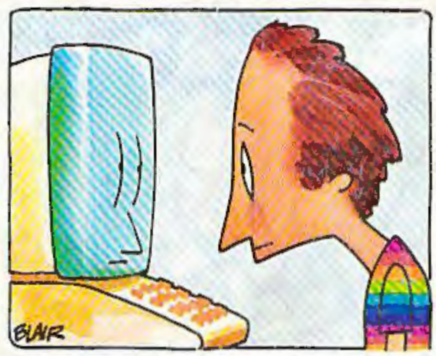
COMPUTE!'s GAZETTE™

$2.00
August 1983
Issue 2 Vol. 1, No. 2
63380 $2.50 in Canada

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

YOUR FIRST HOUR WITH A COMPUTER

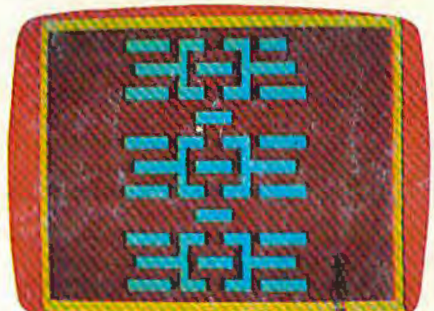
The box is opened, the computer unwrapped, and suddenly there are a hundred things you never thought of. Here's how to make that first hour more enjoyable.



THE VIPER

For VIC-20 And 64

No matter how much it devours, The Viper is never satisfied...it just keeps growing. An electrifying game with skill levels to challenge *everyone.*



Playing Computer Music

This month's Beginner's Corner shows how to make VIC-20 music easy —and fun.

Also In This Issue

New Products For Commodore At Comdex/Spring Show

Computing For Grownups: Revolution In The Nursery

Mailing List For VIC And 64

Commodore 64 Hi-Res Graphics Made Simple

Puzzled over hard-to-use high-resolution graphics? Puzzle no more. This ground-breaking program adds easy graphics commands that BASIC left out.

0 74470 63380 08

Look what for your VIC 20.

Fast action. Complex strategies. Interesting characters. Superior sound effects. Multiple levels of play.

These are the things you want from your VIC 20.™

They're also the things you get from Tronix. From the people who brought you *Swarm!*, *Sidewinder* and *Galactic Blitz*.

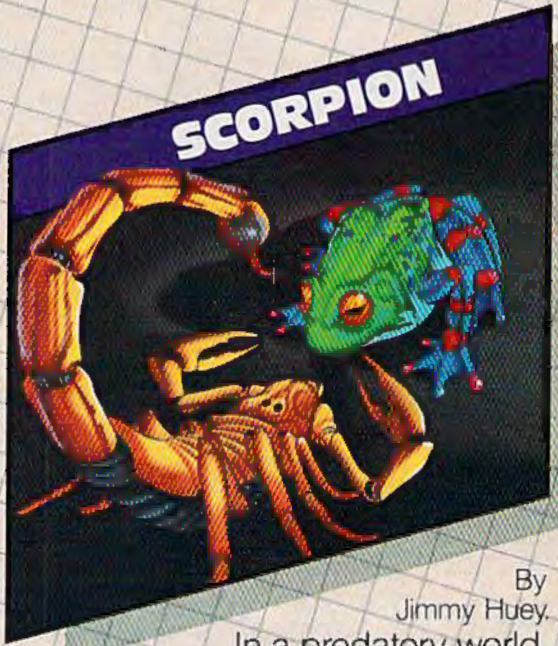
And now, there's more.

Now Tronix brings you the same rewarding rapid-fire excitement in three brand-new game cartridges.

Each one is something different. Something new. But they all have one thing in common.

They're all designed to bring out the best in your VIC 20.

You shouldn't settle for anything less.



By Jimmy Huey.

In a predatory world of killer worms, dragons, stalkers, pods and fly traps, the scorpion prowls the maze in search of sustenance. Frogs and their eggs mean survival to the scorpion. But they can also mean instant death! (Suggested retail $39.95)

FEATURES

GAMES

REVIEWS

EDUCATION/HOME APPLICATIONS

PROGRAMMING

DEPARTMENTS

PROGRAM LISTINGS

* = 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*

Welcome to the second issue of *COMPUTE!'s Gazette*. An exciting fall is shaping up for our industry, and by the time this issue reaches you, many of the new products being introduced for the holiday season will be anxiously anticipated. Next week we'll be visiting the Summer Consumer Electronics Show, and we'll give you a detailed report in the September issue.

Your continuing feedback, through the use of the Editor's Feedback card (bound elsewhere in this issue), and your letters are an important part of the growth and development of this magazine. In case you're not familiar with our parent magazine **COMPUTE!**, many of our articles, tutorials, and programs are contributed by readers. Frequently, here, we'll take an excellent program written for either the VIC-20 or Commodore 64 and create a new version for the other computer, allowing us to present both versions to better meet readers' needs. That's one of our major goals, and your feedback is an important part of that process. So, keep those cards and letters coming.

In a major feature, with accompanying sidebar this issue, you'll find a great deal of information on user groups and their locations. While normal caution is necessary (occasionally you'll encounter a user group with a bit of a commercial bent), user groups can be excellent sources of local support, sharing information and learning. Regardless of your level of experience and expertise, you'll probably find you have things to learn there, and many things to contribute as well.

Given the evolution of the computer marketplace, and the preeminent position of the VIC and 64 among the first of the true "consumer" computers, we'd very much like to hear from you regarding family involvement with your computer. Let us know what equipment you have and how you're using it. What members of the family use the computer on a regular basis? How frequently is the computer used? How frequently do several members use it together? Many of us recall the initial and ongoing concerns regarding the television set as an instrument of passivity and divisiveness in the home. Does your computer promote more collective time for the family? We'd like to hear from you on these and related matters, and would look forward to publishing guest commentaries and collected observations from you.

Copyrights and software: Frequently there's confusion, especially among beginning computer users, regarding the sharing of commercially produced software. If you provide a copy of a game you purchase to a friend, you're violating the manufacturer's copyright. While this activity frequently seems innocent and harmless, the net result of such copying activity can be quite harmful to a software developer. Given enough such copying activity, thousands of dollars in potential revenues may be lost. These are revenues that could have been used by the company to hire more programmers, develop new and better products, even to reduce the retail cost of their existing products. If twenty thousand programs were "shared" each week, and the manufacturer lost \$5 per "sharing," a lot of potential revenues would be drained away. Think about it.

Until next time, enjoy your issue. We'll look forward to your input on these and other matters.

Robert Lock

Editor In Chief

Don't let price get in the way of owning a quality printer.

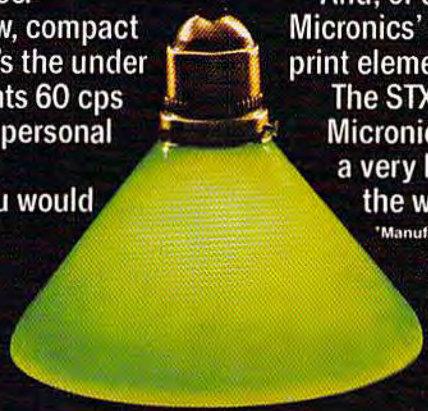
Adding a printer to your computer makes sense. But deciding which printer to add can be tricky. Do you settle for a printer with limited functions and an inexpensive price tag or buy a more versatile printer that costs more than your computer? Neither choice makes sense.

Here's a refreshing option—the new, compact STX-80 printer from Star Micronics. It's the under $200 printer that's whisper-quiet, prints 60 cps and is ready to run with most popular personal computers.

The STX-80 has deluxe features you would expect in higher priced models. It prints a full 80 columns of crisp, attractive characters with true descenders, foreign language characters and special symbols. It offers both finely detailed dot-addressable graphics and block graphics.

And, of course, the STX-80 comes with Star Micronics' 180 day warranty (90 days on the print element).

The STX-80 thermal printer from Star Micronics. It combines high performance with a very low price. So now, there is nothing in the way of owning a quality printer.



*Manufacturer's suggested retail price.

