greater size and weight makes the seesaw unbalanced. I drop like a stone, and Eric flies up in the air.

With *KoalaPainter* on his side, Eric goes down and I go up. What happened? It seems that *KoalaPainter* is a great equalizer. It amplifies and extends Eric's limited cognitive and motor skills

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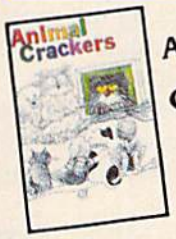

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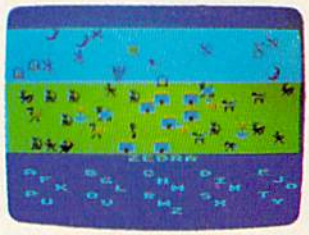

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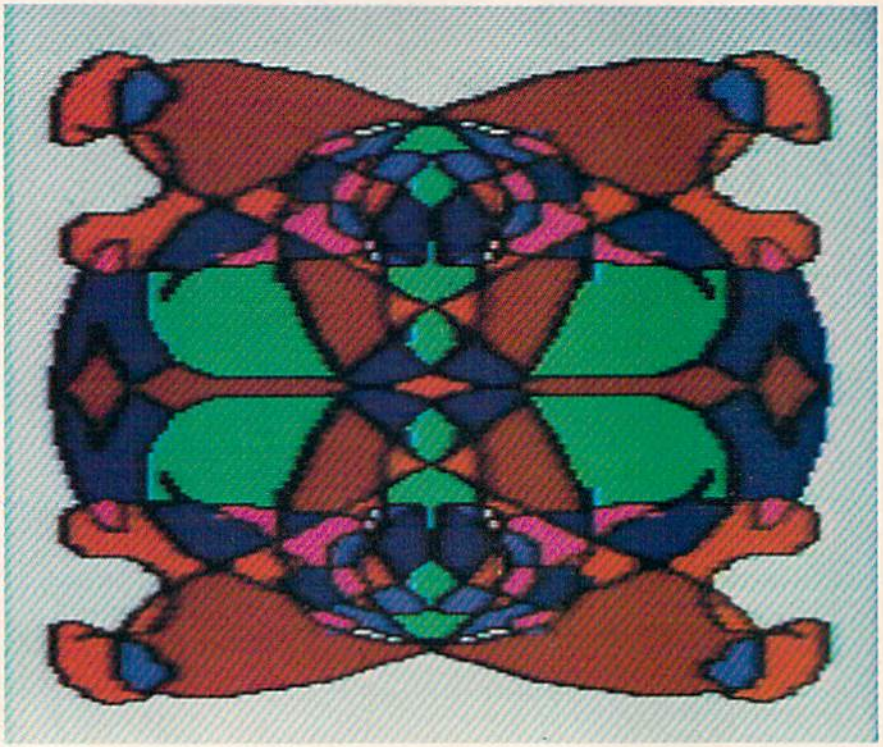

beyond my own. It also taps his unbridled energy and imagination. It harnesses his tremendous curiosity and his tireless capacity for exploration and discovery.

With *KoalaPainter*, Eric does *lots* of rough drafts. And he does them fast!

The Brick Wall

Watching Eric use the KoalaPad and *KoalaPainter* can be sheer delight. It is not sheer delight at all times, however. Eric creates new *KoalaPainter* pictures at 90 miles an hour. Sometimes he takes a wrong turn and runs, SMACK!, into a brick wall.

Not surprisingly, Eric does not like to run into brick walls. So what does he do?

Sometimes when he runs into a wall he backs up and tries a new path. Sometimes he tries climbing over the wall. Sometimes he tries to knock the wall down.

And sometimes he just sits there and howls.

Leonardo The Little

When Eric boots up the *KoalaPainter* disk he sees the menu with all the little pictures of brush sizes, paint colors, and activities. He never pauses to study this menu. Instead he presses the KoalaPad with his stylus, chooses a color, a paintbrush, an activity, and dives right into making a new picture.

I often wonder: Does he think that fast? Or is he in "playground" mode where he races from swings to monkey bars to merry-go-round randomly and at top speed?

In any case, within seconds after turning on the computer, Eric has a new picture under way. And, more often than not, the picture is stupendous.

This is because, to create a picture, Eric has usually employed all the tools that *KoalaPainter* provides. All the tools. It may not be the most efficient way to make the picture, but it's Eric's way.

He uses the CIRCLE command to grow concentric circles of different colors around the screen.

He uses the MIRROR command and the RAYS command to create prickly sea urchins with purple and green spikes.

He uses the MIRROR command and the LINE command to create beautiful, layered tiles of multiple colors.

He uses the COPY command and the ZOOM command to create lots of tiny ERICs inside boxes, triangles, and circles, all over the screen.

He uses the ZOOM command and the BOX command to erase mistakes. The ZOOM command is good for erasing little mistakes. The BOX command is perfect for the great big mistakes.

Electronic Scribble

When Eric draws on a piece of paper on the kitchen table, he often just runs the pencil back and forth across the paper. To Eric this is great fun. To me it looks like scribble.

I think that what Eric is doing on the computer is scribbling, too. He is using the powerful tools made available to him by *KoalaPainter* and the KoalaPad to do advanced (super-advanced) scribbling. This is scribbling at a new plane—*hyper scribbling*.

Maybe the reason Eric is the family champ at video art is that he is also the family's best scribbler. The other family members just can't compete. As Catie grows older, she is losing her ability to scribble. And with Janet and me, it's a lost art.

But Eric is a master scribbler. And, with the Koala tools in his hand, he is also a budding video artist. Maybe these tools will even arrest his development. Maybe he'll keep scribbling forever. And his scribbles will just keep getting more and more complex, and more and more beautiful.

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What do you like best about COMPUTE!'s GAZETTE?

It teaches me more about my Commodore 64 than any other magazine. Explanatory articles on how programs work. The Gazette is the best magazine for Vic-20 owners. Good writers! Your program listings are outstanding. The Gazette Feedback column. I rate it the best magazine for my needs. The interviews with professional programmers. I'M NEW AT COMPUTING; THE GAZETTE IS VERY HELPFUL. Plain language articles for beginners. It helps me learn the essentials and excitement of computing. The articles on Machine Language. Educational programs in basic. It's not too technical for the average person. The advanced programming techniques. The ads and reviews. ARTICLES ABOUT DISK DRIVES AND MODEMS. The large number of programs. The programming tips and reviews. Information on things the manuals do not explain. Your professional writing; you have very knowledgeable authors. I like learning how computers work. It tells me about current events in the computer industry.

The above comments are from The Editor's Feedback Cards, a monthly part of our continuing dialogue with the readers of COMPUTE!'s GAZETTE.

Every month, readers of COMPUTE!'s GAZETTE get ready-to-type-in games and applications programs, tips on programming in BASIC and machine language, reviews of new hardware and software, feature articles that explain and entertain, and much more.

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COMPUTE!'s GAZETTE

P.O. Box 961 Farmingdale, NY 11737

SPEED READER

Phil Geiser

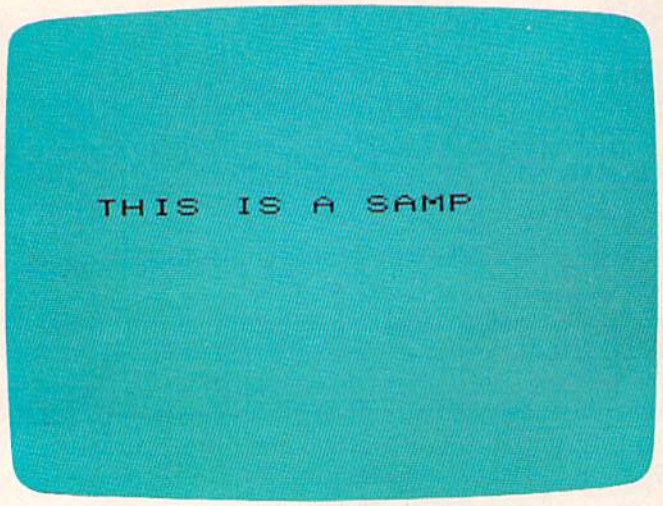
This clever reading-practice program can help increase reading speed when used properly. The program was originally written for the Commodore 64; we've added a version for the unexpanded VIC (memory expansion recommended for longer reading selections).

Everyone knows computers are good at helping us with two of the "Three R's": 'rithmetic and (thanks to word processing) 'ritin'. But what can a computer do to help your readin'?

Reading specialists have known for years that one of the problems of many slow readers is a bad habit called "regression." Simply described, these slow readers spend much of their reading time looking back to earlier words on the line of print or to words earlier in the reading selection. As a matter of fact, most people do this to some extent. Even good readers may regress up to nine or ten times for every hundred words they read.

If the reader can always keep moving ahead in the text, he or she can obviously increase reading speed. Reading teachers at all levels of education use this knowledge to design strategies to teach (force!) the reader to look only to upcoming words. Typically, reading machines display one line of text for a controlled length of time.

