Telecommuting: Dawn Of The Electronic Cottage

COMPUTE!'s GAZETTE

$2.50
December 1983
Issue 6 Vol. 1, No. 6
63380 $3.25 in Canada

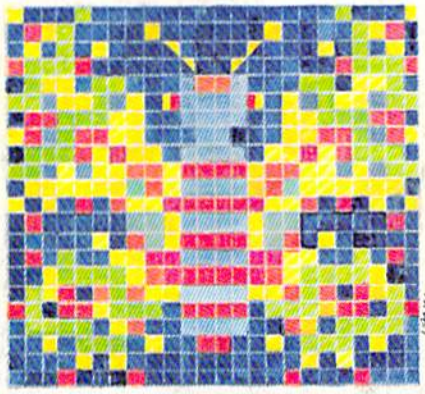
For Owners And Users Of **Commodore VIC-20**™ And **64**™ Personal Computers

SPIKE

Arcade-Action Game For Commodore 64

Written entirely in machine language, Spike is an outstanding arcade-style game with stunning high-resolution graphics — one of the best games we've ever published. Only the skillful can evade the random power spikes and escape the Grid.

Sprites Made Easy For Commodore 64



A simple program to add sprite commands to Commodore BASIC. Examples show how you can animate shapes on the screen in your own programs with a minimum of tricky PEEKs and POKEs.

Educational Games: A Kid's View

A teenager speaks out on what youngsters like to see in educational computer games — and he includes his own game for the VIC-20 and Commodore 64 to show exactly what he means.

A SURVIVAL GUIDE FOR BEGINNERS

Lost in the woods without a compass? Here's a complete guide to finding help through user groups, computer classes, books and magazines, and your fellow computerists.

Also In This Issue

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A million laughs

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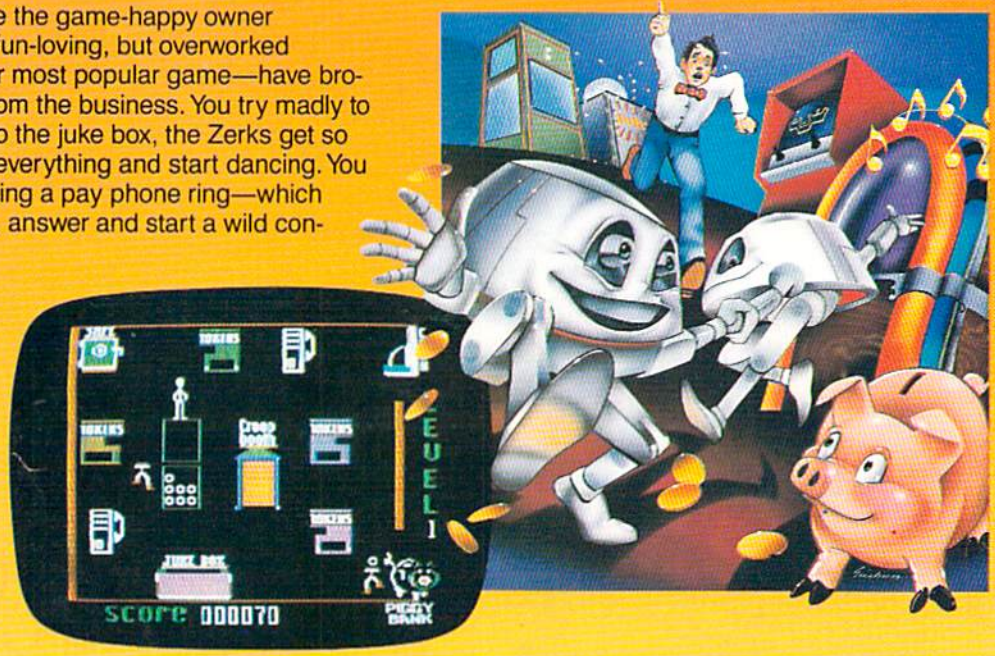

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ALL INSIDE BASIC programs come with both the Commodore 64 and VIC 20 versions on the same disk or cassette. If you plan to upgrade to the Commodore 64, *you won't lose your investment in software.* And if you have both computers you can use the program on either unit.

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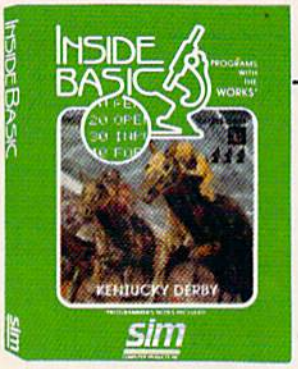
†Programmer's notes available free with response card and include program overview, line by line description, complete listing, variable chart, and suggested changes.

Entertainment



Kentucky Derby **Bet on your favorite horses**

There's nothing more fun than a day at the races. Especially when you don't have to leave your living room. This popular program features colorful hi-resolution graphics and authentic sounds. Pick your favorite horse or ask Hot Tip Sam. Bet to win, place, or show and watch them gallop off! Experience the thrill as your horse crosses the finish line and your payoff appears on the tote board. KENTUCKY DERBY is an exciting game for all ages and may be played with up to four players.

Commodore 64/VIC 20+8K
(suggested retail: $19.95)*

Number Jotto **Outwit your opponents**

Deduction, logic, and patience are the skills you must master to win the game. The object is to discover your secret jotto number using the least number of tries. Each move is your probe that the computer must respond to with two hints. Think carefully, examine your guess chart on the screen, eliminate and choose wisely. Your opponent may show no mercy. NUMBER JOTTO is an ideal strategy game for the entire family and may be played with up to four people.

Commodore 64/VIC 20+8K
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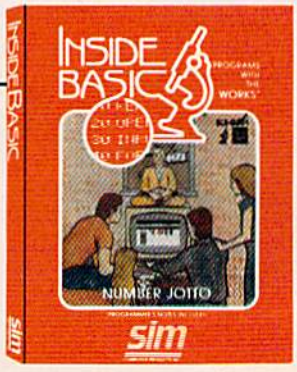

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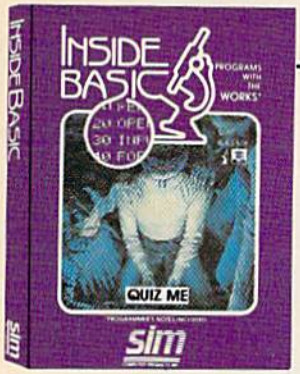
Education



Quiz Me Test your knowledge and build study skills

QUIZ ME is a computer aided testing program. Using its powerful editor, parents and teachers can easily create a quiz for any subject. You can load, save, and print out your quizzes. Create as many quizzes as you like with up to 50 problems per quiz on the Commodore 64.

QUIZ ME is designed to allow multiple choice, fill in the blanks, and for those questions where spelling is not important, approximate answers. You can specify the number of tries per problem. There are advanced features that allow you to specify the time you have to answer and the number of points awarded for each problem. Upon completion of the quiz, automatic scoring, percentage scaling, and letter grading give the student his complete results.

QUIZ ME gives continuous reinforcement and encourages you to try harder and learn more. QUIZ ME is an exceptional program for parents and teachers who wish to make learning more enjoyable.

Commodore 64/VIC 20+8K
(suggested retail: $19.95)*

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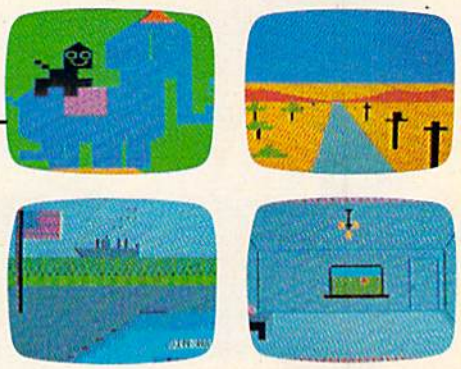
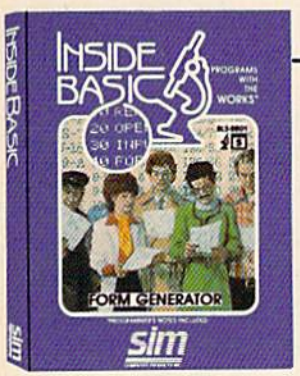
Plus, COLORCRAFT helps children and adults become familiar with computer basics like cursors, graphics and function keys, and simple word processing commands. After a child learns the fundamentals, there are advanced features like speed control and diagonal cursor movement. COLORCRAFT comes with an easy to follow user manual including a glossary of computer terms and a step by step sample animation. COLORCRAFT will teach and entertain your entire family while stimulating your children's creativity.



Commodore 64/VIC 20 - memory expansion not required
(suggested retail: $24.95)*

Business/Home



Form Generator Input, calculate, and fill in the blanks

You can use your existing forms or create your own right on the screen. Applications include all types of business forms, invoices, vouchers, statements, and labels. FORM GENERATOR lets you set up a master which you can use to generate completed forms. Anytime you wish to print out a form, simply load in the master and run. FORM GENERATOR will ask you for the fill-in information needed to complete the form. Next, it will calculate and fill in the blanks. You can then print or save your completed form. It's that easy. You'll be amazed at the time you save and the professional look of your forms.

Requirements: Commodore 1525, 1526 or compatible printer.
16K memory expander recommended on the VIC 20.

Features: labels and formulas: add, subtract, multiply, divide
automatic information prompting
default input values
fixed decimal number formatting
repeat sequences (a must for invoicing)
multiple copy printing

Commodore 64/VIC 20+8K
(suggested retail: $29.95)*

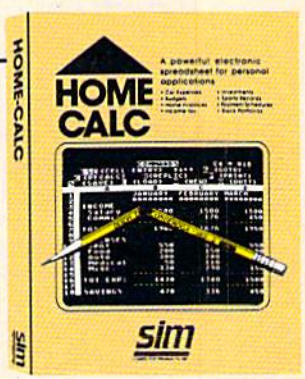
Home-Calc The lowest priced, easiest to use spreadsheet

Spreadsheets are one of the most popular programs and have many applications in the home: investments, payment schedules, home finances, car expenses, and more. The easy reading manual, simple instructions, and easy-to-execute commands make setting up a spreadsheet a snap. HOME-CALC doesn't confuse you with lots of fancy functions and commands. A beginner can have a home budget sheet working in an hour. If you're more sophisticated and want to use it in your business that's okay too. HOME-CALC is ready to handle "what if?, how much?, and bottom line" calculations. Load, save, and print spreadsheets.

Features: sum, replicate, recalculate
title and formula capability
add, subtract, multiply, and divide
selectable column width and number formats
machine language speed

Requirements: Commodore 1525, 1526 or compatible printer

Commodore 64
(suggested retail: $24.95)*



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

COMPUTE!'s Gazette is published twelve times each year by **COMPUTE!** Publications, Inc., Post Office Box 5406, Greensboro, NC 27403 USA. Phone (919)275-9809. Editorial offices are located at 505 Edwardia Drive, Greensboro, NC 27409. Domestic subscriptions: 12 issues, $20. Send subscription orders or change of address (P.O. Form 3579) to Circulation Dept., *COMPUTE!'s Gazette*, P.O. Box 5406, Greensboro, NC 27403. Second class application pending at Greensboro, NC 27403 and additional mailing offices. ISSN 0737-3716.

THE EDITOR'S *notes*

Because we've received numerous letters concerning the Commodore 1541 Disk Drive, I asked Tom Halfhill, Editor of COMPUTE!'s Gazette, *to write an editorial commenting on this matter.*

— Robert Lock

Although every monthly issue of COMPUTE!'s Gazette goes out to more than 200,000 people, in a way we consider each magazine a personal communication with each individual reader. In turn, many hundreds of you write personally to us each month. In this way we keep each other in touch with our problems, discoveries, opinions, and concerns.

For the past month (this is written in September), we have been receiving an unusual number of letters and phone calls on one particular topic: Commodore 1541 Disk Drives. We are hearing that 1541 drives are virtually unavailable, and that many drives purchased before the supply dried up suffer from reliability problems. Most of you who are writing or phoning us are doing so as a last resort — you have first sought answers from your dealers, or even Commodore itself, but have gotten few answers.

Commodore's official line — repeated both to you and to us — is that demand for 1541 disk drives has far exceeded the company's projections, leading to a supply crunch at the distributor level and scarcity in retail stores. Commodore promises the shortage will be relieved in a few weeks. Commodore's response to your other major concern — reliability — is that the 1541s suffer from no unusual problems.

To deal with the supply question first, there is little doubt that Commodore indeed underestimated the great demand for 1541s. A recent survey showed that 90 percent of new Commodore 64 owners bought a disk drive with their computer — a far higher percentage than anyone suspected. With hindsight this isn't surprising: 1541s retail for $250 – $300, hundreds of dollars less than disk drives for other computers.

But even this unexpected demand does not explain the nearly total absence of 1541s from dealers' shelves in August and September. At this moment COMPUTE! Publications sorely needs additional 1541s for in-house use, yet we can't find any to buy. After numerous phone calls over several days, we were able to locate only two units in the entire continental United States. If the problem were merely one of supply and demand, dealers would be telling us that their 1541s are selling as fast as they receive them from Commodore. Instead, dealers say they aren't receiving any 1541s from Commodore at all.

There have been lots of rumors and industry scuttlebutt to explain why 1541s are unavailable. At the risk of disappointing some people, we will not repeat the rumors here until we can find hard facts to support them. Unsupported rumors are potentially damaging — not only to Commodore, but also to the hundreds of Commodore dealers who are as blameless and frustrated as everyone else.

However, as many of you have concluded, there does appear to be a connection between the supply shortage and the reliability problems you have experienced. Commodore will not comment on the matter, but by all accounts (including those of readers, dealers, and our own experience), the 1541 drives are plagued with an abnormally high failure rate. As near as we can determine — our information comes largely from cooperative Commodore dealers — much of the trouble can be traced to a part designed to keep the drive properly aligned. One Commodore dealer who handles service for numerous states told us he has repaired several hundred drives recently, and this part was to blame in all but three cases. Of the seven 1541 drives at COMPUTE! Publications, four have succumbed to the same problem.

We have also learned, unofficially, that Commodore is aware of the problem and is trying to fix it at the manufacturing level. In the meantime, no 1541s are reaching the market. Users and dealers are frustrated and upset, and Commodore is deferring hundreds of thousands of dollars in potential sales.

It is, of course, possible to conclude that the 1541 situation may represent some serious general quality-control problems. The return rate for other equipment also seems to be relatively high.

If you are suffering from these problems, we urge you not to take your frustrations out on the dealers. Although as local representatives of Commodore they are easiest to blame, legitimate dealers will handle your problems in an honest and straightforward manner. Remember, high failure rates hurt them, too.

Since no one benefits from a situation like this — not the manufacturer, nor the dealer, nor the consumer — a solution will likely present itself soon. Until then, the owners of 1541 disk drives (and those who would like to buy them) can only join with the rest of us in wondering what, exactly, is happening.

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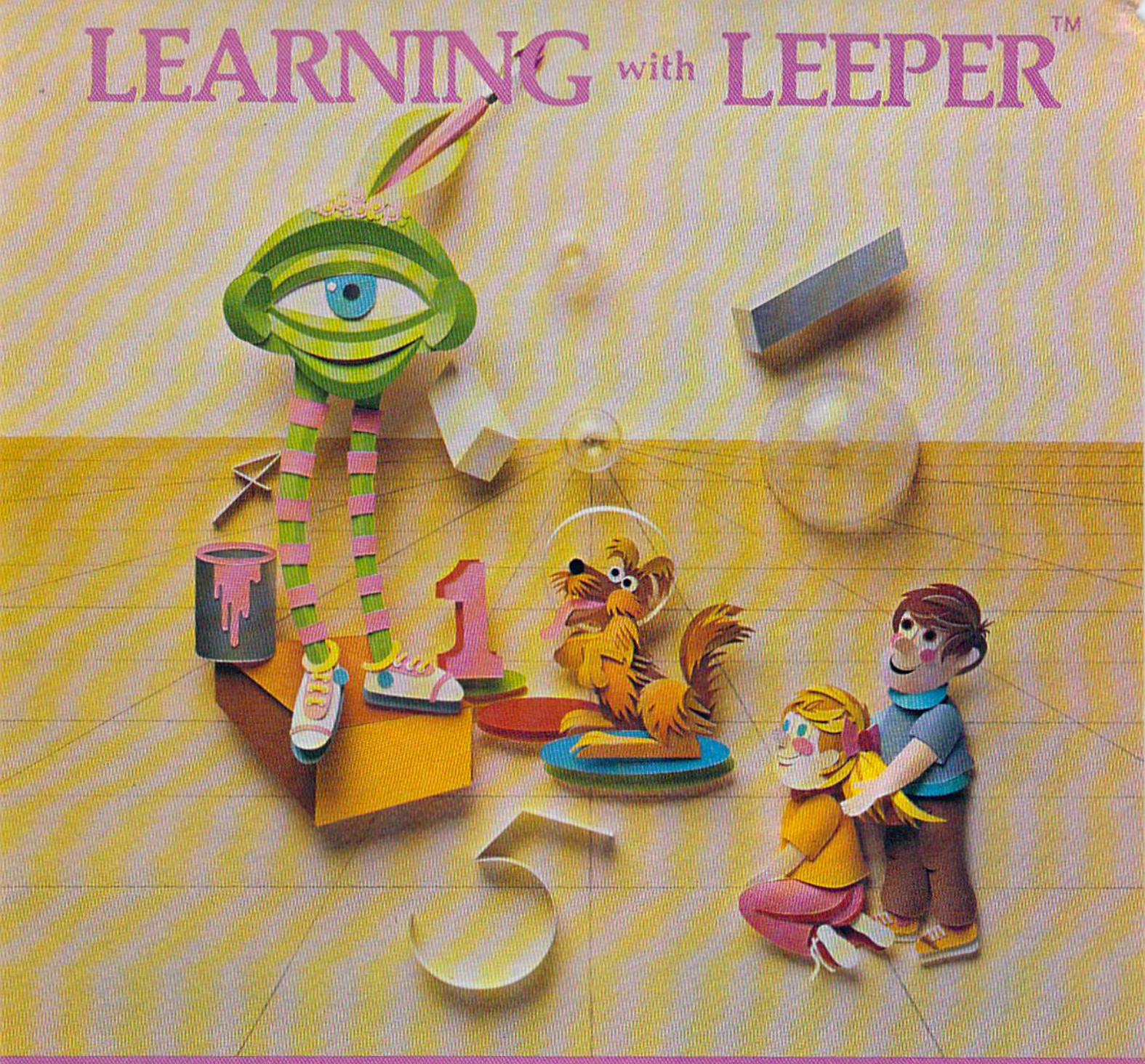

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Corporate Office:
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GAZETTE FEEDBACK

EDITORS AND READERS

Diskette Safety

I recently purchased a 1541 disk drive to use with my 64. I have a couple of questions about its use.

Is it harmful to store a disk in the drive when the drive is not in use?

When I power up my drive, the red read/write light comes on. Is it safe to leave a diskette in the drive during this?

Is it safe to use both sides of a single-sided diskette?

Dan Dabson

It is not a good idea to leave a diskette in the drive when it is not in use (powered off). You might forget to remove the disk before you turn the drive back on. When the drive is powered up, it is not ready for a disk. The read/write head could be in a bad location, and could be momentarily magnetized. The head might erase part of the disk or write bad data to it.

As for using both sides of single-density floppy disks, don't. *Here are a couple of reasons why. First is the danger of dust contamination. As you use the normal side, the disk always spins in one direction. Dust tends to collect in certain places inside the disk's protective jacket (that's the purpose of the felt liner). When you use the other side, the disk spins in the opposite direction. This could "spin" that dust out of the corners and onto the disk, causing great damage.*

Second, and most important, don't use that second side because it may already have been proven substandard. Most disk manufacturers produce disks in the following way. The disks are originally manufactured as double-sided disks with the same magnetic oxide coating and processing on both sides. The disks are then tested (both sides) to see if they meet specifications. If both sides test out OK (they're certified*), the disk is packaged and marketed as double-sided. However, if one side tests good, and the other side fails, the good side is labeled and sold as a single-sided disk. This means the second side may have been tested and rejected as bad. The manufacturers we contacted all stressed this point: if you use that second side of a single-sided floppy, you do so at your own risk.*

Also consider the possibility that if the disk is lost or damaged, you could lose double the amount of data.

Learning Machine Language

I own a VIC-20 and have been trying to learn machine language. I also have a VICMON (machine language monitor/assembler cartridge) and know about 14 mnemonic commands. My problem is that I don't know the other commands and how to use them.

What I would like to know is if there are books to help me learn machine language. I already have the *Programmer's Reference Guide* for the VIC. Are there any books for machine language?

Steven Booth

There are a number of good books available that will help you learn how to program in machine language. One is Richard Mansfield's Machine Language for Beginners, *by COMPUTE! Books. Also, see his monthly column in this magazine, "Machine Language for Beginners."*

Larger Screen For VIC

Could you publish a program that would turn the VIC's 22-character line length into 40 or even 64 columns? I understand about TVs versus monitors for screen clarity using more characters per line, etc. What I am looking for (and have failed in my attempts to program) is a BASIC program to allow the use of 40 or 64 characters per line.

I am not even thinking of graphics, and I understand that the VIC is not a 22-character Commodore 64. The reason for all this is that there is plenty of good, free software available to anybody with a library card. There is so much software out there for most any computer that uses Microsoft BASIC but doesn't require special graphics. The only trouble is that a lot of it uses and depends on many columns of data. Sure, I've tried to convert them to the VIC's screen configuration, but many times the result is complicated juggling of screen displays.

I'm sure many hackers with a VIC would appreciate a BASIC program to expand the VIC's screen. (I'm surprised Commodore doesn't

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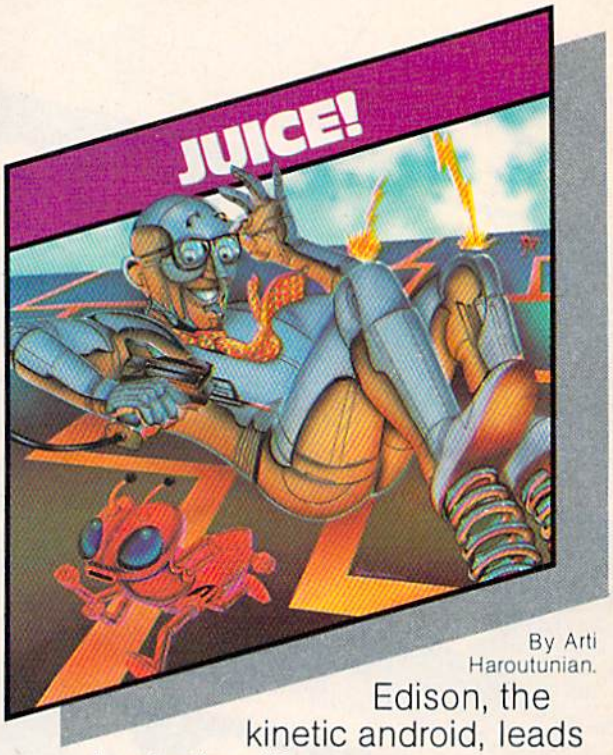

By Arti Haroutunian.

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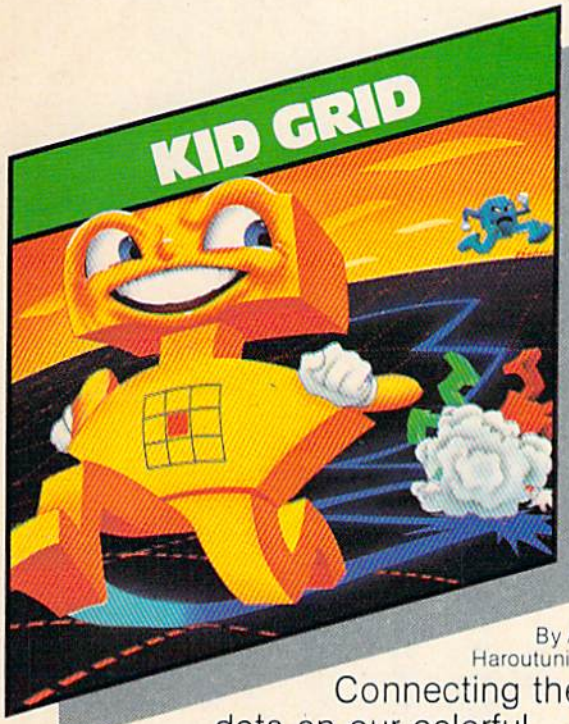

By Arti Haroutunian.

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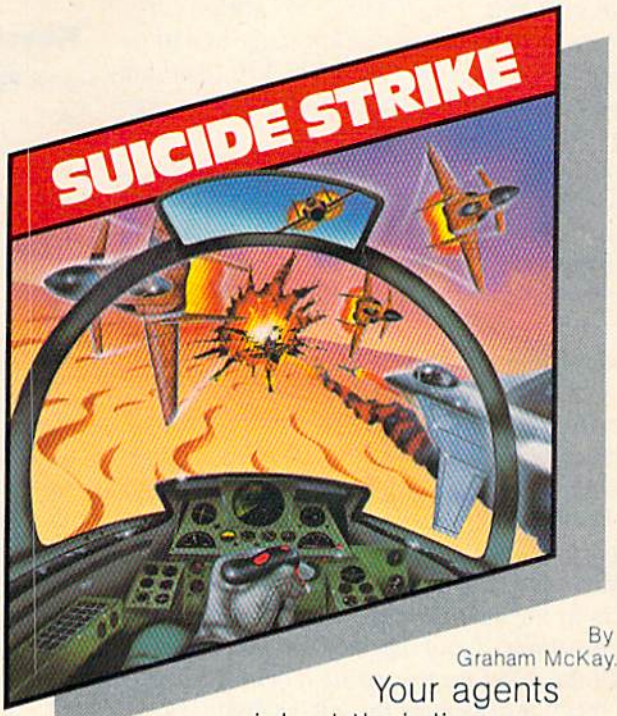

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develop a ROM cartridge for this purpose.)

Brian Greer

Although it is possible to convert the VIC-20 screen to a width of 40 columns through programming, it would be impractical in BASIC. Such a program almost certainly would require some machine language to maintain decently fast key response. Also, the VIC would require memory expansion to leave enough room for the application program.

An example of a 40-column program for the VIC is Terminal-40 *from Midwest Micro Associates (Kansas City, Missouri). This was reviewed in our September 1983 issue. However,* Terminal-40 *is a telecomputing terminal program, not a general-purpose, 40-column converter.*

Commodore does not make a 40-column cartridge for the VIC, but a few independent companies do. Some of them advertise from time to time in COMPUTE!'s Gazette *or our parent magazine,* COMPUTE!. *One product even expands the VIC to a full 80-column width, although anything over 40 columns will require a special computer monitor, since standard TV sets cannot resolve characters that small. We may be reviewing some of these products in the near future.*

In the meantime, if any machine language programmers out there feel up to writing a general-purpose, 40-column utility for the VIC, COMPUTE!'s Gazette *would be glad to consider such a program for publication.*

Keycode Values

Charles Brannon's article in the September 1983 issue was most helpful in showing how to use the Commodore function keys in a program.

I have since noticed programs that also use the function keys without any mention of the particular key or the usual GET or INPUT statement that invites keyboard response. Hours of searching finally revealed a K=PEEK(197) statement.

My question is, where do these "key numbers" come from? Are these numbers decoded to generate the BASIC keyword and CHR$ codes? The *Programmer's Reference Guide* and other similar books have sketchy or no information on the mentioned techniques.

W. K. Brander

The memory location you mentioned (197) is the location to PEEK in both the VIC-20 and the Commodore 64 to detect the current key pressed. *When no keys are pressed, the value of location 197 is 64, and when a key is pressed, the value changes. The value will be the same even if the SHIFT or CTRL key is pressed simultaneously. In the 64, for example, pressing SHIFT/A, CTRL/A, or A all return a value of 10 in location 197.*

PEEK(197) can be used if, for some reason, you do not wish to use the GET or INPUT commands. A few IF-THENs can process the information the same way you would using GET.

Below is a table of the values returned by location 197 when a key is pressed on either the VIC-20 or the 64.

Keycode Values

KEY PRESSED	C64	VIC
A	10	17
B	28	35
C	20	34
D	18	18
E	14	49
F	21	42
G	26	19
H	29	43
I	33	12
J	34	20
K	37	44
L	42	21
M	36	36
N	39	28
O	38	52
P	41	13
Q	62	48
R	17	10
S	13	41
T	22	50
U	30	51
V	31	27
W	9	9
X	23	26
Y	25	11
Z	12	33
0	35	60
1	56	0
2	59	56
3	8	1
4	11	57
5	16	2
6	19	58
7	24	3
8	27	59
9	32	4
←	57	8
+	40	5
−	43	61
£	48	6
CLR/HOME	51	62
INST/DEL	0	7
@	46	53
*	49	14
↑	54	54
:	45	45
;	50	22
=	53	46
,	47	29
.	44	37
/	55	30
CRSR ↕	7	31
CRSR ↔	2	23
F1	4	39
F3	5	47
F5	6	55
F7	3	63
RETURN	1	15
STOP	63	24
NO KEY	64	64
SPACE BAR	60	32

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Colorless Color Monitor

I have an all-Commodore setup, and I have noticed a problem. When I switch off the 64 to clear and reset the computer, my Commodore 1701 color monitor reverts to black and white. Could you please tell me why this happens? I am using the three-lead connector located in the back of the monitor. I have checked the switch on the back of the monitor, and it is indeed switched to the rear position.

Also, I have noticed that when I use SYS64738 to clear memory, all it does is reset the BASIC pointers. Is there a command that will really reset my machine?

Ken Mehawk

For the problem of the 1701 reverting to black and white, we have no real solution. The problem might be with your equipment. However, we can offer these suggestions.

First, when you turn off the 64 (or any computer), wait a good ten seconds before you turn it back on. Some computers, when rapidly turned off and back on, behave strangely. Second, check all your cables and connections for shorts or breaks. Another thing to check is the adjustments (vertical hold, etc.) on the front panel of the 1701 monitor. Especially check the horizontal position. On some TV sets and monitors, if the horizontal position (or horizontal hold) is not centered just right, the color will drop off. If none of these suggestions help, take your 64 and 1701 monitor back to the dealer and have them check it out for you.

The SYS64738 you mentioned is indeed a system reset, but only a partial one. When you enter SYS64738, it does the following:

1) *Resets the BASIC pointers.*
2) *Reinitializes the VIC chip.*
3) *Resets the vector pointers.*
4) *Reinitializes zero page.*
5) *Clears memory from 679 to 767 and 828 to 1019.*
6) *Resets the first ten bytes of BASIC RAM memory.*

It does NOT:

1) *Erase all of BASIC memory.*
2) *Erase RAM memory from 49152 to 53247.*

The fact that it does not clear out BASIC memory, and memory from 49152 to 53247, can be a plus. If you are running a program, and the system becomes partially "hung," you can use this SYS to reset the computer without erasing your BASIC program or any machine language programs (like an assembler/monitor) that may be in 49152 – 53247. After you SYS64738 and type LIST, it may appear as though your BASIC program is gone, but it is not; only the pointers have been reset. You can restore that BASIC program by running the handy "VIC/64 Program Lifesaver," COMPUTE!'s Gazette, *November 1983.*

64 Mystery Bit

While browsing through the *Commodore 64 Programmer's Reference Guide*, I spotted something interesting on page 322 of the BASIC to machine language section. The description of the I/O assignment of location 53270, bit 5, is "ALWAYS SET THIS BIT TO 0!". I am curious to find out just what would happen if I didn't heed that warning. But I don't wish to risk my Commodore 64 in doing so.

J. Berger

Have no fear — you cannot damage a computer with a bad poke or a "bug-infested" program.

To quote the instruction manual (Personal Computing on the VIC-20) *included with the VIC, from page 80, "We want to repeat what we told you way back in chapter one:* There is no way you can hurt the computer by typing on the keyboard...not even with a POKE."

You could, of course, damage it if you have a heavy touch on the keyboard, but as mentioned, a bad POKE to a wrong location will not permanently damage your VIC or 64. You can temporarily mess things up pretty bad if you don't know what you're doing. For example, turn your computer off, then on, and enter POKE 788,0 for the VIC or POKE 1,0 for the 64. These POKEs may lock up the computer, but if they do, simply press RUN/STOP-RESTORE to recover. If this doesn't work, turning your computer off, then on again, will completely reset it back to normal. Don't be afraid to experiment, it won't hurt. Just don't do so with any valuable programs in memory, or you may lose them if you have to turn the computer off to reset it.

As to your original question, we ran tests with bit 5 of location 53270 both off and on, and it seemed to have no effect. To be safe, leave it set at zero.

Fuzzy About Function Keys

In your September 1983 issue of COMPUTE!'s Gazette, you had an article about how to use function keys. I didn't really understand it all that much, so I was wondering if you could send to me or publish a program using the function keys. I'll try to see if I can use the function keys properly:

```
10 PRINT "{CLR}PRESS FUNCTION KEY ONE (F1
   ) TO TYPE A{3 SPACES}CERTAIN NAME."
20 PRINT "WHAT IS THE NAME";
30 INPUT A$
40 PRINT:PRINT "NOW WHEN YOU PRESS F1, ";
   A$;" WILL PRINT ON THE SCREEN."
50 PRINT:PRINT "TRY IT NOW!"
60 GET B$:IF B$="{F1}" THEN PRINT A$
```

Is this the proper way to program the function keys?

Jack Farnsworth III

Your program is very close, but if you RUN it, you'll see that A$ (the string variable containing the name) does not print on the screen when you press the f1

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function key. The program ends before it detects the keypress.

The solution is to program a loop *— a series of instructions that keeps the computer constantly circling around, waiting for input. Add these lines to your program:*

```
60 GET B$:IF B$<>"{F1}" THEN GOTO 60
70 IF B$="{F1}" THEN PRINT A$
```

Line 60 is the loop. The computer constantly executes line 60 as long as the condition is satisfied — that is, as long as B$ (the keyboard input) is "<>" or "not equal" to the f1 function key. When f1 is pressed, the condition is no longer met, so the computer continues to line 70. And line 70 prints A$, the person's name. Such loops are extremely common in programming. We suggest you reread the September article while sitting at your computer so you can type in and try the numerous programming examples.

VIC Games On The 64

I went to several computer and video stores and asked if you could play VIC-20 games on the 64. Their answer was no. Is there any way this is possible?

Thomas Maciejewski

Yes, you can run some VIC programs on the 64. However, most, if not all, commercial games and programs will not.

Most noncommercial VIC programs will run if they are converted. Because the BASIC in the VIC-20 and the 64 is the same, it can remain almost untouched. The PRINT statements might have to be rewritten because of the difference in screen sizes of the VIC and the 64.

But the biggest task in conversion is with the PEEKs and POKEs. Because the VIC and 64's color memory, screen memory, sound chip memory, etc. are different, these conversions could be extensive, depending on how many PEEKs and POKEs the program uses.

Of course, there are some programs that simply cannot be converted. For instance, a sophisticated sound program written for the 64 cannot be converted because the VIC doesn't have the SID (sound interface device) chip found in the 64.

VIC Scrolling With POKEs

I own a VIC-20 and would like to know if you could list any POKEs that could be used to make the screen scroll up, down, right, left, and diagonally.

Jeremy Kropp

There are two locations on the VIC-II chip that control the horizontal and vertical centering. The bytes (36864 and 36865 respectively) can be POKEd with different values to change the positioning of the screen. Although they offer only partial control of scrolling (you cannot scroll completely in all four directions), you can use them to create some interesting special effects.

Enter and then RUN this short sample program which will demonstrate the scrolling techniques:

```
10 POKE36879,27:PRINT"{CLR}{DOWN} {BLK}SC
   ROLLING DOWN"
15 FORT=1TO500:NEXTT
20 FORA=25 TO 130: POKE 36865,A: FORT= 1
   {SPACE}TO 5: NEXTT: NEXTA
30 PRINT"{CLR}{DOWN} {RED}SCROLLING UP"
40 FORA=130 TO 25 STEP-1: POKE 36865,A: F
   ORT= 1 TO 5: NEXTT: NEXTA
50 FORT=1TO1000:NEXTT
60 PRINT"{CLR}{DOWN} {BLU}SCROLLING RIGHT
   "
65 FORT=1TO500:NEXTT
70 FORA=5 TO 50: POKE 36864,A: FORT= 1 TO
    10: NEXTT: NEXTA
80 FORT=1TO500:NEXTT
85 PRINT"{CLR}{DOWN} {BLK}SCROLLING LEFT"
90 FORA=50 TO 5 STEP-1: POKE 36864,A: FOR
   T= 1 TO 10: NEXTT: NEXTA
100 FORT=1TO1000:NEXTT
```

Location 36864 normally contains a value of 5. POKEing integers larger than 5 into this location will scroll the screen to the right. If you POKE a value larger than 18, the screen will display garbage. Just POKE 5 to return the screen to normal.

The normal value in location 36865 is 25. POKEing a value larger than 25 will cause the screen to scroll down. The screen will seem to have disappeared with values of 130 and larger. Again, here you are also limited in that you cannot scroll up completely.

Diagonal scrolling can be accomplished using combinations of both 36864 and 36865.

Disk Drive Solutions

As a Commodore dealer in the province of Nova Scotia, I would like to respond to two items in the "Gazette Feedback" (August 1983).

• Disk drive conversion. Yes, the 1540 can be converted to a 1541 by replacing one ROM. We have had the 1541 conversion ROM for about six months (part #901229-01). There is also a conversion ROM to upgrade the 1525 printer to a 1525E to work with the Commodore 64.

• Dual drive lock-ups. We received a technical bulletin from Commodore indicating that the order of turning on the various pieces of equipment is important, besides changing the disk unit device numbers. The recommended order is as follows:

1) 64, 1541, 1525E.
2) 64, 1541, 1541.
3) 64, 1541, 1541 or 1525E (only one or the other may be on).
4) 64, 1541, 1541, 1526.

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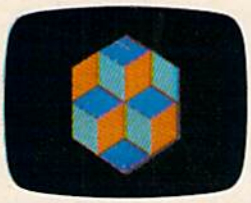

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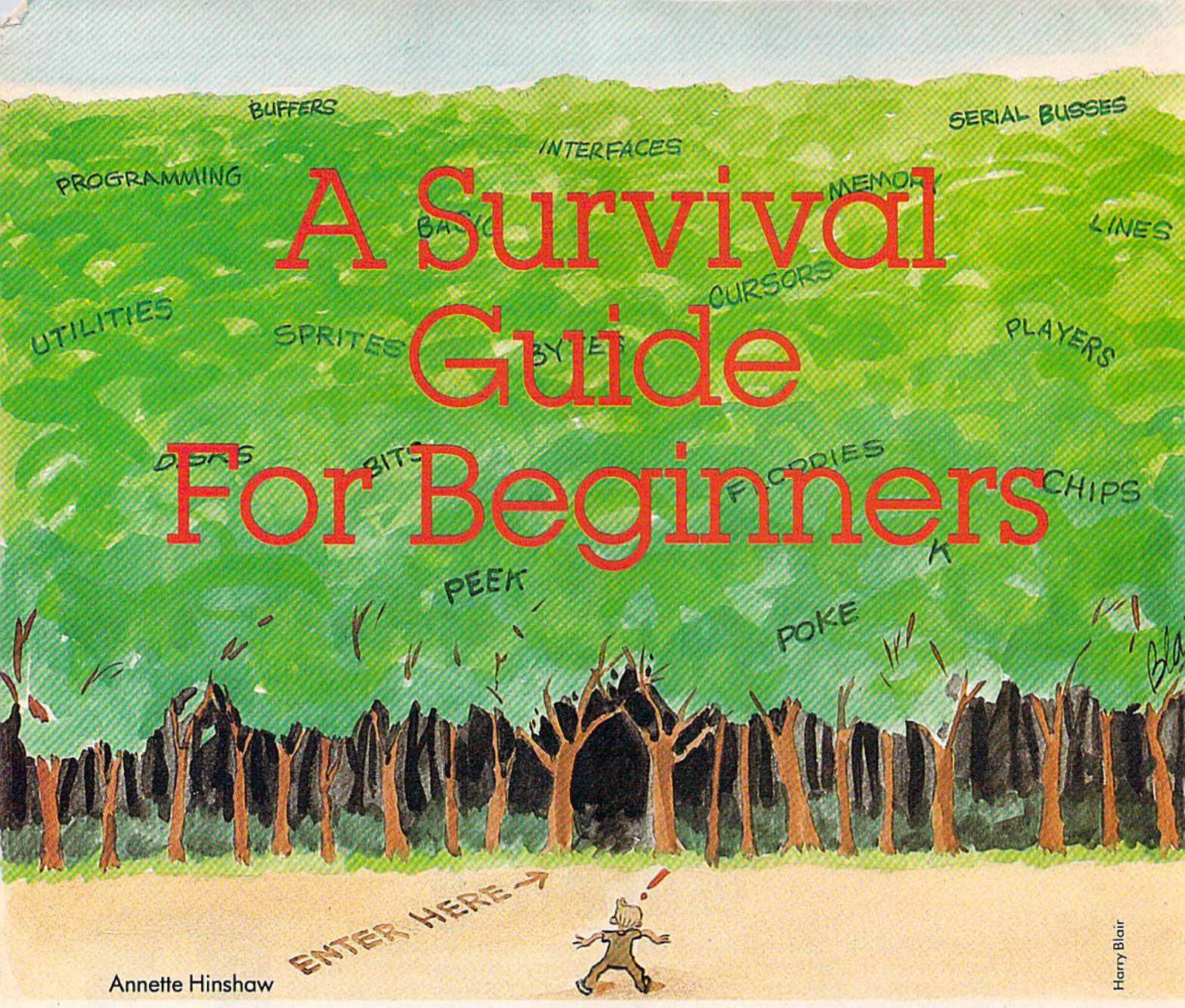

A Survival Guide For Beginners

Annette Hinshaw

Harry Blair

Computing can often be confusing and frustrating for people just getting started. Here are some tips and bits of advice to help sort out the confusion.

With Commodore computers so inexpensive, many people who never before imagined owning a computer are buying them. When these computer novices get their equipment home, they inevitably find that making a computer do what they want it to is not always as simple as it looks. Hidden tricks and pitfalls seem to haunt newcomers. Whatever answers are in the book that comes with the machine escape them. Bewildered, they look around for help.

Help abounds. In fact, so much help is being offered to beginners that sometimes the problem is how to choose effectively from an array of classes, schools, books, magazines, and other sources of computer information. Fortunately, a little common sense and a look at the major sources of computer information help sort out the choices.

The first thing is to find out what you need to know. Most beginners need help in three areas:

1. Computer Literacy/Consumer Education. Prospective buyers or new computer owners wondering what to add to their systems need to know basic facts about what the machines will or won't do. General information on the pros and cons of different computer features or peripherals helps simplify purchasing decisions. Computer literacy information should provide immediately useful knowledge.

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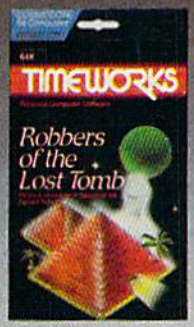

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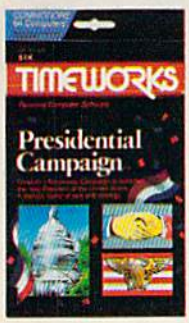

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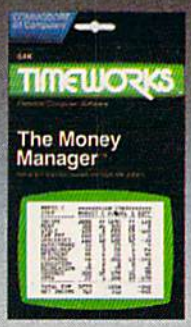

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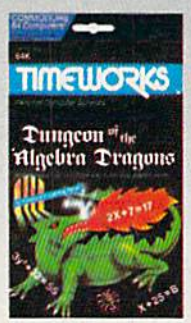

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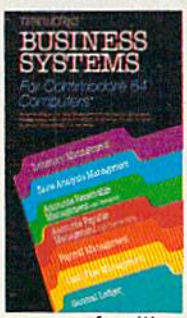

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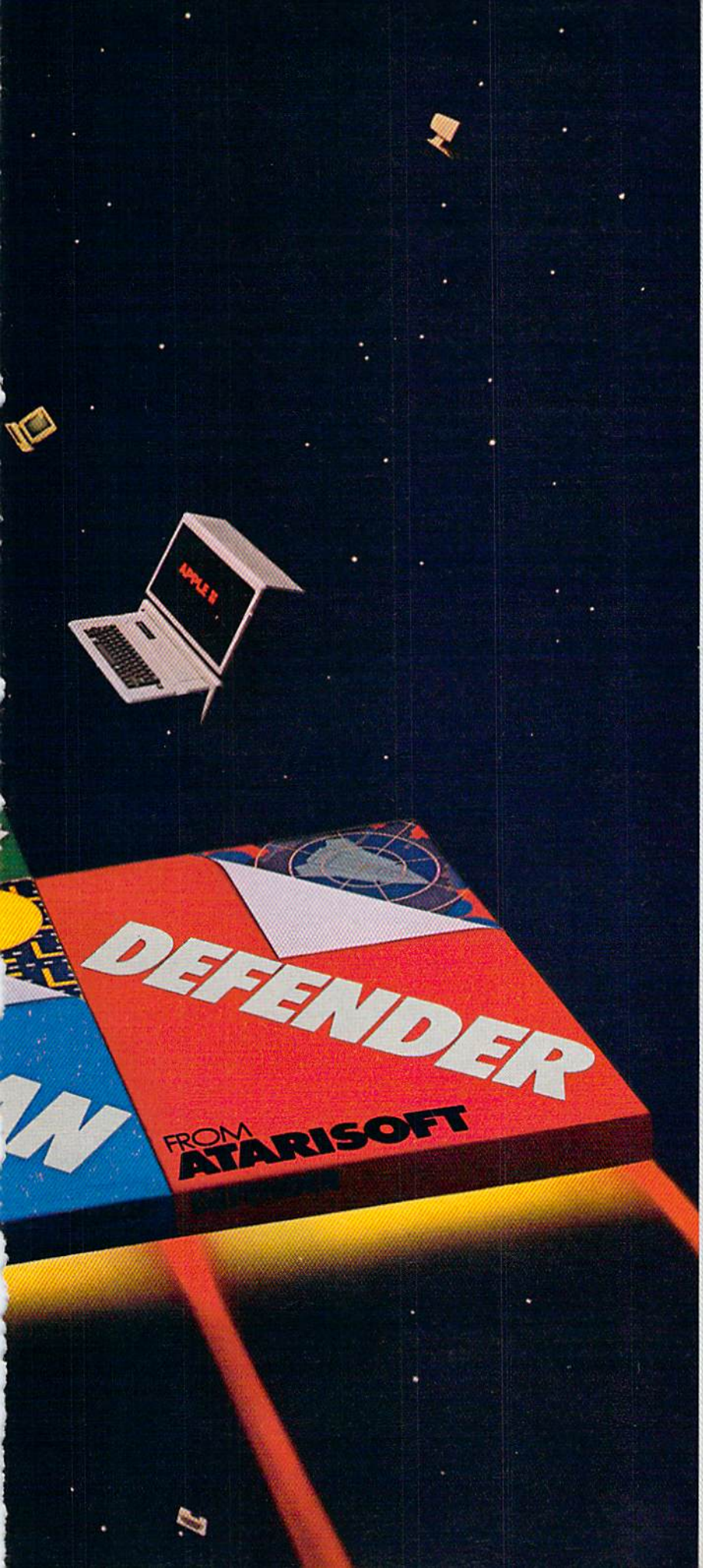

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PRODUCT OWNED: (Check one)

- ☐ TI-99/4A
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2. Computer Programming.
No one has to be a programmer to use and enjoy computers—ready-made programs are available for almost any task. However, even an elementary knowledge of programming helps beginners understand how the computer "thinks." With a little programming ability, they can better understand the possibilities and limitations of their new tools. They can become more skilled in programming if they want to and begin to modify or develop software for their peculiar needs.

Those who are afraid their questions will sound stupid or silly shouldn't worry about it.

Proficiency in programming requires time and practice. Not everyone is willing to invest in gaining it. But a beginners' programming class or self-teaching course is a good idea for newcomers, even if they don't pursue the skill to expertise. They can at least remove the mystique from programming and see for themselves what's going on inside their computers.

3. Access to Operating Information.
Beginners want to be able to find information on operating their computers as the need arises. If they can't make their printers work, or if they want to disable the RUN/STOP key, they need to be able to find out how to do it.

The best place to answer questions that are not in the users' manuals (or are buried where the novice has trouble finding them) is from a network of knowledgeable people. Second best (when you're looking for a particular answer) are books and magazines devoted to the computer involved.

Beginners should define the information they need as clearly and precisely as possible. The specific need is an important guide for choosing among available sources. Those who feel they don't know enough to ask a specific question, or are afraid their questions will sound stupid or silly, shouldn't worry about it. Almost all computer people have experienced similar problems and can often figure out what you want to know even when you can't define it yourself.

The rule of thumb for judging the value of any information source is twofold: First, ask "Do *I* need this information?" Second, ask "Can I *use* it?"

The second question is the most important. It doesn't matter whether a book or a class is good or bad. If you can't understand it, it's not useful to *you*. This is not because you are inadequate. More likely, it's beyond your stage of development or it's a poor source of information. You may grow into information above your skill level if your interests move in that direction. In the meantime, advanced material and poorly designed or inaccurate material may look the same to a novice.

New computer users should avoid anything—class, written material, or friendly advice—that doesn't make any sense at all. The information *must* include something you can effectively apply to your computer. You don't have to understand everything. If you can use a part of a class or a magazine article, you will eventually puzzle through the hard part if you persist. But the facts by themselves won't help unless they lead to actually *doing* something.

Computer classes are an obvious place to learn more about computers. Public schools and junior and four-year colleges are developing classes in adult (or continuing) education programs to meet the needs of the many new or prospective computer users. Some computer dealers and various private schools offer instruction; and local groups such as computer clubs, ham radio clubs, or the public library may sponsor classes as well.

Most classes offered in public education deal with computer literacy or beginning programming (usually in BASIC). Computer literacy courses can vary in scope. Some classes which purport to be for beginners include material that is useless or even discouraging to novices. A useful course will cover a basic vocabulary of words which are needed to learn about computers, such as *byte* and *software*. It will include discussions on what computers can do as well as some understanding of their limitations. The class also needs to address the trade-offs made from one machine to another on issues such as RAM memory, expandability, and availability of software and documentation.

A computer literacy class that spends significant time on the history of computers, binary math, or computer architecture is probably a waste of time for a newcomer. These subjects are valuable to advanced students; but for the novice, they can be discouraging because they reinforce the mistaken idea that understanding computers is only for the few.

Note that credit classes offered by colleges are not usually for beginners. A class called "Introduction to Computers" in a regular college curriculum may not deal with anything as small as a microcomputer. BASIC programming may require a strong math background. The classes

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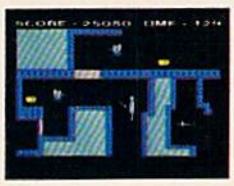

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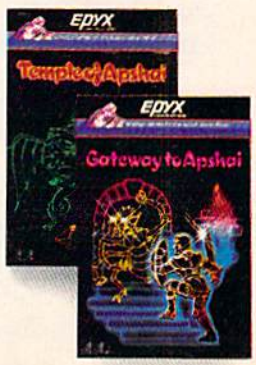
One player; Temple of Apshai, disk/cassette; Gateway to Apshai, cartridge, joystick control.



EPYX COMPUTER SOFTWARE

STRATEGY GAMES FOR THE ACTION-GAME PLAYER.

*Game Manufacturers Association, 1981

offered for real beginners, and especially home users, are usually noncredit.

A beginners' programming course is a worthwhile pursuit when it's designed for people who are really new to computers. Students are introduced to a few fundamental programming mechanisms and ideas such as variables, looping, and branching. They learn to use the most common "words" in computer language to write simple programs under the guidance of someone who can help when they get stuck. Seeing how the programs work (or don't work) educates newcomers in computer logic.

Be suspicious of any programming class that does not have computers in the classroom or offer hands-on practice.

A beginners' class shouldn't be too mathematical. It needs to cover basic math operators such as + and −, but not math functions such as SQR (square root) and ABS (absolute value). Almost all public education in computers has been handled by mathematicians, and even now some forget that trigonometric functions are not needed every day by most people.

Be suspicious of any programming class that does not have computers in the classroom or offer hands-on practice. Programming is almost impossible to learn as a theory, and the reinforcement by seeing how a particular program works when it is executed is essential to further understanding. Classes in schools are usually taught on whatever machine the school owns. When it's the same computer you have at home, the situation is ideal. When the machine is different, you should be prepared for frustrations. Programs written for the Apple usually don't work on the Commodore. However, computer logic is about the same in all home computers. Learning Applesoft BASIC when you have a VIC-20 is still better than not learning any programming at all.

Don't take a programming class if you don't have a computer that you can use outside of class. Programming is not a good introduction to computers unless it can be applied in personal use. Students who have a week between classes and don't practice in that time find that much of what they learn slips away between class periods. They may become discouraged or feel stupid. A computer literacy class is a better bet for people who haven't yet bought a computer.

Dealers' classes are often slanted toward the needs of their business-system customers. They are always machine-specific. A student can learn more about using his Commodore from a Commodore dealer than he can from a similar class in a school that uses TRS-80s.

Private or technical schools, especially those which teach only about computers, may be very responsive to the student's individual needs. They have to satisfy their customers because they continue to make a living by getting referrals and repeat business. They are sometimes expensive, though.

Miscellaneous groups vary a lot depending on the particular interests of the classes they sponsor. A Commodore users' group may offer the best programming class available for the VIC-20 or Commodore 64 owner. A ham radio club will probably offer strong hardware support. The public library may be able to get expert speakers on computer literacy.

When you're looking for an answer to a specific question, one of the best places to go is to a computer club. Such clubs bring together people with all levels of knowledge. Even experienced computer users come to clubs hoping to find sources for solving *their* computer problems. Within this information exchange network newcomers can usually find astonishing patience with their questions.

Computer clubs come in different flavors. A general club has the widest variety of members. It may lean toward hardware tinkerers or programmers. Sometimes the majority of the members will have a particular common interest, such as machine language programming or operating business computer systems. Again, you might want to shop around for a club that meets *your* interests and needs.

Finding computer clubs can be tricky, especially in metropolitan areas. Try asking the public library or the chamber of commerce. Check with any computer stores or electronic supply houses you can find. Ask anyone you know who has a computer, and check lists of local club meetings in newspapers and on radio and TV.

User groups or special interest groups (SIGs) are a more specific kind of computer club. Everyone in such a group will have one kind of computer, or be interested in a particular computer topic. Topics may range from computer languages like FORTH or LOGO to operating systems like CP/M to using computers for analyzing investments.

User groups for a particular machine are a major resource for beginners. The purpose of the

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group is to exchange information and software for a machine that all members own. You may be able to find someone who has successfully interfaced his Commodore 64 with the printer you're thinking about buying. Someone there may have tried that piece of software that sounds so good in the ads. User groups are so valuable to beginners (and all others) that you should consider trying to start one if none has been organized in your town.

So many new book and magazine titles are appearing that a new computer owner can easily feel overwhelmed. Using the rule of thumb "Can I *use* it?" helps thin the selection. When you ignore the material on applications that don't interest you and leave out the things you can't use, you bring the information to buy or read down to manageable proportions.

In general, the more specific a publication is to your needs, the better. A book on programming games on the VIC-20 is usually more helpful than a book on designing computer games, at least at first. Magazines for Commodore machines will have more information for the Commodore 64 or VIC-20 owner than general computer magazines. A magazine that is meant for beginning to intermediate users may be more immediately useable than a magazine that caters to computer professionals.

Books, even more than magazines, are easier to use when they are for your particular machine. A general text on BASIC programming will have commands not found on the VIC-20, or which work differently on the Commodore than the book suggests. A collection of business programs which were written to run on the IBM will be hard for the inexperienced to convert to a different machine.

So much information is available on computers that newcomers may have trouble keeping a sense of perspective. All too often, they come to the computer world expecting to fail, assuming that computers require special education or talent. That may have been true once, when home computers had to be assembled by the buyer, and hardly any software was available. Nowadays, the new "friendly" computers can be used effectively by anyone who will invest some effort in learning how.

Novices should remember that there are no stupid questions about computers. Some computer expert asked the same question when he was a beginner. He reached his expertise by persisting, learning a little at a time, and getting help from others. You can too.

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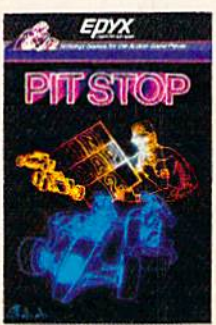

Telecommuting:

Dawn Of The Electronic Cottage

Gregg Peele, Assistant Programming Supervisor

The invention of the telephone a century ago opened a new age of remote communication, weaving the world together with a network of wires. Today, the invention of the microprocessor is revolutionizing our communication system. One of the spin-offs may be a return to the decentralized living of yesterday—people working at home on remote terminals or microcomputers instead of battling the morning and evening rush-hour traffic into the city. As this article shows, "telecommuting" is becoming a viable alternative.

From the barn behind his rural Wisconsin home, Rohn Engh publishes a newsletter that goes out to hundreds of people all over the nation. Published both on paper and in a new electronic edition, Engh's *THE PHOTOLETTER* pairs photo editors for magazines and other publications with photographers. Without microcomputers, Engh might still be caught up in metropolitan hustle and bustle.

Based in Osceola, Wisconsin, Engh left a big city to live and work in his slower-paced rural setting. In rustic surroundings, he has built his business from a small beginning to a newsletter with more than 1700 subscribers, each paying $75 per year. He feels that working at home has been not only profitable, but also has helped him strengthen family ties with his children. "In a time when many don't have time to participate with their children, our sons had us to be there for them."

To handle the accounting for his subscribers, Rohn Engh uses a Radio Shack TRS-80 Model II computer. Recently he put his newsletter on NewsNet, an electronic news and information service. Using his computer, he hopes to develop a network to connect thousands of photographers with his business.

Engh says the choice between pursuing a career in the big city or working out of his home in the country came down to a matter of opposing lifestyles: "I had to decide between making a living or making a life."

More and more people are making the same choice as Engh—to "telecommute" by computer from their homes instead of commuting by car or mass transit to the metropolis. Ironically, this computer-age phenomenon actually is a throwback to the decentralized work patterns of the pre-industrial age.

In the 18th century, before the Industrial Revolution, so-called cottage industries were common in agricultural areas where farmers experienced seasonal unemployment. In the winters,

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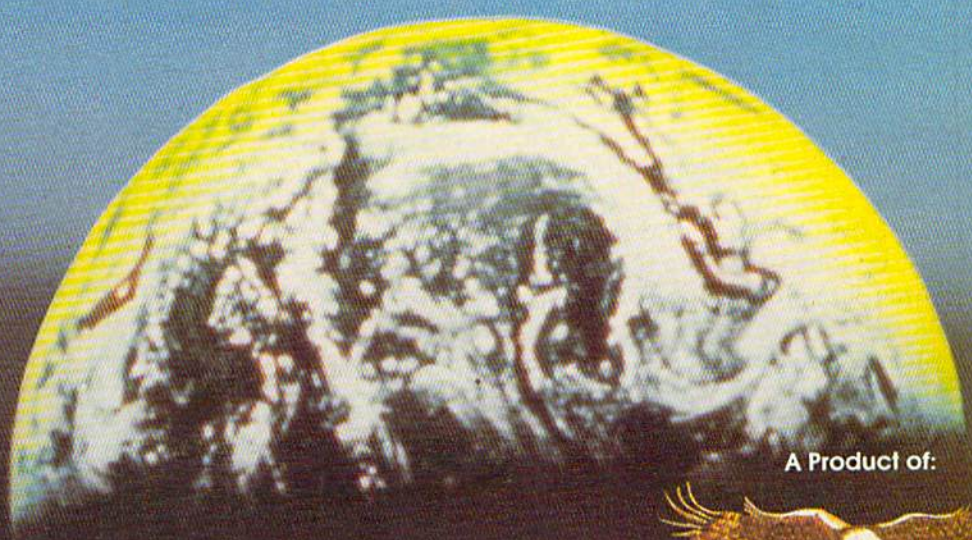

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they made ends meet by making consumer goods at home. Middlemen tried to coordinate this loosely organized network of home producers, supplying raw materials and equipment, and collecting and selling the finished goods.

As demand increased, and the number of domestic producers grew, supply, supervision, and distribution became more difficult. The widely scattered nature of this loose network, in an age before mass transportation, made it economically inefficient. During the Industrial Revolution it was replaced by the factory system—collecting workers under one roof. Industrialization, in turn, led to mass centralization and urbanization. Production became vastly more efficient, but new problems cropped up.

As most of us who lurch out of bed to an alarm clock and fight rush-hour traffic realize, modern society clings to the habit of collecting workers under one roof even though it doesn't always seem necessary. Think about your job. Could you do some or all of your work at home? What would you need in order to do so? Communication and information jobs, and jobs requiring thinking and creativity skills with very little capital equipment, could just as well be done at home as in a distant office.

We may soon see history repeating itself. "The electronic cottage," a term borrowed from the 18th-century cottage industries, describes the computerized home workplace. Only this time, the problem of widely scattered workers is being solved with electronic communication.

Hundreds of thousands of employees at banks, insurance companies, and other businesses already are using computers or computer terminals at work. Recently, some businesses have started using remote terminals to link employees in their homes to the main office computer. These workers, dubbed "telecommuters" by researcher John Niles, perform their duties without having to make the daily trip to and from the office. Telecommuting jobs vary from those which are clerical in nature (data entry, word processing) to those in professional categories (lawyers, stockbrokers, insurance agents, programmers). Then there are workers who are physically handicapped, or who need or prefer to work at home. These people find that telecommuting balances the necessity to earn a living with the advantages of working in their own dwelling.

The University of California at Berkeley's Melvyl Division of Library Automation is implementing a huge project designed to make the library's services available to home users. Employees working on this project have the option of working at home rather than at the university. Already, 200 terminals have been distributed throughout the school and in the project members' homes.

Mary Engle, system analyst for the computing resources group, believes that employees with home terminals can use their time much more flexibly. "Having a terminal at home allows the employee to avoid the early-morning California traffic and still accomplish the same amount of work," she says.

Although the workers are separated by many miles, Engle says that communications are actually more efficient. Messages can be left for workers and supervisors without them ever having to come in contact with each other.

Rohn Engh and his wife, Jeri, using their computer in their barn/office. (Photo courtesy Robert Meier)

Telecommuting, however, raises many issues, and one of them could slow a trend away from central workplaces: working at home with computers is likely to alter many entrenched ideas about employer/employee relations. For instance, the absence of employees from the central workplace forces managers to devise new means of supervision. How does a boss know if an employee working at home is taking a 30-minute coffee break or chatting with the neighbor about the weather? Possible solutions include requiring employees to report to the office occasionally, or to pay them based on the amount of work they complete.

One company experimenting with telecommuting, Blue Cross and Blue Shield of South Carolina, assigns work in its "Cottage Keyer" program according to employee seniority. Only those employees who have proven themselves dependable may work at home.

COMPUTE! Books

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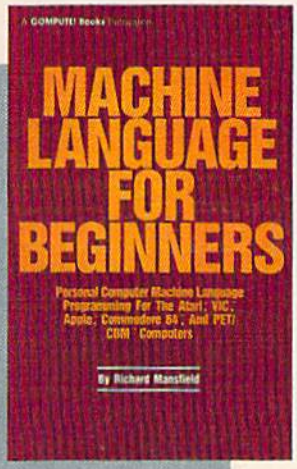

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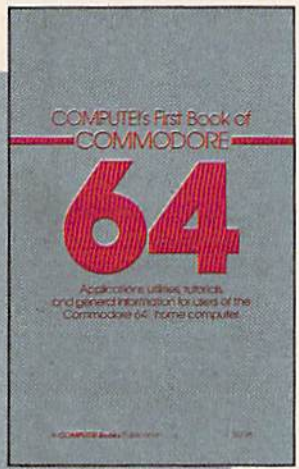

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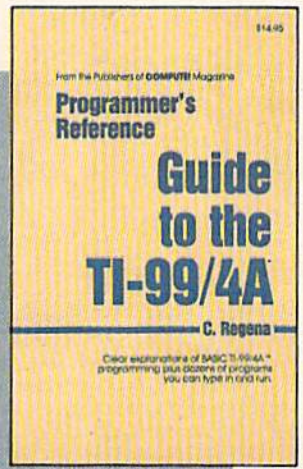

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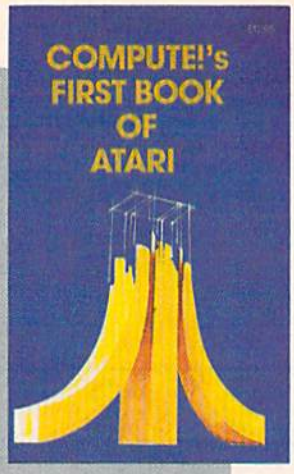

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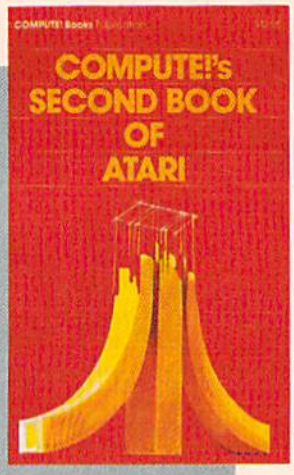

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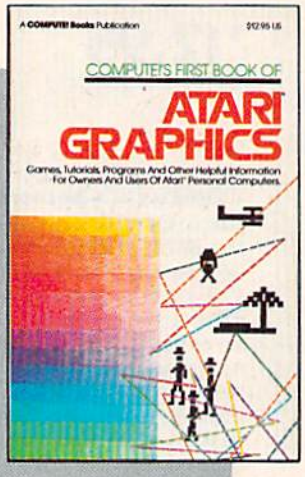

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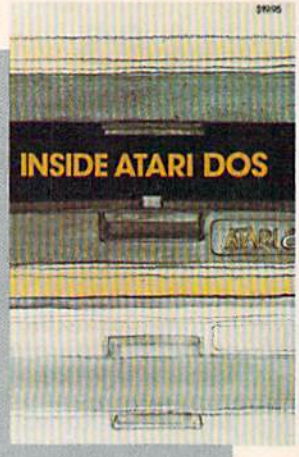

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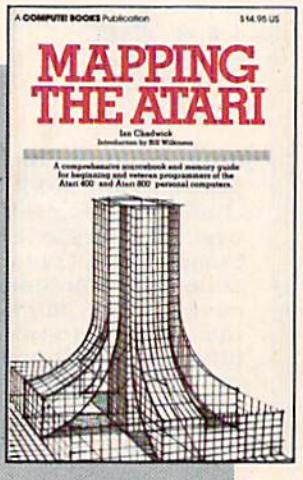

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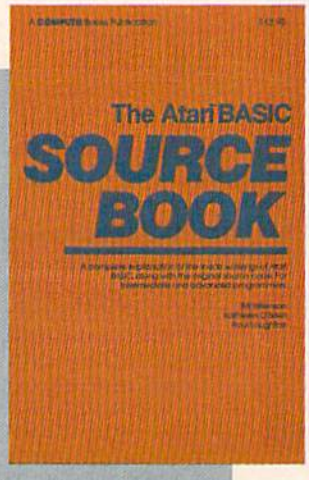

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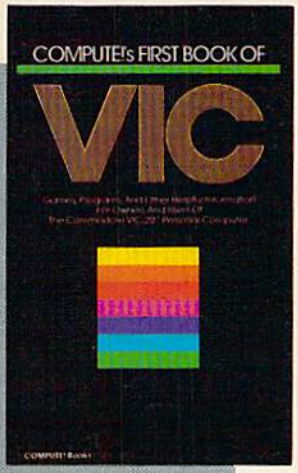

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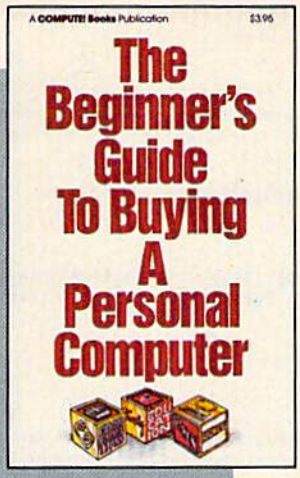

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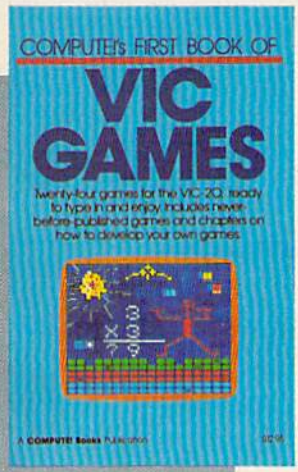

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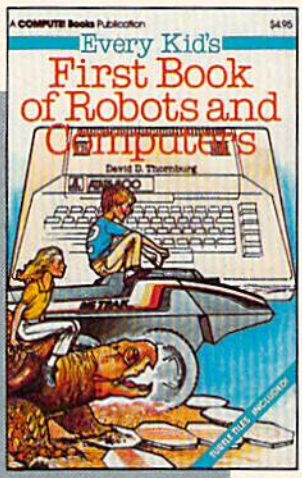

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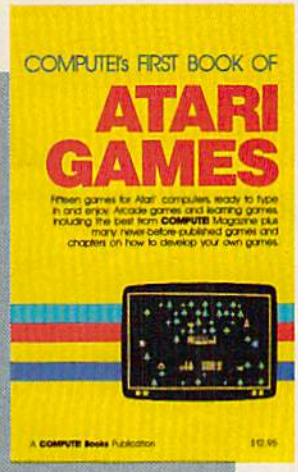

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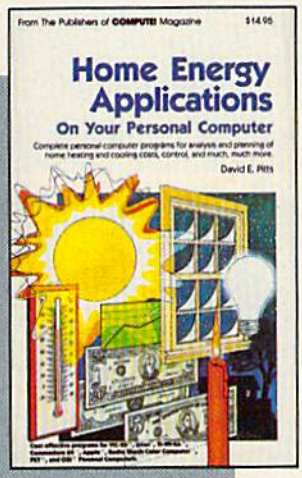

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Other large companies experimenting with telecommuting include Control Data Corporation and the Aetna Insurance Company. Seattle Public Health Hospital employs eight to ten telecommuters involved in medical research and application programming. Larry Rothenburg, operations director at the hospital, believes telecommuting is becoming more and more popular. "People do it all the time. Here, it's so common it's not a big deal." Hospital researchers use home terminals to compile information for their research projects. Even nonadministrative employees use terminals to help meet deadlines and complete work after regular hours.

Some professional people are using home-based computers to set up their own businesses, preferring the privacy and friendly atmosphere of the home to the frenetic pace of the city. James Ward, once managing director in charge of bond trading at Dillon Read and Co., a securities firm in downtown New York, is now using a computer at home to sell corporate bonds and securities. Computer technology has given him the tools to keep track of both the rise and fall of securities prices and his growing clientele.

As telecommuting spreads, some of its more subtle consequences will become increasingly clear. Besides transforming the traditional workplace, it could also dramatically change the role of the home in post-industrial society. There are inherent drawbacks and benefits, depending on your point of view. Here are some possible advantages and disadvantages of telecommuting:

More efficient use of the potential workforce. Lots of human resources are going to waste these days because it costs money to hold a job. Telecommuting can reduce some of these costs. For example, many families today need two incomes, but sometimes both spouses cannot work full-time jobs because it requires buying a second car and/or paying for professional day care for the children. If one spouse were a telecommuter, a second car might be unnecessary. Other work-related expenses also could be avoided—gasoline and maintenance for the second car, a new wardrobe of dress clothes, lunches downtown, etc. Day care expenses also might be avoided, since the telecommuting spouse could care for the children at home (admittedly, this could be a disadvantage, depending on the kids).

Lower costs for employers. The cost of adding new employees is usually less if the employees are telecommuters. In terms of equipment, the company would have to install a remote terminal or microcomputer and perhaps a desk and additional telephone line in the employee's home. This equipment would be necessary even if the employee worked at the central office. The company saves money by not having to provide office space. Consider how much money a business would save if it could expand operations without having to lease or build new offices on expensive downtown or suburban commercial property. Plus, it's that much less space to heat and cool.

On the other hand, some of these costs are shifted to the employee. Room that could otherwise be used for living space must be devoted to work space. People who turn down the heat or air conditioning when the house is empty during the day would have to maintain it at more comfortable (and more expensive) levels. However, it's possible that some of these expenses could be written off on income taxes.

Changing social contacts. Before the industrial age, most people's social contacts were based on proximity—out of necessity, their friends were their neighbors. Today, for the office-bound, the workplace is the most important source of social contact. If people work at home all day, perhaps alone, they might feel isolated. Since most of the dynamics of human relations is from our interactions with others, telecommuters may lack the social stimulation that office employees enjoy. They might even be forced to make friends with their neighbors. Of course, if other family members were at home during the day, the family unit might grow stronger. And someday, part of the youngsters' education might involve staying at home and using *their* terminals.

More relaxed atmosphere, enhancing creativity and productivity. Some companies see telecommuting as a means of making best use of employee creativity. "Many companies want their engineers to take advantage of creative ideas that they may have at home," says Chris Leach of Network Products in Raleigh, North Carolina, a specialized telecommunications networking firm. "If an engineer comes up at midnight with a brilliant idea that may save the company money, companies want to be able to take full advantage of that idea at its conception."

Part-time versus full-time employment. Some companies might find it more efficient to hire part-time telecommuters, perhaps on a contract basis, instead of extra full-time staff. Advantages: Again, the company saves money by avoiding the need for additional office space; the company pays less for salaries and benefits, including health plans and pensions; and more part-time jobs are opened up for people who cannot work full-time. Disadvantages: Part-time employees lose out on benefits, including health plans and pensions; and fewer full-time jobs are opened up for people who need them. These opposing interests are not unique to telecommuting, but they may be exaggerated by telecommuting if it makes part-time

hiring more attractive to employers than full-time hiring.

In addition to the above effects—which are more immediate and immediately obvious— widespread telecommuting could have significant impacts in other ways as well. Futurist Alvin Toffler discusses some of the fascinating possibilities in his landmark book *The Third Wave*. Telecommuting on a very large scale could reverse the trend toward centralization that started with the Industrial Revolution. In a post-industrial, decentralized society where workers are connected by telecommunications instead of transportation systems, there may be relief from such problems as decaying cities, overburdened urban services, traffic jams, energy shortages, pollution, and concentrations of overpopulation.

In the 18th century, working at home provided the best of both worlds—the opportunity to be near one's family and to gain the financial security of regular income. Today's telecommuters have that same opportunity, plus the exciting chance to be pioneers—awakening in their electronic cottages to the dawn of telecommuting.

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C. REGENA

Computer Choreography

In previous columns I have written about graphics and music. (For the Commodore 64 refer to Chapter 7 of the *User's Guide* for music.) Combining graphics with music, which I call "computer choreography," can be a lot of fun.

Synchronizing Sound With Graphics

After sound commands, we usually use a delay loop to play the sound for a certain length of time, then change the tone or turn off the sound. For example:

VIC-20 version

```
10 POKE 36878,15          Turns volume on.
20 POKE 36876,183         Plays a tone.
30 FOR D=1 TO 800:NEXT    Delays.
40 POKE 36876,0           Turns off tone.
```

Commodore 64 version

```
10 POKE 54296,15          Turns volume on.
11 POKE 54277,9           Sets attack/decay.
12 POKE 54278,128         Sets sustain/release.
20 POKE 54273,34:POKE     Plays a tone.
54272,75
25 POKE 54276,17          Sets waveform.
30 FOR D=1 TO 800:NEXT    Delays.
40 POKE 54276,16          Turns off waveform.
```

The above programs play a tone. Notice that while the computer is playing a tone it can also be doing something else. In this case the computer is performing line 30, counting to 800 for a delay loop. You could be making calculations instead. You could also be drawing graphics—using either PRINT or POKE statements.

Change line 30 above to:

```
30 FOR D=1 TO 40:PRINT TAB(D);"** HELLO **":NEXT
```

Now the computer prints a message 40 times while the tone plays. Try using different tones and printing different messages for a series of tones. Using the same idea, design a picture and PRINT graphics while you are playing music. Intermingle sound statements with graphics statements. You may still need delay loops to play the tones long enough.

I have enjoyed mixing graphics with music by drawing pictures to go with a song. If the song has words, you can make pictures appear exactly when appropriate with the lyrics. It takes a little practice, but soon you'll be able to judge how much you can

Program 4 draws a holiday message while playing a carol. (64 version; VIC version similar.)


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do between sound statements. It usually takes some experimentation to coordinate the graphics with the sound.

Try animation with music. Using PRINT statements or POKEing graphics, you need to erase an object in its old position and redraw it in its new position to make it appear to move. You could draw a background during introductory music, then draw a man and make him dance to the music.

With the Commodore 64 you can move sprites in your choreography. You may want to define your sprites while you're playing some music, then later, when it's appropriate in the music, make the sprite appear. Even later in the music you may want to move the sprite around. When you RUN the program, you will hear the music, but the computer is actually also defining sprites for later graphics.

If you have young children, you might try programming the music to some nursery songs, then adding graphics to draw the little characters or animals in the song. Draw a flag while you play a patriotic song. Use a song with a specific theme and draw objects to match the words. Compose your own music to go with a pretty scene of trees and mountains. Use your imagination to create your own choreographic production.

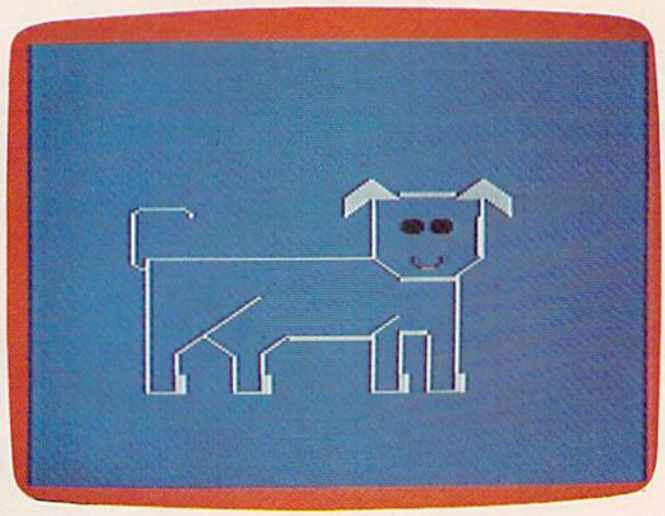
You don't have to be a musician to program music. Find some sheet music or get a book of popular songs. Usually the top note in the treble clef for each word of the song is the melody note. Translate the melody notes to numbers by using the charts in the *User's Guides* (tables of letter names of the musical notes with the corresponding POKE values). If you can't read music, get a beginning piano book (primer level). There are books of songs using single-note melodies with no accompaniment notes to worry about, and some song books have the names of the notes right with the notes.

You don't have to be an artist to program graphics. Scan children's coloring books for line drawings. You can probably find some really cute animals or objects that are quite easy to draw. Draw or trace the picture on graph paper, then match up the lines to the graphic symbols that are available on the computer. Another good source of pictures is in the sewing department of a store. Look for needlepoint or counted cross-stitch pattern books. These patterns are already drawn on squares, and you can use squares of different colors to create a picture.

An Example Of Choreography

Program 1 (VIC version) and Program 2 (64 version) illustrate how it is possible to combine music with POKE graphics in a program nicknamed "Dog."

Lines 10-20 are preliminary statements to get ready to play music. Line 10 turns on the volume to level 15. In the 64 version the attack/decay and sustain/release parameters are also set. Line 20 defines



Synchronizing graphics with sound, Program 1 draws a dog while playing a tune. (VIC version; 64 version similar.)

variables so later we can POKE values into voice 1. This month's programs use only the melody note in voice 1. Feel free to add accompaniment voices.

Line 30 plays the first note of the song. I usually program all the music first, then later add the graphics by inserting graphics statements between the music statements—with a lot of experimentation to get the choreography right. In Dog I started the sound statements with line 30, then incremented the line numbers by 20 for each successive sound statement, so the sound statements are on lines 30, 50, 70, 90, etc. Delay loops are set up in lines 820-830. Depending on how long the note should be played, the command would be GOSUB 820, GOSUB 825, or GOSUB 830. To test the song, I used the GOSUB method to delay between notes.

The next step was to draw the graphics. I made a simple line drawing of a dog on graph paper representing the screen memory locations of the computer and using lines that are available from the keyboard. The code numbers for the graphics symbols are found in the Screen Codes table in the Appendix (pages 141-42 of the *VIC-20 User's Guide* and pages 132-34 of the *Commodore 64 User's Guide*).

The final step of choreography is to combine the graphics with the music. Just start inserting graphics statements between the music statements. The number of graphics statements between music statements will determine how long a note will be played, so you need to make sure you don't have too many statements causing unwanted delays. In the case of Dog, I drew the dog in several steps between music statements and still needed some of the delay loops in lines 820-830 to keep the music playing at the right tempo. This programming step is the crux of choreography, and you may need to experiment with several sequences to get exactly what you want.

Line 810 is GOTO 810 so the computer picture

stays on the screen without the READY message. To stop the program press the RUN/STOP key. Since I've changed the screen color for this program, you won't be able to read the printing, so press RUN/STOP and RESTORE at the same time to recover the original screen color.

If you have trouble running this program, check for typing errors. There are a lot of numbers to be typed, so that is the most likely place for errors. If you use the "Automatic Proofreader" (elsewhere in this issue) for entering these programs, you should be safe. All the DATA statements contain numbers for graphics and will contain pairs of numbers—a screen location and a character number to POKE. All of the graphics commands (line numbers divisible by 20 or lines not ending in zero) contain POKE with a screen location number (four digits) and a character number (two or three digits).

All of the sound commands in the VIC-20 version start with POKES (which is "POKE S" without the space), a comma, then a note number. In the Commodore 64 version the POKE commands for sound are POKESH and POKESL (for sound high and sound low).

Program 3 (VIC version) and Program 4 (64 version) are my Christmas presents to you for this December issue. This program can be used as an electronic Christmas card for your friends who own Commodore computers.

Lines 2 to 5 are the preliminary POKE commands to create music. Lines 6 to 8 contain the delay subroutines to play a note a certain length of time. Again, I first programmed the music, then inserted the graphics. This program illustrates the use of PRINTed graphics. The RVS ON is used to get a solid green square. Press RUN/STOP to end the program, then RUN/STOP and RESTORE to get back to the original screen.

Until next month—happy holiday season!

See program listings on page 210.

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)	1
2	*Fort Apocalypse* (Synapse)	4
3	*Temple of Apshai* (Epyx)	5
4	*Frogger* (Sierra On-Line)	2
5	*Neutral Zone* (Access)	–
6	*Sword of Fargoal* (Epyx)	6
7	*Gridrunner* (HesWare)	3
8	*Supercuda* (CommData)	8
9	*Telengard* (Avalon Hill)	7
10	*Planetfall* (Infocom)	–

Commodore 64 Home/Business/Utility

This Month		Last Month
1	*WordPro 3 Plus/64* (Professional)	1
2	*Quick Brown Fox* (Quick Brown Fox)	3
3	*Inventory Manager* (Timeworks)	4
4	*PractiCalc* (Micro Software International)	–
5	*Money Manager* (Timeworks)	5
6	*Electronic Checkbook* (Timeworks)	–
7	*Household Finance* (Creative)	7
8	*PaperClip* (Batteries Included)	–
9	*TOTL.Text* (TOTL)	6
10	*Turtle Graphics* (HesWare)	2
11	*M File* (M Soft)	–

Commodore 64 Educational

This Month		Last Month
1	*KinderComp* (Spinnaker)	–
2	*Touch Typing Tutor* (Taylormade)	–
3	*Up For Grabs* (Spinnaker)	–
4	*Facemaker* (Spinnaker)	1
5	*Primary Math Tutor* (CommData)	–
6	*Alphabet Zoo* (Spinnaker)	–
7	*Typing Tutor* (Academy)	–
8	*Hey Diddle Diddle* (Spinnaker)	–

VIC-20 Entertainment

This Month		Last Month
1	*Gridrunner* (HesWare)	1
2	*Choplifter* (Creative)	6
3	*Shamus* (HesWare)	–
4	*Temple of Apshai* (HesWare)	–
5	*Kongo Kong* (Victory)	–
6	*Paratrooper* (Computer Mat)	–
7	*Exterminator* (Nüfekop)	–
8	*Robbers of the Lost Tomb* (Timeworks)	–
9	*Predator* (HesWare)	–
10	*Amok* (UMI)	2

VIC-20 Home/Business/Utility

This Month		Last Month
1	*Quick Brown Fox* (Quick Brown Fox)	1
2	*Turtle Graphics* (HesWare)	–
3	*HES Writer* (HesWare)	2
4	*HES Mon* (HesWare)	3
5	*Household Finance* (Creative)	5
6	*Home Office* (Creative)	–
7	*VIC Forth* (HesWare)	–

VIC-20 Educational

This Month		Last Month
1	*Touch Typing Tutor* (Taylormade)	2
2	*Type Attack* (Sirius)	–
3	*English Invaders* (CommData)	4
4	*Hangman/Hangmath* (Creative)	–
5	*Gotcha Math Games* (CommData)	–

Best Of The 1983 Best Sellers

In the five months that HOTWARE has been tracking the software industry for Commodore 64 and VIC-20 computers, some programs have consistently won high positions. Here's a look at those programs and at the new structure this market is beginning to develop.