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Computer Peripherals Division, 1120 Empire Central Place, Suite 216, Dallas, TX 75247 (214) 631-8560

The new STX-80 printer for only $199.*

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COMPUTE! Publications, Inc. publishes
COMPUTE! **COMPUTE! Books** ***COMPUTE!'s Gazette***

Corporate Office
505 Edwardia Drive, Greensboro, NC 27409

Mailing Address
Post Office Box 5406, Greensboro, NC 27403

Telephone: 919-275-9809
Office Hours: 8:30 AM to 4:30 PM Monday-Friday

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Subscription Information
COMPUTE!'s Gazette Circulation Dept.
P.O. Box 5406, Greensboro, NC 27403

TOLL FREE
Subscription Order Line
800-334-0868
In NC 919-275-9809

COMPUTE!'s Gazette
Subscription Rates
(12 Issue Year): US (one year) $20. Canada, Mexico and Foreign Surface Mail $25. Foreign Air Mail $45.

GAZETTE FEEDBACK

EDITORS AND READERS

Off-Center Screen

Here's my question: Where are the memory locations on the Commodore 64 to center the screen? For the VIC, the locations are on the VIC chip at 36864 and 36865. Have I overlooked something somewhere? I would appreciate it if you could answer my question for myself and other readers who might be wondering the same thing.

John Van Winkle

As you mentioned, the VIC chip (which controls the video output in the VIC-20) has the ability to adjust the horizontal and vertical positioning of the screen. Unfortunately, this ability to center the screen display on your monitor or TV is not available on the VIC II chip, which controls the video output on the Commodore 64. There are locations that can be POKEd to adjust the positioning of the output on the screen (53265, 53270), but these locations are not the answer to your problem. While the print characters are moved, the screen is left behind.

Mystery Keys

After looking through the *Commodore 64 Programmer's Reference Guide* several times, I still have no idea how to assign functions to the four keys to the right of the keyboard (F-keys). Could you give an example of this? Also, is it simply a matter of POKEing a location? How does one find out what those precise locations are? Any help will be appreciated.

J. W. Hewitt

The easiest way to assign functions in a program to the special function keys is via the GET statement in BASIC. This can be accomplished with an IF-THEN statement in the same way you would for any other key on the keyboard. Enter the following short program on your VIC or 64 for an example:

```
5 PRINT"{DOWN} PRESS ANY F-KEY{DOWN}"
10 GETA$:IFA$="" THEN GOTO 10
20 IFA$= "{F1}" THEN PRINT "PRESSING F-1
    {UP}"
25 IFA$= "{F2}" THEN PRINT "PRESSING F-2
    {UP}"
30 IFA$= "{F3}" THEN PRINT "PRESSING F-3
    {UP}"
35 IFA$= "{F4}" THEN PRINT "PRESSING F-4
    {UP}"
40 IFA$= "{F5}" THEN PRINT "PRESSING F-5
    {UP}"
45 IFA$= "{F6}" THEN PRINT "PRESSING F-6
    {UP}"
50 IFA$= "{F7}" THEN PRINT "PRESSING F-7
    {UP}"
55 IFA$= "{F8}" THEN PRINT "PRESSING F-8
    {UP}"
60 GOTO10
```

Watch future issues of COMPUTE!'s Gazette *for full-length articles which will describe in detail how to program the special function keys on both the VIC-20 and Commodore 64.*

Which Monitor?

I would like information on monitors for my computer. I own a VIC-20, but haven't seen information on what monitors are on the market and best-suited to buy. Maybe an article put together by this magazine to show what is out there would help me and others decide what to buy. Any information would help.

Maurice H. Albaugh

There are many monitors and TV sets on the market (both black and white and color) that are suitable for use with your computer. Commodore recently introduced a color monitor that is especially designed for use with the 64. The suggested retail price for this monitor is $299.95. If you can wait a few months, COMPUTE!'s Gazette *is planning an article similar to the one you suggested.*

Disk Drive Conversion

I own a VIC-20 with a 1540 disk drive. I and a few of my friends are thinking about buying the Commodore 64. While considering the differences between the 1540 and 1541 disk drives, it has been rumored that the 1540 can be changed to a 1541 by replacing a ROM chip. My problem is in trying to find someone or a store that can replace this chip for me. Do I have to bring it to a Commodore dealer or is it a simple replacement that can be done at home?

David Leung

It's true that a 1540 can be converted into a 1541 by changing one Read Only Memory (ROM) chip. Check

with your local Commodore dealer to see when this chip will become available. After conversion, the drive will still work with a VIC.

As a general rule, any hardware modifications to be performed upon any computer or peripheral (such as a disk drive) should be performed by an authorized technician. Performing "home modifications" may damage your unit and void your warranty at the same time.

To see how you can use your 1540 disk drive successfully with your Commodore 64, refer to "Power BASIC: Using A 1540 Disk Drive And Commodore 64" elsewhere in this issue.

Dual Drive Lock-Up

I have recently purchased one of the new Commodore 64 computers and so far I am very pleased with its performance. I also purchased a second disk drive (both are VIC-1541s), and if I go by the directions in the disk drive manual, and turn my computer on last, the serial bus gets hung up. I have conferred with other Commodore owners, and they also have experienced this same problem. My question is: Does it really hurt to turn on the disk drives after the computer, and do you know if Commodore expects to remedy this situation?

William Davies

Although it is always a good idea to follow the manufacturer's instructions and turn on your computer last, this is probably not the cause of your problem. All disk drives default to the same device number (#8 for the 1541) upon power-up. What is happening is that at power-up the computer is sensing two disk drives on the serial bus with the same device number (8), thus confusing the computer. The answer to your question can be found near the back of your VIC-1541 User's Manual. *To operate two or more disk drives on the 64 at the same time (the 64 can handle up to five), each drive must be assigned a different device number. This can be accomplished via software (programming) each time you power up, or by hardware modifications, which will make the device number assignments permanent. Instructions for both methods can be found in your 1541 manual.*

Standard Recorders OK?

Can a standard tape cassette machine be used with the VIC-20 and the Commodore 64, or must I purchase the C2N cassette from Commodore?

Elmer Aydelotte

There are a few adapters and interfaces made by independent companies which enable you to use standard cassette decks with your VIC or Commodore 64. Watch the News & Products section of this magazine for announcements. COMPUTE!'s Gazette *may review some of these products also. For more information on this subject, see "Does Your Computer Need a Cassette Recorder?",* COMPUTE!'s Gazette, *July 1983.*

Jumping Screens

When connecting my VIC-20 to my Zenith System III TV, I know how to POKE 36864,133 to keep the screen from jumping. However, when using a cartridge, I have no control over the VIC-20. The instructions with the cartridge caution the user about putting in or taking out the cartridge while the computer is on. How do I prevent the screen from jumping when using a cartridge?

Mitchell Bers

If the cartridge instructions do not mention an option for stopping the screen from jumping, then you can't. Usually, when you plug in a game or any other cartridge, control of the keyboard (and the computer) is handled by the cartridge. "Freezing up" the keyboard is one of the means that programmers use to protect their programs from being copied. A well-written program will include options for adjusting the screen. For instance, the instructions may read, "Press F-1 to change screen/border colors." Many VIC-20 games let you center the screen on your TV. In this case, you just "push" the screen (usually with cursor keys or joystick) completely off the left side of the screen until it wraps around and reappears from the right.

Cartridge Compatibility

Will the *VIC-20 Programmer's Aid* cartridge work on the Commodore 64?