Since part of the problem involves training our eyes to move only from left to right, we can gain more speed by teaching ourselves this habit and not looking back to words we have already read. If we could see only a few words at a time moving from left to right, this forced movement would gradually train our eyes to move in a more efficient way. With some practice we can improve our overall reading speed, and it may even be possible to double or triple our speed with dedicated effort.



Sentences scroll by from left to right in "Speed Reader" (VIC version).

Your Computer As A Reading Machine

This program simulates those speed-reading machines which force the reader to view only one line from left to right at a controlled but adjustable reading speed.

Here's how it works. First it sets the screen and background colors as well as a printing color. Variables are initialized, then instructions are displayed. The five options include a faster or slower reading speed and the option to see more or fewer characters on the line at one time. At the start of the program you are reading about 100 words per minute (slow for an adult), and five characters at a time are being displayed.

The program reads the sample text from the first DATA statement and prints that line on the screen in the background color. One entire line (up to 40 characters on the 64 or 22 characters on the VIC) is printed, but it is not visible because it

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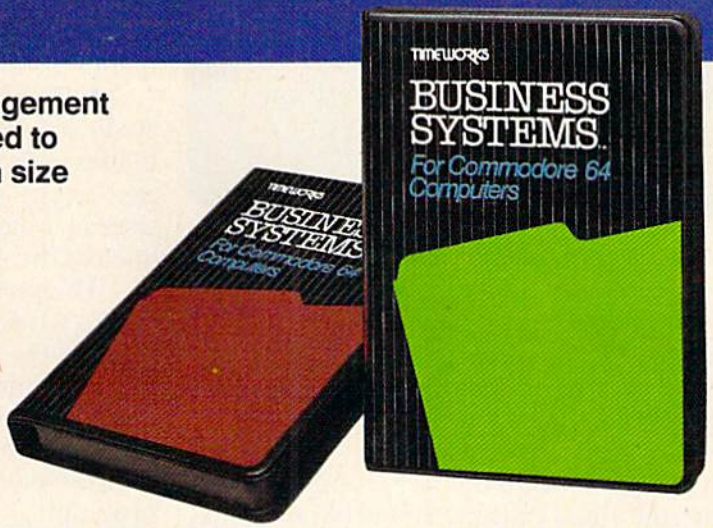

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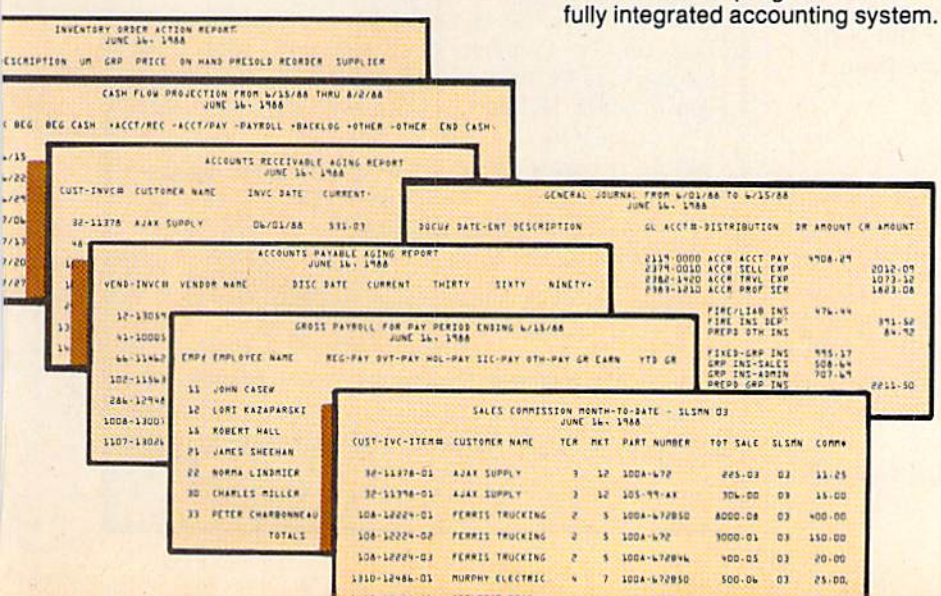

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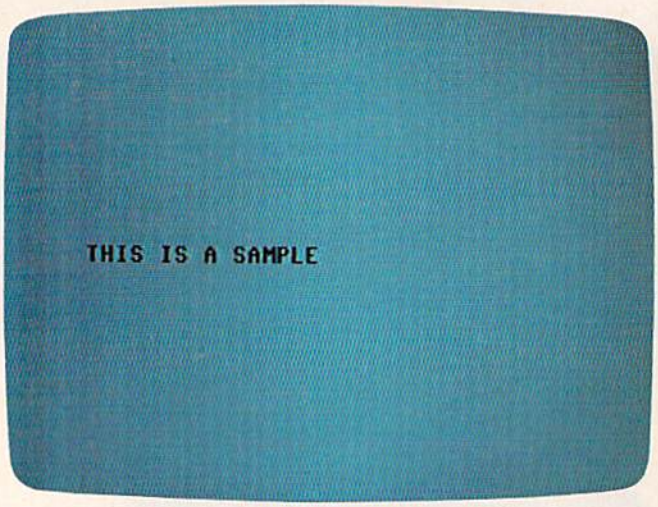


"Speed Reader," Commodore 64 version.

is printed in the same color as the background. Next, a loop POKEs the display colors of the characters already printed on that line so they appear in contrasting colors from left to right. A delay loop slows down this process.

When the left-to-right display loop has reached the rightmost column, the program scans the keyboard to check if a key has been pressed. If so, it changes the speed or the number of characters displayed at one time. Note: A key has to be held down only at the end of a line. It is at this time only that any changes in the display are made. Up to 11 characters may be viewed at one time, or you may select as few as 3 characters at a time. The program then repeats this whole process until all the text is used.

The literary selection displayed on the screen is stored in the DATA statements. The length of each statement cannot exceed 40 characters on the 64 or 22 characters on the VIC (one full screen display line). Virtually anything from a children's story to a scientific article can be typed in as your own DATA statements. The one restriction is quotation marks used in dialogue, etc. Use the single quote (apostrophe) instead.

The short routine at the end resets the computer, stops the program, and stores the final DATA statement.

Modifying The Program

You certainly don't need to be an expert programmer to use this idea to increase your reading speed. All you really have to do is type in a suitable selection in place of the DATA statements in this program. Quite a bit of typing is required to create a reading selection long enough to make this reading practice really beneficial. But such eye training has enabled some readers to make dramatic increases in their reading speed.

Here are some other suggestions and possible modifications:

1. The word DATA can be abbreviated by typing D-SHIFT-A.

2. Since your objective is to attain speed, the reading selection should be easy reading for the intended audience. A selection slightly below that person's reading ability is ideal.

3. The length of the selection should be sufficient to provide five to ten minutes of practice.

4. It is possible to put a five- or ten-question quiz at the end of the program to test for the reader's comprehension of the material.

5. The program can be modified so that the speed gradually increases automatically as the reader goes through the selection. A line such as:

```
205 LK=LK+1:IFLK>10THENLK=0:DD=DD-1
```

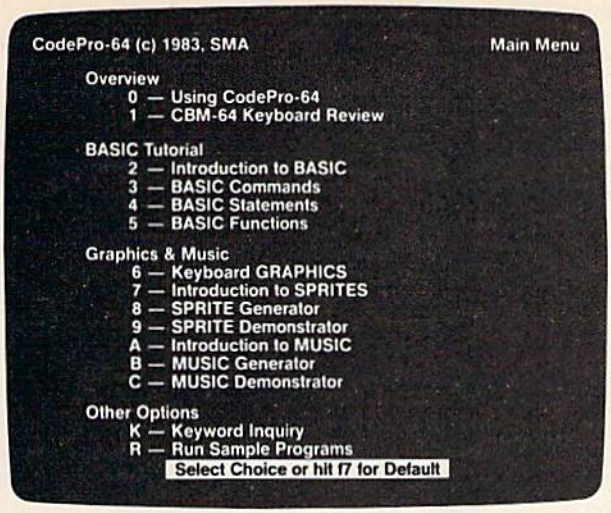
speeds the reading display slightly after each ten lines of the selection.

The program is liberally sprinkled with remarks which explain what is happening at that point in the program. To speed up your typing of this program, you need not type in any of the remarks.

I would be interested to hear from any readers who develop unique or creative uses for this program.

Phil Geiser
Box 483
Stronghurst, IL 61480

See program listings on page 170.