Commodore 64 Entertainment

First Place: *Jumpman* (Epyx)

December	1
November	1
October	1
September	1

Honorable Mention: *Temple of Apshai* (Epyx)

December	3
November	5
October	4
September	3
August	1

Commodore 64 Home/Business/Utility

First Place: *WordPro 3 Plus/64* (Professional)

December	1
November	1
October	1
September	1
August	3

Commodore 64 Educational

First Place: Spinnaker

December	1	(*KinderComp*)
	3	(*Up For Grabs*)
	4	(*Facemaker*)
	6	(*Alphabet Zoo*)
	8	(*Hey Diddle Diddle*)
November	1	(*Facemaker*)
	2	(*Kids On Keys*)
October	1	(*KinderComp*)
	2	(*Facemaker*)
	3	(*Hey Diddle Diddle*)
September	2	(*KinderComp*)
	3	(*Facemaker*)
	4	(*Hey Diddle Diddle*)

VIC-20 Entertainment

First Place: *Choplifter* (Creative)

December	2
November	6
October	1
September	1
August	1

Honorable Mention: *Gridrunner* (HesWare)

December	1
November	1
October	3
September	3
August	7

VIC-20 Home/Business/Utility

First Place: *Quick Brown Fox* (Quick Brown Fox)

December	1
November	1
October	8
August	1

VIC-20 Educational

First Place: *Touch Typing Tutor* (Taylormade)

December	1
November	2
October	2
September	3

Best Of The Best Sellers

Our year-end "Best Of The Best Sellers" is based on the last five months of 1983, not the entire year (HOTWARE debuted in August). It would have been difficult to rank Commodore 64 software before summer anyway, since there was not a great deal available.

Keep in mind that HOTWARE is based on actual unit sales figures obtained from participating retailers and distributors across the country. The rankings are not subject to editorial bias and do not represent a judgment of quality.

This month, we talked to some of the designers and distributors of these best sellers to find out why they think their programs have done so well, and what trends they see carrying over into 1984.

Divisions Of Labor

When a new industry emerges, its first products are usually conceived, manufactured, marketed, and sold by the same person or a small group of people. Eventually, when demand for the product becomes greater, its producers must take on more specialized jobs.

The software industry is beginning to develop that kind of structure. "It's not a cottage industry anymore," says Jim Connelley, a game designer for The Connelley Group in Mountain View, California.

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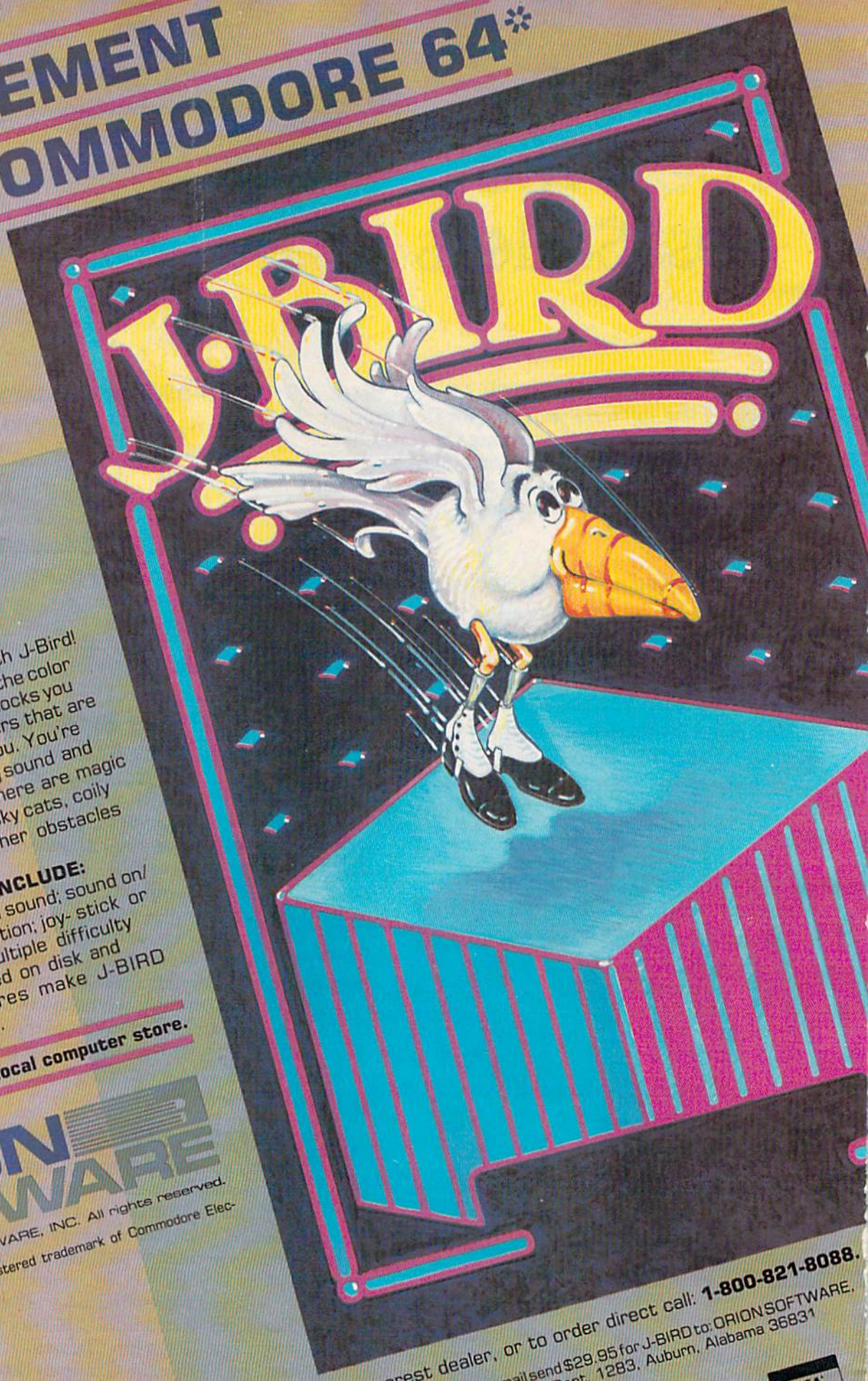

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The Connelley Group is a good example of this evolution. Connelley founded Epyx Software a few years ago to produce and market microcomputer software. *Temple of Apshai* was one of those programs. "But as the company grew, I found I had little time left for product development," says Connelley. "The people who started the industry had to do a little bit of everything."

Now, Connelley and nine other game designers work in a think-tank type of environment. They spend their time conceptualizing and designing games for several different software publishers. They *don't* spend their time in marketing. Or sales. Or production. Just designing.

"The corporate environment is different from the think tank. We're trying to create a very creative environment here," explains Connelley. "The industry is moving toward a structure where there are advantages to separating authors from publishers. It almost had to happen."

Going It Alone

The new division of labor Connelley refers to is becoming more evident in the structure of many major software houses.

An exception to what is fast becoming the rule is Taylormade Software. Its *Touch Typing Tutor* has enjoyed a good deal of success; both the VIC-20 and Commodore 64 versions have held high positions on the HOTWARE list for the last several months.

Taylormade is not your typical East or West Coast software company. It's located in the Midwest — Lincoln, Nebraska — and it's basically a one-person operation: Marion Taylor, who has been programming computers for 28 years. "It's nice to know that one person can still do it alone," she says.

It might seem a bit strange that a typing tutorial would outsell programs dealing with more traditional educational subjects. Taylor thinks it makes a lot of sense. "One of the most popular uses of home computers is word processing," she notes. "Before you can do that, you have to learn to type. In fact, anything you use a computer for requires some knowledge of the keyboard."

Taylor attributes the success of her particular typing program to its wide age appeal and lesson-type format. "*Touch Typing Tutor* appeals to people from eight to 80," she says. "Its 19 lessons make use of color and an actual keyboard display to help teach you not to look at the keyboard while you're typing. And it's not a game — educational programs don't have to be game-like to appeal to people."

More Depth

Jumpman, which didn't even appear in August HOTWARE, leaped to the Number 1 position in September and has remained there ever since.

Randy Glover, who designed this best-selling game for Epyx Software, believes he knows why it's been such a success: "Depth of play. Some games look real nice and are fun for a while, but they don't ever really change. *Jumpman's* many levels provide great playability."

We awarded an Honorable Mention in the Commodore 64 entertainment category to *Temple of Apshai*, another Epyx game. *Temple* is a graphics/text adventure that requires great player involvement.

"It's a one-of-a-kind game," explains Glover. "It gets you very involved with your character, and you want to succeed with it. It also has a very long play time."

Glover believes the next year will see greater popularity for games which involve a lot more time and thought.

In addition, the more powerful personal computers, such as the Commodore 64, can support more complex programs. "A computer with 64K memory and a disk drive allows you to store and retrieve an enormous number of situations, like those in *Temple*," says Glover. "We will continue to make both kinds of games — arcade games and those with more depth — as long as people want them."

Other Trends

Here are some more trends that seem to be developing in the volatile Commodore software market:

- Full-line software houses. Many companies that started out publishing only one kind of software, such as games, are starting to branch out and find success in other areas. HesWare, Creative Software, and Sirius Software are examples of this.
- Commodore dealers are finding it increasingly difficult to compete with mass retailers and discount stores selling Commodore hardware and software at very low prices. Some dealers have stopped stocking the line entirely and have gone back to concentrating on business systems; some are trying to stay in the market by providing more service and support to customers.
- Competition is really heating up in the area of word processing packages. A large percentage of computer owners want to use their machines for word processing, and there are plenty of good programs available. Expect to see the best-selling programs in this area scramble as new ones enter the market.
- Software manufacturers are still trying to determine the most popular format for their products: disk, tape, or cartridge. Disks seem to be preferable — retailers are surprised at the tremendous number of Commodore owners who are adding disk drives to their systems.

The Inner World Of Computers

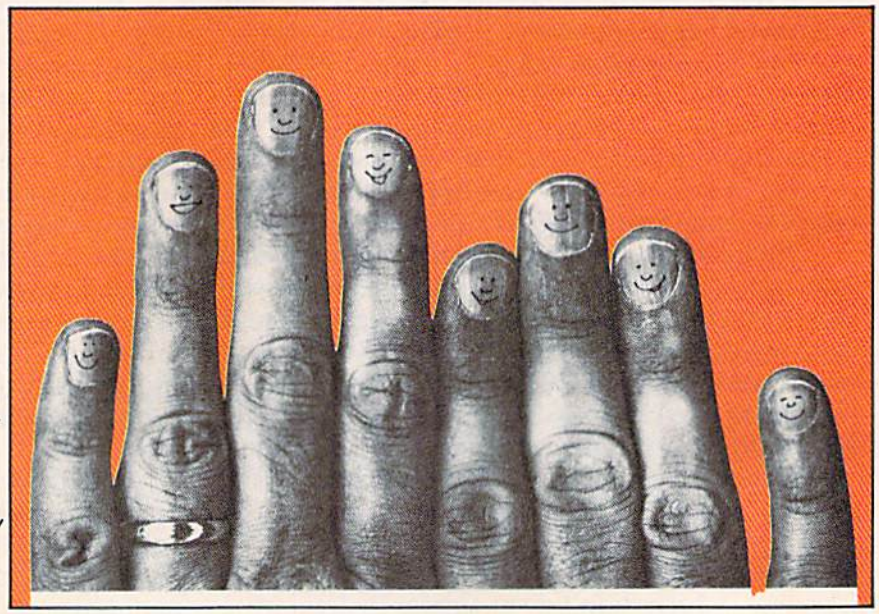
Part 2: Why Computers Are Logical

Tom Prendergast

Do you ever wonder what happens after you type RUN? What goes on inside the computer? How a machine can "think" just by manipulating numbers? This series shows how computers work by explaining computer math in a nontechnical way. It's especially recommended for those who are following our monthly column "Machine Language For Beginners."

We got some flak on last month's article telling about the magic patterns used by the little ELFS (ELectronic FingerS) to set tiny electronic switches inside the computer. The big complaint was that we didn't show any proof for the existence of the ELFS—just a drawing.

Sorry about that. Like all magical folk, ELFS are invisible, and we had to draw on our imagination. To the best of our knowledge, no one had ever seen an ELF, but just as we were about to give up hope of ever being able to present any hard scientific evidence, we got a nice long letter from an ELF thanking us for giving her family this long-delayed recognition. She enclosed a photo taken at a recent family picnic and the letter was signed "Anne Elf," so it must be authentic. We can't reproduce the letter because it was written in invisible ink, but the picture should give you a pretty good idea of what real ELFS look like.



Rare photograph of ELFS gathered for a byte at family picnic.

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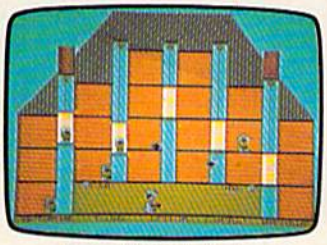

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Another complaint was that the "magic patterns" we showed were nothing but sugar-coated binary.

OK, we admit that. We never said we weren't trying to teach you binary. But whether you want to call them magic patterns or binary patterns, the more you know about how the tiny electronic switches are turned on and off inside your computer, the better you'll be able to understand how a computer "thinks."

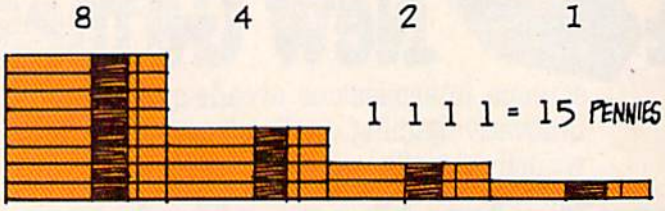
Years ago when computers were the size of a barn and had big banks of switches in front instead of a keyboard, the operators had to plan how to turn all those switches ON or OFF at various times while the computer was running. Finally, some genius—probably John Atanasoff—noticed that the little marks they'd jotted down for the different switch settings resembled binary, and presto!—computer programming was born.

Computers have shrunk a lot in size since then, but how a computer computes hasn't changed. You may think your VIC or 64 is adding 2+2, but the little ELFS inside are turning tiny microswitches ON and OFF like this:

Switch Patterns:	Off	Off	On	Off
	+Off	Off	On	Off
Binary =	0	1	0	0

If you worked with the "15-cent computer" last month (15 pennies in piles of 8,4,2, and 1) you'll know that 0100 is 4 (decimal) in binary.

Figure 1: The "15-Cent Computer"



The "8421 code" as it's sometimes called is enough to represent 16 different switch patterns (if you count 0000 as one of the patterns):

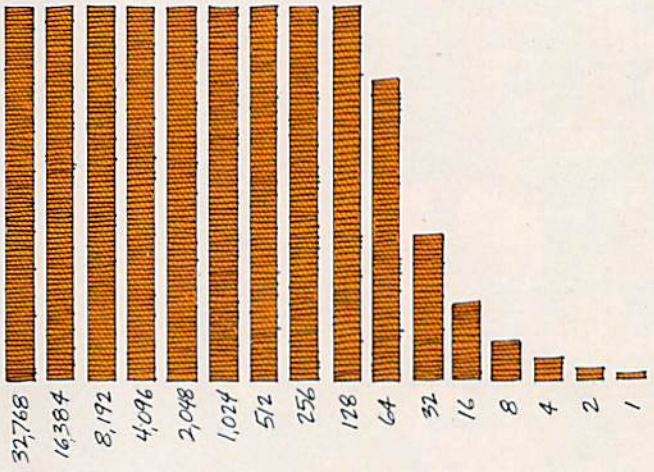
0000
0001
0010
0011
0100
0101
0110
0111
1000
1001
1010
1011
1100
1101
1110
1111

The VIC's color ROM uses these kinds of four-bit *nybbles*, and BCD (Binary Coded Decimal), which I won't confuse you with this month, uses *pairs* of nybbles, as does hexidecimal.

But the VIC and 64 use 16 bits for the AND, OR, and NOT operations we're going to show you. What are we going to do?

We could extend the penny idea to 16 places, but that would cost us $655.35—65,535 pennies, to be exact—because binary values double like rabbits every step to the left. We'd have 32,768 pennies in our leftmost pile, 16,384 in the next, and so on.

Figure 2: Pile Of 65,535 Pennies

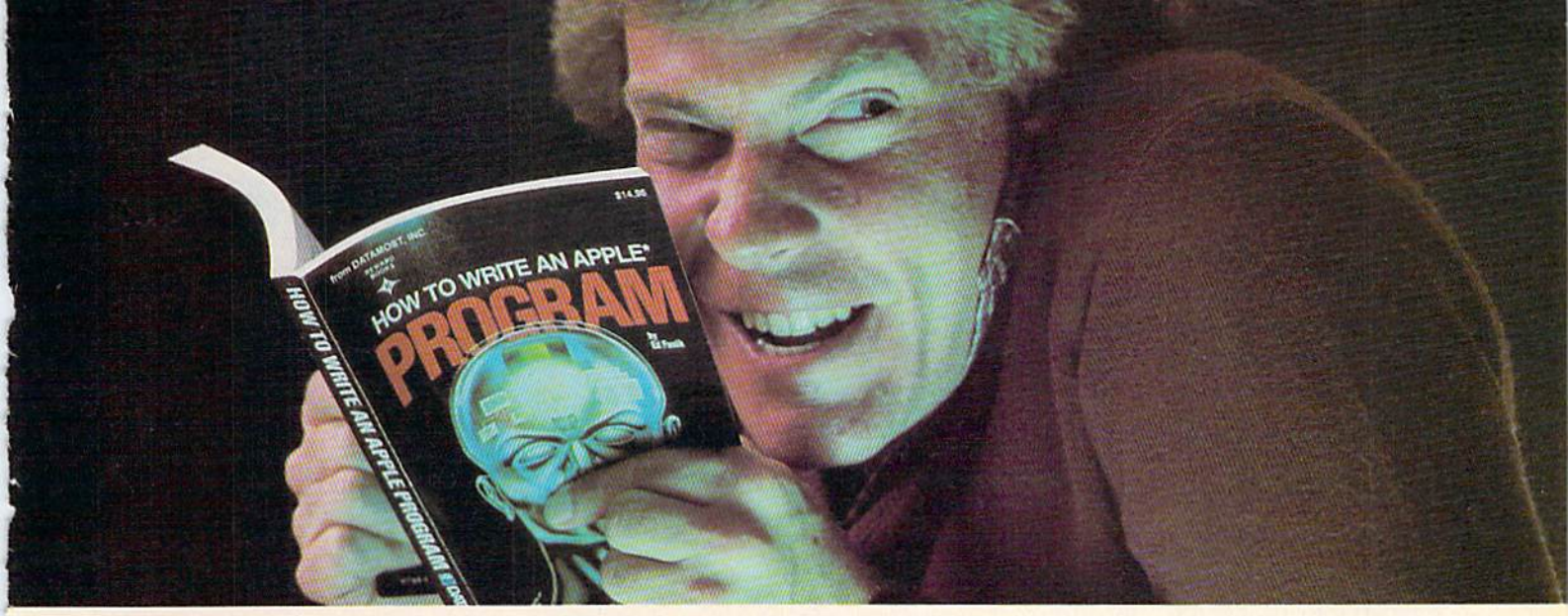


Fortunately, pennies are binary (all coins are, because they have two sides). If we agree that heads means ON and tails means OFF, flipping a penny over turns that particular switch ON or OFF. Let's begin with eight pennies because a BYTE (BinarY uniTs of Eight) is enough to demonstrate most of the patterns we're going to AND and OR (see Figure 3).

Notice that we've called 10000000 a pattern and not a binary number. Computers don't understand numbers, remember? Not even binary. And when you AND, OR, or NOT, you manipulate the individual bits—with no carries or borrowing—because AND, OR, and NOT aren't arithmetical operations.

The trouble with most computer books and manuals is that they throw binary and other complicated stuff at you before you're ready for it—things like "truth tables" and those weird diagrams of "logic gates" with arrows pointing every which way.

Take this, for instance, from the manual for the PET (it's repeated almost word-for-word in the *VIC-20 Programmer's Reference Guide*—so they must think it's a pretty good explanation). Actually, it's a very clear technical explanation, but that's the trouble—it's too technical. I'm a couple



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of years into computing and on my third computer, but I didn't have the haziest idea of what they were driving at until recently:

"Logical operators work by converting their operands to 16-bit, signed, two's-complement integers... The given operation is performed on these integers in bitwise fashion, i.e., each bit of the result is determined by the corresponding bits in the two operands.

"Thus, it is possible to use logical operators to test bytes for a particular bit pattern. For instance, the AND operator may be used to 'mask' all but one of the bits of a status byte...the OR operator may be used to 'merge' two bytes to create a particular binary value...and the NOT operator to form the two's complement of the bits of an integer plus one."

All right, so I knew that NOT, AND, and OR are *logical operators* — although sometimes they seem as logical as Alice in Wonderland. (*Alice in Wonderland*, by the way, was written by an English mathematician who was using Boolean logic long before computers were invented.) The *arithmetical operators* are +, *, −, and /, the signs for addition, multiplication, subtraction, and division; and the binary being operated on by the logical or arithmetical operators are the *operands*.

Figure 3: A Byte With One Bit Switched On

Figure 4: A Byte Holding The Screen Code For Letter A (65)

Figure 5: 65 AND 128 = 0

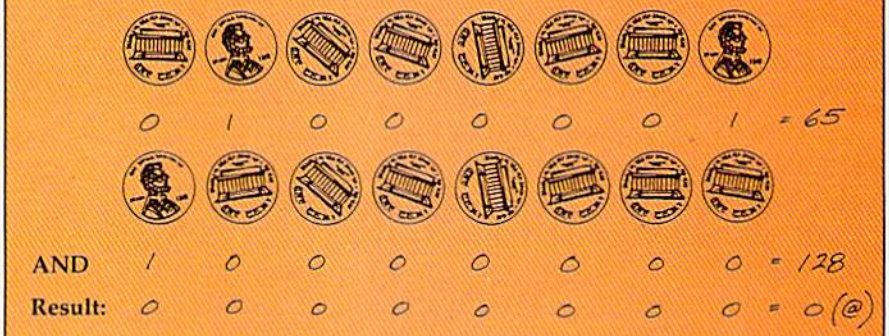
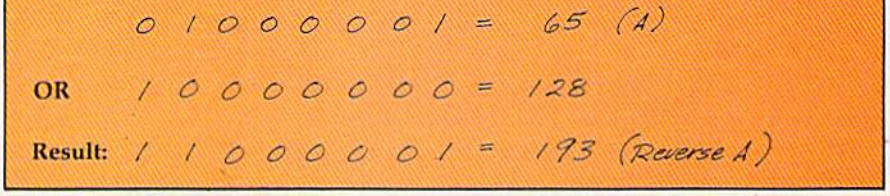


Figure 6: 65 OR 128 = 193



But here you are wading through all this "16-bit, two's-complement" stuff when all you wanted to find out was how a simple game program works! A line like this, for instance,

```
POKE 7724, PEEK(7724) AND 128
```

is an example of the *bit masking* they were talking about, so let's work through it bit by bit. The POKE 7724, PEEK(7724) is to read the pattern currently stored in the VIC's screen RAM at memory address 7724, and not the number 7724 itself. Let's say the pattern is the one that calls up the screen code for the letter A — 65. So we lay out eight pennies with their heads or tails like those in Figure 4.

The A will be ANDed with 128 so we put our second byte of eight pennies like those in Figure 5. AND is interested only in matching 1's and it ignores everything else. As you can see, no 1 in the top byte matches the lonesome 1 on the bottom, so the little ELFS switched every bit off—to zero. The letter A turns into the screen code for an "at" symbol: @.

An easy way to remember how the AND operation works is to think of all the straight lines making up the letters in AND as 1's, so that 1 AND 1 produces 1.

The OR operation on the letter A would look like those in Figure 6.

The OR operation works with 1 OR 0. If one bit is a 1, or both bits are 1, the result is a 1. 0 OR 0 results in 0.

By the way, don't confuse the inequality symbol <> with NOT. A line like "IF X<>15 THEN..."

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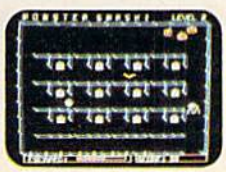

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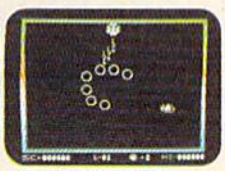

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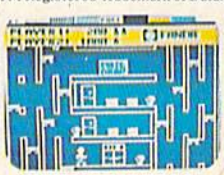

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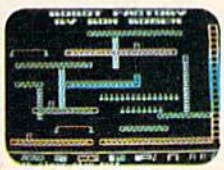

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should be read as "If X isn't equal to 15 then...."

NOT reverses every bit in a byte to its opposite. NOT 1 produces a 0, NOT 0 produces a 1. To put it simply, if you NOT 128, you flip every switch ON that was OFF, and every switch OFF that was ON:

```
NOT 10000000
Result: 1111111101111111
```

What's not so simple is that you end up with a minus result (−129) because, as it says in the manual, logical operators convert their operands to "16-bit, signed integers" and the 16th bit on the left does double-duty as a "sign" bit. A zero in that slot indicates that the number is positive, and a one indicates it's negative. This can get you into a whale of a lot of trouble if you're not careful, because you'll end up with an ILLEGAL QUANTITY ERROR.

NOT is useful to undo something you've done when combined with AND, as in: AND NOT 128. But you're probably confused enough as it is, so rather than go into the whys and wherefores of this, let's get to the keyboard and try a simple program demonstrating OR, AND, and AND NOT. Use Program 1 for the VIC and Program 2 for the Commodore 64.

(Note: If you've added memory to your VIC, the following line should be substituted for line 5:

```
5 PRINT CHR$(147):SC=4*(PEEK(36866)AND 128)
```

This relocates the start of screen memory, 7680 on the unexpanded VIC.)

Program 1: VIC Version

```
5 PRINTCHR$(147):SC=7680                :rem 205
10 PRINT"{RVS}{RED}AMERICA THE BEAUTIFUL"
                                        :rem 212
20 FOR DELAY=1TO2000:NEXT               :rem 4
30 FOR I=1TO4:PRINT"{BLU}******{RED}
   {16 SPACES}{BLU}******":NEXT         :rem 174
40 FOR I=1TO7:PRINT"{RED}{22 SPACES}{WHT}
   :NEXT:FOR DELAY=1 TO 2000:NEXT       :rem 59
50 FOR I=0TO285:POKESC+I,PEEK(SC+I)OR128:
   NEXT                                 :rem 24
70 FOR I=0TO285:POKE SC+I,PEEK(SC+I)AND N
   OT 128:NEXT                          :rem 61
80 GOTO5                                :rem 214
```

Program 2: 64 Version

```
5 PRINTCHR$(147);:SC=1024:POKE53281,1
                                        :rem 136
10 PRINT"{RVS}{RED}AMERICA THE BEAUTIFUL"
                                        :rem 212
20 FOR DELAY=1TO2000:NEXT               :rem 4
30 FOR I=1TO4:PRINT"{BLU}******{RED}
   {34 SPACES}{BLU}******":NEXT         :rem 174
40 FOR I=1TO7:PRINT"{RED}{40 SPACES}{WHT}
   "                                    :rem 8
45 NEXT:FOR DELAY=1 TO 2000:NEXT        :rem 132
50 FOR I=0TO519:POKESC+I,PEEK(SC+I)OR128:
   NEXT                                 :rem 24
70 FOR I=0TO519:POKE SC+I,PEEK(SC+I)AND N
   OT 128:NEXT                          :rem 61
80 GOTO5                                :rem 214
```

Lines 5 to 40 set up the title AMERICA THE BEAUTIFUL and the stars and stripes for the flag. Notice that the stars, however, are not reversed; they're blue stars on a white background. (The DELAY loop at the end of line 40 gives you time to observe this.)

Now the OR in line 50 reverses the stars to white on a blue background. Line 60 starts with a REM statement, so the ELFS ignore the instructions for the moment and jump to line 70, where the AND NOT undoes what the OR in line 50 did—reverses the reverses—and line 80 sends the program back to the beginning.

After you've run the program for a few minutes, hit the RUN/STOP and RESTORE keys. This interrupts the program. Now type LIST 60. When line 60 appears, put the cursor on the F in FOR and press the INST/DEL key four times to delete the REM. After you've hit RETURN to register the line change in program memory, type RUN and RETURN.

When the program is running this time, line 60 is not ignored, so the AND in line 60 changes the POKE value of every character or graphic that's been printed to zero, producing the symbol @ where stars or stripes were before.

Using AND or OR with word strings is limited pretty much to an either/or type of operation. If you have a line such as IF Y$="YES" OR Y$="Y" THEN, either the full word or just the first letter of "YES" would be an acceptable input and the program would carry out whatever follows the THEN.

If the line were IF Y$="YES" AND X=1, both statements would have to be true for the program to proceed.

The computer can evaluate any expression and return a number. For example, the expression 5<4 will give a zero (try PRINT 5<4). The expression 5>4 is true, and is equivalent to −1. You can embed an expression within a calculation to make use of the 0 or −1. For example:

```
V=(J+1)*-(J<2)
```

If the variable J was equal to 3 at this point in the program, the resulting arithmetic would be:

```
V=(3+1)*-(3<2)
or
V=(4)*-(0)
or
V=0
```

If J equaled 1, the arithmetic would be:

```
V=(1+1)*-(1<2)
or
V=(2)*-(-1)
or
V=2
```

See you next month with more about ELFSwitches and hexadecimal.

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Getting Started With A Disk Drive

Part 2: First Steps

Charles Brannon, Program Editor

After a brief discussion of why you should make backup copies of important disks — and why some disks cannot be copied — we'll show you exactly how to get started with your new 1541 disk drive.

Last month, we discussed why it is so important to make backup copies of your disks. Since a disk can hold so much information — more than 170,000 characters — you have a lot to lose if something happens to the disk. You'll always want to make a working copy of an application program such as a word processor. You can then put the original disk (sometimes called the *system master*) in a safe place, secure in the knowledge that if anything goes wrong with the working copy, you still have your original disk.

This seems such an obvious, necessary procedure that many people rightly wonder why most software companies copy-protect their disks.

Software companies feel that they must copy-protect their disks to prevent illegal copies. They have reason to worry. They can lose considerable potential profit if people use copies of programs without paying for them.

In the past, the work of a craftsman was valuable because it was tangible and unique. It could not easily be copied by someone of lesser talent. But nowadays, computers are the equivalent of a "matter photocopier." How could you put a price on an automobile if you could make a copy of it one atom at a time, with energy as your only ingredient? Fantastic as it sounds, we are already at this stage with information. The so-called original program is no more valuable than its duplicate. The only difference between a blank disk and a $150 word processor is a phantom organization of magnetic fields on a three-dollar disk.

With software so easy to copy, it is hard to prevent piracy. The disk drive is designed to translate the patterns on a diskette into numbers that the computer can use. Copy protection allows this transfer, but also attempts to prevent you from reading the disk outside of the application. The methods used are as complex as the drive allows, but are usually quite effective in preventing a casual LOAD/SAVE or file copy. Unfortunately, sometimes the copy protection is so sensitive that even the original copy will not run if your disk drive is slightly out of alignment.

Companies must protect their software, but what about the individual who needs a backup copy? Many companies offer a replacement diskette if the original goes bad. Unfortunately, if the product becomes as indispensable to you as their ads claim it will, how can you tolerate the weeks it might take to replace the program?

Ideally, every computer could have a software-readable serial number. When you first used the program, it would check your serial number

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and offer to copy itself to a work disk. Anyone trying to use one of these copies on another computer would find that their serial number didn't match, and the program would not run. But mass-producing computers with individual serial numbers isn't very practical.

Perhaps the best solution is already in use. The software comes with a key that you must plug into your computer in some manner. On the VIC and 64, the key usually plugs into a joystick port, if unused, or into the cassette port. Other keys can be ROM chips that must be installed in expansion slots. The software will not run without the key installed, but you can make as many copies of the program as you want.

Selling software on cartridge is a similar, though more expensive approach to copy protection. Few people have the expertise to copy a cartridge.

The controversy is still raging, but your rights in the latest copyright law are clear. You have the right to a backup copy as long as you observe a few conditions: that the backup is part of an essential procedure in using the application and is used in no other way; that the copy is used solely for archival purposes; and that if you cease to own the right to use the program, you will destroy any archival copies.

If this is your first experience with a disk drive, you'll have to learn to treat it more carefully than the more rugged cassette recorder you're probably used to. Disk drives are delicate precision instruments.

Treat your drive very carefully when you bring it home (or anytime you move it). Do not subject it to jostling, bumps, or excessive vibrations. Any jar or shock can force your drive out of alignment, and it will have to be carefully readjusted by a service technician.

You should be sure to buy a box of blank disks, which should cost you about $30. Included with the drive are: a pencil-thick cable to attach the drive to your computer, a detachable power cord, a user's manual, and a demonstration disk. You may want to look at the demonstration disk and even run the disk performance test program, but the manual isn't very helpful on this for the novice. So before you do anything, read the rest of this article. The text is divided into levels of sophistication, so you can use your disk drive to whatever degree you want.

If you have no experience at all with disk drives, the first thing you'll want to learn is how to load programs.

Right away, you may buy software, such as games or a word processor. Properly documented software will have easy, step-by-step LOAD and RUN procedures. Usually, you just have to enter:

```
LOAD "*",8
```

The red disk drive light comes on, the drive spins, and if everything works OK, the screen says READY. Now type RUN.

The LOAD command you typed instructed the disk drive (an intelligent device) to search for and retrieve the first program on the disk. The use of the asterisk will be explained below.

Sometimes, you will need to give a specific filename to run the program, such as LOAD "BOOT",8 or LOAD "GAME",8. Also, you may not need to enter RUN, since some programs automatically RUN when they are loaded.

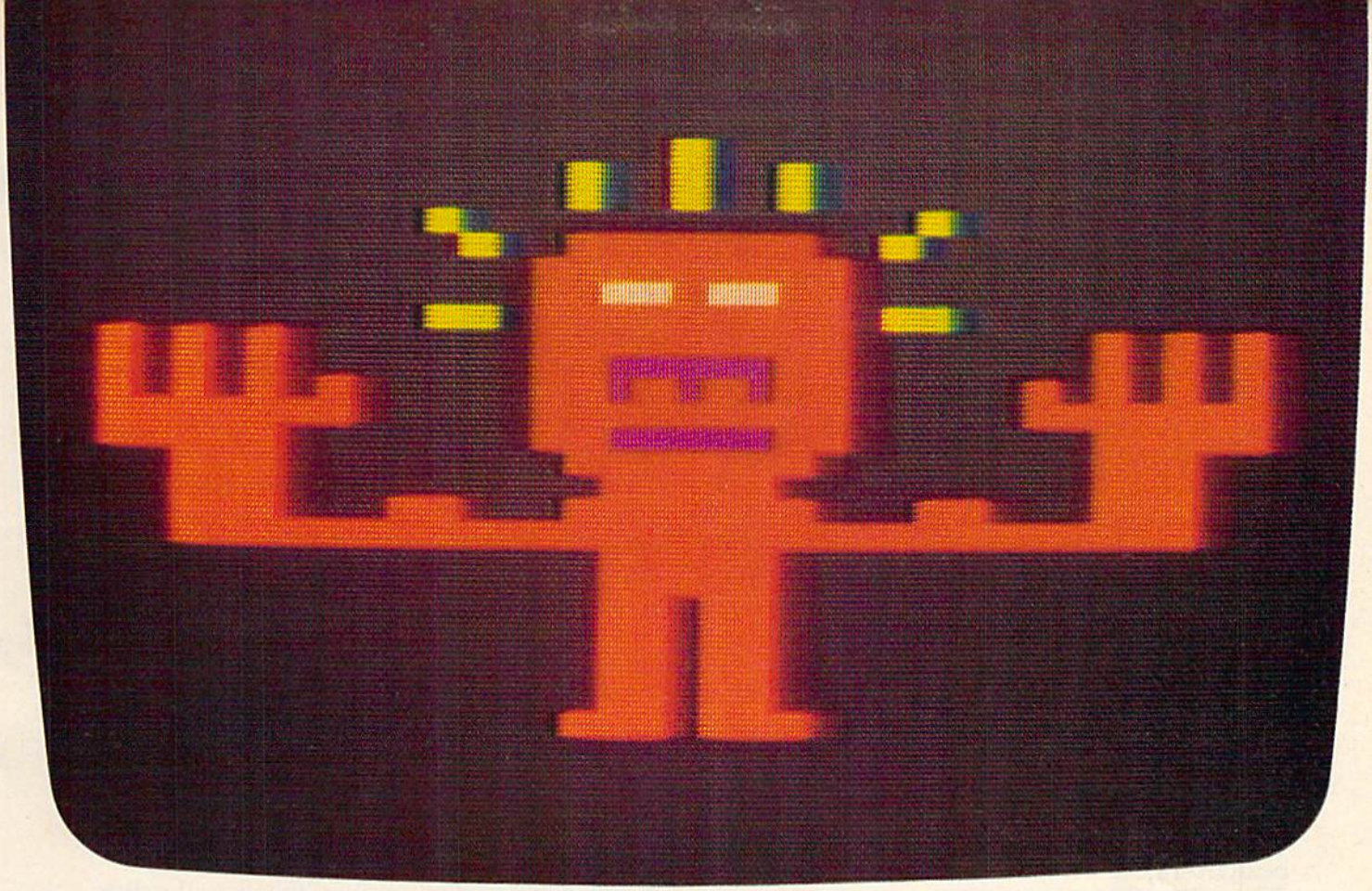
If you've followed the instructions explicitly, and the program still won't load, you need to check for errors. The red error light may be blinking. If you would like to check out the error, enter this one line program and RUN. The error message may seem cryptic, but it might help. We'll talk about the error messages later.

```
10 OPEN 15,8,15:INPUT #15,EN,EM$:PRINT
   EN;EM$:CLOSE15:END
```

If you get an error, try to correct it. Make sure that the disk drive is powered and properly connected. Check to see you have the disk inserted properly (see photo), that the right disk is inserted, that the door closes smoothly, etc.

The proper way to insert a floppy diskette — holding it by the edge (face up with the notch on the left) and sliding it into the slot.

If you fail despite your efforts, the diskette itself may be damaged, or it may be incompatible with your disk drive (every drive is slightly different in terms of speed and alignment). Most companies will replace your disk. However, don't return the flashlight just because the batteries are dead. Make sure that the error is not yours. You'll learn more about the disk system as you read this article, so you may get some insights.



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Loading programs is a one-way street. The real value of a disk drive is that it can hold volumes of *your* information, not just prepared material. The disk drive is a mass-storage device. Like RAM memory, you can read and write to it. The disk is slower than RAM, but is usually larger (170K versus 3.5K on a VIC!).

If you read last month's installment, you'll remember that the simplest access is at the sector level. You can read and write blocks of 254 characters. It's as difficult as it sounds, but fortunately, you should never have to use the disk at such a primitive level. Instead, your computer and disk drive work together as a team to let you create *files*.

A file is a hunk of information, not restricted to 254 characters. It's just a long sequence of numbers. Files can also hold characters, since characters can be represented by numbers, too. A file might be a program, a list, a letter you typed on a word processor, or just raw data. Every file has a name, so to access the file, you just give the disk drive its *file name*.

A filename can be almost any sequence of characters, including the alphabet, graphics characters, punctuation, etc. The filename can be up to 16 characters long. These are valid filenames: "PROOFREADER", "3D DEMO", "SUPERCHASE!", "DDOUBLE TTAKE". Some characters are reserved, such as the asterisk and the question mark. These are used as *wild cards*.

The question mark is used like the joker is in some card games. When searching for the filename on the disk, the disk drive compares the name you give it character by character with all the names on the disk. The question mark lets you allow for some ambiguity. If you are not sure about the filename, for example, you can substitute question marks for the characters you're not sure about. If you think the name might be "TRIX" or "TRIP", you can use the filename "TRI?". If you are searching for something like "HAPPY FACE" or "NAPPY-PACE" you can use "?APPY??ACE". In practice, the question mark isn't all that useful, as these contrived examples show.

Far more useful is the asterisk. It lets you leave off characters. For example, "BAS*" will match with "BASIC AID", "BASEBALL", "BASH", etc. The asterisk alone will match with anything, which is why you use it to load the first program on the disk, since the asterisk will match with the first thing it finds. Incidentally, the asterisk alone will also find the filename most recently accessed, not just the first file the disk finds. We'll talk about other variations on filenames later.

Before you can write to a disk for the first time, you must *format* it. Some application programs (such as word processors) let you do this from within the application, but you will usually do this from BASIC.

A blank disk straight out of the box is not ready for your disk drive. The disk drive does not know where to find the tracks and sectors, since the diskette is just a circular piece of magnetic-coated material. The disk drive must organize the disk into tracks and sectors by writing timing information all over it. This is in addition to whatever data you want to put on the disk. "Format" is the best description, but some people use the term NEW (as in wiping out a BASIC program), Header (like putting a title on a disk), or Initialize (prepare it for first use). Unfortunately, these terms also have other definitions, so they can be confusing. You should know what these people are talking about when they use the other terms, however.

To send commands to the disk, you have to open a *command channel*. Bear with us, because the procedures are very technical-looking. You can memorize what you need to know, but in future installments of this series, it will all become clear. To get ready, you need to enter:

```
OPEN 15,8,15
```

This tells the computer you will use the number 15 (the first number) to talk to the disk drive, *device number* 8. The last number, also 15, is for the disk's sake. It tells the disk that the things you send it are commands, not data. All the commands are sent with the PRINT# statement (pronounced "PRINT-file"). Unlike the other BASIC PRINT command, you cannot use the question mark as an abbreviation for PRINT# (?# does not work). Instead, use P-SHIFT-R to abbreviate PRINT#. (For more information on abbreviations, see this month's "Horizons: 64.")

The format statement looks like this:

```
PRINT#15, "N:DISK NAME, ID"
```

The N stands for NEW, which is the word Commodore uses for format. You can even spell it out:

```
PRINT#15, "NEW:DISK NAME, ID"
```

This command completely erases a disk as it formats, so use it with caution. The colon (:) separates the command from the *parameters* that the command needs to function. The disk name uses the same format as the filename, and can be anything you choose. You should organize your disks. Don't just randomly place any file on any disk. Have a disk for games, a disk for utilities, a disk for your BASIC programs, a disk for your word processor, and so on. This makes it so much easier to find the right disk, and you might as well start organizing when you first get started. The disk name should describe what the disk will store.

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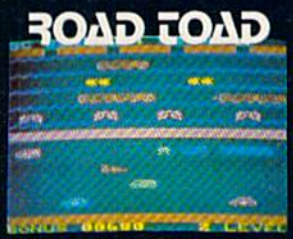

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The ID (identification) is a two-character code. It is not used like the disk name to organize your disks, but is primarily for the disk drive's sake. If every disk has a different ID code, the drive can detect if you've changed disks. This is very important for reliable operation. You can use unique IDs from 00-99 if you like, but you may want to pick them at random. *It is imperative that every disk have a unique ID number.* Ideally, none of your friend's disks should have the same ID numbers. In practice, just be careful. Don't be lax and call all your disks 01. We'll talk more about why the disks need to have unique IDs later, including how to read the ID from within your own programs.

There is an optional form of the NEW command that just lets you erase a disk. It doesn't format, it just wipes out a disk that was previously formatted. You can change the name if you want, but you can't change the ID without reformatting the disk. Just leave off the ID if you want to perform this erase function.

Now that the disk is ready to use, you may want to look at what's on it. Enter:

```
LOAD "$",8
```

When the computer comes back with READY, enter LIST. The *directory* (called a catalog on some systems) is a list of all the filenames. At the top of the list is the disk name and ID. To the left of each name is a number representing how many blocks of 254 characters the file uses. To get a rough estimate, divide the number by four to see how many kilobytes (K) the file uses. A 25-block program uses about 6K of disk space out of 170K.

To the right of each name is a three-character label, either PRG, SEQ, REL, or USR. These tell you what kind of file it is. You'll commonly see PRG (program) and SEQ (sequential or data) files. Again, we'll get into the distinctions when we talk about programming.

The last line of the directory tells you how many blocks are left on the disk. Divide by four to find how many kilobytes remain.

When you LIST the directory from a freshly NEWed disk, you'll see only the name and "664 BLOCKS FREE." If you divide it by four, you'll seem to have only 166K of storage. There is some overhead required by the disk drive. Naturally, the disk directory has to be stored somewhere. Other housekeeping information is also stored.

After you've formatted a disk, it's ready for you to store and retrieve programs and data. If you're ready to do this, enter a small program such as this:

```
10 PRINT "your name":GOTO 10
```

To copy the program from the computer to the disk, use the SAVE command. You may already be familiar with SAVE to tape. The only difference is that you add a comma and an eight to tell the computer that you want to SAVE to the disk drive (remember that the disk drive's device number is eight). Think of a filename. Remember to keep it under 16 characters and enter:

```
SAVE "0:file name",8
```

The "0:" is a new twist. It's a holdover from dual disk drives (two units in one case), where the first drive is numbered 0 and the second is numbered 1. You can leave out the "0:" and you won't get an error, but we've found it to be almost essential for reliable use. We can't go into detail here, but force yourself to remember the "0:" prefix and you won't be sorry.

Anyway, after you enter the SAVE command, the disk spins and the red light glows. This red LED is the busy light. Don't remove a disk while it is on or the computer won't get a chance to finish writing the file. If that happens, it never gets a chance to tie up loose ends, and the disk can be partially scrambled. This applies only to writing to a disk. There should be no problems if you remove a disk during a read or a LOAD.

After the red light goes out, the program is saved. If the light is blinking, something went wrong. You can use the short program we listed above to read the error, or just assume it's your mistake and try to figure out what you've done wrong.

Even if you don't get an error, you may want to confirm the SAVE. VERIFY is most useful with tape to insure that the program is properly saved, since the tape recorder cannot detect a write error during a SAVE. To VERIFY a disk SAVE, just add the ",8":

```
VERIFY "file name",8
```

VERIFY works similar to LOAD, but instead of going into memory, VERIFY compares with memory. When completed, VERIFY displays either OK (good news) or ?VERIFY ERROR (bad news).

You don't have to use the "0:" prefix with LOAD or VERIFY. You can use the asterisk wild card as a shortcut. Just VERIFY "*",8 to check the program you've just SAVEd to disk.

Now enter NEW, and LOAD the program into memory:

```
LOAD "file name",8
```

You don't have to use the "0:" prefix. If the file is not on the disk, or if you used the wrong name, or if there is a disk error, the computer displays "?FILE NOT FOUND." You may have to press the RUN/STOP key to get READY to come back. Attempt to find the cause of the error and try again. If necessary, LOAD "$",8 and LIST the

directory to get the right filename.

That's all for this month. Next issue we'll show how to simplify disk use with the DOS WEDGE and cover the other disk commands such as DELETE and RENAME. Until then, study your manual and see if some of it now makes more sense.

SIMPLE ANSWERS TO COMMON QUESTIONS

TOM R. HALFHILL, EDITOR

Q A

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

Q. ***How well do personal computers match up against "dedicated" word processors for writing?***

A. Personal computers—depending on the particular system—can hold up very well when compared to dedicated word processors, especially when you consider the vast difference in cost.

For the uninitiated, a so-called *dedicated* word processor is a desktop computer or computer terminal designed to be used solely as a word processor, not as a general-purpose computer. Usually these units are found in offices, not homes. A single workstation costs about $5,000 to $10,000, depending on the printer selected.

Although dedicated word processors may be regarded as the ideal writing tools, a personal computer-based word processing system comes very close to satisfying the needs of most writers—while costing less than half as much.

Consider a word processing system built around a Commodore 64. At this writing, the 64 is available locally for $198, the 1541 disk drive for $260, and good word processing software for under $75. To this basic cost of about $535, you need to add either a dot-matrix printer or letter-quality printer, plus a printer interface. A good dot-matrix printer can be had for less than $500, and inexpensive letter-quality printers are available for around $600. Depending on the interface and cable needed, add another $100 or so. This brings the total cost to less than $1300, even for a letter-quality system. (If you bought everything at once from a single computer dealer, you might be able to negotiate an even lower price, especially if you're paying cash.)

Now, what advantages would a dedicated unit offer over this kind of system?

For one thing, the dedicated unit would be easier to get up and running. All the components should be matched to work together perfectly. When assembling a personal computer system with components from various manufacturers, usually there are compatibility problems to be overcome. For instance, the word processing software might allow underlining, but perhaps not with the particular printer. Ditto for subscripts and superscripts. Or maybe the printer does not mate as well with the interface as it should. (By the way, these kinds of headaches should be sorted out as much as possible *before* you buy all the parts, not after.)

Chances are the dedicated unit also would be easier to use, once you learned it. That's because it would have numerous dedicated keys for various functions, matched with the software. For example, to delete a sentence, the dedicated unit might have a special key labeled "Delete Sentence," and so on. Personal computer systems generally require you to memorize keystroke sequences for the same thing, such as CTRL-D-S for "Delete Sentence."

The dedicated unit also would offer greater disk storage (probably two drives), an integral 80-column video screen instead of a 40-column display on a TV set, and more advanced word processing functions, such as automatic footnote spacing and indexing, and maybe a spelling checker.

Of course, to compensate, you could add to the personal computer system a second disk drive ($260), a video monitor ($100), and even an 80-column converter (recently advertised for $159). Again, though, you might encounter compatibility problems between the 80-column board, software, printer interface, and printer.

Still, when all things are considered, the personal computer-based word processor will cost only a fraction as much as a dedicated word processor, and will offer more than enough utility for all but the most critical writing needs. In addition, the personal computer, as a general-purpose machine, can be used for many other tasks as well. For the average home user, student, and free-lance writer on a budget, the personal computer system is almost always the better buy.

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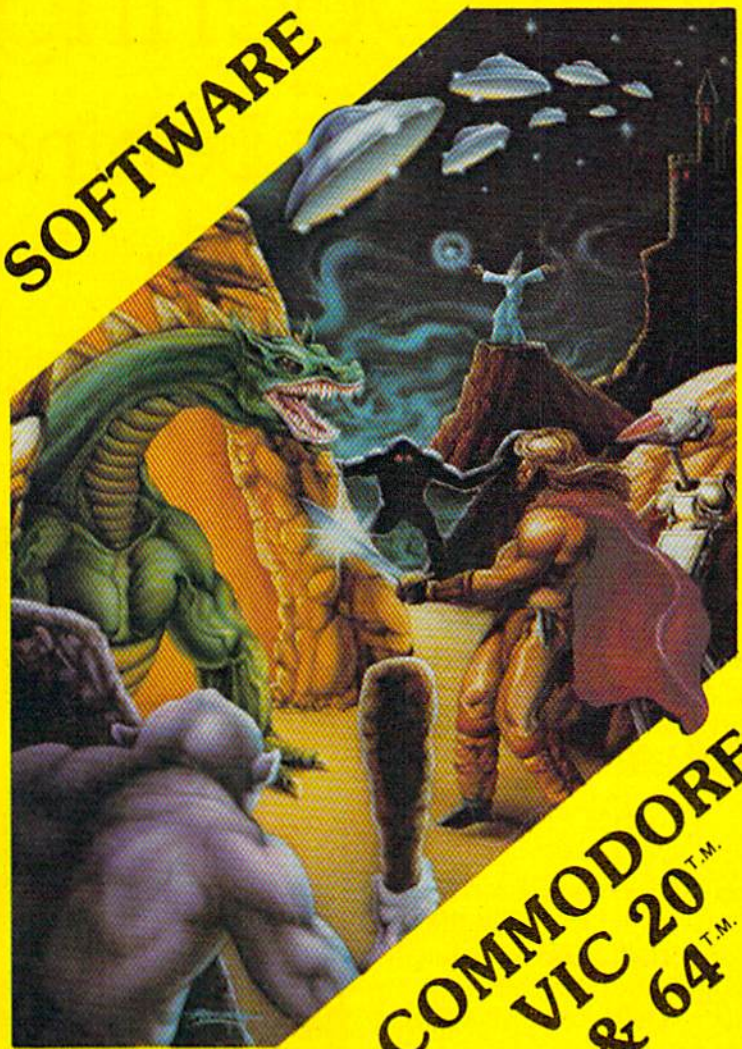

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John Doering

The Programmer Behind *Pipes*

Kathy Yakal, Editorial Assistant

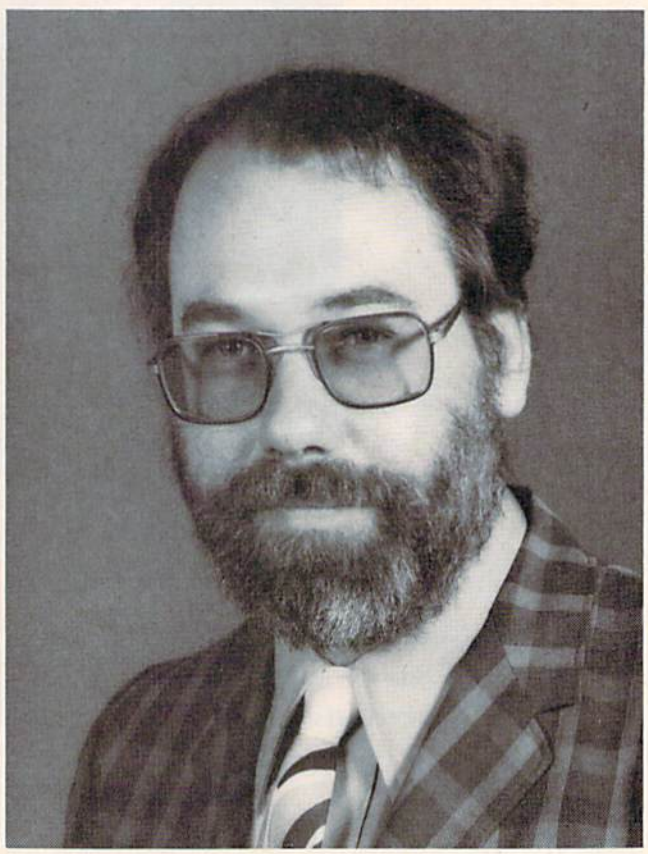
It's not often that an independent software manufacturer has best-selling programs in different categories; most companies stick to a specialty, such as games, educational software, home applications, or business programs. This month's "Inside View" looks at one of the programmers at a company that has winners in every category: John Doering of Creative Software.

You're a utility engineer. Your job is to gather the correct water pipes from the factory, then connect them between the town's water supply and some of its homes. And you must accomplish your task using as little money and as few pipes as possible.

This is the premise of *Pipes*, an educational game from Creative Software. *Pipes* has been well-received by its young audience, and it won the CES Showcase Award for the best educational software program of 1983 at the Consumer Electronics Show in Chicago last June.

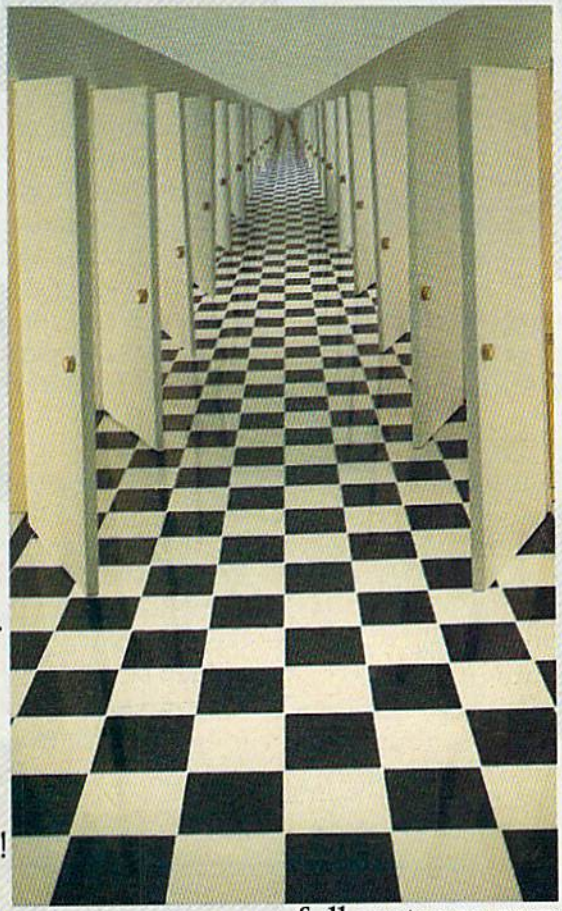
The Birth Of *Pipes*

John Doering, the programmer behind *Pipes*, has been an electronics hobbyist since he was young, though his field of study in college and graduate school was philosophy. His interest in microcompu-



John C. Doering, vice-president, Research and Development at Creative Software, and the author of the award-winning educational program, Pipes.

Last Year Over 20,000 Americans Were Committed To Asylum.



Once people enter *Asylum,* they don't *want* to leave. And neither will you.

Inside this thrilling adventure game from Screenplay™ challenges lie around every corner, behind every door. There are hundreds of doors, too!

You've gone crazy from playing too many adventure games. You've been placed in the asylum to act out your delusions. To cure yourself, you must make good your escape.

There's no one you can turn to for help. Almost every turn leads to a dead end. Or worse, vigilant guards stand in your way. If you can't outmuscle them, can you outthink them? Inmates line hallways offering help.

Asylum runs in 48K on the Atari, Commodore 64 and IBM PC computers. See your local software dealer.

But can they be trusted?

While getting out of the asylum may take months, you'll get into our game instantly.

Smooth scrolling three-dimensional graphics give you a very eerie sense of reality. This feeling is heightened by the use of full sentence commands.

No wonder over 20,000 people bought *Asylum* last year, and *PC Magazine* recently named it one of the top ten games in the world.

Play *Asylum.* All you have to be committed to is fun.

screenplay

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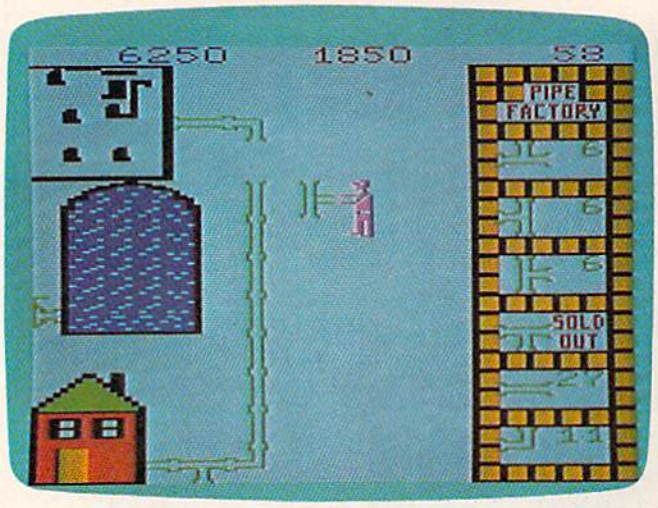
You could win $10,000 from Screenplay anywhere our games are sold.



In Pipes, *Arlo the Plumber must select the correct pipes from the pipe factory and hook up several homes to the city's water system using a minimum of equipment and money. This educational program helps teach the concepts of planning, economics, and spatial relationships.*

ters was sparked when he bought a Commodore PET in 1977 and taught himself to program. At the time, he was working as an electrical engineer for a northern California company.

Then he met up with Paul Zuzello through a mutual friend. Zuzello shared his interest in programming and his appreciation for Commodore computers. So in June 1981, they formed Creative Software, of which Zuzello is now president.

Their first commercial programs were simple games and home applications for the PET. When the VIC-20 and Commodore 64 were introduced, they started creating programs for them, too. Creative Software also is starting a line of software for the Texas Instruments TI-99/4A, in addition to its Commodore products.

Doering got the idea for *Pipes* while wandering through a toy store. "I was trying to find out what kids were buying," he says. "Games where children have to put something together have always seemed very popular, like Erector sets and Tinker Toys."

When he finished programming his new game, Doering tested its appeal by bringing it to fourth, fifth and sixth graders at a local school. They liked it.

"Kids would crowd around while someone else was playing it and give suggestions," says Doering. "That was great help for me, because children are prone to giving lots of criticism when they don't like something."

Doering says the most difficult thing about programming *Pipes* was staying within the VIC-20's memory limitations. It barely fits into the unexpanded VIC. Doering expects the translation to the Commodore 64 to be much easier.

Fun Or Fruitful?

It is sometimes difficult to distinguish between software designed to educate and software designed to entertain. Doering believes that *Pipes* contains elements of both, but is mainly educational.

"*Pipes* is gamelike. It's fun to play using a joystick and it has color, graphics, and sound," he says. "But it also stimulates you to think about what you're doing.

"It's what I call concept education. There are a number of ways to achieve the goal. It forces you to try different methods and techniques."

Concept education, according to Doering, combines games and education to construct an enjoyable learning experience. Doering and his colleagues at Creative Software divide educational software into three categories: home concept education; courseware (software used in classrooms and other formal educational settings); and drill and practice (software that gives you a traditional test of some sort). Though educational software has not taken off as fast as games and home applications have for home computers, Doering thinks it will become as competitive. "I think educational software will be more immune to faddism than games were."

Doering also says that programming has much to offer to programmers as well as users. "I get a lot of personal satisfaction from designing software. There's a challenge to be met, and that always intrigues me.

"But beyond that, it's gratifying to see that a piece of my work can give pleasure to some other human being. We get lots of letters from grateful customers, so I know that I'm making an active contribution to someone else's education or enjoyment."

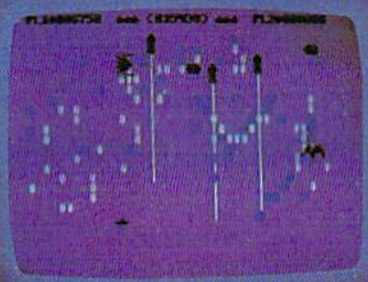
NÜFEKOP passes the buck!

Since we can't decide which of these exciting Commodore 64™ games is more fun, we're passing the buck . . . to YOU!

Exterminator 64

Exterminator for the 64 by Ken Grant is the "big brother" to the very popular version produced for the VIC 20™. Animation by use of interrupt-driven sprites, exceptional use of audio capabilities and the use of approximately four times as much memory (to add more of the bugs responsible for the original Exterminator's fame) has produced a program which, from the moment it comes on screen, clearly states that the Commodore 64 has come of age. **$24.95** (available in cartridge or disk)

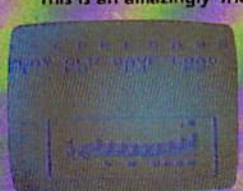
Widow's Revenge



This is another exceptional example of what the 64 can do. From the crawling of the web-slingers to the flapping wings of the egg-layers, author Doug Underwood has done an artist's quality job on animation. This program is similar in format to Exterminator . . . but, though of the same universe, worlds apart. **Widow's Revenge** is a one or two player game that you will find very hard to put away. **$24.95** (available in cartridge or disk)

To be exact, we'll pass 6.4 bucks to you when you purchase both games. Mail us the warranty cards from both Exterminator 64 and Widow's Revenge and we'll send you 6.4 dollars! We also have two exciting new programs for the VIC 20™ . . .

Music Writer III by David Funte



This is an amazingly 'friendly', yet powerful program designed for a broad spectrum of usage. For the entertainment-seeker a more fine, fun way to enjoy your VIC 20™ than by typing in music could scarcely be found. For the music student, the speed of input, the powerful editing, the 500-note memory capacity (three products of pure machine code programming), the clear, pleasing graphic display and the 'save' features make this one a must. **$16.95**

King's Ransom by Scott Elder

A demon's foul curse has condemned a king (who thought himself capable of striking a bargain with immortals) to an eternal half-existence in the five levels of the undead. The very gold coins the king had people put to death to possess now hold the only means of his escape. Help the reformed king collect these coins while jumping from moving level to moving level, carefully leaping over all obstacles encountered. Included is the short story, "The Thirteenth King." **$16.95**

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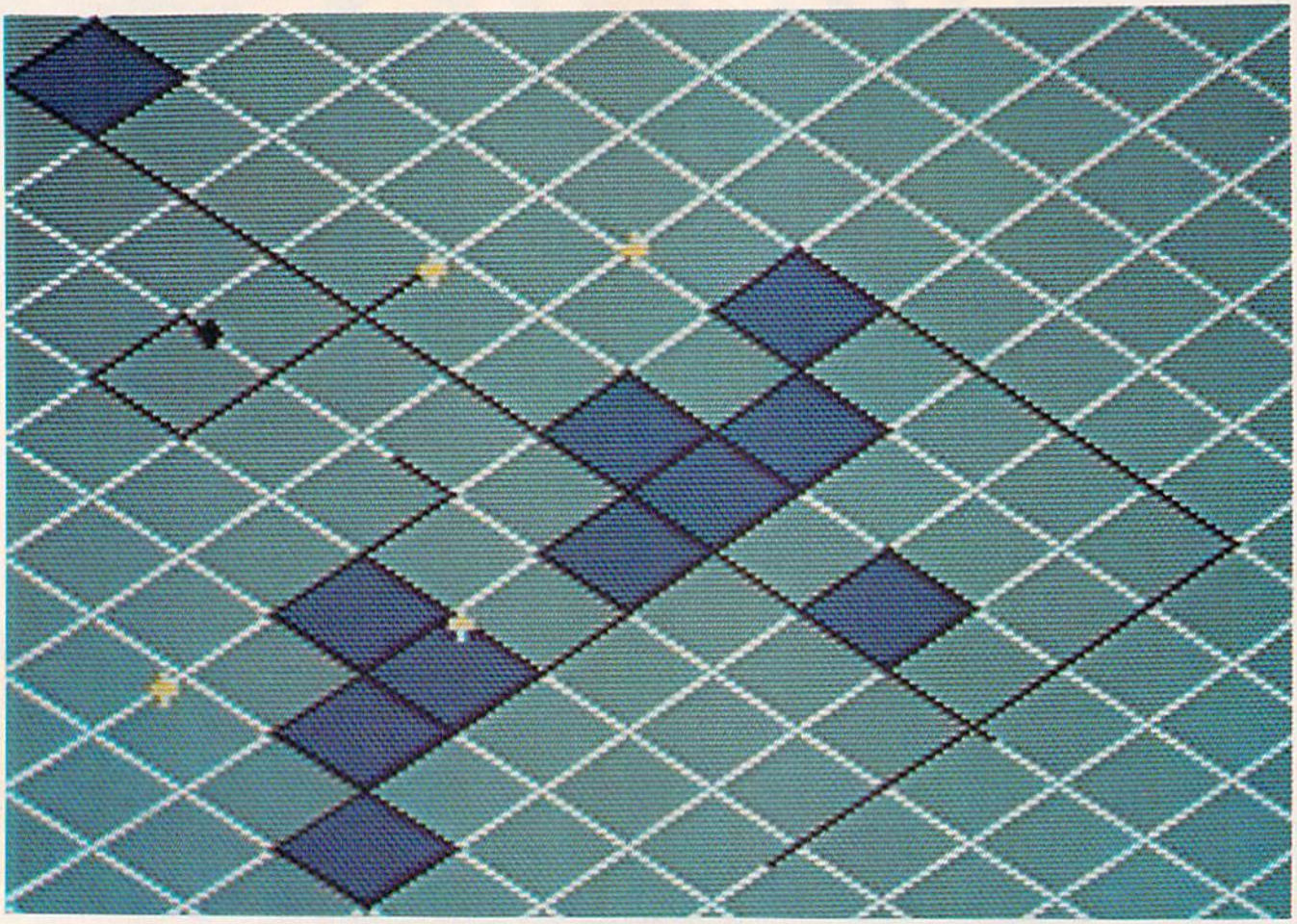

SPIKE

All-Machine-Language Game For Commodore 64

Eric Brandon

COMPUTE!'s Gazette is proud to present its first game program written entirely in machine language. We feel that "Spike" is not only one of the best game programs ever published in a computer magazine, but that it also approaches commercial-quality software – a game for which you might expect to pay $30 or more. In addition, a new machine language entry program premiering this month, "MLX," virtually guarantees you can type in Spike without mistakes (details in article). Spike's author, Eric Brandon, is a Toronto college student who interned at COMPUTE! Publications during the summer.

It is a dark and stormy night, and you are diligently typing games into your Commodore 64.

Suddenly, just outside, you see a dazzling flash of light and almost at once hear the deafening retort of thunder. The lights dim, flicker, and wink out. A wave of dizziness overcomes you.

When you regain consciousness, you cannot recognize your surroundings. "This isn't my computer room," you think. A thousand theories about your situation fly through your head, but none is even close to the terrible truth.

You are trapped inside the Power Grid.

To return to your own world, you must find and encircle your Commodore 64 computer. It is

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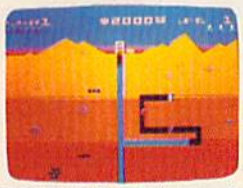

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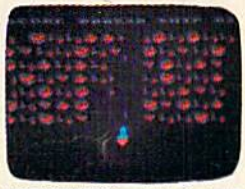

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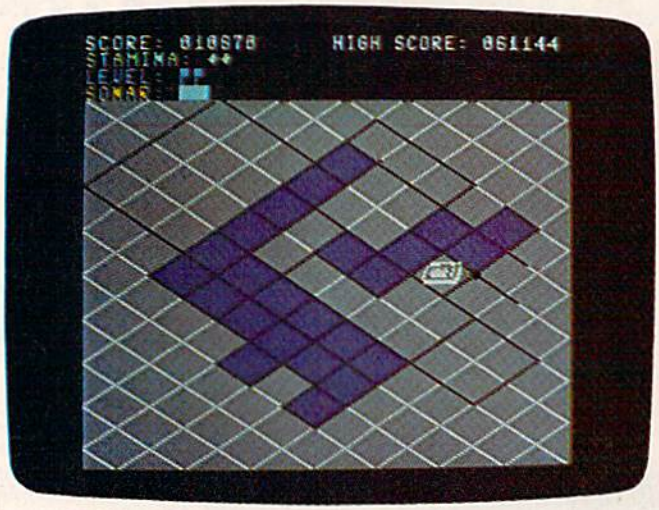


After filling in nearby squares, the player has found and uncovered the hidden Commodore 64.

not visible from where you are. but you know it is hidden inside one of the many grid nodes. Fortunately, you are carrying your pocket sonar, which always tells you how far from the 64 you are. The shorter the line displayed by your sonar, the closer you are to escaping.

You soon discover that the Grid is a dangerous place to be. Deadly power spikes travel up and down the wires. Touching one of the spikes results in a terrible shock. These shocks, though powerful, are very short, so you can endure up to four collisions with the spikes and still stand a chance to make it home.

Unfortunately, should you successfully reach your 64, you will find that the magnetic disturbance which trapped you on the Grid in the first place is worse than ever. You end up on the Grid again, but now it is coursed by even more power spikes.

Is there no escape?

Playing Spike

The recommended way to travel on the Power Grid is with a joystick in port two. The joystick may seem a bit awkward at first: since the Grid is tilted 45 degrees, the four cardinal directions (up, down, left, right) are likewise tilted.

When Spike first starts, you will have to make some decisions. You must decide the speed of the game and whether you want the Easy or Hard option. Pressing the RETURN key or the joystick button automatically chooses the Hard option and a speed of 5. If you want some other option, press the number of the speed you want (1 to 9) and the E key for an Easy game.

Another handy feature of Spike is the pause option. Pressing a SHIFT key pauses the action. Pressing SHIFT/LOCK freezes the game until SHIFT/LOCK is released.

You start each game with five lives. An indicator at the top of the screen, labeled STAMINA, keeps track of your remaining lives, not counting the one currently in play.

Another indicator, SONAR, shows your proximity to your invisible goal, the hidden Commodore 64 computer. The shorter the line, the closer you are to the 64.

The LEVEL indicator displays flags to show how many times you've found the 64 and advanced to a more difficult power grid.

When you start a new game, the Grid is patrolled by two power spikes. Another spike joins them on each succeeding level, up to a maximum of seven spikes.

To develop a winning strategy, it's vital to understand how the scoring works. The screen is divided into 112 grid nodes (diamond-shaped blocks). Your goal, the Commodore 64, is hidden in one of them, leaving 111 empty nodes. You gain survival points for traversing the Grid — ten points for each new side of a node you cross. If you box in a node by leaving your trail along all four of its sides, the node is colored blue. You'll want to box in as few nodes as possible, because it costs you bonus points later.

When you find the Commodore 64 by locating it with your sonar and encircling its node, you win bonus points and advance to the next level. The bonus is figured by multiplying the number of unboxed nodes times the bonus value for the current level. The bonus value starts at 40 for level one and increases by five for each additional level. For instance, if you find the 64 on level three after boxing in 11 nodes, you would win 5000 bonus points (100 unboxed nodes × bonus value of 50 = 5000). This would be added to the survival points you gained while searching the Grid.

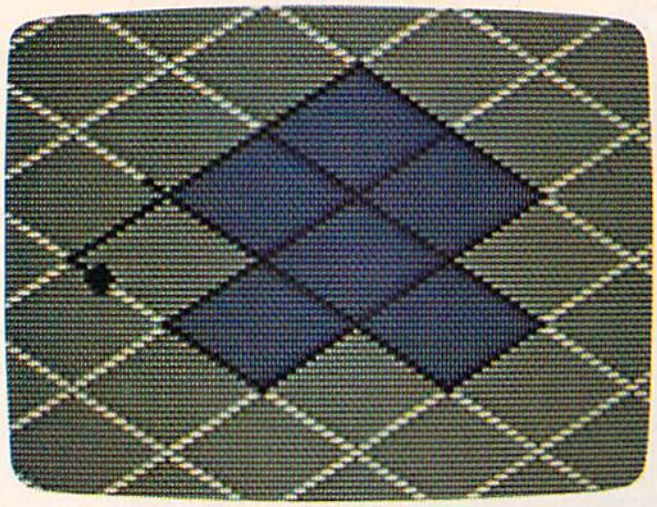
Close-up of a player pursued by a "spike" on the Power Grid, plus the game indicators: "Stamina" shows the number of lives remaining; "Level," the number of screens cleared; and "Sonar," the player's proximity to the hidden computer.

HAVE YOU FLOWN YOUR C-64 TODAY?

Imagine yourself at the controls of a small, single-engine plane, 10,000 feet in the air, on your approach to the runway and safety. You're running low on fuel, but your instruments show that you're on the glide path, and lined up with the runway. It's a beautiful, sunny day, and you can see the airport in the distance, across the grassy fields. But the crosswind is tricky, and it will take all your skill to land safely. You're coming down now, and the runway is getting closer. A bit left, OK, now lower the power, fine, now put down the flaps. Pull the nose up a bit more, you're a little low. Watch the power! Don't stall. OK. Here comes the runway. You hear the squeal of tires on pavement, your pulse quickens, you're down, but watch it, you're pulling right! Brakes, brakes! Left more! You've stopped safely! Good job. The first real-time flight simulator for C-64 is now available from MMG Micro Software. There are four levels of difficulty, landings in clear or foggy weather, landings with or without instruments, and with or without the real-time view from the cockpit. **Final Flight!** requires a Commodore 64, 1 joy stick, and is offered on tape or disk for the same suggested retail price of $29.95

MMG

Final Flight! is available at your local dealer or direct from **MMG Micro Software**. Just send check or money order to P.O. Box 131, Marlboro, N.J. 07746 or for Mastercard, Visa, and C.O.D. deliveries call **(201) 431-3472**. Please add $3.00 for postage and handling. New Jersey residents add 6% sales tax. Also available for ATARI computers.



Before: *Using Sonar to zero in on the invisible computer, a player encircles a suspected node on the Power Grid....*

A HIGH SCORE indicator keeps track of the best game played during the current sitting.

Typing Spike

Unavoidably, Spike is a long program – more than 4K of pure machine language. Normally, it is very difficult to type in such a program without making a mistake. Also, in the past, a machine language monitor was necessary to enter such a program from a published listing in a magazine.

However, to make the typing as easy and as foolproof as possible, another landmark program debuts in COMPUTE!'s Gazette this month—"MLX." MLX, a machine language entry program, was written by Program Editor Charles Brannon to greatly simplify the task of typing ML programs from listings. It includes an instant checksum feature which does not let you continue until you've typed a line correctly. It also automatically types commas and lets you break up the job into several sittings.

After: *The node is encircled and the hidden computer revealed.*

Please read the directions for using MLX elsewhere in this issue. And be sure to save MLX, because it will be needed for future all-machine-language programs in COMPUTE!'s Gazette.

Here is the information you'll need to enter Spike with MLX:

Starting address — 32768
Ending address — 37295

Once Spike is saved on disk or tape, a special procedure is required to load the program.

For disk, enter:

```
LOAD"SPIKE",8,1
```

For tape, enter:

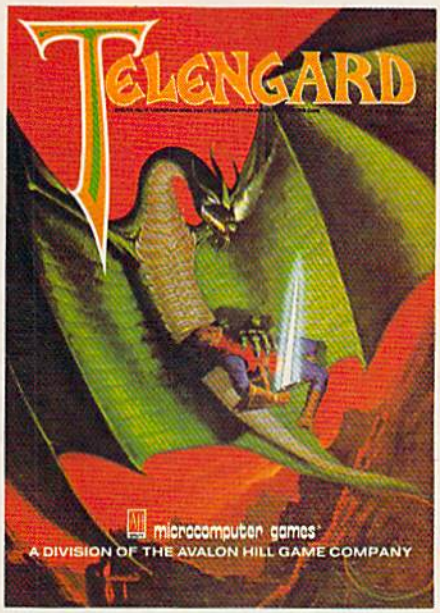
```
LOAD" ",1,1
```

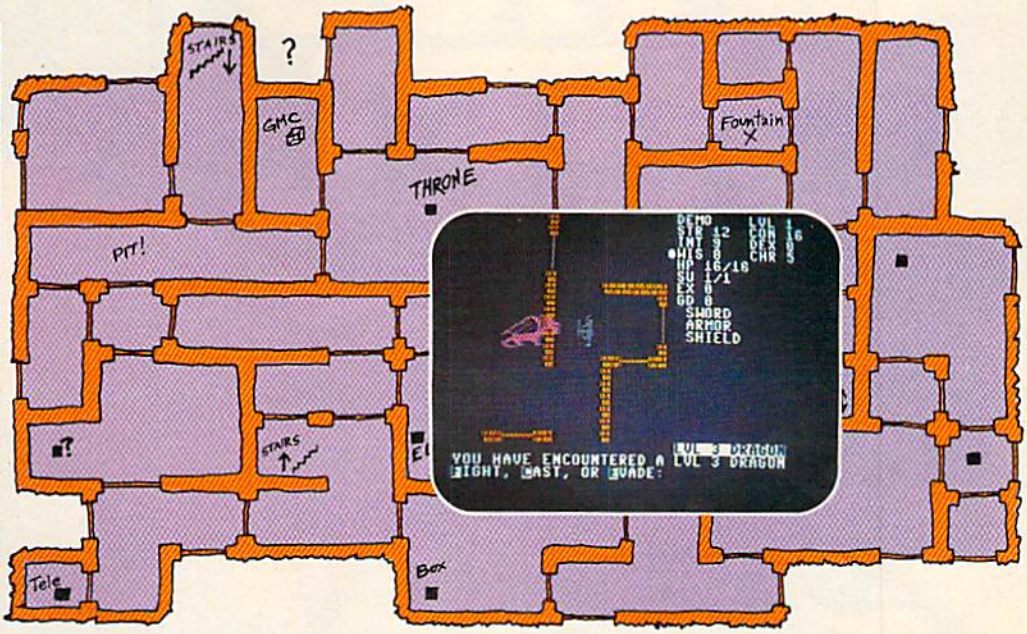
When the program is loaded, run it by entering SYS 32768.

We think you'll agree that Spike is well worth the extra effort.

See program listing on page 213.

Be Amazed!





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T.G.I.F.: Thank Goodness It's Friday! Avalon Hill's new party game for one to four players recreating an often-not-so-typical week in the lives of the working class. Half the fun is just making it from Monday to Sunday. Commodore 64, Atari Home Computers (40K) cassette for a meager $20.00. Atari diskette (48K) for $25.00.

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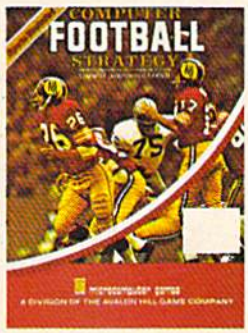
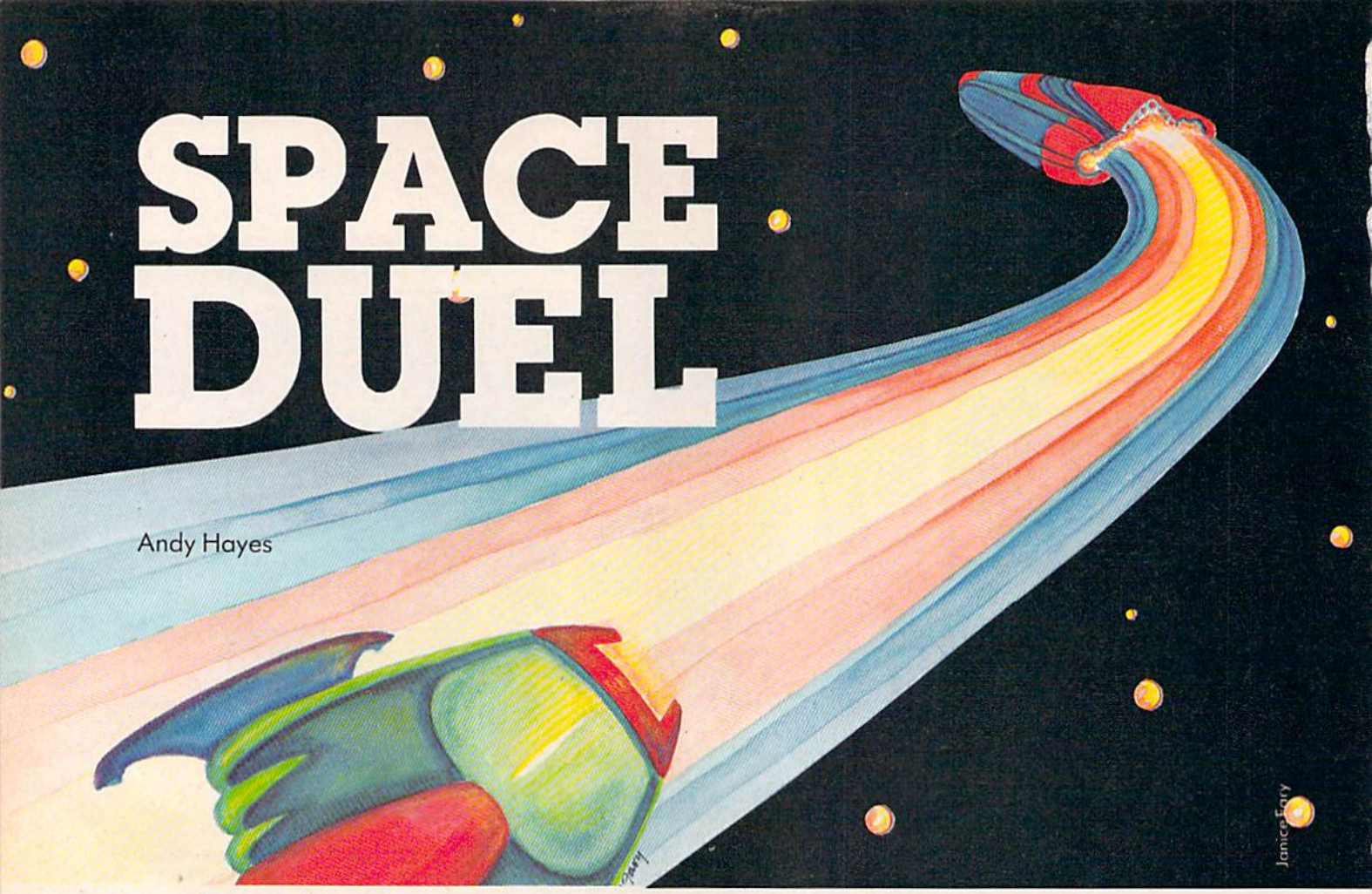


SPACE DUEL



Andy Hayes

"Space Duel" is a two-player fast-action game for the unexpanded VIC-20 and Commodore 64. It requires a pair of paddle controllers. The Commodore 64 version, by Assistant Programming Supervisor Gregg Peele, is written entirely in machine language.

One of the problems encountered when programming games for the VIC-20 is the lack of a second joystick controller port (the Commodore 64 comes equipped with two). Since only one joystick can be plugged in, most games tend to be written for one player only.

But there's no denying the fun of two-player computer games. In a one-player game, your opponent is almost always the computer, which puts you at a great disadvantage whenever reaction time or logical thinking is being tested. Eventually the computer always wins. A two-player game, however, pits you against another human being, someone who shares all the same human frailties. Not only do you have a better chance to win, the game also lets more than one person play with the computer at a time.

There are only three ways to program simultaneous-action, two-player games for the VIC: a second joystick port can be added by building an interface to the user port (not a project for beginners); one or both players can use the keyboard for control (which tends to be clumsy); or the game can be written to take advantage of the paddle controllers.

Paddle controllers come in pairs, wired to a single joystick plug. Essentially they are potentiometers (variable resistors). Atari paddles or Commodore paddles will work with the VIC and Commodore 64, although the Commodore paddles are preferred because their range is better matched to the Commodore computers. However, the Atari paddles are more widely available, and many people who started out with the Atari 2600 VCS game machine may already have a pair of Atari paddles on hand. Either kind will work fine with "Space Duel."

Hi-Res Animation

Space Duel gives each player a spaceship at opposing sides of the screen. Players can move their spaceships up and down by rotating the paddle controller. (With the Commodore 64 version, the paddles should be plugged into port one.)