John Auresto

No, it will not. The cartridge ports on the VIC-20 and the Commodore 64 are different sizes. Your Programmer's Aid *cartridge will not physically fit into the Commodore 64, and any 64 cartridge will not fit into the VIC-20. Even if you could, the cartridge is still written specifically for the VIC-20. It's like running a BASIC program written for the VIC-20 on your 64. The screen width is different, and all the "memory locations" have moved. There has been talk of third-party adapters becoming available in the future, but as of this writing, we know of nothing available to consumers.*

STAR TECH

ARCADIA

Eight screens each more difficult than the last, ultra fast action with superb color and sound, for the expert game player only. This game is very hard indeed to master. Each screen a different opponent, with unique battle tactics and missiles. You will not tire of this game in a hurry.
Cassette $24.00
Un-expanded VIC 20
Keyboard or Joystick

VICMEN

A very fast action game based upon the familiar maze theme, supercharger dots, point dots, random fruit bonus, extra life after 1500 points, high score held, music, sound effects, etc. All this on an un-expanded VIC 20 in super fast high resolution graphics.
Cassette $24.00
Un-expanded VIC 20
Keyboard or joystick

PANIC

A ladder and platform environment where aliens pursue a shovel wielding crew member around the screen. Armed only with a space shovel set traps for the aliens by digging holes in the platforms then pound them to death with the shovel. Multiple screen, hi score, unlimited play, three alien types.
Cassette $24.00
Un-expanded VIC 20
Keyboard or Joystick

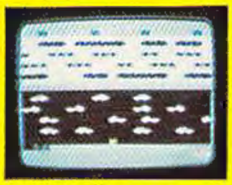
VIC 20™
commodore 64™

STAR TECH

VIC 20™
commodore 64™

METEOR

Your ship is being approached by deadly meteors, your long range scan locates approaching meteor and indicates range. Your task is to spot the approaching meteors destroy it with laser fire before impact. Beautiful graphics, damage indicator, full color hi-resolution graphics and sound.
Cassette $12.00
Un-expanded VIC 20 or Commodore 64
Keyboard or Joystick



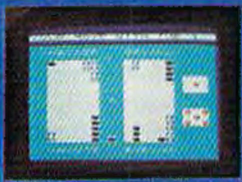
BUNNY

Using the joystick move the bunny across four lanes of speeding traffic, dodging trucks and cars. Then hop across a swiftly flowing, piranha infested river by jumping on floating logs and friendly turtles to safety. Full color high resolution action game with sound effects.
Cassette $20.00
Un-expanded VIC 20 or Commodore 64 Joystick required

SKI-RUN

Three different games in one, Downhill, Slalom, Giant Slalom. Each game with nine skill levels. A race against the clock for the fastest time. In Downhill, dodge the many trees and snowdrifts keeping between the pathmarkers. Slalom adds a new dimension to the game with Slalom gates.
Cassette $20.00
Un-expanded VIC 20 or Commodore 64 Keyboard only

STAR TECH



BACKGAMMON

The traditional game we all know. You versus the computer. Human wits against the power and logic of a computer. Three levels of play, beginner, novice, expert. Single keypress commands for your moves, full color graphics with sound effects. The computer plays a very strong game.
Cassette $24.00
Commodore VIC-20 with 3K RAM Commodore 64

ASTEROIDS20

Pilot a ship in the midst of an asteroid belt, destroy all of the asteroids before they smash the ship. A game for the novice and expert. The game starts with two asteroids and increases with each screen cleared up to 100. Smashed asteroids split into smaller ones, auto increase of 255 speed levels.
Cassette $24.00
Un-expanded VIC 20
Keyboard or Joystick

COSMIADS

A fast action game, multicolored aliens of different types break out of formation at random and attack your laser base firing their own deadly missiles. Full color, super fast action with the most superb sound effects. Features bonus mother ship etc.
Cassette $24.00
Un-expanded VIC-20
Keyboard or Joystick

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commodore 64™

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COMPUTE!'s Gazette for Commodore
AUTHOR GUIDE

COMPUTE!'s Gazette for Commodore is looking for interesting, useful articles aimed at beginning to intermediate VIC-20 and Commodore 64 users. If you have an article idea or a good original program, we'd like to see it. Don't worry if you are not a professional writer. We are more concerned with the content of an article than its style. Simply try to be clear in your writing and check your program for any bugs.

COMPUTE!'s Gazette for Commodore is a consumer-oriented magazine for VIC-20 and Commodore 64 users who want to get the most out of their computers in a non-technical way. It is aimed primarily at home users, not all of whom necessarily want to become expert programmers. If your article covers a more advanced or technical topic, you may choose to submit it to our companion publication, **COMPUTE!**. If you submit an article to one of our magazines and we believe it would be more suitable to the other, we will transfer your submission to the right editors. The basic editorial requirements for publication are the same for both magazines; so are the payment rates.

The following guidelines will permit your good ideas and programs to be more easily edited and published. Most of these suggestions serve to improve the speed and accuracy of publication:

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

2. The following information should appear in the upper right corner of the first page. If your article is specifically directed to either the VIC-20 or Commodore 64, please state which one. In addition, please indicate the memory requirements of programs.

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

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

5. Short programs (under 20 lines) can easily be included within the text. Longer programs should be separate listings. *It is essential that we have a copy of the program, recorded twice, on a tape or disk.* The tape or disk should be labeled with your name and the title of the article. Tapes are fairly sturdy, but disks need to be enclosed within plastic or cardboard mailers (available at photography, stationery, or computer supply stores).

It is far easier for others to type in your program if you use CHR$(X) values and TAB(X) or SPC(X) instead of cursor manipulations to format your output. For five carriage returns, FOR I=1 TO 5:PRINT:NEXT is far more "portable" to other computers with other BASICs and also easier to type in. And, instead of a dozen right-cursor symbols, why not simply use PRINT SPC(12)? A quick check through your program – making these substitutions – would be greatly appreciated by your editors and by your readers.

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

7. All lines within the text of the article should be spaced so that there is about 1/2 inch between them. A one-inch margin should be left at the right, left, top, and bottom of each page. No hyphens should be used at the ends of lines to break words. And please do not justify. Leave the lines ragged.

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

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

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

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

12. *COMPUTE!'s Gazette* for Commodore pays between $75 and $1000 for published articles. In general, the rate reflects the length and quality of the article. Payment is made upon acceptance of an article. Following submission (Editorial Department, *COMPUTE!'s Gazette* for Commodore, P.O. Box 5406, Greensboro, NC 27403) it will take from four to six weeks for us to reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. Rejected manuscripts are returned to authors who enclose an SASE. We do not consider articles which are multiple submissions. If you wish to send an article to another magazine for consideration, please do not submit it to us.

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

14. If you want to include photographs, they should be 5x7, black-and-white glossies.


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Your First Hour With A Computer

Kathy Yakal, Editorial Assistant and Tom R. Halfhill, Editor

The box is opened, the computer is unwrapped, and suddenly there are a hundred things you never thought of. Everyone has been overwhelmed by this feeling at some time. Here is some advice to make your first hour an enjoyable one.

When you bought your first television set, or radio, or microwave oven, you probably didn't have to spend hours with the instruction manual learning how to use it. You knew exactly what it could and couldn't do. Chances are you just plugged it in and punched a few buttons to get it working.

On the other hand, you can't organize a data base on a toaster oven. Or process words with a Cuisinart.

As you may have discovered already, a computer is a bit tougher to hook up and learn to use than most other home appliances. Still, your first hour with a computer needn't be as traumatic as your first hour with an assemble-it-yourself ten-speed bicycle. A little preparation can soften the shock of being launched into the Computer Age.

After you first come home with your new computer, or perhaps even before you buy it, it's wise to decide where you'll set it up. This might not sound too important, but if you share your abode with other people (especially other family members), domestic tranquility is at stake.

First, plan for the future. For instance, do you want to add a modem eventually? If so, the computer will need to be near a phone jack. If the phone cord won't reach the modem, you may be in for some extra installation expenses.

Likewise, make sure there are plenty of electrical outlets nearby. You'd be surprised how many wall sockets a home computer system can gobble up. To begin with, you'll need at least two sockets, one for the television or monitor and another for the computer itself. Figure on one additional socket for each peripheral you add. Although the Commodore Datassette recorder draws its power from the computer, the 1540/1541 disk drive does not. Neither do printers. Some modems (although not the VICmodem) require an outlet, too. Many people end up buying a "powerstrip," a row of sockets that plugs into one outlet. But be sure to add up the power requirements of all your components to avoid blowing a fuse. (Most home computer equipment actually requires very little power.)