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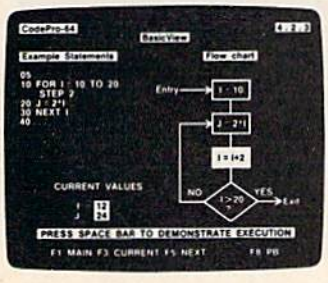
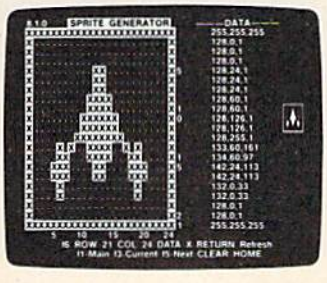
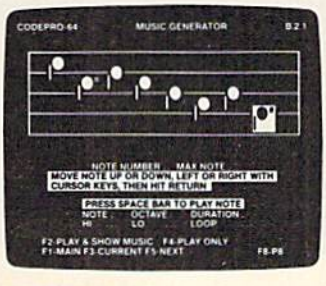
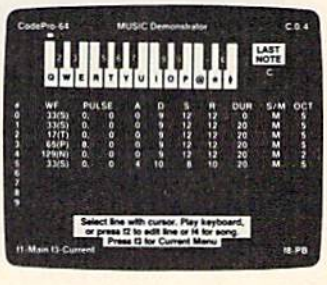




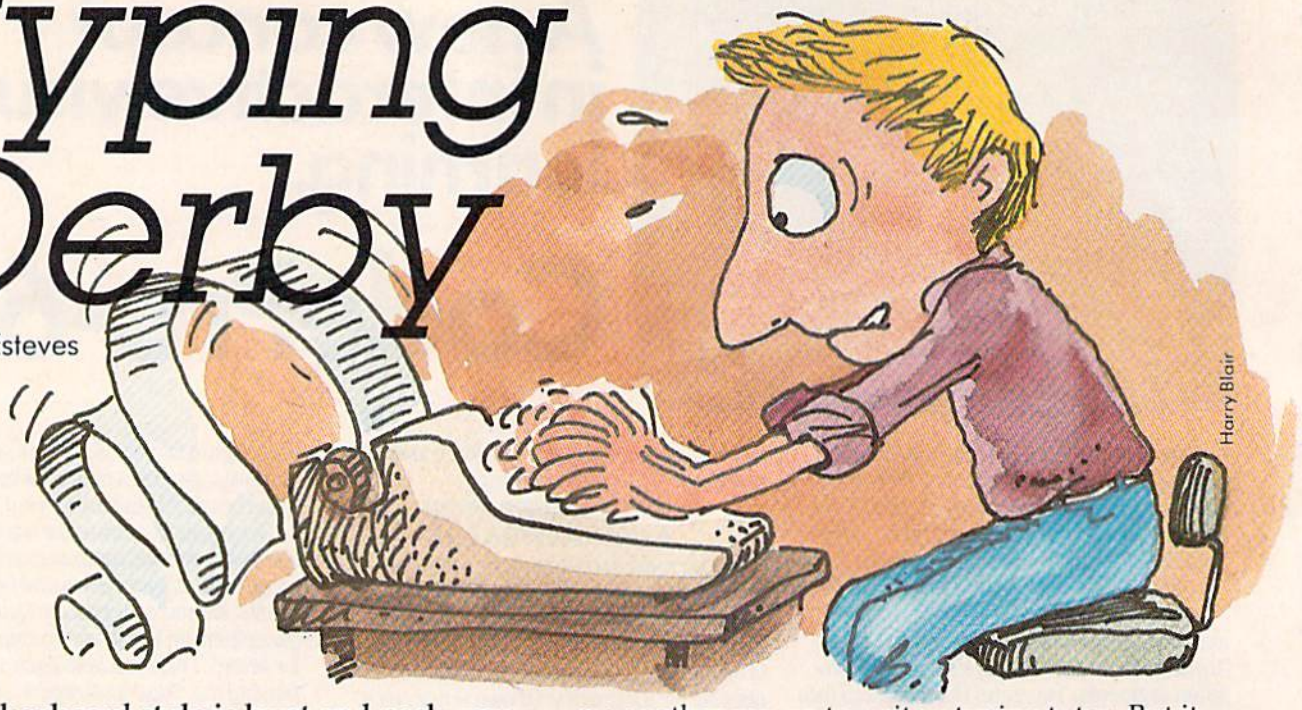




SMA SYSTEMS MANAGEMENT ASSOCIATES

Typing Derby

Carlos Esteves



Harry Blair

If your keyboard style is hunt and peck, you need "Typing Derby." Its repetitive drills can help make you a smooth touch-typist. The original version is for the unexpanded VIC, and we've translated it for the Commodore 64.

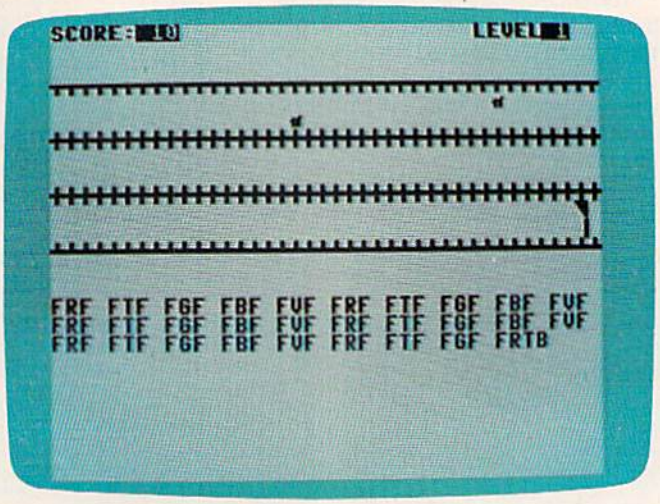
You can acquire lots of good software for very little money by typing in program listings from books and magazines. However, entering a long program at the keyboard can be, for us two-fingered typists, a slow process. So, I decided to enlist the help of the computer to improve my typing. Having three children who are already dealing with the keyboard and who will eventually work with word processors or typewriters gave me another reason to write a typing tutor. But it also called for a program with some game features which would appeal to them and take some of the drudgery out of typing practice. Hence: "Typing Derby."

Racing The Computer

In Typing Derby, players race a red horse against the computer's black horse by correctly typing—without looking at the keyboard—the exercises displayed at the bottom of the screen. Each finger is assigned a range of keys. There are 13 levels of difficulty. When you have won against the black horse 23 times, earning 230 points, you move up to the next level.

At first the pace is slow, allowing each finger to get the feel of the keys in its range. But every

Outracing the computer in the VIC version of "Typing Derby."



The right index finger is getting a real workout in this game of "Typing Derby" on the Commodore 64.

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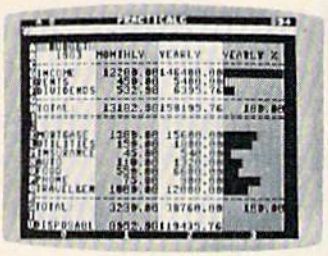

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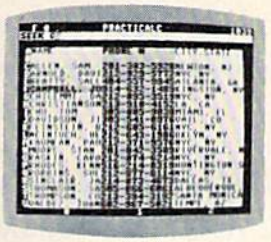

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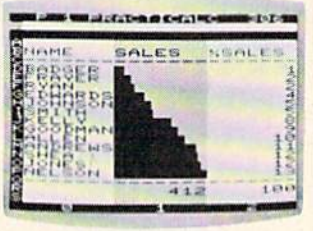

Alpha or numeric sort...

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time your red horse wins, the black horse runs faster in the next race. While it is possible to type faster, make mistakes, and still win handily, it is better to win a close race with no mistakes. At the end of each level you will need the typing speed but cannot afford the mistakes.

Brief Program Description

The program is simple enough, but takes just about all the memory available in an unexpanded VIC-20.

Lines 2-21 contain initialization, opening, and closing routines.

Lines 22-80 set the screen for the beginning of each race, including the "call to the gate" and the text of the corresponding exercise. (The horses and their colors are POKEd while everything else, except colons and commas, is PRINTed).

Lines 90-170 control the development of the race.

Lines 200-290 are DATA statements. Each line corresponds to a level of difficulty and contains the text of the exercise.

Lines 300-390 are the sound subroutine.

Lines 401-432 are instructions.

The choice of the number of points required to move on to the next level (230) is, of course, arbitrary. Since the purpose of Typing Derby is to practice at the keyboard, it does not seem excessive to me. However, this can be changed by adding or subtracting from 220 in line 21, and by adjusting the value of R (lines 10 and 21), which controls the speed of the black horse. (The 64 version lets you enter an initial value for R.)

Finally, the number of exercises is limited only by the size of memory. Any book on touch-typing could provide exercises. Just remember that colons and commas cannot be part of items in the DATA statements. They have to be POKEd directly into screen memory (e.g., lines 52–55).

See program listings on page 176.