Try rotating the paddle knobs slowly while watching the spaceships closely. You'll notice that unlike most games for the VIC and 64, the objects do not move in rough increments of one character space. Instead, they scroll smoothly up and down the screen, one pixel at a time. This kind of high-resolution animation would be far too slow if programmed in BASIC. The VIC ver-

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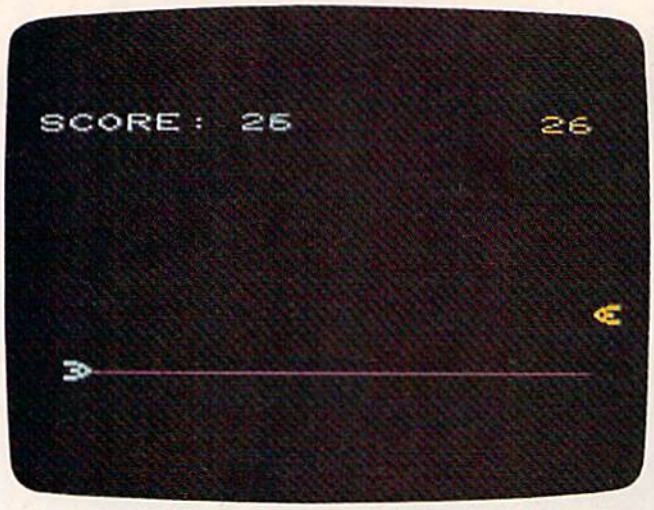
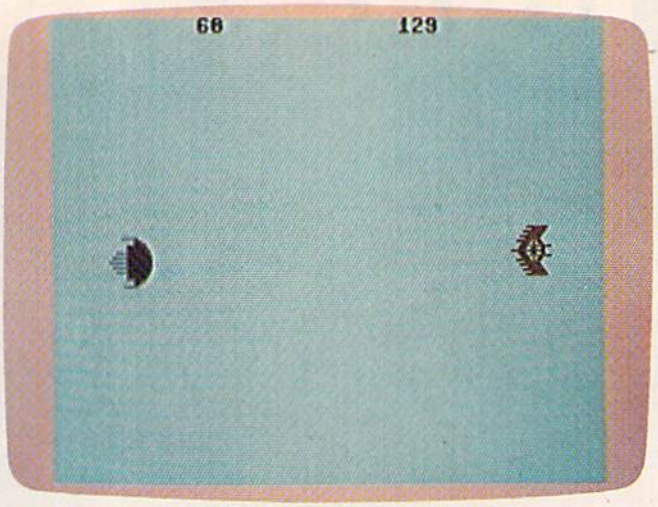


With the score tied, player one fires his laser but misses his opponent's ship. (VIC version).



Both players jockey for position before firing their lasers. (64 version).

sion of Space Duel uses a machine language subroutine to attain this fine movement. The 64 version is written entirely in machine language and uses sprites.

Rotating the paddle knob quickly, though, reveals another kind of movement – extremely fast jumps. Because a paddle controller returns an absolute value to the computer (instead of the directional value of a joystick), it's possible to leap from one screen position to another with a flick of the wrist. You'll find both kinds of movement handy in Space Duel: rapid jumps to avoid enemy shots, and fine adjustments to carefully aim your own shots.

Dueling Spaceships

The object of Space Duel is simple: shoot the enemy spaceship more than it shoots you. To fire your laser, press the paddle fire button. Instantly, a red laser burst zips across the screen (at machine language speed) toward your target. A direct hit triggers an explosive sound effect and flashing screen colors.

Meanwhile, of course, you have to dodge laser bursts fired at your own spacecraft. Space Duel can get so fast that only the quickest players can keep track of what's going on.

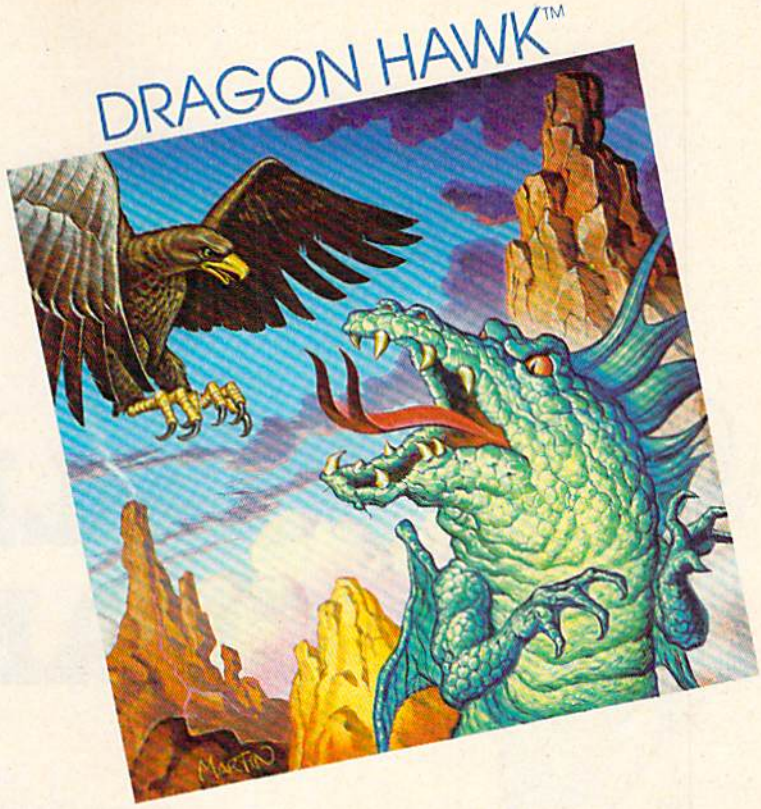
Each hit on the enemy ship is worth ten points. However, to prevent reckless shooting, each laser shot also costs you one point. Therefore, a hit really nets you only nine points. Each player's score is updated in the top corners of the screen.

The game ends when one player scores at least 80 points (500 points in the 64 version). To play again, press one of the fire buttons or respond to the screen prompt.

Hint: In the VIC version, if the paddles don't seem to work right when you first run the program, try pressing RUN/STOP-RESTORE and restarting. This resets the computer and clears out certain memory garbage which can interfere with the controllers. Also be sure not to leave any buttons on the Datassette recorder pressed down, because this interferes with the left paddle.

To type in the machine language 64 version, you must use "MLX," a special machine language-entry utility (see article elsewhere in this issue). The information you need to enter the 64 version of Space Duel with MLX is: starting address 49152, ending address 50393. To start the game, enter SYS 49152.

See program listings on page 207.



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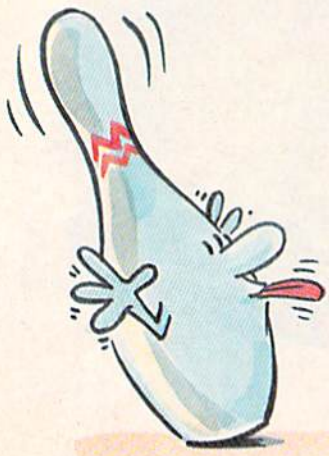
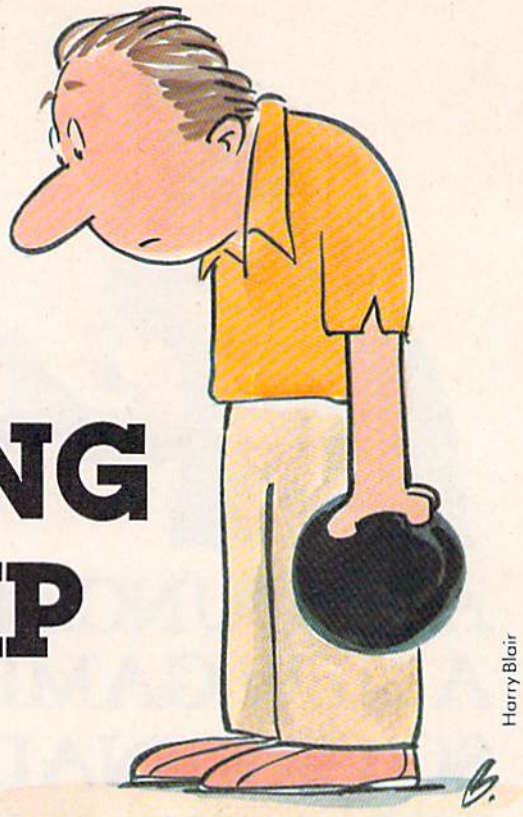


BOWLING CHAMP



Harry Blair

Joseph Ganci

"Bowling Champ," for one to three players, was originally written for the unexpanded VIC-20. We've included a version for the Commodore 64.

Some games like *Space Invaders* or *Adventure* create their own fantasy worlds, while others are simulations of reality. "Bowling Champ" is one of the latter.

It's not easy to take a game with countless physical variables, such as bowling, and reduce it to numbers so it can be re-created by a computer – especially a small computer. Compromises must be made. But Bowling Champ is a reasonable simulation of a game of ten pins, given the limitations imposed by the unexpanded VIC-20's 3.5K of free memory. The elements of skill and luck have been preserved, and the scoring is authentic.

Up To Three Players

When you first run Bowling Champ, it asks for the number of players. One, two, or three people can play.

Next you type in the players' names. To fit the names on the screen, the program truncates them to five characters (six on the Commodore 64).

Now you're ready for the first frame. The bowling ball rapidly moves up and down across the alley until you press the space bar. This rolls the ball down the alley and knocks over the pins, unless you've thrown a gutter ball. The trick is to time your release so the ball rolls down the center of the alley to score a strike.

In case you're unfamiliar with how a game of ten pins is scored, here's a brief summary:

A game consists of ten frames or turns. Each player gets one or two balls per frame. If you roll a strike – knocking down all ten pins with the first ball – you don't get a second ball, but the current ball's score is ten plus the total of your next two throws.

If some pins are left standing after your first ball, you get a second ball. If you knock down all the remaining pins, it counts as a spare, and the current ball's score is ten plus your next throw.

If any pins remain after your second ball (no strike or spare), the number of pins knocked down in that frame is added to your previous score.

Rolling a spare in the tenth (last) frame gains you one extra ball; rolling a strike in the tenth frame gains two extra balls.

Therefore, a perfect game – ten strikes during regular play plus two strikes with the extra bowling balls—scores 300 points. Needless to say, this doesn't happen very often, either in real bowling or in Bowling Champ.

Programming The Game

Bowling Champ was my first real attempt to write a good game in BASIC for my VIC-20. At first I thought it would be fairly simple to simulate a game

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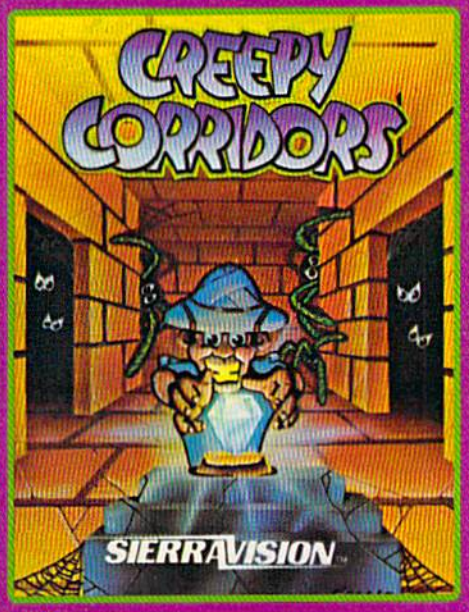

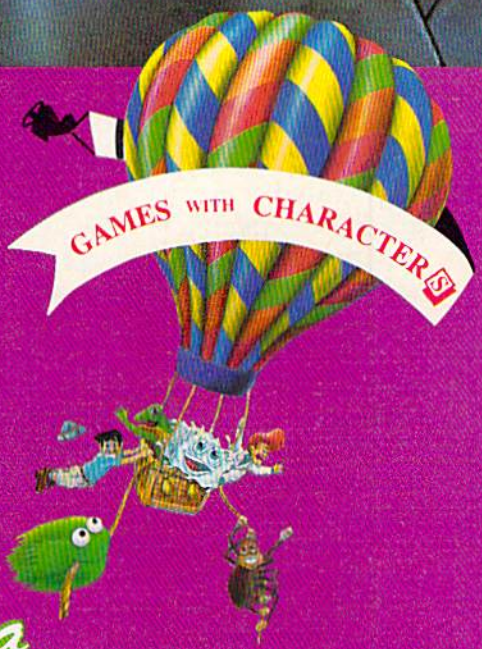

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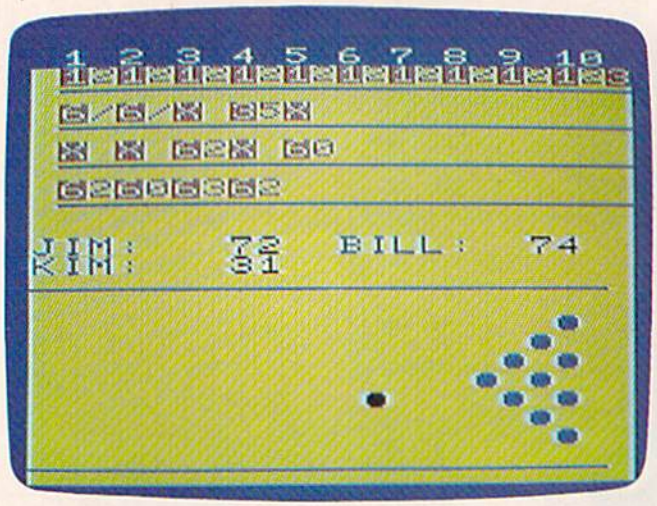
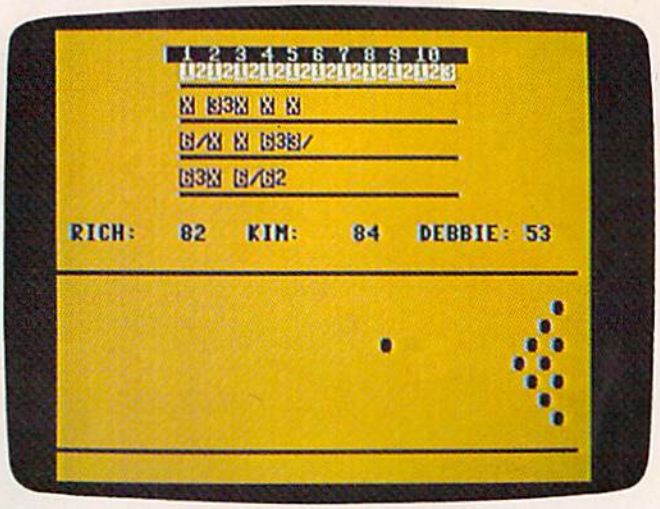


Up to three people can play "Bowling Champ" (VIC version).



"Bowling Champ" (64 version).

like bowling, but I found myself quickly running out of memory as I tried to tell the VIC how to keep track of strikes and spares, how to calculate scores in bowling, and how to keep track of everything at the same time.

Another problem I found was the VIC's small screen size. I wanted to keep a constant log on the screen of each ball thrown, just as you would see on a regular bowling score sheet. But alas, with only 22 characters horizontally across the screen, I just wasn't able to record 20 ball scores with a box around each one. That's when I found a useful application for the REVERSE function (reverse video). At first I thought of it as just a way to pretty things up, but then I realized I could use it to reverse every other ball score on the screen so that each one could be easily distinguished from the one next to it.

With that problem solved, I attacked the next: how to keep track of strikes and spares and tally the scores correctly. At first I thought of just using a flag, a number that would tell the computer when to add extra points. But that got quite confusing and memory-consuming as I tried to keep track of each player's strikes and spares.

It took awhile, but finally the concept of screen memory clicked for me. If the screen locations were also memory locations, then I could tell if a strike or spare had been thrown simply by checking the correct spot on the screen where the symbol for a strike/spare had been recorded. This made things a lot easier and saved a lot of memory.

In short, the program counts the number of pins knocked down, checks for a strike or spare, and records the corresponding symbol on the score sheet. The program then checks to see if the last ball thrown was a spare or a strike; if either, calculations are performed according to standard bowling scoring rules. If a strike or spare is thrown in the tenth frame, the player is allowed to throw one or two extra balls. Every rule of scoring for regular bowling is followed. The only difference is that the computer does not wait until the end of a frame to update the score — it updates it after every ball.

Some new players find the ball moves too fast for them to aim. To slow it down, insert a delay loop (such as FOR X=1 TO 100:NEXT) at the beginning of line 440.

Program Outline

Here is a breakdown of both the VIC and 64 versions of the program:

10–110	Initialization; title is printed.
112–113	How many players? Up to three can play.
118–123	Players' names are typed in and are cut off after the first five letters (six letters on the 64) to fit the screen.
128–156	Screen setup.
160–225	Main part of the program. This includes:
166	Change the screen and border colors for each player.
174–194	Check to see if a spare has been thrown in the tenth frame and, if so, let the player throw one more ball.
195–214	Check to see if a strike has been thrown in the tenth frame and, if so, let the player throw two more balls.
882–896	Final scores and an option to repeat the game are printed.

The program contains the following subroutines:

430–460	Bowling ball moves up and down until a key is pressed.
550–612	Roll the ball toward the pins, knock them down, and count to see how many have been knocked down.
1000–1100	Keep score on the screen with the proper symbol — the number of pins knocked down, the spare symbol, or the strike symbol.
1200–1300	Tally current score.

The VIC version takes up most of the memory, so don't add anything extra until you've typed it in as is. Consider the quotes at the ends of PRINT statements optional where they are not included.

See program listings on page 204.

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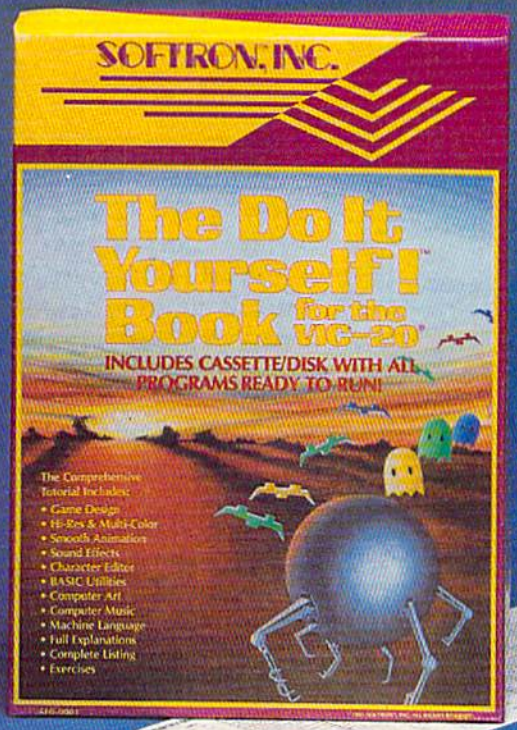

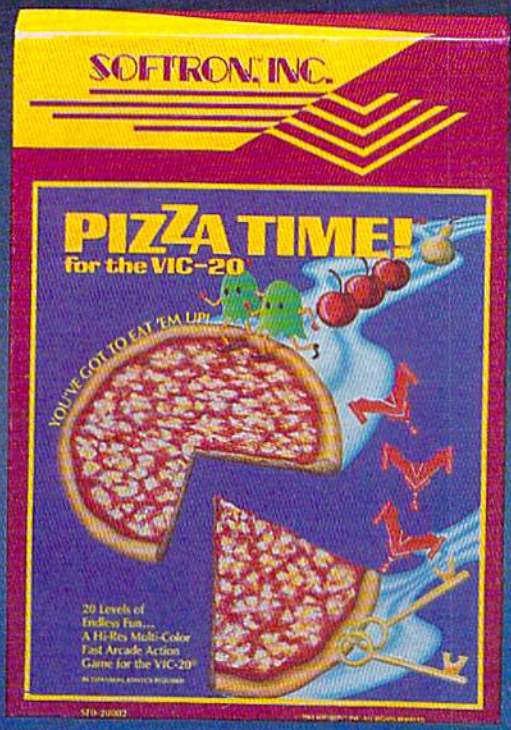

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Saucer Shooter
For VIC-20

Ron Watts

"Saucer Shooter" is an action game for the unexpanded VIC-20 which makes exceptional use of custom characters and sound effects. Unplug (or disable) any memory expanders before using the program. It requires one joystick.

Surrounded by piles of atomic waste, the player's base is under attack by the hovering saucer.

"Saucer Shooter" is not only a fun game, it's also a good demonstration of what can be achieved with user-defined graphics (custom characters).

The custom character technique lets programmers redesign the standard VIC characters into any shapes desired. In Saucer Shooter, standard characters are customized to make an enemy saucer, a defending gun turret, flying shots, piles of atomic waste, explosions, and even 44-column screen characters. (For more information on this technique, see "Introduction To Custom Characters On The VIC And 64" and "How To Make Custom Characters On The VIC" in last month's COMPUTE!'s Gazette.)

A Hostile Saucer

After you type RUN, the title screen comes up and a short tune plays. Press the joystick fire button to start the game. The screen clears, there's a short pause as the program makes a few preparations, and the game begins.

The object is to defend yourself against the hostile saucer orbiting overhead. Your joystick controls a gun turret which moves across the bottom of the screen. The playing field is what is sometimes referred to as a "wraparound universe — if you move off the edge of the screen, you reappear on the other side.

Shots fired by the enemy saucer obey the same rule. Keep this in mind, because a shot that seems to be flying a whole screen away from you might wrap around and catch you by surprise.

Every orbit or so the saucer fires another shot at your turret. You can shoot back by pressing the joystick fire button. Hitting one of the saucer's shots in midair scores 100 points. A direct hit on the saucer scores 500 points. Both the current score and the high score for the session are printed at the top of the screen. *(Editor's Note: During testing of the game, our high score was 19,900.)*

You start the game with four turrets and an unlimited supply of bullets. However, only one bullet can be in flight at a time. Pressing the fire button cancels the previous shot and fires a new one. Since the program is written in BASIC, this was necessary to keep the action going at a fast pace.

There's an important reason for blasting as many enemy shots in midair as possible: when

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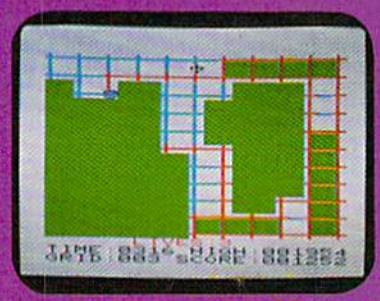

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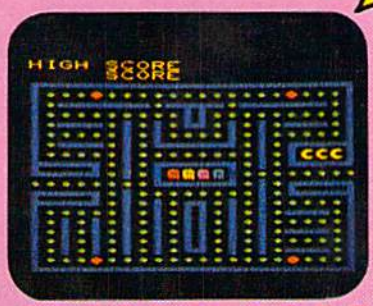

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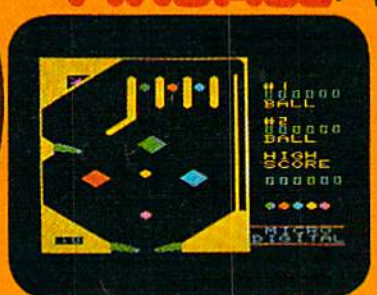

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they miss your turret and hit the ground, they leave behind a small pile of atomic waste. If your turret collides with a pile, it blows up. As the game progresses, your territory gradually becomes littered with these piles of hazardous debris. There's not much you can do about them. Soon your maneuvering room is restricted, and you're at the mercy of the orbiting saucer.

Programmer's Notes

Lines 100 through 140 move the saucer from one side of the screen to the other. Lines 200 through 260 move the bullet and detect hits. Lines 300 through 360 read the joystick and move the turret, and line 400 reads the fire button.

I included the routine at line 410, because it's something I always look for in a game — it lets you move the turret twice as fast as the saucer. That way, you can outrun the blasts and track the saucer as if you were shooting skeets.

The remainder of the 400-series lines initialize new bullets, and lines 500 through 560 move shots fired by the saucer.

See program listing on page 233.

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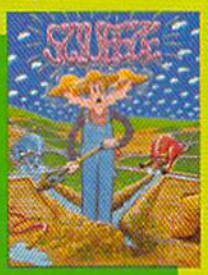
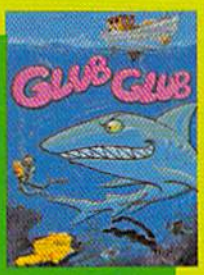
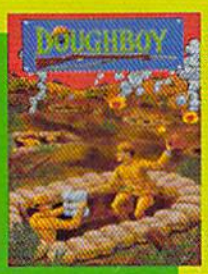




GLUB GLUB
The map was right! Under the boat the unmistakable glitter of gold. A king's ransom! But those dark forms can only be...sharks! Can you conquer your fear and avoid those dark marauders?

DOUGHBOY
The bugle call has sounded. It's time to hit the trenches for a fun-filled contest of bravery and tactics. Your mission: Recover the supplies that are scattered across the playfield while avoiding enemy troops.



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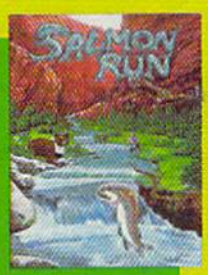

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REVIEWS

VIC/64 Rabbit

Roland L. Ryan

If you feel left out when other people talk about the speed of their disk drives, perhaps a product from Eastern House Software coupled with that slow Datassette can be of some help to those of us on a tight budget. Or maybe some disk drive owners will want to dust off the Datassette to use as a backup to the disk drive that just so seldom—but at the wrong time—goes out.

Just what is the Rabbit? The CBM Rabbit from Eastern House Software is a cartridge that speeds up the transfer of data to and from the Commodore Datassette recorder. The stored program uses about one-fifth the length of tape used in the normal Commodore mode. What can this mean to you? The Rabbit allows much faster loading and saving of programs. For example, a 16K program will load in about one minute (compared to about 45 seconds for the 1540/1541 disk drive).

Three Ways To SAVE

Installation is simple. First plug the Rabbit cartridge into the user port and insert the trailing wire above the third connector on the cassette interface (cassette motor line). After turning on the computer, the Rabbit is linked (switched on) by a SYS 9*4096 command which provides the Rabbit a link with your computer's BASIC language. The Eastern House Software logo appears on the screen and informs you that the Rabbit is linked. Ordinary link-up of the Rabbit does not eliminate the use of the Datassette in the normal Commodore LOAD, SAVE, and VERIFY modes. Instead, the Rabbit adds its own load (*L), save (*S, *SS, and *SL) and verify (*V) commands to those of the Commodore. The Rabbit commands are an asterisk followed by the first letter of the Commodore command, which makes them easy to remember.

With the Rabbit installed, a program which takes four minutes to load from a cassette tape in the Commodore mode can be saved onto a new tape in less than one minute using the Rabbit SAVE (*SL) command. The three Rabbit SAVE commands all work in the same way, except that *SL gives a longer leader tone at the beginning of the save operation to make sure that the leader at the beginning of the cassette tape has passed by the record head before the program is saved. The *S and *SS commands give progressively shorter leader tones and can be used to save programs in the middle of the cassette.

The Rabbit commands *L, *S, and *V are used like the corresponding operations with the Commodore commands LOAD, SAVE, and VERIFY, except the wait is much shorter. The *V (verify) command does not compare the information on the tape with that in the computer's memory, but checks to see if the information on the tape can be read by the computer. This means the Rabbit will *V (verify) a taped program with nothing in the computer's memory.

At the end of a load (*L) or verity (*V) operation, the screen will display the length of the program, the starting address, the ending address, and the name of the program in reverse video. The length of the program and the addresses are in hexadecimal (hex) notation.

A list, or directory, of the programs on a tape may be seen by simply asking the computer to load a program that is not on the tape. By typing *L "*" followed by RETURN and stopping the Datassette at the end of the tape, a list of the programs or data files on the cassette will be displayed.

Additional Features

The Rabbit contains some math functions which will convert the hex notation used in the program lengths and addresses to everyday decimal numbers (*H) or convert decimal numbers to hex (*D). Example:

```
*H 0801 (RETURN)  = 02049
*D 2049 (RETURN)  = 0801
*H A1B1 (RETURN) = 41394
```

Hex address $0801 is the beginning address of all normal BASIC programs (on the Commodore 64) and will be listed each time the program is loaded. To LOAD a program or a machine language subroutine at a different address, you can use the command *L "Program Name",xxxx, where xxxx is the hex notation starting address of the program. The length and addresses are displayed on the screen at the end of the loading operation.

The Rabbit can also append a program to one already in the computer's memory provided there is no duplication of line numbers in the two programs. Appending is done by simply typing *A "PROGRAM NAME". The Rabbit will search the tape and append the new program to the one in the computer's memory. This procedure could be handy for those of us who like to

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Well, almost.

Continental Software

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work on long programs or develop games using sprites or graphics routines.

The Rabbit can test your computer's memory for storage retention (test 1) and for proper chip select operation (test 2) with the command *T followed by the test number, starting address, and ending address of the memory to be tested. Any errors will be displayed in reverse video.

The Rabbit also has other useful commands:
*E Execute–LOADs (*L) and RUNs the program.
*G xxxx—go to the machine language program at hex address xxxx.
* —go to to CBM monitor (a monitor must be in memory).
*Z —toggle lowercase versus graphics character set.
*K—(Kill the Rabbit) removes the link to BASIC.

When using programs already recorded in the Rabbit mode, the usual LOAD, SAVE, and VERIFY commands can be used in place of the Rabbit commands. This is done with a system command that disables the Commodore mode and replaces the Rabbit commands with those of the Commodore.

Data Files, Too

Another added feature of the Rabbit is its ability to use the Rabbit mode to generate data files. This feature means that waiting times for writes and reads of data transferred to and from the Datassette will be much shorter.

The Rabbit generates short and long data files. The short files use the cassette buffer memory and hold only 192 bytes of information before a pause to allow the computer to transfer the data to the Datassette is necessary. The long data files use 1K (1024) bytes of the computer's BASIC memory, which, of course, decreases available memory by 1024 bytes.

The Rabbit does not speed up the loading of programs already saved in the Commodore mode. These programs must be loaded as usual with the Commodore LOAD command and then resaved with the Rabbit commands. (Remember to use the *SL command for the first program on a new tape.) The Rabbit copy may then be used whenever you wish to load the program quickly.

Rabbit + Quickfind = Fast Tapes

If you are thinking about sitting down and resaving all your present program files in the Rabbit mode, why not go one step further—use the "Quickfind" program from the premier issue (July 1983) of COMPUTE!'s Gazette to make the resulting tape into a super job. Quickfind was adapted for the Commodore 64 and VIC-20 by Harvey Herman, Gazette associate editor. It allows you to rapidly locate any program on a cassette. Quickfind can be typed in, saved (*SL) onto a work tape, and then run. The only change that must be made to use the Rabbit with Quickfind is to change LOAD in line 335 to *E.

Following the instructions in the Quickfind article, LOAD each program into memory from the Commodore mode tape and SAVE (*S) them onto the Quickfind tape. When you are finished, rewind the tape and Execute (*E) the Quickfind program. The menu of programs on the tape will be displayed on the screen. Choose the desired program by number, press RETURN, and follow the instructions on the screen to PRESS FAST FORWARD ON CASSETTE. When the Datassette motor stops, the screen prompt will say PRESS STOP ON CASSETTE. Then the screen will say *E "Program Selected". Press RETURN and the PLAY button on the Datassette. It takes only about two minutes from the *E (Execute) "Quickfind" to the running of your selected program, even if the program is at the end of a C-30 cassette holding nine or ten programs of 16K bytes or less.

Rabbit Is Reliable

In my usage the Rabbit worked well, and I recommend it. There were no SAVE (*S) errors and very few LOAD (*L) errors with the Rabbit. Most of the few errors were caused by placing the Datassette too near the television set which I used as a monitor. (TV sets emit strong magnetic fields.)

The Rabbit documentation is well-written, with examples and a short demonstration program on Rabbit data file capability. The program shows how both short and long data files work.

In a telephone interview with Carl Moser, who wrote the Rabbit program for Eastern House, Moser stated that the Rabbit mode should be more reliable than even the normal Commodore mode. His reason is that the Rabbit checks both the leading and trailing edges of a tone to decide if it is a one or zero (files are stored on tape as a series of tones). The improved routines used by the Rabbit were worked out with recording studio equipment to give increased reliability at the faster speeds.

My only disappointment

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with the Rabbit was that it would not make a Rabbit mode backup of protected commercial programs I already own (of course, neither will a disk drive). Moser stated that an updated version of the Rabbit which would make a backup copy of almost all programs was in preparation and should be available by the time this appears. The owners of the earlier 2.0 and 2.1 versions of the Rabbit may have them upgraded by Eastern House. A charge will be made for labor and the additional ROM needed for the upgrade.

My early 2.0 version of the Rabbit, of which only a small number were produced, had a few bugs. Eastern House was already aware of them. Execute (*E) and LOAD to a different address (*L "Program Name", xxxx) would not work. Moser says an upgrade of the 2.0 version to the 2.1 would be made by Eastern House for a handling fee (for more information contact Eastern House).

Low Cost, High Speed

In my opinion, the Rabbit's only drawback compared to a disk drive is that it still uses tape — meaning that the first programs or files on a cassette must be passed over to load or read the programs or files stored after them. Using the Quickfind program should help alleviate this problem.

The Rabbit allows the storage of up to 300K bytes of data files or programs on both sides of a C-30 tape. The 30-minute tape is the longest length recommended by Commodore for use in the Datassette. The Rabbit and Datassette combination may also be a very good backup to the disk drive, since it stores a large amount of data at relatively low cost. The Rabbit, which lists for $39.95, combined with your Datassette is the beginning of a low-cost mass storage system. Cassette tapes are inexpensive and easy to mail or store.

Does the Rabbit plus a Datassette equal a poor man's disk drive? Yes, I think so!

VIC/64 Rabbit
Eastern House Software
3239 Linda Drive
Winston-Salem, NC 27106
$39.95

Busicalc For VIC And 64

Richard Devore

If you do or need to do financial projections for home or business, *Busicalc* may serve your purpose much better than pencil and paper. Besides, you didn't buy your computer just to play games, did you?

Busicalc is a spreadsheet program for the Commodore 64, VIC-20, and PET/CBM computers (this reviewer examined the 64 version). It allows you to set up sales projections, budgets, bowling team averages, or any other figures in row and column format. It is particularly useful if you have variables for a "what-if" analysis. By typing in the changes and recalculating, the program shows what effect the changes will have on your end result. Each time the figures are changed, a hard copy may be made on a printer for later reference.

Changes may also be saved on disk. But be sure to have a formatted disk handy, because *Busicalc* does not allow you to format a disk once the program is loaded. Not having a formatted disk would leave you, at best, with a printout—which means the work would have to be redone once you left the program to format the disk.

Easy To Learn

The *Busicalc 64* package comes with a program disk, 36-page manual, and a licensing agreement. The agreement is pretty much standard—you never actually "own" the copy-protected program, but you are allowed to use it on one computer at a time. A backup copy may be obtained when the warranty registration card is returned with $10, a reasonable fee.

For the most part, the manual is complete and includes several tutorials on using the program. These progress from a simple sales projection of four rows and four columns to a 27-row by 9-column spreadsheet which starts with sales and computes the commission, net sale, costs of goods, and gross profits. The final example sets up a personal budget. This tutorial includes the normal income and expense items. After setting up the budget, you are shown how to work with it, something that is immediately practical.

Following each tutorial, you are taken step by step through the program's commands and functions. There are a few errors in the documentation, but they are eas-

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ily recognized and compensated for. I was amazed at how quickly I could learn the program from the tutorials, and I feel they are well done.

Busicalc 64 does not make use of the 64's sound or color capabilities. On the 64, the maximum sheet size is 33 columns by 33 rows with an eight-character column width, or any row and column format that does not exceed 1100 eight-character blocks of information.

Formulas may be put into any block, addressing information in any other block. However, since the program performs all calculations from the top left of the sheet to the bottom by columns, working from left to right, if a value for a formula being worked is positioned beyond the formula (i.e., the formula is in column C and the value is in column E), the anwer will be wrong. This can be circumvented, but it is both inconvenient and apt to be overlooked.

Although the manual states that you may use formulas of up to 38 characters, brackets are not allowed. This slows things down greatly. For example, you cannot take a figure in column A, multiply it by a number, add that to a figure multiplied by a number in column B, and place the answer in column C. Instead, it would be necessary to add two columns to the sheet. These would hold the answers from each multiplication so you could add the figures in each of the two new columns by the formula and place this answer in what originally was column C.

Numerous Commands

I found *Busicalc* to be a simple-to-use spreadsheet program because of the control functions. They are accessed by the slash (/) key and appear at the top of your screen. The control functions are:

- *Jump*—Move directly from one block to another without scrolling.
- *Save*—Store all or any portion of the sheet to disk or tape.
- *Load*—Bring a saved file onto your worksheet from either a disk or tape.
- *Replicate*—This function, along with the math formulas, gives the program its power and makes it a lot quicker than pencil and paper. It allows you to copy any section of your worksheet to any other section of the sheet, making it unnecessary to type in the same information over and over.
- *Insert*—Squeeze in a row or column that you may find necessary after setting up the worksheet.
- *Delete*—The reverse of Insert, lets you remove an unneeded row or column.
- *Print*—Make a copy of the worksheet on paper.
- *Auto*—Keep the program from performing individual calculations until you finish your input, thus saving time while typing. May be toggled on or off as desired while control functions are being displayed.
- *Walk*—Select the direction the cursor will move upon pressing the RETURN key as you finish an entry. The selections are: up, down, right, left, and cancel.
- *Format*—Specify the spacing between adjacent columns. This is done by selecting the width of each column before the worksheet is printed. You may even choose not to print a column by setting its width to 0.
- *Memory*—Keep track of memory usage by showing available memory at the top of the screen. It also does a "garbage collection" each time it is used, thus helping to conserve memory.

I found *Busicalc* to be a useful program for real-world applications. It is also easy to learn. Although it does not have the calculation power of some other spreadsheet programs, it also costs less than the more powerful products.

Busicalc
Skyles Electric Works
231E South Whisman Road
Mountain View, CA 94041
Commodore 64 tape/disk $69
VIC-20 disk $59
VIC-20 tape $49

Ski-er 64

Eric Brandon

It's 102 degrees outside, but suddenly you find yourself transported to a ski resort in the Swiss Alps. This bit of magic is *Ski-er 64*, by Abacus Software, a fun and realistic downhill skiing game.

The resort has three runs: the Slalom, Giant Slalom, and the Alps. In the first two, when you pass the starting gate, a clock starts timing your run with 1/10-second precision. If you can go around all 40 gates on the course, without missing any, smashing into them, or going off the edge of the screen, you then pass through the finish gate, ending your run and stopping the clock.

The giant slaloms are wider apart than the regular slaloms, so they require tighter turns. For a really exciting run, however, you

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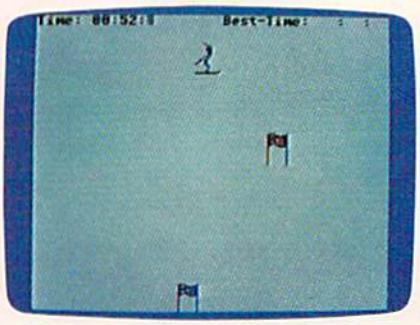
Hurtling down the Alps in Ski-er 64.



Weaving around obstacles on the slalom slope in Ski-er 64.

can try the Alps. This involves skiing down the slope as fast as you can, without hitting any of the numerous trees on the course. A very nice three-dimensional effect is achieved by the game and it looks very realistic, especially on the Alps run. If you successfully navigate through this forest, you once again pass through a finish gate to freeze your time. To make it fair, three separate "best" times are kept by the game, one for each type of run.

Program Controls

The control is very precise once you're used to it. You can use either a joystick or the keyboard. With the joystick, turning right or left is achieved by tapping the stick in either direction. Holding it too long (more than about half a second) in either direction will turn you horizontally and stop your motion. When you are in this position, you can either turn back or ski some more, or you can push yourself forward with your poles. When you're going downhill, pushing forward speeds you up (you can go incredibly fast for a while before you're hit by a tree), and pulling back on the stick slows you down.

With the keyboard you have identical control, except that you use the cursor keys to turn, and the SHIFT and Commodore keys to control your speed.

Just to keep things interesting, programmer Jeff Hanson added three skill levels to each run. You choose these levels by pressing either f1, f3, or f5 before starting. The levels determine how far down from the top of the screen your skier will be, and consequently how much warning he has of objects appearing from the bottom. The first novice level is enough to keep me busy, and I can't imagine anyone would ever be bored with level three, the most difficult.

A short manual is included with the game, but all the instructions you need are right on the screen.

Ski-er 64
Abacus Software
P. O. Box 7211
Grand Rapids, MI 49510
$17.95 disk
$14.95 tape

Mini Jini For VIC And 64

Gregg Peele, Assistant Programming Supervisor

Do you remember why you first decided to purchase your own home computer system? Maybe you had dreams of totally automating the more tedious aspects of your life. All your records could be kept on disk—making record-keeping as simple as typing in the information and hitting a few keys to process the data. Keeping and organizing records is an important application for home computers and is accomplished through the use of a data base manager program. Such a program makes managing records easy with built-in commands for most data base functions.

Using A Data Base Manager

Data base management systems must be capable of performing three basic tasks: defining and organizing a file of records, storing data in the file, and manipulating the file.

First, users must be able to create defined files with specific record descriptions. Just like a filing cabinet, a computer file has records grouped together because of a common denominator. Individual records are further subdivided into categories called *fields*, which are determined by the creator of the file. A typical file record in an address file might look like this:

File Name Address File

Record #1

Field Description

Last Name ...	Doe
First Name ...	John
Address	112 Mystery Place
City	Detroit
State	Michigan
Zip	57776
Account status	Paid

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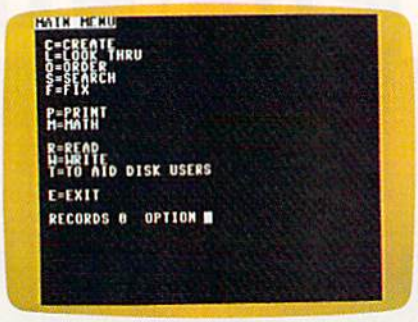
The first stage in using a data base file includes defining the name of the file, and the fields which categorize components of records. The definitions of the fields within records should be chosen carefully because they will be the means of sorting data.

The second stage in using a data base is the process of entering the data for each record. Most data base management programs prompt you with the field name that you have already defined, allowing you to fill in the slot with the appropriate data.

The third stage in your use of a data base management system is the actual manipulation of fields within records to produce reports, summations, or new interpretations of the information. For example, the address file mentioned previously could be sorted by the "Account status" field. We would then be able to print out all the names and addresses of only those people who have an outstanding balance. Similarly, fields can be alphabetized, added, subtracted, averaged, or multiplied by either a constant or another field within the record.

Data Base On A Cartridge

All these features and more are included in *Mini Jini*, a data base manager program for Commodore 64 and VIC-20 microcomputers. Available in cartridge form, *Mini Jini* starts automatically upon power-up—revealing a main menu. This menu contains options to create, review, alphabetize, find, fix, print, save, or load records from disk or tape. An option called "Mathpack" allows you to perform calculations on fields using either other fields or constants. The results of these calculations may be stored in other fields.



The menu of options in the Commodore 64 version of Mini Jini.

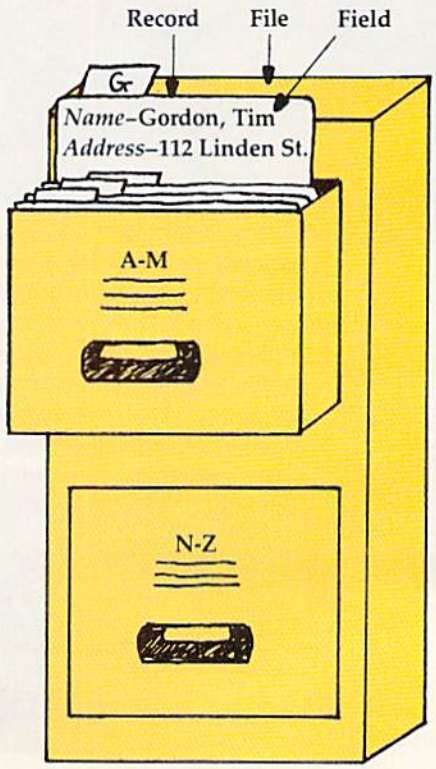
Creating file descriptions and entering data is very easy with *Mini Jini*. All points of data entry are carefully designed to be idiot-proof. Even if you make a mistake, you may return to the menu and fix your error. The documentation is also user-friendly. Designed to be used by computer novices, the manual contains clear, concise instructions and examples for every function. There is even a disk menu with prompts for viewing the disk directory and initializing and scratching files.

For an extra fee of $14.95 for disk or $9.95 for tape, a series of 79 predefined files is available. Although not a necessity, these predefined files may be helpful in designing your own data base. File descriptions include mailing lists, files for amateur radio operators, recipe files, and files for stocks and bonds.

One important consideration when purchasing data base software is the number of records your system can hold with its present memory capacity. *Mini Jini* allows you to store up to 350 characters per record on the VIC and 750 characters per record on the 64. Unexpanded VICs may store up to 50 45-character records. In comparison, the Commodore 64 has a capacity of 500 45-character records (with four fields or less) or 250 100-character records (with six to ten fields). A fully expanded VIC-20 can store as many records as a Commodore 64 (ten times the capacity of an unexpanded VIC). Files produced with *Mini Jini* are compatible with the *WordPro*, *Papermate*, and *BusyWriter* word processors.

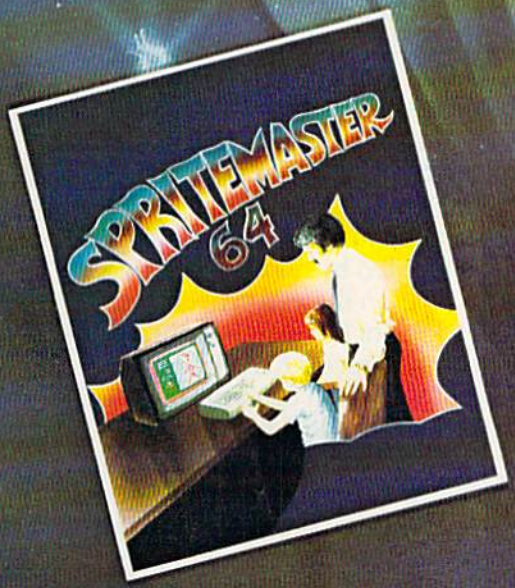
If you have a printer, you can print records by moving to the Print menu. From this menu, you may print all the data (including record numbers) by pressing P. Pressing R prints all the records in a report-style format, and pressing L prints your records in labels format. The manual provides a clear guide to the peculiarities of

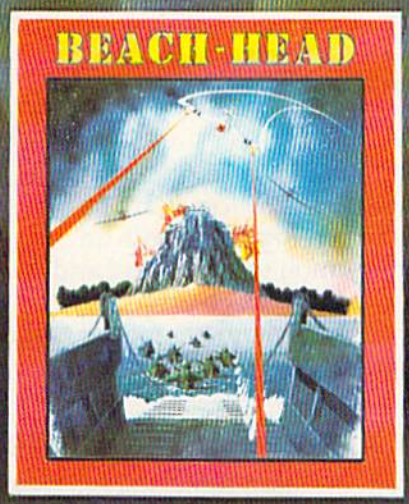
The Parts Of A Data Base

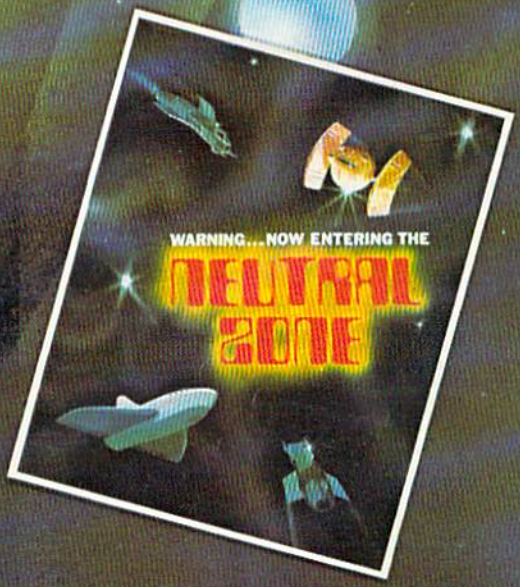


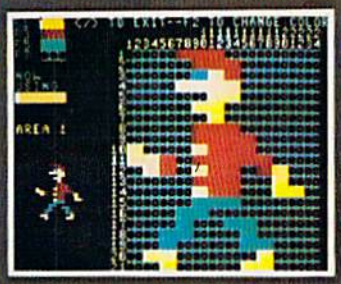
COMMODORE 64™ SOFTWARE

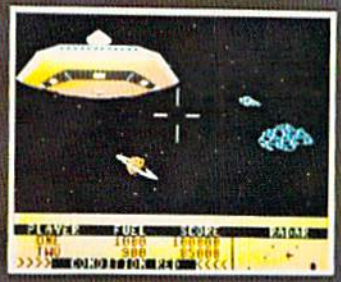
ACCESS











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printing with *Mini Jini* and how you can use *Mini Jini* files with compatible word processors.

Since *Mini Jini* has been constantly updated since it first entered the market, various versions exist—each with different features. To find out which version you have, hit the f5 key and the code number for your version will appear on the screen. Included with the software is a listing of the features unique to each version.

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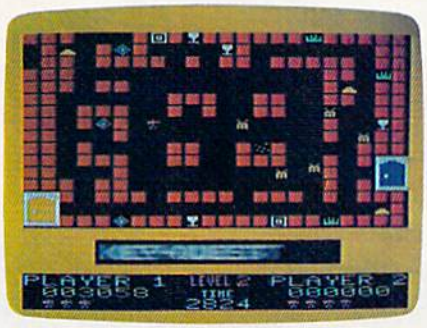
Key Quest For VIC-20

Tony Roberts, Assistant Managing Editor

Deftly mixed color, special effects, and pace provide the potion from which a well-worn idea can gather the strength to rise again.

Key Quest, a product of Micro-Ware Distributing is a maze game and a chase game. It has treasures and monsters and keys that unlock doors leading to mazes more difficult than those that went before.



In quest of treasure, your hero (left-center) prepares to defend himself against an approaching yellow Gorb.

But in its blend of common ingredients, Micro-Ware has endowed *Key Quest* with an uncommon visual appeal and a liquid-like play challenging enough for a broad range of game players.

A Rainbow Of Colors

From the start, *Key Quest* is a treat for the eyes. The title screen slides in from the right, the unconventional horizontal scrolling commanding immediate attention. (The effect is used throughout the program for level changes and to reset the board when the inevitable collision with a monster occurs.)

The walls of the maze are built of brick, rich and red, on a black background. The treasures—gold bars, sapphires, emerald crowns, and silver chalices—almost glow from their protected recesses in the maze walls. The player is represented by a figure clad in regal purple, and the monsters stand out in gold. The entire playfield and the scoreboard below it contrast against an orange-yellow background.

There's color everywhere, but it's neither blaring nor boring. It is well-blended and a pleasure to look at. *Key Quest*'s only visual blemish may be the large block-lettered title that continually floats back and forth in a box above the scoreboard.

The Scenario

Many years ago, a master wizard traveled the land collecting treasure wherever he found it. Below his fortress, he built a dungeon in which to protect his riches. To guard his wealth, he created the Gorbs—powerful monsters that regenerate very quickly. The Gorbs, however, proved to be too powerful for the wizard himself, and the first time he sought to examine his treasure, he was eliminated by his own sentries.

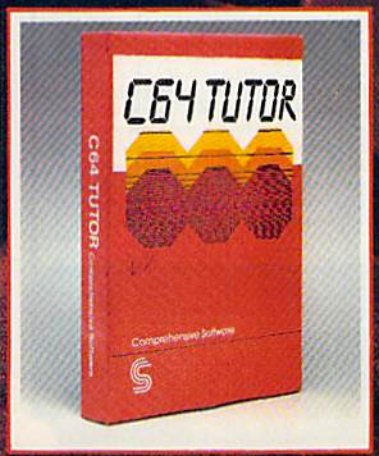
Upon the wizard's demise, the king of the land put out a call for adventurers to reclaim the riches that had been pillaged from the realm and its subjects. Plugging the game cartridge into your VIC-20 indicates your willingness to accept the challenge to restore the treasure. Armed with either a joystick or the keyboard, you delve into the underworld.

Hidden on each level of the dungeon is a key that opens the way to the next level. The key's location will be revealed to you once you have collected 12 of the treasures scattered about the maze. Once the key is visible, you must pick it up and make your way to the door. The Gorbs, which continuously emerge from the swirling cloud that marks their lair, serve to complicate the whole process.

Your Defense Is A Limited Offense

The fire button of your joystick will give you some help in fighting the Gorbs, but it is not universally effective. It fires only right or

BREATHE LIFE INTO YOUR C64



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left. If the Gorbs are above or below you, you'll have to run until you're in a more advantageous position.

Each of the treasures is hidden in an alcove along the walls of the dungeon. The master wizard, in a stroke of genius, protected these areas so the Gorbs would not disturb the treasure. In these nooks you'll find both safety and the most effective position from which to attack the monsters. A word of caution is in order here. If you point your joystick out of the alcove and fire, you begin moving in that direction and, in all probability, will be involved in a fatal collision with a Gorb.

Face into the alcove and fire, and you turn around and are able to defend your position without having to step into the hall. Shooting from an alcove gives you your best advantage against the Gorbs because your shots either hit a Gorb or a wall very quickly, giving you another shot. If you take aim at a Gorb that is down a long hallway, you have to wait until your bullet is spent before you're able to fire again.

The Gorbs are dangerous creatures. Touching one is always fatal, and a near miss is often just as tragic. In some cases, nothing happens if you briefly occupy a space adjacent to a Gorb, but at other times, the Gorb seems to fire a weapon of its own at you.

For safety, give the monsters a wide berth. The crafty Gorbs make a habit of hiding behind each other, disguising their numbers. Be watchful or you'll walk right into a Gorb you didn't realize was there.

At times, your best strategy is to stay hidden in an alcove for a while and shoot as many Gorbs as possible. This will give you a little maneuvering room when you return to treasure hunting.

Building Your Score

High point totals are based on how quickly you discover the hidden keys and move on to new levels of the dungeon.

You pick up points as you pick up treasure. Each of the four treasures has a value ranging from 25 to 100, and each Gorb you shoot is worth 50 points. It's not worth the effort to try to pick up 100-point gold bars as opposed to 25-point emerald crowns. Your best score comes as you accomplish your mission with time left on the clock.

As you enter each level, a time clock begins ticking backwards from 3000. When you leave a level, 100 points will be added to your score for each 100 units left on the clock.

Key Quest has four screens, and after you make your way through those the first time, the screens repeat, but with more and faster Gorbs in your way. A secret passage on each screen allows your player to be transported to the opposite side of the screen. Be certain the exit isn't surrounded by Gorbs.

Key Quest is an exciting and alluring game. It allows the player to develop patterns, but it doesn't become routine because there's more than one path to success. The game plays well and takes your joystick through a comprehensive workout.

Key Quest
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Budget Planner

Charles B. Silbergleith

This home budget program allows you to keep track of various household expenses and calculate totals quickly and easily. The same program works on either a Commodore 64 or VIC-20 (at least 8K memory expansion required).

In the dark days prior to automation, I would plan my budget by writing all my month's expenses on a sheet of paper, adding items, and adjusting amounts as I received a bill.

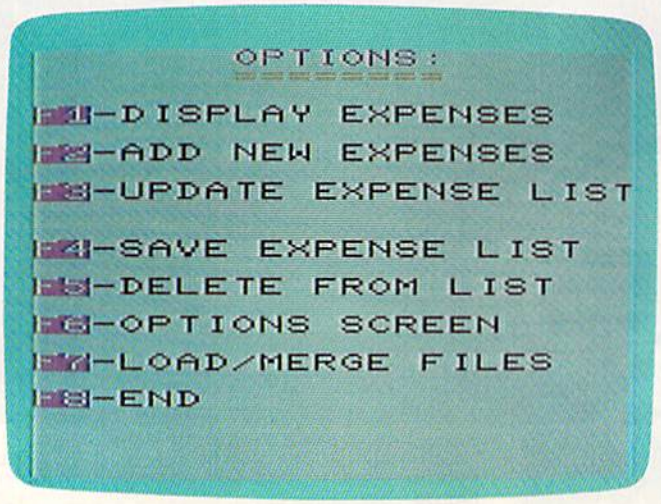
This process worked very well except for the number of revisions necessary for revolving credit accounts such as credit cards. Every time one of the item amounts changed, the grand total changed and needed to be recalculated. That was messy.

I decided to write a program which allowed me to make a list of my monthly expenses, to change amounts, and which provided a grand total of all items. I also wanted the program to save this list to tape and recall it.

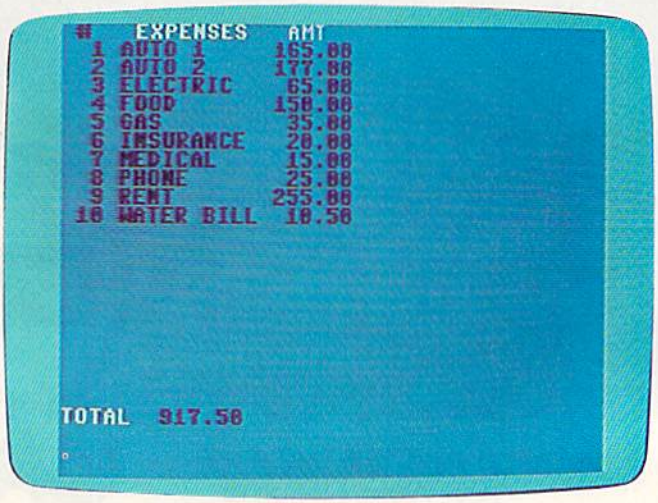
What was produced was a program that allowed me to maintain a list of expense items, add new items, change amounts, delete items, and it would quickly sort and sum all the amounts. This was useful in seeing whether new expenses could be incurred (could I really afford that new disk drive or not?), or whether bill consolidation would help.

Program Operation

First here are some basic characteristics of the program before I discuss how to use it. The list allows



The main menu in "Budget Planner" (VIC version).



A typical expense list made with "Budget Planner" (64 version).

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for entries of ten characters (maximum) per item and amounts of up to 9999.99. The list will be sorted, a total calculated over all item amounts, and the options menu displayed at the end of an add, update, or delete modification to the list. The sort is done by item name. You will be repeatedly prompted for the next add, update, or delete to the list until you type *END to one of the prompts for input. In fact, any function will terminate whenever you respond with an *END to a prompt.

Since the program was written for a VIC-20 (and converted for the Commodore 64 also), it uses the special function keys f1 through f8. Described below are the functions:

f1 **Display Expense List.** This function displays the list and a total of all item amounts at the bottom of the screen. Pressing f1 will display the next 20 items, and the cursor up and down keys scroll the list vertically. All function keys are available.

f2 **Add New Expense To The List.** This allows you to add a new item to the list. The program will not check for duplicates. However, it's simple enough to change or delete an item if you mistakenly duplicate one. Names are up to ten characters, and amounts should not be larger than + or − 9999.99. These restrictions are used to prevent the screen display from overlapping, wrapping around, or otherwise messing up on the 22-column VIC. Type *END to return to the menu screen.

f3 **Expense List Update.** The screen lists a number next to each item. This number is the item's index. Use this number for the ITEM # prompt. The item will be displayed and a new name or amount may be entered replacing the old data. Pressing the RETURN key without data when prompted for an ITEM NAME or AMT will leave the current data intact. Again, type *END to return to the menu.

f4 **Save The List On Tape.** The program asks for a FILE NAME. This should be any name that follows normal Commodore file naming conventions. This is the filename SAVEd on tape. Remember it.

f5 **Delete Items From The List.** The START AT and END AT prompts allow a block of items to be deleted by putting the starting and ending index numbers in the appropriate places. Leaving out the ending index will delete only the starting index number's item. Type *END when prompted for the starting index number to return to the main menu.

f6 **Display The Option Menu.** Function keys and their associated functions are displayed. See program lines 6030-6100 for details.

f7 **Load Or Merge A List.** A previously saved list can be loaded into memory or a list on tape can be merged with a list in memory. For the merge, an item on tape is compared to the items in memory, and if the item names match, their amounts are averaged together and replace the previous amount. If the item doesn't match, the item is added to the list.

f8 **End Of Program.** This function allows you to first save the list before actually ending the program—handy if you've forgotten to save the list before.

Technical Notes

The program is written using the modular concept of structured programming. This means that the program is written in order to isolate its various tasks. Common routines are separate from the routines that use them and are accessed by GOSUB statements.

The main routine (lines 200-299) calls various subfunctions at the user's request. A request to display the list (f1) calls a subroutine at lines 1000-1999; update (f3) calls lines 3000-3999, etc. Notice that each function key corresponds to a range of 1000 line numbers—f1 is lines 1000-1999; f2 is lines 2000-2999; f3 is lines 3000-3999, etc. This makes it easier to remember where things are in the program.

In addition, two utilities are included as separate modules for use by any function. These are the bubble sort, lines 500-599, and an accumulator, lines 300-399.

GOTO statements are kept to a minimum and are used only for branching within subroutines. While certain advocates of structured programming insist on GOTO-less code, I find it sometimes more cumbersome to eliminate all of them than to use a few. Again, the word to remember is *few*.

One last note. The variable SZ (line 20) controls the number of items that can be listed. Naturally, the more items on the list, the more memory is required. Since the computer will consume more memory as needed when the program runs, it is possible to make this variable too large and run out of room while working with the program. As an exercise, I suggest you add a function which will display the amount of memory left. Use the ? key to invoke it. I think you'll find it fairly easy to do given the way the program is organized.

See program listing on page 220.

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The Note Name Game

Jeff Behrens

"The Note Name Game" is an educational program which makes learning the notes of the musical scale easy and fun. Originally written for the unexpanded VIC-20, we've added a version for the Commodore 64.

Musical notation is like anything else—it's easy once you learn it, but learning it is not always easy.

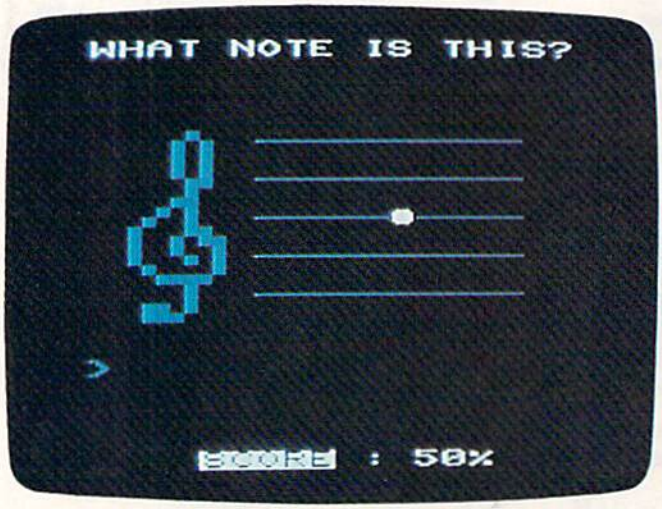
Sight-reading of notes is vital for anyone who wants to play a musical instrument, because instant note recognition is a must. That's the idea behind "The Note Name Game." My daughters, who are taking piano lessons, love playing it. Although it does not teach everything about musical notation, it does allow students to practice quick recognition of notes in the treble and bass clefs.

Treble Or Bass?

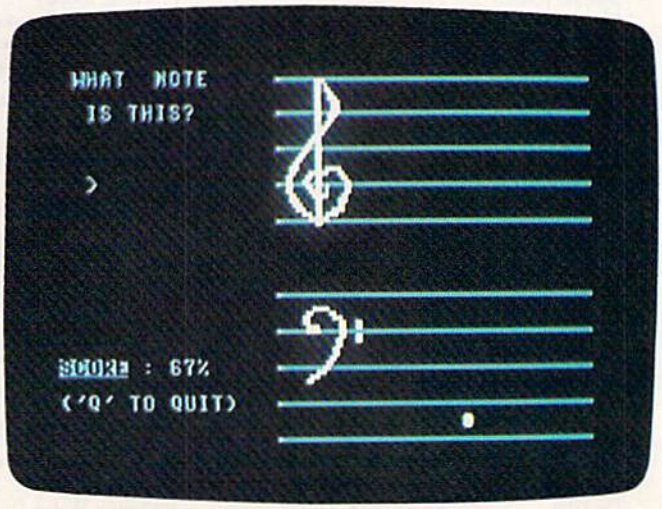
The program begins by asking whether you want to practice notes on the treble clef (enter a T), the bass clef (B), or a mixture of both (M). The program then selects a note at random and places it on the appropriate clef.

Next, the program asks for the letter name of the note displayed. If your response is correct, you are told so, and the next note is displayed. If your response is wrong, the correct answer is highlighted on the screen and the next note is shown. The program constantly updates your score and displays it on the screen.

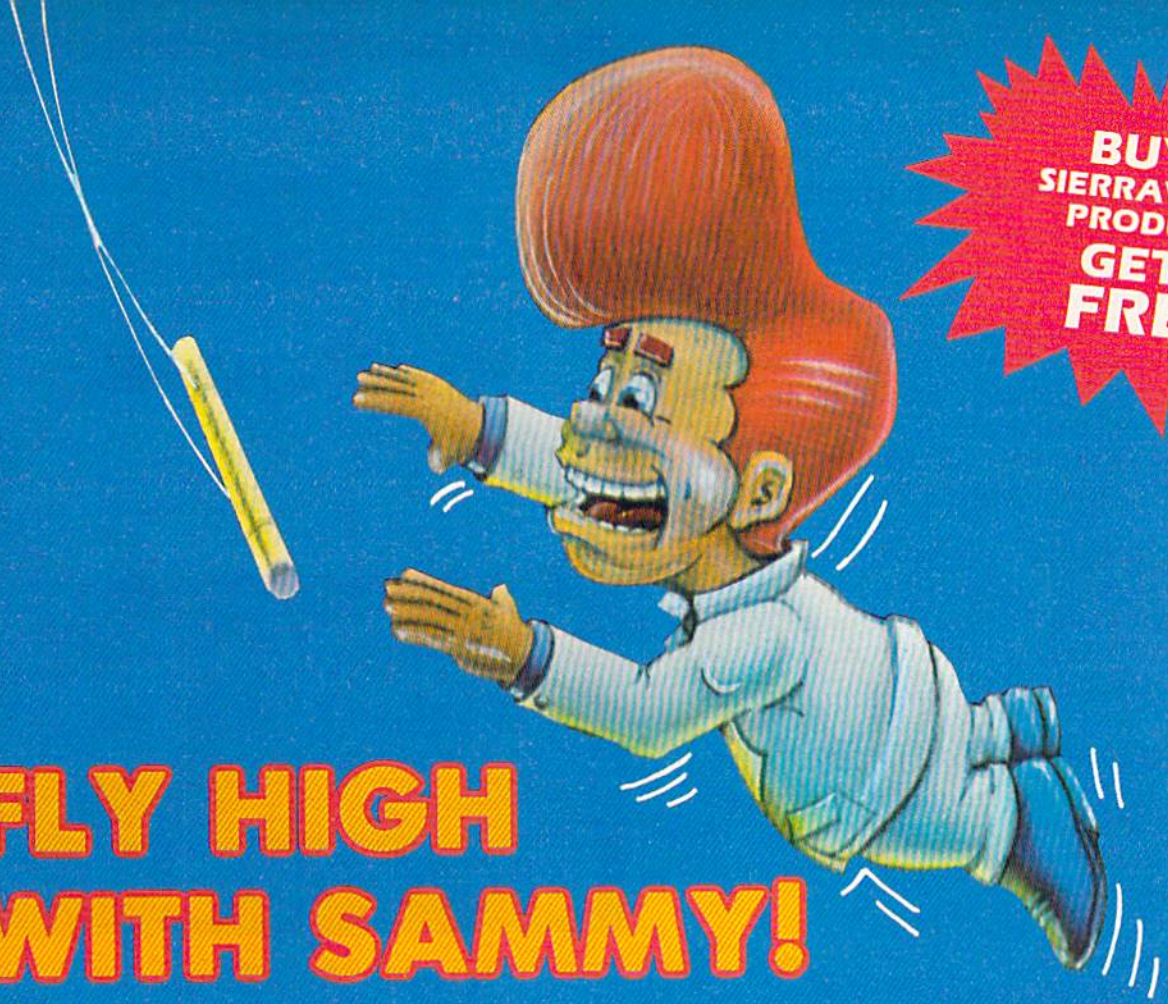
Notes are shown in sets of ten. If you wish to quit before finishing a set, type Q instead of the



Learning to recognize treble clef notes with "The Note Name Game," VIC-20 version.



A bass clef note in the Commodore 64 version of "The Note Name Game."



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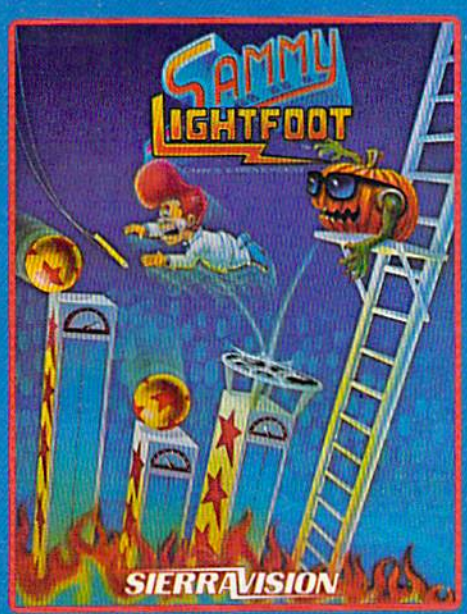

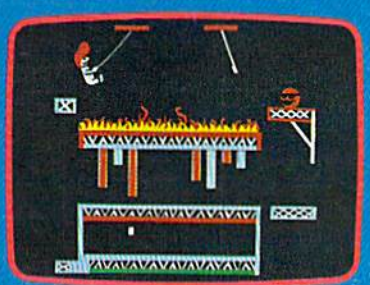

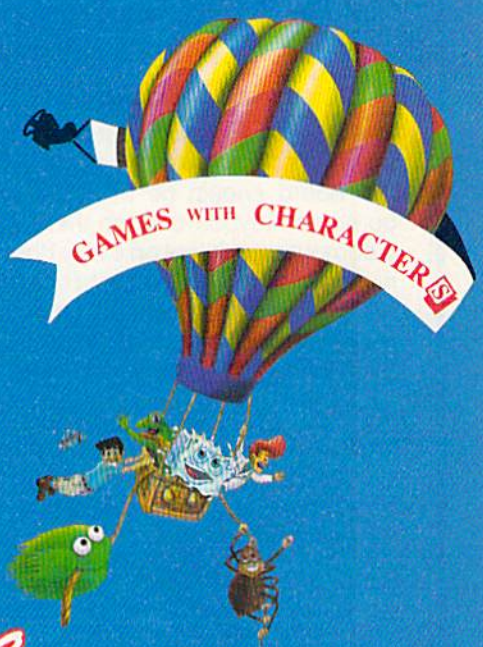

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answer. Whether you finish or not, the score is printed and you are asked if you want to play again.

Customizing The Program

Depending on personal preference, there are some changes you might want to make. With the VIC-20, I find the TV picture is sharpest when the screen and border are black and the cursor blue. You may, of course, specify any screen/border combination by substituting the appropriate number for the 8 in the POKE statement on line 25 of the VIC version (see your manual for possible combinations). Similar modifications are just as easy with the Commodore 64 version.

The variables R and W, respectively, are the number of right and wrong answers and are initialized to zero on line 5. The string variable N$(1,25) is a string array containing the note names and the POKE values for the sound registers.

Tape Copies — VIC Only

If you don't want to type the program, I'll make a copy of the VIC version for you. Please send a blank cassette, a self-addressed stamped mailer, and $3 to:

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See program listings on page 238.

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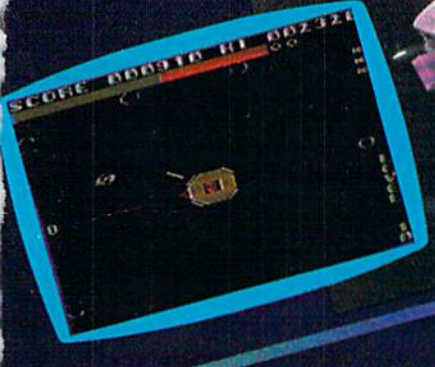

Calling all future fighter pilots. Captain Fargo needs you! If you can defend your ship against the attack of enemy star-cruisers, control of the sky is yours. But beware! Creatures of the night will come at you from all sides . . . firing at you with light missles and white-heat vapor rays. You can take only a few hits or you'll be destroyed. Only a steady eye and rapid-fire reactions can save you and your ship. The challenge is yours. Defeat is agony.

Created by Alan Pavlish

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FRED D'IGNAZIO,
ASSOCIATE EDITOR

Your Wish Is My Command

What can a personal computer do? Nothing—unless you give it orders. The computer may have millions of transistors and be as swift as a bolt of lightning. But it is nothing more than a servant. And you are its king or queen. Like a good king or queen, you want to put your servant to work. But how do you give it orders?

The first computers understood only two numbers—ones and zeros. The ones and zeros that humans fed the old computers represented the pulses of electricity that whizzed through the computers. The ones represented the big

An artist taught a large computer to draw this picture of the space shuttle blasting off. (Courtesy Digital Graphics Systems.)

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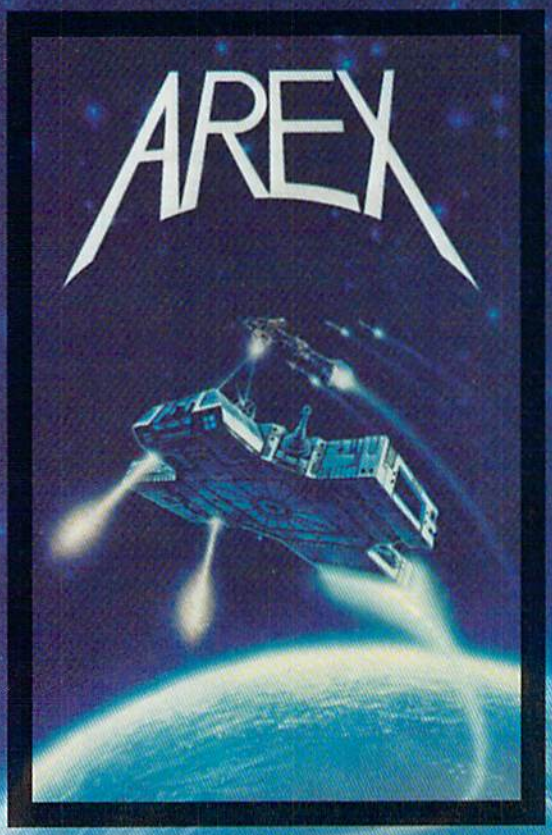

by William Muk
CoCo version by Roger Schrag
Apple version by Gordon Eastman
Atari and Commodore 64 version by John Anderson

Far beyond the known galaxies, you venture deep into the vast reaches of outer space. But you are not alone! In a flash, without so much as a how-do-ya-do, they're in hot pursuit and you're left to do before you're done unto. **Can** you elude your pursuers? **Will** you elude your pursuers? And who ***are*** these guys anyway? Find the answers to these and other compelling questions in AREX. See your dealer today!

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TRS-80 version by Dave Simmons
CoCo version by Roger Schrag

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"I think I'm on to something profitable here." Hartley J. Wormsflather III

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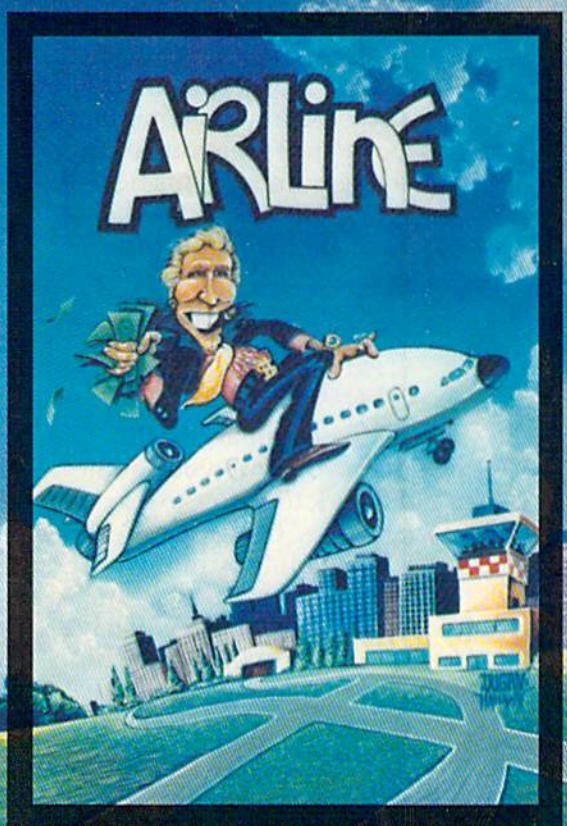

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pulses. The zeros represented the little pulses. Dozens of ones and zeros, strung together like pearls on a necklace, represented only a single computer command — like ADD 1 PLUS 1.

Today's personal computers can almost understand English. You feed them commands by pressing buttons on a keyboard wired to a chip. If you took off the top of the keyboard you would see dozens of little chips inside. The chips might be lined up on green plastic cards the size of graham crackers, or hidden inside black plastic cartridges.

Let's say you type the command PRINT "HI" into the computer. First, the computer translates your command into tiny pulses of electricity. Next, it obeys the command. Then it translates the answer back into English and prints it out on the TV screen. "HI" says the computer.

Writing Simple Programs

Now let's imagine that you want to do your math homework on a computer. As part of your homework, you have to multiply pairs of numbers. Your computer is great at multiplication. But you have to teach it how. You have to give it orders.

You think about what you want the computer to do. First, you want it to accept two numbers. Then you want it to multiply those two numbers. Last, you want it to print the answer so you can use it in your homework.

You sit down at the computer keyboard. You have to teach the computer with a language the computer understands. Your computer talks BASIC, like most other small computers.

You type in your commands one at a time. You make sure that you begin each command with a line number. This helps the computer keep the commands separate when it obeys them.

Here are the commands:

```
10 INPUT N1
20 INPUT N2
30 LET ANSWER = N1*N2
40 PRINT "THE ANSWER IS ";ANSWER
50 GOTO 10
```

All the commands work together to do one job—help you with your homework. When commands work together to do one job they have a special name. They are called a *program*.

When you type in the program, it is stored in the computer's memory chip. To get the computer to obey your program, you have to get the memory chip to send it to the brain chip. To do that is simple. You just type RUN.

When you type RUN, the computer obeys the commands very quickly, but only one command at a time.

First, it obeys the command on line 10. The command on line 10 tells the computer to print a question mark on the TV screen and accept any number you type on the keyboard. Let's say you type 47. The computer stores the 47 in a little memory cubbyhole you've called N1.

Second, the computer obeys the command on line 20. This is just like the command on line 10. Except now you have the computer accept a number and put it into a cubbyhole you've called N2. You type in 82. The computer puts the 82 into the cubbyhole called N2.

Third, the computer obeys the command on line 30. Line 30 is where the computer performs its multiplication. The "times" sign in the computer's language looks like an asterisk (*). The computer takes the first number (the one stored in N1) and the second number (stored in N2) and multiplies them together.

Brandon Rigney programs his home computer to solve complicated problems like how many light bulbs should be installed in an office building. Sometimes Brandon turns his computer on before going to school, and the computer is still solving the problem when Brandon goes to bed that night. (Courtesy Brandon Rigney III.)

Now the computer has an answer. Where does the computer put the answer? You guessed it: into the memory cubbyhole you've called ANSWER.

Next, the computer obeys line 40 and prints the answer on the TV screen. It looks like this:

```
THE ANSWER IS 3854
```

What does the computer do next? It looks at line 50. Line 50 tells the computer to "go to" line 10. The computer jumps back to line 10 in your program and asks you for two new numbers. You type in the numbers. It multiplies the numbers together, then prints the answer.

Then what does the computer do? It looks at line 50 and jumps back to line 10 and asks you for *two more numbers*. It will keep multiplying two

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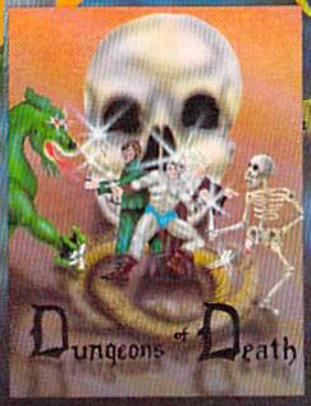

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Quest is also available on TRS-80C as a 32K extra memory, extra fun adventure. It's a little more difficult, and will test the most experienced explorer of the kingdom.

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numbers for you forever—unless you turn it off or pull out its plug. Or else you can type NEW. The NEW command erases all the old commands in the computer's memory. Then you can feed the computer a new program and teach it something new.

Teach The Computer Anything

Our little program reveals lots of secrets about the computer. Now you know what some of the computer's commands look like. You see how you can combine the commands into a program to make the computer do some work for you. You see how the computer can do the same work over and over without ever getting tired or making mistakes. And you see that you can keep teaching the computer new programs.

What kinds of new programs?

Anything you want. There is no limit to what you can teach the computer. What would you like to teach the computer? What can you imagine?

Kids have taught computers to do all sorts of things. A boy I know named Larry teaches computers to play games. A girl named Claudia loves music, so she teaches her computer to play the songs she hears on the radio.

You can program the computer to teach you the alphabet, quiz you about the presidents of the United States, give you a spelling bee, or draw pictures of triangles and circles on the TV screen.

You can teach the computer to act like a simple calculator and spit out numbers. Or you can teach it to imitate other machines.

The computer is a great pretender! For example, some computers have been taught how to act like airplanes. The computer pretends it is an airplane, and you pretend that you are the pilot. To fly the "plane" you push buttons on its keyboard. The TV screen is the cockpit window.

Or you can teach the computer to do biology experiments and breed hundreds of honeybees. The computer speeds up the bees' lifetimes until they live just a few seconds. You get to see how the bee parents' colors, shapes, and abilities are passed on to their children. And their children's children.

Or you can play mad scientist and teach the computer to pretend it is your laboratory. You can conduct experiments with different chemicals. But, watch out! If you mix the wrong chemicals together, your "lab" might blow up. The computer might flash an explosion on the TV screen. From the TV speakers might come a loud "BOOM!".

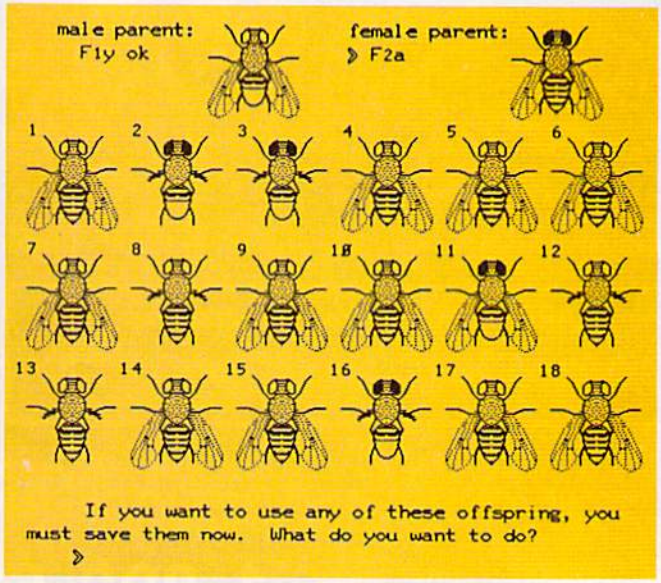
But all is not lost. It's all just pretend. The computer is ready for more. On the TV screen it types: WHAT EXPERIMENT SHOULD WE TRY NEXT?

Personal computers are good at experiments. But they can do a lot more, too. You can teach them to play games such as tic-tac-toe, checkers, backgammon, and chess.

Claudia Napfel and her father built one of the first home computers. Claudia uses the computer to do her homework and to play music. (Photo by Charlotte Knadle/courtesy Claudia Napfel.)

Or you can teach them to take you on an adventure game to a make-believe faraway planet. There are fabulous treasures on the planet. But the treasures are guarded by a fierce dragon. To win the treasures you must fight the dragon. The computer plays the part of the dragon. One warning: Computer dragons can be very, very tricky.

Or, if you are tired of playing games, why not teach the computer to draw pictures? Computers can draw pictures in all the colors of the rainbow. And the pictures move — just like in cartoons!



Would you like to become a famous bee breeder? This computer program lets you pretend you are breeding honeybees. (Courtesy PLATO Project, University of Illinois and Control Data Corporation.)

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An adventure in the Old West. Journey back with us into the days of Jessie James and Billy the Kid where the only form of justice was a loaded revolver and a hangman's noose.

In this full-length text adventure, you play the role of Bounty Hunter, battling against ruthless outlaws, hostile Indians, wild animals and the elements of the wilderness with only your wits and your six gun. Average solving time: 20-30 hours. If you love adventures, this one is a real treat.
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Don't let the bullies catch you as you gobble the goodies! This program has 8 screens and still fits in the standard memory.

Available for COMMODORE 64 and VIC-20. Played with JOYSTICK or KEYBOARD.