Your computer will also demand some space. You've probably read how computers are paving the way for a "paperless society." Well, it might come to pass someday, but in the meantime computers are responsible for generating as much paper as they're eliminating. Count on reserving plenty of space for all the manuals, books, magazines, files, and other stuff you will surely accumulate. It stacks up faster than you think.

You should also set aside some spare room on the tabletop next to the computer. Often, you'll need to spread out those manuals, magazines, and books to type in a program listing or refer to some instructions. It's pretty frustrating to be puzzling over something on the screen while a magazine or book keeps sliding off your lap.

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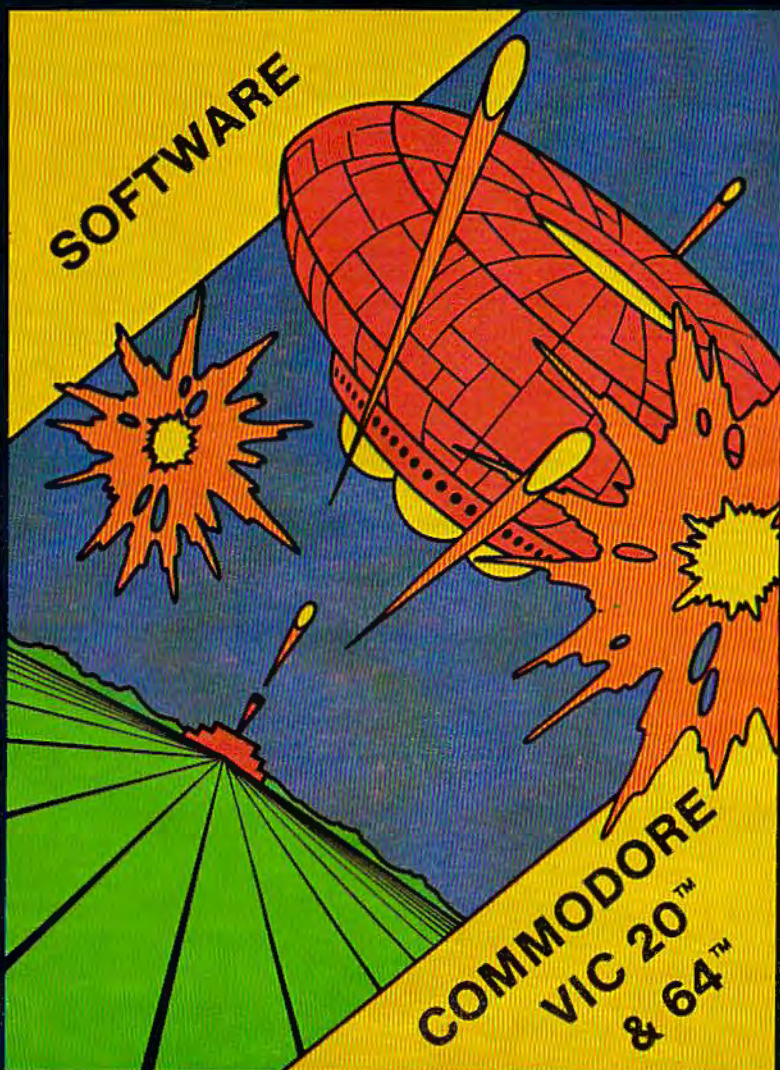

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Two more considerations are traffic and lighting. If space allows, it's best to set up your computer in an area of your home that is not often used by other members of the household, to protect both your hardware and your privacy. Also, good lighting is important, although glaring lamps or sunlight can make the screen hard to see. An adjustable reading lamp next to the computer is ideal.

Instructions for appliances are probably the most avoided reading material in America, except for maybe the classics everyone is assigned to read in high school.

With most appliances it doesn't matter. The majority of people can figure out on their own how to operate a toaster or a blow dryer. But computers are different. If you got away with faking the book report on *A Tale of Two Cities*, you'll quickly discover that a computer is not as easily fooled as Miss Mindbender was.

Naturally, the last thing anyone wants to do when they bring a new computer home is plod through a dull manual. In the long run, though, it will save you hours of frustration. At the very least, read the section on setting up the computer. You are dealing with electrical connections between two sensitive electronic devices (three if you have a Datassette or disk drive), so everything needs to be plugged in correctly. The plugs fit only one way, so don't force anything.

Incidentally, whenever you're plugging or unplugging anything on the computer, make sure the power is turned off. You can often get away without doing this, but occasionally an accidental short circuit caused when a device is connected or disconnected can do some hardware damage. This is particularly true of cartridges, which can be blown if the computer is not powered down first.

One common mistake when setting up a computer results in a blank screen, or a screen full of static, when the machine is switched on for the first time. The problem is that the computer is not tuned to the same channel as the TV set. The computer needs a vacant TV channel to display a clear image. On the back of the Commodore 64, or on the RF modulator box of the VIC-20, there is a small slide switch. This must be set to either channel 3 or 4, depending on which channel in your area is unused (some switches choose between 2 or 3). The TV, also, must be tuned to this vacant channel.

Some other things to check when setting up a computer:

- Be sure the computer is connected to the television's *VHF* antenna terminals, not the *UHF* terminals.
- Make sure the little switchbox connected to the terminals is set for "Computer" or "Game" instead of "TV."
- If you have a clear screen image, but if the colors seem off, tune in a regular TV show. Adjust the TV's color controls for proper flesh tone and so forth. Switch back to the computer. Usually the colors will now be about right. If the computer's screen colors are drastically distorted, or absent altogether, your computer may be at fault. This is a relatively minor problem. There are color controls inside the computer which can be adjusted by your dealer. (Never attempt to adjust these yourself, because any tampering with the computer voids the warranty.)
- If you have more than one disk drive, the device numbers must be altered for them both to work. (See this month's "Gazette Feedback" column.)

As you probably know, a program is simply a list of commands that tells a computer what to do and how to do it. A program can range from one line (PRINT "HELLO") to hundreds of lines.

Since a computer is next to useless without programs – also known as software – you'll want to start building up a program library soon after you get your computer. Your collection will depend on your personal interests – games, education, home applications, programming utilities, business, or whatever. No matter what your interests, there are only three (legal) ways to acquire software: you can buy it prewritten, write it yourself, or type it in from books and magazines.

The easiest way is to buy it. Unfortunately, this is also the most expensive way. A good commercial game program can cost $20 to $50 or more. Some business programs, programming languages, and advanced utilities can cost more than the computer. Of course, if you're a video game addict whose loose change is the prime source of nourishment for the local arcade machines, $35 for a game that's good for unlimited plays can be a fantastic bargain. However, if you're like most people, you can't afford to line your bookshelves with commercial software. You'll buy a good program now and then, but will look for other ways to enlarge your library.

One way is to write programs yourself. If you're not technically minded, don't dismiss this idea offhand. Thousands of people have discovered that computer programming is not as difficult as they feared. It can also be a highly creative and rewarding pursuit. However, it does require study and patience. If the time comes when you are interested in doing your own programming, you can find programming manuals, books, and magazines which will explain the process in detail.

A surprising number of people have picked up programming almost by osmosis, simply by typing in programs from magazines and books – which is the third way of acquiring software. Not only can you collect a lot of programs this way for very little money, you may also gain an intuitive understanding of how programs work just by being observant as you type.

You'll probably be anxious to enter a few programs as soon as you get your system up and running. But before you start typing, it's wise to learn more about the computer keyboard, the functions of each key, and the magazine's or book's "listing conventions." Listing conventions are ways in which publications circumvent the problem of characters and symbols which are not easily reproduced in print. Certain keys on computer keyboards do not have corresponding characters on the printers which are used to generate the program listings. An example of listing conventions can be found in the back of this magazine; refer to "How To Type In *COMPUTE!'s Gazette* Programs."