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Fred Hambrecht

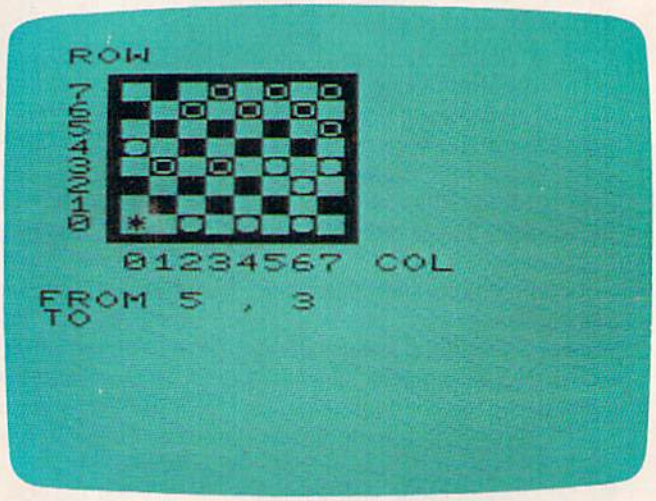
In "Checkers," you match wits with an opponent who rarely makes mistakes: your computer. For the unexpanded VIC and 64.

This computer version of "Checkers" plays just like the traditional game: The same movement rules apply; you can double- (or even triple-) jump, and you can make kings. It is written to run on the VIC (no memory expansion required) and the Commodore 64. Because it uses most of the memory on an unexpanded VIC, screen instructions are not included. If you have a 64 or a VIC with expanded memory, there is plenty of room to add instructions at the beginning of the program if you wish.

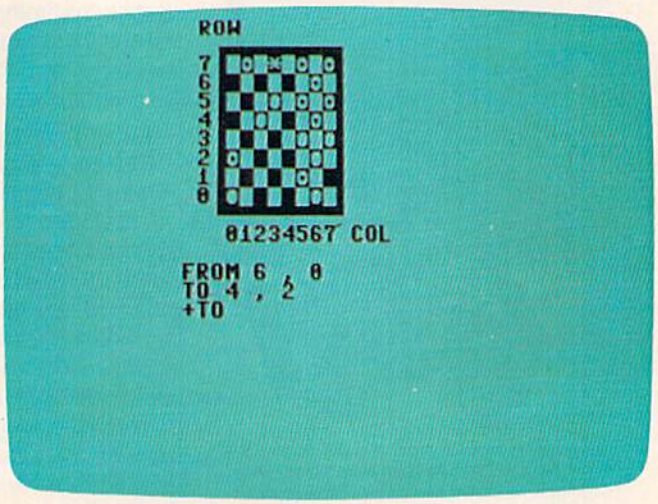
The computer always makes the first move. When it's your turn, decide on the checker you want to move, then identify it first by column, then row. These are labeled next to the checkerboard. Be sure to enter the column number first, then the row number. Don't press RETURN. Before taking its turn, the program automatically moves your checker for you. If you make an illegal move, the program ignores it and waits for a new entry.

To jump a computer's checker, you must press RETURN after entering the coordinates. In the case of a double jump, enter the second set of coordinates after the prompt "+TO", then press RETURN. For a triple jump, enter three sets of coordinates, etc.

You'll find that the computer plays a conservative game, but what it lacks in strategic imagination it makes up for by making few careless



A king is created in the VIC version of "Checkers."



Preparing for a double jump in the 64 version.

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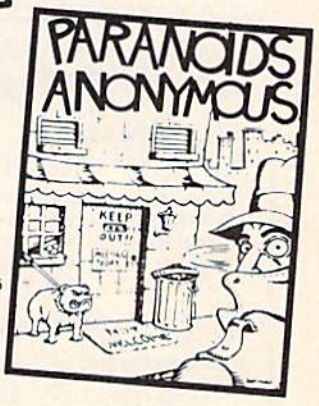

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errors. Also, it does not require you to jump the opponent's checker, and it takes advantage of this tactic.

You'll have to play within the rules for Checkers. You'll find you can cheat the computer by jumping your own checker or by moving backwards. Because the program is written to fit in both the unexpanded VIC and the 64, it is as concise as possible. There are only about 100 bytes free in the VIC, which is not enough room to program the necessary checks for every possible illegal move.

Also, if you lose to the computer (you probably won't), there is no routine that sends you back to the start. Just reLOAD and RUN if you want to play another game.

Note To 64-Users

Because the program was originally written for display on the 22-column screen of the VIC, the checkerboard will not be centered on the 64's 40-column screen. If you would prefer a centered screen display, type in the screen formatter program discussed in "Homonym Practice," elsewhere in this issue. This program adjusts the 64's 40-column screen to simulate a 22-column VIC screen. Just type in the screen formatter program and RUN, then LOAD and RUN Checkers.

See program listing on page 173.

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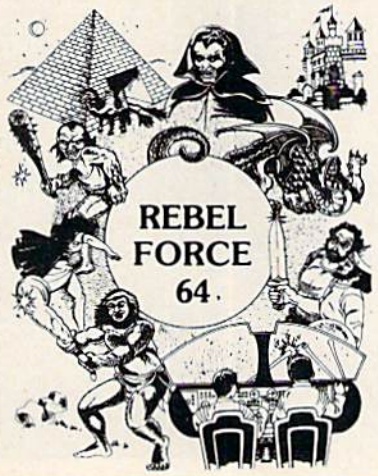

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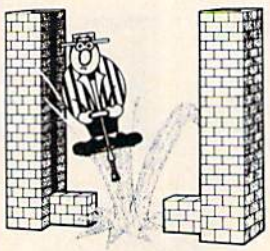

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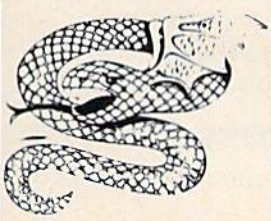

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VIC Piano

Brad Bascom

The VIC has three voices that can play music. Just calculate the number to POKE, set up the durations, and turn the sound on and off. It works beautifully.

But it's programming, not *playing*. What if you want to sit down at the computer and plink out melodies, the way you can with a piano or organ? Typing something like POKE 36876,207 for each separate note isn't exactly recreational music.

Easy Melodies

"VIC Piano" lets you use the top two rows of your keyboard as if they were the keys on the piano. Just type in the program, SAVE it to disk or tape, and type RUN.

You'll see nearly two octaves of a piano keyboard, from G to E, with white and black keys. Below the piano keys are listed the VIC keys to press to play that note. Perhaps more helpful, however, is the white dot that appears directly under the picture of the key that was last pressed. It follows along as fast as you can play, so that very quickly you can pick out melodies without looking down at the VIC keyboard at all.

When you play a note, it will continue to sound until you play the next note. If you want a musical rest, or silence, press any key that does *not* represent a note. The dot will jump to the lower-left corner of the screen and the sound will stop until you press another note.

Sometimes, if you play *very* quickly, you'll get ahead of the program. The keyboard buffer will come to your aid—the VIC can keep track of up to ten notes at a time. You'll find it's pretty hard to play fast enough to use up that buffer.

You may notice that some of the pitches aren't exactly perfect. This can't be helped, unfortunately, since the numbers the VIC understands aren't the regular musical scale. Instead, the VIC understands numbers that represent sound frequencies, and the numbering system does not always have an exact equivalent to the musical scale. So don't tune your piano to your VIC!

How The Program Works

For each key you press, VIC Piano must decide several things:

1. Does this key represent a valid note?
2. Where on the screen should the dot be

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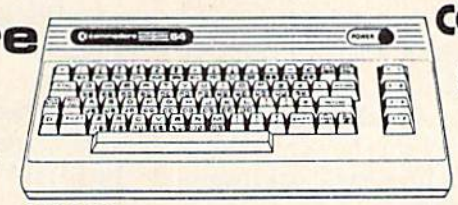

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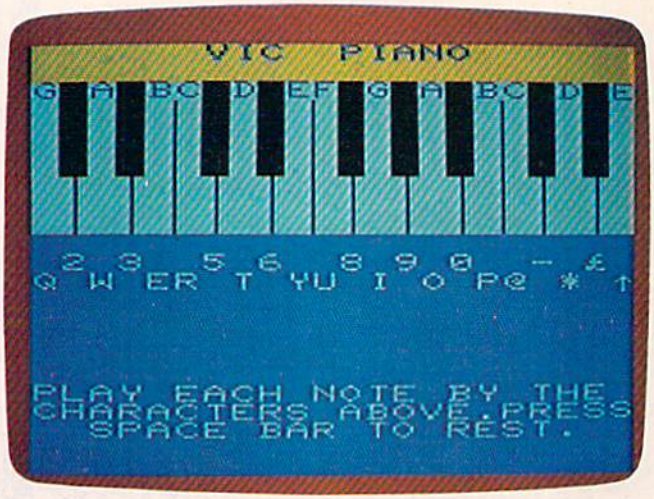
placed, showing which note is being played?

3. What frequency number should be POKEd into the sound register at 36876?

This can be quite complicated, and if the program had to test each time for every possible note, it would run very slowly. Fortunately, by careful design the program can be made to run very, very quickly, even in BASIC.