Illustrations: Elizabeth Hauck

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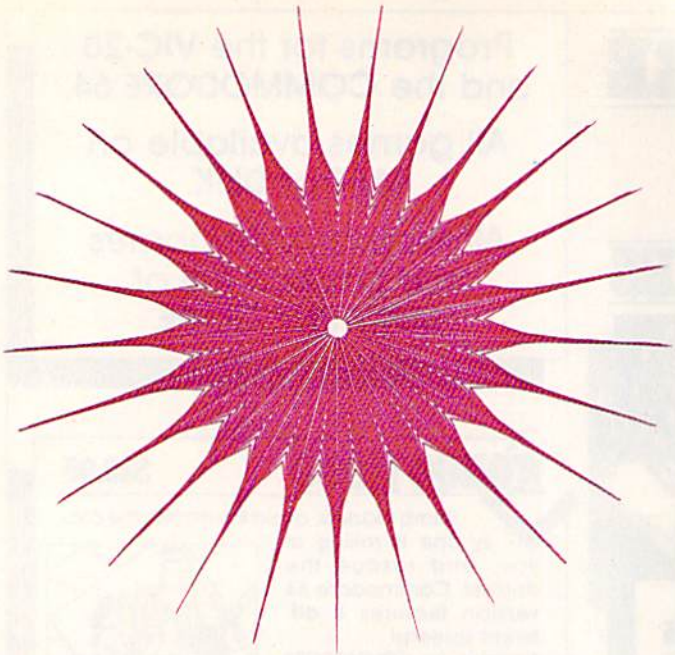

This figure was drawn by a computer with a printer/plotter, following a program by the artist. (Courtesy of computer artist Joe Jacobson/idea by Christian Huebler.)

Kids are teaching computers to draw pictures of zooming race cars, running horses, and pictures of spaceships blasting off from the earth. What would you like your computer to do?

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We sell over fifty types of joysticks but this is the most unusual. All of your OLD games become a new challenge when you use your whole body to play! Yes, your entire body is at the controls — you lean and tilt in 8 possible directions to glide, dive and zoom through the universe of computer games. Heavy duty for up to 250 lbs and the special base allows use on virtually all surfaces.

The joyboard will work on any Commodore or Atari computer. There is a FREE cartridge for VIC-20 or Atari computer owners.

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One of the most popular arcade games ever created for the home computer. In the lair of the Shadow you go through each roomful of Robo-Droids, Whirling Drones and Snap-Jumpers. Intensive arcade action meant only for the experienced joysticker.

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Q*BERT

Official Arcade Version by Parker

All the action and excitement of the popular arcade game as Q*BERT hops up and down on the cubes of the pyramid changing colors as he lands. Color all the cubes and he moves to a new — and more difficult pyramid. But cagey creatures want to stop him from his fanciful mission so the one or two players will have some fast hopping to do!

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from Sierra On-Line

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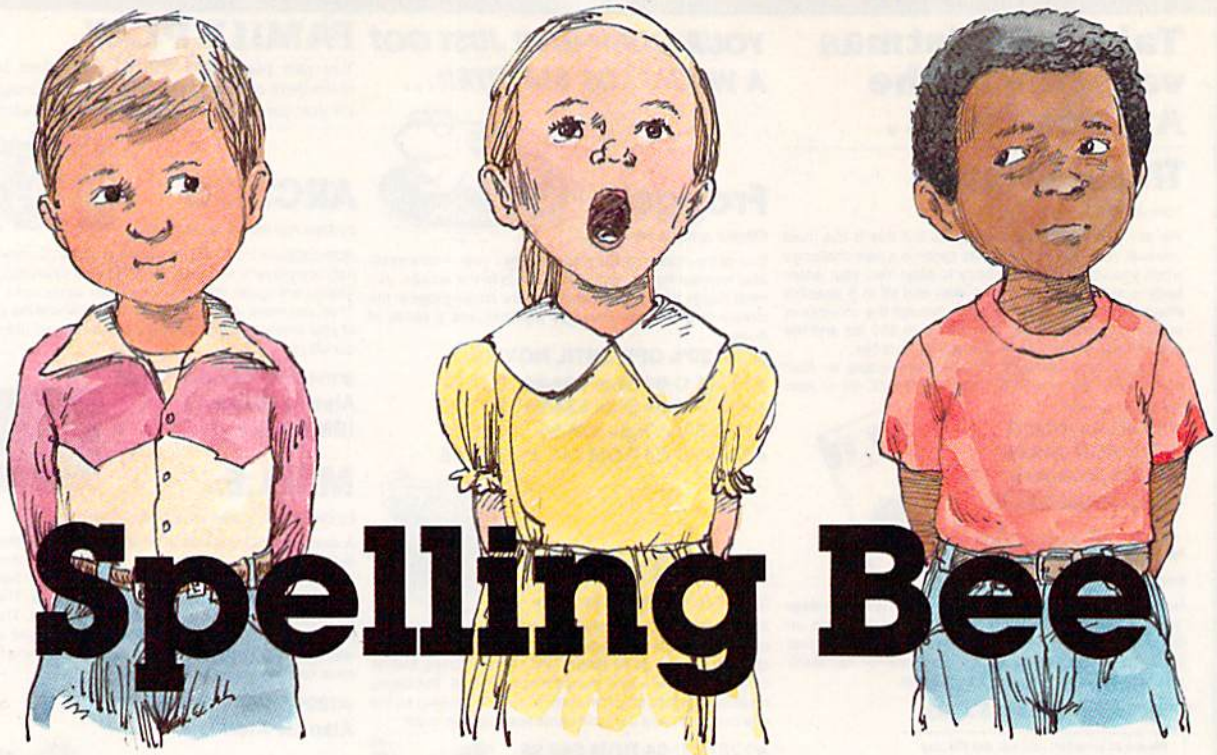


Spelling Bee

Harry Blair

Daniel Bonachea

"Spelling Bee" is an educational spelling game for the Commodore 64 and VIC-20. It requires a joystick and at least 8K of memory expansion on the VIC.

Remember using flash cards in spelling? The teacher flipped the card, let you glance at the word, and asked you to spell it correctly. It happened so quickly, the word appearing for only a moment or two. But it was good practice. You had to concentrate and think quickly. More importantly, you had to imagine the word in your mind, trying to visualize its letters as you spelled it aloud.

"Spelling Bee" is a game for the VIC-20 and Commodore 64 which handles the flash cards just as that teacher did long ago. A practice game for young children, it makes spelling entertaining while it educates. And because it uses a joystick instead of the keyboard, it eliminates some of the fear young children may have of typing in answers.

How To Use Spelling Bee

The program is easy to set up and play. After entering and saving the program, plug a joystick into port 2 (into the single port of the VIC) and type RUN. You can read the directions to younger children and let older children follow the directions themselves.

The computer will ask for your child's name; except for prompts in the instructions, this is the only time the keyboard is used. Throughout the rest of the game your child's name appears each time a message is displayed. Most children will delight in seeing their name shown on the screen. It's almost like a teacher talking to them!

Several screen displays appear, one after the other, with the instructions. Finally, the level of difficulty is set by entering 1 for easy words, 2 for medium-level words, or 3 for harder words. Choose the level you think best for your child's skills.

As soon as the skill level is chosen, a word appears on the screen. It will show for only two seconds, much like a teacher's flash card, and then it is replaced by a row of symbols and letters near the bottom of the screen. You'll see a pointer beneath these characters.

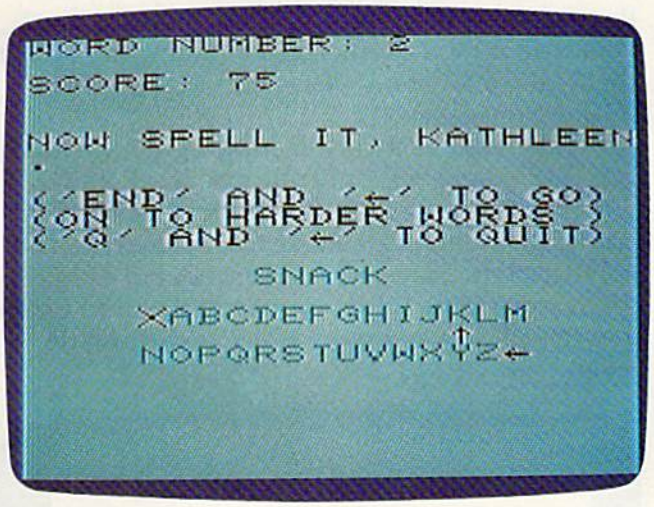
To spell a word, move the joystick left or right until it is directly under the letter you want. Pressing the fire button moves the letter above the alphabet row. It's important that you choose the letters in the right order, just as when you spell a word yourself. If you're satisfied with the spelling, move the joystick so that it's beneath the back-arrow symbol at the far right of the row. This enters your spelling, and the computer tells you whether it's correct or incorrect. To begin spelling the same word again (perhaps you changed your mind), just move the arrow under the red X at the

Variables Used In Spelling Bee

L$(L) = WORD TO BE SPELLED
NA$ = NAME OF PLAYER
S = SCORE
N = MISTAKE COUNTER
D$ = PLAYER'S SPELLING OF WORD
R = REVERSE FLASH REPETITION
SC = SCREEN LOCATION OF ALPHABET
CO = SCREEN COLOR OF LETTERS
CN = SCREEN CODE OF LETTERS
S1 = POSITION OF POINTER ON SCREEN
C1 = COLOR OF POINTER
B$ = EACH LETTER INPUT BY STUDENT
JV = VALUE READ FROM JOYSTICK
FR = FIRE BUTTON VALUE

other end of the row and press the fire button. The computer won't give you a second look at the word, though.

If a word is misspelled three times, the computer spells it correctly, flashes it several times,

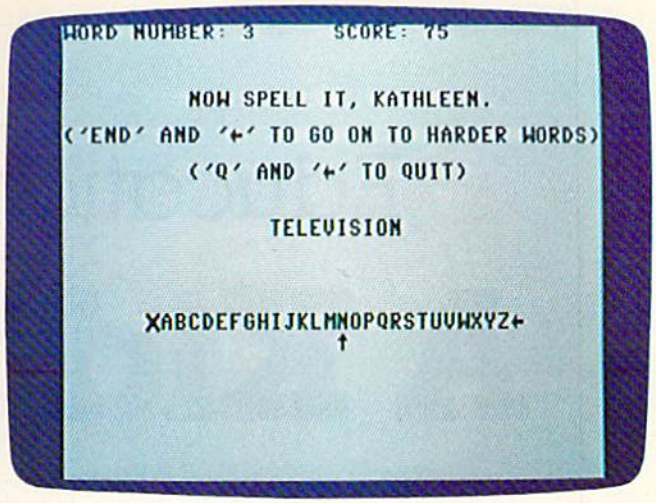


Spelling a medium-level word in the VIC version of "Spelling Bee."

and shows you the next word. The score is always displayed on the screen, and one point is subtracted for each word missed. A perfect score for a round is 75, the number you begin with.

You can quit the game at any time by entering Q with the joystick. If the present level is too easy, typing END lets you choose another level of words.

Moving the arrow with the joystick was easier for my daughter than typing on the keyboard. She was eager to spell the words when she could pick the letters herself, making them appear sud-



Spelling a hard-level word in the 64 version of "Spelling Bee."

denly as she pressed the fire button. It became more of a game to her, and she played it longer.

A Word To Programmers

There are a number of program alterations you can make. If you want to shorten the time the word is flashed on the screen, you can change the delay in line 1180. Altering it to FORY = 1 TO 500, for example, makes the words show for only a half-second.

I slowed down the joystick routine because my five-year-old daughter found it hard to stop the arrow on the correct letter. Older children may be able to handle a more responsive joystick. You can eliminate these delays by removing the FORT = 1 to 25:NEXT T in both lines 1500 and 1510.

New words can be inserted in the DATA statements in lines 230-300, as long as there is always a total of 75 words (25 in each level). This will be something you'll want to do once your child has played the game a number of times and mastered the existing words.

See program listings on page 224.

Educational Games:

A Kid's View

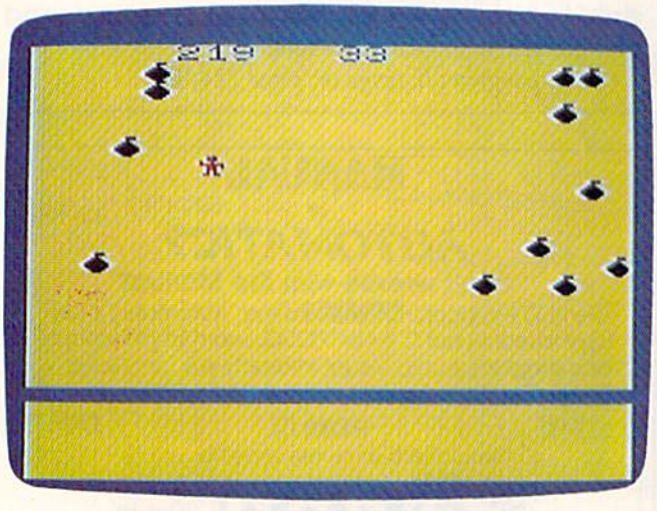
Kevin Dewey

Here's a kid's-eye view of educational computer games—what they should do, how they should teach, and why they should entertain. The writer concludes his article by presenting "BLAM!," a game for the unexpanded VIC-20 that demonstrates his concepts. We've added a version for the Commodore 64. A joystick is required.

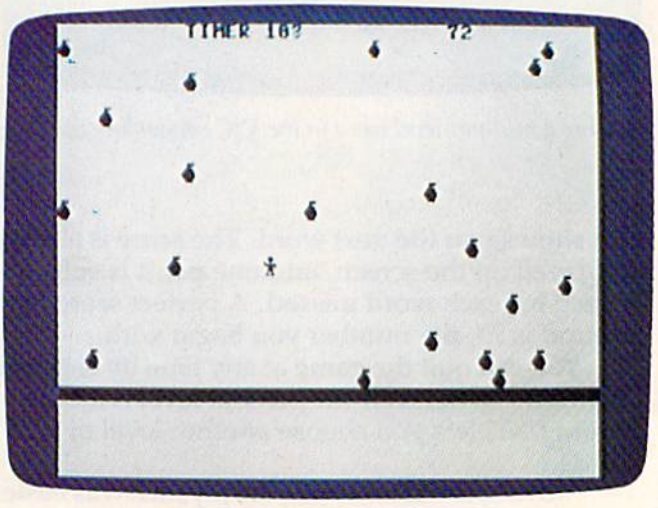
Have you ever tried to write an educational game? If you have, chances are you found it pretty hard. Sure, it's easy to make a simple addition and subtraction program, but education doesn't stop there.

There are many other areas to cover. I know. I'm only 12 and in the seventh grade. We have computers in our school and a variety of educational games. But, unfortunately, some of the games aren't too good. The main flaw that I see in them (and a lot of my classmates agree) is that they are too easy.

Take, for instance, a math program we had last year. There was only one skill level, and it was just basic multiplication with zeros on the end of the numbers to make it seem harder. The game itself had a very good concept but didn't teach you a thing (unless you're in the third grade, and the game was supposed to be sixth-grade level).



Defusing bombs to solve subtraction problems in a game of "Blam!" (VIC-20 version).



The player is surrounded by ticking bombs in "Blam!" (Commodore 64 version).

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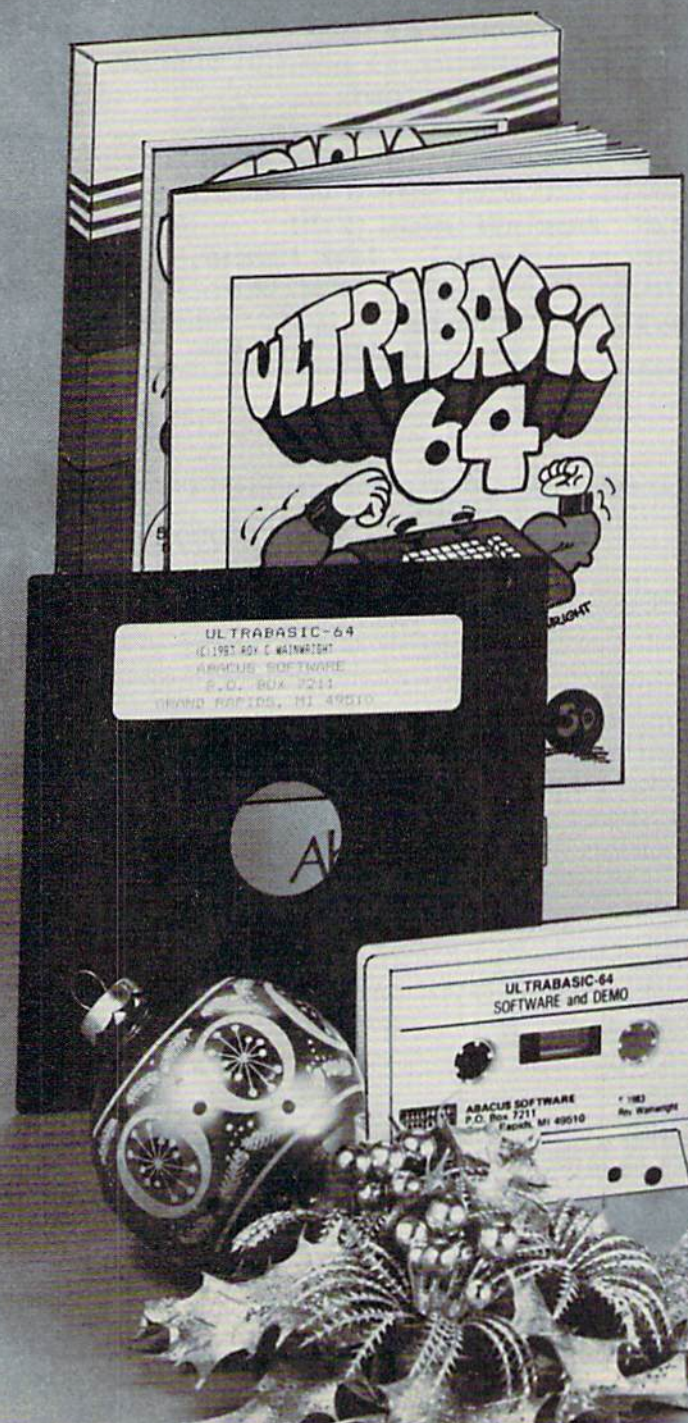

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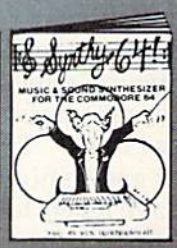

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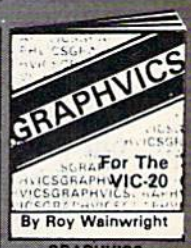

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Educational Guidelines

Now, if that is what comes from experts, how are ordinary people supposed to write good educational games? Programmers should keep in mind the following things:

1. You should make your game one that teaches someone something. After you've thought of your idea, ask yourself, "Is this *truly* educational or just a near miss?" This will help very much.

2. Your game should have varying skill levels. It should have levels to challenge the slowest to the fastest student.

3. Use good graphics so your game will be appealing to look at.

4. Have good sound effects. It is good for the player to get a rewarding sound or song if he or she is correct.

5. Most of all, make your game interesting and fun. How many kids want to sit and play a boring game, no matter how educational it is? Not very many. It is good, in some cases, to make your game half-arcade and half-education.

Those are five basic steps in making educational games. Try to follow them when writing one.

Now, here is a game I have made. I call it "BLAM!" It is educational and fun, and I hope you enjoy it.

Game Description

BLAM! is a half-arcade and half-educational game. You must maneuver your player around a building filled with bombs, while trying to disarm all the explosives. You move your player with the joystick and, once you've run into a bomb, disarm it with the keyboard.

You disarm bombs as follows: there is a number at the top of the screen next to the time clock. When you run into a bomb, another number appears at the bottom of the screen (under the blue line). You subtract this number from the one at the top and type your answer. If you are correct, the bomb disappears and you have one less bomb to disconnect. But if you subtract wrong, the bomb explodes! You can survive the explosions, but after three, the whole place falls apart. When you give a wrong answer, the computer also prints the correct answer at the top of the screen.

You get only five minutes to clear each story of bombs, because they are time bombs. When you clear a story, you go on to the next (which has ten more bombs than the one before). There are six stories in the building and, if you clear them all, you win the game.

There are also variable skill levels. At the beginning of the game, you choose a skill level from 1 to 100. Skill level one uses only numbers through 100, level two uses numbers through 200, and so on. Only very, very smart people should play on level 100.

Ways To Change BLAM!

You can raise the possible skill levels by changing the 100s in lines 5 and 6. You can vary the number of stories in the building by changing the 70 in line 131 to the number of stories you want multiplied by ten, plus ten. For example, to make a four-story building, change the 70 to 50.

See program listings on page 231.

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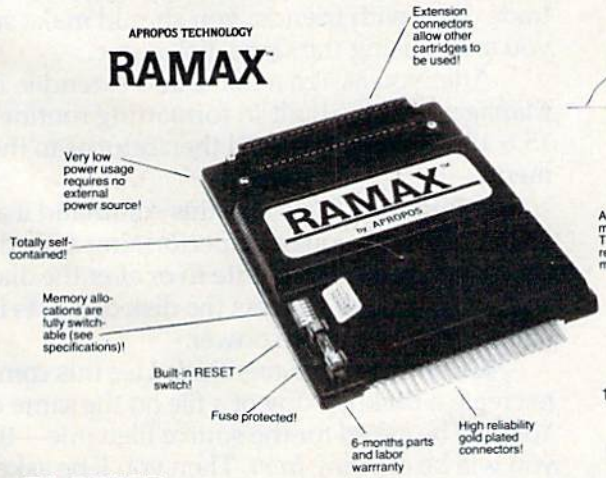

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Disk File Manager

Philip Dale

"Disk Manager" works on both the Commodore 64 and expanded VIC-20. At least 8K memory expansion is recommended for the VIC—the more memory, the larger files you can copy.

Its own microprocessor, 2K RAM, and 170K disk format make the Commodore 1541 disk drive unusually flexible and economical. However, the 1541 has a number of limitations.

First, it's awkward to use, especially in direct mode, since it takes several statements for basic disk operations such as formatting, reading the error channel, and renaming and erasing files.

Second, some useful and needed functions have not been included. For instance, there's no built-in routine to copy a file from one disk to another. The COPY command can be used only to create a duplicate file on the same disk.

"Disk Manager" provides an easy-to-use, menu-driven system for managing program and data files on disk. You can select any of the basic disk commands just by typing in the operation number from the menu. In addition, three new functions are provided. The first copies any file (program, sequential, or random) from one disk to another disk. The second copies the DOS wedge program(s)onto a new disk in a single pass. And the third writes a copy of Disk Manager onto a new disk for backup.

Disk Manager Commands

To use any of the Disk Manager commands, just enter the number of the function you want and press RETURN.

1. Disk Directory. This function reads the directory without overwriting the BASIC program. If you want your own program to read the directory, you can use the techniques in the routine from lines 250 to 284. Press RETURN to get back to the menu.

2. Format New Disk. Your computer can't do anything with a new disk straight out of the box. First the disk has to be set up in a format that the 1541 can read. Part of formatting is naming the disk. This routine asks you for the name and name extender you want the disk to have. You should never give two disks the same name, and if you trade disks with friends, you should make sure that you aren't using the same disk name.

After you assign a name and extender, Disk Manager calls the built-in formatting routine (OPEN 15,8,15, "disk name") and then returns to the menu.

3. Initialize Disk. Use this command if a disk error is keeping you from performing a needed operation. It does not write to or alter the disk in any way. Instead, it resets the disk drive, as if you had just turned on the power.

4. Copy File on Same Disk. Use this command to create a backup copy of a file on the same disk. You will be asked for the source filename—the file you will be copying *from*. Then you'll be asked for the object filename—the name you want to give the new copy.

If the disk light is flashing when this function ends, the copy was unsuccessful. Use Command 11, *Error Status,* to find out why. The most common error is asking for a source file that doesn't exist. It's a good idea to write down filenames, so you don't forget you named the file "SOUNDS" instead of

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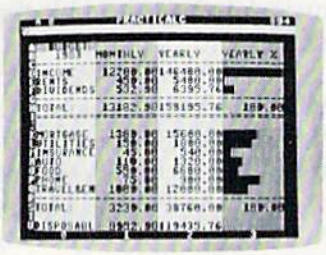

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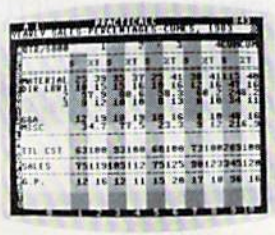

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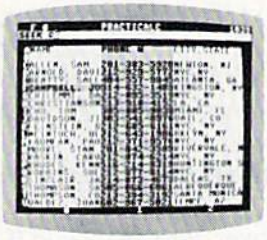
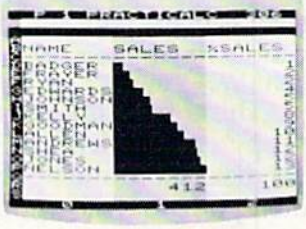


High-speed and wild card search...

All of which is a far cry from just playing with a joystick. Still, PractiCalc has one thing in common with a computer game. The price. Only $40.



Alpha or numeric sort...

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*$40 is suggested retail price for tape version of PractiCalc-20 ($45 for disk version; PractiCalc Plus or PractiCalc 64 = $50 for tape version, $55 for disk).

"SOUND" and get repeated error messages. Another likely error is asking for an object filename that already exists. This routine won't erase an existing file, which means you're protected against accidentally deleting something you want to save. If you *want* to overwrite a file, first use Command 8, *Erase File(s)*, to delete the file; then use Command 4 to make a new copy with the now unused name.

5. Copy File on New (Formatted) Disk. This function reads the file from the source disk and stores it in the computer's memory. The file is then written from RAM to the new disk. You have the option of making several copies of the same file.

There is a maximum file size of 66 blocks for the Commodore 64; maximum file sizes for the VIC are likely to be smaller, depending on how much memory is available. This command tells you how much memory is available. Sometimes garbage will have built up in the computer, wasting memory. Lines 7 and 8 test for the amount of free memory (and for the memory configuration in the VIC version). If garbage is tying up some of the available memory, so that you have less than the maximum possible memory for your machine configuration, you will be notified. The garbage can be eliminated by turning off the machine, LOADing and RUNning Disk Manager, and selecting Command 5 again.

After you have entered the filename, you will be asked to state what type of file it is—program, sequential, user, or relative. Then you are asked to put the source disk in the drive and press RETURN (if it is already in the drive, simply press RETURN). When the file has been loaded into memory, you will be asked to put the destination disk in the drive and press RETURN.

When the operation is over, you are asked if you want to make another copy of the *same file* on still another disk. If your answer begins with the letter Y, you will be prompted to insert the new destination disk and press RETURN. This allows you to make as many copies as you want on different disks without having to read the file from the original disk each time.

This routine is *not* fast. It takes about a minute to copy a six-block file. And be sure to format the new disk before attempting to copy files on it. Attempting to write to an unformatted disk will cause an error.

6. Copy DOS Wedge Program(s). You will be prompted to insert a disk containing the DOS wedge program(s).(For the VIC, the wedge program is the "VIC-20 Wedge," while the 64 wedge programs are "C-64 Wedge" and "DOS 5.1".) When you press RETURN, the wedge(s) is loaded into a buffer. Then you are prompted to insert the destination disk—a formatted disk that does not contain the wedge program(s)—and press RETURN; the routine puts the wedge file(s) on the new disk.

7. Rename File. You will be asked for the old filename. After you press RETURN, you will be asked for the new filename. After entering the new name, the routine executes the change.

8. Erase File(s). You are asked for the name of the file(s) you want to delete. You can erase more than one file at a time by using wild cards.

The wild card ? stands for any character in a particular position in the filename. For instance, if you erase ????TEST?, you will erase the files BYTETEST1, BYTETEST2, and DISKTEST5—but *not* the files NEWTEST5 (only three letters before TEST) or SOUNDTESTEDITOR (more than one character after TEST).

The wild card * stands for any number or combination of characters to the end of the filename. For example, if you say to erase NEW*, you will erase the files NEWGAME1, NEWGAME2, NEW, and NEWCOMER, but not the files NEVER and RENEW.

After running this routine, if you select Command 11, *Error Status*, the error number will contain the number of files deleted (it *won't* be a genuine error, even if *Error Status* says it is).

9. Validate Files. This is a housecleaning routine. It reorganizes the disk directory, cleaning up any isolated, unused blocks, and closing any files inadvertently left open.

10. Write Disk Manager. This routine simply saves the Disk Manager program then in memory. If Disk Manager is already on the disk, the version presently in memory will be saved over it.

11. Error Status. This routine checks to see what error is currently being reported. If no error is reported, you'll get error number 0 and the OK message. Remember that getting the error status changes it—if you run this routine twice in a row, the result the second time will always be 0 and OK.

12. Exit to BASIC. This ends the program in an orderly fashion, after PRINTing the message NOTE: DISKMANAGER PROGRAM IS STILL RESIDENT. This is to remind you that the program is still in memory. You can then LIST it, alter it, or get rid of it with a NEW command.

Tracing The Program

If you want to use some of these disk techniques in your own programs, it's easy to trace the way the program logic works. Check line 200. The starting line numbers of the subroutines are listed right after GOSUB, in the same order as the function numbers. Thus line 250 is the beginning of Command 1, *Disk Directory;* line 700 is the beginning of Command 12, *Exit to BASIC.*

The subroutine from 1000 to 1020 reads from a disk file into a buffer. The subroutine from 1050 to 1068 writes from the buffer to a disk file. Both subroutines are called by Commands 5 and 6.

See program listings on page 222.

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VIC Music Writer

Robert D. Heidler

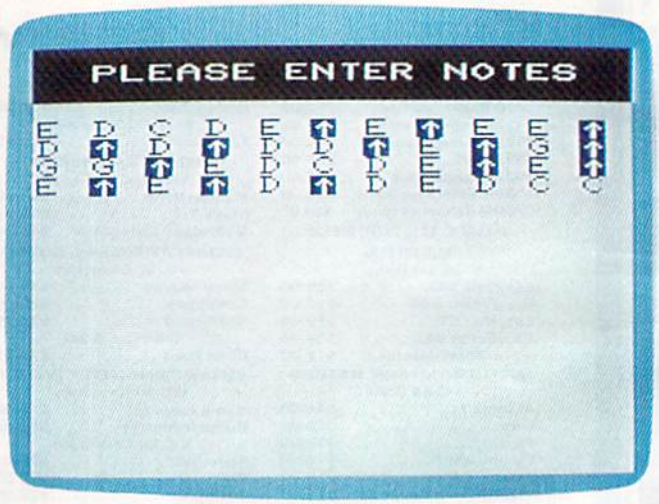
This flexible music-composition utility works on the unexpanded VIC-20. With it, you can compose and play songs, edit your music, and add the tunes to your own programs.

Music can be a welcome addition to a computer program, particularly if the program is educational or recreational in nature. (Who wouldn't like to have the theme from *Close Encounters of the Third Kind* playing softly in the background as your flying saucer glides across the screen?) Unfortunately, adding music to a program can be a long and complex task that many new programmers hesitate to attempt. That's where "VIC Music Writer" comes in.

VIC Music Writer is a program designed to make composing at your VIC keyboard *easy*. Here are some of its features:

1. VIC Music Writer allows you to easily enter any combination of notes from a two-octave range, and to hold each note for any duration.
2. It allows you to hear each note played as you enter it.
3. It allows you to hear your entire song played back at any time while you are composing.
4. It allows you to insert, delete, or change notes anywhere in the song at any time.
5. When your song is complete, VIC Music Writer will display the data necessary to reproduce your song in a program.

With this brief overview of the program's capabilities, let's explore in detail how to use VIC Music Writer.



Try entering this sample tune with "VIC Music Writer."

Entering Notes

When you run the program, the words Please Enter Notes appear at the top of the screen. To enter a note, simply press any valid note key from A through G. The VIC will respond by sounding the corresponding note and displaying its letter name on the screen in blue.

To move to a higher octave, press the f1 special function key. Now, pressing any key A through G plays the note one octave higher. The note's name is printed on the screen in red. To return to the lower octave, press f3.

This program requires you to convert all flats to sharps (B-flat becomes A-sharp, etc.). To play a

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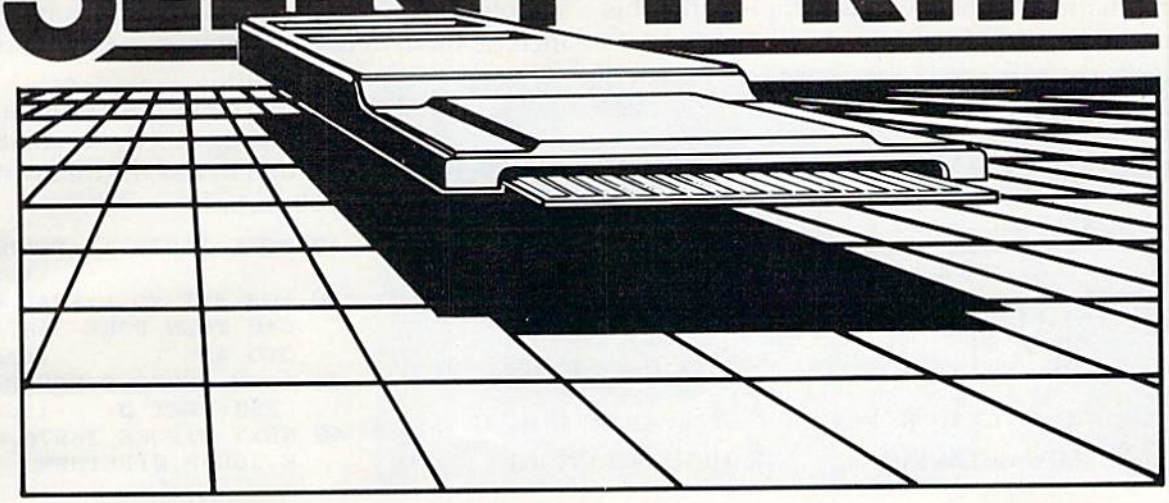

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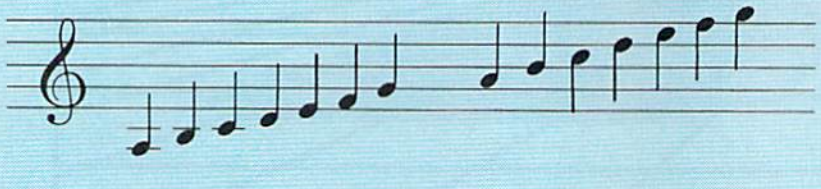
sharped note, hold down the SHIFT key while pressing the key of the desired note. For example, to enter a C-sharp, hold down SHIFT and hit the C. The VIC will play a C-sharp note and the symbols C# are displayed on the screen.

If you aren't sure what note to use, press f5. This puts you in the search mode. You can now strike any combination of keys in either octave. The notes will sound as before, but no new notes will be added to the screen. When you have found the combination of notes you want, press f7. This returns you to the write mode.

Figure 1:
The Range Of Notes Possible With VIC Music Writer.



Duration

A note's duration is determined by the number of times the note is entered. Normally, I count each keystroke as one beat. Thus, pressing the C once plays and holds a C note for one beat. Pressing the C twice plays and holds the C for two beats. If you want to play two notes of the same pitch but you don't want the VIC to run them together, enter the first note, press the up-arrow key (next to RESTORE), and enter the second. The up-arrow key places a momentary break between the notes—just long enough to distinguish between them.

Sometimes you will want to count each keystroke as one-half beat and double the playback speed in your program. (This allows you to use eighth notes in a song written in 4/4 time, etc.)

If you want to place a rest in your song, press R. The duration of rests is handled in the same way as the duration of notes.

Any time you want the VIC to play back what you have written, press P. The computer plays your song, momentarily illuminating the symbol of each note as it is played.

Editing Your Song

To insert, delete, or change a note anywhere in your song, use the left-right cursor key to move the cursor back to where you wish to make the change. (While the cursor itself is invisible, the color of the notes will change as the cursor passes over them.) To change a note, simply position the cursor over the old note and press the key for the desired note. Insertions and deletions are made with the INSERT/DELETE key.

To clear a song from the screen, press the left-arrow key at the upper-left corner of the keyboard and then press the S key.

Data Display

When your song is complete, press the left-arrow key. This clears the screen and displays the data necessary to reproduce the song in your program. Simply copy these numbers off the screen and include them in DATA statements in your own program.

To make your program play your song exactly as you have written it, use the following subroutine:

```
10 POKE 36878,15:READA
                        :rem 201
20 FOR B=1 TO A:READ C:IF
   C=0 THEN POKE 36876,0:G
   OTO 40               :rem 142
30 POKE 36876,C:FOR D=1 TO
    250:NEXT D          :rem 217
40 NEXT B:POKE 36876,0:POK
   E 36878,0:RETURN
                        :rem 167
```

The value 250 in line 30 controls the playback speed. You can substitute your own number here. I suggest starting with 250 and then increasing or decreasing the tempo to suit your taste. If you want to synchronize any kind of graphics on the screen while the song is playing, you will want to decrease the value of 250 and place the instructions for the screen display between lines 30 and 40.

If you want to play a song several times in a program, you may want to include a RESTORE statement at the beginning of line 10.

Figure 2:
Sample Songs For VIC Music Writer.

"Mary Had A Little Lamb"

```
E D C D E ↑ E ↑ E E D ↑ D ↑ D D E
G ↑ G G E D C D E ↑ E ↑ E ↑ E D ↑
D E D C C P
```

"London Bridge"

```
f1 A B A f3 G F# G f1 A R f3 E F# G R F#
G f1 A R A B A f3 G F# G f1 A R f3 E E
f1 ↑ A A f3 F# D P
```

Typing The Program

When you are typing VIC Music Writer, leave out line 5 until you have tested your program to be sure you have typed it correctly. Line 5 disables the RUN/STOP key, preventing you from acci-

dentally destroying your work. To exit the program without turning off the power you must hit the left-arrow key.

Since this program uses a good deal of memory, I would advise typing it in without any spaces, apart from those within quotation marks.

If you want to save yourself a lot of typing, I would be glad to make a copy of the program for you. Send a blank cassette tape, a stamped, self-addressed tape mailer, and $3 to:

Robert D. Heidler
3409 Kingfisher Lane
Denton, TX 76201

While this program was written primarily to aid in writing programs, it is also a lot of fun to play around with. It is very user friendly, and the editing features make it a lot of fun to experiment with, as you change notes and durations to get different effects.

My seven-year-old daughter mastered the program in about ten minutes and now enjoys typing in the songs she learns at school and hearing the computer play them back. My two-year-old son isn't quite ready for serious composition, but he enjoys playing the keys like a piano to hear the music. I hope you find this program as useful and enjoyable as we have.

See program listing on page 234.

THINKING

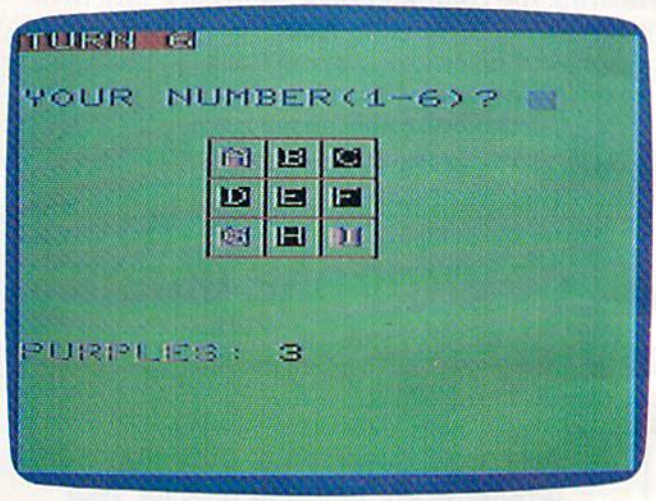
Andy VanDuyne

"Thinking"—and its advanced version, "Thinking Harder"—is a game of pattern recognition and memory that tests your ability to think logically. Originally written for the unexpanded VIC, we've added a version for the Commodore 64.

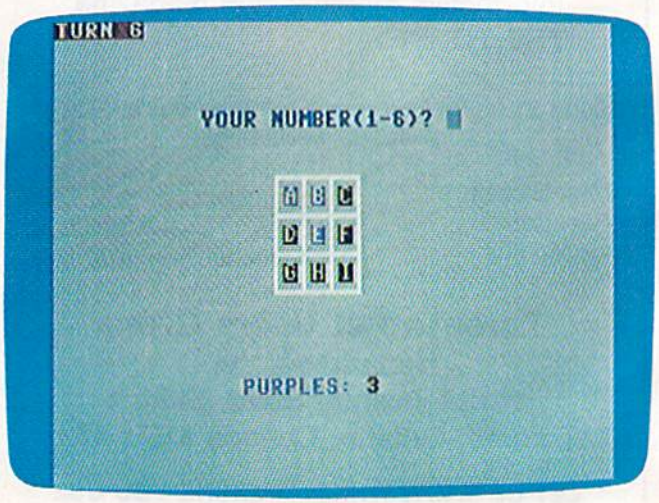
You have nine black boxes labeled from A to I in front of you. Your job is to make them all light up with a purple glow.

The trouble is, you can't get to them directly. Instead, you have a set of six switches, numbered from one to six. Each switch controls *three* of the boxes. When you choose switch 1, for example, boxes A, D, and H might change condition. If they were all dark, then they'll all glow; if they were all glowing purple, then they'll all go dark. And if A and D were purple and H was black, then A and D will go dark and H will glow purple.

The trouble is figuring out which switches control certain boxes. You know that there is a correct combination—three of the switches, toggled at once, will make all nine boxes glow. But which three? That's where luck and genius combine. It's possible to guess right with your first three choices. But if you aren't concentrating, it's also possible to get such a mishmash of purple and black boxes that it could take a hundred tries before the puzzle is solved.



Solving a puzzle in "Thinking," VIC version.



"Thinking," Commodore 64 version.

How To Play "Thinking"

After you have typed in "Thinking" and SAVEd it on tape or disk, RUN it and the game will begin. A

title screen and two screens of instructions appear first. Press any key to go on.

Nine black boxes lettered from A to I appear in the center of the screen. Below the boxes you can see the number of purple boxes, which is 0 at the beginning of the game. At the top of the screen is the number of turns you have taken, which is 1 at the start of the game.

The input line just above the black boxes asks you for a number from 1 to 6. Enter a number and press RETURN. Three boxes will immediately turn purple. The turn number will change to 2 and the count of purple boxes will change to 3.

Suppose you enter the number 5, and the A, B, and I boxes glow purple. You don't know about any of the other numbers, but you know that from then on, in that game, number 5 will toggle boxes A, B, and I. The pattern for each switch is randomly assigned at the beginning of each game, so that each time you play there'll be a new set of patterns. But the pattern for a particular switch will never change *during* a game.

If you choose a number and don't like what it did, choosing the same number again toggles the same three boxes and restores them to the way they were originally. In fact, in order to choose the same number, all you have to do is press RETURN without entering anything. Your last choice will be repeated. It will cost you a turn each time, though, just as if you had entered a new number.

When all nine boxes turn purple, the computer congratulates you, tells you how many turns you took, and asks if you want another game. If you choose to play again, a new set of patterns is randomly created.

Strategy And Frustration

At the beginning of every game there are always two perfect solutions. The puzzle can always be solved. Winning in three or five tries is entirely a matter of luck. Students in my school average between 9 and 25 turns—slightly better than the teachers. If you become totally lost, however, it can take dozens or even a hundred tries to solve the puzzle.

But if you think logically, you should soon become quite good at the game. I won't give away the whole strategy, but you might keep in mind that any two patterns that overlap (that change the condition of the same box) cannot possibly be in the same winning combination. And in the last turn before you win, you must always have exactly six purple boxes and three black ones.

Is It Too Easy?

If you become a master at Thinking, you might want to try Thinking Harder. In this version of the game, you have *nine* possible patterns instead of six. This makes it possible to get much more confused, and getting it right by luck alone is much less likely.

To play Thinking, type in Program 1 for the VIC-20 or Program 2 for the Commodore 64. To play Thinking Harder, remove the REM in line 2 and change the 6 in line 132 to a 9.

If Thinking Harder is too difficult, you can always reverse the changes and go back to Thinking again.

Tape Copies — VIC Only

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606	**Dam Busters.** Navigate bombers and helicopters behind enemy lines on a top secret mission to destroy a major dam. **Joystick/Keyboard.**
842	**Dangers of the Deep.** You're out for a nice dip on a Sunday afternoon. Then suddenly they come from everywhere...sharks and octopi. They're all out to get you!! Will you survive? **Joystick/Keyboard.**
594	**Downhill Racer.** The gold medal is on the line. The course is icy and the dangers are everywhere. One mistake and you're out of it. Will you have the winning time? **Keyboard.**
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571	**Explorer.** As captain of a star ship, it is your mission to seek out new peoples and planets. You will go where no person has ever gone before. Adventure and danger are your constant companions. **16K Exp.* Keyboard.**
881	**Friend or Foe.** You have only a microsecond to decide. Shoot too soon, and you may disintegrate a friend. **3K Exp.* Joystick.**
723	**Intruder.** They come from outer space, strange creatures threatening our planet. Who are they? What do they want? No time for questions now, only action will save you from the Intruders. **3K Exp.* Joystick.**

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551	**Moonlanding.** You are landing on the moon for exploration. Suddenly you are attacked by Zurkons. Will you be destroyed? **16K Exp.* Keyboard.**
908	**Nightcrawler.** Quick movement and rapid fire will protect you from the attacking nightcrawler, spider and bugs. A centipede type game. **Joystick.**
599	**Nuclear Attack.** Nuclear war has been declared and you have been designated to destroy with your missiles the enemy silos. You have 30 rockets and 6 silos to destroy. Good Luck! **Keyboard.**
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851	**Rabbit.** Cross the highway and canal avoiding the hazards. **8/16K Exp.* Joystick.**
689	**Road Demon.** You are one of California's finest—a California Highway Patrolman, "CHIPS". Apprehend the highway menace before he becomes another statistic, or makes you one! **Joystick.**
658	**Shooting Gallery.** Run up points as you shoot the birds and animals. Hit the musical notes and music begins. Hit the numbers to earn extra bullets. Careful, watch the clock. **3K Exp.* Keyboard.**
829	**Space Fight.** You are the pilot of a spaceship. You must destroy the enemy machines if you can, without being destroyed yourself. **Joystick/Keyboard.**
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VIC Billboard

Andy VanDuyne

This program takes advantage of a little-used technique — doubling the height of the VIC-20's characters — to turn any TV screen into a repeating message display board. For the unexpanded VIC.

One of the interesting features of the VIC-20 is the large 8 by 16 (pixels) character size mode. The *VIC-20 Programmer's Reference Guide* says this normally would be used for high-resolution graphics. But it can also be used very effectively for text.

Possible uses include programs for very young children, people with vision problems, or situations in which you want larger, eye-catching text displays, such as window displays in stores.

"Billboard," the program accompanying this article, displays up to four messages beneath a main heading, all in the double-height, 8 by 16 text mode. It's a great attention-getter for small businesses, or for bazaars and fairs, parent-teacher nights, and other occasions.

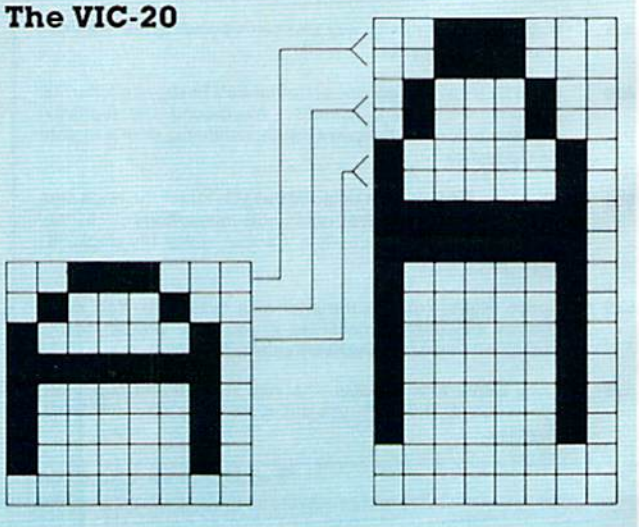
Using Billboard

The program itself is very easy to use, with prompts for all the input. After you enter all the messages and colors you want displayed, it switches to the double-height text mode and begins endlessly repeating the messages.

When you first run Billboard, it asks you for the heading or title. This will be automatically centered at the top of the screen and must be limited to 22 characters or less (the VIC-20's screen width). Then you choose the color in which you want the heading to appear. When choosing colors, be sure to pick a contrasting combination; if the text color is the same as the background color, the text will be invisible. Another caution: If you are entering text in all capitals with the SHIFT LOCK key, you must release SHIFT when typing a space. The character set for the large-size text mode has no shifted space character.

Next the program asks you to choose a screen/border color combination (please remember to contrast your text colors). Refer to the VIC owner's manual to find an interesting color combination for your display. To keep the screen/border combination included with the program, just press RETURN.

Double-Height Characters On The VIC-20



Now the program asks you to enter up to four messages. Each message can be up to four screen lines long. All the rules for entering strings apply, including no commas, colons, and, in this case, shifted spaces. Each message can be a different color.

Finally, after entering the last message, press any key to activate Billboard. One by one, your messages are spelled out beneath the heading in king-size characters.

You can edit your messages at any time by pressing the back-arrow key (at the upper-left corner of the keyboard) while a message is being displayed. Just follow the prompts; you can enter as many as four additional messages or change any previous message.

To end the program and restore text to normal, press RUN/STOP—RESTORE.

A Memory-Hungry Mode

One of the problems with the 8 by 16 text mode is the amount of memory the character set uses. Each 8 by 16 character needs 16 bytes of memory (as opposed to eight bytes in the standard mode), and since these are custom characters, they must be stored in Random Access Memory (RAM). Each character is moved down from the standard character set in Read Only Memory (ROM); and to achieve the double height, each ROM character must be stored twice.

While writing Billboard, I decided I wanted both upper- and lowercase letters. These include characters 0 through 90 in the ROM character table that begins at memory address 34816 (some editions of the *Programmer's Reference Guide* erroneously list this address at 33816). Since each double-height character uses 16 bytes, this adds up to 1456 bytes! The free memory ceiling would have to be lowered to address 6224. However, the VIC cannot be adjusted to find a character set at that address. There's another address in the neighborhood, though — 6144 — where the VIC can find a character set, if address 36869 is set to 254. Unfortunately, using this address means the new character set burns up even more memory — 1536 bytes — almost half the free memory available in an unexpanded VIC.

So you can see why memory has to be conserved in every way possible. That's why there aren't an abundance of REM statements to explain what's going on.

If you want to experiment with the large text mode without using Billboard, enter this program:

```
10 POKE 56,24:CLR
20 Z=0
30 FOR N=6144 TO 7678 STEP 2
40 POKE N,PEEK(34816+Z):POKE N+1,PEEK
   (34816+Z)
50 Z=Z+1:NEXT
```

Now RUN. Nothing will seem to happen for about half a minute. Be patient; the character set is being moved from ROM to RAM. Soon you'll see the usual READY message; again, it will look as though nothing has happened.

Next, type this line in direct mode (without a line number) and press RETURN:

```
POKE 36869,254:POKE 36867,PEEK(36867) OR 1
```

Double-height characters! You will notice that the bottom of the screen has disappeared, and the cursor may not be visible. Both are there, but they are below the screen limits of your TV or monitor. The number of visible rows has changed from 23 standard-size ones to 11½ big ones. Try pressing the CLR/HOME key to clear the screen. Now the flashing cursor is visible, though it looks a little strange. Try typing some characters — everything appears twice as tall. You can even LIST a program and enter new lines.

To bring things back to normal, press RUN/STOP—RESTORE. You can erase the short character set-relocating program from memory by typing NEW, but the character set itself will remain. Enter the POKE statements above to switch back to large characters.

Remember: These programs are for the unexpanded VIC. You'll have to modify Billboard to use it on expanded VICs.

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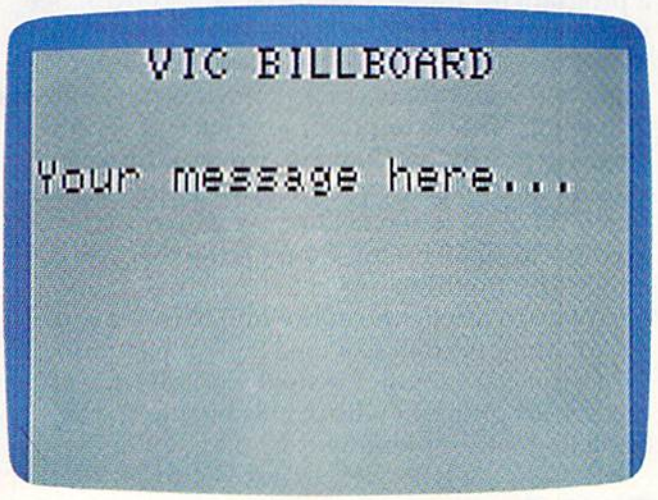
See program listing on page 231.



Up to four repeating messages can be displayed with "VIC Billboard."

Tricks For Saving Memory

John Stilwell

Writing programs to fit in an unexpanded VIC-20 is not easy — there's only 3.5K of free memory to work with. You should find the following tricks very useful. They also work on the Commodore 64, although with about 39K of free memory space available, the need is less acute.

Trick 1

Always use keyword abbreviations when entering a program (example: P-SHIFT-O for POKE). See your manual for a list of these abbreviations. This won't save any memory because of the abbreviations, but it will allow you to cram more statements into a line. This is important because every line takes up five bytes, then you start counting the statements. The only problem with this trick is that if the line, when listed, exceeds 88 characters on the VIC or 80 on the Commodore 64, you can't edit it. If something needs to be changed, you will have to retype the entire line. Also, if you submit the program to a magazine which publishes the listing, other people won't be able to enter your program without also using the abbreviations — something they may not know.

Trick 2

If the last thing on a line is an ending quotation mark of a PRINT statement, leave it off. It won't hurt anything as long as it's the last thing on the line. Besides less typing for you, it saves one byte for each quote you leave off. This may not seem like much, but everything adds up. Remember, the average line statement is 40 bytes long.

Trick 3

This one will save the greatest amount of memory. Use cursor controls whenever possible. Here are some examples:

```
10 PRINT
20 PRINT
30 PRINT
40 PRINT"HI MOM"
```

This program uses 34 bytes of memory. If the PRINT statements are replaced by down-cursor controls, there is a significant saving.

```
10 PRINT"{3 DOWN}HI MOM"
```

This accomplishes the same thing but uses 19 bytes, so we save a whole 15 bytes. Now we are getting somewhere. Look through your program and see how many times you can do this. You may be amazed. Oh, don't forget to leave the ending quotation mark off.

```
10 PRINT "{3 DOWN}HI MOM
```

This saves one extra byte.

Trick 4

This is a modification on Trick 3. Always use TABs instead of cursor controls if there are a lot of cursor controls. However, with TABs you are limited to moving from left to right and down.

To move to the right five columns, use TAB(5). To move down, add 22 for every row. For example, we will move to the right five columns and down ten rows:

(10 rows * 22) + 5 columns = 225, so use TAB (225).

Unfortunately, the TAB number must be less than 256. If you need to TAB further than 255, it is legal to stack TABs — TAB(255)TAB(25).

Instead of this:

```
10 PRINT "{10 DOWN}{5 SPACES}HI MOM"
```

Memory usage is 31 bytes. Try it this way:

(10 rows * 22) + 5 columns = 225

```
10 PRINT TAB(225)"HI MOM"
```

This now only uses 22 bytes. In comparison to Trick 3, nine bytes may not seem like much, but if the above program were written with ten PRINT statements, it would use approximately 77 bytes. So we would have saved 56 bytes by using TABs.

To know when to use TABs instead of cursor controls, you must look at the memory requirements. Cursor controls take one byte each. TABs take two bytes plus one byte for each digit in the TAB number.

Trick 5

If something looks strange with the TAB above, you are right. There is no semicolon between the TAB and the quote. It is not necessary. Since it doesn't affect the spacing, why use it? After all, it uses up one byte. You can also eliminate the semicolon between quotes and variables.

10 PRINT "A =";A can be written as 10 PRINT"A ="A

Note that the semicolon must be used if the PRINT was changed to an INPUT.

10 INPUT"A =";A

Trick 6

This trick is frowned upon by traditional programmers. Nevertheless, you can number a program by ones. You won't want to do this unless you have a renumber program. If you renumber the program by ones, starting with zero as the first line number, the program will take up less space. This is because all branching commands such as GOTO take one byte plus one for every digit of the address.

This trick has on occasion saved me a couple of hundred bytes. Unfortunately, modifying this program will be hard, since you can't insert any lines without renumbering.

Trick 7

Trick 7 does not hold for most computers. But with the VIC and 64, use PRINT statements instead of POKEs whenever possible. This is for three reasons.

First of all, POKE statements are so amazingly slow that it isn't funny. I recently rewrote the graphics in a program, changing the POKEs into PRINT statements. I was amazed. You would think that it was written in machine language. The speed difference is that great.

Second, POKE statements take up more memory than PRINT statements (in most cases). A POKE takes two bytes plus one for every digit of the numbers that go with it. That's an average of eight bytes for every character POKEd on the screen. In contrast, it takes one byte for the PRINT and one for each of the quotes and characters in-between. So, if you are creating graphics, you might save a lot of memory by using PRINT statements.

Third, when POKEing directly into screen memory on the VIC and late-model 64s, a corresponding POKE to color memory is necessary to make the character appear on the screen. This then requires two POKE statements for each character. It will be more economical (memory-wise) to use PRINT, which automatically takes care of color memory.

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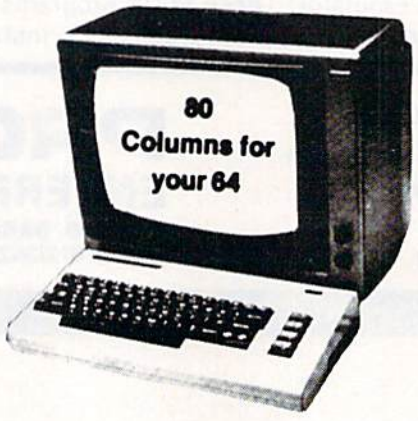

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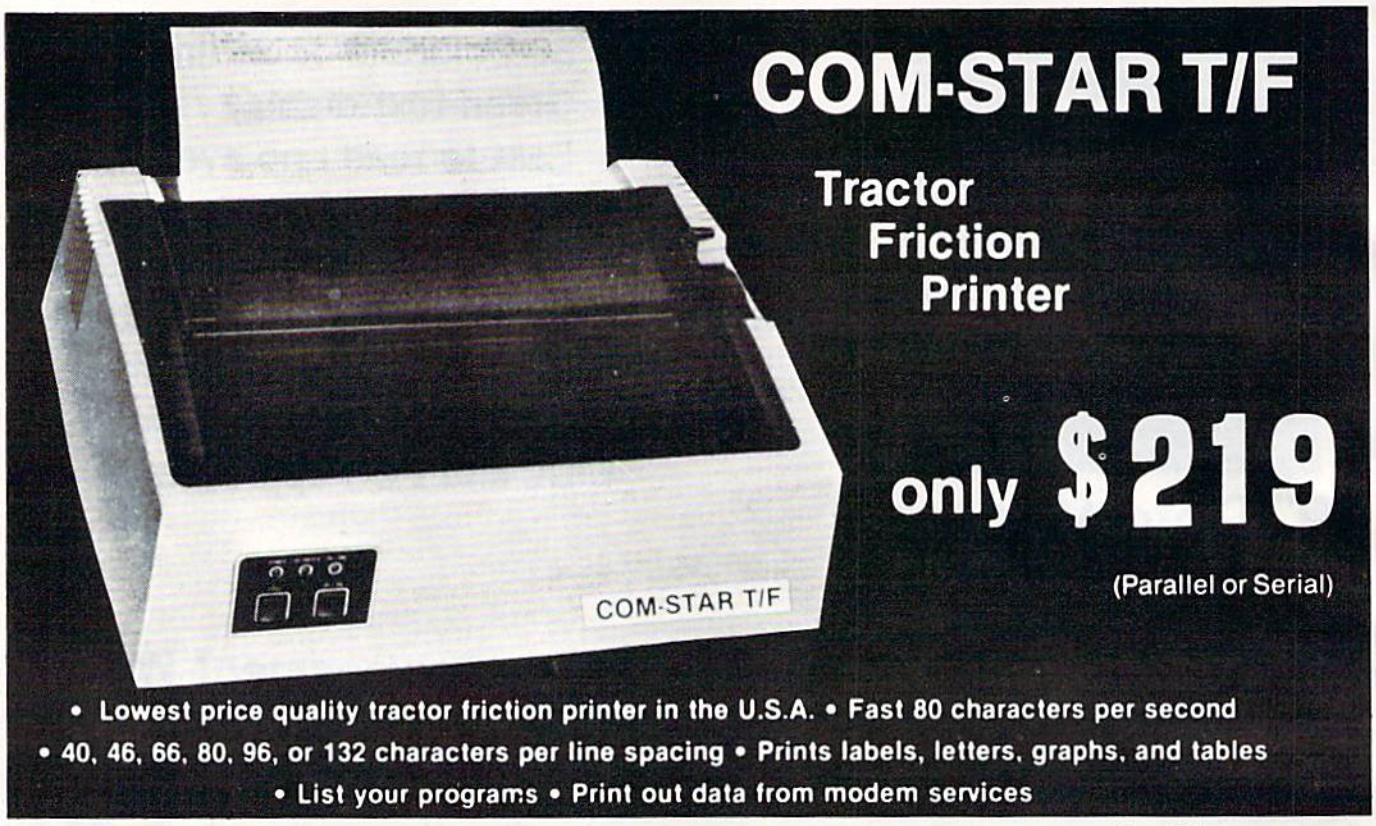

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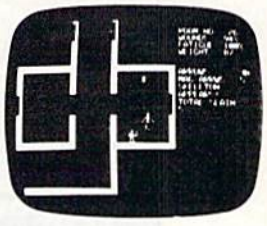

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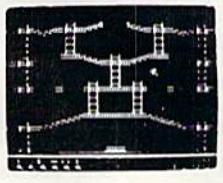

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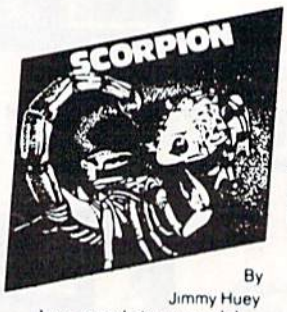

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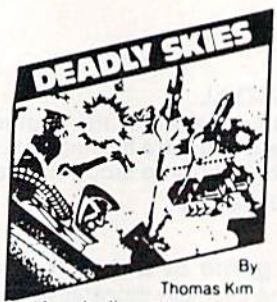

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MACHINE LANGUAGE FOR BEGINNERS

RICHARD MANSFIELD, SENIOR EDITOR

Safe Places

This month we'll start constructing a game. It will be written entirely in machine language (ML). After each small section is written, we'll test it and combine it with other modules until the game is complete. Along the way, we'll learn the meaning of the commands available to us in ML, as well as how to build a program from start to finish.

But first we've got to clear up an important issue: where do you put an ML program? BASIC programs always start in the same address in the computer's memory. An unexpanded VIC starts them at address 4096. VIC-20s with memory expansion start them at 4608. Commodore 64s start them at 2048. ML programmers, however, must decide where they want to put their programs. When you fire up the Assembler (see last month's column), the first thing it wants to know is the starting address. The choice is yours.

Nevertheless, there are some places you clearly can't put an ML program. ROM memory can't be POKEd or changed, so you can't store something there. Likewise, roughly the first 500 addresses are heavily used by the computer to keep track of the screen location of the cursor, current variable addresses, and many other things. The cassette buffer is safe enough (addresses 828-1019) *if you use a disk drive*. If you use cassettes, you will destroy what's in this buffer whenever you use the cassette drive.

Another consideration is that you will often want to have an ML program and a BASIC program coexist inside the computer. For example, many BASIC programs can be significantly speeded up by replacing slow sections, usually loops, with an ML program. SYS within BASIC sends control to the ML and RTS sends it back — similar to the way you use GOSUB within BASIC. Also, when we use the Assembler, we're creating an ML program, but the Assembler itself is in BASIC — they've got to be in the computer at the same time.

Where's the best place to put ML? On the 64, it's easy: you've got a block of memory from 49152 to 53247 (4096 cells, or 4K) which isn't disturbed by BASIC or the computer's operating system. We'll locate everything there from now on.

On the VIC, it's a bit more tricky. For one thing, the Assembler itself would use up all the available memory in an unexpanded VIC. And, when you add expansion memory to a VIC, several key memory locations shift around. For our purposes, we'll assume that you've added at least 8K of expansion memory. We'll set aside a zone at the top of your memory expansion (from 12288 on) which will give us a good amount of protected space for our ML programs.

Since BASIC uses up some RAM memory to build its arrays and variables, we've got to protect our ML zone from being overwritten while BASIC is active. In fact, the Assembler builds an array. If you want to assemble something with it, you've got to protect the newly created ML program from the Assembler itself. We can do this by fooling BASIC into thinking that its available RAM memory is less than it really is. This forces BASIC to build its variables below the zone we set aside. This is done by POKEing location 56 with a 48. When you've done that, your computer will not disturb RAM memory above address 12287.

To summarize, 64-users should always answer

Connect your computer to the air!

The "AIRWAVES" that is, they're literally crackling with interesting things to listen to. Did you know that you can get local and overseas news a day ahead of your daily paper's publication? Weather stations, news services, ships and "HAM" radio operators all use the SHORT-WAVE radio bands daily for radio-teleprinter and Morse code communication. The Microlog AIR-1 plugs into your computer just like a "game cartridge." The single board AIR-1 contains both program in ROM AND radio interface circuit. All you need is a typical short-wave receiver, with CW capability (BFO). Connect your radio speaker and off you go . . . tuning in the world of digital communications. Instead of "COSMIC BLIVETTES" on your video screen, you'll be watching text readout from all sorts of stations around the world . . . free for the listening . . . a whole new use for your home computer . . . SHORT-WAVE DXing on RTTY and Morse. The manual lists some suggested times and frequencies, and your standard printer can provide a permanent record of copy. The AIR-1 will even tell you what Morse speed you're copying and provide built-in send/receive code practice! For HAM radio use the AIR-1 will also send and receive RTTY/CW with AFSK/PTT and CW keying outputs. Convenient plug-in jacks make connection to your radio a snap. "On-Screen" tuning indicator and versatile program make it easy to use. The simple, one board design makes it inexpensive. And Microlog know how makes it best! If you've been looking for something to spice-up your computing, try the ultimate "peripheral" and connect your computer to the AIR-1.

The complete AIR-1 for the VIC-20 or "64" is $199. (With 4 mode AMTOR, $279.) See it at your local dealer or call Microlog Corporation, 18713 Mooney Drive, Gaithersburg, Maryland 20879.
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Note: VIC-20 is a trademark of Commodore Electronics, Ltd.

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49152 when their assembler or disassembler asks for the Starting Address. VIC users should have an expansion memory of at least 8K attached to their computer and should protect a zone of memory at the start of every ML programming session by typing: POKE 56,48. VIC users can then answer 12288 as the starting address of an assembly or disassembly.

Starting The Game

We're about ready to start putting together a game, but first let's add a convenience feature to the Assembler. Enter the line in Program 3 and you can then type XX if you've made a mistake when entering a line of ML. Give the address and you can then type the line in correctly. This is most useful if you notice an error after you've hit RETURN. You can correct it without having to restart assembly. Of course, you could also restart the Assembler by giving the address of the error as the Starting Address, but that's somewhat clumsy.

Now type in your version of the first part of our all-ML game (Program 1 or 2). Don't forget to tell the Assembler you're finished by typing the word END when you hit RETURN after typing RTS.

As we talk about the meaning of the ML commands within a program, we'll refer to the leftmost numbers (see Program 1 or 2) as *line numbers* since that's how they function. They are really addresses in memory, but it's fine to think of them the same way you think of BASIC's line numbers.

Let's briefly look at the ML. Both versions need to first set color memory by filling it with a color that will show up when something is POKEd into it. We load the Y register (registers are like variables) with a zero so it can count for us. The A register is then loaded with our color code (6 for the VIC, 8 for the 64, but you can select which color you want by changing these). Then we store the A value into color memory. On the VIC, we are storing into 37888 *plus* the value of Y. We raise Y by one (INY) each time through the loop created by the BNE (Branch Not Equal to zero) instruction. Y can only go as high as 255 so it eventually resets to zero, and we fall through the branch. For the VIC, we need to fill only two, 256-cell large blocks of memory (starting at 37888 and 38144). The 64 has twice as large a screen, so we fill four, 256-cell blocks (they're called *pages*.)

That accomplished, we can now put things on screen by using the STA command (like BASIC's POKE). Lines 12301 for the VIC and 49171 for the 64 are the start of our drawing loop. It's similar to the loop we used to fill color memory, but this time we want to draw a bar across the top and bottom of the screen. This will be part of a frame to contain the visual action of our game. This time we load A with 224, a solid square character, and proceed to store it as two lines. On the VIC we count up with Y until Y=22 (the number of characters on the VIC screen line); on the 64 we count up to 40. The RTS sends us back to BASIC.

After you've typed in your version, test it by typing SYS 12288 (for VIC) or SYS 49152 (for 64). You should see a top and bottom border appear across your screen. If you don't, you've made a mistake in typing and you should try again with the Assembler. Or, you could load in your Disassembler (September 1983) and compare your ML against Program 1 or 2.

If the program works correctly, you'll want to SAVE it so you don't have to reassemble it next month when we add to it. To do this, we'll make a BASIC loader out of our ML by using the "Datamaker" program (October 1983). Simply LOAD in Datamaker, change line 1 to read:

```
1 S=12288: F=12316: L=9    (for the VIC)
1 S=49152: F=49186: L=9    (for the 64)
```

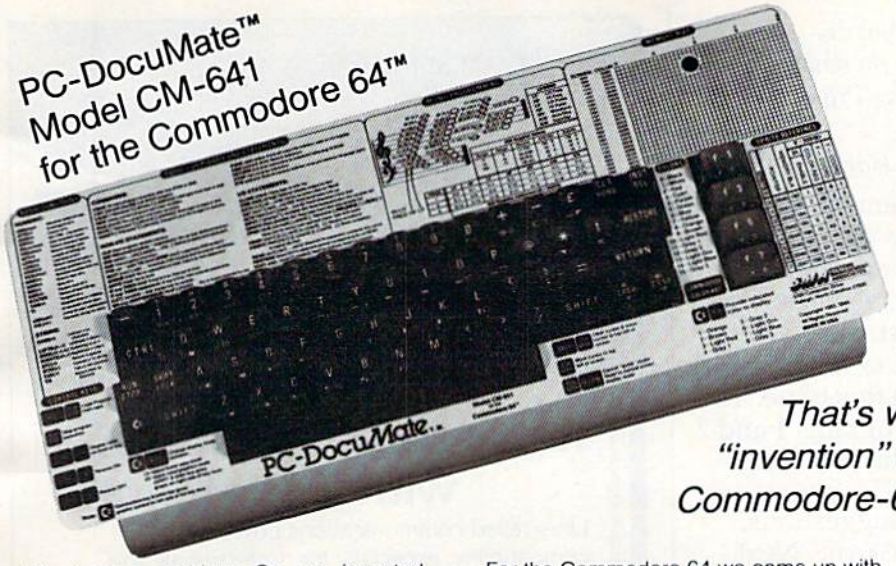
and change line 800 in the same fashion. Then RUN. Datamaker will create your loader and then remove itself. (You might need to hit RETURN a few times when Datamaker stops.) You can SAVE the loader and, whenever you want to recreate your ML, just LOAD it and RUN it. Programs 4 and 5 are examples of the finished loaders.

ML Mailbag

Here are a couple of letters I received recently:

> *I would suggest the following line changes to your August RAMtest program to include VICs with expansion RAM. Problems with RAM, though rare, are more likely to be with RAM expansion than with the internal RAM. Also, it would be useful to have the capability to test out new RAM packs. The following changes to Program 1: RAMtest, August 1983, p. 125, will allow testing on VICs with any memory configurations:*
>
> **VIC With 3K RAM Expansion:**
> **882 DATA 69, 32, 169, 4, 133, 58**
>
> **VIC With 8K RAM Expansion:**
> **882 DATA 69, 32, 169, 18, 133, 58**
> **894 DATA 24, 141, 0, 16, 145, 57**
> **936 DATA 230, 58, 165, 58, 201, 64**
>
> **VIC With 16K RAM Expansion:**
> **Lines 882 and 894 same as for 8K**
> **936 DATA 230, 58, 165, 58, 201, 96**
>
> **VIC With 24K RAM Expansion:**
> **Lines 882 and 894 same as for 8K**
> **936 DATA 230, 58, 165, 58, 201, 128**
>
> *Allan Wheeler*

Many thanks for this useful table of modifications.



EUREKA!

That's what we said when our new "invention" solved all our VIC-20™ and Commodore-64™ programming problems

We had a problem. So we invented PC-DocuMate™ to solve it. The problem was how to quickly master the VIC-20 and CBM-64 keyboards and easily start programming in BASIC on our new personal computers. First we went through the manuals.

INCONVENIENT MANUALS

The user's guide was a nuisance and the programmer's reference manual was just plain inconvenient to use. We found the control key combinations confusing and the introduction to BASIC to be too "basic" for our needs. We needed a simple solution to our documentation problems.

So we decided to surround the keyboard of each PC with the information we wanted. We decided to print whatever we needed on sturdy **plastic templates** which would fit the keyboard of either the VIC-20 or Commodore 64.

SIMPLE SOLUTION

This was the simple solution to our problem. Now we could have the essential information right at our fingertips.

On the left side and top of the templates we put **BASIC** functions, commands, and statements. On the lower left we used **key symbols** to remind us of how to use SHIFT, RUN/STOP, CTRL and the "Commodore" key. Over on the bottom right side we put some additional keys to help remember about CLR/HOME and RESTORE. But we were still a little confused.

STILL CONFUSED

We found we were confused about music programming, color graphics, and sprites. On both the VIC-20 and the CBM-64 templates we carefully organized and summarized the essential reference data for **music** programming and put it across the top—showing notes and the scale. All those values you must POKE and where to POKE them are listed.

Then to clarify **color graphics** we laid out screen memory maps showing character and color addresses in a screen matrix. (We got this idea from the manuals.)

For the VIC-20 we added a complete memory address map for documenting where everything is in an expanded or unexpanded VIC.

For the Commodore 64 we came up with a really clever summary table for showing almost everything you ever need to know for **sprite** graphics.

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Now we had organized the most essential information for our VIC and 64 in the most logical way. BASIC, music, color graphics, and sprites all seemed a lot easier. Our initial problem was solved by PC-DocuMate™

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In reference to your column on disassembly (September 1983), how do you load in Program 2 without erasing Program 1 (RAMtest)?

Harry Metz

Disk users will have no problem since RAMtest is designed to reside in the cassette buffer. If you use cassette, however, anything coming into the computer from the cassette drive will cover up the buffer and destroy RAMtest. There were several letters asking about this, and the first part of this month's column deals with this issue. The solution is to change line 800 in Programs 1 and 2 (August 1983) to send the ML to the safe areas described above.

If you have any questions or suggestions, please write to me c/o COMPUTE!'s Gazette. Next month we'll build onto the all-ML game and talk some more about addressing modes.

See program listing on page 222.

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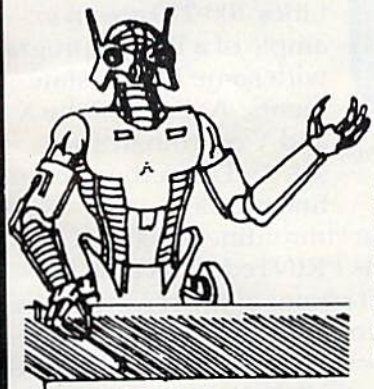

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Easy Screen Formatting

Edward Zobel

This routine makes screen formatting easy — without dozens of cursor controls.

Here is an easy way to position text on the screen. This method works on both the VIC-20 and Commodore 64. It avoids the often cumbersome typing of cursor movements within the quotes of a PRINT statement. You simply set the X and Y (horizontal and vertical) screen coordinates and then direct the program to the accompanying subroutine. After RETURN, the next PRINT statement is positioned at the chosen spot.

Remember that the Commodore 64 screen has 40 horizontal positions numbered 0 to 39 (the VIC has 22, numbered 0 to 21). These are the X coordinates. There are also 25 vertical or Y coordinates numbered 0 to 24 on the Commodore 64, and 23 Y coordinates numbered 0 to 22 on the VIC.

Wherever the cursor is currently positioned, the next PRINT statement is executed. So the trick is to move the cursor. There are two memory locations that will help us with this. Address 214 holds the Y position, and 211 holds the X position. POKEing values into these spots will put the cursor where we want it. There is just one catch. The POKE to 214 works only *after* something is PRINTed. We want it to work *before*. Let's look at the program to see how to get around this.

POKEing The Cursor Position

Lines 100-270 are an example of a BASIC program with some PRINT statements. At line 150 the X and Y coordinates are set, and then the subroutine is called.

The first line of the subroutine is 60000. Here the HOME command is PRINTed. This puts the cursor in the upper-left corner of the screen where both X and Y equal zero. In the next line, if Y is not set to zero, then its value minus one is POKEd into 214. The following PRINT command activates this POKE and moves the cursor down one line. This yields the proper Y value, since we subtracted one from Y when we POKEd into 214. If Y was set to zero, then none of this would happen and the cursor would stay at the top line of the screen.

Be sure to include the semicolon in line 60000 or the subroutine will not work properly. In line 60020 the X position is POKEd into 211. Nothing special is required here.

Type in the program and RUN it (the same version works on both the VIC and 64). You should see the word HELLO printed three times at the defined positions. This subroutine should be helpful in formatting menus and instructions in your own programs.

See program listing on page 240.

The Most Practical Software — Now Has Graphics

The **Graphics Assistant,** the latest addition to the ASSISTANT SERIES, lets you and your 64 produce charts and graphs in three formats. You can display them on screen or print them out. On screen display is 30 columns by 14 rows — about 60% of the screen. Print-out can be two sizes: a compact 4" x 4" or a full page, 7" x 9", display.

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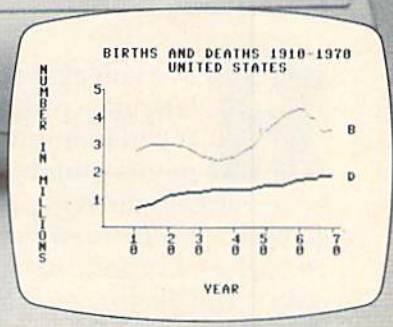

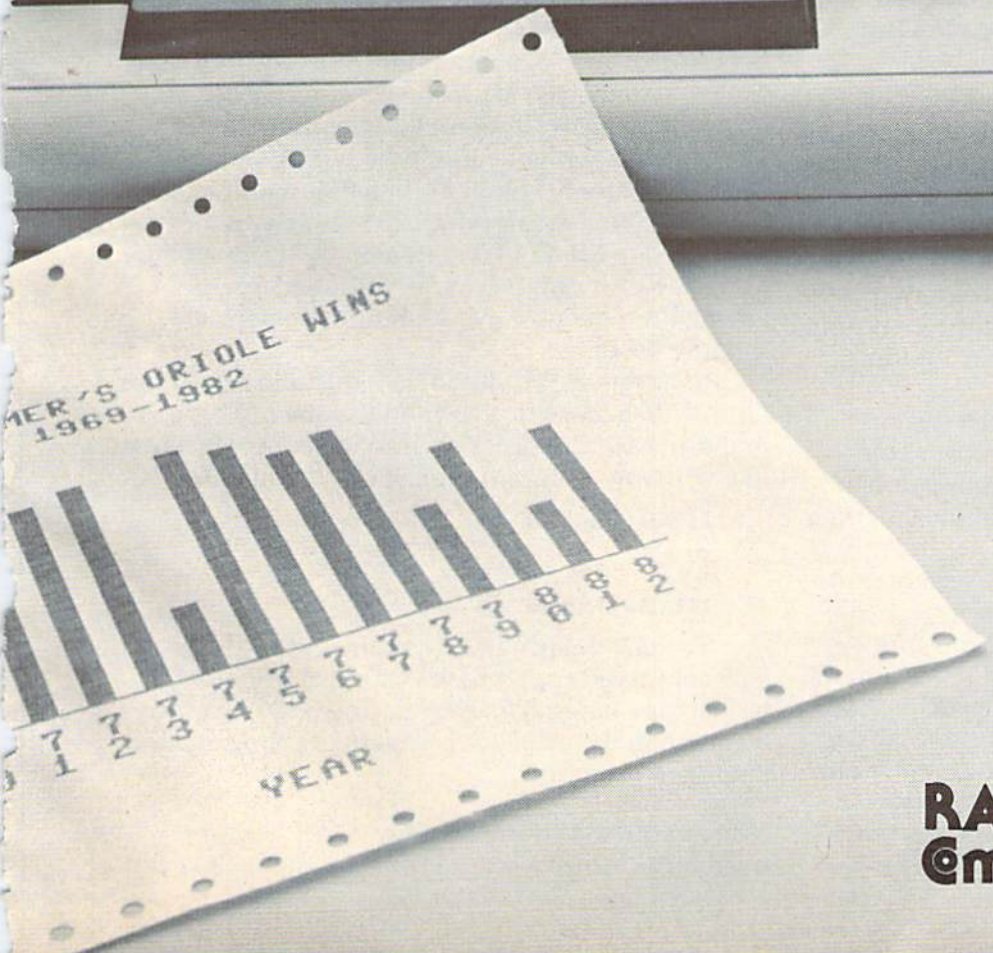

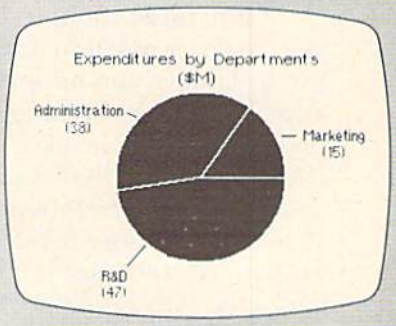

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MLX

Machine Language Entry Program For Commodore 64

Charles Brannon, Program Editor

MLX is a labor-saving utility that allows virtually foolproof entry of all-machine-language programs published in COMPUTE!'s Gazette. You need to know nothing about machine language to use MLX—it was designed for everyone. Important: MLX is required to type in the machine language games in this issue, such as "Spike" and the 64 version of "Space Duel."

Have you ever typed in a long machine language program? Chances are you typed in hundreds of DATA statements, numbers, and commas. You're never sure if you've typed them in right. So you go back, proofread, try to run the program, crash, go back and proofread again, correct a few typing errors, run again, crash, recheck your typing.... Frustrating, isn't it?

Until now, though, that has been the best way to enter machine language into your computer. Unless you happen to own an assembler and are willing to wrangle with machine language on the assembly level, it is much easier to enter a BASIC program that reads the DATA statements and POKEs the numbers into memory.

Some of these *BASIC loaders*, as they are known, check to see if you've typed the numbers correctly with a *checksum*. The simplest checksum is just the sum of all the numbers in the DATA statements. If you make an error, your checksum will not match up. Some programmers make the task easier by calculating checksums every ten lines, so you can zero in on your errors. The Automatic Proofreader introduced in the October issue of COMPUTE!'s Gazette is a more sophisticated variation of the checksum concept.

But now there's an even better way than the Automatic Proofreader to enter programs written completely in machine language. "MLX" lets you type in long machine language listings with almost foolproof results. Using MLX, you enter the numbers from a special list that looks similar to BASIC DATA statements. MLX checks your typing on a line-by-line basis. It won't let you enter illegal characters when you should be typing numbers, such as an l for a 1 or an O for a 0. It won't let you enter numbers greater than 255 (which are not permitted in ML DATA statements). It *will* prevent you from entering the wrong numbers on the wrong line. In short, MLX should make proofreading obsolete!

In addition, MLX will generate a ready-to-use tape or disk file. You can then use the LOAD command to read the program into the computer, just like with any program. Specifically, you enter:

```
LOAD "program",1,1      (for tape)
```

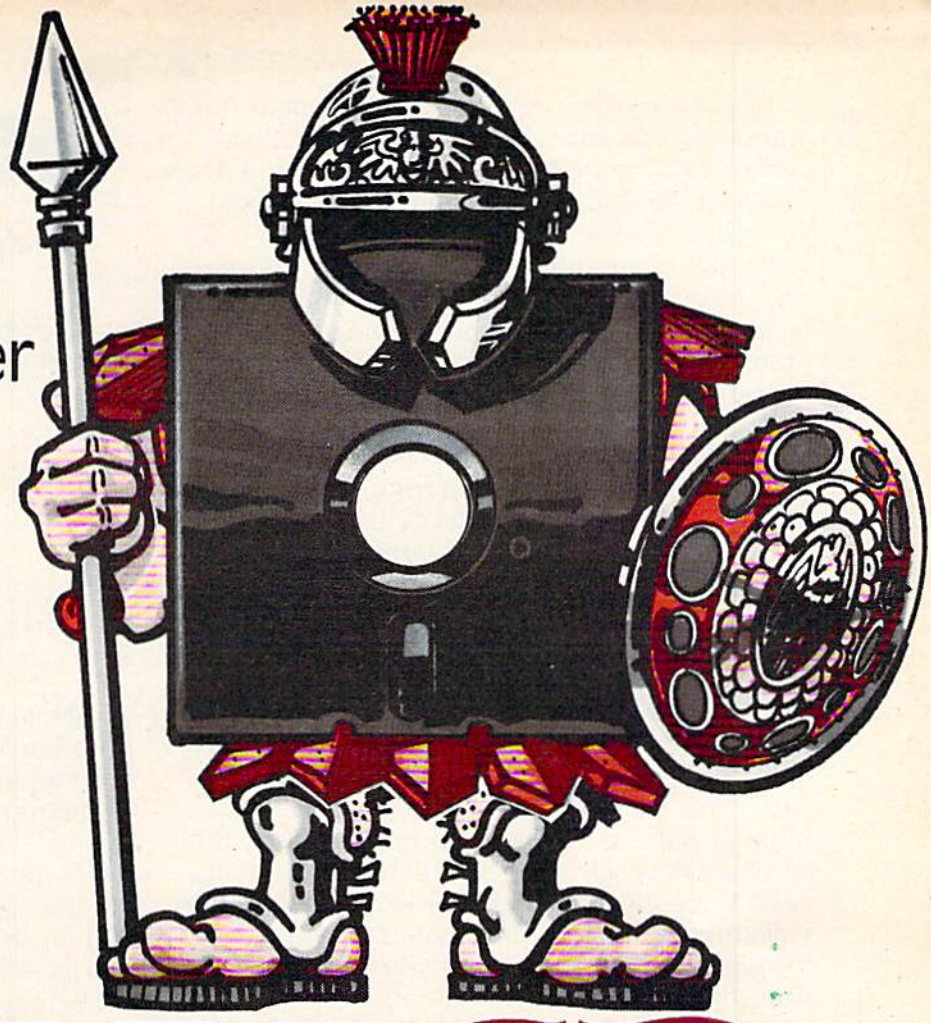
or

```
LOAD "program",8,1      (for disk)
```

To start the program, you need to enter a SYS command that transfers control from BASIC to machine language. The starting SYS will always be given in the article accompanying the machine language program.