To understand why this is so important, take a look at one of the programs listed in the back of this issue. Simply typing in lines of letters and numbers may not seem so difficult, but what happens when you've typed in a program and it won't run right? Sometimes you will get an error message that reads "?SYNTAX ERROR AT LINE ---". Then you can LIST that line and find your typing error. Other times, however, a program will begin to run, yet fail to operate correctly. How do you know where to find your error without proofreading the entire program? Unless you're a fairly proficient programmer yourself, you may be baffled. The safest procedure is to be extra careful when entering the program, because the few seconds you save by typing too fast could cost you hours of labor when the inevitable errors turn up.

In addition, *always save a program on tape or disk before running it for the first time.* Sometimes an error will cause the computer to "crash" or "lock up" – everything comes to a screeching halt and the computer ignores your commands. Occasionally you can recover by holding down the RUN/STOP key while pressing RESTORE, but even this won't rescue you from a true "system crash." In such cases, the only way to clear the computer is to switch it off and then on again. Of course, this erases any program in memory, and all of your typing is history.

In fact, when typing in a long program, it's not a bad idea to save it once or twice *before* you finish. If the unexpected happens – your restless foot kicks the computer's power cord out of the wall, or a distant thunderstorm knocks out the electricity – most of your work will be preserved. Play it safe and SAVE.

Nobody's perfect. No matter how careful you are, it's almost guaranteed that someday you'll make at least one mistake when typing in a program listing. When you're puzzled by a program that refuses to run correctly, here are some common things to look for:

- *Punctuation errors.* In English, sometimes it doesn't matter if you omit a comma, replace a comma with a semicolon, or substitute a colon for a dash. But BASIC, the computer's language, is a lot more picky. Punctuation marks are very significant. Type in the program *exactly* as it's listed, unless you're an accomplished programmer yourself and really know what you're doing.
- *Look-alike characters.* On many typewriters, you can type an uppercase "O" instead of a zero, or a lowercase "l" instead of a numeral one. Unfortunately, computer keyboards are not nearly so forgiving. Computers detect a keypress by checking for keycode numbers which are unique to each key. No matter how alike the characters look on the screen, the computer will not be fooled. Proofread your program for mistyped O's, zeroes, l's, and ones. Also, on some TV sets, the uppercase "B" may resemble an "8".
- *DATA statements.* Some programs have DATA statements – lines that begin with the command DATA followed by numbers and/or letters, usually the former. DATA statements are especially critical, because often they are machine language routines converted to decimal numbers. One mistyped digit can mean the difference between a smoothly running program and a program that bombs out. Check these lines carefully.
- *Fake RETURNs.* After typing each program statement, you must press the RETURN key so the computer will accept the statement and keep it in memory. But occasionally a program line happens to end exactly at the right screen margin. When you type the final character, the blinking cursor automatically jumps down to the next screen line. This may fool you into thinking that you pressed RETURN, or that you don't have to press RETURN. If you continue to the next statement, the computer never remembers the one you just typed. Always press RETURN after typing each statement, and check faulty programs for missing lines.

If these tips don't help, try to recruit someone else to check your program. Often another person can find errors that seem invisible to you. Some people find it helpful to proofread the screen while the second person reads the program lines aloud.

Your first hours with a computer can be lots of fun if you're careful. Keep in mind the adage, "When all else fails, read the instructions." And above all, exercise patience. Computers can't take much physical abuse.

SIMPLE ANSWERS TO COMMON QUESTIONS

TOM R. HALFHILL, EDITOR

QA

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

Q. ***I recently bought a Commodore disk drive. When I try to save programs on some new blank disks I bought, something goes wrong. The red light on the disk drive starts flashing, and the program is not saved. I've tried this with several disks, all brand-new, and none of them work. What is happening?***

A. As you probably know, a flashing red light on a Commodore disk drive indicates some sort of error condition. There are several things to check for if you have this problem. Some might seem obvious, but check them anyway.

First, if you have a Commodore 64, make sure you are using a VIC-1541 disk drive. The older VIC-1540 drives – which look identical – will not work with the 64 without special adjustments. The 1540 drives are intended for VIC-20s. The newer 1541 drives work with both computers.

Second, check all the plug connections. Be certain the plugs are firmly seated.

Third, make sure the disk drive is level. We've found that some Commodore disk drives are sensitive to this.

Fourth, the disk drive should not be too near the TV set or monitor. This goes for Datassette recorders, cassette tapes, and disks, too. TVs and monitors generate strong magnetic fields which can interfere with disk drives and recorders, and which can erase tapes and disks. Try moving the disk drive or Datassette as far away from the TV as its cord allows. Sometimes it helps to move the storage device to the other side of the TV, because some TVs generate a stronger magnetic field on one side than on the other.

Fifth, examine the floppy disk on which you're trying to save the program. When you're holding the disk as if inserting it in the drive, you should see a tiny notch cut into the left side of the protective sleeve. This is a *write-enable notch*. The notch allows data to be recorded on the disk. If the notch is absent, or covered with a piece of tape, the disk is *write-protected*. This means the disk drive will read the disk and load programs, but will not allow programs to be saved. Commercial software on disk usually is write-protected so you can't accidentally erase it. New blank disks should have uncovered notches. *Never defeat the write-protection on a disk unless you're sure you know what you're doing.*

The final problem to check for actually happened to someone we know. The disk drive worked fine with the disk that came with it, but would not save programs on some new blank disks – the drive would stop with the red light flashing. After checking everything else, it turned out the new disks were not *formatted*. Without going into detail here, formatting is basically a way of preparing a new disk so the disk drive can use it. All new disks must be formatted before their first use. Once a disk is formatted, it need never be formatted again – unless you want to reuse it for some other purpose (formatting *completely erases* a disk). New blank disks are not sold preformatted because different brands of computers use different disk formats, and the formats usually are incompatible.

To learn how to format a new disk, consult page 15 of the *VIC-1541 User's Manual*, or pages 17 and 18 of the *VIC-1540 User's Manual*.

Q. ***Why do I have to press the RETURN key each time I type in a command or a line of a BASIC program?***

A. To tell the computer to accept and act on what you've typed.

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When you type something on the keyboard, even though it appears on the screen, the computer is not aware of anything until you press RETURN. Before pressing RETURN, you are free to back up the cursor and make changes to your typing. Pressing RETURN tells the computer to accept the input, and it will respond in one of two ways:

If you do not type a number before the input, the computer will act on the input immediately after you press RETURN. This is called *immediate mode* or *command mode*. For example, if you type PRINT "HELLO" and press RETURN, the computer will immediately print the word HELLO on the screen, or anything else you've typed between the quotation marks. The computer interprets PRINT as an immediate mode command.

But if you type 10 PRINT "HELLO" and press RETURN, nothing happens immediately. The number 10 (or any number up to 63999) tells the computer that what follows is a line of a program. The computer then interprets PRINT as a program instruction. It will not *execute*, or carry out, the instruction until you run the program by typing the command RUN (followed, of course, by a RETURN).

Exterminator **By Ken Grant**
Just about as action-packed and complex as is nufisically possible in your standard 5K VIC 20. This extremely well-written, machine code game is invariably praised by customers and has been called the second best tape game made for the VIC of 1982 (oh, no, not by us, we don't agree with that opinion). Rapidfire from the bottom of the screen at moving insects and creatures . . . anything that moves, and even anything that doesn't. Just don't be overrun by any or all. It's as much fun the hundredth time you play it as it was the first. This game plays stick or key and runs in standard 5K VIC 20.

3-D Man Not just another eat-the-dots-in-a-maze game, this! Though you find yourself in an edible dot-littered floor plan that may seem vaguely familiar, we guarantee you have never looked at it from this perspective (eye level) before. The dots diminish into the distance as you race down a hallway eating them one after the other. The dot-remaining counter on the right clicks downward. Race through a 4-way intersection and whoops! Head to head with one of the ghosts that haunt these halls! Back quickly on the stick puts you facing the dotless hall you just cleaned out when . . . another ghost! A quick left turn into that junction saves you, but in the confusion you've lost direction momentarily and must check the miniature radar plotting screen to set things straight. . . . Definitely, an ordinary maze game this one is *not*. 3-D Man requires a joystick and at least 3K extra memory.