How? The placement of the dot is easiest. The piano keys are displayed on the screen so that each of the 22 notes can be clearly represented by a character on the VIC's 22-character line. So all we need to do is determine the starting address of the row just under the piano keys. In the unexpanded VIC, the address is 7900. Each key pressed will cause the dot to be displayed at 7900 plus the left-to-right order of that note. G, the lowest note, is 0, so that the dot character (screen code 81) will



"VIC Piano" turns the computer keyboard into a musical instrument.

be POKEd into 7900+0. The highest note, high E, is in the 21st column, so that when high E is played the dot character is POKEd into 7900+21.

Slightly harder is the calculation of the frequency to be played. For instance, the notes G, G#, A, and A# have POKE values of 175, 179, 183, and 187. So far, all the notes are four steps apart. But high C#, D, D#, and E have values of 227, 228, 229, and 231. There's no regular mathematical relationship between the notes' order and their POKE values.

The answer is to use arrays for both values. The screen offsets from 0 to 21 are the array J(n). The sound POKE values from 175 to 231 are the array N(n). They both occur in exactly the same order, so that when the note N(x) is played, the dot will be displayed at 7900+J(x); when the note N(y) is played, the dot will be displayed at 7900+J(y).

What will be the index into the arrays? The value of the key the user presses. That way we won't have to use IF statements to set the sound and screen POKE values—we just use the arrays J(n) and N(n), with the keypress as the index n. It couldn't be faster in BASIC.

We'll get the ASCII character of the key pressed with the statement GET A$. Each ASCII character has a numeric value, which we find using the function ASC(A$). If the key pressed was Q, for instance, the value of ASC(A$) would be 81; if W is pressed, the value of ASC(A$) would be 87.

Using this system, the lowest value of A$ that would play a note is 42, and the highest is 94. Since values lower than 42 and higher than 94 can never play a note, we can simply leave them out of the array. Let's DIMension both arrays like this: DIM J(55),N(55). Then, when we GET A$, we'll say X=ASC(A$)−42. This means that if the * (asterisk) key (42) is pressed, X will equal 0, and if the UP-ARROW key (94) is pressed, X will equal 52.

That's just what the program does. In line 160, the program DIMs N(55),J(55). Then in line 180, it READs the values of the arrays. Each pair of numbers in the DATA statements starting at 800 represents the ASC value of a key and the sound register POKE value for the corresponding note. The number for the dot to appear in is in the same order, a number from 0 to 21, so the loop FOR I=0 TO 21 gives us the right values for the screen POKEs. In one pass through the loop, we have given every valid note an ASC value (the subscript or index number), a sound POKE value—N(n)—and a screen POKE value—J(n).

What about the leftover values of N(n) and J(n), all the possible values in between each note? Line 170 puts 0 in every element of N(n) and 264 in every element of J(n). By default, every possible key value will have the effect of the space bar—a musical rest, a stop in the sound. Then, when the note values are initialized in line 180, all the elements that are not valid notes will be rests.

Because of all this setup, initialization takes a few seconds. However, the extra time spent in setting up makes the program itself run very quickly. The main loop is from 400 to 480, only eight short lines. Line 400 GETs the value of A$. If no key is pressed (A$=""), the line keeps looping back on itself until a key *is* pressed.

Lines 10 to 190 set up the screen and initialize the arrays and variables. Lines 800 to 830 are the DATA statements. Each pair of numbers is an ASCII value and its corresponding sound POKE value. (The true ASCII values are in the DATA statements, instead of the ASCII value minus 42, so it will be easier to see which character is paired with each sound POKE value.)

See program listing on page 172.

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Cassette Cataloger

Kevin Gough

If you're using tape storage, by now you probably know how fast those cassettes seem to multiply. Pretty soon it's almost impossible to remember which program is on which tape. "Cassette Cataloger" will help organize your tape library. It works on the Commodore 64 or unexpanded VIC-20 (Commodore 1515/1525 printer optional).

How would you like a listing of all the programs on your cassettes? A catalog that tells you the location of each file according to the tape counter, and how many bytes long the file is. All this, and without much effort on your part. "Cassette Cataloger" will do it!

This program will work in any size VIC-20 and the Commodore 64. Carefully enter the BASIC program and then save a copy or two.

Creating A Catalog

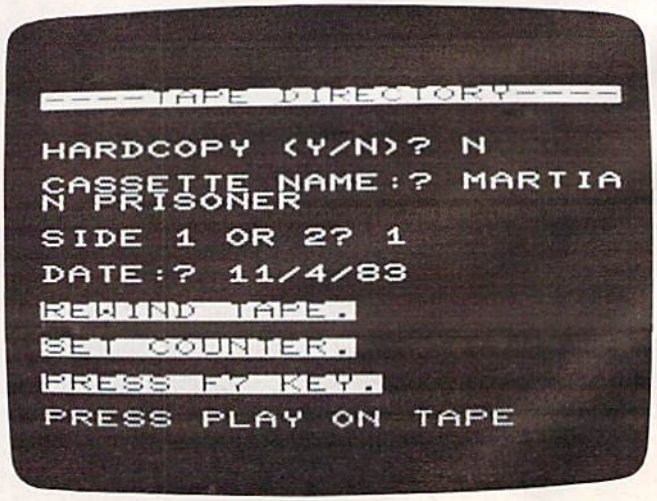
When you first run the program, you're prompted with HARDCOPY? If you have a Commodore 1515 or 1525 printer you can print the catalog.

Other prompts will follow. PRINTER ON? Press RETURN. CASSETTE NAME:? Enter a name for your cassette. SIDE 1 OR 2? Enter 1 or 2. DATE:? Enter the date. (Do not use commas in the date.)

Now the screen says, REWIND TAPE. SET COUNTER. PRESS f7 KEY. Make sure the tape counter reads 000. Press f7 and you are prompted to press PLAY on tape. Moments later, the catalog starts appearing on the screen and/or printer. The tape counter location prompt appears—COUNTER? You must look at the tape counter and enter its number. (The tape is stopped during this input so you have time to read the counter and enter its value.) The tape starts moving again and the catalog continues to appear. Every time the tape stops, you are requested to enter the counter number. If you are careful, you can even do this with your TV or monitor turned off.

If the counter value is stopped somewhere between two numbers, enter the one that is most visible. If it is exactly in between, use the lowest of the numbers. For example, if the count is exactly between 019 and 020, enter 19 for the counter prompt.

To stop the catalog process, press the back-



Compiling directories of all your tapes is easy with "Cassette Cataloger" (VIC version; 64 version similar).

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arrow (←) key at the counter prompt. The process automatically stops at the end of the tape. If the last program on your cassette is far from the end of the tape, you can save time by pressing STOP on the Datassette and then the RUN/STOP key on the computer. The break message appears. Now type GOTO 700 and press RETURN. This should be done only if you know that the tape remaining has no more programs.

After the catalog is created, the computer begins executing the program at line 700. The tape input/output status is displayed and you are prompted with DISPLAY Y/N/H? Pressing RETURN or entering Y will display the catalog. This is helpful if you do not have a printer. Simply copy the catalog on a piece of paper. Pressing N will end the program. H will print the catalog on the printer. Make sure the printer is on.

Note: The Cataloger will not categorize data files; it will just by-pass them.

How The Cataloger Works

VERIFY is the key. Line 10 POKEs a short machine language program into memory starting at memory address 707. The SYS 707 in line 110 calls the program. The program uses Kernal routines that cause a tape VERIFY. The screen prompts you to "Press Play On Tape." The program on tape is compared to the one in the computer's memory—a function we are not concerned with. All we want is the tape to stop moving at the end of each program. That's where the next program begins. This is explained in the VIC and 64 user guides and reference manuals under the VERIFY command. The VERIFY must be done in machine language so that a VERIFY error message does not appear on the screen and stop the program.

The Cataloger learns the length of each program on tape by PEEKing memory addresses 829 through 832—the cassette buffer area. The filename is PEEKed from 833 to 848.

With a listing of all the programs on your cassettes, and where they are located, it will be much easier to find a program you want. Just rewind the tape and set the counter to 000. Now look at the cassette catalog and find the counter location for the desired program. Suppose the program name is "WORD PROCESSOR" and its location is 049. Just Fast Forward the tape to 048 and begin the load. Why 048 instead of 049? To assure that your tape is cued before the program.

If you have any suggestions for improvement, please let me know. I hope you find Cassette Cataloger useful.

Kevin Gough
24 Daisy Lane
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See program listing on page 179.

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Homonym Practice

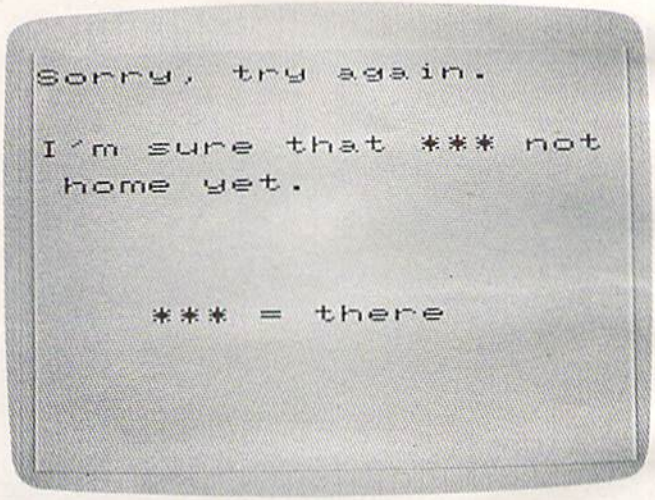
Michael A. Tyborski

This educational program, designed by a schoolteacher, drills young people on the use of homonyms. It works on both the unexpanded VIC-20 and Commodore 64.