To get started, type in and save MLX (you'll need it for future ML programs published in COM-

Mirage Concepts' Awesome New Data Base Manager Jumps to Every Command...



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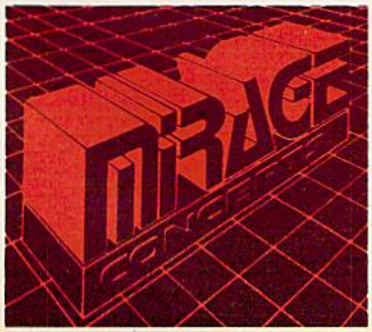

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PUTE!'s Gazette). Be sure to use the Automatic Proofreader to make sure you've typed in MLX correctly—MLX can't check itself. When you're ready to type in the ML program, such as the "Spike" game in this issue, run MLX. The program will ask you for two numbers: the starting address and the ending address. These vital numbers can be found in the article accompanying the ML program. The Spike article, for example, gives a starting address of 32768 and an ending address of 37295.

Next you'll see a prompt. The prompt is the current line you are entering from the listing. Each line is six numbers plus a checksum. If you enter any of the six numbers wrong, or enter the checksum wrong, the Commodore 64 will ring a buzzer and prompt you to reenter the line. If you enter it correctly, a pleasant bell tone will sound and you proceed to the next line.

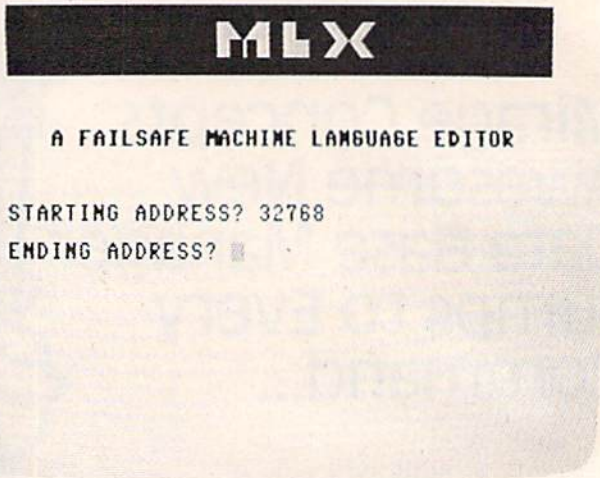
You are not using the normal Commodore 64 screen editor with MLX. For example, it will accept only numbers as input. If you need to make a correction, press the INST/DEL key; the entire number is deleted. You can press it as many times as necessary back to the start of the line. If you enter three-digit numbers as listed, the computer will automatically print the comma and prepare to accept the next number. If you enter less than three digits, by omitting beginning zeros, you can press either the comma, space bar, or RETURN key to advance to the next number. The checksum will automatically appear in inverse video; don't worry, it's highlighted for emphasis.

When testing MLX, we've found that it makes entering long listings extremely easy. With the audio cues provided, you don't even have to look at the screen if you're a touch-typist. We have tested MLX with people lacking any computer background whatsoever. No one has ever managed to enter a listing wrong with it.

When you finish typing, assuming you type the entire listing in one session, you can then save the completed program on tape or disk. Follow the screen instructions. If you get any errors while saving, you probably have a bad disk, or the disk is full, or you made a typo when entering the MLX program. (Remember, it can't check itself, though the Proofreader can.)

What if you don't want to enter the whole program in one sitting? MLX lets you enter as much as you want, save the whole schmeer, and then reload the file from tape or disk when you want to continue. MLX recognizes these few commands:

SHIFT-S: SAVE
SHIFT-L: LOAD
SHIFT-N: New Address
SHIFT-D: Display



With "MLX," typo-proof entry of machine language listings is virtually guaranteed.

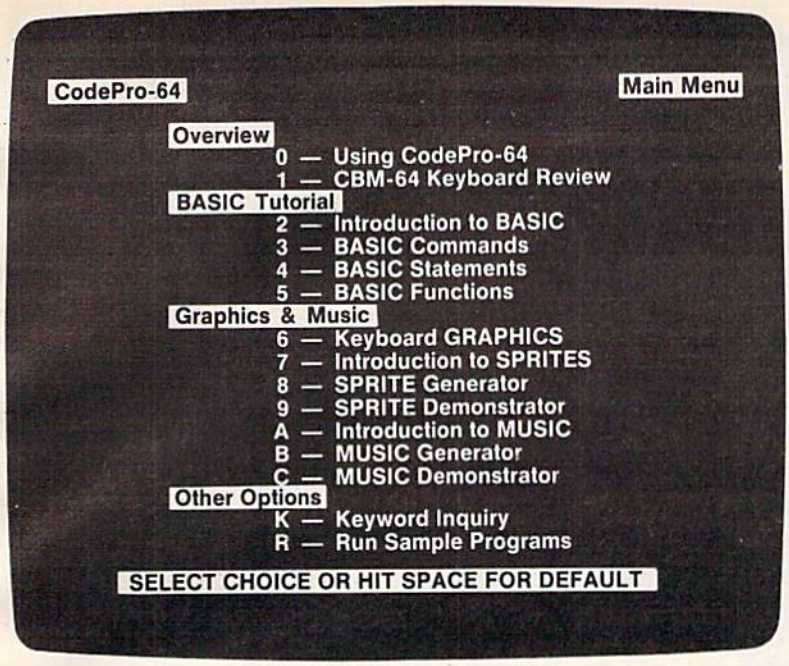
Hold down SHIFT while you press the appropriate key. You will jump out of the line you've been typing, so I recommend you execute these commands at a new prompt. Use the SAVE command to save what you've been working on. It will write the tape or disk file as if you've finished, but the tape or disk won't work, of course, until you finish the typing. *Remember what address you stop on.* The next time you run MLX, answer all the prompts as you did before, then insert the disk or tape. When you get to the entry prompt, press SHIFT-L to reload the file into memory. You'll then use the New Address command to resume typing.

Here's how the New Address command works. After you press SHIFT-N, enter the address where you previously stopped. The prompt will change, and you can then continue typing. Always enter a New Address that matches up with one of the line numbers in the special listing, or else the checksum won't match up.

You can use the Display command to display a section of your typing. After you press SHIFT-D, enter two addresses within the line number range of the listing. You can abort the listing by pressing any key.

The special commands may seem a little confusing, but as you work with MLX, they will become valuable. What if you forgot where you stopped typing, for instance? Use the Display command to scan memory from the beginning to the end of the program. When you see a bunch of 170s, stop the listing by pressing a key and continue typing where the 170s start. Some programs contain many sections of 170s. To avoid typing them, you can use the New Address command to skip over the blocks of 170s. Be careful, though, you don't want to skip over anything you *should* type.

You can use the MLX SAVE and LOAD com-



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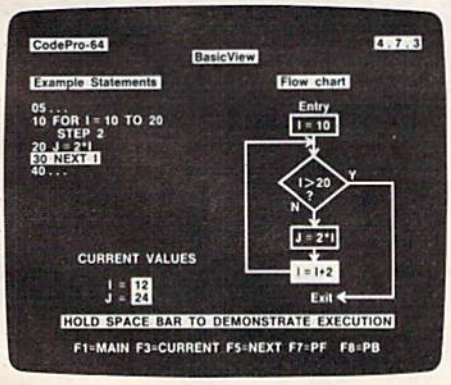

EXTENSIVE TUTORIAL

CodePro-64's extensive tutorial guides you through each BASIC command, program statement, and function. You get clear explanations. Then you enter program statements as interactive examples. Where appropriate, you invoke BasicView to see examples execute and watch their flow charts and variables change.

By seeing graphic displays of program segment execution you learn by visual example. You **learn faster and grasp programming concepts easier** with CodePro-64 because you immediately see the results of your input.

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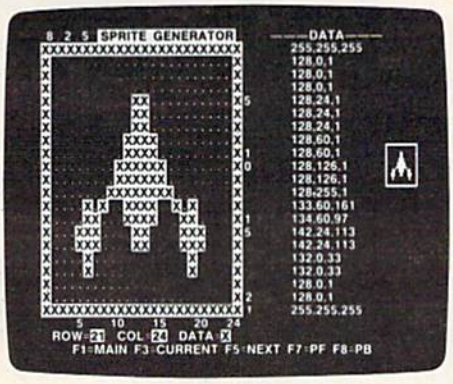
CodePro-64's sprite generator lets you **define your own sprites** on the screen. You learn how to define sprites and what data values correspond to your sprite definitions. (You can then use these values to write your own programs.) You can **easily experiment** with different definitions and make changes to immediately see the effects.



We also help you learn to program with sprites by giving you a **sprite demonstrator** so you can see the effect of changing register values. You can experiment by moving your sprite around in a screen segment, change its color or priority, and see the effects of your changes. You learn by visual examples.

MUSIC GENERATOR & DEMONSTRATOR

To teach you music programming CodePro-64 gives you an interactive music generator and demonstrator. First we help you set all your SID parameters (attack/decay, sustain/release, waveform, etc.). Then you enter notes to play and **we show your tune graphically as it plays,** note by note, on the scale. You learn by seeing and hearing the results of your input.

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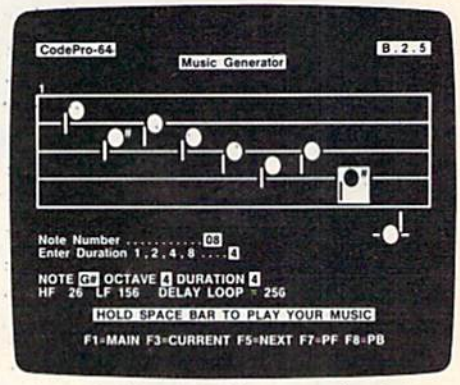

Our music demonstrator **lets you experiment** with various combinations of music programming parameters and hear the results. You can **quickly modify any of the SID register values** to hear the effects of the change. For example, you could easily change waveform and attack/decay values while holding all other SID values constant. By seeing your input and hearing the result you quickly learn how to create new musical sounds and special sound effects.

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mands to make copies of the completed ML program. Use LOAD to reload the tape or disk, then insert a new tape or disk and use the SAVE command to make a new copy.

One quirk about tapes made with the SAVE command: when you load them, the message "FOUND program" may appear twice. The tape will load just fine, however.

(Programmers will find MLX to be an interesting program in terms of protecting the user from mistakes. There is also some screen formatting. Most interesting is the use of ROM Kernal routines for LOADing and SAVEing blocks of memory. Just POKE the starting address [low byte/high byte] into 251 and 252, and POKE the ending address into 254 and 255. Any error code can be found in location 253—an error would be a code less than ten.)

We hope you will find MLX to be a true labor-saving utility. Since it has been thoroughly tested by entering actual programs, you can count on it as an aid for generating bug-free machine language. And be sure to save MLX; it will be used for future all-machine-language programs in COMPUTE!'s Gazette.

See program listing on page 229.

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HINTS&TIPS

Using The Period For Extra Speed

Mike Roth

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

As you may know, variables are faster than regular numbers, but they take up memory. What you may not know is that Commodore computers have a built-in "variable" that is always equal to zero and cannot be changed. It is even faster than regular variables and doesn't take a bite out of memory (sorry). It's the period (.).

```
X=INT(RND(1)*506)
```

Look at the above statement. It could be made much more efficient, but many programmers leave it like that. Now look at the next example:

```
X=INT(RND(.)*506)
```

It doesn't look very different from the first example, but it is about 29 percent faster. Even if a zero were used in the RND statement in the first example, the period still would be about six percent faster.

This wonderful, but overlooked feature can be used for more than random numbers, however. The period (.) can be used in place of the zero anytime that the zero is used as the entire number. This means that if you want the variable X to equal zero,

```
X=.
```

is correct. If you want X to equal 160, though,

```
X=16.
```

would *not* be correct. In the latter case, X would equal 16.

You now have a wonderful and easy-to-use trick which should significantly speed up many programs. Try going through a few programs and replacing the zeros with periods. You might be pleasantly surprised.

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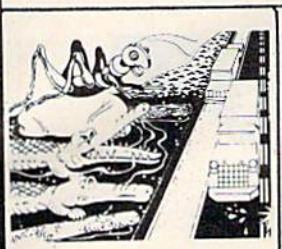

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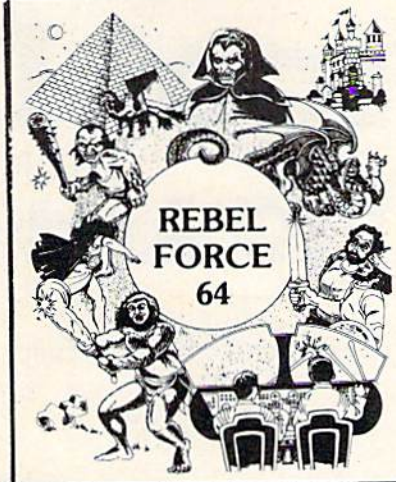

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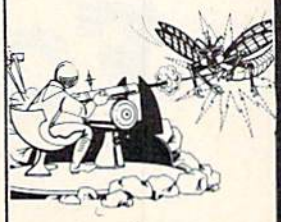

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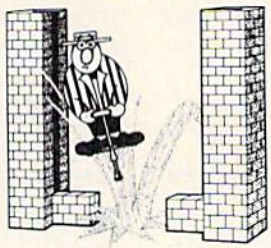

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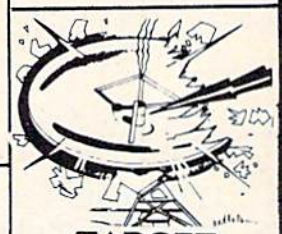

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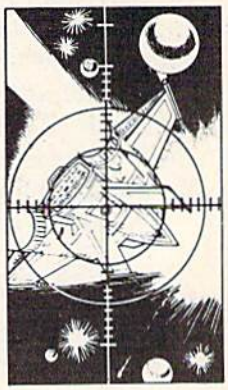

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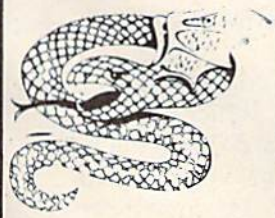

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Foolproof INPUT

For VIC And 64

Charles Brannon, Program Editor

This month's "Power BASIC" — a continuing series of useful utilities and routines — overcomes some of the problems of the INPUT statement. The program included is a short machine language routine that requires no special knowledge of machine language. Easy to use, it reprograms BASIC's own INPUT routine on either the VIC-20 or Commodore 64.

Problems With INPUT

You are probably familiar with some of the problems with the INPUT statement. First, it will not properly handle input with commas and colons. If you entered the previous sentence, the computer would accept only the word "First" and ignore the rest of the line (as the computer warns you with ?EXTRA IGNORED). This is because the comma is used to separate multiple INPUTs on the same line, as in this example:

```
INPUT "ENTER NAME: FIRST,LAST";A$,B$
```

The colon, too, triggers an ?EXTRA IGNORED message. Yet it cannot be used to separate INPUT items, so it appears to be some kind of a bug (error) in the BASIC language itself.

You can get around these problems somewhat, but they become especially annoying when you are trying to read a file on tape or disk containing these characters. In a mailing list program, for instance, you need commas for address fields such as "Greensboro, NC, 27403".

There are other difficulties with the INPUT statement as well. Quotation marks are not handled correctly. Leading and trailing spaces are stripped away. INPUT also allows people to use all the cursor and color control keys. Theoretically, you can place the cursor anywhere on the screen where there is something you want to INPUT, and press RETURN. In effect, this is what happens when you edit a program (the same INPUT routine is used by both the system and BASIC). But it just makes no sense to allow cursor moves all over the screen when you simply want the user to answer a question. If the user accidentally presses a cursor key and then tries to move the cursor back, the entire line, including any prompts, is read.

This can also be a problem when you have carefully laid out a screen format with blanks or boxes into which the user is supposed to enter information. You have no way to control how many characters the user can type, so if your blank space is only ten characters long, there is nothing to prevent someone from typing more. Not only that, but also with the standard INPUT routine, someone can move the cursor out of the box you want them to use, clear the screen entirely, or otherwise destroy your carefully planned screen format.

Improving On INPUT

What we need, then, is a new INPUT routine that will not allow cursor moves. The DEL key should still let the user delete characters to make corrections, however. Additionally, the ideal INPUT routine should let your program limit the number of characters typed, and allow commas and colons.

The usual solution is to write your own INPUT routine using the GET statement, which fetches one key at a time from the keyboard. With such a simple statement as GET, however, you have to reinvent the wheel anytime you need such a protected INPUT routine. And it certainly isn't as easy to use as a simple INPUT statement.

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Well, I certainly wouldn't bring such gloom to the scene without a solution. The accompanying program is the key. It works on both the VIC-20 and Commodore 64, and is a machine language routine that replaces the standard Commodore INPUT with a protected INPUT such as described above. The beauty of it is that after you GOSUB 60000, all INPUT (and INPUT#) statements are redefined. You don't have to understand how the machine language works in order to use it, and you don't have to rewrite any existing programs, other than to insert the GOSUB. You still have all the flexibility of the standard INPUT statement. Just add the subroutine to the end of your program.

The machine language program has a couple of niceties. After you GOSUB 60000, you can change the maximum number of characters allowed by POKEing memory location 252 with the length (don't POKE with zero, or more than 88). The cursor is an underline by default, but you can change the character used for the cursor by POKEing the ASCII value of the character you want into memory location 2. For example, to change the cursor into an asterisk, enter:

```
POKE 2,ASC("*")
```

When you use the routine to INPUT data from files, just remember that it strips away all control characters, from CHR$(0) to CHR$(31) and CHR$(128) to CHR$(159). This includes all special codes such as cursor controls, function keys, color codes, etc. You'll rarely write these to a standard data file, anyway.

You may be intrigued to find that this special INPUT routine even works in direct mode. You can still LIST and RUN, but cursor controls remain disabled. If you want the special INPUT routine out of your way, just press RUN/STOP-RESTORE.

See program listing on page 209.

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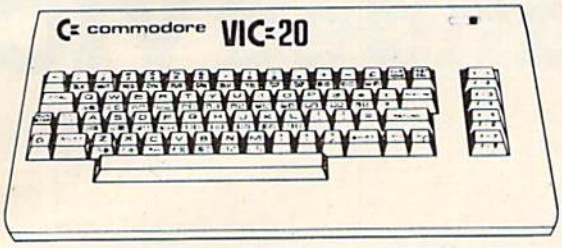

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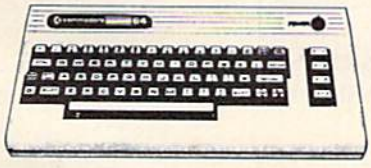

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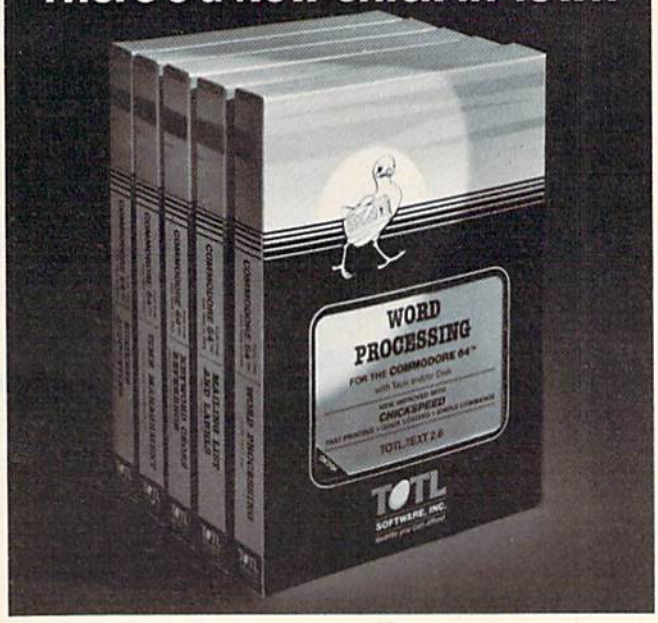

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DAN CARMICHAEL, ASSISTANT EDITOR

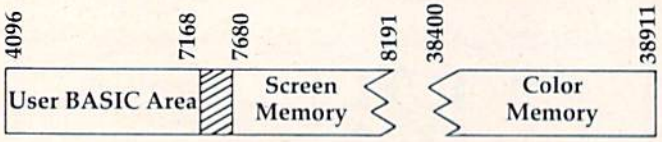
Custom Characters On The Expanded VIC

In this month's column, we'll show you how to set up the expanded VIC (8K or more) for custom characters.

The *VIC-20 Programmer's Reference Guide* has an entire section on creating custom characters on the unexpanded VIC. However, it only briefly touches upon how to set up the *expanded* VIC for custom characters. If you want to program custom characters on the expanded VIC, there are some important differences to learn.

Using custom characters in the unexpanded VIC is easy. The way memory is laid out is perfect for it. With BASIC programming memory running from 4096 to 7679, you can partition off, or "reserve," 512 bytes from the top of BASIC (7168 to 7679), enough for up to 64 custom characters. This, plus the fact that memory is neatly laid out (see Figure 1), makes the task easy.

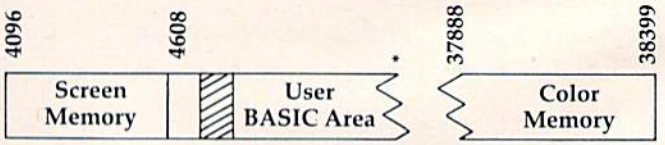
Figure 1:
Memory Map Of The Unexpanded VIC-20



= Custom Character Area

However, getting the (8K or more) expanded VIC-20 set up for custom characters takes a little more work. As you can see in Figure 2, adding an 8K or larger memory expander to the VIC-20 moves things around a bit. The start of BASIC programming memory moves from 4096 to 4608, and the area where BASIC was in the unexpanded VIC (4096 – 4607) is now screen memory. The color memory starting address also moves from 38400 to 37888.

Figure 2:
Memory Map Of The Expanded (8K Or More) VIC-20



= Custom Character Area = 5120 to 5632
*Depending on the size of memory expansion

Making custom characters in the expanded configuration should be easy. Just reserve 512 or more bytes at the top of BASIC memory as we did in the unexpanded VIC and go, right? Unfortunately, it's not that easy. The problem is that the VIC chip, the chip which determines where the VIC-20 gets its character information, cannot "see" expansion memory. Because of this limitation, we cannot put our custom characters anywhere in the VIC's expansion RAM.

The answer is to put the custom characters underneath the user BASIC area, in an area of memory accessible to the VIC chip. This is accomplished by moving BASIC memory up and reserving a block of memory for the custom characters.

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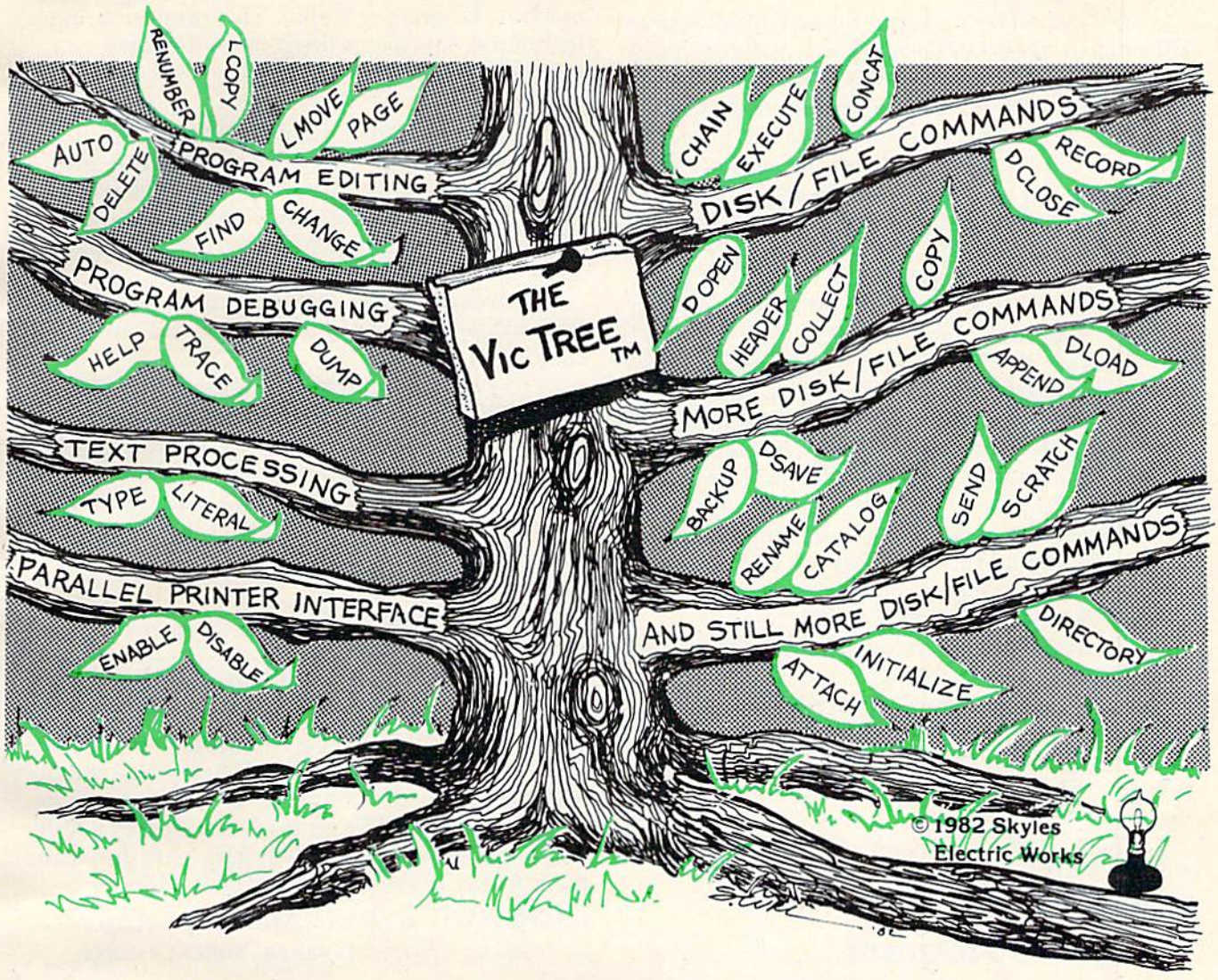

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Moving BASIC

The first part of our task is moving BASIC memory up a page or two (a *page* is a block of 256 bytes in memory). This is done with a few easy POKEs. First we'll POKE memory locations 43 and 44, which signal to the operating system where the *start of BASIC* is. When you add 8K or more expansion to the VIC, the values in 43 and 44 change to 1 and 18, respectively. This signals the system that the start of BASIC is at 4608. To make room for the custom characters, we'll POKE 43,1 and POKE 44,22. This tells the operating system that we now want the start of BASIC to begin at 5632.

Next we'll POKE memory locations 45 and 46. These two bytes tell the system where the *start of variables* is. The start of variables always stays a few bytes just past the end of your BASIC program, no matter how large the program grows. We'll POKE 45,3 and POKE 46,22.

Now we have to tell the operating system where we moved things. Bytes 641 and 642 signal where the *start of memory for the operating system* is. We'll POKE 641, 0 and POKE 642, 22.

The last thing we have to do is POKE zeros into the beginning of BASIC to signal the operating system that it's ready. We'll POKE 5632, 5633, and 5634 with zeros. These three zeros tell the system that this is the end of the BASIC program. Because there is no BASIC program in memory, the end *is* the beginning.

These POKEs will reserve 512 bytes (from 5120 to 5631) for our custom characters. This is enough memory to hold up to 64 characters.

Using The Program

Program 1 POKEs a short machine language routine into memory that sets all the necessary parameters in the expanded VIC for custom characters. The program simply performs all the POKEs we just discussed.

Program 1: Memory Setup

```
1 FORA=8192TO8224:READB:POKEA,B:NEXT
                                    :rem 6
2 PRINT"{CLR}{WHT}SYS8192:CLR{BLU}":POKE6
  31,19:POKE632,13:POKE198,2        :rem 62
5 DATA169,0,141,129,2,141,0,22,141,1,22,1
  41,2,22,169,1,133,43,169,3,133,45,169,2
  2,133                             :rem 97
6 DATA44,133,46,141,130,2,96,234    :rem 81
```

When you run Program 1, make sure no BASIC programs are in memory. You could lose all or part of the other program. Line 2 of Program 1 starts the machine language routine. It does this by PRINTing SYS8192:CLR at the top of the screen. Then, by POKEing CHR$(19) (cursor home) and CHR$(13) (carriage return) into the keyboard buffer (bytes 631–640), it fools the VIC into thinking you typed these commands from the keyboard. POKEing 198,2 tells the operating system to read the characters in the keyboard buffer, starting the machine language routine. This programming technique, known as the *dynamic keyboard*, is a very useful tool and will be discussed in a future column.

Type in Program 1, verify it carefully, and SAVE it. Be sure to SAVE it first, because after running, it will seem to disappear. Also check your DATA statements carefully, because an error in a machine language program can lock up your VIC.

Now enter RUN. After running, you are ready to LOAD in your BASIC program and create your custom characters.

To switch to the custom characters, POKE 36869,205. To switch back to standard character ROM, POKE 36869,192. If you wish to copy the first 64 characters from standard character ROM into your custom character area, add this line to your program:

```
10000 FOR P=5120 TO 5631: POKE P, PEEK
      (P+27648): NEXT
```

You can then change or delete them at will.

More Custom Characters

If 64 custom characters are not enough for you, you can enter Program 2. Program 2 works basically the same except it sets aside enough memory for 128 custom characters. They will reside from 5120 to 6143. With Program 2, the start of BASIC will move from 5632 to 6144, giving us the extra memory we need for 64 more characters.

Program 2: Extra Memory Setup

```
1 FORA=8192TO8224:READB:POKEA,B:NEXT
                                    :rem 6
2 PRINT"{CLR}{WHT}SYS8192:CLR{BLU}":POKE6
  31,19:POKE632,13:POKE198,2        :rem 62
5 DATA169,0,141,129,2,141,0,24,141,1,24,1
  41,2,24,169,1,133,43,169,3,133,45,169,2
  4,133                             :rem 105
6 DATA44,133,46,141,130,2,96,234    :rem 81
```

In Program 2, if you want to copy the first 128 characters from ROM into your custom character area, add this line to your BASIC program:

```
10000 FOR P=5120 TO 6143: POKE P, PEEK
      (P+27648): NEXT
```

Creating Custom Characters

Creating your custom characters is up to you. We won't go into the details here, but there are many good resources available, including the *VIC-20 Programmer's Reference Guide* and articles in last month's issue of COMPUTE!'s Gazette.

If you use Program 1, the 64 characters will go into memory between 5120 and 5631, and will correspond to screen POKE characters 0 (@) to 63 (?). If you use Program 2, the 128 characters will go into 5120–6143, and will correspond to characters 0 (@) to 127 (▀).

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CHARLES BRANNON
PROGRAM EDITOR

Tricky Business

After working with your computer for a while, you will begin to discover certain tricky techniques. I'll take the opportunity here to assemble some of my favorite tricks and review some others you may have overlooked.

Abbreviations

You may already know that you can use abbreviations to enter BASIC commands. The abbreviation consists of enough letters to distinguish it from any other command, then a shifted character of the command. The most common abbreviation is ? for PRINT. Another is L SHIFT-I for LIST. See the table accompanying this article for other common abbreviations. A complete list can be found in Appendix D of the user's guide that came with your computer.

Just as the question mark expands out to PRINT when you LIST the program, the other abbreviations also appear in their unabbreviated form. The abbreviations are convenient when entering programs, but some programmers use them to save memory.

You may wonder why you need to worry about memory conservation with 64K (38K for BASIC, of course) of RAM to work with. First of all, you always want to make your programs easy to type in if you intend to publish them (and shorter is better). Second, there is a programming maxim that states that a complex program will always expand to fill available memory, no matter how much you have. There is much truth in this, especially when you have a lot of data to hold in RAM.

Every new line of BASIC has five bytes of overhead beyond the programming on that line. So every time you fit another statement on the same line, you save four bytes. This can make quite a difference in a long program.

Unfortunately, if the programmer has really "crunched" a line, it will LIST out to be longer than 80 characters. The computer doesn't mind; internally, it can hold up to 255 characters (each keyword uses only one byte). But since the screen editor can work with up to only 80 characters, these lines cannot be easily edited. You usually have to reabbreviate and retype the part of the line that spills over 80 characters. This is hard for many beginners, so if you submit a program to COMPUTE!'s Gazette or COMPUTE!, try to keep your line length under 80 characters.

Instant RUN

You know that SHIFT-RUN/STOP will LOAD, then automatically RUN the next program from tape. It does this by feeding the letters LOAD ‹RETURN›, then RUN ‹RETURN› into the keyboard buffer. The computer then displays and executes these two commands as if you typed them in. One novelty is to prevent the LOAD from executing, then using the RUN to run your program. For example, type the letter A first, then press SHIFT-RUN/STOP. The computer will display:

```
ALOAD
?SYNTAX ERROR
READY.
RUN
[the program starts]
```

The ALOAD caused a syntax error, but the RUN is still in the keyboard buffer, so the program runs. This may be more trouble than it's worth, but there is another application for disk users. Just type the LOAD command for disk, type a colon, and press RUN/STOP, like this:

```
LOAD "PROOFREADER",8:‹SHIFT-RUN/STOP›
```

The computer ignores any command after a LOAD (the second LOAD generated by RUN/STOP), but since the RUN is still in the keyboard buffer, your program will automatically run after a load. This is handy: you can run some errand while you're waiting for the program to load, then come back with the program ready to use.

Emergency Reset

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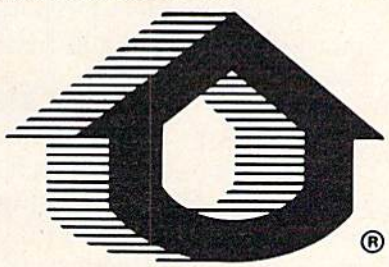

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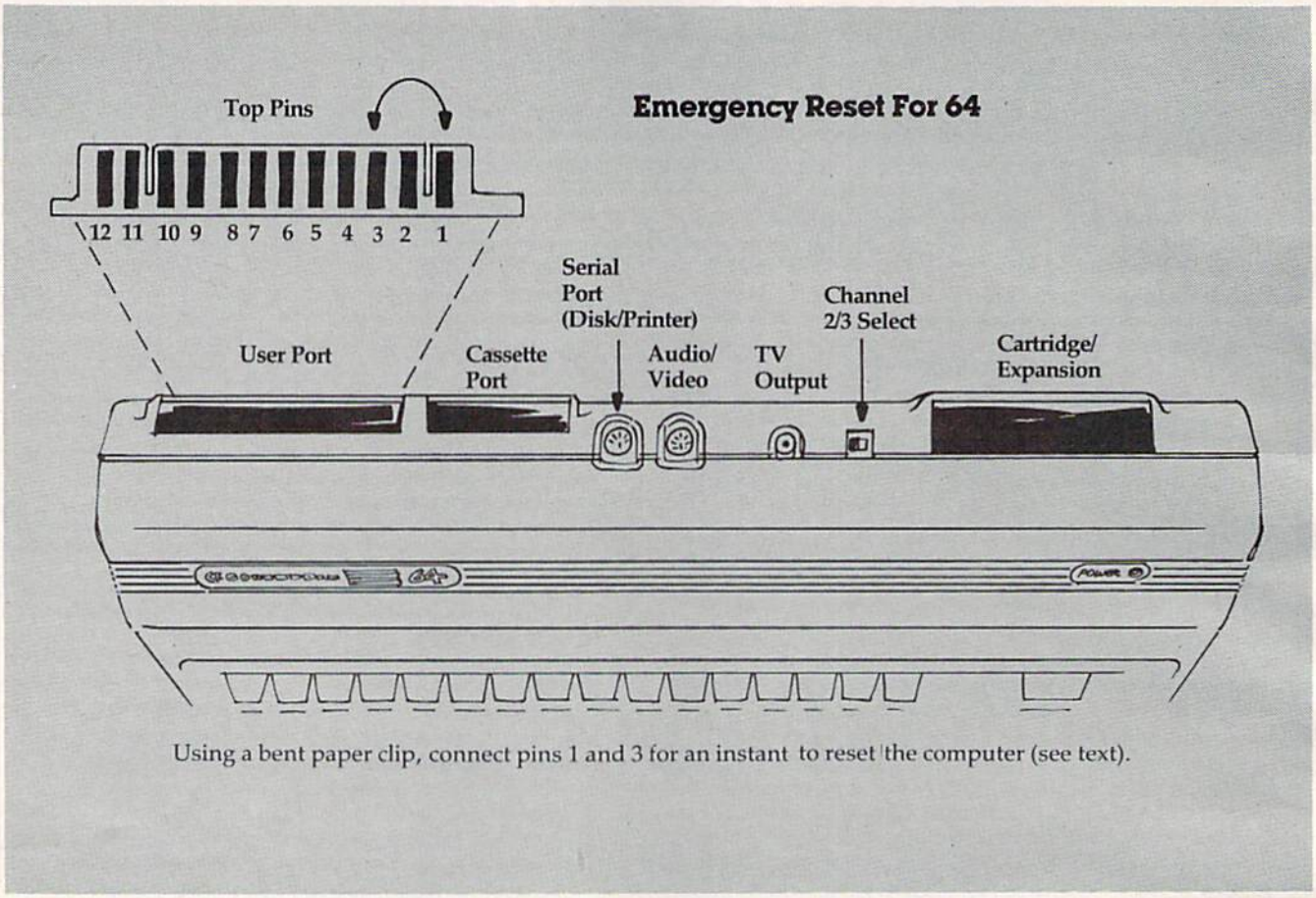

Using a bent paper clip, connect pins 1 and 3 for an instant to reset the computer (see text).

chance. There are two pins on the user port (the one the modem plugs into, not the cartridge slot) that you can *briefly* connect to reset your Commodore 64 (see figure). When you ground pins 1 and 3 together, the machine hiccups, then gives you the "*** COMMODORE BASIC V2 ***" message, implying your program is gone. And it is.

When you type LIST, there is nothing to be seen. I'm not playing a cruel trick on you, however. If you have previously typed in the "Program Lifesaver" from the November issue of COMPUTE!'s Gazette, you can LOAD "UNNEW",1,1 from tape or LOAD "UNNEW",8,1 from disk, SYS 525, and CLR to recover your program. This *warm reset* or *warmstart* does not clear memory; it just resets BASIC's pointers and variables. The Program Lifesaver unNEWs the program. You can then SAVE your resurrected program to tape or disk. If the lock-up was caused by memory being scrambled, you will get back only a garbled version of your program. This technique is useful only if the program in memory was left untouched by the lock-up.

Note: If you ground the incorrect pins when attempting to reset the computer, there is a chance you could blow a fuse within the 64. Replacing the fuse is simple enough, but it involves opening the case, which voids the warranty. It is highly unlikely that grounding the wrong pins will permanently damage the computer, but if you have any doubts about this procedure, do not try it.

Case Closed

You probably know that SHIFT-COMMODORE (press both SHIFT and the Commodore logo key) switches the machine from upper- to lowercase and vice versa. You can also do this from within a program by PRINTing either CHR$(14) for lowercase or CHR$(142) for uppercase. You can also lock and unlock either mode by disabling the SHIFT-COMMODORE sequence. This prevents confusion if the keys are accidentally pressed. Just PRINT CHR$(8) to lock the switch, and PRINT CHR$(9) to reenable SHIFT-COMMODORE.

Faster BASIC

There are many tricks to speed up program execution, such as packing many statements on one line, deleting extra spaces and REMs, etc. You should know that GOTO and GOSUB do not jump directly to the target line, but must search for the line from the top of the program. Therefore, you can gain speed by placing much-used subroutines at the top of a program (use GOTO to skip over the subroutines when the program is run).

Other techniques seem obvious when you examine them. For example, this line will POKE asterisks to screen memory to form a line going

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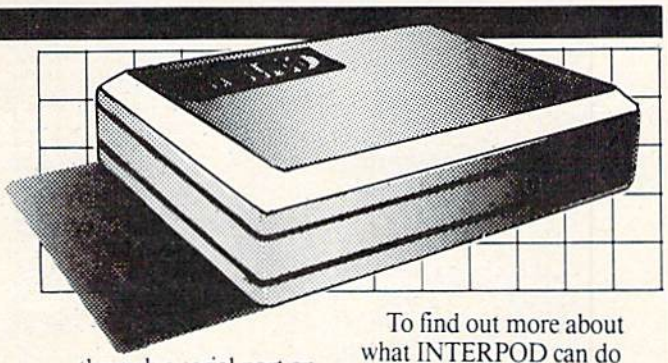

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Common Keyword Abbreviations

Keyword	Abbreviation
AND	A-SHIFT-N
ASC	A-SHIFT-S
CHR$	C-SHIFT-H
CLOSE	CL-SHIFT-O
CLR	C-SHIFT-L
CMD	C-SHIFT-M
DATA	D-SHIFT-A
DEF	D-SHIFT-E
DIM	D-SHIFT-I
FOR	F-SHIFT-O
GET	G-SHIFT-E
GOSUB	GO-SHIFT-S
GOTO	G-SHIFT-O
LEFT$	LE-SHIFT-F
LIST	L-SHIFT-I
LOAD	L-SHIFT-O
MID$	M-SHIFT-I
NEXT	N-SHIFT-E
NOT	N-SHIFT-O
OPEN	O-SHIFT-P
PEEK	P-SHIFT-E
POKE	P-SHIFT-O
PRINT	?
READ	R-SHIFT-E
RESTORE	RE-SHIFT-S
RETURN	RE-SHIFT-T
RIGHT$	R-SHIFT-I
RND	R-SHIFT-N
SAVE	S-SHIFT-A
SPC(	S-SHIFT-P
STEP	ST-SHIFT-E
STOP	S-SHIFT-T
STR$	ST-SHIFT-R
SYS	S-SHIFT-Y
TAB(	T-SHIFT-A
THEN	T-SHIFT-H
TIME	TI
TIME$	TI$
VERIFY	V-SHIFT-E

down the left side of your screen:

```
FOR I=0 TO 24:POKE 1024+I*40,42:POKE 55296+
I*40,1:NEXT
```

Each screen line is 40 bytes long, so the row number (0-24) is multiplied by 40 to reach each line. But addition is faster than multiplication in BASIC, so range the loop from 0 to 24*40 (960) with a STEP size of 40. The STEP, which defaults to one, is added to I when NEXT is executed. NEXT then checks to see if the variable I is greater than the number after TO in the FOR statement. So this line is faster:

```
FOR I=0 TO 960 STEP 40:POKE 1024+I,42:POKE
55296+I,1:NEXT
```

Techniques like these can speed up your program, but there is no better way to speed up a loop than to use variables in place of constants. For example, notice the difference in speed between this line:

```
FOR I=0 TO 999:POKE 1024+I,1:POKE
    55296+I,1:NEXT
```

and:

```
SC=1024:CM=55296:FOR I=0 TO 999:POKE
SC+I,1:POKE CM+I,1:NEXT
```

(By the way, NEXT by itself is faster than NEXT with a variable, such as NEXT I)

Finally, you can speed up a program by turning off the VIC-II chip, which steals time away from the 6510 microprocessor. Of course, when this happens, the TV screen goes blank. You can turn the VIC-II chip (and the screen) back on when you need to display again. In tests I've tried, the speed-up is about seven percent, not significant unless we're talking about a really long loop.

```
Disable VIC-II Chip: POKE 53265,PEEK(53265) AND 239
Enable VIC-II Chip: POKE 53265,PEEK(53265) OR 16
```

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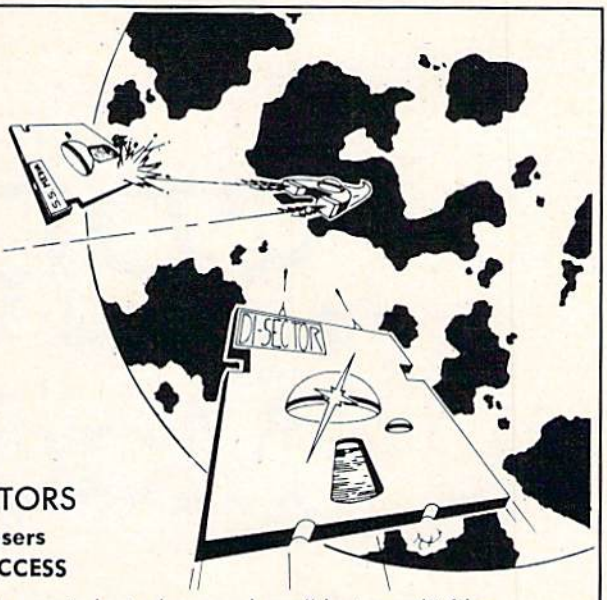

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SPRITES Made Easy

by Paul F. Schatz

If you've always wanted to create sprites on your Commodore 64, but have been put off by all the complicated POKEs, this article is your answer. It lets you modify BASIC to add three new sprite commands to make the job much easier. An accompanying side article also explains the rudiments of sprite design.

One of the most powerful features of the Commodore 64 is its sprite animation ability. Sprites, also called MOBs (for Movable Object Blocks), are in effect graphics blocks which you can sculpt into any shape and move about the screen. Since they move independently of the screen image and move more smoothly than custom characters, they are often used when creating games or demonstrating animation.

Sprites are accessed from BASIC by a series of POKEs. The Video Interface Controller (VIC-II chip) holds several registers which you manipulate to create and move sprites on your screen. Manipulating these VIC-II registers can get complicated, however, especially for the beginning programmer, because the routines require numerous POKEs for each sprite. Turning on and off various sprite functions can become confusing. Crossing the invisible *seam* on the 64's screen is especially cumbersome.

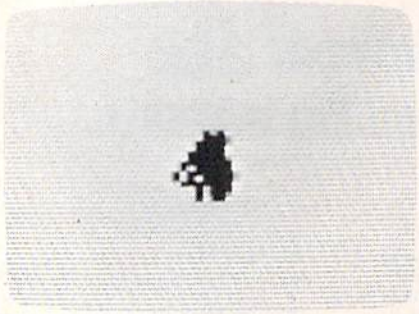
A solution is to add some new commands to BASIC to control the sprites. This article provides a method for adding three new commands to BASIC which will allow you to control sprites more easily.

If you're unfamiliar with the methods used to design and create sprites on the 64, refer to the accompanying article, "Sprite Creation," before you continue.

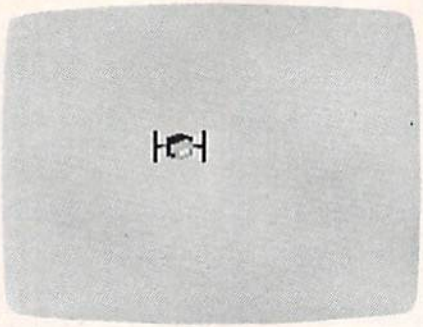
Modifying BASIC

The Commodore 64 is a flexible computer and it's possible to use the Random Access Memory (RAM) under the BASIC Read Only Memory (ROM) for a modified BASIC. You make a duplicate of BASIC, place it in RAM, and then modify "RAM BASIC" to suit your needs. The technique was outlined by Jim Butterfield in his article "Commodore 64 Architecture," which appeared in the January 1983 issue of COMPUTE! Magazine. It was also used in my article "Commodore 64 Hi-Res Graphics Made Simple," which appeared in the August 1983 issue of COMPUTE!'s Gazette. Refer to these two articles for other uses of this same process.

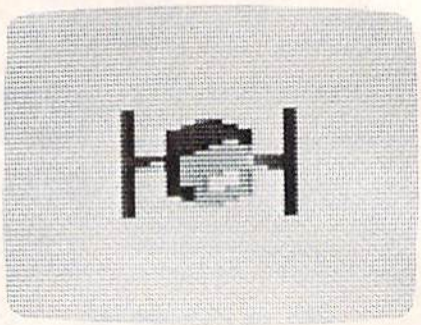
"Sprite BASIC," which I'll call my BASIC modification program, replaces three old keywords, LET, WAIT, and VERIFY, with three new keywords, OFF, MOVE, and SPRITE. Notice that the new keywords are the same length as the ones they replace. A new keyword has to be mapped exactly into the old keyword's spot in the keyword lookup table. Program 1 is the BASIC program which moves the BASIC ROM code to RAM, modifies it, and loads the new machine language routines into a safe area of memory. Machine language is an excellent method of programming sprite movements, since it is both very fast and very efficient. (Sprite BASIC extends from $C000 to $C0E2 in the machine language buffer.)



A close-up screen photo of the "butterfly" sprite created by Program 2.



Program 3 creates a "tie fighter" that can be maneuvered around the screen with a joystick.



Close-up of the tie fighter. Note how multicolor sprite graphics is used to simulate 3-D.

Sprite BASIC is loaded into the Commodore 64 by typing in and running Program 1. When typing it in, be as accurate as possible, since an incorrect number may cause the computer to crash when you type RUN. To clear this, you'd have to switch it off and on again, erasing anything you'd already entered. To be safe, SAVE the program before running it for the first time, and use the Automatic Proofreader.

It will take the computer a minute or so to run the program. Be patient. When the READY prompt appears again, type in:

```
POKE 1,54
```

This switches on Sprite BASIC. If you want to return to Commodore (your original) BASIC, simply type in:

```
POKE 1,55
```

Since you can switch from the old BASIC to Sprite BASIC within programs with these POKEs, your program can contain both the old and new BASIC command words.

Sprite BASIC is also switched off by pressing the RUN/STOP and RESTORE keys simultaneously. Because the new BASIC tokenizes the new keywords, make sure you have Sprite BASIC turned on as you enter your own program. The old keywords that were replaced cannot be used unless the old BASIC is switched back on.

The New Commands

After you've entered and switched on Sprite BASIC, you'll have three new commands available while you program sprites.

OFF ‹number›

This statement disables (turns off) the sprite designated by the number. Sprites are numbered from 0 to 7, so a number 8 or greater will give an ILLEGAL QUANTITY ERROR.

MOVE ‹number›, ‹number›, ‹number›

This new keyword enables (turns on) a sprite and places it at the desired location on the screen. The first number is the sprite's number (0-7). The next two numbers are the X and Y coordinates, respectively, of the sprite's upper-left corner. Because the sprite display area is larger than the screen area, the X coordinate must be 24 or greater, while the Y coordinate must be 50 or greater for the sprite to be fully visible. Allowed values for the X coordinate range from 0 to 511, although those greater than 344 are totally off the screen. Y values can range from 0 to 255, but numbers greater than 250 are completely off the screen. Any number greater than the accepted range will cause an ILLEGAL QUANTITY ERROR message.

SPRITE ‹number›, ‹number›, ‹number›, ‹number›

This new statement defines a sprite. The first number is the number of the sprite being defined. The second number is the 64-byte data block where the values used to actually draw the sprite are stored. This number can have values from 0 to 255. For example, sprite data stored in memory locations 832 to 895 (cassette buffer) is block 13 (832/64 = 13). The third number in this command is the color of the sprite. The color codes are:

0 Black	4 Purple	8 Orange	12 Med Gray
1 White	5 Green	9 Brown	13 Light Green
2 Red	6 Blue	10 Light Red	14 Light Blue
3 Cyan	7 Yellow	11 Dark Gray	15 Light Gray

The fourth number determines the size of the sprite. If the number is 0, the sprite is normal size. A 1 entered here doubles the sprite's width. If the number is 2, the sprite is doubled in height. Entering a 3 doubles *both* the width and the height.

Some Sample Programs

You're now ready to enter and run a couple of simple programs using Sprite BASIC. Both demonstrate how this new BASIC can be used for easy animation. The first program animates a sprite

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Sprite Creation On The 64

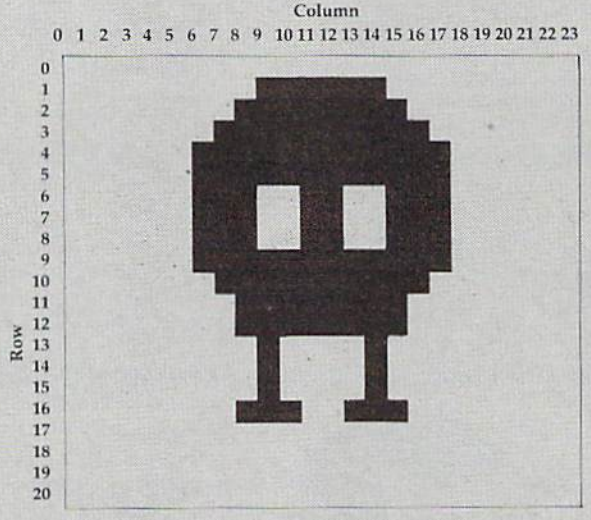
Gregg Keizer, Assistant Book Editor

Drawing Sprites

Creating a sprite is much like creating a custom character—it must be drawn. The 64 does not do this for you; you have to place the data information within a program for the computer to look at, and then *draw* the sprite on the screen.

A sprite is much larger than a custom character, consisting of a graphics block 24 pixels wide by 21 pixels high. A custom character is only an 8-by-8 pixel block. The information to draw a sprite uses more memory than a custom character because of its size, so fewer sprites can be displayed at a time. Eight sprites are available to you on the Commodore 64.

Just as when you create custom characters, you can use graph paper to design your sprites. Take a piece of graph paper and outline an area 24 blocks wide by 21 high. Simply fill in the blocks in the pattern to create a sprite. Figure 1 shows a sample sprite drawn in this way.

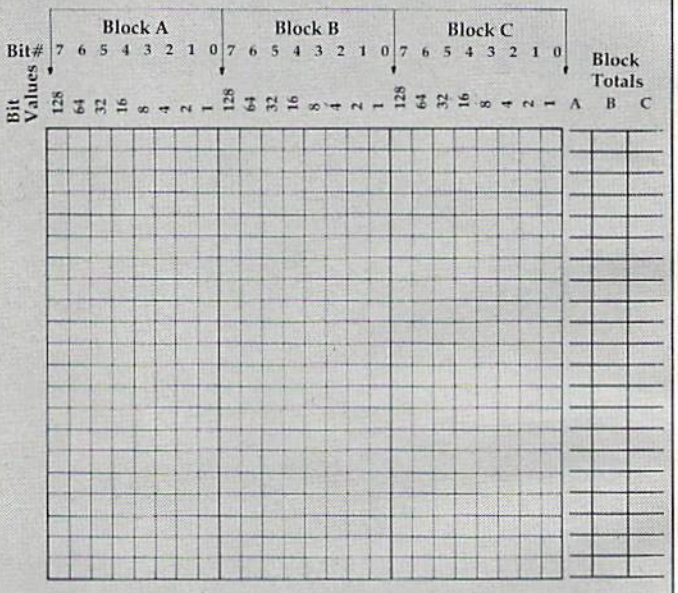


The blocks that are filled in will be *on*, or displayed in the color you later select for your sprite, while the empty blocks will be *off*, or shown in the screen's background color.

Drawing sprites is not enough for the computer, however. It cannot just look at something and display it on the screen. Instead, it needs numbers it can refer to which *tell* it what to create. You have to do this.

Bit Values

To come up with the numbers the 64 needs to draw your sprites, you'll have to do some addition. As when creating custom characters, to show some of a sprite's pixels *on* and others *off*, bits have to be set. It's not as hard as it sounds. Figure 2 shows you how it's done.

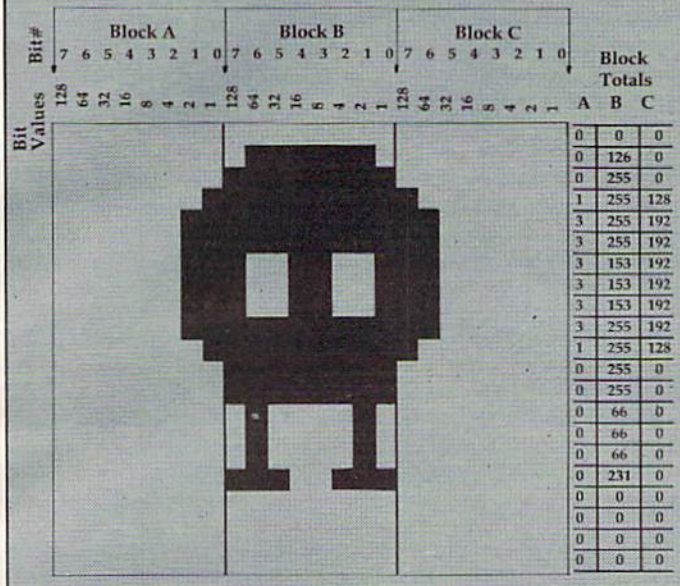


This is similar to the graph paper you used to design your sprite, only bit values have been assigned to each pixel. As in Figure 1, there are 24 columns and 21 rows. Each box represents one pixel in your sprite.

The similarity with custom characters ends here. Instead of only one eight-bit block in each row, a sprite has three. These have been named Block A, Block B, and Block C in Figure 2. When the 64 looks at the numbers to create a sprite, it starts with the eight-bit block in the upper-left corner, moves across the first row, and then jumps down to the left-most block on the next row. The last number it reads to create a sprite represents the bottom right corner of Block C.

Calculating the bit values to show a sprite is only a matter of adding together the values of

the bits you want *on*. Figure 3 shows the same sample sprite, but with its bit values computed.



The first row has none of its pixels on, so the bit value for all three bytes is 0. Row 2, however, has six bits in the Block B byte turned on. These bits, numbers 1 through 6, have a total bit value of 126 (2 + 4 + 8 + 16 + 32 + 64). The other two bytes, represented by Blocks A and C, are 0, since neither has any bits on.

Each byte is calculated in this same way. Remember that each row of a sprite consists of three bytes, and that each must be figured separately. Figure 2 makes this simple, for each byte has its own total column at the far right.

When you've finished computing the bit values for a sprite, you should have 63 numbers. These are the numbers the Commodore 64 will look at to display your sprite. Normally, you would insert them in a program in several DATA statements and have the computer READ from this table. For instance, using the numbers for the sample sprite, the DATA statements would look like this:

```
DATA 0,0,0,0,126,0,0,255,0
DATA 1,255,128,3,255,192,3,255,192
DATA 3,153,192,3,153,192,3,153,192
DATA 3,255,192,1,255,128,0,255,0
DATA 0,255,0,0,66,0,0,66,0
DATA 0,66,0,0,231,0,0,0,0
DATA 0,0,0,0,0,0,0,0,0,-1
```

(The -1 is used to fill up the 64-byte block each sprite occupies in memory. Without that additional number, you may get an error message.)

Every sprite you design is created like this. But once you have it designed, you have to POKE other values into the 64 to make it appear.

Normally, you would have to POKE values into the computer to do such things as enable the sprite (turn it on), locate the sprite's DATA in an available memory address, set its color, and finally, place it on the screen. This is where sprite creation becomes tedious. By modifying BASIC, you can get the Commodore 64 to do much of this for you. "Sprites Made Easy" gives a detailed description on how to make sprite control easier.

which appears as a butterfly by moving it as it changes its shape. Actually two sprites are used. The program displays first one, then the other, to simulate movement. To see this, LOAD and RUN SPRITE BASIC, type NEW, switch on the new BASIC, and enter Program 2. Before you RUN it, SAVE it on tape or disk.

A peculiarity of the Commodore 64 concerning sprites is that there are actually two separate sections of the screen for the X, or horizontal, coordinates. An invisible seam runs all the way down the screen immediately after the 255th X coordinate. Normally, you would have to POKE a value into an additional register each time a sprite moved across this seam. Notice, however, that you don't have to do this when you use Sprite BASIC. After you enter Program 2 and type RUN, it moves the sprite smoothly across the seam from left to right. This is one of the advantages of using something like SPRITE BASIC, for the computer does as much as possible for you.

To see a joystick-driven sprite, type in NEW and enter Program 3. Plug a joystick into port 2 and you'll be able to maneuver the tie fighter-shaped sprite across the screen.

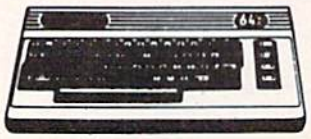
Just Starting

Using Sprite BASIC, you can create and move your own sprites with much more ease than if you had to POKE each register on your own. All you really have to do is design a sprite, calculate the DATA numbers, which allows the 64 to display it properly, and the new BASIC does all the rest.

This lets you concentrate on creating unique sprites, or in using them to your program's advantage. A game, for example, would be much easier to program, with sprites, using this new programming tool. Try some of your own sprites, perhaps simply replacing the DATA numbers in the sample programs with your own sprite information.

See program listings on page 240.

Happy Holiday Savings



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NEWS & PRODUCTS

Home Accounting Program

U.H.L. Research Associates has created a Commodore 64 version of its *Bill Writer/Summary* program.

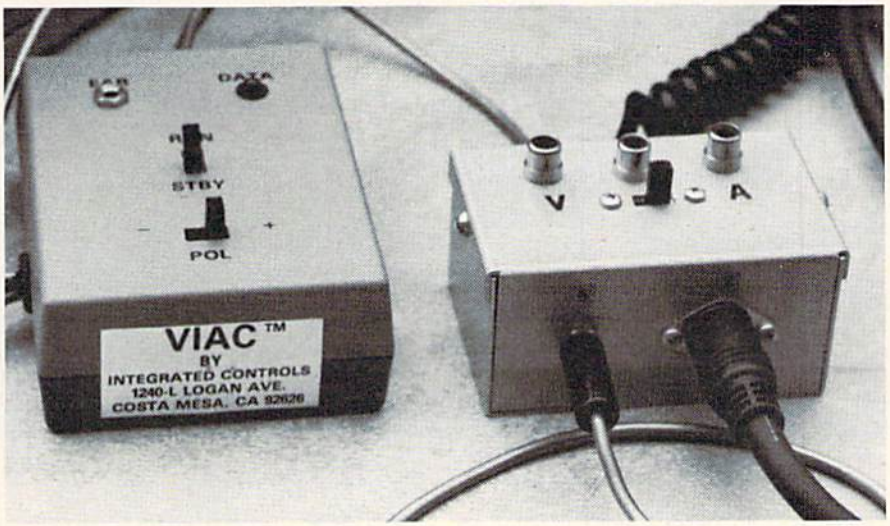
The program is designed as a home accounting system and check writer. Account data can be printed on screen or a printer, or saved to tape. No special checks are required if your printer can pull double 18-pound paper.

Bill Writer/Summary is available for the Commodore 64 or VIC-20 with 16K expansion for $29.95. An 80-column printer and cassette drive are required.

A more sophisticated version of the program is available for business use. *Business Billwriter/Summary* allows accounts to be separated into credit and debit categories. The business version, at $39.95, requires a Commodore 64 or a VIC-20 with 24K expansion, an 80-column printer, and a tape drive.

Also available from U.H.L. is *Home Math Analyzer,* which analyzes home loans, savings, and simple statistical data. The program, which sells for $19.95, is available for the 64 or VIC with 8K expansion.

U.H.L. Research Associates, Inc.
7926 Berner St.
Long Beach, CA 90808
(213) 493-1955



Integrated Controls' VIAC/VAAB Combo provides audio and video interfaces for the Commodore 64 and VIC-20 computers.

Audio And Video Interface

Integrated Controls has produced the VIAC/VAAB Combo, a system that allows VIC-20 or Commodore 64 owners to connect audio and video equipment to their computers.

The system lets users create programs that integrate voice or other audio sources for playback through the monitor speaker under program control. The VIAC/VAAB Combo sells for $64.95.

The elements of the combo also are available separately. The VIAC (VIC Interface to Any Cassette) provides an interface to any cassette recorder to LOAD/SAVE programs or make backup duplications of program tapes. The VIAC sells for $44.95.

The VAAB (Video/Audio Adapter Box) provides an easy connection to an audio/stereo system, video monitor, or video recorder. It sells for $24.95 assembled, or for $15.95 in kit form. Plans only are $5.95.

Integrated Controls
1240-L Logan Ave.
Costa Mesa, CA 92626
(714) 641-0181

Market Minder

Stock Helper is a Commodore 64 disk program designed to maintain a history of stock prices and market indicators.

The program, designed for

the "weekend investor," allows input and editing of up to 52 weeks of data on 100 stocks; input of prices in fractional, decimal, or eighths form; input of 52 weeks of data for 20 market indicators; display of price and indicator charts to screen or printer; sorting of stocks by market or name, and sorting of indicators by name.

The program sells for $30 plus $1.25 shipping. A VIC-20 version of the program is promised.

(M)agreeable Software, Inc.
5925 Magnolia Lane
Plymouth, MN 55442
(612) 559-1108

Learning The Keyboard

Boston Electronic Systems Training has released the *B*E*S*T Keyboard Coach* for the Commodore 64.

The audiovisual program uses colorful screen graphics and a cassette tape to lead the user around the 64's multi-faceted keyboard.

The program includes "Alpha-Speed," a touch-typing training game. *The B*E*S*T Keyboard Coach* sells for $19.95.

Boston Electronic Systems Training, Inc.
24 Munroe St.
Newtonville, MA 02160
(617)969-2378

Music Synthesis Software

Electronic Lab Industries has produced a trio of programs to make use of the Commodore 64's sound capabilities.

Note Pro II allows you to control the pitch of each of the 64's three voices. The program offers high-speed play (up to 450 notes per second), eight-measure treble clef display, eight-octave range, ADSR control, and arrangement capabilities. The program sells for $46.95 on tape, or $49.95 on disk.

Note Pro I is a similar, but less sophisticated program. *Note Pro I* has a four-octave range, and it creates files that are compatible with *Note Pro II*. The program is available for $24.95 on tape, or $27.95 on disk.

Note Pro Bridge provides a machine language subroutine which lets you play *Note Pro* songs or sound effects from within your own programs. *Note Pro Bridge* sells for $24.95 on tape, $27.95 on disk.

Electronic Lab Industries
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Flight Simulator

An IFR flight simulator is among the three new products introduced by Fantasy Computerware for the Commodore 64.

Flight 64 is an IFR simulator that turns your screen into a flight panel with displays including radar, altimeter, artificial horizon, and vertical speed indicator. The topography changes with every flight in this $15.95 program.

Datafile is a data base management program designed for address lists, collections, and general record keeping. Up to 200 five-field records can be managed by the program which includes tape and disk output routines. *Datafile* sells for $15.95.

Spellathon, a spelling tutor for all ages, sells for $19.95. The program includes a letter-scramble game and lets you build and save your own word lists.

For disk versions of the above programs, add $2.

Fantasy Computerware, Inc.
P.O. Box 451
Sioux Falls, SD 57101
(605) 335-7684

Two-Player Space Game

Stellar Triumph, a machine language space-wars game for the Commodore 64, pits two players against each other amid asteroids, aliens, and mysterious force fields.

The playing environment — gravity, thrust, missile configurations, space objects, fuel, ammunition, and aliens — can be preselected by the players.

The screen display uses sprite and bitmapped graphics. *Stellar Triumph* is available on tape or disk for $25.

H.A.L. Labs
4074 Midland Road, Suite 23
Riverside, CA 92505

CP/M For The 64

A CP/M interface card for the Commodore 64 is available from Estes Engineering.

The card, which plugs into the expansion port, is sold in a variety of formats; the interface card with an 8-inch disk drive is available for $599; the interface card with a 5¼-inch disk drive is available for $499; and the interface card alone is available for $349.

Estes Engineering, Inc.
P.O. Box 753
Salina, KS 67402
(913) 827-0629

Numbers By Computer

The Math Teacher is a math tutorial program for students from first grade through junior high school. The program, for the Commodore 64, presents 25 math problems per session.

The Math Teacher, which sells for $39.95, covers addition, subtraction, multiplication, and division, and offers four skill levels.

CompuTech
P.O. Box 7000-309
Redondo Beach, CA 90277

Manage The Mail

The *Mail Management* program from Avastar Software combines mail file maintenance, letter processing, and custom letters into one program for the Commodore 64.

The menu-driven program includes flexible data entry routines and comes with a guide outlining sample transactions, a field dictionary, and an error message section.

The program's report section allows for custom selection and sorting, and the program can maintain 600 records and five letters on one disk. It is available for $34.95.

Avastar Software Products
Box 203
Hasbrouck Heights, NJ 07604
(201) 592-5857

Language Translator

Household Spanish is a program designed to simplify communication between English- and Spanish-speaking people. It runs on the VIC-20.

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Type a word in one language on the screen, and the program supplies the translation.

Household Spanish requires 8K expansion and includes a two-sided cassette with an English-Spanish vocabulary of more than 500 words. The program sells for $24.95.

RS Computer Programs
P.O. Box 9801
Marina Del Rey, CA 90292

Speed Reader

Speed Reader II, a program to increase reading speed and improve comprehension, is available for the Commodore 64 from Davidson & Associates.

The program includes a timed reading test, warm-up exercises to strengthen eye muscles and enlarge eye span, lessons in eye movement, column reading, and test reading.

Speed Reader II, which sells for $69.95, includes a data disk with 35 reading selections and an editor which allows the user to enter additional reading material. Additional data disks are available for junior high and upper elementary students.

Davidson & Associates
6069 Groveoak Place #14
Rancho Palos Verdes, CA 90274
(213) 378-7826

COMPUTE!'s Gazette *for Commodore welcomes announcements of new products for VIC-20 and Commodore 64 computers, especially products aimed at beginning to intermediate users. Please send press releases and photos well in advance to: Tony Roberts, Assistant Managing Editor,* COMPUTE!'s Gazette, *P.O. Box 5406, Greensboro, NC 27403.*

New product releases are selected from submissions for reasons of timeliness, available space, and general interest to our readers. We regret that we are unable to select all new product submissions for publication. Readers should be aware that we present here some edited version of material submitted by vendors and are unable to vouch for its accuracy at time of publication.

COMPUTE!'s Gazette Back Issues

JULY 1983: Commodore 64 Video Update, Snake Escape, Alphabug, VIC Marquee, Word Hunt, VIC Timepiece, product reviews, Learning To Program In BASIC, Quickfind, 64 Paddle Reader, Machine Language For Beginners, Enlivening Programs With Sound, Using Joysticks On The 64, Simple Answers To Common Questions, VICreations — Speedy Variables, 64 Explorer.

AUGUST 1983: Your First Hours With A Computer, Should You Join A Users Group, Guide To Commodore Users Groups, The Viper, Cylon Zap, product reviews, VIC/64 Mailing List, Word Spell, Global Scan For VIC/64, Machine Language For Beginners, VIC Title Screens, 64 Hi-Res Graphics Made Easy, VIC/64 Four-Speed Brake, Disk Menu, Using A 1540 Disk Drive With The 64, Playing Computer Music, Simple Answers To Common Questions, HOTWARE, VICreations — Caring For Disk Drives/Cassettes, 64 Explorer, News & Products.

SEPTEMBER 1983: Telecomputing Today, Telecomputing Glossary, Commodore's Nationwide Party Line, Commodore Bulletin Boards, Demon Star For VIC/64, Potholes, product reviews, Checkbook Reporter, States & Capitals Tutor For VIC/64, MiniTerm-20, TeleTerm 64, POKEing Graphics, Machine Language For Beginners, 64 Searcher, Better Commodore Input, Using The Function Keys, Simple Answers To Common Questions, HOTWARE, VICreations — Understanding Random Numbers.

OCTOBER 1983: The Anatomy Of Computers, Telegaming Today And Tomorrow, Commodore's Public-Domain Programs, Oil Tycoon, Re-Beep, product reviews, Aardvark Attack, Word Match, A SHIFTy Solution: The WAIT Command, Program Transfers, Machine Language For Beginners, Improved Paddle Reader Routine, How To Use Tape And Disk Files, Understanding 64 Sound — Part 1, Speeding Up The VIC, Simple Answers To Common Questions, HOTWARE, Horizons 64 — Improving 64 Video Quality, VICreations — Using The VIC's Clock, News & Products.

NOVEMBER 1983: Binary Numbers — Part 1, Getting Started With A Disk Drive — Part 1, Chicken Little, Martian Prisoner, product reviews, Munchmath, VIC Super Expander Graphics, 64 Aardvark Attack, 64 Timepiece, Connect The Dots, Custom Characters For VIC/64, Making Custom Characters On The 64, Making Custom Characters On The VIC, VIC/64 Program Lifesaver, Understanding 64 Sound — Part 2, Merging Programs On The 64, Tutorial On DATA, READ, RESTORE Statements, One-Touch Commands For The 64, VIC/64 Disk Defaulter, Machine Language For Beginners, Simple Answers To Common Questions, HOTWARE, VICreations — Animation With Custom Characters, Horizons 64 — Software And Hardware Reviews, News & Products, Automatic Proofreader.

Back issues of July, August, and September 1983 are $2.50 each. Issues from October forward are $3. Bulk rates are 6 issues for $15 or 12 issues for $30. All prices include freight in the U.S. Outside the U.S. add $1 per magazine order for surface postage. $4 per magazine for air mail postage. ALL BACK ISSUES ARE SUBJECT TO AVAILABILITY.

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A Beginner's Guide To Typing In Programs

What Is A Program?

A computer cannot perform any task by itself. Like a car without gas, a computer has *potential*, but without a program, it isn't going anywhere. Most of the programs published in *COMPUTE!'s Gazette* for Commodore are written in a computer language called BASIC. BASIC is easy to learn and is built into all VIC-20s and Commodore 64s.

BASIC Programs

Each month, *COMPUTE!'s Gazette* for Commodore publishes programs for both the VIC and 64. To start out, type in only programs written for your machine, e.g., "VIC Version" if you have a VIC-20. Later, when you gain experience with your computer's BASIC, you can try typing in and converting certain programs from another computer to yours.

Computers can be picky. Unlike the English language, which is full of ambiguities, BASIC usually has only one "right way" of stating something. Every letter, character, or number is significant. A common mistake is substituting a letter such as "O" for the numeral "0", a lowercase "l" for the numeral "1", or an uppercase "B" for the numeral "8". Also, you must enter all punctuation such as colons and commas just as they appear in the magazine. Spacing can be important. To be safe, type in the listings *exactly* as they appear.

Brackets And Special Characters

The exception to this typing rule is when you see the curved bracket, such as "{DOWN}". Anything within a set of brackets is a special character or characters that cannot easily be listed on a printer. When you come across such a special statement, refer to "How To Type In *COMPUTE!'s Gazette* Programs."

About DATA Statements

Some programs contain a section or sections of DATA statements. These lines provide information needed by the program. Some DATA statements contain actual programs (called machine language); others contain graphics codes. These lines are especially sensitive to errors.

If a single number in any one DATA statement is mistyped, your machine could "lock up," or "crash." The keyboard and STOP key may seem "dead," and the screen may go blank. Don't panic – no damage is done. To regain control, you have to turn off your computer, then turn it back on. This will erase whatever program was in memory, *so always SAVE a copy of your program before you RUN it*. If your computer crashes, you can LOAD the program and look for your mistake.

Sometimes a mistyped DATA statement will cause an error message when the program is RUN. The error message may refer to the program line that READs the data. *The error is still in the DATA statements, though.*

Get To Know Your Machine

You should familiarize yourself with your computer before attempting to type in a program. Learn the statements you use to store and retrieve programs from tape or disk. You'll want to save a copy of your program, so that you won't have to type it in every time you want to use it. Learn to use your machine's editing functions. How do you change a line if you made a mistake? You can always retype the line, but you at least need to know how to backspace. Do you know how to enter inverse video, lowercase, and control characters? It's all explained in your computer's manuals.

A Quick Review

1) Type in the program a line at a time, in order. Press RETURN at the end of each line. Use backspace or the back arrow to correct mistakes.

2) Check the line you've typed against the line in the magazine. You can check the entire program again if you get an error when you RUN the program.

3) Make sure you've entered statements in brackets as the appropriate control key (see "How To Type *COMPUTE!'s Gazette* Programs" elsewhere in the magazine.)

We regret that we are not able to respond to individual inquiries about programs, products, or services appearing in COMPUTE!'s Gazette *for Commodore due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear in the magazine, usually within eight weeks. If you have specific questions about items or programs which you've seen in* COMPUTE!'s Gazette *for Commodore, please send them to Gazette Feedback, P.O. Box 5406, Greensboro, NC 27403.*

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

Many of the programs which are listed in *COMPUTE!'s Gazette* contain special control characters (cursor control, color keys, inverse video, etc.). To make it easy to know exactly what to type when entering one of these programs into your computer, we have established the following listing conventions.

Generally, any VIC-20 or Commodore 64 program listings will contain bracketed words which spell out any special characters: {DOWN} would mean to press the cursor down key. {5 SPACES} would mean to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key would be underlined in our listings. For example, S would mean to type the S key while holding the shift key. This would appear on your screen as a "heart" symbol. If you find an underlined key enclosed in braces (e.g., {10 N}), you should type the key as many times as indicated (in our example, you would enter ten shifted N's).

If a key is enclosed in special brackets, [key], you should hold down the *Commodore key* while pressing the key inside the special brackets. (The Commodore key is the key in the lower left corner of the keyboard.) Again, if the key is preceded by a number, you should press the key as many times as necessary.

Rarely, you'll see a solitary letter of the alphabet enclosed in braces. These characters can be entered on the Commodore 64 by holding down the CTRL key while typing the letter in the braces. For example, {A} would indicate that you should press CTRL-A. You should never have to enter such a character on the VIC-20, but if you do, you would have to leave the quote mode (press RETURN and cursor back up to the position where the control character should go), press CTRL-9 (RVS ON), the letter in braces, and then CTRL-0 (RVS OFF).

About the *quote mode*: you know that you can move the cursor around the screen with the CRSR keys. Sometimes a programmer will want to move the cursor under program control. That's why you see all the {LEFT}'s, {HOME}'s, and {BLU}'s in our programs. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote (the double quote, SHIFT-2), you are in the quote mode. If you type something and then try to change it by moving the cursor left, you'll only get a bunch of reverse-video lines. These are the symbols for cursor left. The only editing key that isn't programmable is the DEL key; you can still use DEL to back up and edit the line. Once you type another quote, you are out of quote mode.

You also go into quote mode when you INSerT spaces into a line. In any case, the easiest way to get out of quote mode is to just press RETURN. You'll then be out of quote mode and you can cursor up to the mistyped line and fix it.

Use the following table when entering cursor and color control keys:

When You Read:	Press:	See:	When You Read:	Press:	See:	When You Read:	Press:	See:
{CLEAR}	SHIFT CLR/HOME		{CYN}	CTRL 4		[7]	C= 7	
{HOME}	CLR/HOME		{PUR}	CTRL 5		[8]	C= 8	
{UP}	SHIFT ↑ CRSR ↓		{GRN}	CTRL 6		{F1}	f1	
{DOWN}	↑ CRSR ↓		{BLU}	CTRL 7		{F2}	f2	
{LEFT}	SHIFT ←CRSR→		{YEL}	CTRL 8		{F3}	f3	
{RIGHT}	←CRSR→		[1]	C= 1		{F4}	f4	
{RVS}	CTRL 9		[2]	C= 2		{F5}	f5	
{OFF}	CTRL 0		[3]	C= 3		{F6}	f6	
{BLK}	CTRL 1		[4]	C= 4		{F7}	f7	
{WHT}	CTRL 2		[5]	C= 5		{F8}	f8	
{RED}	CTRL 3		[6]	C= 6				

The Automatic Proofreader

"The Automatic Proofreader" will help you type in program listings from COMPUTE!'s Gazette without typing mistakes. It is a short error-checking program that hides itself in memory. When activated, it lets you know immediately after typing a line from a program listing if you have made a mistake. Please read these instructions carefully before typing any programs in COMPUTE!'s Gazette.

Preparing The Proofreader

1. Using the listing below, type in the Proofreader. The same program works on both the VIC-20 and Commodore 64. Be very careful when entering the DATA statements — don't type an l instead of a 1, an O instead of a 0, extra commas, etc.

2. SAVE the Proofreader on tape or disk at least twice *before running it for the first time.* This is very important because the Proofreader erases this part of itself when you first type RUN.

3. After the Proofreader is SAVEd, type RUN. It will check itself for typing errors in the DATA statements and warn you if there's a mistake. Correct any errors and SAVE the corrected version. Keep a copy in a safe place — you'll need it again and again, every time you enter a program from COMPUTE!'s Gazette.

4. When a correct version of the Proofreader is RUN, it activates itself. You are now ready to enter a program listing. If you press RUN/STOP-RESTORE, the Proofreader is disabled. To reactivate it, just type the command SYS 886 and press RETURN.

Using The Proofreader

All VIC and 64 listings in COMPUTE!'s Gazette now have a *checksum number* appended to the end of each line, for example ":rem 123". *Don't enter this statement when typing in a program.* It is just for your information. The rem makes the number harmless if someone does type it in. It will, however, use up memory if you enter it, and it will confuse the Proofreader, even if you entered the rest of the line correctly.

When you type in a line from a program listing and press RETURN, the Proofreader displays a number at the top of your screen. *This checksum number must match the checksum number in the printed listing.* If it doesn't, it means you typed the line differently than the way it is listed. Immediately recheck your typing. Remember, don't type the rem statement with the checksum number; it is published only so you can check it against the number which appears on your screen.

The Proofreader is not picky with spaces. It will not notice extra spaces or missing ones. This is for your convenience, since spacing is generally not important. But occasionally proper spacing *is* important, so be extra careful with spaces, since the Proofreader will catch practically everything else that can go wrong.

There's another thing to watch out for: if you enter the line by using abbreviations for commands, the checksum will not match up. But there is a way to make the Proofreader check it. After entering the line, LIST it. This eliminates the abbreviations. Then move the cursor up to the line and press RETURN. It should now match the checksum. You can check whole groups of lines this way.

Special Tape SAVE Instructions

When you're done typing a listing, you must disable the Proofreader before SAVEing the program on tape. Disable the Proofreader by pressing RUN/STOP-RESTORE (hold down the RUN/STOP key and sharply hit the RESTORE key). This procedure is not necessary for disk SAVEs, *but you must disable the Proofreader this way before a tape SAVE.*

SAVE to tape erases the Proofreader from memory, so you'll have to LOAD and RUN it again if you want to type another listing. SAVE to disk does not erase the Proofreader.

Replace Original Proofreader

If you typed in the original version of the Proofreader (October 1983 issue), you should replace it with the improved version below. We added a POKE to the original version to protect it from being erased when you LOAD another program from tape. The POKE does protect the Proofreader, and the Proofreader itself was not affected. However, a quirk in the VIC-20's operating system means that programs typed in with the Proofreader and SAVEd on tape cannot be LOADed properly later. If you LOAD a program SAVEd while the Proofreader was in memory, you see ?LOAD ERROR. This applies only to VIC tape SAVEs (disk SAVEs work OK, and the quirk was fixed in the Commodore 64).

If you have a program typed in with the original Proofreader and SAVEd on tape, follow this special LOAD procedure:

1. Turn the power off, then on.

2. LOAD the program from tape (disregard the ?LOAD ERROR).

3. Enter: POKE 45,PEEK(174):POKE 46,PEEK(175):CLR

4. ReSAVE the program to tape.

The program will LOAD fine in the future. We strongly recommend that you type in the new version of the Proofreader and discard the old one.

Automatic Proofreader For VIC And 64

```
100 PRINT"{CLR}PLEASE WAIT...":FORI=886TO
    1018:READA:CK=CK+A:POKEI,A:NEXT
110 IF CK<>17539 THEN PRINT"{DOWN}YOU MAD
    E AN ERROR":PRINT"IN DATA STATEMENTS.
    ":END
120 SYS886:PRINT"{CLR}{2 DOWN}PROOFREADER
     ACTIVATED.":NEW
886 DATA 173,036,003,201,150,208
892 DATA 001,096,141,151,003,173
898 DATA 037,003,141,152,003,169
904 DATA 150,141,036,003,169,003
910 DATA 141,037,003,169,000,133
916 DATA 254,096,032,087,241,133
922 DATA 251,134,252,132,253,008
928 DATA 201,013,240,017,201,032
934 DATA 240,005,024,101,254,133
940 DATA 254,165,251,166,252,164
946 DATA 253,040,096,169,013,032
952 DATA 210,255,165,214,141,251
958 DATA 003,206,251,003,169,000
964 DATA 133,216,169,019,032,210
970 DATA 255,169,018,032,210,255
976 DATA 169,058,032,210,255,166
982 DATA 254,169,000,133,254,172
988 DATA 151,003,192,087,208,006
994 DATA 032,205,189,076,235,003
1000 DATA 032,205,221,169,032,032
1006 DATA 210,255,032,210,255,173
1012 DATA 251,003,133,214,076,173
1018 DATA 003
```

Bug-Swatter:
Modifications And Corrections

• **Important:** If you are still using the original version of the "Automatic Proofreader" (October), please switch to the improved version published last month and in this issue. Carefully read the new instructions. VIC-20 tape users experiencing problems with the original version of the Proofreader should also read the corrective measures in the new Proofreader article.