Racefun Extensive use of multi-color character graphic capabilities of the VIC make this game very appealing to the eye. Fast all-machine language action, quick response to the stick or keyboard-controlled throttle, combine with the challenge of driving in ever-faster traffic to make it appeal to the rest of the body. Plays joystick or keyboard.

Antimatter Splatter! A more dastardly alien could scarcely be found than one who would wipe out an entire civilization by dropping anti-matter anti-canisters, right? If your opinion of this alien troublemaker is the same as ours, probably your first thought was, get some matter! We say calm down! All is not lost. A mobile rapid splatter cannon capable of both breaking through his standard alien moving force fields and laying waste to the ever-increasing number of anti-canisters is even now hovering above us. If only our cannoneer hadn't called in sick...say, what are you doing today? *Anti-Matter Splatter* is 100% machine language and runs in standard 5K VIC.

Defender on Tri As pilot of the experimental Defender-style ship "Skyes Limited," you are the only hope for an advance party of scientists trapped in ancient alien sphere which suddenly (heat from collision course with sun presumably—G.E.) came to life. Four screens worth of unique defenses, on-off shields, fuel deposits, alien treasures, running timer, energy, score and very nice graphics display make this one that does not quickly wax old. *Defender on TRI* requires at least 3K memory expander, but will run with any memory add-on (8K, 16K, 24K, etc.) we have come across.

Alien Panic Standard 5K VIC 20/combination stick & keyboard. This arcade-type game pits you against time and an alien on a six level construction sight with ladders and pitfalls, but *not to worry!* You have a shovel.

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HOTWARE

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

Kathy Yakal, Editorial Assistant

This month we premiere a new regular feature for *COMPUTE!'s Gazette:* "HOTWARE," a monthly tracking of best selling software for the VIC-20 and Commodore 64.

Software – the cartridges, disks, and cassettes that store recorded programs – can be a major investment. Even if you take the time to type in programs from a computer magazine or book, or become adept enough at programming to create your own, you may still want to purchase an occasional program for word processing, recordkeeping, or even just for fun.

There are different types of software. Programs which have been written by an individual or group, but which are not copyrighted, are in the *public domain* and may be freely copied. If you write your own program, it is also permissible for you to make copies to share with people. However, programs typed in from copyrighted magazines or books are themselves copyrighted, and it is illegal for anyone who does not own that copy of the publication to make copies of the program.

So-called *commercial software* is always copyrighted. These are programs sold by companies for profit. Commercial software is available from two sources: computer manufacturers and *third-party* vendors. Most computer manufacturers write or acquire the rights to programs for their own machines, such as Atari's *Centipede* or Commodore's *Gorf*. Third-party software consists of programs owned and sold by independent companies not connected with the computer manufacturers.

Each month, HOTWARE will be tracking the sales of commercial software from both third-party vendors and Commodore itself.

Compiling HOTWARE

When you buy a piece of software at a retail store, most often that software was supplied by a distributor. Distributors stock programs from many different companies. Discount stores, as well as other retailers, often carry programs from third-party companies in addition to those from the computer manufacturer. You can also get software from mail-order houses; sometimes they act as distributors, but some of them carry only programs that they themselves produce.

To compile HOTWARE, we have set up a nationwide network of both distributors and retailers who each month tell us what their best sellers are, and what they see happening in the industry. To insure accuracy, we are constantly expanding this network of sources (distributors and retailers who wish to participate in HOTWARE should contact us for details). These lists are not guesswork. Rankings in each category are based on actual numbers of units sold, although we do not publish the numbers because they are considered proprietary information by the companies involved. To eliminate regional biases, our sources are scattered throughout the United States.

HOTWARE will be more than just a page of lists. As we survey our sources, we ask questions and probe for viewpoints which provide insights into the workings of the home computer software industry. The lists will be accompanied by an analysis of trends and opinions of those who make up the industry.

Commodore 64 Entertainment

Whenever a new computer hits the market, it always takes awhile for a wide supply of software to build up. Although the Commodore 64 has been around for almost a year now, software is

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still scarce. There are many good programs available, but merchants and customers are frustrated that there aren't more. Expect to see this situation improve greatly in the next few months.

Many customers, some retailers say, put a lot of faith in individual software manufacturers. One store owner in Nashville reports that people will often come in and play a couple of games from a certain company, then purchase a third game from that company that they haven't even seen. Consequently, some companies account for several programs on a single month's list.

That trend is evident in this month's best selling games for the Commodore 64. Epyx, a West Coast manufacturer, has three games on this month's list, placing First, Third, and Ninth: *Temple of Apshai, Upper Reaches of Apshai,* and *Curse of Ra.* Another factor in their success is that they are a progressive series of adventure games. Epyx has another game that, although it did not make this month's Top Ten, may be showing up soon: *Jumpman*, an action game with five skill levels, eight speeds, and 30 different screens.

Infocom, a Cambridge, Massachusetts, software manufacturer which draws on the skills of people from the nearby Massachusetts Institute of Technology, also has several best sellers. Infocom's games do not use graphics; they are all text adventures. Of its *Zork* series, games in which you have to solve puzzles and problems to get through an underground empire and acquire different kinds of treasures, *Zork I* and *Zork III* placed Fifth and Eighth. *Suspended*, a newer game, fared even better, landing in Fourth. *Suspended*'s packaging, says one distributor, is the best he's ever seen. The game involves six robots deep in space who must use their individual talents to restore an ailing planet. The score is measured by the number of people that survive.

Human Engineered Software (HES) claims the No. 2 position on the games list with *Gridrunner* (see this month's "Inside View," elsewhere in this issue, for an interview with *Gridrunner* programmer Jeff Minter). *Meteor Madness*, a game by Soft Plus in which you must destroy comets whizzing by before you yourself are destroyed, finished No. 6. In Seventh place is Magic Carpet's *Weather War II*, an unusual battle between castles in which the combatants use weather as their weapons. Tenth place goes to Commdata's *Pakacuda*. Incidentally, Commdata also had two other games which just missed making the list: *Centrapods* and *Logger*.

Commodore 64 Home/Business/Utility

HES claims two spots in this category: *HES Writer*, a word processor, and *HES Mon*, a machine language monitor, placing First and Fourth. *Calc Result*, a Handic product, placed Second. Another popular word processor, *WordPro III +/64* by Professional Software, takes Third. Fifth and Sixth go to two programs by Totl Software: *Totl Text* and *Totl Label*.

Two to watch for here are *PaperClip*, a word processor by Batteries Included, and *64 Checkbook Manager*, from Data Equipment Supply Corporation.

Commodore 64 Educational

Two math programs appear this month. Commodore's *Bingo Speed Math* takes Second, and Micro Ed's *Math Bid* finishes in Third. First place was won by Taylormade's *Touch Typing Tutor*. Watch for *Typing Strategy*, a new instructional program from Behavioral Engineering, to possibly make next month's list.

VIC-20 Best Sellers

With thousands of people snapping up VIC-20s at their incredibly low price of less than $90, users are clamoring for more software. Since the machine has been around longer than the Commodore 64, there is more available from a greater variety of manufacturers.

In the entertainment category, Creative Software wins First place with *Choplifter*, an authorized translation of the popular Brøderbund game. Creative Software also comes in Fifth with *Apple Panic*. Commodore, whose educational programs have done better than its games, nevertheless claims Third in the entertainment category with *Gorf*, followed by Commercial Data's *Road Toad*. Rounding out the list are *Exterminator*, by Nüfekop; the VIC-20 version of *Gridrunner*, by HES; *Snackman*, by Microdigital; and *River Rescue*, by Thorn E.M.I.

HES Writer and *HES Mon* seem to be as popular with VIC-20 users as with their Commodore 64 fans. These programs take positions two and three in the home/business/utility category. *Quick Brown Fox*, a word processing program by Quick Brown Fox (who else?), is the top-seller, with *Household Finance* by Creative Software coming in at Tenth.

Commodore claims both First and Second in educational programs with its *Introduction to Basic* and *Bingo Speed Math*. In Third is *VIC Music Composer* by Thorn E.M.I. (reviewed elsewhere in this issue).