My VIC-20 computer supports my teaching in a crowded fifth-grade classroom. It provides daily practice of language and math skills.

I load the computer in the morning and let students practice throughout the day. Since I am busy teaching, I need programs that do not require teacher assistance. To meet this need, I have developed "Homonym Practice" and other educational programs.

Homonym Practice drills students on the homonyms "to, two, too" and "there, their, they're." It also shows some of the features that enhance these types of programs. A standard format allows students to easily work with any one of a series of such programs I have written.



"Homonym Practice" was designed by a schoolteacher for the VIC-20.

Friendly Features

Push-button reset is the most important feature. It involves checking the f1 special function key whenever the keyboard is read. If pressed, the program restarts for the next student. This allows many students to use the program without supervision.

In addition, function key f3 turns the program into a learning guide. It recalls examples of properly used homonyms. This is done in the subroutine at line 42. The student can press RETURN to continue the drill. For this type of lesson, the student must type in the correct answer. This helps the student learn spelling.

Unfortunately, typing is an error-prone activity. This made it necessary to use the simulated INPUT routine at lines 29 to 35. It uses the GET statement to ignore unwanted keys. This prevents data-entry errors from stopping the program. It even allows apostrophes to be typed without the SHIFT key.

The name entry routine at lines 2 to 9 also uses the GET statement. It capitalizes the student's name even if the SHIFT key was not used.

Lines 10 through 20 display directions in a series of frames. This increases readability. Although more memory is used, the trade-off is definitely worth it. Subroutine 51 holds the text until the student presses a key.

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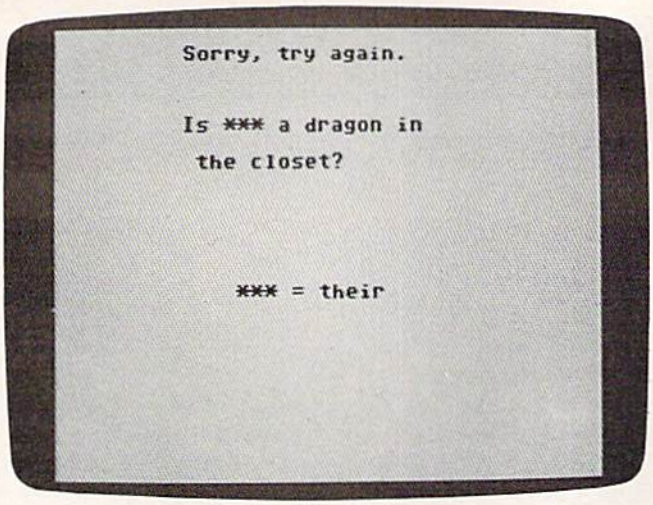

The VIC version of "Homonym Practice" also works on the Commodore 64 with a special screen-formatter program.

Random, But Not Repetitious

It is not easy to fit this program into an unexpanded VIC. (Be sure not to type any extra spaces, or you may run out of memory.) In this case, you can fit only 16 sentences for each set of homonyms. Although this is a reasonable drill, it complicates problem selection.

The first version of the program used random selection. Unfortunately, many repeats occurred. The present method provides better results. It starts at a random point in the list and walks through it in a read-two-sentences-skip-one pattern. This assures no repeats in a lesson and few repeats in any two consecutive lessons.

These features have made Homonym Practice an effective classroom aid. Interestingly, developing drill variety proved to be the most difficult problem. The effort, however, paid off when I watched my students practice much-needed skills.

Commodore 64 Notes

The same program (Program 1) works on both the VIC-20 and Commodore 64. However, because the VIC has a 22-column screen and the Commodore 64 has 40 columns, ordinarily the screen formatting would appear messed up on the 64.

To avoid this, Commodore 64 users should type in Program 2. This is a 22-column screen formatter for the 64 that emulates the VIC screen. It centers the image for an attractive display and automatically handles line wraparound. VIC users should not type in Program 2.

This screen formatter first appeared in the November 1983 issue of COMPUTE!'s GAZETTE with the text-adventure game "Martian Prisoner." If you typed in the formatter for Martian Prisoner, you needn't type it again for Homonym Practice. It's the same program. It creates a machine language program which forces the 64 to PRINT within 22 columns.

SAVE Program 2 before running it for the first time. When you type RUN, it activates itself. If you ever need to reactivate it (after pressing RUN/STOP-RESTORE, for instance), enter SYS 828.

The correct procedure is to first LOAD the screen formatter, RUN it, type NEW, and then enter the main program. You may have success using the screen formatter to adapt other VIC programs to your Commodore 64, too.

See program listings on page 180.

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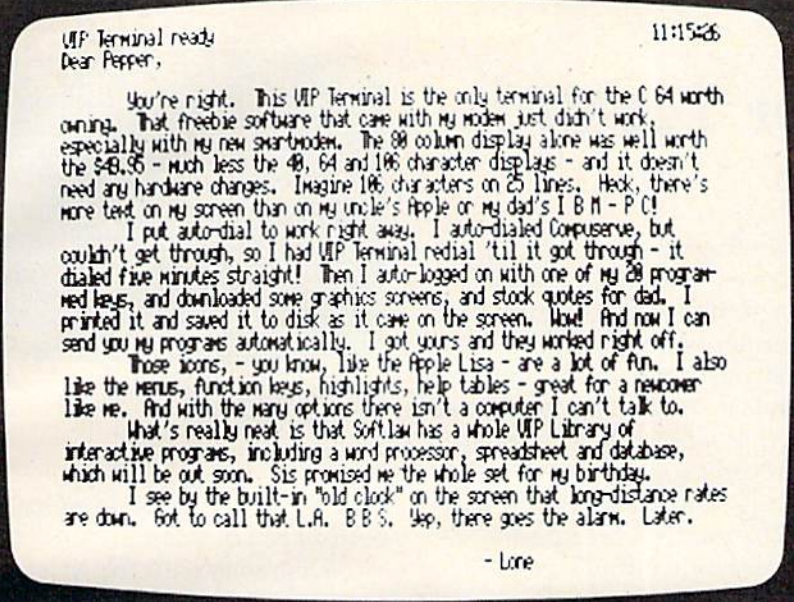

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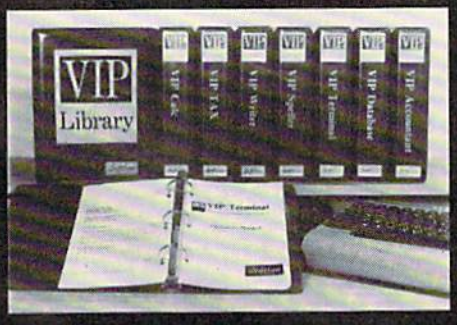

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AUTHOR'S SUBMISSIONS ARE ENCOURAGED.

Fourth Encounter For VIC

Tony Roberts, Assistant Managing Editor

Destroy successive waves of hostile aliens.

This instruction, taken from the manual accompanying Thorn EMI Video's *Fourth Encounter* game cartridge, tells you nearly everything you need to know to play the game.

What it doesn't tell you is that this is one space shoot-em-up that plays into the hands of less-experienced game players. *Fourth Encounter* gives the player the advantage of being able to play and practice any of the game's phases and skill levels.

Those who suffer the frustration of never having seen a game's most difficult level won't have that problem here.

The Game: A Quick Look

In *Fourth Encounter*, the player, piloting a yellow spaceship, faces four enemies. Let's call them the Bees, the Moths, the Clones, and the Rays. You take on these evil aliens one by one. If you manage to defend your planet against each of these four attackers, you move to the next skill level and face them all again. This time, however, the aliens are a little faster, and much more heavily armed.

As you play against the Bees, Moths, or Clones, your ship is anchored to the bottom of the screen. It can move only horizontally to defend against the attacks, most of which come from above. When fighting the Rays, however, your ship can move anywhere to defend against the attacks that come from everywhere.

You have five ships allotted to you per game. Each time one is destroyed, you must endure several seconds of a sound effect similar to a machine gun blast. You receive an additional ship for every 10,000 points you score.

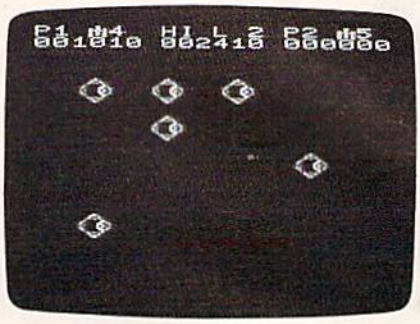
The game is set up to accommodate either one player or two players taking turns. The high score is always posted as an incentive.