• In the Commodore 64 version of "Oil Tycoon" (October), a comma is missing after the word "space" in line 130 on page 147. The program works fine without the comma, but since the Automatic Proofreader expects to see it, the checksum number won't match when you type the line. The comma was mistaken for a smudge of ink by our printers and removed from the page.

• The article "Potholes" for the VIC-20 and Commodore 64 (September) stated that the street commissioner's car leaves behind new potholes as it travels. This was in error. Once you clear a pothole from a street, it is not replaced unless you collide with the street commissioner's car and trigger a new screen. Also, many VIC readers called to say there were missing lines from the initialization program (Program 1), because the line numbers do not match the program description on page 66. The description is in error; the program works OK.

Reader Harry Metz sent us the following modification for the 64 version of Potholes. By adding these lines, the game works with a joystick plugged into port two instead of the keyboard:

```
300 JV=PEEK(56320)
305 JV=15-(JV AND 15)
310 IF JV=0 THEN HA=4:RETURN
315 IF JV=1 THEN P=0:GOTO 360
320 IF JV=2 THEN P=1:GOTO 360
330 IF JV=4 THEN P=2:GOTO 360
340 IF JV=8 THEN P=3:GOTO 360
```

• To modify "States & Capitals Tutor" (September) for disk, change the second number in the OPEN statements in line 5 (Program 1) and line 40 (Program 2):

```
5 OPEN1,8,0,"STATES"
40 OPEN1,8,1,"STATES"
```

• Reader Joel M. Rubin has modified "Commodore 64 Hi-Res Graphics Made Simple" (August) to speed up the initialization. The following three lines create a machine language subroutine that cuts the waiting time from 38 seconds to four seconds when you first type RUN:

```
30 FORI=828TO851:READN:POKEI,N:NEXT:SYS82
   8
32 DATA160,0,132,97,169,160,133,98,177,97
   ,145,97,200,208,249,230,98
34 DATA165,98,201,192,208,241,96
```

• The Commodore 64 version of "Cylon Zap" (August) lists the high scorers in the wrong order. Make this change:

```
2155 IFSC>=W2ANDSC<W1THENA5$=A4$:A4$=A3$:
     A3$=A2$:W5=W4:W4=W3:W3=W2:W2=SC:GO27
     40
```

Bowling Champ

(Article on page 84.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1:

Bowling Champ — VIC Version

```
10 POKE36878,15:L(1)=7747:L(2)=7791:L(3)=
   7835:C$(1)="{HOME}{10 DOWN}{6 RIGHT}"
                                    :rem 155
11 C$(2)=C$(1)+"{11 RIGHT}":C$(3)=C$(1)+"
   {DOWN}":C$=C$(1)                 :rem 178
12 SC=36879:CO=30720:V1=36876:SC(1)=152:S
   C(2)=10:SC(3)=126                :rem 154
20 POKESC,27                        :rem 188
110 PRINT"{CLR}{BLU}"C$"{5 UP}{RIGHT}BOWL
    ING!"                           :rem 229
112 PRINT"{5 DOWN}HOW MANY PLAYERS (1-3)
                                    :rem 189
113 GETA$:A=VAL(A$):IFA<1ORA>3THEN113
                                    :rem 185
115 X$="NAMES":IF A=1 THEN X$="NAME"
                                    :rem 205
118 PRINT"{CLR}{DOWN}TYPE IN YOUR ";X$
                                    :rem 238
120 FORX=1TOA                        :rem 36
121 PRINT"{DOWN}PLAYER"X":";         :rem 84
122 INPUTA$(X)                       :rem 51
123 A$(X)=LEFT$(A$(X),5):NEXT       :rem 105
128 PRINT"{CLR}{UP}{RVS} {BLU}1 2 3 4 5 6
     7 8 9 10 {OFF}{PUR} ";:FORX=1TO10:PR
    INT"{RVS}1{OFF}2";:NEXT:PRINT"{RVS}3
    {OFF}";                         :rem 54
132 PRINT"{BLU} DDDDDDDDDDDDDDDDDDDD
```

```
    {DOWN}DDDDDDDDDDDDDDDDDDDD":ON-(A=1)
    GOTO138                          :rem 152
134 PRINT" DDDDDDDDDDDDDDDDDDDD":ON-(A=2
    )GOTO138                         :rem 87
136 PRINT" DDDDDDDDDDDDDDDDDDDD  :rem 93
138 PRINTLEFT$(C$,11)+A$(1)":"       :rem 78
146 IFA>1THENPRINTTAB(10)+"{RIGHT}{UP}"+A
    $(2)":"                          :rem 205
150 IFA>2THENPRINTA$(3)":"           :rem 249
154 PRINTLEFT$(C$,11)"{2 DOWN}{BLU}FFFFFF
    FFFFFFFFFFFFFF{DOWN}{RIGHT}{8 DOWN}E
    EEEEEEEEEEEEEEEEEE{2 UP}        :rem 94
160 FORQ=1TO10                       :rem 65
166 FORZ9=1TOA:POKESC,SC(Z9)         :rem 14
167 FORX=1TO10:READV:POKEV,81:POKEV+CO,6:
    NEXT:RESTORE                     :rem 4
169 J=0:G=0                          :rem 69
170 GOSUB430:GOSUB550:P=L(Z9):GOSUB1000:L
    (Z9)=P                           :rem 108
172 GOSUB1200                        :rem 221
174 ON -(L(Z9)/2=INT(L(Z9)/2))GOTO169
                                     :rem 43
175 IF(PEEK(L(Z9)-1)=47ANDQ=10)=0THEN195
                                     :rem 38
178 PRINTLEFT$(C$,11)+"{7 DOWN}"+A$(Z9)+"
    , THROW"                         :rem 75
179 PRINT"ONE MORE!"                 :rem 168
180 FORX=1TO3000:NEXT                :rem 37
182 PRINTLEFT$(C$,11)+"{7 DOWN}"+"
    {13 SPACES}"                     :rem 18
183 PRINT"{13 SPACES}"               :rem 109
184 FORX=1TO10:READV:POKEV,81:POKEV+CO,6:
    NEXT:RESTORE                     :rem 3
190 J=0:GOSUB430:GOSUB550:T(Z9)=T(Z9)+J:P
    RINTC$(Z9);T(Z9)                 :rem 215
192 K=J+48:IFJ+PEEK(L(Z9)-1)-224=10THENK=
    47                               :rem 204
193 IFK=58THENK=152                  :rem 112
194 POKEL(Z9),K:POKEL(Z9)+CO,4:GOTO225
                                     :rem 54
195 U=0:IF(PEEK(L(Z9)-2)=152ANDQ=10)=0THE
    N225                             :rem 76
198 PRINTLEFT$(C$,11)+"{7 DOWN}"+A$(Z9)+"
    , THROW"                         :rem 77
199 PRINT"TWO MORE!"                 :rem 194
202 FORX=1TO3000:NEXT                :rem 32
203 PRINTLEFT$(C$,11)+"{7 DOWN}"+"
    {13 SPACES}"                     :rem 12
205 PRINT"{13 SPACES}"               :rem 104
206 L(Z9)=L(Z9)-1                    :rem 147
207 FORX=1TO10:READV:POKEV,81:POKEV+CO,6:
    NEXT:RESTORE                     :rem 255
209 J=0:GOSUB430:GOSUB550:T(Z9)=T(Z9)+J:P
    RINTC$(Z9);T(Z9)                 :rem 216
210 K=J+176:IFK=186THENK=152         :rem 109
211 POKEL(Z9),K:POKEL(Z9)+CO,4:L(Z9)=L(Z9
    )+1                              :rem 83
213 IFPEEK(L(Z9)-1)=152THENFORX=1TO10:REA
    DV:POKEV,81:POKEV+CO,6:NEXT:RESTORE
                                     :rem 147
214 U=U+1:ONUGOTO209,225             :rem 159
225 NEXTZ9:NEXTQ                     :rem 53
230 GOTO882                          :rem 112
430 N=8123:I=22                      :rem 20
440 POKEN,32:N=N+I:IFN<7988ORN>8124THENI=
    -I                               :rem 135
460 POKEN+30720,0-(PEEK(SC)=10):POKEN,81:
    GETA$:ON-(A$="")GOTO440:RETURN
                                     :rem 179
550 N=N+1:GETA$                      :rem 78
554 IFPEEK(N)<>81THEN595             :rem 166
558 Q2=N:GOSUB610                    :rem 1
560 POKEV1,150:POKEN-1,32:POKEN+CO,0-(PEE
    K(SC)=10):POKEN,81:POKEV1,0      :rem 73
562 FORW=1TO3                        :rem 31
566 IFPEEK(N-21*W)=81THENQ2=N-21*W:GOSUB6
    10                               :rem 74
569 IFPEEK(N+23*W)=81THENQ2=N+23*W:GOSUB6
    10                               :rem 77
572 NEXT                             :rem 221
595 H=H+1:POKEV1,150:POKEN-1,32:POKEN+CO,
    0-(PEEK(SC)=10):POKEN,81:POKEV1,0
                                     :rem 180
597 IFH=18THEN612                    :rem 234
600 FORSS=1TO50:NEXT:GOTO550         :rem 31
610 J=J+1:POKEV1,210:POKEQ2,32:FORK=1TO50
    :NEXT:POKEV1,0:FORK=1TO40:NEXT:RETURN
                                     :rem 11
612 H=0:POKEN,32:POKEN-1,32:RETURN:rem 86
882 PRINTC$;"{LEFT}{DOWN}{2 LEFT}{2 DOWN}
    {PUR}FINAL SCORES{DOWN}{BLU}"    :rem 36
883 PRINT"{5 RIGHT}"A$(1);T(1):IFA>1THENP
    RINT"{RIGHT}{DOWN}{4 RIGHT}"A$(2);T(2
    )                                :rem 18
884 IFA=3THENPRINT"{DOWN}{5 RIGHT}";A$(3)
    ;T(3)                            :rem 189
887 PRINT"{DOWN}{3 RIGHT}AGAIN (Y/N)?"
                                     :rem 166
894 GETA$:IFA$=""THEN{5 SPACES}894
                                     :rem 109
895 IFA$="Y"THENRUN                  :rem 152
896 PRINT"{CLR}":POKE36879,27:END    :rem 43
1000 G=J:IFP/2<>INT(P/2)THENG=G+176
    {5 SPACES}                       :rem 51
1002 IFG=186THENG=152                :rem 192
1004 IFP/2=INT(P/2)THENG=G+48{11 SPACES}
                                     :rem 192
1006 IFG+PEEK(P-1)-224=10THENG=47:rem 109
1012 POKEP,G:POKEP+CO,4:IFG=152THENP=P+1:
    G=0                              :rem 199
1100 P=P+1:RETURN                    :rem 21
1200 REM ** SCORING *                :rem 58
1201 T(Z9)=T(Z9)+J                   :rem 230
1205 T(Z9)=T(Z9)-J*(PEEK(L(Z9)-2)=47)
                                     :rem 20
1210 T(Z9)=T(Z9)-10*(PEEK(L(Z9)-3)=47ANDP
    EEK(L(Z9)-2)=152)                :rem 213
1220 IFL(Z9)=7746ORL(Z9)=7790ORL(Z9)=7834
    THEN1290                         :rem 93
1225 T(Z9)=T(Z9)-J*(PEEK(L(Z9)-4)=152)
                                     :rem 69
1227 T(Z9)=T(Z9)-J*(PEEK(L(Z9)-3)=152)
                                     :rem 70
1228 T(Z9)=T(Z9)-J*((PEEK(L(Z9)-5)=152AND
    PEEK(L(Z9)-3)=152))              :rem 72
1230 T(Z9)=T(Z9)-J*(PEEK(L(Z9)-6)=152 AND
     PEEK(L(Z9)-4)=152ANDPEEK(L(Z9)-2)=1
    52)                              :rem 159
1290 PRINTC$(Z9);T(Z9)               :rem 23
1300 RETURN                          :rem 164
2200 DATA 8007,8028,8049,8051,8070,8072,8
    093,8095,8116,8139               :rem 157
```

Program 2:

Bowling Champ — 64 Version

```
10 L(1)=1193:L(2)=1273:L(3)=1353:C$(1)="
   {HOME}{11 DOWN}{8 RIGHT}"         :rem 186
11 C$(2)=C$(1)+"{13 RIGHT}":C$(3)=C$(2)+"
   {13 RIGHT}":C$=C$(1)              :rem 85
```

```
12 BO=53280:SC=53281:CO=54272:SC(1)=15:SC
   (2)=0:SC(3)=7:BO(1)=13:BO(2)=2:rem 120
15 BO(3)=9                          :rem 241
17 FORT=COTOCO+24:POKET,0:NEXT:POKECO+24,
   15:POKECO+5,17:POKECO+6,241:POKECO,30
                                    :rem 128
18 POKECO+1,10                      :rem 19
110 POKEBO,6:POKE SC,7:PRINT"{CLR}{BLU}"C
   $"{5 UP}{8 RIGHT}BOWLING!"       :rem 110
112 PRINT"{5 DOWN}{9 RIGHT}HOW MANY PLAYE
   RS (1-3)                         :rem 194
113 GETA$:A=VAL(A$):IFA<1ORA>3THEN113
                                    :rem 185
115 X$="NAMES":IF A=1 THEN X$="NAME"
                                    :rem 205
118 PRINT"{CLR}{3 DOWN}{4 RIGHT}TYPE IN Y
   OUR ";X$                         :rem 132
120 FORX=1TOA                       :rem 36
121 PRINT"{DOWN}{5 RIGHT}PLAYER"X":";
                                    :rem 229
122 INPUTA$(X)                      :rem 51
123 A$(X)=LEFT$(A$(X),6):NEXT       :rem 106
128 PRINT"{CLR}{DOWN}{8 RIGHT}{RVS} {BLU}
   1 2 3 4 5 6 7 8 9 10{2 SPACES}{OFF}
   {WHT} ":PRINT"{9 RIGHT}";        :rem 73
129 FORX=1TO10:PRINT"{RVS}1{OFF}2";:NEXT:
   PRINT"{RVS}3{OFF}"               :rem 245
132 PRINTTAB(8)"{BLU} DDDDDDDDDDDDDDDDDDD
   DD":PRINTTAB(9)"{DOWN}DDDDDDDDDDDDDDD
   DDDDDD"                          :rem 139
133 ON-(A=1)GOTO138                 :rem 54
134 PRINTTAB(8)" {DOWN}DDDDDDDDDDDDDDDDDD
   DDD":ON-(A=2)GOTO138             :rem 200
136 PRINTTAB(8)" {DOWN}DDDDDDDDDDDDDDDDDD
   DDD                              :rem 206
138 PRINTLEFT$(C$,12)+" "+A$(1)":"
                                    :rem 190
146 IFA>1THENPRINTTAB(14)+"{UP}"+A$(2)":"
                                    :rem 180
150 IFA>2THENPRINTTAB(27)"{UP}"+A$(3)":"
                                    :rem 138
154 PRINTLEFT$(C$,12)"{2 DOWN}{BLU}FFFFFF
   FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF"
                                    :rem 108
156 PRINT"{9 DOWN}EEEEEEEEEEEEEEEEEEEEEE
   EEEEEEEEEEEEEEE"                 :rem 9
160 FORQ=1TO10                      :rem 65
166 FORZ9=1TOA:POKESC,SC(Z9):POKEBO,BO(Z9
   )                                :rem 169
167 FORX=1TO10:READV:POKEV,81:POKEV+CO,6:
   NEXT:RESTORE                     :rem 4
169 J=0:G=0                         :rem 69
170 GOSUB430:GOSUB550:P=L(Z9):GOSUB1000:L
   (Z9)=P                           :rem 108
172 GOSUB1200                       :rem 221
174 ON -(L(Z9)/2=INT(L(Z9)/2))GOTO169
                                    :rem 43
175 IF(PEEK(L(Z9)-1)=47ANDQ=10)=0THEN195
                                    :rem 38
178 PRINTLEFT$(C$,12)+"{7 DOWN}"+A$(Z9)+"
   , THROW ONE MORE!"               :rem 130
180 FORX=1TO3000:NEXT               :rem 37
182 PRINTLEFT$(C$,12)+"{7 DOWN}"+"
   {23 SPACES}"                     :rem 19
183 REM{2 SPACES}PRINT"{13 SPACES}"
                                    :rem 81
184 FORX=1TO10:READV:POKEV,81:POKEV+CO,6:
   NEXT:RESTORE                     :rem 3
190 J=0:GOSUB430:GOSUB550:T(Z9)=T(Z9)+J:P
   RINTC$(Z9);T(Z9)                 :rem 215
192 K=J+48:IFJ+PEEK(L(Z9)-1)-224=10THENK=
   47                               :rem 204
193 IFK=58THENK=152                 :rem 112
194 POKEL(Z9),K:POKEL(Z9)+CO,4:GOTO225
                                    :rem 54
195 U=0:IF(PEEK(L(Z9)-2)=152ANDQ=10)=0THE
   N225                             :rem 76
198 PRINTLEFT$(C$,12)+"{7 DOWN}"+A$(Z9)+"
   , THROW TWO MORE!"               :rem 156
202 FORX=1TO3000:NEXT               :rem 32
203 PRINTLEFT$(C$,12)+"{7 DOWN}"+"
   {23 SPACES}"                     :rem 13
206 L(Z9)=L(Z9)-1                   :rem 147
207 FORX=1TO10:READV:POKEV,81:POKEV+CO,6:
   NEXT:RESTORE                     :rem 255
209 J=0:GOSUB430:GOSUB550:T(Z9)=T(Z9)+J:P
   RINTC$(Z9);T(Z9)                 :rem 216
210 K=J+176:IFK=186THENK=152         :rem 109
211 POKEL(Z9),K:POKEL(Z9)+CO,4:L(Z9)=L(Z9
   )+1                              :rem 83
213 IFPEEK(L(Z9)-1)=152THENFORX=1TO10:REA
   DV:POKEV,81:POKEV+CO,6:NEXT:RESTORE
                                    :rem 147
214 U=U+1:ONUGOTO209,225            :rem 159
225 NEXTZ9:NEXTQ                    :rem 53
230 GOTO882                         :rem 112
430 N=1827:I=40                     :rem 24
440 POKEN,32:N=N+I:IFN<1624ORN>1868THENI=
   -I                               :rem 124
460 POKEN+CO,-(PEEK(SC)=240):POKEN,81:GET
   A$:ON-(A$="")GOTO440:RETURN      :rem 78
550 N=N+1:GETA$                     :rem 78
554 IFPEEK(N)<>81THEN595            :rem 166
558 Q2=N:GOSUB610                   :rem 1
560 POKECO+4,17:POKEN-1,32:POKEN+CO,-(PEE
   K(SC)=240):POKEN,81:POKECO+4,16
                                    :rem 43
562 FORW=1TO3                       :rem 31
566 IFPEEK(N-39*W)=81THENQ2=N-39*W:GOSUB6
   10                               :rem 92
569 IFPEEK(N+41*W)=81THENQ2=N+41*W:GOSUB6
   10                               :rem 77
572 NEXT                            :rem 221
595 POKECO+4,17:H=H+1:POKEN-1,32:POKEN+CO
   ,-(PEEK(SC)=240):POKEN,81:POKECO+4,16
                                    :rem 150
597 IF H=36 THEN 612                :rem 234
600 GOTO550                         :rem 105
610 J=J+1:POKECO+4,33:POKEQ2,32:FORT=1TO5
   0:NEXT:POKECO+4,32:RETURN        :rem 150
612 H=0:POKEN,32:POKEN-1,32:RETURN:rem 86
882 PRINTC$;"{3 DOWN}{PUR}FINAL SCORES
   {DOWN}{BLU}"                     :rem 77
883 PRINT"{9 RIGHT}"A$(1);T(1):IFA>1THENP
   RINT"{DOWN}{9 RIGHT}"A$(2);T(2)
                                    :rem 250
884 IFA=3THENPRINT"{DOWN}{9 RIGHT}";A$(3)
   ;T(3)                            :rem 49
887 PRINT"{DOWN}{7 RIGHT}AGAIN (Y/N)?"
                                    :rem 26
894 GETA$:IFA$=""THEN{5 SPACES}894
                                    :rem 109
895 IFA$="Y"THENRUN                 :rem 152
896 SYS2048                         :rem 116
1000 G=J:IFP/2<>INT(P/2)THENG=G+176
                                    :rem 51
1002 IFG=186THENG=152               :rem 192
1004 IFP/2=INT(P/2)THENG=G+48       :rem 192
1006 IFG+PEEK(P-1)-224=10THENG=47:rem 109
1012 POKEP,G:POKEP+CO,4:IFG=152THENP=P+1:
     G=0                            :rem 199
```

```
1100 P=P+1:RETURN                          :rem 21
1200 REM ** SCORING *                      :rem 58
1201 T(Z9)=T(Z9)+J                         :rem 230
1205 T(Z9)=T(Z9)-J*(PEEK(L(Z9)-2)=47)
                                           :rem 20
1210 T(Z9)=T(Z9)-10*(PEEK(L(Z9)-3)=47ANDP
     EEK(L(Z9)-2)=152)                     :rem 213
1220 IFL(Z9)=1272ORL(Z9)=1352ORL(Z9)=1432
     THEN1290                              :rem 57
1225 T(Z9)=T(Z9)-J*(PEEK(L(Z9)-4)=152)
                                           :rem 69
1227 T(Z9)=T(Z9)-J*(PEEK(L(Z9)-3)=152)
                                           :rem 70
1228 T(Z9)=T(Z9)-J*((PEEK(L(Z9)-5)=152AND
     PEEK(L(Z9)-3)=152))                   :rem 72
1230 T(Z9)=T(Z9)-J*(PEEK(L(Z9)-6)=152 AND
      PEEK(L(Z9)-4)=152ANDPEEK(L(Z9)-2)=1
     52)                                   :rem 159
1290 PRINTC$(Z9);T(Z9)                     :rem 23
1300 RETURN                                :rem 164
2200 DATA 1661,1700,1739,1741,1778,1780,1
     819,1821,1860,1901                    :rem 129
```

Space Duel

(Article on page 80.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: Space Duel For VIC-20

```
0 PRINT"{CLR}":FORI=6656TO6891:READA:POKE
  I,A:NEXT                                 :rem 188
1 GOSUB200:PRINT"{CLR}"                    :rem 225
3 POKE4,0:POKE2,0:POKE3,0                  :rem 225
4 FORI=7167TO7600:POKEI,0:NEXTI:POKE36869
  ,255                                     :rem 247
7 FORI=1TO8:POKE7662,0:NEXT                :rem 195
8 A$="{2 RIGHT}{PUR}222222222222222222
  {2 RIGHT}"                               :rem 178
9 C$="{2 RIGHT}{PUR}333333333333333333
  {2 RIGHT}"                               :rem 199
10 B$="{HOME}{22 DOWN}"                    :rem 209
11 D$="{2 RIGHT}{BLK}{18 SPACES}{2 RIGHT}
   ":POKE36879,8:F=80                      :rem 82
30 FORI=7747TO8099STEP22:POKEI,J:J=J+1:NE
   XT                                      :rem 206
35 FORI=7747+30720TO8099+30720STEP22:POKE
   I,3:NEXT                                :rem 163
40 J=33:FORI=7766TO8118STEP22:POKEI,J:J=J
   +1:NEXT                                 :rem 239
45 FORI=7766+30720TO8118+30720STEP22:POKE
   I,7:NEXT                                :rem 161
46 PRINT"{HOME}{RVS}{WHT}SCORE:"           :rem 27
50 SYS6656                                 :rem 59
52 PRINT"{HOME}{6 RIGHT}{RVS}{CYN}"PEEK(2
   )"{LEFT} ";TAB(17);"{YEL}"PEEK(3)"
   {LEFT} "                                :rem 165
54 FORT=1TO30:NEXT                         :rem 145
55 SYS6811                                 :rem 57
56 ONPEEK(4)GOSUB80                        :rem 154
57 SYS6864:ONPEEK(5)GOSUB100               :rem 214
58 SYS6772                                 :rem 66
60 GOTO50                                  :rem 4
80 A=PEEK(0)+33+3                          :rem 123
82 B=INT(A/8)-1:D=(A-B*8)+2                :rem 166
84 POKE7566+D,255                          :rem 170
90 IFD<7THENPRINTLEFT$(B$,B);A$:SYS6832:P
   RINTLEFT$(B$,B);D$:POKE7566+D,0
                                           :rem 117
91 H=PEEK(2)-1:IFH>-1THENPOKE2,H:GOTO93
                                           :rem 133
92 H=0                                     :rem 32
93 IFD>7THENPRINTLEFT$(B$,B+1);C$:SYS6832
   :PRINTLEFT$(B$,B+1);D$:POKE7566+D,0
                                           :rem 52
94 IFPEEK(7432+PEEK(0)+3)<>0THENGOSUB120
                                           :rem 93
95 RETURN                                  :rem 78
100 A=PEEK(1)+33+3                         :rem 165
102 B=INT(A/8)-1:D=(A-B*8)+2               :rem 207
103 POKE7566+D,255                         :rem 210
104 H=PEEK(3)-1:IFH>-1THENPOKE3,H:GOTO106
                                           :rem 221
105 H=0                                    :rem 75
106 IFD<7THENPRINTLEFT$(B$,B);A$:SYS6832:
    PRINTLEFT$(B$,B);D$:POKE7566+D,0
                                           :rem 163
107 IFD>7THENPRINTLEFT$(B$,B+1);C$:SYS683
    2:PRINTLEFT$(B$,B+1);D$:POKE7566+D,0
                                           :rem 96
109 IFPEEK(7168+PEEK(1)+3)<>0THENGOSUB140
                                           :rem 147
110 RETURN                                 :rem 114
120 POKE36878,15                           :rem 100
121 FORI=255TO130STEP-2:POKE36877,I:POKE3
    6879,INT(RND(1)*7)+8:NEXT              :rem 225
122 POKE2,PEEK(2)+10                       :rem 86
123 IFPEEK(2)=>FTHEN150                    :rem 83
124 POKE36879,8:POKE36877,0:RETURN:rem 41
140 POKE36878,15                           :rem 102
141 FORI=255TO130STEP-2:POKE36877,I:POKE3
    6879,INT(RND(1)*7)+8:NEXT              :rem 227
142 POKE3,PEEK(3)+10                       :rem 90
143 IFPEEK(3)=>FTHEN150                    :rem 86
144 POKE36879,8:POKE36877,0:RETURN:rem 43
150 PRINT"{HOME}{RVS}{WHT}SCORE:" :rem 71
152 PRINT"{HOME}{6 RIGHT}{RVS}{CYN}"PEEK(
    2);TAB(18);"{YEL}"PEEK(3):POKE36877,0
                                           :rem 233
154 POKE36879,8                            :rem 62
156 PRINT"{HOME}{2 DOWN}{RVS}{GRN}GAME OV
    ER!"                                   :rem 73
157 POKE198,0:WAIT198,1:RUN                :rem 103
200 POKE36879,8:POKE36869,240:PRINT"{CLR}
    "                                      :rem 15
210 PRINT"{RVS}{YEL}{23 SPACES}{OFF}
    {4 SPACES}{CYN}SPACE{2 SPACES}DUEL
    {4 SPACES}{YEL} {RVS} {OFF}"; :rem 88
220 PRINT"{RVS}{YEL}{22 SPACES}"  :rem 21
240 PRINT"{4 DOWN}{BLU}{2 SPACES}HIT ANY
    {SPACE}KEY TO PLAY"                    :rem 89
250 POKE198,0:WAIT198,1:RETURN             :rem 76
260 DATA173,8,144,74,133,0,234,170,169,24
    0,157,0,28,232,169,252,157,0,28,232
                                           :rem 208
262 DATA169,14,157                         :rem 174
265 DATA0,28,232,169,59,157,0,28,232,
    169,59,157,0,28,232,169,14,157,0,28,2
    32,169,252                             :rem 116
270 DATA157,0,28,232,169,240,157,0,28,173
    ,9,144,74,133,1,170,169,15,234,157,8,
```

```
    29                                  :rem 161
275 DATA 232,169                        :rem 27
280 DATA63,157,8,29,232,169,112,157
    ,8,29,232,169,220,157,8,29,232,169,22
    0,157,8,29,232                      :rem 221
290 DATA169,112,157,8,29,232,169,63,1
    57,8,29,232,169,15,157,8,29,96,251,4,
    24,66,252                           :rem 84
300 DATA166,0,169,0,160,0,157,0,28,232,20
    0,192,9,208,247,166,1,169,0,160,0
                                        :rem 82
305 DATA157,8,29,232                    :rem 13
310 DATA200,192,9,208,247,96,3,255,179,
    252,81,119,1,111,174,17,145,224,110,2
    40,5,169,0                          :rem 183
320 DATA133,4,96,169,1,133,4,96,253,162,2
    24,56,169,14,141,14,144,162,255,142
                                        :rem 211
325 DATA11,144,202                      :rem 155
330 DATA160,0,200,192,74,208,251,224,128,
    208,241,169,0,141,11,144,96,119,111,1
    59                                  :rem 135
335 DATA163,169                         :rem 27
340 DATA127,141,34,145,174,32,145,169,255
    ,141,34,145,224,119,240,5,169,0,133
                                        :rem 205
345 DATA5,96,169,1                      :rem 175
350 DATA133,5,96,219                    :rem 13
```

Program 2:

Space Duel For Commodore 64

```
49152 :169,055,141,000,208,169,230
49158 :002,141,016,208,169,032,062
49164 :141,002,208,032,070,196,149
49170 :169,147,032,210,255,169,232
49176 :012,141,033,208,169,192,011
49182 :141,248,007,169,193,141,161
49188 :249,007,169,193,141,249,020
49194 :007,169,003,141,021,208,079
49200 :169,000,141,134,002,169,151
49206 :000,141,039,208,169,002,101
49212 :141,040,208,169,000,160,010
49218 :000,145,000,200,192,024,115
49224 :208,249,169,015,141,024,110
49230 :212,169,017,141,005,212,066
49236 :169,246,141,006,212,169,003
49242 :050,141,000,212,141,001,123
49248 :212,169,000,160,000,153,022
49254 :060,003,200,192,060,208,057
49260 :248,169,000,170,168,024,119
49266 :109,025,212,144,004,200,040
49272 :140,060,003,202,208,243,208
49278 :169,000,170,168,024,109,254
49284 :026,212,144,004,200,140,090
49290 :062,003,202,208,243,169,001
49296 :000,205,060,003,240,007,147
49302 :144,005,169,000,141,060,157
49308 :003,169,180,205,060,003,008
49314 :176,005,169,180,141,060,125
49320 :003,169,000,205,062,003,098
49326 :144,005,169,000,141,062,183
49332 :003,169,180,205,062,003,034
49338 :176,005,169,180,141,062,151
49344 :003,024,173,060,003,105,048
49350 :050,141,001,208,024,173,027
49356 :062,003,105,050,141,003,056
49362 :208,056,173,060,003,074,016
49368 :074,074,024,105,001,141,123
49374 :090,003,056,173,062,003,097
49380 :074,074,074,024,105,001,068
49386 :141,092,003,169,000,141,012
49392 :091,003,173,090,003,010,098
49398 :046,091,003,010,046,091,021
49404 :003,010,141,072,003,173,142
49410 :091,003,141,073,003,173,230
49416 :072,003,010,046,091,003,233
49422 :010,046,091,003,024,109,041
49428 :072,003,141,090,003,173,246
49434 :091,003,109,073,003,141,190
49440 :091,003,024,173,090,003,160
49446 :105,005,141,090,003,173,043
49452 :091,003,105,004,141,091,223
49458 :003,169,000,141,093,003,203
49464 :173,092,003,010,046,093,217
49470 :003,010,046,093,003,010,227
49476 :141,074,003,173,093,003,043
49482 :141,075,003,173,074,003,031
49488 :010,046,093,003,010,046,032
49494 :093,003,024,109,074,003,136
49500 :141,092,003,173,093,003,085
49506 :109,075,003,141,093,003,010
49512 :024,173,092,003,105,005,250
49518 :141,092,003,173,093,003,103
49524 :105,004,141,093,003,173,123
49530 :090,003,133,251,173,091,095
49536 :003,133,252,173,092,003,016
49542 :133,253,173,093,003,133,154
49548 :254,173,001,220,041,004,065
49554 :240,003,076,077,194,160,128
49560 :000,169,067,145,251,024,040
49566 :165,252,105,212,133,252,253
49572 :169,002,145,251,056,165,184
49578 :252,233,212,133,252,200,172
49584 :192,030,208,229,056,165,032
49590 :251,233,080,141,064,003,186
49596 :165,252,233,000,141,065,020
49602 :003,024,165,251,105,040,014
49608 :141,066,003,165,252,105,164
49614 :000,141,067,003,056,173,134
49620 :064,003,229,253,141,068,202
49626 :003,173,065,003,229,254,177
49632 :013,068,003,176,061,056,089
49638 :173,066,003,229,253,141,071
49644 :068,003,173,067,003,229,011
49650 :254,013,068,003,144,042,254
49656 :032,121,195,024,173,078,103
49662 :003,105,010,141,078,003,082
49668 :173,079,003,105,000,141,249
49674 :079,003,056,173,078,003,146
49680 :233,244,141,068,003,173,110
49686 :079,003,233,001,013,068,163
49692 :003,144,003,076,015,195,208
49698 :162,255,160,015,136,208,202
49704 :253,202,208,248,173,078,178
49710 :003,013,079,003,240,014,142
49716 :173,078,003,208,003,206,211
49722 :079,003,206,078,003,032,203
49728 :149,195,160,030,169,032,031
49734 :145,251,136,192,000,016,042
49740 :247,173,001,220,041,008,254
49746 :240,003,076,012,195,160,000
49752 :000,169,067,145,253,024,234
49758 :165,254,105,212,133,254,193
49764 :169,006,145,253,056,165,126
49770 :254,233,212,133,254,200,112
49776 :192,030,208,229,056,165,224
49782 :253,233,080,141,064,003,124
49788 :165,254,233,000,141,065,214
49794 :003,024,165,253,105,040,208
49800 :141,066,003,165,254,105,102
```

```
49806 :000,141,067,003,056,173,070
49812 :064,003,229,251,141,068,136
49818 :003,173,065,003,229,252,111
49824 :013,068,003,176,060,056,024
49830 :173,066,003,229,251,141,005
49836 :068,003,173,067,003,229,203
49842 :252,013,068,003,144,041,187
49848 :032,121,195,173,076,003,016
49854 :105,010,141,076,003,173,186
49860 :077,003,105,000,141,077,087
49866 :003,056,173,076,003,233,234
49872 :244,141,084,003,173,077,162
49878 :003,233,001,013,084,003,039
49884 :144,003,076,068,195,162,100
49890 :255,160,015,136,208,253,229
49896 :202,208,248,173,076,003,118
49902 :013,077,003,240,014,173,246
49908 :076,003,208,003,206,077,049
49914 :003,206,076,003,032,149,207
49920 :195,160,030,169,032,145,219
49926 :253,136,192,000,016,247,082
49932 :076,109,192,169,147,032,225
49938 :210,255,169,000,141,021,046
49944 :208,160,012,162,010,032,096
49950 :240,255,160,000,185,236,082
49956 :195,200,032,210,255,192,096
49962 :044,208,245,165,197,201,078
49968 :064,240,250,165,197,201,141
49974 :025,240,008,165,197,201,122
49980 :039,208,238,096,096,076,045
49986 :000,192,169,147,032,210,048
49992 :255,169,000,141,021,208,098
49998 :160,012,162,010,032,240,182
50004 :255,160,000,185,025,196,137
50010 :200,032,210,255,192,044,255
50016 :208,245,165,197,201,064,152
50022 :240,250,165,197,201,025,156
50028 :240,008,165,197,201,039,190
50034 :208,238,096,096,076,000,060
50040 :192,162,255,238,032,208,183
50046 :202,208,250,169,129,141,201
50052 :004,212,162,255,160,115,016
50058 :136,208,253,202,208,248,113
50064 :169,128,141,004,212,160,190
50070 :011,162,000,024,032,240,107
50076 :255,169,032,032,210,255,085
50082 :160,012,162,000,024,032,040
50088 :240,255,169,032,032,210,082
50094 :255,160,026,162,000,024,033
50100 :032,240,255,169,032,032,172
50106 :210,255,160,027,162,000,232
50112 :024,032,240,255,169,032,176
50118 :032,210,255,160,010,162,003
50124 :000,024,032,240,255,174,161
50130 :078,003,173,079,003,032,066
50136 :205,189,160,025,162,000,189
50142 :024,032,240,255,174,076,255
50148 :003,173,077,003,032,205,209
50154 :189,096,080,076,065,089,061
50160 :069,082,032,049,032,087,079
50166 :073,078,083,013,013,032,026
50172 :032,032,032,032,032,032,188
50178 :032,032,072,073,084,032,071
50184 :089,032,084,079,032,080,148
50190 :076,065,089,032,065,071,156
50196 :065,073,078,032,032,080,124
50202 :076,065,089,069,082,032,183
50208 :050,032,087,073,078,083,179
50214 :013,013,032,032,032,032,192
50220 :032,032,032,032,032,072,020
50226 :073,084,032,089,032,084,188
50232 :079,032,080,076,065,089,221
50238 :032,065,071,065,073,078,190
50244 :032,032,160,000,185,084,049
50250 :196,153,000,048,200,192,095
50256 :147,208,245,096,001,255,008
50262 :000,000,003,192,000,003,028
50268 :240,000,063,248,000,063,194
50274 :252,000,063,254,015,255,169
50280 :254,000,063,255,063,255,226
50286 :255,000,063,255,255,255,169
50292 :255,000,063,255,063,255,239
50298 :255,000,063,255,015,255,197
50304 :254,000,063,254,000,063,250
50310 :252,000,063,248,000,003,188
50316 :240,000,003,192,000,255,062
50322 :000,255,000,127,252,000,012
50328 :015,248,001,255,240,000,143
50334 :063,224,007,255,192,000,131
50340 :255,128,031,245,192,003,250
50346 :228,224,007,213,127,015,216
50352 :142,048,255,255,240,015,107
50358 :142,048,007,213,127,003,210
50364 :228,224,031,245,192,000,084
50370 :255,128,007,255,192,000,007
50376 :063,224,001,255,240,000,215
50382 :015,248,000,127,252,255,079
50388 :255,013,013,013,013,013,020
```

Power Basic

(Article on page 170.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
60000 IF PEEK(830)=133 THEN 60020:rem 145
60010 FORI=828TO977:READA:POKEI,A:NEXT
                                    :rem 127
60020 SYS 828:RETURN                :rem 179
60030 DATA 169,000,133,252,169,080
                                    :rem 135
60040 DATA 133,251,169,164,133,002
                                    :rem 131
60050 DATA 169,083,141,036,003,169
                                    :rem 142
60060 DATA 003,141,037,003,096,152
                                    :rem 127
60070 DATA 072,138,072,165,252,208
                                    :rem 144
60080 DATA 007,032,116,003,169,000
                                    :rem 123
60090 DATA 133,253,166,253,189,000
                                    :rem 143
60100 DATA 002,133,254,198,252,230
                                    :rem 129
60110 DATA 253,104,170,104,168,165
                                    :rem 133
60120 DATA 254,096,160,000,132,252
                                    :rem 127
60130 DATA 165,002,032,210,255,169
                                    :rem 130
60140 DATA 157,032,210,255,032,228
                                    :rem 131
60150 DATA 255,240,251,164,252,133
                                    :rem 135
60160 DATA 254,169,032,032,210,255
                                    :rem 135
```

```
60170 DATA 169,157,032,210,255,165
                                    :rem 145
60180 DATA 254,201,013,240,043,201
                                    :rem 119
60190 DATA 020,208,013,192,000,240
                                    :rem 120
60200 DATA 211,136,169,157,032,210
                                    :rem 129
60210 DATA 255,076,118,003,041,127
                                    :rem 132
60220 DATA 201,032,144,196,196,251
                                    :rem 137
60230 DATA 240,192,165,254,153,000
                                    :rem 131
60240 DATA 002,032,210,255,169,000
                                    :rem 120
60250 DATA 133,212,200,076,118,003
                                    :rem 123
60260 DATA 230,252,153,000,002,169
                                    :rem 125
60270 DATA 032,032,210,255,096,013
                                    :rem 129
```

The Beginner's Corner

(Article on page 40.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: Dog — VIC Version

```
1 REM DOG                           :rem 239
10 POKE36878 ,15                     :rem 50
20 S=36876
30 POKES,201                        :rem 164
40 PRINT"{CLR}":POKE36879,106:F=30720:GOS
   UB820                             :rem 18
50 POKES,191                        :rem 174
60 FOR I=1TO12:READP,C:POKEP,C:NEXT:GOSUB
   830                               :rem 21
65 DATA7868,79,7847,111,7848,111,7871,80,
   7893,106,7915,106,7937,78,7958,119,795
   7,119                             :rem 239
66 DATA7934,77,7912,101,7890,101    :rem 118
70 POKES,175                        :rem 178
80 FOR P=7959 TO 8047 STEP 22:POKEP,101:N
   EXT:GOSUB820                      :rem 20
90 POKES,170                        :rem 175
100 POKE8069,117:POKE8068,76:POKE8046,101
    :POKE8024,101                    :rem 34
105 POKE8001,111:POKE8023,101:POKE8045,10
    1                                :rem 57
107 POKE8067,117:POKE8066,76:POKE8044,101
    :POKE8022,101:GOSUB830          :rem 118
110 POKES,175                       :rem 221
120 FORP=7933 TO 7926 STEP -1:POKEP,99:NE
    XT:GOSUB830                      :rem 23
130 POKES,183                       :rem 222
140 FOR I=1 TO 10:READP,C:POKEP,C:NEXT:GO
    SUB830                           :rem 66
142 DATA8000,78,8021,119,8020,119,8019,11
    9,8018,78,8040,101,8062,117,8061,76
                                     :rem 247
144 DATA8039,101,8016,77            :rem 218
150 POKES,0:POKES,183               :rem 248
160 FOR I=1 TO 6:READP,C:POKEP,C:NEXT:GOS
    UB830                            :rem 25
165 DATA7973,78,7994,78,8015,78,8037,101,
    8059,117,8058,76                :rem 129
170 POKES,170                       :rem 222
180 FOR P=7948 TO 8036 STEP 22:POKEP,101:
    NEXT:POKE7926,79:GOSUB830        :rem 31
190 POKES,147:GOSUB820              :rem 56
210 POKES,201:GOSUB825              :rem 45
230 POKES,207                       :rem 220
240 POKE7891,81:POKE7891+F,0:POKE7892,81:
    POKE7892+F,0:POKE7935,74:POKE7935+F,2
                                     :rem 18
245 POKE7936,75:POKE7936+F,2:GOSUB820
                                    :rem 160
250 POKES,201:GOSUB825               :rem 49
270 POKES,195:GOSUB825               :rem 63
290 POKES,191:GOSUB825               :rem 61
310 POKES,183:GOSUB825               :rem 55
330 POKES,201:GOSUB820:GOSUB820     :rem 127
350 POKES,191:GOSUB825               :rem 58
370 POKES,195:GOSUB825               :rem 64
390 POKES,201                       :rem 221
400 POKE7846,223:POKE7845,233:POKE7867,10
    5                               :rem 107
405 POKE7849,233:POKE7850,223:POKE7872,95
    :GOSUB820                       :rem 151
410 POKES,191:GOSUB825               :rem 55
430 POKES,175:GOSUB825               :rem 59
450 POKES,170:GOSUB825               :rem 56
470 POKES,175:GOSUB825               :rem 63
490 POKES,183                       :rem 231
500 POKE7925,74:POKE7903,93:POKE7881,93:P
    OKE7859,85:POKE7860,64:POKE7861,73:GO
    SUB820                          :rem 187
510 POKES,170:GOSUB825               :rem 53
530 POKES,147:GOSUB820               :rem 54
550 POKES,201:GOSUB825               :rem 52
570 POKES,207:GOSUB820               :rem 55
590 POKES,201:GOSUB825               :rem 56
610 POKES,195:GOSUB825               :rem 61
630 POKES,191:GOSUB825               :rem 59
650 POKES,183:GOSUB825               :rem 62
670 POKES,175:GOSUB820:GOSUB820     :rem 144
800 POKES,0:POKE36878,0              :rem 75
810 GOTO 810                        :rem 107
820 FOR D=1 TO 200:NEXT             :rem 225
825 FOR D=1 TO 100:NEXT             :rem 229
830 FOR D=1 TO 100:NEXT:RETURN      :rem 251
840 END                             :rem 115
```

Program 2: Dog — 64 Version

```
1 REM DOG                           :rem 239
10 POKE54296,15:POKE54277,17:POKE54278,13
   0                                :rem 101
20 SH=54273:SL=54272:W=54276         :rem 47
30 POKESH,37:POKESL,162:POKEW,17    :rem 228
40 PRINT"{CLR}":POKE53281,3:POKE53280,2:F
   =54272:GOSUB820                  :rem 113
50 POKESH,31:POKESL,165:POKEW,17    :rem 227
60 FOR I=1 TO 12:READ P,C:POKEP,C:NEXT:GO
   SUB830                            :rem 21
65 DATA1366,79,1327,111,1328,111,1369,80,
   1409,106,1449,106                :rem 115
66 DATA1489,78,1528,119,1527,119,1486,77,
```

```
   1446,101,1406,101                :rem 131
70 POKESH,25:POKESL,30:POKEW,17     :rem 175
80 FOR P=1529 TO 1689 STEP 40:POKEP,101:N
   EXT:GOSUB820                     :rem 12
90 POKESH,23:POKESL,181:POKEW,17    :rem 230
100 POKE1729,117:POKE1728,76:POKE1688,101
   :POKE1648,101                    :rem 36
105 POKE1607,111:POKE1647,101:POKE1687,10
   1                                :rem 72
107 POKE1727,117:POKE1726,76:POKE1686,101
   :POKE1646,101:GOSUB830           :rem 120
110 POKESH,25:POKESL,30:POKEW,17    :rem 218
120 FOR P=1485 TO 1478 STEP -1:POKEP,99:N
   EXT:GOSUB830                     :rem 15
130 POKESH,28:POKESL,49:POKEW,17    :rem 233
140 FOR I=1 TO 10:READP,C:POKEP,C:NEXT:GO
   SUB830                           :rem 66
142 DATA1606,78,1645,119,1644,119,1643,11
   9,1642,78,1682,101               :rem 174
144 DATA1722,101,1721,76,1681,101,1640,77
                                    :rem 24
150 POKESH,28:POKESL,49:POKEW,17    :rem 235
160 FOR I=1 TO 6:READP,C:POKEP,C:NEXT:GOS
   UB830                            :rem 25
165 DATA1561,78,1600,78,1639,78,1679,101,
   1719,117,1718,76                 :rem 96
170 POKESH,23:POKESL,181:POKEW,17   :rem 21
180 FOR P=1518 TO 1678 STEP 40:POKEP,101:
   NEXT:POKE1478,79:GOSUB830        :rem 19
190 POKESH,18:POKESL,209:GOSUB820   :rem 28
210 POKESH,37:POKESL,162:GOSUB825   :rem 25
230 POKESH,42:POKESL,62:POKEW,17    :rem 225
240 POKE1407,81:POKE1407+F,0:POKE1408,81:
   POKE1408+F,0                     :rem 246
245 POKE1487,74:POKE1487+F,2:POKE1488,75:
   POKE1488+F,2:GOSUB820            :rem 120
250 POKESH,37:POKESL,162:GOSUB825   :rem 29
270 POKESH,33:POKESL,135:GOSUB825   :rem 27
290 POKESH,31:POKESL,165:GOSUB825   :rem 30
310 POKESH,28:POKESL,49:GOSUB825    :rem 238
330 POKESH,37:POKESL,162:POKEW,17   :rem 23
340 FOR D=1 TO 200:NEXT:GOSUB820    :rem 50
350 POKESH,31:POKESL,165:GOSUB825   :rem 27
370 POKESH,33:POKESL,135:GOSUB825   :rem 28
390 POKESH,37:POKESL,162:POKEW,17   :rem 29
400 POKE1326,223:POKE1325,233:POKE1365,10
   5                                :rem 68
405 POKE1329,233:POKE1330,223:POKE1370,95
   :GOSUB820                        :rem 112
410 POKESH,31:POKESL,165:GOSUB825   :rem 24
430 POKESH,25:POKESL,30:GOSUB825    :rem 228
450 POKESH,23:POKESL,181:GOSUB825   :rem 27
470 POKESH,25:POKESL,30:GOSUB825    :rem 232
490 POKESH,28:POKESL,49:POKEW,17    :rem 242
500 POKE1477,74:POKE1437,93:POKE1397,93:P
   OKE1357,85                       :rem 165
505 POKE1358,64:POKE1359,73:GOSUB 820
                                    :rem 85
510 POKESH,23:POKESL,181:GOSUB825   :rem 24
530 POKESH,18:POKESL,209:GOSUB820   :rem 26
550 POKESH,37:POKESL,162:GOSUB825   :rem 32
570 POKESH,42:POKESL,62:GOSUB820    :rem 232
590 POKESH,37:POKESL,162:GOSUB825   :rem 36
610 POKESH,33:POKESL,135:GOSUB825   :rem 25
630 POKESH,31:POKESL,165:GOSUB825   :rem 28
650 POKESH,28:POKESL,49:GOSUB825    :rem 245
670 POKESH,25:POKESL,30             :rem 145
680 POKEW,17:FORD=1TO200:NEXT:GOSUB820
                                    :rem 141
800 POKESH,0:POKESL,0:POKE54296,0:rem 241
810 GOTO 810                        :rem 107
820 POKEW,17:FOR D=1 TO 200:NEXT    :rem 53
825 POKEW,17:FOR D=1 TO 100:NEXT    :rem 57
830 FOR D=1 TO 100:NEXT:POKEW,16:RETURN
                                    :rem 78
840 END                             :rem 115
```

Program 3:

Merry Christmas — VIC Version

```
1 REM MERRY CHRISTMAS               :rem 82
5 POKE36878,15:S=36876:POKE36879,26:GOTO1
  0                                 :rem 192
6 FORD=1TO200:NEXT                  :rem 125
7 FORD=1TO200:NEXT:RETURN           :rem 152
10 PRINT"{CLR}{BLK}":PRINT"{2 SPACES}COMP
   UTE!'S GAZETTE{DOWN}"            :rem 61
15 POKES,159:GOSUB6                 :rem 163
20 PRINTTAB(10);"{YEL}UI":PRINTTAB(10);"J
   K"                               :rem 151
25 POKES,183:GOSUB6                 :rem 161
27 POKES,0:POKES,183:GOSUB6         :rem 187
30 PRINTTAB(10);"{GRN}{RVS}£{*}"
                                    :rem 176
35 POKES,191:GOSUB7                 :rem 162
40 PRINTTAB(9);"{RVS}£{2 SPACES}{*}"
                                    :rem 107
45 POKES,183:GOSUB7                 :rem 164
50 PRINTTAB(9);"{RVS}£{2 SPACES}{*}"
                                    :rem 108
55 POKES,179:GOSUB7                 :rem 170
60 PRINTTAB(8);"{RVS}£{4 SPACES}{*}"
                                    :rem 108
65 POKES,167:GOSUB6                 :rem 167
70 PRINTTAB(8);"{RVS}£{4 SPACES}{*}"
                                    :rem 109
75 POKES,0:POKES,167:GOSUB6         :rem 192
80 PRINTTAB(7);"{RVS}£{6 SPACES}{*}"
                                    :rem 109
85 POKES,0:POKES,167:GOSUB6         :rem 193
90 PRINTTAB(7);"{RVS}£{6 SPACES}{*}"
                                    :rem 110
95 POKES,191:GOSUB6                 :rem 167
100 PRINTTAB(6);"{RVS}£{8 SPACES}{*}"
                                    :rem 149
105 POKES,0:POKES,191:GOSUB7        :rem 232
110 PRINTTAB(6);"{RVS}£{8 SPACES}{*}"
                                    :rem 150
115 POKES,199:GOSUB7                :rem 217
120 PRINTTAB(5);"{RVS}£{10 SPACES}{*}"
                                    :rem 150
125 POKES,191:GOSUB7                :rem 210
130 PRINTTAB(5);"{RVS}£{10 SPACES}{*}"
                                    :rem 151
135 POKES,183:GOSUB7                :rem 212
140 PRINTTAB(4);"{RVS}£{12 SPACES}{*}"
                                    :rem 151
145 POKES,179:GOSUB6                :rem 217
150 PRINTTAB(10);"{BLK}{2 +}"       :rem 7
155 POKES,159:GOSUB6                :rem 216
160 PRINTTAB(10);"{2 +}"            :rem 120
165 POKES,0:POKES,159:GOSUB6        :rem 241
166 POKES,199:GOSUB6                :rem 222
167 POKES,0:POKES,199:GOSUB7        :rem 248
168 POKES,201:GOSUB7                :rem 209
169 POKES,199                       :rem 241
170 PRINTTAB(4);"{RED}MER";         :rem 59
172 GOSUB7:POKES,191                :rem 212
174 PRINT"RY ";                     :rem 83
175 GOSUB7:POKES,183                :rem 216
176 PRINT"CHRIST";                  :rem 119
```

```
177 GOSUB6:POKES,167                :rem 219
178 PRINT"MAS{DOWN}"                 :rem 99
179 GOSUB6:POKES,159:GOSUB7         :rem 207
180 POKES,0:POKES,159:GOSUB7        :rem 239
182 POKES,167                       :rem 231
184 PRINTTAB(4);"HAP";               :rem 25
186 GOSUB6:POKES,191                :rem 216
188 PRINT"PY ";                      :rem 86
190 GOSUB6:POKES,179                :rem 217
192 PRINT"NEW ";                    :rem 146
194 GOSUB6:POKES,183                :rem 216
196 PRINT"YEAR!"                    :rem 195
200 POKE7844,170                     :rem 92
201 POKE7890,170                     :rem 94
202 POKE7909,170                     :rem 96
203 POKE7933,170                     :rem 94
204 POKE7974,170                    :rem 100
205 POKE7979,170                    :rem 106
206 POKE7998,170                    :rem 108
207 POKE8017,170                     :rem 92
208 POKE8024,170                     :rem 91
209 POKE8041,170                     :rem 91
210 POKE8044,170                     :rem 86
220 GOSUB6:GOSUB6                    :rem 58
230 POKE36878,0:POKES,0              :rem 72
240 B=36879                          :rem 38
250 POKEB,29                        :rem 159
255 GOSUB6                           :rem 82
260 POKEB,26                        :rem 157
265 GOSUB6                           :rem 83
270 GOTO250                         :rem 105
300 END                             :rem 106
```

Program 4:
Merry Christmas — 64 Version

```
1 REM MERRY CHRISTMAS                :rem 82
2 FORL=54272TO54296:POKEL,0:NEXT :rem 221
4 POKE54277,9:POKE54278,128:W=54276
                                     :rem 225
5 POKE 54296,15:SH=54273:SL=54272:POKE532
  81,1:POKE53280,2:GOTO10            :rem 151
6 POKEW,17:FORD=1TO200:NEXT:GOTO8:rem 124
7 POKEW,17                           :rem 81
8 FORD=1TO200:NEXT:RETURN           :rem 153
10 PRINT"{CLR}{BLK}":PRINTTAB(11);"COMPUT
   E!'S GAZETTE{DOWN}"                 :rem 2
15 POKESH,25:POKESL,30:GOSUB6        :rem 74
20 PRINT TAB(19);"{YEL}UI":PRINT TAB(19);
   "JK"                              :rem 169
25 POKESH,33:POKESL,135:GOSUB6       :rem 128
27 POKEW,16:POKESH,33:POKESL,135:GOSUB7
                                     :rem 214
30 PRINT TAB(19);"{GRN}{RVS}£{*}"
                                     :rem 185
35 POKESH,37:POKESL,162:GOSUB7       :rem 134
40 PRINT TAB(18);"{RVS}£{2 SPACES}{*}"
                                     :rem 155
45 POKESH,33:POKESL,135:GOSUB7       :rem 131
50 PRINT TAB(18);"{RVS}£{2 SPACES}{*}"
                                     :rem 156
55 POKESH,31:POKESL,165:GOSUB7       :rem 133
60 PRINT TAB(17);"{RVS}£{4 SPACES}{*}"
                                     :rem 156
65 POKESH,28:POKESL,49:GOSUB6         :rem 92
70 PRINT TAB(17);"{RVS}£{4 SPACES}{*}"
                                     :rem 157
75 POKEW,16:POKESH,28:POKESL,49:GOSUB6
                                     :rem 176
80 PRINT TAB(16);"{RVS}£{6 SPACES}{*}"
                                     :rem 157
85 POKEW,16:POKESH,28:POKESL,49:GOSUB6
                                     :rem 177
90 PRINT TAB(16);"{RVS}£{6 SPACES}{*}"
                                     :rem 158
95 POKESH,37:POKESL,162:GOSUB6       :rem 139
100 PRINT TAB(15);"{RVS}£{8 SPACES}{*}
    "                                :rem 197
105 POKEW,16:POKESH,37:POKESL,162:GOSUB7
                                       :rem 7
110 PRINT TAB(15);"{RVS}£{8 SPACES}{*}
    "                                :rem 198
115 POKESH,42:POKESL,62:GOSUB7       :rem 128
120 PRINT TAB(14);"{RVS}£{10 SPACES}
    {*}"                            :rem 198
125 POKESH,37:POKESL,162:GOSUB7      :rem 182
130 PRINT TAB(14);"{RVS}£{10 SPACES}
    {*}"                            :rem 199
135 POKESH,33:POKESL,135:GOSUB7      :rem 179
140 PRINT TAB(13);"{RVS}£{12 SPACES}
    {*}"                            :rem 199
145 POKESH,31:POKESL,165:GOSUB6      :rem 180
150 PRINT TAB(19);"{BLK}{2 +}"       :rem 16
155 POKESH,25:POKESL,30:GOSUB6       :rem 127
160 PRINT TAB(19);"{2 +}"           :rem 129
165 POKEW,16:POKESH,25:POKESL,30:GOSUB6
                                     :rem 211
166 POKESH,42:POKESL,62:GOSUB6       :rem 133
167 POKEW,16:POKESH,42:POKESL,62:GOSUB7
                                     :rem 218
168 POKESH,44:POKESL,193:GOSUB7      :rem 191
169 POKESH,42:POKESL,62:POKEW,17     :rem 236
170 PRINTTAB(4);"{2 DOWN}{RED}M E R
    {SHIFT-SPACE}";                  :rem 253
172 GOSUB8:POKESH,37:POKESL,162:POKEW,17
                                      :rem 13
174 PRINT "R Y{3 SPACES}";           :rem 83
175 GOSUB8:POKESH,33:POKESL,135:POKEW,17
                                     :rem 12
176 PRINT "C H R I S T ";           :rem 119
177 GOSUB6:POKESH,28:POKESL,49:POKEW,17
                                     :rem 228
178 PRINT "M A S !{DOWN}"           :rem 132
179 GOSUB6:POKESH,25:POKESL,30:GOSUB7
                                     :rem 118
180 POKESH,25:POKESL,30:GOSUB7       :rem 126
182 POKESH,28:POKESL,49:POKEW,17     :rem 240
184 PRINT TAB(5);"H A P ";           :rem 26
186 GOSUB6:POKESH,37:POKESL,162:POKEW,17
                                     :rem 16
188 PRINT "P Y {2 SHIFT-SPACE}";    :rem 150
190 GOSUB6:POKESH,31:POKESL,165:POKEW,17
                                      :rem 8
192 PRINT "N E W{3 SPACES}";        :rem 146
194 GOSUB6:POKESH,33:POKESL,135:POKEW,17
                                     :rem 11
196 PRINT "Y E A R !"               :rem 195
200 POKE1284,170                     :rem 84
201 POKE1363,170                     :rem 83
202 POKE1405,170                     :rem 81
203 POKE1442,170                     :rem 83
204 POKE1484,170                     :rem 90
205 POKE1521,170                     :rem 83
206 POKE1526,170                     :rem 89
207 POKE1563,170                     :rem 91
208 POKE1600,170                     :rem 84
209 POKE1606,170                     :rem 91
210 POKE1642,170                     :rem 83
211 POKE1647,170                     :rem 89
212 POKE1679,170                     :rem 95
213 POKE1685,170                     :rem 93
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220 GOSUB6:GOSUB6                          :rem 58
230 POKE54296,0:POKESH,0:POKESL,0:rem 238
240 B=53280                                :rem 23
250 POKEB,5                               :rem 105
255 GOSUB6                                 :rem 82
260 POKEB,2                               :rem 103
265 GOSUB6                                 :rem 83
270 GOTO 250                              :rem 105
300 END                                   :rem 106
```

Spike

(Article on page 74.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

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32768 :169,005,141,190,207,169,113
32774 :072,141,180,207,032,019,145
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32786 :169,040,141,200,207,169,176
32792 :012,141,199,207,169,000,240
32798 :141,039,208,162,024,157,249
32804 :000,212,202,224,255,208,113
32810 :248,169,070,141,254,207,107
32816 :169,120,141,253,207,169,083
32822 :255,141,015,212,141,182,232
32828 :207,169,128,141,018,212,167
32834 :169,064,141,136,002,169,235
32840 :001,141,246,207,169,019,087
32846 :032,210,255,169,000,141,117
32852 :032,208,173,014,220,041,004
32858 :254,141,014,220,165,001,117
32864 :041,251,133,001,160,000,170
32870 :185,000,208,153,000,080,216
32876 :185,000,209,153,000,081,224
32882 :185,000,210,153,000,082,232
32888 :185,000,211,153,000,083,240
32894 :185,000,212,153,000,084,248
32900 :185,000,213,153,000,085,000
32906 :185,000,214,153,000,086,008
32912 :185,000,215,153,000,087,016
32918 :200,208,205,165,001,009,170
32924 :004,133,001,173,014,220,189
32930 :009,001,141,014,220,169,204
32936 :198,141,000,221,169,008,137
32942 :141,024,208,032,183,128,122
32948 :076,219,128,120,169,127,251
32954 :141,013,220,169,001,141,103
32960 :026,208,169,000,141,018,242
32966 :208,173,017,208,041,127,204
32972 :141,017,208,169,119,141,231
32978 :020,003,169,140,141,021,192
32984 :003,088,096,032,225,128,020
32990 :076,249,128,169,089,133,042
32996 :252,160,000,133,251,169,169
33002 :000,145,251,200,208,251,009
33008 :230,252,166,252,224,128,212
33014 :208,243,096,169,016,160,114
33020 :000,153,000,064,153,000,110
33026 :065,153,000,066,153,000,183
33032 :067,200,208,241,169,022,147
33038 :141,248,067,169,006,153,030
33044 :000,216,153,000,217,153,247
33050 :000,218,153,000,219,200,048
33056 :208,241,032,182,137,032,096
33062 :043,129,076,187,129,032,122
33068 :133,139,169,001,133,002,109
33074 :169,050,141,255,207,172,020
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33086 :139,232,224,151,240,005,029
33092 :136,192,030,208,243,173,026
33098 :255,207,024,105,020,141,058
33104 :255,207,201,200,144,225,032
33110 :169,010,141,255,207,174,018
33116 :255,207,160,200,032,239,161
33122 :139,136,232,224,151,208,164
33128 :247,173,255,207,024,105,091
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33140 :144,229,169,190,141,255,220
33146 :207,172,255,207,162,000,101
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33158 :240,005,200,192,200,208,155
33164 :243,173,255,207,056,233,027
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33176 :176,225,169,020,141,255,114
33182 :207,174,255,207,160,030,167
33188 :032,239,139,200,232,224,206
33194 :151,208,247,173,255,207,131
33200 :024,105,020,141,255,207,160
33206 :201,151,144,229,096,169,148
33212 :096,133,252,169,032,133,235
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33224 :253,177,251,145,253,200,199
33230 :208,249,230,252,230,254,093
33236 :166,252,224,127,208,239,148
33242 :177,251,145,253,200,192,156
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33452 :207,032,155,139,162,255,098
33458 :160,000,200,208,253,232,207
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33542 :169,001,141,206,207,173,135
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33578 :173,240,207,024,105,041,064
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33632 :207,074,144,008,169,010,196
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33752 :032,032,210,255,169,000,146
33758 :174,200,207,032,205,189,205
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33806 :210,255,169,146,032,210,012
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33932 :157,120,064,202,224,007,146
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33950 :132,153,062,138,136,192,203
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34064 :002,208,062,232,232,032,016
34070 :055,134,201,002,208,053,163
34076 :173,217,207,024,105,009,251
34082 :170,173,216,207,024,105,161
34088 :009,168,032,055,134,201,127
34094 :002,208,032,200,200,032,208
34100 :055,134,201,002,208,023,163
34106 :173,217,207,056,233,009,185
34112 :170,032,055,134,201,002,146
34118 :208,009,136,136,032,055,134
34124 :134,201,002,240,001,096,238
34130 :174,217,207,172,216,207,251
34136 :236,241,207,208,012,152,120
34142 :024,105,010,205,240,207,117
34148 :208,003,076,245,130,162,156
34154 :011,032,035,134,169,003,234
34160 :133,002,169,255,141,246,034
34166 :207,141,214,207,172,216,251
34172 :207,200,238,246,207,173,115
34178 :246,207,201,019,240,044,063
34184 :201,010,144,006,206,214,149
34190 :207,076,149,133,238,214,135
34196 :207,173,217,207,024,109,061
34202 :214,207,141,215,207,173,031
34208 :217,207,056,237,214,207,018
34214 :170,202,232,032,239,139,156
34220 :236,215,207,208,247,076,081
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34238 :016,192,030,240,012,224,136
34244 :150,240,008,152,056,233,011
34250 :020,168,032,230,132,172,188
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34598 :076,048,135,173,254,207,163
34604 :056,237,241,207,141,245,147
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34820 :245,207,144,004,024,109,225
34826 :244,207,106,110,242,207,102
34832 :202,208,240,141,243,207,233
34838 :096,096,162,006,032,086,244
34844 :136,208,049,032,106,136,183
34850 :208,044,173,027,212,201,131
34856 :064,176,008,169,014,157,116
34862 :183,207,076,080,136,201,161
34868 :128,176,008,169,013,157,191
34874 :183,207,076,080,136,201,173
34880 :192,176,008,169,011,157,009
34886 :183,207,076,080,136,169,153
34892 :007,157,183,207,202,224,032
34898 :255,208,197,096,189,055,058
34904 :138,024,125,062,138,141,204
34910 :250,207,008,104,041,001,193
34916 :141,251,207,076,085,139,231
34922 :189,055,138,056,253,062,091
34928 :138,144,011,141,250,207,235
34934 :169,000,141,251,207,076,194
34940 :085,139,189,062,138,056,025
34946 :253,055,138,141,250,207,150

34952 :169,000,141,251,207,076,212
34958 :085,139,238,182,207,173,142
34964 :182,207,205,181,207,240,090
34970 :001,096,169,255,141,182,230
34976 :207,162,006,189,183,207,090
34982 :041,001,208,029 189,062,184
34988 :138,201,030,208,003,076,060
34994 :030,137,189,055,138,201,160
35000 :150,208,003,076,030,137,020
35006 :254,055,138,222,062,138,035
35012 :076,030,137,189,183,207,250
35018 :041,002,208,023,189,062,215
35024 :138,201,200,240,073,189,225
35030 :055,138,201,000,240,066,146
35036 :254,062,138,222,055,138,065
35042 :076,030,137,189,183,207,024
35048 :041,004,208,023,189,062,247
35054 :138,201,030,240,043,189,055
35060 :055,138,201,000,240,036,146
35066 :222,055,138,222,062,138,063
35072 :076,030,137,189,183,207,054
35078 :041,008,208,020,189,062,022
35084 :138,201,200,240,013,189,225
35090 :055,138,201,150,240,006,040
35096 :254,055,138,254,062,138,157
35102 :202,224,255,208,128,096,119
35108 :162,006,169,128,141,247,121
35114 :207,189,055,138,010,176,049
35120 :059,105,014,008,072,138,188
35126 :010,170,104,157,002,208,193
35132 :138,074,170,040,173,247,134
35138 :207,073,255,045,016,208,102
35144 :144,003,013,247,207,141,059
35150 :016,208,189,062,138,024,203
35156 :105,041,072,138,010,170,108
35162 :104,157,003,208,138,074,006
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35168 :170,078,247,207,202,224,200
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35180 :024,105,014,072,138,010,215
35186 :170,104,157,002,208,138,125
35192 :074,170,173,016,208,013,006
35198 :247,207,141,016,208,076,253
35204 :080,137,206,246,207,208,192
35210 :035,169,010,141,246,207,178
35216 :173,248,207,201,021,240,210
35222 :008,169,021,141,248,207,176
35228 :076,164,137,169,020,141,095
35234 :248,207,162,006,157,249,167
35240 :067,202,224,255,208,248,092
35246 :173,141,002,201,001,240,164
35252 :249,096,162,006,169,007,101
35258 :157,040,208,169,020,157,169
35264 :249,067,202,224,255,208,117
35270 :241,162,036,169,003,157,198
35276 :120,216,202,224,255,208,149
35282 :248,162,039,169,032,157,249
35288 :000,064,157,040,064,157,186
35294 :120,064,157,080,064,202,141
35300 :224,255,208,239,160,000,034
35306 :185,069,138,032,210,255,099
35312 :200,192,011,208,245,160,232
35318 :000,185,088,138,032,210,131
35324 :255,200,192,043,208,245,115
35330 :160,007,185,080,138,153,213
35336 :000,080,136,192,255,208,111
35342 :245,200,185,131,138,032,177
35348 :210,255,200,192,040,208,101
35354 :245,160,000,185,170,138,156
35360 :032,210,255,200,192,016,169
35366 :208,245,160,000,185,080,148
35372 :142,153,000,069,200,208,048
35378 :247,173,030,208,096,010,046
35384 :030,040,060,080,110,130,250
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35396 :160,158,019,017,017,017,200
35402 :083,079,078,065,082,058,007
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35444 :032,032,032,032,032,032,052
35450 :032,032,032,032,032,032,058
35456 :032,032,032,005,019,083,075
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35468 :048,048,048,048,048,048,172
35474 :032,032,032,032,032,032,082
35480 :072,073,071,072,032,083,043
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35516 :207,041,001,208,009,238,124
35522 :254,207,206,253,207,076,117
35528 :247,138,173,249,207,041,231
35534 :002,208,009,238,253,207,099
35540 :206,254,207,076,247,138,060
35546 :173,249,207,041,004,208,076
35552 :009,206,254,207,206,253,079
35558 :207,076,247,138,173,249,040
35564 :207,041,008,208,006,238,176
35570 :254,207,238,253,207,032,153
35576 :155,139,162,255,160,000,095
35582 :200,208,253,232,208,250,069
35588 :032,024,136,032,144,136,252
35594 :032,036,137,032,217,130,082
35600 :032,030,139,208,165,032,110
35606 :050,139,208,160,032,181,024
35612 :133,096,173,254,207,024,147
35618 :109,253,207,141,250,207,177
35624 :008,104,041,001,141,251,074
35630 :207,076,085,139,173,254,212
35636 :207,056,237,253,207,144,132
35642 :011,141,250,207,169,000,068
35648 :141,251,207,076,085,139,195
35654 :173,253,207,056,237,254,226
35660 :207,141,250,207,169,000,026
35666 :141,251,207,173,250,207,031
35672 :056,233,010,141,250,207,217
35678 :173,251,207,233,000,141,075
35684 :251,207,048,028,173,250,033
35690 :207,013,251,207,240,020,020
35696 :173,250,207,056,233,020,027
35702 :141,250,207,173,251,207,067
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35714 :102,139,096,169,002,133,003
35720 :002,162,159,160,031,032,170
35726 :239,139,200,192,200,208,040
35732 :248,202,224,150,208,241,141
35738 :096,173,254,207,010,176,046
35744 :029,105,015,141,000,208,146
35750 :173,016,208,041,254,144,234
35756 :002,009,001,141,016,208,037
35762 :173,253,207,024,105,041,213
35768 :141,001,208,076,207,139,188
35774 :024,105,015,141,000,208,171
35780 :173,016,208,009,001,141,232
35786 :016,208,076,178,139,169,220
35792 :002,133,002,174,254,207,212
35798 :172,253,207,032,055,134,043
35804 :201,001,208,005,162,012,041
35810 :032,035,134,174,254,207,038
35816 :172,253,207,032,239,139,250
35822 :096,072,152,072,138,072,072
35828 :169,096,133,252,169,000,039
35834 :133,251,138,072,074,074,224
35840 :170,152,072,074,074,074,104
35846 :168,202,224,255,240,014,085
35852 :165,251,024,105,008,133,186
35858 :251,144,242,230,252,076,189
35864 :007,140,136,192,255,240,226
35870 :016,165,251,024,105,064,143
35876 :133,251,165,252,105,001,175
35882 :133,252,076,026,140,104,005
35888 :041,007,168,136,192,255,079
35894 :240,009,230,251,208,247,215
35900 :230,252,076,051,140,104,145
35906 :041,003,170,169,063,141,141
35912 :247,207,165,002,010,010,201
35918 :010,010,010,010,202,224,032
35924 :255,240,012,074,074,056,027
35930 :110,247,207,110,247,207,194
35936 :076,082,140,200,072,173,071
35942 :247,207,049,251,145,251,228
35948 :104,017,251,145,251,104,212
35954 :170,104,168,104,096,173,161
35960 :025,208,141,025,208,041,000
35966 :001,240,077,169,012,160,017
35972 :059,162,024,142,022,208,237
35978 :141,033,208,140,017,208,117
35984 :141,024,208,173,018,208,148
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35996 :141,018,208,173,017,208,153
36002 :041,127,141,017,208,076,004
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36032 :141,018,208,173,017,208,189
36038 :041,127,141,017,208,076,040
36044 :049,234,104,168,104,170,009
36050 :104,064,169,070,141,254,244
36056 :207,169,120,141,253,207,033
36062 :162,039,169,032,157,120,133
36068 :064,202,224,007,208,248,157
36074 :032,155,139,032,029,135,244
36080 :173,199,207,201,007,240,243
36086 :057,032,248,141,032,024,012
36092 :136,032,144,136,032,036,000
36098 :137,162,255,160,000,200,148
36104 :208,253,232,208,250,162,041
36110 :249,160,000,200,208,253,060
36116 :232,208,250,173,000,220,079
36122 :041,016,208,220,162,013,174
36128 :169,032,157,040,064,232,214
36134 :224,039,208,248,173,030,192
36140 :208,076,247,129,162,039,137
36146 :169,013,157,040,216,202,079
36152 :224,255,208,248,160,000,127
36158 :162,000,189,041,064,157,163
36164 :040,064,232,224,037,208,105
36170 :245,185,037,142,141,077,133
36176 :064,152,072,160,000,162,178
36182 :000,200,208,253,232,208,163
36188 :250,104,168,173,000,220,239
36194 :041,016,240,010,200,192,029
36200 :043,208,211,160,000,076,034
36206 :062,141,162,000,189,007,159
36212 :064,221,031,064,240,018,242
36218 :144,021,162,005,189,007,138
36224 :064,157,031,064,202,224,102
36230 :255,208,245,076,145,141,180
36236 :232,224,006,208,225,162,173
36242 :005,189,031,064,157,192,016
36248 :207,202,224,255,208,245,213
36254 :173,000,220,041,016,240,080
36260 :249,032,073,145,032,182,109
36266 :137,162,005,189,192,207,038
36272 :157,031,064,202,224,255,085
36278 :208,245,169,096,133,252,005
36284 :169,032,133,254,160,000,168
36290 :133,251,133,253,177,253,114
36296 :145,251,200,208,249,230,203
36302 :252,230,254,166,252,224,048
36308 :127,208,239,177,253,145,081
36314 :251,200,192,064,208,247,100
36320 :032,145,143,169,007,141,093
36326 :021,208,141,201,207,169,153
36332 :040,141,200,207,169,012,237
36338 :141,199,207,076,212,140,193
36344 :162,000,189,006,142,032,011
36350 :210,255,232,224,032,208,135
36356 :245,096,005,019,017,029,159
36362 :029,029,029,029,029,029,184
36368 :029,029,029,029,029,029,190
36374 :029,029,029,080,082,069,084
36380 :083,083,032,066,085,084,205
36386 :084,079,078,135,129,141,168
36392 :133,160,143,150,133,146,137
36398 :032,046,046,032,016,018,236
36404 :005,019,019,032,002,021,150
36410 :020,020,015,014,032,020,179
36416 :015,032,016,012,001,025,165
36422 :032,001,007,001,009,014,134
36428 :032,046,046,032,000,000,232
36434 :000,000,000,000,000,000,082
36440 :000,000,000,000,000,000,088
36446 :000,000,000,000,000,000,094
36452 :000,000,048,000,000,048,196
36458 :000,000,252,000,000,252,098
36464 :000,000,048,000,000,048,208
36470 :000,000,000,000,000,000,118
36476 :000,000,000,000,000,000,124
36482 :000,000,000,000,000,000,130
36488 :000,000,000,000,000,000,136
36494 :000,000,000,000,000,000,142
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36506 :000,000,000,000,000,000,154
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36530 :216,000,001,140,000,000,023
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36542 :000,000,000,000,000,000,190
36548 :000,000,000,000,000,000,196
36554 :000,000,000,000,000,000,202
36560 :000,000,000,000,000,000,208
36566 :000,000,000,000,000,000,214
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36578 :000,000,000,000,096,000,066
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36596 :000,000,000,000,000,000,244
36602 :000,000,000,000,000,000,250
36608 :000,000,000,000,000,000,000
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36620 :000,000,000,000,000,000,012
36626 :000,000,000,000,000,000,018
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36638 :255,023,224,049,016,000,085
36644 :001,035,102,051,102,219,034
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36656 :102,128,000,014,255,255,034
36662 :252,255,255,248,000,000,040
36668 :000,000,000,000,000,000,060
36674 :000,000,000,000,000,000,066
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36692 :000,157,000,212,202,224,111
36698 :255,208,248,169,141,141,228
36704 :024,212,169,005,141,005,140
36710 :212,169,218,141,006,212,036
36716 :169,150,141,001,212,169,182
36722 :139,141,000,212,169,017,024
36728 :141,004,212,160,140,162,171
36734 :000,232,208,253,200,208,203
36740 :250,169,016,141,004,212,156
36746 :232,208,253,200,208,250,209
36752 :096,160,000,169,000,153,210
36758 :000,212,200,192,008,208,202
36764 :246,169,143,141,024,212,067
36770 :169,008,141,005,212,169,098
36776 :243,141,006,212,169,129,044
36782 :141,004,212,162,255,142,066
36788 :001,212,202,160,255,136,122
36794 :192,001,208,251,224,001,039
36800 :208,241,169,128,141,004,059
36806 :212,096,162,000,169,000,069
36812 :157,000,212,232,224,008,013
36818 :208,248,169,143,141,024,119
36824 :212,169,017,141,005,212,204
36830 :169,213,141,006,212,169,108
36836 :002,141,003,212,169,100,087
36842 :141,002,212,169,005,141,136
36848 :001,212,169,135,141,000,130
36854 :212,169,065,141,004,212,025
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36866 :200,208,253,232,208,250,073
36872 :024,105,001,208,245,169,248
36878 :064,141,004,212,096,162,181
36884 :000,142,033,208,142,032,065
36890 :208,189,206,144,240,007,252
36896 :032,210,255,232,076,027,096
36902 :144,234,173,190,207,105,067
36908 :048,032,210,255,169,157,147
36914 :032,210,255,032,228,255,038
36920 :208,010,173,000,220,041,196
36926 :016,208,244,076,091,144,073
36932 :201,013,240,019,201,049,023
36938 :144,233,201,058,176,229,091
36944 :072,056,233,048,141,190,052
36950 :207,104,032,210,255,162,032
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36974 :145,240,007,032,210,255,231
36980 :232,076,108,144,173,180,005
36986 :207,032,210,255,169,157,128
36992 :032,210,255,032,228,255,116
36998 :208,010,173,000,220,041,018
37004 :016,208,244,076,167,144,227
37010 :201,013,240,017,201,069,119
37016 :240,007,201,072,240,003,147
37022 :076,131,144,141,180,207,013
37028 :032,210,255,234,056,169,096
37034 :010,237,190,207,010,073,129
37040 :255,024,105,002,141,177,112
37046 :130,141,251,138,141,004,219
37052 :141,173,180,207,056,233,154
37058 :069,074,073,001,141,181,221
37064 :207,169,001,133,204,096,242
37070 :014,147,017,017,159,018,066
37076 :029,029,029,029,029,029,130
37082 :029,032,032,032,032,032,151
37088 :032,032,017,157,157,157,008
37094 :157,157,157,157,032,211,077
37100 :208,201,203,197,032,146,199
37106 :032,045,032,005,032,194,070
37112 :089,032,197,082,073,067,020
37118 :032,194,082,065,078,068,005
37124 :079,078,013,029,029,029,005
37130 :029,029,029,029,159,018,047
37136 :032,032,032,032,032,032,208
37142 :032,013,013,013,013,013,119
37148 :029,029,029,029,029,029,202
37154 :158,211,080,069,069,068,177
37160 :032,040,049,045,057,041,048
37166 :063,032,159,000,013,013,070
37172 :013,029,029,029,029,029,210
37178 :029,158,197,065,083,089,167
37184 :047,200,065,082,068,063,077
37190 :032,159,000,120,173,013,055
37196 :220,009,129,141,013,220,040
37202 :169,000,141,026,208,169,027
37208 :234,141,021,003,169,049,193
37214 :141,020,003,088,169,021,024
37220 :141,024,208,169,027,141,042
37226 :017,208,169,199,141,000,072
37232 :221,169,004,141,136,002,017
37238 :169,000,141,021,208,032,177
37244 :019,144,169,064,141,136,029
37250 :002,169,198,141,000,221,093
37256 :169,008,141,024,208,169,087
37262 :216,133,252,160,000,132,011
37268 :251,169,006,145,251,200,146
37274 :208,251,230,252,166,252,233
37280 :224,220,208,243,032,183,246
37286 :128,169,255,141,182,207,224
37292 :096,253,208,232,162,140,239
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Thinking

(Article on page 138.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: Thinking — VIC Version

```
1 PRINT"{CLR}{10 DOWN}{7 RIGHT}{BLK}{RVS}
  THINKING{OFF}":G=6:B1=2:B2=17  :rem 253
2 REM PRINT"{DOWN}{8 RIGHT}{RVS}HARDER
  {OFF}":G=9:B1=3:B2=26          :rem 161
3 X=RND(0):FORP=1TO2000:NEXT:GOSUB2001:G$
  =STR$(G):GOTO1005               :rem 55
6 PRINT"{CLR}"SPC(225)"THINKING....."
                                  :rem 240
7 O=30720:S=36876:V=S+2:POKES,0:POKEV,15:
  POKEV+1,190                     :rem 94
10 FORN=1TOG:CH%(N)=0:NEXT:FORN=1TO9:C%(N
   )=0:NEXT:CO=0:Q=0              :rem 110
12 FORN=1TOG                      :rem 240
13 Z=INT(RND(1)*G)+1:IFCH%(Z)<>0THEN13
                                  :rem 203
14 CH%(Z)=N:NEXT                  :rem 196
25 FORB=1TOB1                      :rem 20
30 FORN=1TO9                      :rem 226
32 Z=INT(RND(1)*9)+1:IFZ%(Z)<>0THEN32
                                  :rem 142
34 Z%(Z)=N:NEXT                   :rem 149
36 FORN=1TO9:X=Z%(N):X$=RIGHT$((STR$(X)),
   1):P$(B)=P$(B)+X$:NEXT         :rem 212
38 FORN=1TO9:Z%(N)=0:NEXT          :rem 40
40 NEXTB                          :rem 229
50 P$=P$(1)+P$(2):IF G=9 THEN P$=P$(1)+P$
   (2)+P$(3)                      :rem 207
100 PRINT"{CLR}"                  :rem 245
105 FORN=1TOB2STEP3               :rem 191
110 P$(INT(N/3)+1)=MID$(P$,N,3):NEXT
                                  :rem 241
112 RESTORE:FORN=1TO9:READSQ%(N):NEXT:GOS
    UB 3000                        :rem 37
113 DATA7819,7821,7823,7863,7865,7867,790
    7,7909,7911                   :rem 158
114 FORN=1TO9:POKESQ%(N),N+128:POKESQ%(N)
    +O,C%(N):POKES,150+10*N: NEXT:POKES,0
                                  :rem 183
115 FORN=1TO9:IFC%(N)=4THENCO=CO+1:rem 67
116 NEXT:PRINT"{HOME}{16 DOWN}{PUR}PURPLE
    S:{BLK}"CO                     :rem 40
117 IF CO=9 THEN 200              :rem 241
118 CO=0:Q=Q+1                     :rem 14
130 PRINT"{HOME}{RVS}{RED}TURN"Q   :rem 64
132 INPUT"{HOME}{3 DOWN}{BLU}YOUR NUMBER(
    1-6){6 SPACES}{6 LEFT}";SE$   :rem 113
135 SE=VAL(SE$):IF(SE>G)OR(SE<1)THEN132
                                  :rem 81
136 SE=CH%(SE)                     :rem 8
140 FORN=1TO3                     :rem 14
150 W=VAL(MID$(P$(SE),N,1))       :rem 225
160 IFC%(W)=0THENC%(W)=4:GOTO180   :rem 95
```