Three best sellers we classify as utilities – that is, programs that relate directly to the operation of the computer – are *Turtle Graphics*, by HES; Commodore's Super Expander (which might be called "firmware," since it's a combination of software and hardware); and Midwest Micro's *Terminal 40*, a program for operating a modem (watch for a review in an upcoming issue).

A final word from our sources: some of you who have had computers for a while are beginning to tire of playing games all the time and are asking for more home and business programs. Therefore, expect sales of these to increase. This does not necessarily mean that games sales will drop, however. There is still a great demand for entertainment software, especially among new computer owners and young people.

August HOTWARE

Commodore 64 Entertainment

1. *Temple of Apshai* (Epyx)
2. *Gridrunner* (HES)
3. *Upper Reaches of Apshai* (Epyx)
4. *Suspended* (Infocom)
5. *Zork I* (Infocom)
6. *Meteor Madness* (Soft Plus)
7. *Weather War II* (Magic Carpet)
8. *Zork III* (Infocom)
9. *Curse of Ra* (Epyx)
10. *Pakacuda* (Commdata)

Commodore 64 Home/Business/Utility

1. *HES Writer* (HES)
2. *Calc Result* (Handic)
3. *WordPro III+/64* (Professional Software)
4. *HES Mon* (HES)
5. *Totl Text* (Totl Software)
6. *Totl Label* (Totl Software)

Commodore 64 Educational

1. *Touch Typing Tutor* (Taylormade)
2. *Bingo Speed Math* (Commodore Business Machines)
3. *Math Bid* (Micro Ed)

VIC-20 Entertainment

1. *Choplifter* (Creative Software)
2. *Amok* (UMI)
3. *Gorf* (Commodore Business Machines)
4. *Road Toad* (Commercial Data)
5. *Apple Panic* (Creative Software)
6. *Exterminator* (Nüfekop)
7. *Gridrunner* (HES)
8. *Snackman* (Microdigital)
9. *River Rescue* (Thorn E.M.I.)

VIC-20 Home/Business/Utility

1. *Quick Brown Fox* (Quick Brown Fox)
2. *HES Writer* (HES)
3. *HES Mon* (HES)
4. *ViCalc* (UMI)
5. *Totl Text* (Totl Software)
6. *Totl Label* (Totl Software)
7. *Turtle Graphics* (HES)
8. Super Expander (Commodore Business Machines)
9. *Terminal 40* (Midwest Micro)
10. *Household Finance* (Creative Software)

VIC-20 Educational

1. *Introduction to Basic* (Commodore Business Machines)
2. *Bingo Speed Math* (Commodore Business Machines)
3. *VIC Music Composer* (Thorn E.M.I.)

Should You Join A Users Group?

James Calloway

Whether you are new to computing or a veteran, a good users group can offer numerous benefits. Here's how users groups originated, how they work, and some things to think about if a new one is forming in your area.

When computers first came to the attention of the public, decades ago, many people worried that the giant flashing machines somehow would dehumanize society, turning names into numbers and isolating people in self-sufficient, electronic cocoons. That was before home computers.

Something funny happened. Plenty of people still feel a bit dehumanized whenever impersonal computer bills arrive in the mail, but now home computers are causing an opposite effect. They are providing an impetus for people to meet others, to make new friends, to collaborate on projects, and to exchange information. The result has been the formation of computer clubs, also known as "users groups," all over the world, and the movement has grown quickly since its modest beginnings less than a decade ago.

The earliest users groups actually began before the venerables of personal computing – PET, Apple, and TRS-80 – had come off the drawing boards. The popular computers in those ancient days (the middle 1970s) had names like Altair, Imsai, and "homebrew." Many of the clubs that began in those days are still active, and some are flourishing. The older computer clubs tend to be generic, meaning their members may own or be interested in any number of different brands of computers. The members are united by an interest in computers in general. That makes sense when you think about it. Even before the major home computers came on the market, computer hobbyists benefitted from comparing notes and helping each other out. Computers were so complicated even back then that so-called experts were not afraid to approach other hobbyists for advice.

That still applies today. Although users groups perform a number of auxiliary activities, such as accumulating software libraries and organizing hardware flea markets, the primary function of the groups is still the exchange of information. If anything, the need for information is greater today than ever. Home computers are easier to use and better documented than their cruder predecessors. They also are more complex, and perhaps most importantly, more and more are being bought by a new breed of home computer users – people who as recently as a year ago had not thought of owning a computer. Now they have ventured bravely into unknown territory, and they turn to one another for help. A white-haired gentleman at the recent inaugural meeting of a new VIC-20 group put it best: "I just need someone to tell me what to do."

These newer computerists are changing the nature of users groups in several ways. A larger percentage of women are showing up at meetings, not to mention teen-agers and even children. The younger members may be the product of computers in the schools and video games in the shopping malls, but there also is a growing number of retired citizens who have decided it is never too late to get involved with computers.

The most recently formed groups tend to specialize in specific computers. A VIC-20 group and a Commodore 64 group might spring up independently in the same city, and the two will have only tenuous crossover between them. Many of the old generic clubs have literally fallen apart,

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A fortune — yours for the taking. But can you avoid the ghost of Rama and the evil mummy? Are you nimble enough to leap the chasms and avoid the booby traps standing between you and freedom?
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PROTECTOR II
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For Commodore 64® in disk or cassette: $34.95. Also available — Slam Ball and Drelbs for the Commodore 64®, and Astro Patrol, Squeeze and Harrier for the VIC-20®. Cartridge versions available soon.
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as clusters of members have split off into smaller brand-specific groups. Other generic clubs, such as the 1,400-member Amateur Computer Group of New Jersey, have survived and grown by allowing subgroups to develop within the larger organization.

The older brand-specific clubs are experiencing a similar change as new members come in and as companies such as Commodore produce more consumer-oriented computers such as the VIC-20. One of the oldest and largest Commodore clubs, the Toronto PET Users Group (TPUG), has seen a large contingent of VIC and Commodore 64 owners forming within itself, causing TPUG to hold special meetings just for the VIC and the 64.

At this meeting of the Triad Amateur Computer Society, a 3M Company spokesman gave a talk on the care of floppy disks. (Commodore User Group, c/o Dave Hill, P.O. Box 7073, Greensboro, NC 27407, 919-275-8014).

"A lot of users groups are running into this problem," says Jim Butterfield, who has been called the "grandfather of TPUG."

"Old-timers don't understand what the newcomers need, and they tend to be impatient with them. The newcomers want to know, 'What can I do with a VIC-20? What can I do with a Commodore 64?' This is important, but I would hate to see the groups completely break into separate units, because we have a lot to share with each other.

"Back in the old days we had to go snooping for ourselves. Anybody who wanted to peer into the insides of the machines had to spend some time at it. We would have killed to get our hands on the information that is available to everyone now in the *Programmer's Reference Guides* for the VIC-20 and 64.

"The old days were very good, but the world is still changing, and it is getting very full of beginners. For them it doesn't matter as much why their machines work as long as they can do something when they turn them on."

The older groups have changed in other ways. Most noticeably, many have grown to gargantuan proportions. TPUG began in 1978 with a handful of people (some accounts say 12, some say 35). They met in the basement of an apartment building where the group's founder, Lyman Duggan, lived at the time. (Duggan since has moved to Florida.) The group now has more than 5000 members, about half of whom live outside Toronto. Five separate chapters meet in Toronto each month and may be attended by as many as 600 people at a time. Understandably, the group investigated the use of video projectors early in its history so that large groups could watch a single computer being demonstrated.

TPUG publishes a monthly newsletter, "The Torpet," which really is more of a magazine, running as long as 24 pages and featuring advertising. The group also maintains a large software library from which members may obtain programs by the disk-full or cassette-full for the cost of materials and handling. Members also can get programs for free by copying disks at the monthly meetings and by attending TPUG's celebrated annual copy session. To keep all this operating, the club rents office space in Toronto and has several paid employees, at least one of whom works full-time.

People outside Canada might wonder, "Why Toronto?" Butterfield attributes TPUG's success to the helpfulness and relative stability of Commodore Canada. During the period TPUG was growing, he says, the United States arm of Commodore Business Machines, Inc., experienced repeated staff turnover and a degree of confusion that only really ended with the surprise success of the VIC-20.