The Opposition: A Scouting Report

The first problem you face in *Fourth Encounter* is a swarm of red and yellow aliens. Somewhat beelike in appearance, these aliens drop from above. You must shoot them before they crash into your ship. There are 60 aliens in this swarm, and they'll keep attacking until you've wiped them all out.

During the game's first level, the Bees can do nothing but attempt to crash into you. In levels two and three, however, the Bees augment their attack with dozens of colored bombs that rain down upon you.

The next wave of aliens are rather like electrically charged moths. They flit about the night sky, and they can knock your ship out either by crashing into it or dropping bombs onto it. These Moths move in a sort of circular motion. But, beware—just because one has moved off the bottom of the screen doesn't mean it's gone. It may rise up from nowhere, crashing into the bottom of your craft.



Mothlike aliens descend and drop bombs on the player's ship in Fourth Encounter.

Dispense with the Moths and you face the Clones—exact copies of your ship. These aliens, however, carry an arsenal of colored bombs and sophisticated radar systems. The attack force seems to dance in the sky, each ship taking a turn using you for target practice. The Clones themselves, however, make very difficult targets. They seem to sense your shots as they dance out of harm's way. At upper levels of the game, their evasive maneuvers are more agile, and their fire power is more awesome.

The final opponent, the Rays, presents an entirely different problem. In this test, your ship is free to roam—or rather run—about the entire screen. The Rays attempt to eliminate you with a sort of ray gun. To survive this round, you must dodge the Rays which crisscross the screen, and destroy the alien bases which move quickly about the perimeter of the screen.

The Battle: Your Choice

Before play begins, you are presented with a menu of options that allows you to select the number of players, the level of

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difficulty, and the phase of the game you wish to play.

With these options, you can play the game in a traditional fashion, moving from one opponent to the next and from one level to the next. Alternatively, you can practice parts of the game that give you trouble, or avoid parts of the game that you've outgrown.

In each phase of the game, you must eliminate a fixed number of aliens before moving on. In the early moments of an attack, the screen will be filled with targets, and most of your shots will hit something. Once the attackers' numbers have dwindled, however, marksmanship becomes much more important.

Fourth Encounter plays very well on the VIC. It is fast, smooth, and colorful. The game includes an interesting visual treat that is repeated each time a ship is destroyed or each time you move to a new level. The scoreboard, which normally occupies the top lines of the screen, collapses into a small block in the center of the screen, almost as if it has become the victim of a black hole. Then the process reverses and the updated scoreboard is restored.

Fourth Encounter
Thorn EMI Home Video
1370 Avenue of the Americas
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$39.95

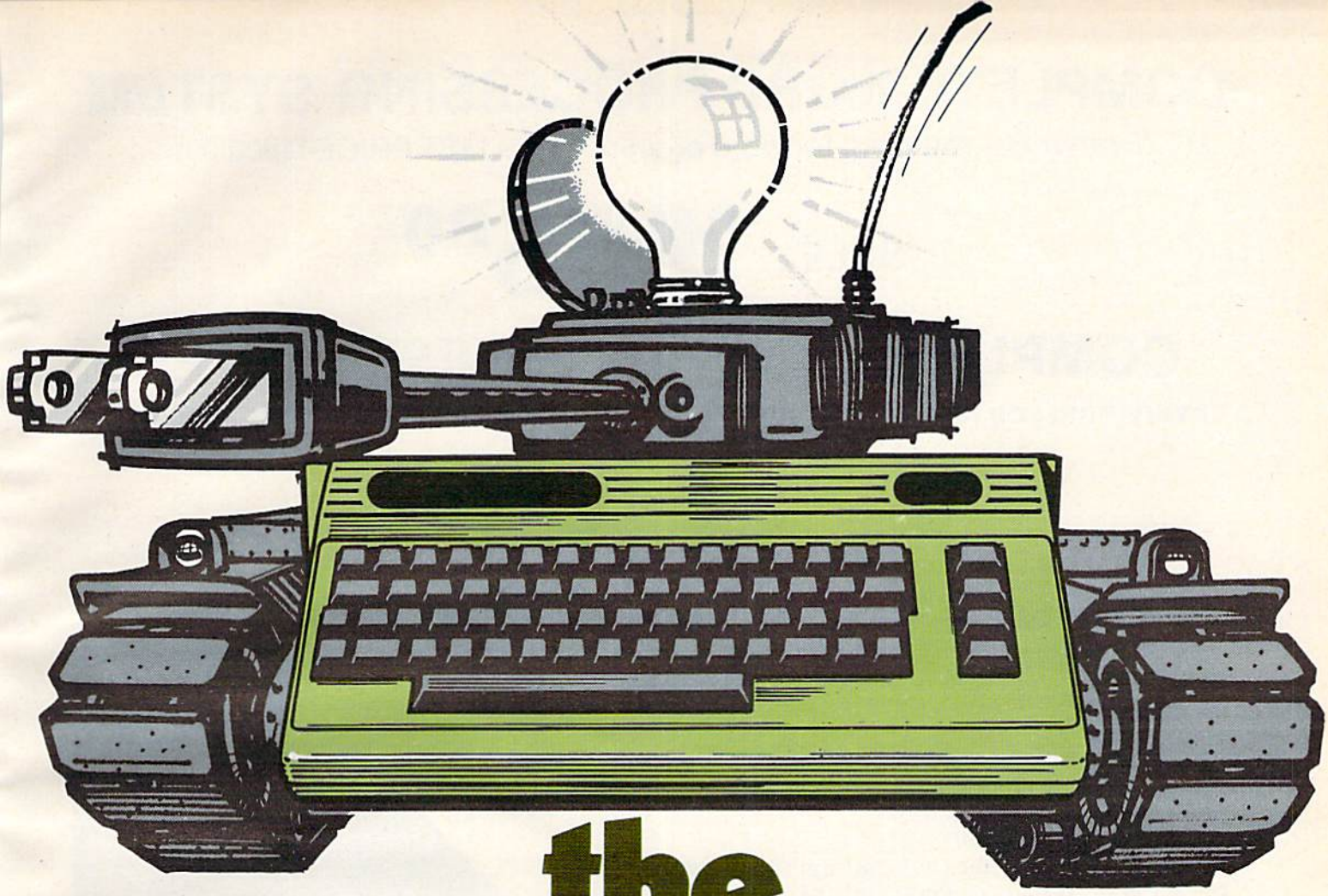
Suspended For Commodore 64

Dan Carmichael
Submissions Editor

In the world of text adventure games, Infocom has long been one of the leaders. In 1979, its programmers started writing their own language which enabled the adventure game player to communicate with the program using complex sentences instead of the usual one- or two-word commands. Ever since 1980, when Infocom marketed its first commercial success (*Zork I*), Infocom's games have almost always been on the various software best-seller lists.

One of Infocom's latest releases, *Suspended*, is no exception to the rule. It is an exciting, imaginative adventure game that's likely to keep you glued to your keyboard for hours.

The game is set in a future society where mankind has relegated all duties—from the control of transportation to farming—to



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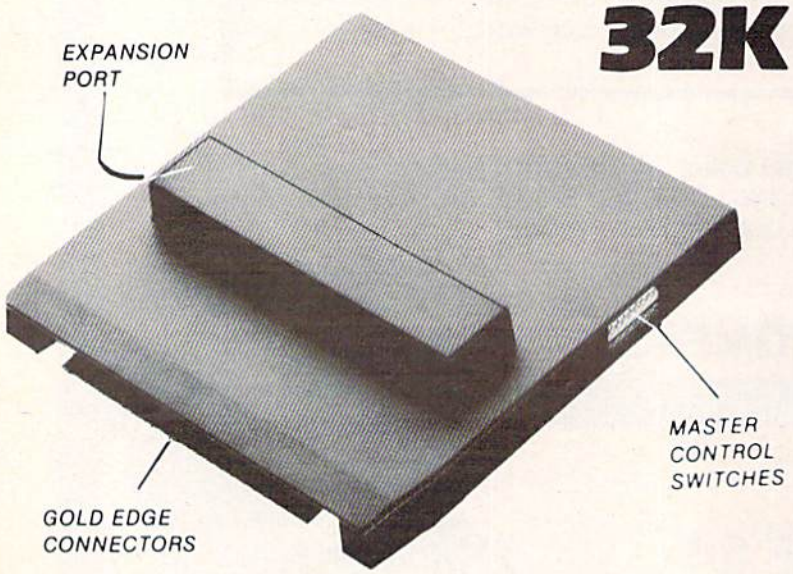