```
170 IFC%(W)=4THENC%(W)=0                :rem 84
180 NEXTN                               :rem 38
188 GOTO114                             :rem 112
200 REM WIN                             :rem 100
205 FORN=1TO50                          :rem 66
210 POKES,INT(RND(1)*100)+150:POKEV+1,PEE
    K(S):NEXT:POKES,0:POKEV+1,204:rem 221
215 PRINT"{CLR}"SPC(48)"THAT'S IT!!!!"SPC
    (115)"YOU TOOK"Q"TURNS."            :rem 90
220 PRINT"{3 DOWN}WANT ANOTHER?(Y/N)
                                        :rem 39
225 GETA$:IFA$="Y"THEN6                 :rem 75
230 IFA$="N"THENPRINT"{CLR}{BLU}":POKEV+1
    ,27:CLR:END                         :rem 230
235 GOTO225                             :rem 108
1000 REM INSTRUCTIONS                   :rem 90
1005 PRINT"{CLR}{BLK}YOU WILL SEE 9 BLACK
     {2 SPACES}{DOWN}BLOCKS. BY ENTERING
     {SPACE}A                           :rem 117
1010 PRINT"{DOWN}NUMBER BETWEEN 1 AND"G$"
     {DOWN}YOU CAN CHANGE SOME OF{DOWN}TH
     EM TO {PUR}PURPLE{BLK}.{DOWN}"
                                        :rem 158
1012 PRINT"{RED}BUT, SOME {PUR}PURPLE
     {RED} ONES {DOWN}MIGHT TURN BACK TO
     {3 SPACES}{DOWN} {BLK}BLACK{RED}!"
                                        :rem 131
1015 PRINT"{DOWN}{BLU}EACH NUMBER YOU ENT
     ER {DOWN}WILL CHANGE THE COLORS
     {DOWN}IN ITS OWN WAY.              :rem 72
1020 GOSUB2000                          :rem 5
1025 PRINT"{CLR}TRY TO CHANGE ALL THE
     {DOWN}BLOCKS TO {PUR}PURPLE{BLU} IN
     {SPACE}AS{DOWN}FEW TRIES AS YOU CAN.
     "                                  :rem 105
1030 GOSUB2000:GOTO6                    :rem 175
2000 REM GET KEYPRESS                   :rem 252
2001 PRINT"{HOME}{22 DOWN}"TAB(9)"{RVS}
     {BLU}TOUCH A KEY{OFF}";            :rem 109
2002 POKE198,0                          :rem 241
2005 GETA$:IFA$=""THEN2005              :rem 177
2010 RETURN                             :rem 163
3000 PRINT"{4 DOWN}"TAB(6)"{RED}{A}*
     {R}*{R}*{S}"           :rem 152
3010 PRINTTAB(6)"- - - -"               :rem 103
3020 PRINTTAB(6)"{Q}*+*+*{W}"
                                        :rem 72
3030 PRINTTAB(6)"- - - -"               :rem 105
3040 PRINTTAB(6)"{Q}*+*+*{W}"
                                        :rem 74
3050 PRINTTAB(6)"- - - -"               :rem 107
3060 PRINTTAB(6)"{Z}*{E}*{E}*
     {X}"                               :rem 4
3070 RETURN                             :rem 170
```

Program 2: Thinking — 64 Version

```
1 PRINT"{CLR}":POKE53281,1:PRINT"
  {10 DOWN}"TAB(15)"{BLK}{RVS}THINKING
  {OFF}":G=6:B1=2:B2=17                 :rem 216
2 REM PRINT"{DOWN}"TAB(16)"{RVS}HARDER
  {OFF}":G=9:B1=3:B2=26                 :rem 140
3 BO=53280:SC=53281:X=RND(0):FORP=1TO2000
  :NEXT:GOSUB2001:G$=STR$(G):GOTO1005
                                        :rem 81
6 PRINT"{CLR}":POKEBO,14:POKESC,13:PRINT"
  {10 DOWN}"TAB(14)"{GRN}THINKING....."
                                        :rem 154
7 O=54272:FORT=OTOO+24:POKET,0:NEXT:POKEO
  +24,15:POKEO+5,17:POKEO+6,167         :rem 71
10 FORN=1TOG:CH%(N)=0:NEXT:FORN=1TO9:C%(N
   )=0:NEXT:CO=0:Q=0                    :rem 110
12 FORN=1TOG                            :rem 240
13 Z=INT(RND(1)*G)+1:IFCH%(Z)<>0THEN13
                                        :rem 203
14 CH%(Z)=N:NEXT                        :rem 196
25 FORB=1TOB1                           :rem 20
30 FORN=1TO9                            :rem 226
32 Z=INT(RND(1)*9)+1:IFZ%(Z)<>0THEN32
                                        :rem 142
34 Z%(Z)=N:NEXT                         :rem 149
36 FORN=1TO9:X=Z%(N):X$=RIGHT$((STR$(X)),
   1):P$(B)=P$(B)+X$:NEXT               :rem 212
38 FORN=1TO9:Z%(N)=0:NEXT               :rem 40
40 NEXTB                                :rem 229
50 P$=P$(1)+P$(2):IF G=9 THEN P$=P$(1)+P$
   (2)+P$(3)                            :rem 207
100 PRINT"{CLR}":POKESC,15              :rem 134
105 FORN=1TOB2STEP3                     :rem 191
110 P$(INT(N/3)+1)=MID$(P$,N,3):NEXT
                                        :rem 241
112 RESTORE:FORN=1TO9:READSQ%(N):NEXT:GOS
    UB 3000                             :rem 37
113 DATA1400,1402,1404,1480,1482,1484,156
    0,1562,1564                         :rem 59
114 FORN=1TO9:POKESQ%(N),N+128:POKESQ%(N)
    +O,C%(N):NEXT:POKEO+4,17:FORT=50TO100
                                        :rem 19
115 POKEO,T:POKEO+1,T:NEXT:POKEO+4,16:FOR
    N=1TO9:IFC%(N)=4THENCO=CO+1         :rem 50
116 NEXT:PRINT"{HOME}{19 DOWN}{13 RIGHT}
    {PUR}PURPLES:{BLK}"CO               :rem 212
117 IFCO=9THEN205                       :rem 246
118 CO=0:Q=Q+1                          :rem 14
130 PRINT"{HOME}{RVS}{RED}TURN"Q        :rem 64
132 INPUT"{HOME}{5 DOWN}{10 RIGHT}{BLU}YO
    UR NUMBER(1-6){6 SPACES}{6 LEFT}";SE$
                                        :rem 181
135 SE=VAL(SE$):IF(SE>G)OR(SE<1)THEN132
                                        :rem 81
136 SE=CH%(SE)                          :rem 8
140 FORN=1TO3                           :rem 14
150 W=VAL(MID$(P$(SE),N,1))             :rem 225
160 IFC%(W)=0THENC%(W)=4:GOTO180        :rem 95
170 IFC%(W)=4THENC%(W)=0                :rem 84
180 NEXTN                               :rem 38
188 GOTO114                             :rem 112
200 REM WIN                             :rem 100
205 FORN=1TO50                          :rem 66
210 POKEO+4,17:YT=INT(RND(1)*100)+150:POK
    EO+1,YT:POKEO,YT                    :rem 196
212 POKESC,YT:POKEBO,YT+1:NEXT:POKEO+4,16
                                        :rem 133
215 PRINT"{CLR}":POKESC,4:POKEBO,2:PRINT"
    {7 DOWN}"TAB(13)"{BLK}THAT'S IT!!!!"
                                        :rem 97
217 PRINT"{3 DOWN}"TAB(11)"YOU TOOK"Q"TUR
    NS."                                :rem 5
220 PRINT"{DOWN}"TAB(10)"WANT ANOTHER (Y/
    N)?"                                :rem 244
225 GETA$:IFA$="Y"THEN6                 :rem 75
230 IFA$="N"THENSYS2048                 :rem 84
235 GOTO225                             :rem 108
1000 REM INSTRUCTIONS                   :rem 90
1005 PRINT"{CLR}{DOWN} {BLK}YOU WILL SEE
     {SPACE}9 BLACK BLOCKS. BY ENTER-
     {DOWN}"                            :rem 182
1010 PRINT"ING A NUMBER BETWEEN 1 AND"G$"
     , YOU CAN"                         :rem 51
1011 PRINT"{DOWN}CHANGE SOME OF THEM TO
     {PUR}PURPLE{BLK}.{2 DOWN}"         :rem 57
```

```
1012 PRINT" {RED}BUT, SOME {PUR}PURPLE
     {RED} ONES MIGHT TURN BACK" :rem 148
1014 PRINT"{DOWN}TO {BLK}BLACK{RED}!"
                                 :rem 117
1015 PRINT"{2 DOWN} {BLU}EACH NUMBER YOU
     {SPACE}ENTER WILL CHANGE THE"
                                 :rem 237
1017 PRINT"{DOWN}COLORS IN ITS OWN WAY."
                                  :rem 23
1025 PRINT"{2 DOWN} {GRN}TRY TO CHANGE AL
     L THE BLOCKS TO {PUR}PURPLE{GRN}
                                 :rem 172
1030 PRINT"{DOWN}IN AS FEW TRIES AS YOU C
     AN.":GOSUB2000:GOTO6        :rem 240
2000 REM GET KEYPRESS            :rem 252
2001 PRINT"{HOME}{23 DOWN}"TAB(14)"{RVS}
     {BLU}TOUCH A KEY{OFF}";     :rem 170
2002 POKE198,0                   :rem 241
2005 GETA$:IFA$=""THEN2005       :rem 177
2010 RETURN                      :rem 163
3000 PRINT"{7 DOWN}"TAB(15)"{WHT}{A}{C
     }{R}{C}{R}{C}{S}"           :rem 237
3010 PRINTTAB(15)"B B B B"       :rem 43
3020 PRINTTAB(15)"{Q}{C+C+C}{W}"
                                 :rem 129
3030 PRINTTAB(15)"B B B B"       :rem 45
3040 PRINTTAB(15)"{Q}{C+C+C}{W}"
                                 :rem 131
3050 PRINTTAB(15)"B B B B"       :rem 47
3060 PRINTTAB(15)"{Z}{C}{E}{C}{E}{C}{X}
     "                           :rem 61
3070 RETURN                      :rem 170
```

Budget Planner

(Article on page 108.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
10 REM DEF VARIABLES             :rem 173
20 SZ=100:I=-19                   :rem 52
30 R$=CHR$(13):TA=0                :rem 8
40 DIM A$(SZ),AE(SZ)              :rem 81
50 DEFFNRN(X)=INT(X*100+.5)/100  :rem 235
200 REM MAINROUTINE              :rem 193
210 GOSUB6000                    :rem 217
220 Z$="":GETZ$:IFZ$=""THENGOTO220
                                 :rem 239
230 IFZ$=CHR$(133)THENI=I+20:GOSUB1000
                                 :rem 206
235 IFZ$=CHR$(134)THENGOSUB3000   :rem 64
240 IFZ$=CHR$(135)THENGOSUB5000   :rem 63
245 IFZ$=CHR$(136)THENGOSUB7000   :rem 71
250 IFZ$=CHR$(137)THENGOSUB2000   :rem 63
255 IFZ$=CHR$(138)THENGOSUB4000   :rem 71
260 IFZ$=CHR$(139)THENGOSUB6000   :rem 70
265 IFZ$=CHR$(140)THENGOSUB8000   :rem 69
270 IFZ$=CHR$(17)THENI=I-1:GOSUB1000
                                 :rem 116
275 IFZ$=CHR$(145)THENI=I+1:GOSUB1000
                                 :rem 169
299 GOTO220                      :rem 113
300 REM ACCUM TOTALS             :rem 183
310 TA=0                         :rem 150
320 FOR J=1TOMX                  :rem 124
330 TA=TA+AE(J)                   :rem 73
340 NEXTJ                         :rem 32
399 RETURN                       :rem 133
400 REM LOAD FILES                :rem 11
410 INPUT"FILE NAME";F$           :rem 79
420 IFF$="*END"THENGOSUB6000:RETURN
                                 :rem 160
450 OPEN1,1,0,F$                  :rem 75
455 PRINT"{RVS}{GRN}FOUND{OFF}{BLK}";F$
                                 :rem 226
460 INPUT#1,MX                    :rem 79
470 FORJ=1TOMX                   :rem 130
480 INPUT#1,Y,A$(J),AE(J)        :rem 126
490 NEXTJ                         :rem 38
495 CLOSE1                        :rem 73
499 RETURN                       :rem 134
500 REM SORT BY NAME             :rem 125
505 IFMX=1THENGOTO599             :rem 75
510 PRINT"{2 DOWN}{5 RIGHT}{RVS}SORTING
    {OFF}"                       :rem 228
520 FORJ=1TOMX-1                 :rem 220
530 FORK=J+1TOMX                 :rem 245
540 IFA$(K)>A$(J)THENGOTO590     :rem 109
550 SM$=A$(K):SM=AE(K)           :rem 213
560 A$(K)=A$(J):AE(K)=AE(J)      :rem 147
570 A$(J)=SM$:AE(J)=SM           :rem 213
590 NEXTK                         :rem 40
595 NEXTJ                         :rem 44
599 RETURN                       :rem 135
1000 REM DISPLAY                 :rem 187
1010 IF(I<1)OR(I>MX)THENI=1       :rem 92
1020 PRINT"{CLR} #"TAB(5)"{CYN}EXPENSES
     {BLK}"TAB(16)"{PUR}AMT{BLK}":rem 102
1030 FORJ=ITOI+19                :rem 252
1040 IFJ>MXTHENPRINT" ":GOTO1080 :rem 189
1050 PR$=STR$(AE(J)+.001):PR$=MID$(PR$,2,
     (LEN(PR$)-2))               :rem 196
1060 IFAE(J)=0THENPR$="0.00"      :rem 24
1065 J$=MID$(STR$(J),2)          :rem 220
1070 PRINTTAB(3-LEN(J$))J$;TAB(4)A$(J)TAB
     (21-LEN(PR$))PR$            :rem 244
1080 NEXTJ                        :rem 82
1090 TA$=STR$(TA+.001)           :rem 173
1100 TA$=LEFT$(TA$,LEN(TA$)-1)   :rem 132
1110 IFTA=0THENTA$="0.00"        :rem 123
1120 PRINT"{CYN}TOTAL {BLK}"TA$    :rem 1
1999 RETURN                      :rem 188
2000 REM ADD NEW                  :rem 89
2010 R=MX+1:N$="":E1$=""         :rem 213
2020 PRINT"{CLR}{3 RIGHT}ADD NEW EXPENSES
     "                           :rem 157
2030 PRINT"{DOWN}{12 RIGHT}ITEM #";R
                                 :rem 226
2040 INPUT"{DOWN}ITEM NAME ";N$  :rem 168
2050 IFN$="*END"THENGOTO2999     :rem 143
2055 IFLEN(N$)>10THENN$=LEFT$(N$,10)
                                  :rem 25
2060 A$(R)=N$                    :rem 127
2070 INPUT"{DOWN}ITEM AMT{2 SPACES}";E1$
                                 :rem 148
2080 IFE1$="*END"THENGOTO2999    :rem 186
2085 IFVAL(E1$)=0THENAE(R)=0:GOTO2100
                                 :rem 148
2090 AE(R)=FNRN(VAL(E1$))        :rem 132
2095 IFAE(R)>9999.99THENAE(R)=9999.99
                                  :rem 99
2100 MX=MX+1                     :rem 166
2110 GOTO2010                    :rem 192
2200 MX=MX+1                     :rem 167
```

```
2999 GOSUB500:GOSUB300:GOSUB6000:RETURN
                                    :rem 217
3000 REM UPDATE                     :rem 106
3010 PRINT "{CLR}{BLU}EXPENSE ";"{RVS}UPD
     ATE{OFF}{BLK}"                 :rem 213
3020 INPUT"{DOWN}ITEM # ";P1$       :rem 220
3025 IFP1$="*END"THENGOTO3999       :rem 198
3026 IF(VAL(P1$)=0)OR(VAL(P1$)<1)THENPRIN
     T"{2 DOWN}{4 RIGHT}{PUR}{RVS}INPUT E
     RROR{OFF}{BLK}":GOTO3020       :rem 225
3027 P=INT(VAL(P1$))                :rem 110
3030 N$="":E1$=""                    :rem 14
3040 IFP>SZTHENPRINT"MAX EXCEEDED":P=SZ:M
     X=P                            :rem 142
3050 IFP>MXTHENMX=P                 :rem 235
3060 PR$=STR$(AE(P)+.001):PR$=MID$(PR$,2,
     (LEN(PR$)-2))                  :rem 205
3065 IFAE(P)=0THENPR$="0.00"         :rem 37
3070 PRINTP;TAB(4)A$(P)TAB(21-LEN(PR$))PR
     $                              :rem 184
3080 INPUT"{DOWN}ITEM NAME";N$      :rem 173
3090 IFN$="*END"THENGOTO3999        :rem 149
3100 IFN$<>""THENA$(P)=N$           :rem 103
3105 IFLEN(A$(P))>10THENA$(P)=LEFT$(A$(P)
     ,10)                           :rem 210
3110 INPUT"AMT ";E1$                 :rem 80
3120 IFE1$="*END"THENGOTO3999       :rem 183
3125 IFE1$=""GOTO3010               :rem 114
3130 IF(VAL(E1$)=0)AND(E1$<>"0")THENPRINT
     "{2 DOWN}{3 RIGHT}{RVS}{PUR}INPUT ER
     ROR{OFF}{BLK}":GOTO3110        :rem 41
3135 IFVAL(E1$)=0THENAE(P)=0:GOTO3800
                                    :rem 151
3140 AE(P)=FNRN(VAL(E1$))           :rem 127
3150 IFAE(P)>9999.99THENAE(P)=9999.99
                                    :rem 88
3800 GOTO3010                       :rem 200
3999 GOSUB500:GOSUB300:GOSUB6000:RETURN
                                    :rem 218
4000 REM SAVE FILE                  :rem 247
4010 PRINT"{CLR}{3 RIGHT}SAVE EXPENSE LIS
     T"                               :rem 3
4020 INPUT"{2 DOWN}FILE NAME";F$    :rem 162
4030 IFF$="*END"THENGOSUB6000:RETURN
                                    :rem 209
4050 OPEN1,1,1,F$                   :rem 124
4060 PRINT#1,MX                     :rem 124
4070 FORJ=1TOMX                     :rem 178
4080 PRINT#1,J;R$;A$(J)R$;AE(J);R$
                                    :rem 146
4090 NEXTJ                           :rem 86
4100 CLOSE1                         :rem 108
4999 GOSUB6000:RETURN                :rem 63

5000 REM DELETE                      :rem 92
5005 DT=0:TM=0                       :rem 23
5010 PRINT"{CLR}{8 RIGHT}DELETE"    :rem 197
5020 S1$=""                         :rem 240
5030 INPUT"{2 DOWN}START AT";S1$    :rem 196
5040 IFS1$="*END"THENGOTO5900       :rem 184
5050 DS=INT(VAL(S1$))               :rem 182
5060 S1$=""                         :rem 244
5070 IFDS=0THENPRINT"{DOWN}{6 RIGHT}{RVS}
     {PUR}INPUT ERROR{OFF}{BLK}":GOTO5020
                                    :rem 66
5080 S1$=""                         :rem 246
5090 INPUT"{2 DOWN}END AT";S1$       :rem 19
5100 IFS1$="*END"THENGOTO5900       :rem 181
5110 IFS1$=""ORS1$="0"THENDE=0:GOTO5200
                                    :rem 216
5120 DE=INT(VAL(S1$))               :rem 166
5125 IFDE>MXTHENDE=MX               :rem 98
5130 IFDE=>DSTHENGOTO5200           :rem 34
5135 PRINT"{2 DOWN}{2 RIGHT}{RVS}{PUR}0 O
     R NUMBER GREATER"              :rem 77
5140 PRINT"{2 DOWN}{2 RIGHT}THAN{OFF}
     {RED}";DE;"{RVS}{PUR}REQUIRED"
                                    :rem 34
5150 GOTO5080                       :rem 209
5200 IFDE=0THENDE=DS                :rem 216
5205 TM=DE-DS+1                      :rem 83
5207 DT=DT+TM                         :rem 7
5210 FORJ=DSTODE                    :rem 249
5220 A$(J)="[9 B]":AE(J)=0         :rem 201
5230 NEXTJ                           :rem 83
5240 GOTO5010                       :rem 202
5900 GOSUB500                       :rem 227
5910 MX=MX-DT                        :rem 27
5999 GOSUB300:GOSUB6000:RETURN      :rem 141
6000 REM OPTIONS MENU                :rem 11
6010 PRINT"{CLR}{7 RIGHT}{PUR}OPTIONS:
     {BLK}"                         :rem 136
6020 PRINT"{7 RIGHT}{YEL}========{BLK}"
                                    :rem 122
6030 PRINT"{DOWN}{RVS}{PUR}F1{OFF}{BLK}-D
     ISPLAY EXPENSES"               :rem 160
6040 PRINT"{DOWN}{RVS}{PUR}F2{OFF}{BLK}-A
     DD NEW EXPENSES"                :rem 63
6050 PRINT"{DOWN}{RVS}{PUR}F3{OFF}{BLK}-U
     PDATE EXPENSE LIST"            :rem 58
6060 PRINT"{DOWN}{RVS}{PUR}F4{OFF}{BLK}-S
     AVE EXPENSE LIST"              :rem 168
6070 PRINT"{DOWN}{RVS}{PUR}F5{OFF}{BLK}-D
     ELETE FROM LIST"               :rem 74
6080 PRINT"{DOWN}{RVS}{PUR}F6{OFF}{BLK}-O
     PTIONS SCREEN"                 :rem 21

6090 PRINT"{DOWN}{RVS}{PUR}F7{OFF}{BLK}-L
     OAD/MERGE FILES"               :rem 93
6100 PRINT"{DOWN}{RVS}{PUR}F8{OFF}{BLK}-E
     ND"                            :rem 251
6999 RETURN                         :rem 193
7000 REM LOAD/MERGE                 :rem 106
7010 PRINT"{CLR}{6 RIGHT}LOAD/MERGE"
                                    :rem 153
7020 PRINT"{DOWN}{5 RIGHT}EXPENSE FILES"
                                    :rem 199
7030 INPUT"LOAD OR MERGE (L/M)";AN$
                                    :rem 214
7040 IFAN$="L"THENMX=0:GOSUB400:GOTO7999
                                    :rem 190
7050 IFAN$="*END"THENGOSUB6000:RETURN
                                     :rem 31
7060 IFAN$<>"M"GOTO7030              :rem 29
7070 PRINT"{DOWN}{4 RIGHT}MERGE"    :rem 148
7080 INPUT"{DOWN}FILE NAME";F$      :rem 154
7090 IFF$="*END"THENGOSUB6000:RETURN
                                    :rem 218
7120 OPEN1,1,0,F$                   :rem 124
7130 INPUT#1,T1                      :rem 96
7140 FORT2=1TOT1                    :rem 207
7150 INPUT#1,Y,T3$,T4               :rem 193
7160 FORJ=1TOMX                     :rem 181
7170 IFA$(J)=T3$THENAE(J)=INT(((AE(J)+T4)
     /2)*100)/100:T3$=""            :rem 199
7180 NEXTJ                           :rem 89
7190 IFT3$<>""THENMX=MX+1:A$(MX)=T3$:AE(M
     X)=T4                          :rem 211
7200 NEXT                             :rem 8
7210 CLOSE1                         :rem 113
7999 GOSUB500:GOSUB300:GOSUB6000:RETURN
                                    :rem 222
```

```
8000 REM END OF JOB                    :rem 243
8010 PRINT"{CLR}{4 RIGHT}END OF PROGRAM
     {2 DOWN}"                         :rem 71
8020 PRINT"WOULD YOU LIKE TO SAVE (Y/N)":
     INPUT AN$                         :rem 190
8030 IFAN$="*END"THENGOSUB6000:RETURN
                                       :rem 30
8040 IFAN$="N"THENGOTO8060             :rem 19
8050 GOSUB4000                         :rem 17
8060 PRINT"{CLR}THANK YOU"             :rem 165
8070 PRINT"{13 RIGHT}END"              :rem 240
8080 END                               :rem 167
```

Machine Language For Beginners

(Article on page 154.)

Program 1: VIC Version

```
12288  LDY   # 0
12290  LDA   # 6
12292  STA   37888 ,Y
12295  STA   38144 ,Y
12298  INY
12299  BNE         12292
12301  LDY   # 0
12303  LDA   # 224
12305  STA   4096 ,Y
12308  STA   4580 ,Y
12311  INY
12312  CPY   # 22
12314  BNE         12305
12316  RTS
```

Program 2: 64 Version

```
49152  LDY   # 0
49154  LDA   # 8
49156  STA   55296 ,Y
49159  STA   55552 ,Y
49162  STA   55808 ,Y
49165  STA   56064 ,Y
49168  INY
49169  BNE         49156
49171  LDY   # 0
49173  LDA   # 224
49175  STA   1024 ,Y
49178  STA   1984 ,Y
49181  INY
49182  CPY   # 40
49184  BNE         49175
49186  RTS
```

Program 3: Assembler Convenience

```
245 IFMN$="XX"THENPRINT"TO ADDRESS":INPUT
    DA:SA=DA:GOTO230
```

Program 4: VIC Loader

Remember to POKE 56,48

```
800 FOR ADRES=12288TO12316:READ DATTA:POK
    E ADRES,DATTA:NEXT ADRES
864 DATA 160, 0, 169, 6, 153, 0
870 DATA 148, 153, 0, 149, 200, 208
876 DATA 247, 160, 0, 169, 224, 153
882 DATA 0, 16, 153, 228, 17, 200
888 DATA 192, 22, 208, 245, 96
```

Program 5: 64 Loader

```
800 FOR ADRES=49152TO49186:READ DATTA:POK
    E ADRES,DATTA:NEXT ADRES
864 DATA 160, 0, 169, 8, 153, 0
870 DATA 216, 153, 0, 217, 153, 0
876 DATA 218, 153, 0, 219, 200, 208
882 DATA 241, 160, 0, 169, 224, 153
888 DATA 0, 4, 153, 192, 7, 200
894 DATA 192, 40, 208, 245, 96
```

Disk File Manager

(Article on page 130.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Disk Manager For VIC And 64

```
3 POKE 49152,10:IF PEEK(49152)<>10 THEN C
  0=1:GOTO6                            :rem 204
5 C0=2                                  :rem 23
6 DIM DOS%(65)                         :rem 215
7 FR=FRE(0):IF FR<0 THEN FR=FR+65536
                                        :rem 7
8 S=(FR-400)/2:M2=INT(S/256)+1         :rem 128
9 DIM TEMP%(S)                          :rem 18
10 PRINT"{CLR}";
15 PRINT"{2 SPACES}******************"
                                       :rem 43
20 PRINT"{2 SPACES}*{2 SPACES}DISK MANAGE
   R{2 SPACES}*"                       :rem 173
25 PRINT"{2 SPACES}******************"
                                       :rem 44
50 PRINT:PRINT"1.DISK DIRECTORY"       :rem 60
60 PRINT"2.FORMAT NEW DISK"            :rem 117
70 PRINT"3.INITIALIZE DISK"            :rem 182
80 PRINT"4.COPY FILE ON SAME DISK"
                                       :rem 228
85 PRINT"5.COPY FILE ON NEW (FORMATTED) D
   ISK"                                :rem 165
88 PRINT"6.COPY BOTH DOS WEDGE PROGRAMS"
                                       :rem 202
90 PRINT"7.RENAME FILE"                :rem 119
100 PRINT"8.ERASE FILE(S)"             :rem 252
110 PRINT"9.VALIDATE FILES"            :rem 135
120 PRINT"10.WRITE DISK MANAGER"       :rem 164
130 PRINT"11.ERROR STATUS"              :rem 99
140 PRINT"12.EXIT TO BASIC":PRINT:rem 253
170 INPUT"CHOICE{4 SPACES}{4 LEFT}";CHOIC
    E                                  :rem 113
180 IF (CHOICE<1)OR(CHOICE>12)THEN PRINT"
    {UP}";:GOTO 170                    :rem 166
200 ON CHOICE GOSUB 250,300,350,400,800,1
    200,450,500,550,600,650,700        :rem 127
210 GOTO 10                             :rem 45
250 REM *** DISPLAY DIRECTORY ***      :rem 66
251 PRINT"{CLR}"                       :rem 252
252 OPEN 1,8,0,"$"                      :rem 80
253 GET #1,A$,B$                       :rem 241
254 GET#1,A$,B$                        :rem 242
256 GET #1,A$,B$                       :rem 244
258 C=0:IF A$<>""THEN C= ASC(A$)       :rem 119
260 IF B$<>""THEN C=C+ ASC(B$)*256
                                       :rem 189
```

```
262 PRINT MID$(STR$(C),2);TAB(3); :rem 86
264 GET#1,B$:IF ST<>0 THEN 282    :rem 71
266 IF B$<> CHR$(34) THEN 264    :rem 145
268 GET #1,B$:IF B$<> CHR$(34) THEN PRINT
    B$;:GOTO 268                 :rem 56
270 GET #1,B$:IF B$= CHR$(32) THEN 270
                                 :rem 74
272 PRINT TAB(18);:C$=""         :rem 22
274 C$=C$+B$:GET #1,B$:IF B$<>"" THEN 274
                                 :rem 242
276 PRINT LEFT$(C$,3)            :rem 146
280 IF ST=0 THEN 254              :rem 7
282 PRINT" BLOCKS FREE "         :rem 77
284 CLOSE 1:PRINT:PRINT:PRINT"HIT ANY KEY
    TO RETURN"                   :rem 23
290 GET X$:IFX$=""THEN 290       :rem 135
295 RETURN                       :rem 128
300 REM *** FORMAT (NEW) DISK ***:rem 162
301 PRINT"{CLR}"                 :rem 248
305 PRINT"INSERT DISK TO BE":PRINT"FORMAT
    TED.":PRINT                  :rem 57
310 PRINT"INPUT DISK NAME":INPUT DISK$
                                 :rem 90
320 PRINT:PRINT"INPUT EXTENDER NAME":INPU
    T EXT$                       :rem 28
325 MACRO$="N0:"+DISK$+","+EXT$  :rem 190
330 OPEN 15,8,15,MACRO$          :rem 230
340 CLOSE 15:MACRO$="":RETURN    :rem 222
350 REM *** INITIALIZE DISK ***  :rem 149
355 PRINT"{CLR}"                  :rem 1
360 PRINT"INSERT DISK TO BE":PRINT"INITIA
    LIZED.":PRINT                :rem 202
370 PRINT"HIT <RETURN> TO":PRINT"INITIALI
    ZE":INPUT X$                 :rem 144
380 OPEN 15,8,15,"I"             :rem 226
390 CLOSE 15:RETURN              :rem 146
400 REM *** COPY FILE ON SAME DISK ***
                                 :rem 189
405 PRINT"{CLR}":PRINT:PRINT     :rem 139
410 PRINT"INPUT SOURCE FILE NAME":INPUT D
    ISK$                         :rem 33
420 PRINT:PRINT"INPUT NEW FILE NAME":INPU
    T NWS$                       :rem 207
425 MACRO$="C:"+NWS$+"="+DISK$   :rem 156
430 OPEN 15,8,15,MACRO$          :rem 231
440 CLOSE 15:MACRO$="":RETURN    :rem 223
450 REM *** RENAME FILE ***       :rem 81
455 PRINT"{CLR}":PRINT           :rem 201
460 PRINT"INPUT OLD FILE NAME":INPUT DISK
    $                            :rem 52
470 PRINT:PRINT"INPUT NEW FILE NAME":INPU
    T NWS$                       :rem 212
475 MACRO$="R:"+NWS$+"="+DISK$   :rem 176
480 OPEN 15,8,15,MACRO$          :rem 236
490 CLOSE 15:MACRO$="":RETURN    :rem 228
500 REM *** ERASE FILE ***        :rem 5
505 PRINT"{CLR}":PRINT:PRINT     :rem 140
510 PRINT"INPUT FILE NAME(S) TO DELETE":I
    NPUT DISK$                   :rem 75
520 PRINT:PRINT:PRINT"HIT ANY KEY TO DELE
    TE"                           :rem 2
525 GET X$:IF X$="" THEN 525     :rem 137
530 MACRO$="S0:"+DISK$           :rem 230
535 OPEN 15,8,15,MACRO$          :rem 237
540 CLOSE 15:MACRO$="":RETURN    :rem 224
550 REM *** VALIDATE FILES ***    :rem 55
555 PRINT"{CLR}":PRINT:PRINT     :rem 145
560 PRINT"WARNING:OPEN FILES ":PRINT"WILL
     BE DELETED"                 :rem 34
570 PRINT:PRINT:PRINT"HIT ANY KEY TO VALI
    DATE"                        :rem 158
575 GET X$:IF X$="" THEN 575     :rem 147
580 OPEN 1,8,15,"V"              :rem 188
590 CLOSE 1:RETURN                :rem 95
600 REM ** WRITE DISKMANAGER PROGRAM **
                                 :rem 235
605 PRINT"{CLR}":PRINT:PRINT     :rem 141
610 PRINT"INSERT DISK TO BE WRITTEN TO.":
    PRINT                        :rem 87
620 PRINT:PRINT:PRINT"HIT ANY KEY TO WRIT
    E DISK MANAGER"               :rem 1
622 GET X$:IF X$="" THEN 622     :rem 133
625 OPEN 1,8,15                  :rem 246
630 SAVE "@0:DISKMANAGER",8       :rem 64
635 CLOSE 1                       :rem 69
640 RETURN                       :rem 122
650 REM *** DISPLAY ERROR STATUS ***
                                 :rem 255
655 OPEN15,8,15                   :rem 46
660 INPUT#15,A$,B$,C$,D$         :rem 255
670 PRINT"{CLR}":PRINT:PRINT     :rem 143
680 PRINT"ERROR STATUS:{2 SPACES}"B$:PRIN
    T:PRINT"ERROR NUMBER:{2 SPACES}"A$
                                 :rem 65
690 PRINT:PRINT:PRINT"HIT ANY KEY TO RETU
    RN"                          :rem 55
695 GET X$:IF X$=""THEN 695      :rem 153
697 CLOSE 15:RETURN              :rem 156
700 REM *** RETURN TO BASIC ***   :rem 92
705 PRINT"{CLR}":PRINT:PRINT     :rem 142
710 PRINT "NOTE:DISKMANAGER PROGRAM IS ST
    ILL RESIDENT"                :rem 153
720 END                          :rem 112
800 REM *** COPY FILE ON NEW DISK ***
                                 :rem 133
801 PRINT "{CLR}"                :rem 253
802 CLOSE 15                     :rem 118
803 MAX=INT(S/256)                :rem 25
804 PRINT "{2 SPACES}MAXIMUM SIZE OF FILE
     WHICH CAN BE COPIED IS "MAX" BLOCKS"
    :PRINT                        :rem 70
806 IF MAX>=M2 THEN GOTO 809      :rem 22
807 PRINT "{2 SPACES}FOR MAXIMUM COPY SIZ
    E OF "M2" BLOCKS,";          :rem 104
808 PRINT "TURN COMPUTER OFF/ON AND RELOA
    D PROG."                     :rem 192
809 PRINT:PRINT"{2 SPACES}READ/WRITE RATE
     IS APPROXIMATELY 6 BLOCKS/MINUTE"
                                 :rem 187
810 PRINT:PRINT "INPUT NAME OF FILE TO BE
     COPIED"                     :rem 117
820 INPUT FILE$                  :rem 110
830 PRINT:PRINT "{3 SPACES}INPUT FILE TYP
    E:"                          :rem 95
840 PRINT "{5 SPACES}P PROGRAM"  :rem 213
850 PRINT "{5 SPACES}S SEQUENTIAL"
                                 :rem 188
860 PRINT "{5 SPACES}U USER"      :rem 3
870 PRINT "{5 SPACES}R RELATIVE"  :rem 30
880 INPUT TYPE$                  :rem 150
890 PRINT:PRINT "INSERT SOURCE DISK AND P
    RESS <RETURN>"               :rem 196
900 GET W$:IF W$="" THEN GOTO 900:rem 186
910 GOSUB 1000:REM READ FILE INTO TEMP
                                 :rem 165
920 PRINT:PRINT "INSERT DESTINATION DISK
    {SPACE}AND PRESS <RET>"      :rem 58
930 GET W$:IF W$="" THEN GOTO 930:rem 192
940 GOSUB 1050:REM WRITE FILE FROM TEMP$
                                 :rem 58
950 PRINT:PRINT "MAKE ANOTHER COPY";:INPU
    TW$                          :rem 32
```

```
960 IF LEFT$(W$,1)="Y" THEN GOTO 920
                                    :rem 131
970 GOTO 1100                       :rem 155
980 REM - CHECK FOR GOOD OPEN       :rem 82
985 INPUT#15,A$,B$,C$,D$            :rem 9
990 IF VAL(A$)=0 THEN RETURN        :rem 70
995 PRINT A$,B$,C$,D$:CLOSE 15:STOP
                                    :rem 232
1000 REM - READ FILE INTO TEMP%     :rem 163
1002 I=1                            :rem 122
1004 OPEN 15,8,15                   :rem 83
1006 OPEN 5,8,5,"0:"+FILE$+","+TYPE$+",R"
                                    :rem 85
1008 GOSUB 980                      :rem 234
1009 PRINT "{5 SPACES}NOW READING . . ."
                                    :rem 19
1010 GET#5,A$                       :rem 139
1012 TEMP%(I)=ASC(A$+CHR$(0))       :rem 48
1014 I=I+1                          :rem 241
1016 IF ST=0 THEN 1010              :rem 92
1018 PRINT:PRINT "FILE=? ";FILE$,"ST=";ST,
     "BYTES=";I:CLOSE 5:CLOSE 15    :rem 39
1020 RETURN                         :rem 163
1050 REM - WRITE FILE FROM TEMP%    :rem 17
1052 OPEN 15,8,15                   :rem 86
1054 OPEN 5,8,5,"0:"+FILE$+","+TYPE$+",W"
                                    :rem 93
1056 GOSUB 980                      :rem 237
1057 PRINT "{5 SPACES}NOW WRITING . . ."
                                    :rem 64
1058 J=1                            :rem 134
1060 PRINT#5,CHR$(TEMP%(J));        :rem 91
1062 J=J+1                          :rem 246
1064 IF J<I THEN 1060               :rem 31
1066 PRINT:PRINT "FILE= ";FILE$,"BYTES=";
     J:CLOSE 5:CLOSE 15             :rem 245
1068 RETURN                         :rem 175
1100 RETURN                         :rem 162
1200 REM ***COPY BOTH DOS PROGRAMS ***
                                    :rem 92
1205 PRINT "{CLR}":PRINT "INSERT SOURCE D
     ISK WITH WEDGE AND/OR DOS";    :rem 116
1210 PRINT " PROGRAM(S) AND PRESS <RETURN
     >"                             :rem 11
1215 GET W$:IF W$="" THEN GOTO 1215
                                    :rem 26
1218 TYPE$="P"                      :rem 3
1219 IF C0=1 THEN FILE$="VIC-20 WEDGE":GO
     TO 1235                        :rem 76
1220 FILE$="C-64 WEDGE":GOSUB 1000:rem 75
1225 FOR C=1 TO 64:DOS%(C)=TEMP%(C):NEXT
     {SPACE}C:REM MOVE C-64 WEDGE TO SMAL
     L BUFFER                       :rem 161
1230 FILE$="DOS 5.1"                :rem 5
1235 GOSUB 1000:PRINT:PRINT "INSERT DESTI
     NATION DISK AND PRESS <RET>":rem 229
1240 GET W$:IF W$="" THEN GOTO 1240
                                    :rem 22
1245 GOSUB 1050:IF C0=1 THEN RETURN
                                    :rem 203
1250 FOR C=1 TO 64:TEMP%(C)=DOS%(C):NEXT
     {SPACE}C                       :rem 46
1255 FILE$="C-64 WEDGE":I=64:GOSUB 1050:R
     EM WRITE C-64 WEDGE            :rem 113
1290 RETURN                         :rem 172
```

Spelling Bee

(Article on page 124.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: Spelling Bee For VIC-20

```
1 POKE36879,30:PRINT"{BLK}":REM WHITE SCR
  EEN BLACK LETTERS                 :rem 122
2 DIML$(75)                         :rem 57
3 ::::REM SPELLING BEE              :rem 41
4 PRINT"{CLR}"TAB(9)"{BLK}IU{YEL}"  :rem 9
5 PRINTTAB(8)"U**I"                 :rem 132
10 PRINTTAB(8)"-{BLK}WW{YEL}-"      :rem 40
15 PRINTTAB(8)"-{BLK}JK{YEL}-"      :rem 20
20 PRINTTAB(8)"J{S}{A}K"            :rem 134
25 PRINTTAB(7)"U*{X}{Z}*I"          :rem 31
30 PRINTTAB(6)"N-{BLK}{RVS}{4 SPACES}
   {OFF}{YEL}-M"                    :rem 185
35 PRINTTAB(5)"N -{4 SPACES}- M"    :rem 235
40 PRINTTAB(4)"N{2 SPACES}-{BLK}{RVS}
   {4 SPACES}{OFF}{YEL}-{2 SPACES}M"
                                    :rem 184
45 PRINTTAB(3)"N{2 SPACES}N-{4 SPACES}-M
   {2 SPACES}M"                     :rem 133
50 PRINTTAB(3)"M N -{BLK}{RVS}{4 SPACES}
   {OFF}{YEL}- M N"                 :rem 83
55 PRINTTAB(4)"{T}{2 SPACES}J*{2 R}
   *K{2 SPACES}{T}"                 :rem 86
110 PRINT"{BLK}{3 DOWN}HELLO! MY NAME IS"
                                    :rem 30
113 PRINT"{DOWN}{YEL}SPELLING BEE{BLK}."
                                    :rem 253
115 PRINT"{DOWN}WHAT IS YOUR NAME? ":PRIN
    T:GOSUB1630                     :rem 67
120 PRINT"{CLR}{5 DOWN}{4 RIGHT}WOULD YOU
     LIKE"                          :rem 109
122 PRINT"{DOWN}{5 RIGHT}INSTRUCTIONS"
                                    :rem 189
123 PRINT"{DOWN}{7 RIGHT}(Y OR N)?"
                                    :rem 27
125 GETA$:IFA$=""THEN125            :rem 83
130 IFA$="Y"THEN700                 :rem 40
135 IFA$="N"THEN320                 :rem 32
140 PRINT"{DOWN}YES OR NO ONLY PLEASE":FO
    RT=1TO1500:NEXTT:GOTO120        :rem 193
143 :                               :rem 210
145 REM SPELL AND FLASH WORD        :rem 123
147 :                               :rem 214
150 GOSUB1800:PRINT"{CLR}{BLK}{DOWN}THAT
    {SPACE}IS INCORRECT."           :rem 194
160 PRINT"{DOWN}THE CORRECT SPELLING"
                                    :rem 202
170 PRINT"{DOWN}IS:{RED}":FORT=1TO2000:NE
    XTT                             :rem 129
180 A$="{CLR}{RED}{9 DOWN}{6 RIGHT}":PRIN
    TA$;                            :rem 220
190 FORI=1TOLEN(L$(L)):PRINTMID$(L$(L),I,
    1);:FORJ=1TO500:NEXTJ,I         :rem 145
200 FORR=1TO20:PRINT"{CLR}";A$;"{RVS}";L$
    (L);"{OFF}":FORI=1TO15:NEXTI:PRINT"
    {CLR}";A$;L$(L)                 :rem 143
210 FORI=1TO15:NEXTI:NEXTR          :rem 199
211 IFL$(L)=L$(25)THEN360:REM CATCH 3RD M
    ISTAKE ON LAST EASY WORD        :rem 244
212 IFL$(L)=L$(50)THEN360:REM CATCH 3RD M
    ISTAKE ON LAST MEDIUM WORD      :rem 130
```

```
213 IFL$(L)=L$(75)THEN360:REM CATCH 3RD M
    ISTAKE ON LAST HARD WORD      :rem 232
215 PRINT"{CLR}{10 DOWN}{2 RIGHT}HERE, TR
    Y ANOTHER.":FORT=1TO2000:NEXTT
                                  :rem 131
220 RETURN                        :rem 116
222 :                             :rem 208
225 :REM WORDS                    :rem 70
227 :                             :rem 213
230 DATACAT,DOG,ANT,AND,ANY,AN,AM,CAN,CAP
    ,TOP,STOP,POT,TAP,PAT,CAR,CART,ART
                                  :rem 95
240 DATAHAND,HAT,FOOT,BOOK,FLY,SKY,SAW,SE
    E                             :rem 233
250 DATASNAKE,SNACK,BOAT,MANY,LOOSE,LOSE,
    CHOOSE,CHOSE,CHASE,CHEESE,STOVE,STORE
                                  :rem 233
260 DATASTEAL,STAIRS,WHOLE,SCREW,WASHER,H
    ORSE,STEER,STONE,PLANT,RADIO,COUCH
                                  :rem 115
270 DATACHAIR,TABLE               :rem 174
280 DATASTEREO,STATION,TELEVISION,CUSHION
    ,CAUTION,FREEZER,WEATHER,WHETHER
                                  :rem 68
290 DATAWHOEVER,HAMMOCK,COMMITTEE,COMPUTE
    R,LICENSE,MONITOR,DICTIONARY,RECEIVE
                                  :rem 67
300 DATARECORD,SPEAKER,CURTAIN,PILLOW,WAT
    ERBED,WINDOW,THEATER,PIANO,LIVER
                                  :rem 240
310 :                             :rem 206
313 :REM NO INSTRUCTIONS REQUESTED
                                  :rem 185
315 :                             :rem 211
320 PRINT"{CLR}{4 DOWN}GREAT, ";NA$;".":P
    RINT"{4 DOWN}{6 RIGHT}LET'S GO!"
                                  :rem 138
330 PRINT:PRINT"{DOWN}{RIGHT}(PRESS {RVS}
    SPACE{OFF} BAR TO)"           :rem 194
335 PRINT"{DOWN}{5 RIGHT}(CONTINUE.)"
                                  :rem 242
340 GETA$:IFA$<>" "THEN340        :rem 142
350 GOTO990                       :rem 115
355 :                             :rem 215
360 PRINT"{CLR}{5}{5 DOWN}WASN'T THAT F
    UN?":GOTO1735                 :rem 58
365 :                             :rem 216
685 :                             :rem 221
690 :REM INSTRUCTIONS             :rem 114
695 :                             :rem 222
700 PRINT"{CLR}{4 DOWN}GREAT! NOW, ";NA$;
    ",":PRINT"{DOWN}ALL YOU HAVE TO DO"
                                  :rem 216
710 PRINT"{DOWN}IS FOLLOW THESE SIMPLE"
                                  :rem 44
715 PRINT"DIRECTIONS."            :rem 144
720 PRINT"{4 DOWN}(PRESS THE {RVS}SPACE
    {OFF} BAR)"                   :rem 82
725 PRINT"{DOWN}{3 RIGHT}(TO CONTINUE.)"
                                  :rem 94
730 GETA$:IFA$<>" "THEN730        :rem 148
740 PRINT"{CLR}FIRST,THE ALPHABET, A"
                                  :rem 66
742 PRINT"{DOWN}RETURN ARROW (←), AND"
                                  :rem 153
745 PRINT"{DOWN}A {RED}RED V{BLK} WILL BE
     PLACED"                      :rem 136
750 PRINT"ON THE LOWER HALF OF"   :rem 36
755 PRINT"{DOWN}THE SCREEN WITH A"
                                  :rem 161
760 PRINT"{DOWN}POINTER (↑) UNDER THE"
                                  :rem 174
765 PRINT"{DOWN}{RED}RED V{BLK}.
    {2 SPACES}THEN, A WORD"       :rem 231
770 PRINT"{DOWN}WILL BE FLASHED ONTO":PRI
    NT"{DOWN}THE SCREEN."         :rem 97
775 PRINT"{2 DOWN}(PRESS THE {RVS}SPACE
    {OFF} BAR)"                   :rem 58
780 PRINT"{DOWN}{3 RIGHT}(TO CONTINUE.)"
                                  :rem 95
785 GETA$:IFA$<>" "THEN785        :rem 168
790 PRINT"{CLR}{DOWN}USING A JOYSTICK, TY
    PE"                           :rem 186
795 PRINT"THE WORD BY PLACING"    :rem 44
800 PRINT"{DOWN}THE POINTER (↑) UNDER"
                                  :rem 169
810 PRINT"{DOWN}THE CORRECT LETTER AND"
                                  :rem 17
820 PRINT"PRESSING THE {RVS}FIRE{OFF}":PR
    INT"{DOWN}BUTTON."            :rem 167
830 PRINT"{DOWN}WHEN THE WORD HAS BEEN"
                                  :rem 194
840 PRINT"SPELLED CORRECTLY,"     :rem 89
841 PRINT"{2 DOWN}(PRESS THE {RVS}SPACE
    {OFF} BAR)"                   :rem 52
842 PRINT"{DOWN}{3 RIGHT}(TO CONTINUE.)"
                                  :rem 94
843 GETA$:IFA$<>" "THEN843        :rem 158
845 PRINT"{CLR}{DOWN}PLACE THE POINTER (↑
    )"                            :rem 44
850 PRINT"{DOWN}UNDER RETURN (←) AND"
                                  :rem 96
855 PRINT"{DOWN}PRESS THE {RVS}FIRE{OFF}
    {SPACE}BUTTON."               :rem 198
860 PRINT"IF YOU MAKE A MISTAKE" :rem 104
865 PRINT"{DOWN}BEFORE YOU FINISH, PUT"
                                  :rem 27
870 PRINT"THE POINTER (↑) UNDER" :rem 159
875 PRINT"{DOWN}THE {RED}RED V{BLK} AND P
    RESS"                         :rem 36
880 PRINT"{DOWN}THE {RVS}FIRE{OFF} BUTTON
    ."                            :rem 55
883 PRINT"{3 DOWN}(PRESS THE {RVS}SPACE
    {OFF} BAR)"                   :rem 75
885 PRINT"{DOWN}{3 RIGHT}(TO CONTINUE.)"
                                  :rem 101
890 GETA$:IFA$<>" "THEN890        :rem 162
895 PRINT"{CLR}YOU WILL THEN BE ABLE"
                                  :rem 9
898 PRINT"{DOWN}TO RE-SPELL THE WORD"
                                  :rem 143
900 PRINT"{DOWN}WITH NO PENALTY.
    {2 SPACES}YOU"                :rem 156
903 PRINT"{DOWN}WILL BE GIVEN THREE"
                                  :rem 46
905 PRINT"{DOWN}CHANCES TO GET IT"
                                  :rem 149
908 PRINT"{DOWN}RIGHT.{2 SPACES}IF YOU HA
    VEN'T"                        :rem 168
910 PRINT"GOTTEN IT RIGHT BY"     :rem 242
913 PRINT"{DOWN}THEN, I WILL TELL YOU"
                                  :rem 137
915 PRINT"{DOWN}THE CORRECT SPELLING."
918 PRINT"{2 DOWN}(PRESS THE {RVS}SPACE
    {OFF} BAR)"                   :rem 57
920 PRINT"{DOWN}{3 RIGHT}(TO CONTINUE.)"
                                  :rem 91
923 GETA$:IFA$<>" "THEN923        :rem 156
925 PRINT"{CLR}{DOWN}YOU WILL START WITH
    {SPACE}A"                     :rem 85
930 PRINT"{DOWN}SCORE OF 75 AND ONE"
                                  :rem 176
```

```
935 PRINT"{DOWN}POINT WILL BE DEDUCTED"
                                    :rem 14
940 PRINT"EACH TIME YOU MISSPELL" :rem 20
945 PRINT"A WORD."                  :rem 30
950 PRINT"{2 DOWN}EASY, HUH?"       :rem 19
955 PRINT"{4 DOWN}(PRESS THE {RVS}SPACE
    {OFF} BAR)"                     :rem 92
960 PRINT"{DOWN}{3 RIGHT}(TO CONTINUE.)"
                                    :rem 95
965 GETA$:IFA$<>" "THEN965          :rem 168
990 S=0:L=0:PRINT"{CLR}{DOWN}HOW HARD WOU
    LD YOU"                         :rem 153
995 PRINT"{DOWN}LIKE YOUR WORDS,{DOWN}"
                                    :rem 201
1000 PRINTNA$;"?"                   :rem 191
1010 PRINTTAB(7)"{2 DOWN}{RED}1) EASY"
                                    :rem 188
1020 PRINTTAB(7)"{DOWN}{RED}2) MEDIUM"
                                    :rem 60
1030 PRINTTAB(7)"{DOWN}{RED}3) HARD{BLK}"
    :PRINT                          :rem 243
1040 PRINT"{2 DOWN}{5 RIGHT}('Q' TO QUIT)
    "                               :rem 31
1060 GETA$:IFA$=""THEN1060          :rem 177
1070 IFA$="1"THENPRINT"{CLR}":FORX=1TO25:
    GOTO1130:REM EASY               :rem 122
1080 IFA$="2"THENPRINT"{CLR}":FORX=26TO50
    :GOTO1130:REM MEDIUM            :rem 64
1090 IFA$="3"THENPRINT"{CLR}":FORX=51TO75
    :GOTO1130:REM HARD              :rem 165
1100 IFA$="Q"THEN1735               :rem 135
1110 PRINT"PLEASE TRY AGAIN,";NA$;".":PRI
    NT"YOU PRESSED ";A$:FORX=1TO2000:NEX
    TX:GOTO990                      :rem 100
1130 RESTORE:FORL=1TO75             :rem 211
1133 :                               :rem 2
1135 :REM READ THE WORDS            :rem 116
1138 :                               :rem 7
1140 READL$(L)                      :rem 239
1150 IFL=XTHEN1170                   :rem 47
1160 NEXT                            :rem 7
1170 FORN=1TO3:REM MISTAKE COUNTER
                                    :rem 142
1180 LL=(22-LEN(L$(L)))/2:PRINT"{CLR}
    {GRN}{10 DOWN}";TAB(LL);L$(L):FORY=1
    TO2000:NEXTY                    :rem 231
1182 Z=L                            :rem 175
1183 IFL>25THENZ=L-25:IFL>50THENZ=L-50
                                    :rem 79
1185 PRINT"{CLR}{PUR}WORD NUMBER:";Z:PRIN
    T"{DOWN}SCORE:";75-S            :rem 156
1190 PRINT"{RED}{2 DOWN}NOW SPELL IT, ";N
    A$;".{BLK}"                     :rem 66
1200 PRINT"{DOWN}('END' AND '{RED}←{BLK}
    ' TO GO)"                       :rem 128
1203 PRINT"(ON TO HARDER WORDS )":rem 109
1205 PRINT"('Q' AND '{RED}←{BLK}' TO QUI
    T)"                             :rem 155
1210 GOSUB1390:PRINTCHR$(13):IFD$="END"TH
    EN990                           :rem 232
1220 IFD$="Q"THEN1735               :rem 141
1230 IFD$=""THEN1260:REM CATCHES CARRIAGE
     RETURN WITH EMPTY SET          :rem 36
1240 IFD$=L$(25)THEN1320:REM LAST EASY WO
    RD                              :rem 216
1241 IFD$=L$(50)THEN1320:REM LAST MEDIUM
    {SPACE}WORD                     :rem 102
1242 IFD$=L$(75)THEN1320:REM LAST HARD WO
    RD                              :rem 204
1250 IFD$=L$(L)THEN1300             :rem 252
1260 IFN=3THENGOSUB150:NEXTX        :rem 44
1270 GOSUB1800:PRINT"{5 DOWN}TRY AGAIN, "
    ;NA$:PRINT"THAT'S INCORRECT.":FORY=1
    TO3000:NEXTY                    :rem 153
1280 S=S+1                          :rem 10
1290 NEXTN                          :rem 89
1300 GOSUB1810:PRINT"{RED}{5 DOWN}
    {3 RIGHT}CORRECT! NOW TRY"      :rem 7
1305 PRINT"{7 RIGHT}ANOTHER.{BLK}":FORY=1
    TO2000:NEXTY                    :rem 83
1310 NEXTX                          :rem 92
1320 FORHT=1TO5:GOSUB1810:NEXTHT:PRINT"
    {3}{6 DOWN}CORRECT!{5}":FORT=1TO
    2000:NEXTT:GOTO360              :rem 27
1380 RETURN                         :rem 172
1385 REM PRINT ALPHABET AND POINTER
                                    :rem 119
1390 PRINT:PRINTTAB(7):D$="":SC=4409:CO=S
    C+33792:CN=1                    :rem 140
1400 POKESC,CN:POKECO,5             :rem 163
1410 SC=SC+1:CO=CO+1:CN=CN+1:IFSC=4422THE
    NSC=4452:CO=SC+33792            :rem 130
1415 IFSC=4465THEN1430              :rem 247
1420 GOTO1400                       :rem 197
1430 POKESC,31:POKECO,2:POKESC-57,86:POKE
    CO-57,2                         :rem 154
1440 S1=4430                         :rem 85
1450 IFS1<4430THENS1=4487:REM MOVE POINTE
    R TO LEFT ARROW SYMBOL          :rem 80
1455 IFS1=4444THENS1=4474           :rem 178
1460 IFS1=4473THENS1=4443           :rem 172
1465 IFS1>4487THENS1=4430:REM MOVE POINTE
    R TO LETTER A                   :rem 221
1470 C1=S1+33792                     :rem 52
1480 POKES1,30:POKEC1,2              :rem 74
1490 GOSUB1540                       :rem 24
1500 IFJV=8THENS1=S1+1:C1=C1+1:POKES1-1,3
    2:FORT=1TO25:NEXTT:REM MOVE RIGHT
                                    :rem 94
1510 IFJV=4THENS1=S1-1:C1=C1-1:POKES1+1,3
    2:FORT=1TO25:NEXTT:REM MOVE LEFT
                                    :rem 10
1520 IFJV=FRTHENGOSUB1570:IFB$=CHR$(13)TH
    ENPRINT"{BLK}":RETURN           :rem 20
1530 GOTO1450                       :rem 204
1533 :                               :rem 6
1535 :REM READ JOYSTICK             :rem 120
1538 :                              :rem 11
1540 POKE37154,127:REM DISABLE KEYBOARD
                                    :rem 38
1542 EW=PEEK(37152)AND128:POKE37154,255:R
    EM ENABLE KEYBOARD              :rem 214
1545 WE=PEEK(37151)AND16:FB=PEEK(37151)AN
    D32                              :rem 7
1548 JV=0:FR=16:IF WE=0THEN JV=4    :rem 103
1550 IF EW=0 THEN JV=8              :rem 167
1553 IF FB=0 THEN FR=0              :rem 134
1560 RETURN                         :rem 172
1570 H=PEEK(S1-22)                  :rem 221
1580 GETB$                           :rem 20
1590 B$=CHR$(H+64)                  :rem 161
1600 IFS1=4430THENPRINT"{CLR}{8 DOWN}":GO
    TO1390:REM START SAME WORD AGAIN WIT
    H NO PENALTY                    :rem 161
1605 IFB$="←"THENB$=CHR$(13):RETURN
                                    :rem 67
1610 PRINT"{GRN}";TAB(LL);B$;       :rem 142
1620 D$=D$+B$:FORT=1TO180:NEXTT:RETURN
                                    :rem 109
1624 :                               :rem 7
```

```
1625 REM NAME INPUT                    :rem 99
1626 :                                 :rem 9
1630 NA$=""                            :rem 254
1635 PRINT"{@3}{LEFT}";                :rem 28
1640 GETN$:IFN$=""THEN1640             :rem 211
1650 PRINTN$;                          :rem 6
1660 IFN$=CHR$(13)THENRETURN           :rem 208
1670 NA$=NA$+N$:GOTO1635               :rem 80
1671 :                                 :rem 9
1675 REM ANSWER INPUT                  :rem 23
1676 :                                 :rem 14
1680 A$=""                             :rem 181
1685 PRINT"{@3}{LEFT}";                :rem 33
1690 GETN$:IFN$=""THEN1690             :rem 221
1700 PRINTN$;                          :rem 2
1710 IFN$=CHR$(13)THENRETURN           :rem 204
1720 A$=A$+N$:GOTO1685                 :rem 181
1730 :                                 :rem 5
1735 REM DOUBLE CHECK                  :rem 205
1737 :                                 :rem 12
1740 PRINT"{CLR}{BLK}{5 DOWN}{RIGHT}IF YO
     U WISH TO STOP,"                  :rem 14
1745 PRINT"{DOWN}{7 RIGHT}PRESS {RVS}Q
     {OFF}."                           :rem 46
1750 PRINT"{DOWN}{2 RIGHT}IF NOT, PRESS T
     HE"                               :rem 3
1755 PRINT"{DOWN}{6 RIGHT}{RVS}SPACE{OFF}
      BAR."                            :rem 117
1760 GETA$:IFA$=""OR A$<>" "AND A$<>"Q" T
     HEN1760                           :rem 202
1770 IFA$<>"Q"THEN990                  :rem 163
1780 PRINT"{CLR}{5 DOWN}THANK YOU FOR PLA
     YING."                            :rem 37
1785 IFL<>0THENPRINT"{DOWN}{BLK}( YOUR SC
     ORE WAS";75-S;")"                 :rem 168
1790 PRINT"{DOWN}{BLK}{2 RIGHT}SEE YOU NE
     XT TIME!":END                     :rem 247
1800 POKE36878,15:FORZ=180TO145STEP-1:POK
     E36876,Z:NEXT:POKE36878,0:RETURN
                                       :rem 39
1810 POKE36878,15:FORZ=220TO255:POKE36876
     ,Z:NEXT:POKE36878,0:RETURN        :rem 139
```

Program 2:

Spelling Bee For Commodore 64

```
1 POKE53281,1:PRINT"{5}":POKE788,52:REM
   WHITE SCREEN,GRAY LETTERS,IGNORE STOP
   {SPACE}KEY                          :rem 6
2 DIML$(75)                            :rem 57
3 ::::REM SPELLING BEE                 :rem 41
4 PRINT"{CLR}"TAB(18)"{BLK}IU{YEL}"
                                       :rem 57
5 PRINTTAB(17)"U**I"                   :rem 180
10 PRINTTAB(17)"-{BLK}WW{YEL}-"        :rem 88
15 PRINTTAB(17)"-{BLK}JK{YEL}-"        :rem 68
20 PRINTTAB(17)"J{S}{A}K"              :rem 182
25 PRINTTAB(16)"U*{X}{Z}*I"            :rem 79
30 PRINTTAB(15)"N-{RVS}{BLK}{4 SPACES}
   {OFF}{YEL}-M"                       :rem 233
35 PRINTTAB(14)"N -{4 SPACES}- M"      :rem 27
40 PRINTTAB(13)"N{2 SPACES}-{RVS}{BLK}
   {4 SPACES}{OFF}{YEL}-{2 SPACES}M"
                                       :rem 232
45 PRINTTAB(12)"N{2 SPACES}N-{4 SPACES}-M
   {2 SHIFT-SPACE}M"                   :rem 245
50 PRINTTAB(12)"M N -{RVS}{BLK}{4 SPACES}
   {OFF}{YEL}- M N"                    :rem 131
55 PRINTTAB(13)"{T}{2 SPACES}J*{2 R}
   *K{2 SPACES}{T}"                    :rem 134
110 PRINT"{5}{3 DOWN}HELLO! MY NAME IS
    {SPACE}SPELLING BEE."              :rem 126
115 PRINT"{DOWN}WHAT IS YOUR NAME? ";:GOS
    UB1630                             :rem 183
120 PRINT"{CLR}{5 DOWN}{RIGHT}WOULD YOU L
    IKE INSTRUCTIONS (Y OR N)?"        :rem 163
125 GETA$:IFA$=""THEN125               :rem 83
130 IFA$="Y"THEN700                    :rem 40
135 IFA$="N"THEN320                    :rem 32
140 PRINT"{DOWN}{9 RIGHT}YES OR NO ONLY P
    LEASE":FORT=1TO1500:NEXTT:GOTO120
                                       :rem 198
143 :                                  :rem 210
145 REM SPELL AND FLASH WORD           :rem 123
147 :                                  :rem 214
150 GOSUB1800:PRINT"{4}{5 DOWN}
    {11 RIGHT}THAT IS INCORRECT.":rem 185
160 PRINT"{8 RIGHT}THE CORRECT SPELLING "
    ;                                  :rem 220
170 PRINT"IS:{5}":FORT=1TO1000:NEXTT
                                       :rem 235
180 A$="{CLR}{3}{10 DOWN}{15 RIGHT}":PR
    INTA$;                             :rem 108
190 FORI=1TOLEN(L$(L)):PRINTMID$(L$(L),I,
    1);:FORJ=1TO500:NEXTJ,I            :rem 145
200 FORR=1TO20:PRINT"{CLR}";A$;"{RVS}";L$
    (L);"{OFF}":FORI=1TO15:NEXTI:PRINT"
    {CLR}";A$;L$(L)                    :rem 143
210 FORI=1TO15:NEXTI:NEXTR             :rem 199
211 IFL$(L)=L$(25)THEN360:REM CATCH 3RD M
    ISTAKE ON LAST EASY WORD           :rem 244
212 IFL$(L)=L$(50)THEN360:REM CATCH 3RD M
    ISTAKE ON LAST MEDIUM WORD         :rem 130
213 IFL$(L)=L$(75)THEN360:REM CATCH 3RD M
    ISTAKE ON LAST HARD WORD           :rem 232
220 RETURN                             :rem 116

230 DATACAT,DOG,ANT,AND,ANY,AN,AM,CAN,CAP
    ,TOP,STOP,POT,TAP,PAT,CAR,CART,ART
                                       :rem 95
240 DATAHAND,HAT,FOOT,BOOK,FLY,SKY,SAW,SE
    E                                  :rem 233
250 DATASNAKE,SNACK,BOAT,MANY,LOOSE,LOSE,
    CHOOSE,CHOSE,CHASE,CHEESE,STOVE,STORE
                                       :rem 233
260 DATASTEAL,STAIRS,WHOLE,SCREW,WASHER,H
    ORSE,STEER,STONE,PLANT,RADIO,COUCH
                                       :rem 115
270 DATACHAIR,TABLE                    :rem 174
280 DATASTEREO,STATION,TELEVISION,CUSHION
    ,CAUTION,FREEZER,WEATHER,WHETHER
                                       :rem 68
290 DATAWHOEVER,HAMMOCK,COMMITTEE,COMPUTE
    R,LICENSE,MONITOR,DICTIONARY,RECEIVE
                                       :rem 67
300 DATARECORD,SPEAKER,CURTAIN,PILLOW,WAT
    ERBED,WINDOW,THEATER,PIANO,LIVER
                                       :rem 240
320 PRINT"{CLR}{5 DOWN}{8 RIGHT}GREAT, ";
    NA$;".{2 SPACES}LET'S GO."         :rem 147
330 PRINT"{DOWN}{4 RIGHT}(PRESS {RVS}SPAC
    E{OFF} BAR TO CONTINUE.)"          :rem 229
340 GETA$:IFA$<>" "THEN340             :rem 142
350 GOTO990                            :rem 115
360 PRINT"{CLR}{5}{5 DOWN}WASN'T THAT F
    UN?":GOTO1735                      :rem 58
700 PRINT"{CLR}{8 DOWN}{5 RIGHT}GREAT! NO
    W, ";NA$;", ALL YOU":PRINT"{DOWN}
    {2 RIGHT}HAVE TO DO IS ";          :rem 190
710 PRINT"FOLLOW THESE SIMPLE":PRINT"
    {DOWN}{2 RIGHT}DIRECTIONS."        :rem 247
720 PRINT:PRINT"{3 DOWN}{2 RIGHT}(PRESS T
```

```
    HE {RVS}SPACE{OFF} BAR TO CONTINUE.)"
                                        :rem 120
730 GETA$:IFA$<>" "THEN730              :rem 148
740 PRINT"{CLR}{5 DOWN}FIRST,THE ALPHABET
    , A RETURN ARROW (←),"              :rem 222
741 PRINT"AND A RED X WILL BE PLACED ON T
    HE"                                 :rem 154
750 PRINT"LOWER HALF OF THE SCREEN WITH A
    "                                   :rem 196
760 PRINT"POINTER (↑) UNDER THE {3}RED
    {SPACE}X{5}.{2 SPACES}THEN,"
                                        :rem 135
770 PRINT"A WORD WILL BE FLASHED ONTO THE
     SCREEN."                           :rem 177
780 PRINT"{2 DOWN}USING A JOYSTICK PLUGGE
    D INTO"                             :rem 11
790 PRINT"{RVS}CONTROL PORT 2{OFF} ON THE
     RIGHT SIDE OF THE"                 :rem 68
800 PRINT"COMPUTER, SPELL THE WORD BY PLA
    CING THE"                           :rem 27
810 PRINT"POINTER (↑) UNDER THE CORRECT L
    ETTER"                              :rem 123
820 PRINT"AND PRESSING THE {RVS}FIRE{OFF}
     BUTTON.":PRINT:PRINT               :rem 236
821 PRINT"{2 RIGHT}(PRESS THE {RVS}SPACE
    {OFF} BAR TO CONTINUE.)"            :rem 128
822 GETA$:IFA$<>" "THEN822              :rem 152
830 PRINT"{CLR}{5 DOWN}WHEN THE WORD HAS
    {SPACE}BEEN SPELLED"                :rem 162
840 PRINT"CORRECTLY, PLACE THE POINTER (↑
    ) UNDER"                            :rem 228
850 PRINT"RETURN (←) AND PRESS THE {RVS}
    FIRE{OFF} BUTTON."                  :rem 19
851 PRINT"{2 DOWN}IF YOU MAKE A MISTAKE B
    EFORE YOU"                          :rem 58
852 PRINT"FINISH, PUT THE POINTER (↑) UND
    ER THE"                             :rem 102
853 PRINT"{3}RED X{5} AND PRESS THE
    {RVS}FIRE{OFF} BUTTON.{2 SPACES}YOU"
                                        :rem 228
854 PRINT"WILL THEN BE ABLE TO RE-SPELL T
    HE WORD"                            :rem 120
855 PRINT"WITH NO PENALTY.":PRINT:PRINT
                                        :rem 37
860 PRINT"{2 RIGHT}(PRESS THE {RVS}SPACE
    {OFF} BAR TO CONTINUE.)"            :rem 131
870 GETA$:IFA$<>" "THEN870              :rem 158
880 PRINT"{CLR}{5 DOWN}YOU WILL BE GIVEN
    {SPACE}3 CHANCES TO GET IT"         :rem 214
890 PRINT"RIGHT. IF YOU HAVEN'T GOTTEN IT
     RIGHT"                             :rem 131
900 PRINT"BY THEN, I WILL TELL YOU THE CO
    RRECT"                              :rem 2
910 PRINT"SPELLING OF THE WORD.{2 SPACES}
    YOU WILL START"                     :rem 108
920 PRINT"WITH A SCORE OF 75 AND 1 POINT
    {SPACE}WILL BE"                     :rem 179
930 PRINT"DEDUCTED EACH TIME YOU MISSPELL
     A WORD."
940 PRINT"{2 DOWN}EASY, HUH?":PRINT:PRINT
                                        :rem 160
950 PRINT"{2 RIGHT}(PRESS THE {RVS}SPACE
    {OFF} BAR TO CONTINUE.)"            :rem 131
960 GETA$:IFA$<>" "THEN960              :rem 158
990 S=0:L=0:PRINT"{CLR}{6 DOWN}{2 RIGHT}H
    OW HARD WOULD YOU LIKE YOUR WORDS,"
                                        :rem 87
1000 PRINTTAB(8);"{DOWN}";NA$;"?":PRINT
                                        :rem 177
1010 PRINTTAB(15)"{3}1) EASY"    :rem 67
1020 PRINTTAB(15)"{3}2) MEDIUM":rem 212
1030 PRINTTAB(15)"{3}3) HARD{5}";"
    {3 DOWN}"                           :rem 126
1040 PRINTTAB(13);"('Q' TO QUIT)" :rem 51
1060 GETA$:IFA$=""THEN1060              :rem 177
1070 IFA$="1"THENPRINT"{CLR}":FORX=1TO25:
    GOTO1130:REM EASY                   :rem 122
1080 IFA$="2"THENPRINT"{CLR}":FORX=26TO50
    :GOTO1130:REM MEDIUM                :rem 64
1090 IFA$="3"THENPRINT"{CLR}":FORX=51TO75
    :GOTO1130:REM HARD                  :rem 165
1100 IFA$="Q"THEN1735                   :rem 135
1110 PRINT"PLEASE TRY AGAIN,";NA$;".":PRI
    NT"YOU PRESSED ";A$                 :rem 50
1115 FORX=1TO2000:NEXTX:GOTO990         :rem 192
1130 RESTORE:FORL=1TO75                 :rem 211
1140 READL$(L):REM READ THE WORDS:rem 153
1150 IFL=XTHEN1170                      :rem 47
1160 NEXT                               :rem 7
1170 FORN=1TO3:REM MISTAKE COUNTER
                                        :rem 142
1180 LL=(40-LEN(L$(L)))/2:PRINT"{CLR}
    {GRN}{10 DOWN}"TAB(LL);L$(L):FORY=1T
    O2000:NEXTY                         :rem 172
1182 Z=L                                :rem 175
1183 IFL>25THENZ=L-25:IFL>50THENZ=L-50
                                        :rem 79
1185 PRINT"{CLR}{PUR}WORD NUMBER:";Z:PRIN
    T"{HOME}{20 RIGHT}SCORE:";75-S
                                        :rem 226
1190 PRINT"{3}{3 DOWN}{9 RIGHT}NOW SPEL
    L IT, ";NA$;".{5}"          :rem 218
1200 PRINT"{DOWN}('END' AND '{3}←{5}
    ' TO GO ON TO HARDER WORDS)":rem 135
1205 PRINT"{9 RIGHT}('Q' AND '{3}←
    {5}' TO QUIT)"              :rem 34

1210 GOSUB1390:PRINTCHR$(13):IFD$="END"TH
    EN990                               :rem 232
1220 IFD$="Q"THEN1735                   :rem 141
1230 IFD$=""THEN1260:REM CATCHES CARRIAGE
     RETURN WITH EMPTY SET              :rem 36
1240 IFD$=L$(25)THEN1320:REM LAST EASY WO
    RD                                  :rem 216
1241 IFD$=L$(50)THEN1320:REM LAST MEDIUM
    {SPACE}WORD                         :rem 102
1242 IFD$=L$(75)THEN1320:REM LAST HARD WO
    RD                                  :rem 204
1250 IFD$=L$(L)THEN1300                 :rem 252
1260 IFN=3THENGOSUB150:PRINT"{CLR}
    {10 DOWN}";TAB(10);"HERE, TRY ANOTHE
    R."                                 :rem 116
1265 IFN=3THEN FORT=1TO2000:NEXTT:NEXTX
                                        :rem 246
1270 GOSUB1800:PRINT"{4}{6 DOWN}
    {2 RIGHT}THAT IS INCORRECT, ";NA$;".
     TRY AGAIN."                        :rem 31
1275 FORY=1TO2000:NEXTY                 :rem 180
1280 S=S+1                              :rem 10
1290 NEXTN                              :rem 89
1300 GOSUB1850:PRINT"{3}{6 DOWN}
    {8 RIGHT}CORRECT! NOW TRY ANOTHER":F
    ORY=1TO2000:NEXTY                   :rem 87
1310 NEXTX                              :rem 92
1320 GOSUB1850:PRINT"{3}{6 DOWN}";TAB(1
    5);"CORRECT!{5}":FORT=1TO2000:NEXT
    T:GOTO360                           :rem 79
1380 RETURN                             :rem 172
1385 REM PRINT ALPHABET AND POINTER
                                        :rem 119
1390 PRINT:PRINT:PRINTTAB(15):D$="":SC=16
    71:CO=SC+54272:CN=1                 :rem 124
```

```
1400 POKESC,CN:POKECO,5              :rem 163
1410 SC=SC+1:CO=CO+1:CN=CN+1:IFSC=1697THE
     N1430                           :rem 225
1420 GOTO1400                        :rem 197
1430 POKESC,31:POKECO,10:POKESC-27,86:POK
     ECO-27,10                       :rem 242
1440 S1=1710                         :rem 83
1450 IFS1<1710THENS1=1737:REM MOVE POINTE
     R TO LEFT ARROW SYMBOL          :rem 73
1460 IFS1>1737THENS1=1710:REM MOVE POINTE
     R TO LETTER A                   :rem 209
1470 C1=S1+54272                     :rem 48
1480 POKES1,30:POKEC1,10             :rem 121
1490 GOSUB1540                       :rem 24
1500 IFJV=8THENS1=S1+1:C1=C1+1:POKES1-1,3
     2:FORT=1TO25:NEXTT:REM MOVE RIGHT
                                     :rem 94
1510 IFJV=4THENS1=S1-1:C1=C1-1:POKES1+1,3
     2:FORT=1TO25:NEXTT:REM MOVE LEFT
                                     :rem 10
1520 IFJV=FRTHENGOSUB1570:IFB$=CHR$(13)TH
     ENPRINT"{5}":RETURN            :rem 28
1530 GOTO1450                        :rem 204
1540 JV=PEEK(56320):REM CONTROL PORT 2
                                     :rem 211
1545 FR=JVAND16:REM FIRE BUTTON      :rem 158
1550 JV=15-(JVAND15):REM GET DIRECTION
                                      :rem 4
1560 RETURN                          :rem 172
1570 H=PEEK(S1-40)                   :rem 221
1580 GETB$                           :rem 20
1590 B$=CHR$(H+64)                   :rem 161
1600 IFS1=1710THENPRINT"{CLR}{7 DOWN}":GO
     TO1390:REM SAME WORD AGAIN WITH NO P
     ENALTY
1605 IFB$="←"THENB$=CHR$(13):RETURN
                                     :rem 67
1610 PRINT"{GRN}";TAB(LL);B$;        :rem 142
1620 D$=D$+B$:FORT=1TO180:NEXTT:RETURN
                                     :rem 109
1624 :                                :rem 7
1625 REM NAME INPUT                  :rem 99
1626 :                                :rem 9
1630 NA$=""                          :rem 254
1635 PRINT"{@}{LEFT}";              :rem 28
1640 GETN$:IFN$=""THEN1640           :rem 211
1650 PRINTN$;                         :rem 6
1660 IFN$=CHR$(13)THENRETURN         :rem 208
1670 NA$=NA$+N$:GOTO1635             :rem 80
1671 :                                :rem 9
1675 REM ANSWER INPUT                :rem 23
1676 :                               :rem 14
1680 A$=""                           :rem 181
1685 PRINT"{@}{LEFT}";              :rem 33
1690 GETN$:IFN$=""THEN1690           :rem 221
1700 PRINTN$;                         :rem 2
1710 IFN$=CHR$(13)THENRETURN         :rem 204
1720 A$=A$+N$:GOTO1685               :rem 181
1730 :                                :rem 5
1735 REM DOUBLE CHECK                :rem 205
1737 :                               :rem 12
1740 PRINT"{CLR}{5 DOWN}{5 RIGHT}IF YOU W
     ISH TO STOP, PRESS {RVS}Q{OFF}."
                                     :rem 162
1750 PRINT"{DOWN}{5 RIGHT}IF NOT, PRESS T
     HE {RVS}SPACE{OFF} BAR."        :rem 109
1760 GETA$:IFA$=""OR A$<>" "AND A$<>"Q" T
     HEN1760                         :rem 202
1770 IFA$<>"Q"THEN990                :rem 163
1780 PRINT"{CLR}{5 DOWN}{10 RIGHT}THANK Y
     OU FOR PLAYING."                :rem 71
1785 IFL<>0THENPRINT"{DOWN}{10 RIGHT}
     {BLK}( YOUR SCORE WAS";75-S;")"
                                     :rem 202
1790 PRINT"{DOWN}{12 RIGHT}{5}SEE YOU N
     EXT TIME!"                      :rem 16
1795 POKE788,49:END:REM RESTORES STOP KEY
                                     :rem 26
1800 SD=54272:FORZ=SDTOSD+28:POKEZ,0:NEXT
                                     :rem 87
1805 POKE54296,15:POKE54277,18:POKE54278,
     242                             :rem 215
1810 POKE54276,33:POKE54273,4:POKE54272,4
     8                               :rem 102
1815 FORZ=1TO700:NEXTZ:POKE54276,32:FORZ=
     1TO400:NEXT                     :rem 38
1820 FORZ=SDTOSD+28:POKEZ,0:NEXTZ:RETURN
                                     :rem 187
1850 SD=54272:FORZ=SDTOSD+28:POKEZ,0:NEXT
     Z                               :rem 182
1855 POKE54296,15:POKE54277,42:POKE54278,
     250                             :rem 216
1860 POKE54276,33:POKE54273,23:POKE54272,
     181                             :rem 202
1865 FORZ=1TO200:NEXT:POKE54276,32:FORZ=1
     TO1250:NEXT
1870 FORZ=SDTOSD+28:POKEZ,0:NEXT:RETURN
                                     :rem 102
```

MLX—Machine Language Entry Program For Commodore 64

(Article on page 162.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
100 PRINT"{CLR}{RED}";CHR$(142);CHR$(8);:
    POKE53281,1:POKE53280,1          :rem 198
101 POKE 788,52:REM DISABLE RUN/STOP
                                     :rem 119
110 PRINT"{RVS}{40 SPACES}";         :rem 176
120 PRINT"{RVS}{15 SPACES}{RIGHT}{OFF}
    {*}£{RVS}{RIGHT} {RIGHT}{2 SPACES}
    {*}┌{OFF}{*}£{RVS}£{RVS}
    {13 SPACES}┐";                  :rem 250
130 PRINT"{RVS}{15 SPACES}{RIGHT} {G}
    {RIGHT} {2 RIGHT} {OFF}£{RVS}£{*}
    {OFF}{*}{RVS}{13 SPACES}┘";     :rem 35
140 PRINT"{RVS}{40 SPACES}"          :rem 120
150 V=53248:POKE2040,13:POKE2041,13:FORI=
    832TO894:POKEI,255:NEXT:POKEV+27,3
                                     :rem 223
160 POKEV+21,3:POKEV+39,2:POKEV+40,2:POKE
    V,144:POKEV+1,54:POKEV+2,192:POKEV+3,
    54                                :rem 51
170 POKEV+29,3                        :rem 18
180 FORI=0TO23:READA:POKE679+I,A:POKEV+39
```

```
    ,A:POKEV+40,A:NEXT                :rem 188
185 DATA169,251,166,254,164,255,32,216,25
    5,133,253,96                      :rem 125
187 DATA169,0,166,251,164,252,32,213,255,
    133,253,96                        :rem 14
190 POKEV+39,7:POKEV+40,7             :rem 202
200 PRINT"{2 DOWN}{PUR}{BLK}{3 SPACES}A F
    AILSAFE MACHINE LANGUAGE EDITOR
    {5 DOWN}"                         :rem 130
210 PRINT"{5}{2 UP}STARTING ADDRESS?
    {8 SPACES}{9 LEFT}";:INPUTS:F=1-F:C$=
    CHR$(31+119*F)                    :rem 215
220 IFS<256OR(S>40960ANDS<49152)ORS>53247
    THENGOSUB3000:GOTO210             :rem 235
225 PRINT:PRINT:PRINT                 :rem 180
230 PRINT"{5}{2 UP}ENDING ADDRESS?
    {8 SPACES}{9 LEFT}";:INPUTE:F=1-F:C$=
    CHR$(31+119*F)                    :rem 20
240 IFE<256OR(E>40960ANDE<49152)ORE>53247
    THENGOSUB3000:GOTO230             :rem 183
250 IFE<STHENPRINTC$;"{RVS}ENDING < START
    {2 SPACES}":GOSUB1000:GOTO 230
                                      :rem 176
260 PRINT:PRINT:PRINT                 :rem 179
300 PRINT"{CLR}";CHR$(14):AD=S:POKEV+21,0
                                      :rem 225
310 PRINTRIGHT$("0000"+MID$(STR$(AD),2),5
    );":";:FORJ=1TO6                  :rem 234
320 GOSUB570:IFN=-1THENJ=J+N:GOTO320
                                      :rem 228
390 IFN=-211THEN 710                  :rem 62
400 IFN=-204THEN 790                  :rem 64
410 IFN=-206THENPRINT:INPUT"{DOWN}ENTER N
    EW ADDRESS";ZZ                    :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETHENPRINT"
    {RVS}OUT OF RANGE":GOSUB1000:GOTO410
                                      :rem 225
417 IFN=-206THENAD=ZZ:PRINT:GOTO310
                                      :rem 238
420 IF N<>-196 THEN 480               :rem 133
430 PRINT:INPUT"DISPLAY:FROM";F:PRINT,"TO
    ";:INPUTT                         :rem 234
440 IFF<SORF>EORT<SORT>ETHENPRINT"AT LEAS
    T";S;"{LEFT}, NOT MORE THAN";E:GOTO43
    0                                 :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINTRIGHT$("000
    0"+MID$(STR$(I),2),5);":";        :rem 30
451 FORK=0TO5:N=PEEK(I+K):PRINTRIGHT$("00
    "+MID$(STR$(N),2),3);",";         :rem 66
460 GETA$:IFA$>""THENPRINT:PRINT:GOTO310
                                      :rem 25
470 NEXTK:PRINTCHR$(20);:NEXTI:PRINT:PRIN
    T:GOTO310                         :rem 50
480 IFN<0 THEN PRINT:GOTO310          :rem 168
490 A(J)=N:NEXTJ                      :rem 199
500 CKSUM=AD-INT(AD/256)*256:FORI=1TO6:CK
    SUM=(CKSUM+A(I))AND255:NEXT       :rem 200
510 PRINTCHR$(18);:GOSUB570:PRINTCHR$(20)
                                      :rem 234
515 IFN=CKSUMTHEN530                  :rem 255
520 PRINT:PRINT"LINE ENTERED WRONG : RE-E
    NTER":PRINT:GOSUB1000:GOTO310:rem 176
530 GOSUB2000                         :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):NEXT:POKE54
    272,0:POKE54273,0                 :rem 227
550 AD=AD+6:IF AD<E THEN 310          :rem 212
560 GOTO 710                          :rem 108
570 N=0:Z=0                           :rem 88
580 PRINT"{+}";                       :rem 79
581 GETA$:IFA$=""THEN581              :rem 95
585 PRINTCHR$(20);:A=ASC(A$):IFA=13ORA=44
    ORA=32THEN670                     :rem 229
590 IFA>128THENN=-A:RETURN            :rem 137
600 IFA<>20 THEN 630                  :rem 10
610 GOSUB690:IFI=1ANDT=44THENN=-1:PRINT"
    {LEFT} {LEFT}";:GOTO690           :rem 172
620 GOTO570                           :rem 109
630 IFA<48ORA>57THEN580               :rem 105
640 PRINTA$;:N=N*10+A-48              :rem 106
650 IFN>255 THEN A=20:GOSUB1000:GOTO600
                                      :rem 229
660 Z=Z+1:IFZ<3THEN580                :rem 71
670 IFZ=0THENGOSUB1000:GOTO570        :rem 114
680 PRINT",";:RETURN                  :rem 240
690 S%=PEEK(209)+256*PEEK(210)+PEEK(211)
                                      :rem 149
691 FORI=1TO3:T=PEEK(S%-I)            :rem 67
695 IFT<>44ANDT<>58THENPOKES%-I,32:NEXT
                                      :rem 205
700 PRINTLEFT$("{3 LEFT}",I-1);:RETURN
                                      :rem 7
710 PRINT"{CLR}{RVS}*** SAVE ***{3 DOWN}"
                                      :rem 236
720 INPUT"{DOWN} FILENAME";F$         :rem 228
730 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
    {RVS}D{OFF}ISK: (T/D)"            :rem 228
740 GETA$:IFA$<>"T"ANDA$<>"D"THEN740
                                      :rem 36
750 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                      :rem 158
760 OPEN 1,DV,1,F$:POKE252,S/256:POKE251,
    S-PEEK(252)*256                   :rem 137
765 POKE255,E/256:POKE254,E-PEEK(255)*256
                                      :rem 37
770 POKE253,10:SYS 679:CLOSE1:IFPEEK(253)
    >9ORPEEK(253)=0THENPRINT"{DOWN}DONE."
    :END                              :rem 24
780 PRINT"{DOWN}ERROR ON SAVE.{2 SPACES}T
    RY AGAIN.":IFDV=1THEN720          :rem 171
781 OPEN15,8,15:INPUT#15,DS,DS$:PRINTDS;D
    S$:CLOSE15:GOTO720                :rem 161
790 PRINT"{CLR}{RVS}*** LOAD ***{2 DOWN}"
                                      :rem 212
800 INPUT"{2 DOWN} FILENAME";F$       :rem 244
810 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
    {RVS}D{OFF}ISK: (T/D)"            :rem 227
820 GETA$:IFA$<>"T"ANDA$<>"D"THEN820
                                      :rem 34
830 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                      :rem 157
840 OPEN 1,DV,0,F$:POKE252,S/256:POKE251,
    S-PEEK(252)*256                   :rem 135
850 POKE253,10:SYS 691:CLOSE1         :rem 173
860 IFPEEK(253)>9 OR PEEK(253)=0 THEN PRI
    NT:PRINT:GOTO310                  :rem 92
870 PRINT"{DOWN}ERROR ON LOAD.{2 SPACES}T
    RY AGAIN.{DOWN}":IFDV=1THEN800
                                      :rem 172
880 OPEN15,8,15:INPUT#15,DS,DS$:PRINTDS;D
    S$:CLOSE15:GOTO800                :rem 160
1000 REM BUZZER                       :rem 135
1001 POKE54296,15:POKE54277,45:POKE54278,
     165                              :rem 207
1002 POKE54276,33:POKE 54273,6:POKE54272,
     5                                :rem 42
1003 FORT=1TO200:NEXT:POKE54276,32:POKE54
     273,0:POKE54272,0:RETURN         :rem 202
2000 REM BELL SOUND                   :rem 78
2001 POKE54296,15:POKE54277,0:POKE54278,2
     47                               :rem 152
2002 POKE 54276,17:POKE54273,40:POKE54272
```

```
    ,0                                :rem 86
2003 FORT=1TO100:NEXT:POKE54276,16:RETURN
                                      :rem 57
3000 PRINTC$;"{RVS}NOT ZERO PAGE OR ROM":
     GOTO1000                         :rem 89
```

VIC Billboard

(Article on page 142.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
1 PRINT"{CLR}{DOWN}PLEASE WAIT...":POKE56
  ,24:CLR                             :rem 160
2 D=6144:E=7678:F=34816               :rem 221
3 Z=0:FORN=DTOE STEP2                  :rem 64
4 POKEN,PEEK(F+Z):POKEN+1,PEEK(F+Z)
                                      :rem 158
5 Z=Z+1:NEXTN                         :rem 73
10 POKE36869,242                      :rem 100
20 PRINT"{CLR}{2 DOWN}WHAT IS THE HEADING
   {3 SPACES}(22-CHARACTER LIMIT)?":INPUT
   H$                                 :rem 108
22 PRINT"{2 DOWN}":GOSUB800:INPUT"HEADING
    COLOR";HC                         :rem 108
30 PRINT"{CLR}NUMBER OF ENTRIES?(4
   {3 SPACES}MAX.)":INPUT NE:IFNE>4THEN30
                                      :rem 84
32 PRINT"{CLR}USING THE CHART IN THE USER
   S MANUAL, PICK A{2 SPACES}CODE FOR SCR
   EEN AND{3 SPACES}BORDER";          :rem 12
33 PRINT" COLOR.":PRINT"{DOWN}(HITTING JU
   ST RETURN{3 SPACES}WILL USE THE PRESEN
   T{2 SPACES}SET UP.)"               :rem 244
35 INPUTBK:IFBK=0THENBK=PEEK(36879)
                                      :rem 200
40 DIME$(4):DIMC%(4)                   :rem 45
50 FORN=1TONE                          :rem 62
60 PRINT"{CLR}ENTRY #"N                :rem 77
70 INPUTE$(N)                         :rem 255
80 GOSUB800                           :rem 128
85 INPUT"{2 DOWN}COLOR";C%(N)          :rem 36
90 NEXTN                              :rem 246
100 PRINT"{CLR}TOUCH A KEY TO START
    {3 SPACES}DISPLAY. YOU CAN EDIT ANYTI
    ME BY PRESSING{3 SPACES}{DOWN}:rem 24
101 PRINT"{9 SPACES}←"                :rem 194
105 GETA$:IFA$=""THEN105               :rem 79
150 REM DISPLAY                       :rem 144
160 POKE36869,254:POKE36867,PEEK(36867)OR
    1                                 :rem 150
170 POKE36879,BK                      :rem 145
200 FORN=1TONE                        :rem 107
210 POKE646,HC:PRINT"{CLR}"TAB(11-(LEN(H$
    ))/2)H$                           :rem 40
215 D=0                               :rem 73
220 PRINT"{DOWN}":POKE646,C%(N)       :rem 178
230 FORZ=1TOLEN(E$(N)):PRINTMID$(E$(N),Z,
    1);                               :rem 91
235 D=D+1:IFD=22THEND=0:PRINT         :rem 16
240 FORP=1TO100:NEXT                  :rem 232
250 GETA$:IFA$="←"THEN400             :rem 173
260 NEXTZ                              :rem 49
270 FORP=1TO4E3:NEXTP,N:GOTO200       :rem 213
400 REM EDIT                          :rem 158
405 POKE36869,242:POKE36867,PEEK(36867)AN
    D254:POKE36879,BK                 :rem 100
410 PRINT"{CLR}{BLU}DO YOU WISH TO ADD AN
    {2 SPACES}ANNOUNCEMENT?(Y/N)"     :rem 79
412 GETA$:IFA$="N"THEN450             :rem 161
414 IFA$="Y"THEN420                    :rem 44
415 GOTO412                           :rem 106
420 IFNE=4THENPRINT"NO ROOM FOR MORE.":FO
    RP=1TO2E3:NEXT:GOTO160            :rem 122
421 NE=NE+1                            :rem 86
422 PRINT"{CLR}ENTRY #"NE:INPUTE$(NE?)
                                      :rem 219
425 GOSUB800:PRINT"{DOWN}COLOR?":INPUTC%(
    NE)                               :rem 35
430 GOTO160                           :rem 103
450 FORN=1TONE:PRINT"{CLR}#"N:PRINTE$(N):
    PRINT"COLOR="C%(N)"{3 DOWN}"      :rem 21
455 PRINT"EDIT (Y/N)"                 :rem 60
457 GETA$:IFA$="N"THEN470             :rem 172
458 IFA$="Y"THEN460                    :rem 56
459 GOTO457                           :rem 123
460 PRINT"CORRECTED ENTRY:":INPUTE$(N):GO
    SUB800:INPUT"COLOR";C%(N)         :rem 197
470 NEXT:GOTO160                      :rem 228
800 PRINT"{2 DOWN}0. BLACK":PRINT"1. WHIT
    E":PRINT"2. RED":PRINT"3. CYAN"
                                      :rem 14
802 PRINT"4. PURPLE":PRINT"5. GREEN":PRIN
    T"6. BLUE":PRINT"7. YELLOW"       :rem 103
805 RETURN                            :rem 125
```

Educational Games: A Kid's View

(Article on page 126.)