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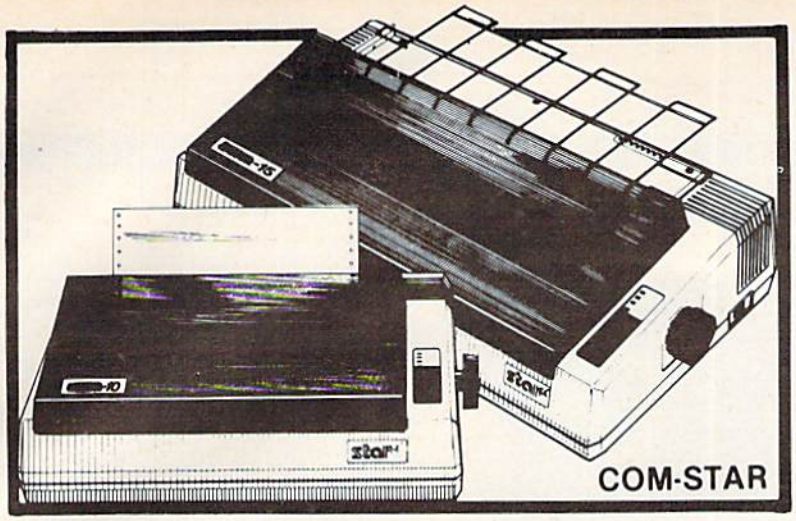

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robots and computers. While the human species continues to live on the surface of the planet, the robots move about in a huge underground complex controlling all the computers and machinery that is necessary to sustain life on the surface of the planet. However, the underground complex is not completely automatic, and that's where you come in.

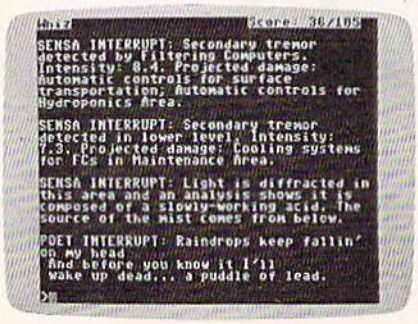
In the game, you have been chosen as the winner of the semi-millennial lottery, and an honor it is. As such, you will serve as Contra's Central Mentality for the next 500 years. This is a position of immense responsibility because you must insure the survival of all life on the surface of the planet.

You will be placed in a state of suspended animation, and your brain will be used to control the Filter Computers, which control all systems on the planet surface.

Computers And Robots

To help you manage the huge underground complex and all its machinery, you are given the use of six robots. You communicate with the robots through the Filter Computers. The robots are individual personalities and each possesses unique qualities and talents.

The six robots are Iris, Waldo, Sensa, Auda, Whiz, and Poet. Iris is a visual robot, the only one capable of seeing. Waldo is your heavy-duty robot. He is capable of carrying many heavy objects and is able to perform tasks ranging from heavy equipment repairs to delicate microsurgery. Sensa has a mixture of different sensory apparatus. She can detect such things as vibrations in the underground



Poet's messages mystify with rhyme, but can be very revealing in Suspended.

complex, photon emission sources, and ionic discharges. Auda is all ears, the only robot capable of hearing. Whiz is the brilliant one. He is used as an interface to the four computers that are the main sources of information about the complex. Poet is the unusual one. He talks to you in rhyme. His messages are sometimes hard to figure out, but very informative once you understand his style. He is also a diagnostic robot with a highly developed sense of touch.

The four computers that Whiz operates (called *peripherals*) are an important key to the game. They are the Index, Technical, Advisory, and Historical Computers. By using Whiz, you can gain information ranging from the technical aspects of any object found in the complex to the history of various subjects. The Advisory Computer might even give you some advice on how to accomplish the task you're currently working on.

Playing The Game

The Filter Computers control the surface systems such as weather control, food production, and all surface transportation. When the game is first started, the Filter Computers have just begun to break down, and a major world catastrophe is in the making. The weather system is in error, and major storms on the planet's surface are killing the human population. The food-producing system (deep underground hydroponic farms) has gone awry and crops are dying. Without food, the population will starve. And the transportation system has become chaotic. The Floaters, Taxis, and Glide Ramps (forms of mass transit) are running uncontrolled and are killing people by the hundreds of thousands.

Your job as central controller is to repair the Filter Computers and reset all the surface systems to normal operation. You must use your robots, and you encounter a number of extra surprises along the way.

A Busy Program

While *Suspended* is enjoyable and stretches your imagination to its limits, the great complexity of the program itself does result in one minor drawback: occasional slow response. Because the program in *Suspended* has to keep track of six characters, the response time can be somewhat slow. Infocom's special language enables you not only to communicate with the robots using complex sentences, but also to issue multiple commands in one statement. Some commands require as long as two or more minutes for a response. This is to be expected in a "thinking" game as complex as *Suspended*—many computer chess programs take hours to ponder their moves.

If the small inconvenience of a sometimes slow response does not bother you, then I can highly recommend *Suspended*.

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The Obstacle

Despite the wild claims made by the Blackjack system charlatans, it is not possible to learn an effective strategy overnight. Learning an effective strategy takes time and discipline. If learning a strategy were easy, everyone would be making a living playing Blackjack. As it stands, less than one percent play well enough to make money.

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BLACKJACK TEACHER simulates, in precise detail, the events that transpire in actual casino play. The display screen depicts the top view of a Blackjack table. You interact with the program just as you would an actual game. Computer controlled players occupy adjacent seats. All events occur in real-time.

BLACKJACK TEACHER teaches seven different strategies of varying complexity and accuracy. This spectrum of strategies allows you to select a strategy that suits your needs.

BLACKJACK TEACHER monitors your betting and strategy decisions (hit/stand/double/split/insurance). If your decisions are incorrect within the guidelines of your strategy, the system will display error messages showing you the correct decisions.

BLACKJACK TEACHER is the result of over ten years of Blackjack research. The strategies encompassed by the system were developed using computers. The more complex strategies are among the most powerful ever devised.

Complete documentation is included which tells you everything you need to know to become an expert strategy player.

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SOTA Enterprises has consistently produced nothing less than the highest quality software. When you buy software from SOTA, we do our utmost to make sure you get your money's worth.

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A new version of BLACKJACK TEACHER is now available for the VIC 20. Although not as comprehensive as the original 32K program, the VIC 20 version does teach Basic Strategy – a must for the Blackjack strategy beginner!

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Cassette Interface For VIC/64

A. C. Pendleton

The VIAC (VIC Interface to Any Cassette) is very well named. It is a unit that allows the use of a conventional audio cassette recorder as a storage and playback device for the VIC-20, Commodore 64 or any Commodore computer designed to work with the Commodore Datassette recorder.

The VIAC and a cassette recorder duplicate all the functions of the Datassette, plus provide a number of features not available with the Datassette.

Before rushing out to buy a VIAC or similar unit, however, a word of caution might be in order. The Commodore Datassette is specifically designed to handle the Commodore signal format and, generally speaking, offers a higher degree of accuracy and reliability than a conventional audio cassette recorder. More on this subject later.

Good Documentation

The VIAC does have a number of things going for it, and if you are contemplating the purchase of a VIC or 64 and already own an audio cassette recorder, you can save a few dollars over the Datassette.

The VIAC fits in one hand and comes in an attractive and well-constructed case. Cables are attached to plug into the VIC or 64 cassette interface and the earphone, microphone, and remote-control jacks of the audio cassette recorder.

Switches let you select positive or negative polarity and run or standby mode. An earphone jack and LED indicator permit data monitoring.

In the run mode, all functions of the cassette recorder are under computer control, as with the Datassette. In the standby mode, computer control is disabled and the cassette recorder is operated manually.

The documentation is well done and provides a step-by-step procedure for setting up and using the VIAC with almost any cassette recorder.

Using the VIAC and a cassette recorder was slightly more complicated than using the Datassette, but after a while it became second nature.

As noted earlier, audio playback or recording of computer signals is generally more error-prone than the digital format used by the Datassette.

This could be considered a disadvantage of the VIAC, but it did not present a problem during my tests. The VIAC worked flawlessly with three brands of popular recorders. Even the level adjustment, normally a problem with audio recorders, worked well over a reasonably wide range of settings.

Easy Cassette Duplication

Some of the advantages of using the VIAC are described in the manual, and include the ability to monitor data via the earphone jacks and allowing use of Fast Forward and Rewind keys for quickly locating programs.

One very interesting feature is the ability to record audio remarks directly on the tape, thus saving memory space. These voice remarks are distorted at the VIAC monitor jack and must be monitored at the cassette output jack or by the speaker.

Another key feature is the ability to make duplicate copies for backup. Duplication works perfectly by connecting the output of one recorder to the auxiliary input jack of another.

All in all, the VIAC works as described in the manual and offers a number of extra, useful features. As your primary recorder, a VIAC-equipped cassette recorder is reliable and will save you a few dollars over a Datassette (if you already own a cassette recorder). I purchased my unit as a backup for my Datassette and to quickly make multiple copies of some of my own programs. If you have a similar need, the VIAC is very functional and meets all expectations for a cassette interface.

VIAC
Integrated Controls
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$44.95