Program 1: BLAM!—VIC Version

```
4 GOTO500                             :rem 2
5 POKE36879,27:PRINT"{CLR}{7 DOWN}"TAB(5)
  "{RVS}{RED}SKILL LEVEL":INPUT"{DOWN}
  {5 RIGHT}(1-100)";A                 :rem 81
6 IFA<1ORA>100THEN5                   :rem 136
7 B=A*100:M=0:H=10                    :rem 198
8 Y=RND(0):GOTO30                      :rem 9
9 J=INT(RND(1)*I):PRINT"{HOME}{19 DOWN}("
  ;J;") EF NO.?":POKE198,0:INPUTK$
                                      :rem 192
10 K=VAL(K$)                          :rem 140
11 IFK+J=ITHENPRINT"{RVS}CORRECT!!"
                                      :rem 157
12 IFK+J<>ITHENPRINT"{RVS}WRONG...";:GOTO
   80                                 :rem 180
13 POKEC,32:M=M+1:IFM=HTHEN110        :rem 48
14 FORT=1TO10:POKEE-2,241:FORTT=1TO20:NEX
   T:POKEE-2,135:FORTT=1TO20:NEXT:POKEE-2
   ,0:NEXT
15 FORN=8098TO8163:POKEN,32:NEXTN     :rem 53
16 GOTO60                              :rem 6
30 C=7911:D=38631:E=36878:POKEE,15:POKEE+
   1,126:DD=37154:P1=37151:P2=37152:POKE3
   6869,255                           :rem 136
31 PRINT"{CLR}":FORF=1TOH             :rem 136
32 G=INT(RND(1)*374)+22:V=PEEK(G+7680):IF
   (V<>32)OR(G=231)THEN32             :rem 91
33 POKEG+7680,1:POKEG+38400,0         :rem 111
34 NEXTF:PRINT"{HOME}{18 DOWN}{BLU}GGGGGG
   GGGGGGGGGGGGGGG";:RESTORE          :rem 14
```

```
35 FORF=1TO30:READFF:POKEE-2,FF:FORT=1TO5
   0:NEXTT:POKEE-2,0:POKEE-3,FF:FORT=1TO5
   0:NEXTT                              :rem 79
36 POKEE-3,0:NEXTF:TI$="000000"         :rem 244
37 I=INT(RND(1)*B)                      :rem 254
38 POKEC,0:POKED,4                      :rem 70
40 POKEDD,127:P=PEEK(P2)AND128:J0=-(P=0)
                                        :rem 58
42 POKEDD,255:P=PEEK(P1):J1=-((PAND8)=0):
   J2=-((PAND16)=0):J3=-((PAND4)=0)
                                        :rem 108
44 KD=C                                 :rem 119
45 IFJ1=1THENPOKEKD,32:C=C+22:D=D+22
                                        :rem 121
46 IFJ2=1THENPOKEKD,32:C=C-1:D=D-1:rem 25
47 IFJ3=1THENPOKEKD,32:C=C-22:D=D-22
                                        :rem 129
48 IFJ0=1THENPOKEKD,32:C=C+1:D=D+1:rem 21
49 DV=DV+1:IFDV=10THENPOKEE-2,135:POKEE-2
   ,0:DV=0                              :rem 172
52 IFPEEK(C)=7THENC=C-88:D=D-88         :rem 78
53 IF C<7702 THEN C=C+22:D=D+22         :rem 85
54 IFPEEK(C)=1THEN9                     :rem 135
55 PRINT"{HOME}{5 RIGHT}";RIGHT$(TI$,3);"
   {2 SPACES}";I                        :rem 48
56 IFTI$>"000500"THEN200                :rem 35
60 GOTO38                               :rem 10
80 POKEC,4:FORT=15TO0STEP-1:POKEE-1,220:P
   OKEE,T:POKED,2:FORTT=1TO20:NEXTTT:POKE
   D,5                                  :rem 47
81 FORTT=1TO50:NEXTTT:NEXTT:PRINT"{HOME}
   {RVS}CORRECT{OFF} EF!{RVS} NO.=";I-J:N
   N=NN+1                               :rem 252
82 IFNN=3THEN200                        :rem 198
83 FORT=1TO4000:NEXTT:PRINT"{HOME}
   {20 SPACES}":POKEE,15:POKEE-1,0:rem 14
84 M=M+1:IFM=HTHEN110                   :rem 251
85 FORN=8098TO8163:POKEN,32:NEXTN:GOTO38
                                        :rem 26
90 .67/7.31                             :rem 252
110 POKE36869,240:PRINT"{CLR}{2 DOWN}
    {6 SPACES}GOOD WORK!!":M=0          :rem 245
120 POKEE-4,241:FORT=1TO1000:NEXT:POKEE-3
    ,241:FORT=1TO1500:NEXT:POKEE-2,241
                                        :rem 81
130 FORT=1TO3000:NEXT:H=H+10:POKEE-3,0:PO
    KEE-4,0:POKEE-2,0                   :rem 237
131 IFH=70THEN600                       :rem 213
132 PRINT"{3 DOWN}{RIGHT}YOU GOT ALL THE
    {SPACE}BOMBSOUT OF THAT STORY, BUTTHE
     TERRORISTS PUT"                    :rem 60
133 PRINT"EVEN MORE IN THE NEXT!":PRINT"
    {2 DOWN}{3 RIGHT}GET READY AGAIN!!":F
    ORT=1TO3000:NEXTT                   :rem 50
134 POKEE-4,241:FORT=1TO1000:NEXT:POKEE-3
    ,241:FORT=1TO1500:NEXT:POKEE-2,241
                                        :rem 86
135 FORT=1TO3000:NEXT:POKEE-3,0:POKEE-4,0
    :POKEE-2,0:GOTO30                   :rem 53
200 FORT=15TO0STEP-1:POKEE-1,220:POKEE,T:
    POKEE+1,47:FORTT=1TO50:NEXTTT:rem 216
205 POKEE+1,138:FORTT=1TO50:NEXTTT:NEXTT
                                        :rem 92
210 POKEE-1,0:POKEE+1,8:POKE36869,240:PRI
    NT"{CLR}{WHT}THE PLACE BLEW UP!
    {4 SPACES}GAME OVER!"               :rem 186
215 PRINT"{7 DOWN}PLAY AGAIN?"          :rem 181
220 GOTO612                             :rem 102
395 REM SOUND DATA                      :rem 40
400 DATA220,220,220,220,210,210,210,210,2
    20,220,220,220,230,229,228,227,226,22
    5,224,223                           :rem 169
405 DATA222,221,220,219,219,219,219,135,1
    35,135                              :rem 57
500 PRINT"{CLR}{9 DOWN}{4 RIGHT}A FEW MOM
    ENTS..."                            :rem 214
505 POKE52,28:POKE56,28:CLR:FORI=7168TO76
    79:POKEI,PEEK(I+25600):NEXT         :rem 134
510 FORF=1TO30:READX:NEXT               :rem 94
520 FORY=7168TO7168+64:READX:POKEY,X:NEXT
    Y:GOTO5                             :rem 102
524 REM CHAR DATA                       :rem 183
525 DATA56,56,144,254,58,56,40,108,28,16,
    56,124,254,254,124,56               :rem 52
530 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                                        :rem 70
535 DATA215,254,124,255,255,223,147,161,0
    ,0,232,168,232,168,238,0            :rem 177
540 DATA0,0,234,174,238,170,170,0,255,255
    ,255,255,255,255,0,0,0,0,0          :rem 245
600 PRINT"{2 DOWN}YOU CLEARED THE BUILD-I
    NG OF BOMBS.YOU ARE AVERY GREAT PERSO
    N."                                 :rem 220
605 FORT=135TO241STEP5:POKEE-2,T:FORTT=1T
    O50:NEXT:NEXT                       :rem 21
610 POKEE-2,0:PRINT"{3 DOWN}{4 RIGHT}PLAY
     AGAIN?"                            :rem 77
612 GETA$:IFA$=""THEN612                :rem 85
620 IFA$="Y" THEN5                      :rem 202
630 PRINT"{CLR}":POKE36879,27:END :rem 29
```

Program 2: BLAM!—64 Version

```
2 POKE53281,4:POKE53280,14              :rem 192
3 GOTO500                               :rem 1
4 SC=53281:BO=53280:POKESC,1:POKEBO,10:PR
  INT"{CLR}{9 DOWN}"TAB(15)"{RVS}{RED}SKI
  LL LEVEL"                             :rem 37
5 PRINT"{DOWN}"TAB(15)"(1-100) ";:INPUT A
                                        :rem 111
6 IFA<1ORA>100THEN4                     :rem 135
7 PRINT"{2 DOWN}"TAB(11)"USE JOYSTICK POR
  T 2":FORT=1TO2000:NEXT:Y=RND(0):B=A*100
  :H=10                                 :rem 151
8 W=54272:FORT=WTOW+24:POKET,0:NEXT:POKEW
  +24,15:POKEW+5,17:POKEW+6,241:GOTO25
                                        :rem 75
9 J=INT(RND(1)*I):PRINT"{HOME}{22 DOWN}
  {9 RIGHT}(";J;") BLAM NO. ";          :rem 229
10 POKE198,0:INPUTK$:K=VAL(K$)          :rem 44
11 IFK+J=ITHENPRINT"{RVS}{DOWN}{15 RIGHT}
   CORRECT!!{OFF}";                     :rem 46
12 IFK+J<>ITHENPRINT"{DOWN}{16 RIGHT}
   {RVS}WRONG...";:GOTO80               :rem 149
13 POKEC,32:M=M+1:IFM=HTHEN110          :rem 48
14 FORT=1TO25:POKEW,71:POKEW+1,71:POKEW+4
   ,33:FORQ=1TO50:NEXT:POKEW+4,32:NEXT
                                        :rem 87
15 FORN=1910TO2015:POKEN,32:NEXTN :rem 29
16 GOTO38                               :rem 11
25 C=1524:D=55796                       :rem 126
27 PRINT"{CLR}":POKEBO,4:POKESC,1:FORF=1T
   OH                                   :rem 67
28 G=INT(RND(1)*760)+40:V=PEEK(G+1024):IF
   (V<>32)OR(G=500)THEN28               :rem 85
29 POKEG+55296,0:POKEG+1024,66          :rem 173
30 NEXTF:PRINT"{HOME}{20 DOWN}{BLU}DDDDDD
   DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD";
                                        :rem 84
34 RESTORE                              :rem 139
35 FORF=1TO30:READL,Q:POKEW,L:POKEW+1,Q:P
   OKEW+4,17:FORT=1TO50:NEXT:POKEW+4,16
                                        :rem 194
```

```
36 POKEW+1,L-20:POKEW,Q:POKEW+4,17:FORT=1
   TO50:NEXT:POKEW+4,16:NEXT      :rem 209
37 TI$="000000":I=INT(RND(1)*B):PRINT"
   {HOME}{9 RIGHT}TIMER"          :rem 62
38 POKED,4:POKEC,65               :rem 129
40 JS=PEEK(56320):JS=15-(JSAND15):JS=JS+1
   :REM READ JOYSTK               :rem 173
41 KD=C:ONJSGOTO51,42,43,51,44,45,46,51,4
   7,48,49                        :rem 87
42 POKEKD,32:C=C-40:D=D-40:GOTO51:REM NOR
   TH                             :rem 85
43 POKEKD,32:C=C+40:D=D+40:GOTO51:REM SOU
   TH                             :rem 90
44 POKEKD,32:C=C-1:D=D-1:GOTO51:REM WEST
                                  :rem 169
45 POKEKD,32:C=C-41:D=D-41:GOTO51:REM NW
                                  :rem 116
46 POKEKD,32:C=C+39:D=D+39:GOTO51:REM SW
                                  :rem 132
47 POKEKD,32:C=C+1:D=D+1:GOTO51:REM EAST
                                  :rem 146
48 POKEKD,32:C=C-39:D=D-39:GOTO51:REM NE
                                  :rem 115
49 POKEKD,32:C=C+41:D=D+41:GOTO51:REM SE
                                  :rem 103
50 POKEKD,32:C=C-40:D=D-40:REM NORTH
                                  :rem 123
51 DV=DV+1:IFDV=10THENPOKEW+4,129:POKEW+4
   ,128:DV=0                      :rem 55
52 IFPEEK(C)=68THENC=C-160:D=D-160
                                  :rem 211
53 IF C<1064 THEN C=C+40:D=D+40   :rem 80
54 IFPEEK(C)=66THEN9              :rem 194
55 T$=RIGHT$(TI$,3):PRINT"{HOME}
   {15 RIGHT}";T$;"{10 RIGHT}";I  :rem 219
56 IFT$>"500"THEN200              :rem 74
60 GOTO38                         :rem 10
80 POKEC,67:FORT=100TO1STEP-2:POKEW+1,T:P
   OKEW+4,129:POKED,2             :rem 179
81 POKED,5:NEXTT:FORTT=1TO50:NEXTTT:PRINT
   "{HOME}{RVS}{2 RIGHT}CORRECT{OFF} BLAM
   !{RVS} NO.=";I-J:NN=NN+1       :rem 213
82 POKEW+4,128:IFNN=3THEN200      :rem 172
83 FORT=1TO4000:NEXTT:PRINT"{HOME}
   {31 SPACES}"                   :rem 102
84 M=M+1:IFM=HTHEN110             :rem 251
85 FORN=1910TO2015:POKEN,32:NEXTN:GOTO37
                                  :rem 1
110 PRINT"{CLR}{DOWN}{14 RIGHT}GOOD WORK!
   !":M=0                         :rem 63
119 ER=28                         :rem 217
120 FORU=0TO3:POKEW+1,ER*U:POKEW,49:POKEW
   +4,17:FORT=1TO1000:NEXT:NEXT   :rem 181
130 POKEW+4,16:H=H+10             :rem 159
131 IFH=70THEN600                 :rem 213
132 PRINT"{6 DOWN}{3 RIGHT}YOU GOT ALL TH
   E BOMBS OUT OF THAT"           :rem 246
133 PRINT"STORY, BUT THE TERRORISTS PUT E
   VEN MORE"                      :rem 124
135 PRINT"IN THE NEXT.":PRINT"{4 DOWN}
   {13 RIGHT}SEE YA AGAIN!"       :rem 15
139 ER=28                         :rem 219
140 FORU=0TO3:POKEW+1,ER*U:POKEW,49:POKEW
   +4,17:FORT=1TO1000:NEXT:NEXT   :rem 183
145 POKEW+4,16                    :rem 18
150 FORI=1TO3000:NEXT:GOTO25      :rem 237
200 FORT=100TO0STEP-2:POKEW+1,T:POKEW+4,1
   29                             :rem 140
202 POKESC,INT(RND(1)*16):POKEBO,INT(RND(
   1)*16):PRINT"{CLR}"            :rem 175
204 NEXT:POKEW+4,128              :rem 187
210 PRINT"{CLR}":POKEBO,0:POKESC,0:PRINT"
   {5 DOWN}{11 RIGHT}{WHT}THE PLACE BLEW
    UP!"                          :rem 130
215 PRINTTAB(14)"GAME OVER!!"     :rem 142
218 PRINT"{7 DOWN}"TAB(11)"PLAY AGAIN (Y/
   N)?"                           :rem 173
220 GETA$:IFA$=""THEN220          :rem 75
225 IF A$="Y" THEN M=0:GOTO4      :rem 247
230 SYS2048                       :rem 98
400 DATA50,50,50,50,50,50,50,50,50,50,50,
   50,50,50,50,50,50,50,50,50,50,50,50
                                  :rem 248
403 DATA50,50,50,50,50,50,50,50   :rem 13
404 DATA70,70,70,70,70,70,70,70,70,70,70,
   70,70,70,68,66,64,62,60,58,56,54
                                  :rem 67
405 DATA52,50,48,46,44,42,40,38   :rem 38
500 PRINT"{CLR}{11 DOWN}"TAB(11)"{WHT}A F
   EW MOMENTS....."               :rem 179
505 POKE52,48:POKE56,48:CLR:POKE56334,PEE
   K(56334)AND254                 :rem 210
506 POKE1,PEEK(1)AND251:FORN=0TO2047:POKE
   N+12288,PEEK(N+53248):NEXTN    :rem 84
510 FORF=1TO60:READX:NEXT:FORF=0TO31:READ
   X:POKEE+12808,X:NEXT           :rem 196
520 POKE 1,PEEK(1)OR4:POKE56334,PEEK(5633
   4)OR1                          :rem 134
523 POKE 53272,(PEEK(53272)AND240)+12
                                  :rem 185
525 DATA56,56,144,254,58,56,40,108,28,16,
   56,124,254,254,124,56          :rem 52
535 DATA215,254,124,255,255,223,147,161
                                  :rem 184
540 DATA255,255,255,255,255,255,0,0
                                  :rem 239
560 GOTO4                         :rem 8
600 REM YOU WIN!                  :rem 134
605 PRINT"{6 DOWN}{3 RIGHT}YOU CLEARED TH
   E BUILDING OF BOMBS."          :rem 123
610 PRINT"{DOWN}{3 RIGHT}YOU ARE A VERY G
   REAT PERSON.":PRINT"{3 DOWN}"TAB(13)"
   PLAY AGAIN?"                   :rem 135
612 GETA$:IFA$=""THEN612          :rem 85
620 IF A$="Y" THEN PRINT"{CLR}":M=0:GOTO4
                                  :rem 148
630 SYS 2048                      :rem 102
```

Saucer Shooter For VIC-20

(Article on page 88.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
1 GOTO6000                        :rem 48
5 PRINT"{CLR}":POKE36879,10:POKE38862,0
                                  :rem 112
10 FORI=7168TO7263:READX:POKEI,X:NEXT:FOR
   I=7264TO7679:POKEI,PEEK(I+25600):NEXT
                                  :rem 174
15 FORI=38400TO38421:POKEI,1:POKEI+66,1:N
   EXT                            :rem 165
```

```
20 POKE52,28:POKE56,28:CLR:POKE36869,255:
   GOTO40                              :rem 43
25 POKEZ1,15:POKEZ-1,220:POKEZ-1,0:POKEZ1
   ,0                                  :rem 97
30 IFHI<SCTHENHI=SC                    :rem 232
35 PRINT"{UP}"TAB(3)SCTAB(13)HI:P1=0:RETU
   RN                                  :rem 26
40 L=8131:D=0:L1=7763:L2=L-22:S=0:D1=1:L3
   =L1+22+D1:B=2:P2=1                  :rem 16
50 T=1:P=3:A=30720:P1=0:X=0:SC=0:Z=36877:
   Z1=Z+1:N=4:N1=8181                  :rem 146
60 POKE37139,0:POKE37154,127:JA=37137:JB=
   37152                               :rem 55
65 FORI=7680TO7701:POKEI,32:NEXT       :rem 219
70 I=7680:POKEI,6:POKEI+1,7:POKEI+2,8:POK
   EI+10,9:POKEI+11,10:POKEI+12,11:GOSUB3
   0                                   :rem 20
75 FORI=1TO3:POKEN1+I,T:POKEN1+I+A,5:NEXT
                                       :rem 94
80 FORI=38840TO38861:POKEI,4:NEXT:FORI=81
   20TO8141:POKEI,32:NEXT              :rem 179
90 FORI=38488TO38839:POKEI,7:NEXT:POKEL,T
                                       :rem 90
100 POKEL1,32:IFL1=7746ORL1=7767THENDI=-D
    1                                  :rem 226
110 IFP2=1THEN130                      :rem 212
120 IFL-L1=368ORL-L1=391THENL3=L1+23:P2=1
                                       :rem 137
125 IFL-L1=390ANDL1=7746THENL3=L1+22:P2=1
                                       :rem 124
130 L1=L1+D1:IFPEEK(L1)=PTHEN240       :rem 121
140 POKEL1,S                           :rem 192
200 IFP1=0THEN300                      :rem 209
210 POKEL2,32:L2=L2-22:IFL2<7746THENP1=0:
    GOTO300                            :rem 83
220 IFPEEK(L2)=32THENPOKEL2,P:GOTO300
                                       :rem 23
230 IFPEEK(L2)=2THENPOKEL2,5:SC=SC+100:GO
    SUB25:POKEL2,32:P2=0:GOTO300       :rem 235
240 POKEL2,5:SC=SC+500:L1=7747+INT(RND(1)
    *10):P2=0:GOSUB30                  :rem 114
250 POKEZ,220:FORI=15TO0STEP-1:POKEZ1,I:P
    OKE36879,I+10:FORJ=1TO50:NEXTJ:NEXTI
                                       :rem 164
260 POKEZ,0:POKEZ1,0:POKEL2,32:POKEL3,32
                                       :rem 190
300 IF(PEEK(JA)AND16)=0THEND=-1:GOTO340
                                       :rem 51
310 IF(PEEK(JB)AND128)=0THEND=1:GOTO330
                                       :rem 59
320 GOTO360                            :rem 103
330 IFL+D=8142THENPOKEL,32:L=8119:GOTO350
                                       :rem 200
340 IFL+D=8119THENPOKEL,32:L=8142:rem 190
350 POKEL,32:L=L+D:IFPEEK(L)=4THEN2030
                                       :rem 18
360 POKEL,T                            :rem 148
400 IF(PEEK(JA)AND32)=0THENPOKEL2,32:L2=L
    -22:P1=1:GOTO418                   :rem 146
410 X=X+1:IFX=2THENX=0:GOTO500         :rem 106
415 GOTO200                            :rem 101
418 IFPEEK(L2)=2THEN230                :rem 83
420 POKEL2,P:L2=L2-22:POKE36878,15:FORI=2
    50TO210STEP-10:POKE36877,I         :rem 249
430 NEXTI:POKE36877,0:POKE36878,0:POKEL2+
    22,32:IFPEEK(L2)=2THEN230          :rem 191
440 POKEL2,P                           :rem 193
500 IFP2=0THEN100                      :rem 211
510 POKEL3,32:L3=L3+23:IFPEEK(L3)=PTHENPO
    KEL2,2:GOTO230                     :rem 103
520 IFL3<8120THENPOKEL3,B:GOTO100:rem 251
530 P2=0:IFPEEK(L3)=32THENPOKEL3,4:GOTO10
    0                                  :rem 40
540 IFPEEK(L3)=4THENPOKEL3,5           :rem 204
550 IFPEEK(L3)=32THEN100               :rem 128
560 POKEL3,5:P2=0                      :rem 211
2000 REM DESTRUCT                      :rem 20
2030 POKEL,5:N=N-1:N1=N1+1             :rem 227
2040 POKEZ,220:FORI=15TO0STEP-1:POKEZ1,I:
     FORJ=1TO50:NEXTJ:NEXTI            :rem 88
2050 POKEZ,0:POKEZ1,0:FORI=1TO2000:NEXT
                                       :rem 178
2060 POKEN1,32:IFN>0THENPOKEL,T:GOTO200
                                       :rem 187
2065 PRINT:PRINT"{RVS}GAME OVER--PRESS FI
     RE"                               :rem 218
2070 IF(PEEK(JA)AND32)=0THENPOKEL,32:POKE
     L1,32:POKEL2,32:POKEL3,32:PRINT"
     {CLR}":GOTO40                     :rem 103
2080 GOTO2070                          :rem 204
5000 DATA0,153,189,231,189,153,0,0,8,28,2
     8,54,107,93,127,54                :rem 139
5010 DATA0,64,32,24,28,15,7,7,8,8,28,28,8
     ,0,0,0                            :rem 35
5020 DATA0,0,0,0,16,56,124,0,18,64,1,128,
     0,65,0,18                         :rem 161
5030 DATA5,226,162,128,231,37,164,231,117
     ,85,119,0,57,41,41,57             :rem 29
5040 DATA96,64,64,12,201,76,137,76,0,164,
     164,164,228,228,164,164           :rem 148
5050 DATA0,229,133,133,167,167,229,229,0,
     0,0,64,0,64,0,0                   :rem 221
6000 PRINT"{CLR}{4 DOWN}{4 RIGHT}{RED}SAU
     CER SHOOTER"                      :rem 229
6010 PRINT"{4 DOWN}{RIGHT}{BLU}PRESS FIRE
      TO BEGIN"                        :rem 211
6020 POKE37139,0:POKE37154,127:JA=37137:J
     B=37152:HI=0                      :rem 209
6030 N1=230:N2=225:FORI=1TO1000:NEXT:X=36
     878:Y=X-4:POKEX,15                :rem 26
6040 FORI=1TO3:POKEY,N1:POKEY+1,N1:POKEY+
     2,N1:FORJ=1TO70:NEXTJ:POKEY,0     :rem 2
6050 POKEY+1,0:POKEY+2,0:FORJ=1TO50:NEXTJ
     :NEXTI:POKEY,N2:POKEY+1,N2        :rem 36
6060 POKEY+2,N2:FORI=1TO1400:NEXT:POKEY,0
     :POKEY+1,0:POKEY+2,0              :rem 41
6070 IFN1=230THENN1=228:N2=221:FORI=1TO16
     00:NEXT:GOTO6040                  :rem 184
6080 IF(PEEK(JA)AND32)=0THEN5          :rem 184
6090 GOTO6080                          :rem 214
```

VIC Music Writer

(Article on page 134.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
5 POKE808,100                          :rem 193
50 DIMA%(209):PRINT"{CLR}":H%=1:POKE36878
   ,15                                 :rem 79
90 PRINT"{RED}{RVS}{UP}{24 SPACES}PLEASE
   {SPACE}ENTER NOTES{24 SPACES}{OFF}
   {BLU}"                              :rem 107
```

```
100 FORL=1TO200:NEXT:POKE36876,0 :rem 179
102 B%=PEEK(197):IFB%=64THEN102  :rem 231
103 IFB%=39THENPRINT"{RED}";:H%=2:GOTO100
                                 :rem 164
104 IFB%=47THENPRINT"{BLU}";:H%=1:GOTO100
                                 :rem 166
105 IFN>N%THENN%=N               :rem 81
106 IFB%=55THEN600               :rem 249
108 IFPEEK(653)=1THEN200         :rem 107
112 IFB%=23THEN450               :rem 244
120 IFB%=13THEN300               :rem 236
130 IFB%=8THEN500                :rem 195
140 IFB%=7THEN375                :rem 205
145 IFN%=208THEN100              :rem 51
150 IFB%=35THENN=N+1:A%(N)=191:PRINT"B ";
    :IFH%=2THENA%(N)=223         :rem 225
152 IFB%=34THENN=N+1:A%(N)=195:PRINT"C ";
    :IFH%=2THENA%(N)=225         :rem 233
156 IFB%=18THENN=N+1:A%(N)=201:PRINT"D ";
    :IFH%=2THENA%(N)=228         :rem 231
160 IFB%=49THENN=N+1:A%(N)=207:PRINT"E ";
    :IFH%=2THENA%(N)=231         :rem 231
162 IFB%=42THENN=N+1:A%(N)=209:PRINT"F ";
    :IFH%=2THENA%(N)=232         :rem 230
166 IFB%=19THENN=N+1:A%(N)=215:PRINT"G ";
    :IFH%=2THENA%(N)=235         :rem 239
170 IFB%=17THENN=N+1:A%(N)=183:PRINT"A ";
    :IFH%=2THENA%(N)=219         :rem 232
174 IFB%=10THENN=N+1:A%(N)=50:PRINT"{RVS}
    R{OFF} ";                    :rem 177
176 IFB%=54THENN=N+1:A%(N)=0:PRINT"{RVS}↑
    {OFF} ";                     :rem 146
178 POKE36876,A%(N)              :rem 14
180 GOTO100                      :rem 99
200 IFB%=23THEN425:REM *SHIFTED KEYS*
                                 :rem 169
203 IFN%=208THEN100              :rem 46
204 IFB%=7THEN400                :rem 195
205 IFB%=34THENN=N+1:A%(N)=199:PRINT"C#";
    :IFH%=2THENA%(N)=227         :rem 17
210 IFB%=18THENN=N+1:A%(N)=203:PRINT"D#";
    :IFH%=2THENA%(N)=229         :rem 4
215 IFB%=42THENN=N+1:A%(N)=212:PRINT"F#";
    :IFH%=2THENA%(N)=233         :rem 3
220 IFB%=19THENN=N+1:A%(N)=217:PRINT"G#";
    :IFH%=2THENA%(N)=236         :rem 12
225 IFB%=17THENN=N+1:A%(N)=187:PRINT"A#";
    :IFH%=2THENA%(N)=221         :rem 9
230 POKE36876,A%(N)              :rem 3
250 GOTO100                      :rem 97
300 FORL=1TON:REM *PLAYBACK*     :rem 222
320 J=2*L+38486:J%=PEEK(J):POKEJ,5:POKEJ+
    1,5                          :rem 38
330 IFA%(L)=0THENPOKE36876,0:GOTO350
                                 :rem 104
340 POKE36876,A%(L):FORQ=1TO250:NEXTQ
                                 :rem 231
350 POKEJ,J%:POKEJ+1,J%:NEXTL    :rem 27
360 GOTO100                      :rem 99
375 IFN=N%ANDN=0THEN100:REM *DELETE*
                                 :rem 159
376 IFN=N%THENN=N-1:N%=N:PRINT"{2 LEFT}
    {2 SPACES}{2 LEFT}";:GOTO100 :rem 137
380 FORT=N+1TON%                 :rem 211
382 TP=2*T+7766:TC=2*T+38486     :rem 41
384 T1%=PEEK(TP+2):T2%=PEEK(TP+3):POKETP,
    T1%:POKETP+1,T2%             :rem 186
386 T3%=PEEK(TC+2)AND7:POKETC,T3%:POKETC+
    1,T3%                        :rem 10
388 A%(T)=A%(T+1):NEXTT          :rem 31
390 POKETP,32:POKETP+1,32:N%=N%-1:rem 131
395 GOTO102                      :rem 109
400 FORT=N%TON+1STEP-1:REM *INSERT*
                                 :rem 173
405 TP=2*T+7766:TC=2*T+38486     :rem 37
410 T1%=PEEK(TP):T2%=PEEK(TP+1):POKETP+2,
    T1%:POKETP+3,T2%             :rem 176
412 T3%=PEEK(TC)AND7:POKETC+2,T3%:POKETC+
    3,T3%                        :rem 2
414 A%(T+1)=A%(T):NEXTT          :rem 21
416 N%=N%+1:POKETP,32:POKETP+1,32:rem 178
420 GOTO102                      :rem 98
425 IFN=0THEN100:REM *CURSOR LEFT*:rem 32
427 N=N-1:Y=2*N+38488:Y%=PEEK(Y)AND7:IFY%
    =2THENPOKEY,7:POKEY+1,7      :rem 167
428 IFY%=6THENPOKEY,5:POKEY+1,5  :rem 181
430 FORL=1TO100:NEXTL:PRINT"{2 LEFT}";:GO
    TO102                        :rem 183
450 Y=2*N+7768:IFPEEK(Y)=32THEN100:REM *C
    URSOR RIGHT*                 :rem 168
452 Y=2*N+38488:Y%=PEEK(Y)AND7:IFY%=5THEN
    POKEY,6:POKEY+1,6            :rem 53
453 IFY%=7THENPOKEY,2:POKEY+1,2  :rem 174
455 FORL=1TO100:NEXTL:PRINT"{2 RIGHT}";:N
    =N+1:GOTO102                 :rem 45
500 PRINT"{CLR}{UP}DATA FOR SONG:";N;:REM
     *PRINT DATA*                :rem 217
520 FORL=1TON:PRINT"{LEFT},";A%(L);
                                 :rem 118
525 IFL=70ORL=144THENPRINT:PRINT"{RVS}
    {3 SPACES}PRESS ANY KEY TO{6 SPACES}C
    ONTINUE{11 SPACES}{OFF}";    :rem 234
527 IFL=70ORL=144THENM=PEEK(197):IFM=64TH
    EN527                        :rem 58
530 NEXTL                        :rem 35
535 PRINT:PRINT"{RVS}{RED}PRESS D TO REPE
    AT DATAPRESS S TO START AGAINPRESS X
    {SPACE}TO STOP{7 SPACES}{BLU}{OFF}"
                                 :rem 162
540 LL=PEEK(197):IFLL=41THENRUN  :rem 172
545 IFLL=18THEN500               :rem 47
547 IFLL<>26THEN540              :rem 113
550 POKE198,0:POKE808,112:STOP   :rem 16
600 FORL=1TO200:NEXT:POKE36876,0:REM *SEA
    RCH MODE*                    :rem 5
602 B%=PEEK(197):IFB%=64THEN602  :rem 241
603 IFB%=39THENPRINT"{RED}";:H%=2:GOTO600
                                 :rem 174
604 IFB%=47THENPRINT"{BLU}";:H%=1:GOTO600
                                 :rem 176
606 IFB%=63THEN100               :rem 248
608 IFPEEK(653)=1THEN650         :rem 121
610 IFB%=35THENSE%=191:IFH%=2THENSE%=223
                                 :rem 91
612 IFB%=34THENSE%=195:IFH%=2THENSE%=225
                                 :rem 98
614 IFB%=18THENSE%=201:IFH%=2THENSE%=228
                                 :rem 93
616 IFB%=49THENSE%=207:IFH%=2THENSE%=231
                                 :rem 99
618 IFB%=42THENSE%=209:IFH%=2THENSE%=232
                                 :rem 97
620 IFB%=19THENSE%=215:IFH%=2THENSE%=235
                                 :rem 94
622 IFB%=17THENSE%=183:IFH%=2THENSE%=219
                                 :rem 100
624 POKE36876,SE%:GOTO600        :rem 203
650 IFB%=34THENSE%=199:IFH%=2THENSE%=227
                                 :rem 106
```

COMPUTE! Back Issues

Here are some of the applications, tutorials, and games from available back issues of COMPUTE!. Each issue contains much, much more than there's space here to list, but here are some highlights:

Home and Educational COMPUTING! (Fall 1981 and Summer 1981 — count as one back issue): Exploring The Rainbow Machine, VIC As Super Calculator, Custom Characters On The VIC, Alternative Screens, Automatic VIC Line Numbers, Using The Joystick (Spacewar Game), Fast VIC Tape Locater, Window, VIC Memory Map.

May 1981: Named GOSUB/GOTO in Applesoft, Generating Lower Case Text on Apple II, Copy Atari Screens to the Printer, Disk Directory Printer for Atari, Realtime Clock on Atari, PET BASIC Delete Utility, PET Calculated Bar Graphs, Running 40 Column Programs on a CBM 8032, A Fast Visible Memory Dump, Cassette Filing System, Getting To A Machine Language Program, Epidemic Simulation.

June 1981: Computer Using Educators (CUE) on Software Pricing, Apple II Hires Character Generator, Ever Expanding Apple Power, Color Burst for Atari, Mixing Atari Graphics Modes 0 and 8, Relocating PET BASIC Programs, An Assembler In BASIC for PET, Quadra PET: Multitasking?, Mapping Unknown Machine Language, RAM/ROM Memory, Keeping TABs on a Printer.

July 1981: Home Heating and Cooling, Animating Integer BASIC Lores Graphics, The Apple Hires Shape Writer, Adding a Voice Track to Atari Programs, Machine Language Atari Joystick Driver, Four Screen Utilities for the PET, Saving Machine Language Programs on PET Tape Headers, Commodore ROM Systems, Using TAB, SPC, And LEN.

August 1981: Minimize Code and Maximize Speed, Apple Disk Motor Control, A Cassette Tape Monitor for the Apple, Easy Reading of the Atari Joystick, Blockade Game for the Atari, Atari Sound Utility, The CBM "Fat 40," Keyword for PET, CBM/PET Loading, Chaining, and Overlaying, Adding A Programmable Sound Generator, Converting PET BASIC Programs To ASCII Files.

October 1981: Automatic DATA Statements for CBM and Atari, VIC News, Undeletable Lines on Apple, PET, and VIC; Budgeting on the Apple, Atari Cassette Boot-tapes, Atari Variable Name Utility, Atari Program Library, Train Your PET to Run VIC Programs, Interface a BSR Remote Control System to PET, A General Purpose BCD to Binary Routine, Converting to Fat-40 PET.

December 1981: Saving Fuel $$ (multiple computers), Unscramble Game (multiple computers), Maze Generator (multiple computers), Animating Applesoft Graphics, A Simple Atari Word Processor, Adding High Speed Vertical Positioning to Atari P/M Graphics, OSI Supercursor, A Look At SuperPET, Supermon for PET/CBM, PET Mine Maze Game, Replacing The INPUT# Command, Foreign Language Text on The Commodore Printer, File Recovery.

January 1982: Invest (multiple computers), Developing a Business Algorithm (multiple computers), Apple Addresses, Lowercase with Unmodified Apple, Cryptrogram Game for Atari, Superfont: Design Special Character Sets on Atari, PET Repairs for the Amateur, Micromon for PET, Self-modifying Programs in PET BASIC, Tinymon: a VIC Monitor, VIC Color Tips, VIC Memory Map, ZAP: A VIC Game.

May 1982: VIC Meteor Maze Game, Atari Disk Drive Speed Check, Modifying Apple's Floating Point BASIC, Fast Sort For PET/CBM, Extra Atari Colors Through Artifacting, Life Insurance Estimator (multiple computers), PET Screen Input, Getting The Most Out Of VIC's 5000 Bytes.

August 1982: The New Wave Of Personal Computers, Household Budget Manager (multiple computers), Word Games (multiple computers), Color Computer Home Energy Monitor, A VIC Light Pen For Under $10, Guess That Animal (multiple computers), PET/CBM Inner BASIC, VIC Communications, Keyprint Compendium, Animation With Atari, VIC Curiosities, Atari Substring Search, PET and VIC Electric Eraser.

September 1982: Apple and Atari and the Sounds of TRON, Commodore Automatic Disk Boot, VIC Joysticks, Three Atari GTIA Articles, Commodore Disk Fixes, The Apple Pilot Language, Sprites and Sound on the Commodore 64, Peripheral Vision Exerciser (multiple computers), Banish INPUT Statements (multiple computers),

COMPUTE! Back Issues

Charades (multiple computers), PET Pointer Sort, VIC Pause, Mapping Machine Language, Commodore User-defined Functions Defined, A VIC Bug.

January 1983: Sound Synthesis And The Personal Computer, Juggler And Thunderbird Games (multiple computers), Music And Sound Programs (multiple computers), Writing Transportable BASIC, Home Energy Calculator (multiple computers), All About Commodore WAIT, Supermon 64, Perfect Commodore INPUTs, VIC Sound Generator, Copy VIC Disk Files, Commodore 64 Architecture.

March 1983: An Introduction To Data Storage (multiple computers), Mass Memory Now And In The Future, Games: Closeout, Boggler, Fighter Aces, Letter And Number Play (all for multiple computers), VIC Music, Direct Atari Disk Access, Automatic Commodore Program Selector, PET Quickplot, A Commodore Gotcha, VIC and Atari Memory Management, Friendly VIC INPUTs.

April 1983: Selecting The Right Word Processor, Air Defense (multiple computers), Commodore Structure BASIC, Retirement Planner (multiple computers), Dr. Video For Commodore, Atari Filefixer, Video 80:80 Columns For The Atari, VICword, Magic Commodore BASIC, A BASIC Hex Editor For VIC, VIC Music Theory.

May 1983: The New Low Cost Printer/Plotters, Jumping Jack (multiple computers), Deflector (multiple computers), VIC Kaleidoscope, Graphics on the Sinclair/Timex, Bootmaker For VIC, PET and 64, VICSTATION: A "Paperless Office," The Atari Musician, Puzzle Generator (multiple computers), Instant 64 Art, 64 Odds And Ends, Versatile VIC Data Acquisition, POP For Commodore.

June 1983: How To Buy The Right Printer, The New, Low-cost Printers, Astrostorm (multiple computers), The Hawkmen Of Dindrin (multiple computers), MusicMaster For The Commodore 64, Commodore Data Searcher, Atari Player/Missile Graphics Simplified, VIC Power Spirals, Un NEW For The VIC and 64, Atari Fast Shuffle, VIC Contractor, Commodore Supermon Q & A.

July 1983: Constructing The Ideal Computer Game, Techniques For Writing Your Own Adventure Game, SpeedSki And Time Bomb (VIC), Castle Quest And Roadblock (Atari), RATS! And Goblin (64), How To Create A Data Filing System (multiple computers), How To Back Up Disks For VIC And 64, Atari Artifacting, All About The Commodore USR Command, TI Mailing List.

August 1983: Weather Forecaster (multiple computers), First Math And Clues (multiple computers), Converting VIC And 64 Programs To PET, Atari Verify, Apple Bytechanger, VIC And 64 Escape Key, Banish Atari INPUT Statements, Mixing Graphics Modes On The 64, VICplot, VIC/64 Translations: Reading The Keyboard, Musical Atari Keyboard, VIC Display Messages.

September 1983: Games That Teach, Caves Of Ice, Diamond Drop, Mystery Spell, and Dots (multiple computers), VIC Pilot, Ultrasort (VIC, 64, PET), Easy Atari Page Flipping, Computer Aided Design On The TI, Relative Files On the VIC/64, Atari Fontbyter, TI Sprite Editor, All About Interrupts (multiple computers), Cracking The 64 Kernal, Making Change On The Timex/Sinclair, Build Your Own Random File Manager (multiple computers).

October 1983: Computer Games By Phone, Coupon File (multiple computers), Dragon Master And Moving Maze (multiple computers), Merging Programs From Commodore Disks, Atari Master Disk Directory, Sprites In TI Extended BASIC, Commodore EXEC, Multicolor Atari Character Editor, High Speed Commodore Mazer, Apple Sounds, Extra Instructions (multiple computers), Commodore DOS Wedges, Invisible Disk Directory For VIC And 64.

Back issues are $3 each or six for $15. Price includes freight in the US. Outside the US add $1 per magazine ordered for surface postage, $4 per magazine for air mail postage. All back issues subject to availability.

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```
652 IFB%=18THENSE%=203:IFH%=2THENSE%=229
                                        :rem 98
654 IFB%=42THENSE%=212:IFH%=2THENSE%=233
                                        :rem 92
656 IFB%=19THENSE%=217:IFH%=2THENSE%=236
                                       :rem 106
658 IFB%=17THENSE%=187:IFH%=2THENSE%=221
                                       :rem 106
660 POKE36876,SE%:GOTO600          :rem 203
```

The Note Name Game

(Article on page 112.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1:
The Note Name Game — VIC Version

```
5 DIMN$(1,25),A%(9,3),B%(5,3):R=0:W=0:RO%
  =13:SC=0                              :rem 94
7 FORJ=0TO3:FORI=0TO9:READA%(I,J):NEXT:NE
  XT                                    :rem 28
8 FORJ=0TO3:FORI=0TO5:READB%(I,J):NEXT:NE
  XT                                    :rem 26
10 FORI=0TO25:READN$(0,I):NEXTI         :rem 136
15 FORI=0TO25:READN$(1,I):NEXTI         :rem 142
25 POKE36879,8:PRINT"{CLR}{2 DOWN}
   {2 RIGHT}{BLU}{RVS}THE NOTE NAME GAME
   {OFF}"                               :rem 26
30 PRINT"{DOWN}{3 SPACES}I WILL PLAY A NO
   TE":PRINT"{DOWN}FOR YOU AND THEN SHOW"
                                        :rem 182
35 PRINT"{DOWN}YOU THE NOTE ON A":PRINT"
   {DOWN}STAFF.{2 SPACES}I WANT YOU TO"
                                        :rem 29
40 PRINT"{DOWN}TELL ME THE NAME OF":PRINT
   "{DOWN}THE NOTE."                    :rem 1
50 PRINT"{3 DOWN}INPUT {RVS}B{OFF} FOR BA
   SS,{RVS}T{OFF} FOR";"{DOWN}TREBLE, OR
   {SPACE}{RVS}M{OFF} FOR MIXED" :rem 100
55 GETE$:IFE$=""THEN55                  :rem 255
60 IFE$<>"T"ANDE$<>"B"ANDE$<>"M"THEN55
                                        :rem 140
65 FORL=1TO10                           :rem 16
70 PRINT"{CLR}{WHT}{2 SPACES}WHAT NOTE IS
    THIS?{BLU}"                         :rem 108
75 PRINT"{HOME}{22 DOWN}{6 RIGHT}{WHT}
   {RVS}SCORE{OFF} :";SC;"{LEFT}%
   {2 SPACES}{BLU}{HOME}{4 DOWN}" :rem 91
80 RN%=INT(RND(0)*13)                   :rem 153
82 IFRN%=RO%THEN80                      :rem 88
83 RO%=RN%                              :rem 51
85 CF%=INT(RND(0)*2)                    :rem 85
90 IFE$="B"THENCF%=0                    :rem 110
95 IFE$="T"THENCF%=1                    :rem 134
100 ON CF%+1 GOSUB 3000,2000            :rem 105
105 POKE8023-RN%*22,81:POKE8023+30720-RN%
   *22,1                                :rem 225
110 B=RN%:IFCF%=1THENB=RN%+13           :rem 189
115 FOR Z=1TO500: NEXTZ: POKE36878,0
                                        :rem 38
120 PRINT"{3 DOWN}{2 RIGHT}> ";         :rem 74
125 GETGU$:IFGU$=""THEN125              :rem 9
130 IF (ASC(GU$)<65 OR ASC(GU$)>71) AND A
   SC(GU$)<>81 THEN PRINT"{4 UP}":GOTO12
   0                                    :rem 26
135 PRINTGU$;                           :rem 33
140 IF GU$="Q" THEN160                  :rem 124
145 IF GU$=N$(0,B) THEN GOSUB 500:rem 203
150 IF GU$<>N$(0,B) THEN GOSUB 600 :rem 5
155 IFR+W<>0THENSC=INT((R/(R+W))*100+.5):
   NEXT                                 :rem 159
160 PRINT"{CLR}{5 DOWN}{RIGHT}YOUR SCORE
   {SPACE}WAS";SC;"{LEFT}%"             :rem 53
165 PRINT"{3 DOWN}{2 RIGHT}WOULD YOU LIKE
    TO":PRINT"{DOWN}{5 RIGHT}PLAY AGAIN"
   ;:INPUTY$                            :rem 239
170 IF LEFT$(Y$,1)="Y" THEN RUN         :rem 159
175 PRINT"{CLR}":POKE36879,27:END :rem 33
500 SD=36874:FORZ=SDTOSD+4:POKEZ,0:NEXT
                                        :rem 245
510 POKESD+4,15:PRINT"{2 DOWN}"; :rem 181
520 FOR Z=128TO255STEP2:PRINTTAB(8);"
   {DOWN}{WHT}{RVS}CORRECT{OFF}":POKESD,
   P                                    :rem 75
530 PRINTTAB(8);"{UP}CORRECT{2 UP}{BLU}":
   POKESD+1,383-Z:NEXTZ                 :rem 104
540 R=R+1:POKESD+4,0:FORZ=1TO1000:NEXT:RE
   TURN                                 :rem 113
600 SD=36874:FORZ=SDTOSD+4:POKEZ,0:NEXT
                                        :rem 246
610 POKESD+4,15:PRINT"{5 LEFT}{WHT}SORRY
   {SPACE}THAT'S INCORRECT":PRINT"
   {7 RIGHT}IT WAS ";N$(0,B)            :rem 92
620 POKESD,158:FORZ=1TO750:NEXTZ  :rem 35
630 W=W+1:POKESD+4,0:FORZ=1TO950:NEXT:RET
   URN                                  :rem 88
800 DATA 32,32,32,32,32,225,225,32,32,32
                                        :rem 152
801 DATA 32,32,32,32,255,32,32,127,32,160
                                        :rem 207
802 DATA 255,97,127,254,225,255,127,98,22
   5,255                                :rem 246
803 DATA 123,97,97,32,32,252,225,255,32,3
   2                                    :rem 25
900 DATA32,118,32,32,32,32              :rem 34
901 DATA255,32,127,32,32,226            :rem 143
902 DATA127,32,97,32,255,32             :rem 102
903 DATA32,97,97,97,32,32               :rem 17
1000 DATAE,F,G,A                        :rem 114
1010 DATAB,C,D,E                        :rem 110
1020 DATAF,G,A,B                        :rem 113
1030 DATAC,C,D,E                        :rem 113
1040 DATAF,G,A,B                        :rem 115
1050 DATAC,D,E,F                        :rem 118
1060 DATAG,A                            :rem 149
1070 DATA207,209,215,219                :rem 206
1080 DATA223,225,228,231                :rem 201
1090 DATA232,235,237,239                :rem 211
1100 DATA240,195,201,207                :rem 193
1110 DATA209,215,219,223                :rem 199
1120 DATA225,228,231,232                :rem 196
1130 DATA235,237                        :rem 65
2000 SD=36874:FORZ=SDTOSD+4:POKEZ,0:NEXT
                                        :rem 34
2010 POKESD+2,VAL(N$(1,RN%+13)):POKESD+4,
   15                                   :rem 171
2020 IFRN%=12THENPRINT"{2 UP}{12 SPACES}
   ***{DOWN}"                     :rem 43
2030 FORI=1TO5                          :rem 59
```

```
2040 PRINTTAB(8)"**********":PR
     INT:NEXT                          :rem 183
2113 SR=7793:CO=38513                  :rem 144
2115 FORI=ØTO9:FORJ=ØTO3:Z=I*22+J:POKESR+
     Z,A%(I,J):POKECO+Z,6:NEXT:NEXT
                                       :rem 22
2120 IFRN%=ØTHENPRINT"{12 SPACES}***"
                                       :rem 198
2130 PRINT"{UP}";:RETURN               :rem 125
3000 SD=36874:FORZ=SDTOSD+4:POKEZ,Ø:NEXT
                                       :rem 35
3010 POKESD,VAL(N$(1,RN%)):POKESD+4,15
                                       :rem 192
3020 IFRN%=12THENPRINT"{2 UP}{12 SPACES}
     ***{DOWN}"                        :rem 44
3030 FORI=1TO5                         :rem 60
3040 PRINTTAB(8)"**********":PR
     INT:NEXT                          :rem 184
3050 SR=7793:CO=38513                  :rem 145
3060 FORI=ØTO5:FORJ=ØTO3:Z=I*22+J:POKESR+
     Z,B%(I,J):POKECO+Z,6:NEXT:NEXT
                                       :rem 19
3070 POKE SR+26,46:POKESR+48,46:POKECO+26
     ,6:POKECO+48,6                    :rem 230
3100 IFRN%=ØTHENPRINT"{12 SPACES}***"
                                       :rem 197
3110 PRINT"{UP}";:RETURN               :rem 124
```

Program 2:

The Note Name Game — 64 Version

```
 5 PRINT"{CLR}":V=53248:SD=54272:POKE646,1
   4:POKEV+32,Ø:POKEV+33,Ø:DIM N$(2,24):SC
   =Ø                                  :rem 71
 6 NO%=25:POKEV+21,Ø                   :rem 69
 8 FORI=SDTOSD+28:POKEI,Ø:NEXTI        :rem 219
10 FOR I=ØTO24:READN$(Ø,I):NEXTI       :rem 135
15 FOR I=ØTO24:READN$(1,I):NEXTI       :rem 141
20 FOR I=ØTO24:READN$(2,I):NEXTI       :rem 138
25 :::REM READ SPRITE DATA             :rem 6
30 FOR I=OTO62: READQ: POKE832+I,Q: NEXTI
                                       :rem 138
35 FOR I=OTO62: READQ: POKE896+I,Q: NEXTI
                                       :rem 153
40 FOR I=OTO62: READQ: POKE960+I,Q: NEXTI
                                       :rem 141
45 :::REM TELL COMPUTER WHERE SPRITE IS
                                       :rem 137
50 POKE2042,13:POKE2043,14:POKE2044,15
                                       :rem 116
55 :::REM POSITION SPRITE ON SCREEN
                                       :rem 165
60 POKEV+4,160:POKEV+5,70              :rem 191
65 POKEV+6,158:POKEV+7,110             :rem 250
70 POKEV+8,158:POKEV+9,171               :rem 1
75 :::REM COLOR SPRITES                :rem 167
78 POKEV+41,1:POKEV+42,1:POKEV+43,1
                                       :rem 60
80 :::REM EXPAND SPRITES               :rem 228
85 POKEV+29,28:POKEV+23,28               :rem 3
90 :::REM SET SOUND PARAMETERS         :rem 100
95 POKESD+24,15:POKESD+5,4:POKESD+6,170:P
   OKESD+2,Ø:POKESD+3,9:POKESD+12,2
                                       :rem 164
96 POKESD+13,243:POKESD+19,Ø:POKESD+20,24
   5                                   :rem 206
100 PRINT"{CLR}{2 DOWN}";TAB(11);"{RVS}TH
    E NOTE NAME GAME{OFF}"             :rem 81
105 PRINT"{5 DOWN}{6 RIGHT}I WILL PLAY A
    {SPACE}NOTE FOR YOU AND"           :rem 79
110 PRINT"{DOWN}{3 RIGHT}THEN SHOW YOU A
    {SPACE}NOTE ON A STAFF."           :rem 47
115 PRINT"{DOWN}{3 RIGHT}I WANT YOU TO TE
    LL ME THE NAME OF":PRINT"{DOWN}
    {3 RIGHT}THE NOTE."                :rem 5
120 PRINT"{3 DOWN}{4 RIGHT}INPUT
    {2 SPACES}{RVS}B{OFF} FOR BASS, {RVS}
    T{OFF} FOR TREBLE,"                :rem 134
125 PRINTTAB(13);"{DOWN}OR{2 SPACES}{RVS}
    M{OFF} FOR MIXED."                 :rem 95
128 POKE198,Ø                          :rem 200
130 GETE$:IFE$=""THEN130               :rem 83
135 IFE$<>"T"ANDE$<>"B"ANDE$<>"M"THEN130
                                       :rem 233
190 FOR L=1TO10                        :rem 63
200 POKEV+21,Ø:PRINT"{CLR}{7}{2 DOWN}
    {RIGHT}WHAT{2 SPACES}NOTE":PRINT"
    {DOWN}{2 RIGHT}IS THIS?{HOME}":rem 94
205 M=25:S=Ø:IFE$="B"THENM=13          :rem 148
210 IFE$="T"THENM=13:S=12              :rem 170
215 RN%=INT(RND(Ø)*M+S)                :rem 48
217 IFRN%=NO%THEN215                   :rem 180
218 NO%=RN%                            :rem 95
220 GOSUB4500                          :rem 221
225 POKEV+21,28:PRINT"{HOME}{DOWN}":GOSUB
    750                                :rem 199
230 FORZ=1TO2:PRINT"{16 RIGHT}{24 SPACES}
    ";:NEXTZ                           :rem 2
235 GOSUB750:PRINT"{HOME}"             :rem 212
245 IFRN%=24THENPRINT"{HOME}{29 SPACES}
    ***{HOME}"                         :rem 248
250 IFRN%=12THENPRINT"{HOME}{12 DOWN}
    {29 SPACES}***{HOME}"              :rem 189
255 IFRN%=ØTHENPRINT"{HOME}{24 DOWN}
    {29 SPACES}***{HOME}"              :rem 91
260 POKE2014+54272-RN%*40,1:POKE2014-RN%*
    40,81                              :rem 223
265 PRINT"{HOME}{20 DOWN}('Q' TO QUIT)
    {HOME}"                            :rem 190
268 PRINT"{HOME}{18 DOWN}{RVS}SCORE{OFF}
    {SPACE}:";SC;"{LEFT}%{2 SPACES}{HOME}
    "                                  :rem 53
270 PRINT"{7 DOWN}{2 RIGHT}> ";        :rem 148
273 POKE198,Ø                          :rem 201
275 GETGU$:IFGU$=""THEN275             :rem 21
280 IF (ASC(GU$)<65 OR ASC(GU$)>71) AND A
    SC(GU$)<>81 THENPRINT"{8 UP}":GOTO270
                                       :rem 106
285 PRINTGU$                           :rem 236
290 IFGU$="Q"THEN 310                  :rem 127
295 IFGU$=N$(Ø,RN%)THENGOSUB400        :rem 83
300 IFGU$<>N$(Ø,RN%)THENGOSUB500       :rem 132
305 IFR+W<>ØTHENSC=INT((R/(R+W))*100+.5):
    NEXT                               :rem 156
310 POKEV+21,Ø:PRINT"{CLR}"            :rem 161
315 PRINT"{7 DOWN}{9 RIGHT}YOUR SCORE WAS
    ";SC;"{LEFT}%"                     :rem 174
320 PRINT"{5 DOWN}{4 RIGHT}WOULD YOU LIKE
     TO PLAY AGAIN";:INPUTY$           :rem 151
325 IFLEFT$(Y$,1)="Y"THENR=Ø:W=Ø:SC=Ø:GOT
    O100                               :rem 170
330 SYS2048:REM END OF PROGRAM           :rem 5
400 :::REM CORRECT                     :rem 56
410 POKESD+11,129                      :rem 176
420 FORI=536TO9094STEP256:PRINT"{3 DOWN}
    {RIGHT}{WHT}{RVS} CORRECT {OFF}{WHT}"
    :HI=INT(I/256):LO=I-HI*256         :rem 71
430 PRINT"{UP}{2 SPACES}CORRECT {4 UP}
    {7}":POKESD+8,HI:POKESD+7,LO:NEXTI
                                       :rem 244
440 FORT=1TO10:NEXT:POKESD+11,128:FORT=1T
    O900:NEXT:R=R+1:RETURN             :rem 59
```

```
500 :::REM INCORRECT                    :rem 208
505 POKESD+18,33:POKESD+16,0:POKESD+15,6
                                        :rem 103
510 PRINT"{DOWN}SORRY, THAT'S":PRINT"
    {DOWN}INCORRECT."                   :rem 225
515 PRINT"{DOWN}IT WAS: ";N$(0,RN%)
                                        :rem 94
520 FORT=1TO1000:NEXT:POKESD+18,32:FORT=1
    TO900:NEXT:W=W+1:RETURN             :rem 117
750 FORX=1TO5                           :rem 33
755 PRINT TAB(16);:FORI=1TO24:PRINT CHR$(
    99);:NEXT                           :rem 24
760 PRINT"{16 RIGHT}{24 SPACES}";:NEXTX:R
    ETURN                               :rem 100
780 PRINT"THE NOTE WAS:";N$(0,RN%)
                                        :rem 203
785 W=W+1:RETURN                         :rem 5
1000 :::REM TELL COMPUTER WHERE SPRITE IS
                                        :rem 225
1005 POKE2042,13:POKE2043,14:POKE2044,15
                                        :rem 213
1010 :::REM POSITION SPRITE ON SCREEN
                                        :rem 253
1015 POKEV+4,160:POKEV+5,70              :rem 32
1020 POKEV+6,158:POKEV+7,110             :rem 82
1025 POKEV+8,158:POKEV+9,171             :rem 98
1030 :::REM COLOR SPRITES               :rem 255
1035 POKEV+41,1:POKEV+42,1:POKEV+43,1
                                        :rem 150
1040 :::REM EXPAND SPRITES IN BOTH DIRECT
     IONS                               :rem 249
1045 POKEV+29,28:POKEV+23,28             :rem 96
1050 :::REM TURN ON SPRITES             :rem 104
1055 POKEV+21,28                        :rem 116
1999 END                                :rem 179
2000 PRINT:GOSUB 4970                   :rem 221
2005 FORZ=1TO2:PRINT"{16 RIGHT}
     {24 SPACES}";:NEXTZ                :rem 52
2010 GOSUB4970:PRINT"{HOME}"            :rem 53
4500 POKE SD+1,VAL(N$(2,RN%)):POKESD,VAL(
     N$(1,RN%)):POKESD+4, 65            :rem 108
4510 FORT=1TO 600 :NEXT:POKESD+4, 64
                                        :rem 26
4520 RETURN                             :rem 171
4970 FORX=1TO5                           :rem 89
4980 PRINT TAB(16);: FORZ=1TO24: PRINT CH
     R$(99);:NEXTZ                      :rem 183
4990 PRINT"{16 RIGHT}{24 SPACES}";:NEXTX:
     RETURN                             :rem 157
5000 DATAE,F,G,A,B,C,D,E,F,G,A,B,C,D,E
                                        :rem 68
5010 DATAF,G,A,B,C,D,E,F,G,A             :rem 22
5020 DATA71,152,71,12                    :rem 48
5030 DATA233,97,104,143                 :rem 155
5040 DATA48,143,24,210                  :rem 100
5050 DATA195,209,31,96                  :rem 117
5060 DATA30,49,165,135                  :rem 110
5070 DATA162,62,193,60,99                :rem 12
5080 DATA5,5,6,7,7                      :rem 165
5090 DATA8,9,10,11,12                    :rem 47
5100 DATA14,15,16,18,21                 :rem 142
5110 DATA22,25,28,31,33                 :rem 144
5120 DATA37,42,44,50,56                 :rem 154
5140 DATA0,224,0,0,208,0,0,216,0,0,204,0,
     0,206,0,0,199,0,0,199,0,0,199,0,0,20
     6,0                                :rem 54
5150 DATA0,204,0,0,216,0,0,240,0,0,224,0,
     1,192,0,3,192,0,6,192,0,12,192,0,24,
     192                                :rem 61
5160 DATA0,48,192,0,96,192,0,224,192,0
                                        :rem 121
5170 DATA48,111,128,97,248,192,195,96,96,
     198,96,48,195,104,48,193           :rem 246
5175 DATA232,48,96,248,96                :rem 27
5180 DATA112,96,224,56,96,192,28,99,192,7
     ,111,0,1,248,0,0,96,0,0,0,0,0,0,0,0,
     0,0                                :rem 97
5190 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                                        :rem 33
5200 DATA 0,248,0,3,6,0,6,3,128,6,0,198,3
     ,192,198,3,192,192,0,0,198,0,1,134,0
     ,1                                 :rem 8
5210 DATA128,0,3,0,0,3,0,0,6,0,0,12,0,0,2
     4,0,0,112,0,1,192,0,3,0,0,0,0,0,0,0,
     0                                  :rem 142
5220 DATA0,0,0,0,0,0                    :rem 223
```

Easy Screen Formatting

(Article on page 160.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
100 REM CLEAR SCREEN, HOME CURSOR:rem 207
110 PRINT"{CLR}"                        :rem 246
120 :                                   :rem 205
130 :                                   :rem 206
140 REM SET X,Y POSITIONS FOR CURSOR
                                        :rem 207
150 X=5:Y=5:GOSUB 60000                  :rem 21
160 :                                   :rem 209
170 :                                   :rem 210
180 REM PRINT HELLO                     :rem 126
190 PRINT"HELLO";                        :rem 26
200 :                                   :rem 204
210 :                                   :rem 205
220 REM OTHER EXAMPLES                   :rem 89
230 X=0:Y=0:GOSUB 60000                  :rem 10
240 PRINT"HELLO";                        :rem 22
250 X=10:Y=10:GOSUB 60000               :rem 110
260 PRINT"HELLO";                        :rem 24
270 END                                 :rem 112
59970 :                                  :rem 72
59980 :                                  :rem 73
59990 REM SUBRT: POSITION CURSOR         :rem 17
60000 PRINT"{HOME}";                     :rem 21
60010 IF Y<>0 THEN POKE 214,Y-1:PRINT
                                        :rem 40
60020 POKE 211,X                         :rem 63
60030 RETURN                            :rem 217
```

Sprites Made Easy

(Article on page 184.)

Program 1: Sprite BASIC

```
10 A=0: REM INITIALIZE CHECKSUM         :rem 114
20 REM MOVE BASIC ROM TO RAM             :rem 80
30 FORI=40960TO49151:POKEI,PEEK(I):NEXTI
                                        :rem 217
```

```
40 REM CHANGE LET TO OFF                :rem 81
50 FORI=41150TO41152:READN:POKEI,N:A=A+N:
   NEXTI                                :rem 113
60 READL,H:POKE40988,L:POKE40989,H:A=A+L+
   H                                    :rem 254
70 DATA 79, 70, 198, 2, 192             :rem 120
80 REM CHANGE WAIT TO MOVE               :rem 1
90 FOR I=41189TO41192:READN:POKEI,N:A=A+N
   :NEXTI                               :rem 133
100 READL,H:POKE41008,L:POKE41009,H:A=A+L
   +H                                    :rem 9
110 DATA 77, 79, 86, 197, 19, 192:rem 123
120 REM CHANGE VERIFY TO SPRITE  :rem 108
130 FORI=41201TO41206:READN:POKEI,N:A=A+N
   :NEXTI                               :rem 157
140 READL,H:POKE41014,L:POKE41015,H:A=A+L
   +H                                    :rem 7
150 DATA 83,80,82,73,84,197,96,192
                                        :rem 163
160 REM READ IN NEW ROUTINES     :rem 145
170 FORI=49152TO49378:READN:POKEI,N:A=A+N
   :NEXTI                               :rem 192
180 IFA<>29989THENPRINT"ERROR IN DATA STA
   TEMENTS"                              :rem 59
190 END                                 :rem 113
200 DATA 80, 70, 83, 32,158,183,224, 8,17
   6, 31,189,219,192, 45, 21,208,141
                                        :rem 237
210 DATA 21,208, 96, 32,158,183,224, 16,1
   76, 14,134, 2, 32,253,174, 32,235
                                        :rem 222
220 DATA183,165, 21,201, 2,144, 3, 76, 72
   ,178,138, 72,166, 2, 32, 10,192
                                        :rem 70
230 DATA189,219,192, 45, 16,208,141, 16,2
   08, 70, 21,144, 9,189,211,192, 13
                                        :rem 28
240 DATA 16,208,141, 16,208,138, 10,170,1
   04,157, 1,208,165, 20,157, 0,208
                                        :rem 255
250 DATA166, 2,189,211,192, 13, 21,208,14
   1, 21,208, 96, 32,158,183,224, 8
                                        :rem 228
260 DATA176,193,134, 2,169,248,133,251,17
   3, 24,208, 41,240, 9, 12,133,252
                                        :rem 70
270 DATA173, 0,221, 73,255, 74,102,252, 7
   4,102,252, 32,253,174, 32,158,183
                                        :rem 65
280 DATA138,164, 2,145,251, 32,253,174, 3
   2,158,183,224, 16,176,146,138,153
                                        :rem 182
290 DATA 39,208,185,219,192, 72, 45, 29,2
   08,141, 29,208,104, 45, 23,208,141
                                        :rem 86
300 DATA 23,208, 32,253,174, 32,158,183,2
   24, 4,176,223,134, 2, 70, 2,144
                                        :rem 163
310 DATA 9,185,211,192, 13, 29,208,141, 2
   9,208, 70, 2,144, 9,185,211,192
                                        :rem 178
320 DATA 13, 23,208,141, 23,208, 96, 1, 2
   , 4, 8, 16, 32, 64,128,254,253
                                        :rem 171
330 DATA251,247,239,223,191,127    :rem 43
```

Program 2: Butterfly

```
10 READ SB: IF SB<0 THEN 180: REM READ SP
   RITE DATA                            :rem 207
20 LO= SB*64: FOR I= 0 TO 62            :rem 69
30 READ SD: POKE LO+I,SD: NEXT I  :rem 19
40 GOTO 10                              :rem 254
50 DATA 13: REM SPRITE DATA BLOCK 13
                                        :rem 193
60 DATA 14, 32, 0, 31, 112, 0, 63, 112, 0
   , 63, 186, 0                         :rem 235
70 DATA 127, 217, 128, 127, 237, 128, 63,
    247, 0, 63, 254, 0                  :rem 111
80 DATA 31, 252, 0, 15, 248, 0, 15, 240,
   {SPACE}0, 31, 224, 0                  :rem 31
90 DATA 31, 192, 0, 13, 128, 0, 0, 0, 0,
   {SPACE}0, 0, 0                       :rem 230
100 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
    0, 0, 0, 0                          :rem 227
110 DATA 14: REM SPRITE DATA BLOCK 14
                                        :rem 240
120 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 50
   , 0                                   :rem 6
130 DATA 60, 121, 128, 127, 125, 128, 255
   , 191, 128, 255, 239, 0               :rem 48
140 DATA 255, 254, 0, 255, 252, 0, 255, 2
   48, 0, 127, 240, 0                    :rem 41
150 DATA 63, 224, 0, 127, 192, 0, 62, 0,
   {SPACE}0, 28, 0, 0                   :rem 189
160 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
    0, 0, 0, 0                          :rem 233
170 DATA -1: REM END OF DATA        :rem 180
180 PRINT"{CLR}": POKE 53281,1: REM WHITE
    SCREEN                              :rem 37
190 X=0: Y=0: REM STARTING POSITION
                                        :rem 94
200 POKE 1,54: REM TURN ON SPRITE BASIC
                                        :rem 196
210 SPRITE 0, 13, 11, 0: REM DEFINE SPRIT
   E                                    :rem 180
220 MOVE 0, X, Y: REM PUT SPRITE 0 ON SCR
   EEN                                  :rem 127
230 FOR T = 0 TO 100: NEXT T: REM DELAY L
   OOP                                   :rem 5
240 SPRITE 0, 14, 11, 0: REM REDEFINE SPR
   ITE                                  :rem 79
250 FOR T = 0 TO 100: NEXT T: REM DELAY L
   OOP                                   :rem 7
260 X=X+3: Y=Y+ 3*(INT(RND(1)*3)-1)
                                        :rem 66
270 IF X>345 THEN X=0                   :rem 78
280 IF (Y<30) OR (Y>250) THEN Y=150
                                        :rem 237
290 GOTO 210                            :rem 103
```

Program 3: Tie Fighter

```
10 READ SB: IF SB<0 THEN 120: REM READ SP
   RITE DATA                            :rem 201
20 LO= SB*64: FOR I= 0 TO 62            :rem 69
30 READ SD: POKE LO+I, SD: NEXT I :rem 19
40 GOTO 10                              :rem 254
50 DATA 13: REM SPRITE DATA BLOCK 13
                                        :rem 193
60 DATA 192, 0, 3, 192, 0, 3, 192, 40, 3,
    192, 171, 3                         :rem 253
70 DATA 194, 171, 195, 194, 155, 195, 194
   , 90, 195, 194, 90, 195               :rem 95
80 DATA 194, 106, 195, 250, 170, 235, 254
   , 170, 239, 254, 170, 255            :rem 163
90 DATA 194, 171, 195, 194, 175, 195, 195
   , 191, 195, 195, 255, 195            :rem 202
100 DATA 195, 255, 195, 192, 255, 3, 192,
    60, 3, 192, 0, 3                     :rem 8
110 DATA 192, 0, 3, -1: REM END OF SPRITE
    DATA                                :rem 8
```

```
120 X= 184: Y= 150: REM POSITION IN MIDDL
    E OF SCREEN                      :rem 89
130 PRINT"{CLR}":POKE 53281,3: POKE53280,
    3: REM CYAN SCREEN AND BORDER :rem 39
140 POKE 53276,1: REM MULTICOLOR SPRITE 0
                                     :rem 87
150 POKE 53285,15: POKE 53286,11: REM AUX
     COLORS                          :rem 59
160 POKE1,54: REM TURN ON SPRITE BASIC
                                     :rem 201
170 SPRITE 0, 13, 12, 1: REM DEFINE SPRIT
    E 0                              :rem 235
180 MOVE 0, X, Y: REM POSITION SPRITE
                                     :rem 115
190 GOSUB 300: IF J=15 THEN 190    :rem 44
200 GOTO 180:REM MOVE SPRITE       :rem 144
300 REM READ JOYSTICK               :rem 3
310 J= PEEK(56320) AND 15: REM PORT 2
                                     :rem 95
320 IF (J AND 8)=0 THEN X=X+1: REM MOVE R
    IGHT                             :rem 130
330 IF (J AND 4)=0 THEN X=X-1: REM MOVE L
    EFT                              :rem 46
340 IF (J AND 2)=0 THEN Y=Y+1: REM MOVE U
    P                                :rem 167
350 IF (J AND 1)=0 THEN Y=Y-1: REM MOVE D
    OWN                              :rem 60
360 IF Y<50 THEN Y=50: REM STAY IN RANGE
                                     :rem 175
370 IF Y>229 THEN Y=229            :rem 191
380 IF X<24 THEN X=24               :rem 78
390 IF X>295 THEN X=295            :rem 197
400 RETURN                         :rem 116
```

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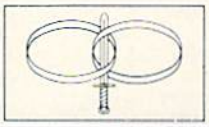

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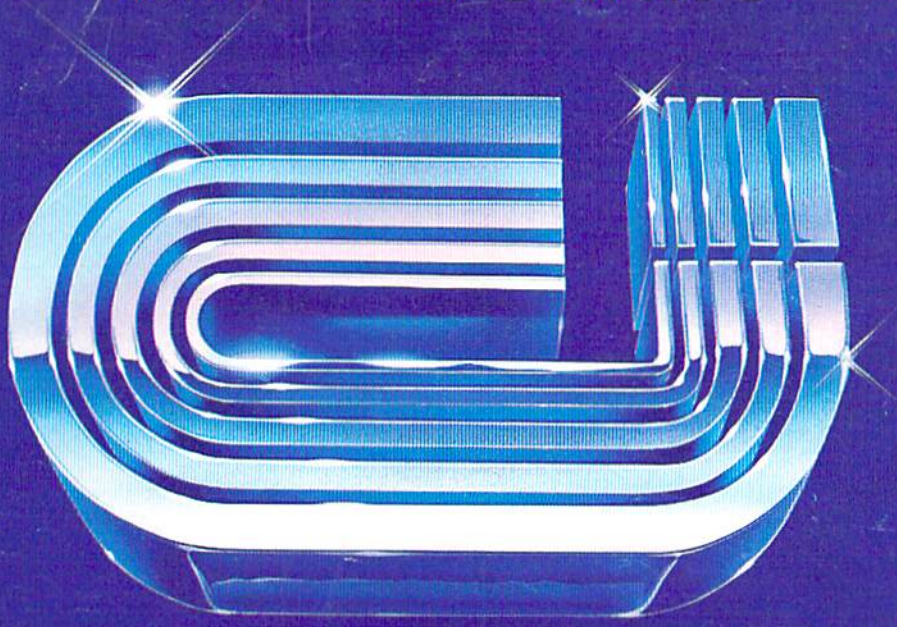

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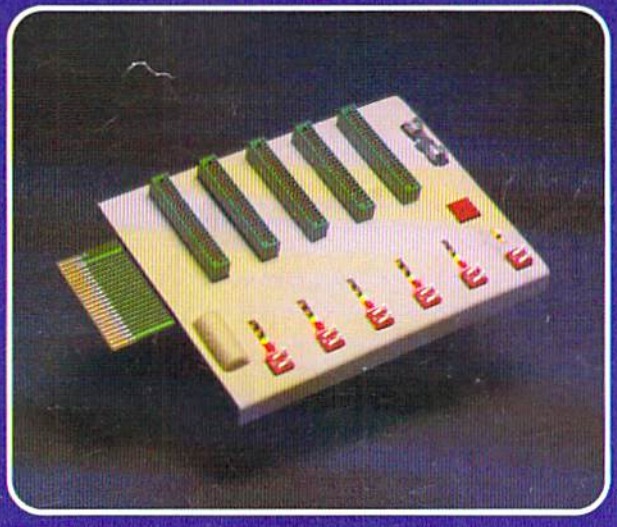

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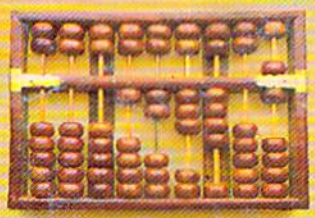
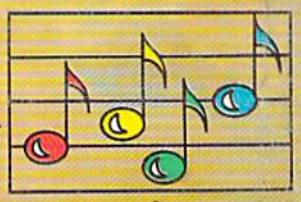
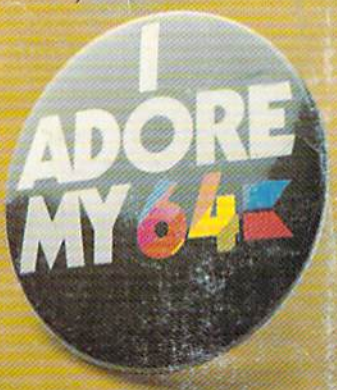
That's because Commodore 64 halved the price of high technology: while you can compare the 64's capabilities with those of any sophisticated business PC, you can compare its price with that of an average television.

What can you do with it? Create with its high resolution Sprite Graphics. Add a printer and type with it. Add a disk drive to use spread sheets and other financial programs. Learn and play music through your home sound system on the 64's professional quality music synthesizer.





Add a modem, and hook up with the vast computer networks through your telephone. In short, the Commodore 64 is the ultimate personal computer, at a price you can afford.



COMMODORE 64