"We were in the peculiar position of having the company come to the users for information, whereas in Canada, Commodore was very stable. You could go to an engineer and ask, 'Do you remember such and such?' and he'd say, 'Oh yes, that was when the original machine came out.' "

Another factor that Butterfield doesn't call attention to is Jim Butterfield. He has become world-renowned for his intimate understanding of Commodore computers, and although he has not participated directly in the running of TPUG, he has been a regular speaker at its meetings and teaches courses in machine language for the group. He also has a television program about computers that is broadcast throughout Ontario, and he contributes to a number of publications, most notably **COMPUTE!**, of which he is an associate editor. Butterfield gives Duggan all the credit for starting TPUG, but if you listen to the folklore of the club, you will hear that Butterfield and Duggan cooked up the idea for TPUG one night over a few rounds of beer.

Many groups have started in similar fashion, with a small number of persons getting together and spreading the word. Sol Libes founded the Amateur Computer Group of New Jersey by sending letters to several friends he knew were interested in computers. Michael Kleinert is organizing his National VIC Association out of Nanuet, New York, by advertising in "The Torpet" and sending out announcements by mail. Bill Trammell, founder of the Raleigh (North Carolina) VIC-20 Users Group, used the local newspaper's computer column to announce the group's first meeting. The important thing in each case was to let people know that someone wanted to start a users group. With varying degrees of success, other clubs have used campus bulletin boards, posters at obliging computer stores, and information services such as CompuServe and The Source to spread the message.

The structure and activities of groups vary. The Northern Utah VIC & 64 Users Group, for example, has about 12 members and no formal organization. The group doesn't bother with a newsletter because it is simpler just to call the members by phone. Meetings are held in members' homes.

"We have no big ambitions for the group," says David Sanders, its founder. "We just enjoy getting together and finding out what everybody has learned during the month."

In areas where the population is more concentrated, the number of VIC-20 or Commodore 64 owners is likely to be quite large, and any new group that announces itself publicly may be surprised at how many people show up. This may require some formal organization, depending on what the members want to do with the group. Even the simple matter of meeting on a regular basis will require members to find a suitable location, such as in a civic hall or a library. If the meeting room has to be rented, then dues will have to be collected to cover the cost.

There are plenty of other ways to spend dues. After a group reaches a certain size, it will have more members than will ever attend any single meeting. A newsletter offers an easy way to keep in touch. If the group is scattered over a large geographical area, such a publication becomes essential. The newsletter probably will start humbly as a photocopied leaflet, or perhaps a member will contribute the use of his printer.

If a users group in the United States finds itself mailing more than 200 newsletters at a time, it can qualify for bulk mailing rates. The initial permit for bulk mail costs $40, but it can lead to substantial savings. The group may also apply for further reductions in postage as a nonprofit organization. Most groups apply under the "educational" classification.

More users groups also are setting up their own *bulletin board systems*, or BBS for short. A BBS is a specially programmed computer and disk drive tied to its own telephone line with a modem that can answer the line automatically whenever a call comes in. Club members who have modems can call the BBS by telephone and use their VIC or 64 to leave messages, read other members' messages, or even copy any users group software that might be stored on the BBS's disk. This, of course, raises the dues a bit, although once the initial cost of the system has been absorbed, the only ongoing expense is the fee for the "dedicated" phone line. However, having spent dues on such a system, many clubs institute a password system so that only paid-up members can use the club's BBS.

Almost all users groups make arrangements for members to trade and copy software. This sometimes gets into a sticky area, because it is illegal in most countries to duplicate copyrighted programs without paying a royalty to the copyright holder. The fact that it is illegal does not always deter the copiers, but the more reputable clubs make it clear from the beginning that members are expected not to indulge in illegal copying at the copy sessions. Fortunately, there are thousands of programs available that are not copyrighted. These are said to be in the *public domain*, and anyone is free to duplicate them.

"There is so much available in the public domain," Libes says, "that I don't know why anyone would really want to copy programs illegally. Much of the public domain software is as good as or better than the copyrighted material, anyway."

There are several ways a users group can accumulate public domain software. Members usually contribute their own programs to the club library. Groups also trade with other groups around the country, either by swapping entire libraries or by joining a much larger group as if the entire club were a single member. TPUG, for example, welcomes users groups to join either as a single associate member or at reduced rates as a collection of individual members. This gives the group access to TPUG's software library and the opportunity, if desired, to reprint articles from "The Torpet" in the group's own newsletter.

In recent years, software has tended to overshadow hardware in users groups, but there still are "hardware hackers" around who are willing to lend their expertise to the "softies." Interestingly, many people who understand the intricacies of digital circuitry may know relatively little about programming, so the two sides often can help each other out. Hardware specialists can lead users groups in projects such as adding a reset button to the VIC, constructing light pens, or wiring color television sets (safely) to double as color monitors.

Sharing information is only one way in which users groups can save their members money. Another is by approaching computer merchants for discounts. Some clubs, such as Kleinert's National VIC Association, have talked software firms into offering reduced prices to members as a promotional gesture. Other groups arrange to buy products in quantity for the members, which usually results in lower prices.

Businesses can be helpful in other ways. A computer store might offer its showroom for meetings, if the group is not too large, or it may agree to help publicize the meetings. This is an area in which users groups should use caution, however. Most stores deal fairly and may even offer to sponsor a club without expecting anything in return other than good will. On the other hand, there are reports of commercial outfits that have tried to dominate a club, insisting that the group buy only from that store or setting higher dues for members who bought their equipment elsewhere. Ultimately it is up to a group's members whether they want to operate in that manner. Sometimes it may be necessary to dissolve the group and reorganize it from scratch in order to escape the commercial influence.

Another problem may come from within. Some people join users groups to make money. They may want to sell products to the other members or draw them into a pyramid-type sales scheme. Again, the members have to judge for themselves whether this is desirable for the group.

Sometimes new users groups can get advice from Commodore itself. Unlike some other consumer computer companies, Commodore does not have an official users group liaison, but there are two people at Commodore who can answer questions: Neil Harris, the publications department manager, and Diane Ottinger, the public relations director. Both can be contacted by writing to Commodore Business Machines, Inc. 1200 Wilson Dr., West Chester, PA 19380.

Some users groups contemplate setting up their own commercial ventures, such as by charging nonmembers for computer classes or by selling software to the public. The club's members should think carefully before launching into such endeavors. Matters can get complicated. There are legal issues to consider, such as financial and material liability. Also, the specter of income tax arises. Strictly speaking, any organization in the United States that shows an income must file Form 1120 with the Internal Revenue Service. This is not often done, and spokesmen for the IRS are not clear whether they really want it to be done for organizations whose only income is dues. There is the opinion that clubs need file only if they bring in more than $5000 in an average year, but that figure really applies to tax-exempt organizations.

Users groups are ideal for exchanging information and advice with fellow home computerists.

Most computer clubs are eligible to apply for tax-exempt status as nonprofit educational organizations. The status, if granted, solves the question of taxes once and for all, but unfortunately, filing for it is no simple matter. The application, Form 1023, is 26 pages long, and the IRS is very picky about what it will accept as nonprofit activity. For more information, club members should call the IRS toll free at (800) 241-3860 and request Package 1023 and Publication 557, "Tax-Exempt Status for Your Organization."

The tax question makes a good argument for keeping a users group simple, but that's a matter for individual groups to decide. Some people like the informal atmosphere of a small group. Others prefer the services and excitement of a large one. The important point to remember is that the clubs are called users groups because they exist, first of all, for the users. That puts other issues into perspective.

A Guide To Commodore Users Groups

Compiled By Kathy Yakal, Editorial Assistant

Here's a nationwide list of Commodore users groups so you may find one in your area if you're interested. The groups are listed by state, alphabetically. If you belong to a group and don't find it listed here, either your group wasn't around when this list was prepared a few weeks back, or we didn't know about you. We regret any omissions.

We will repeat this listing periodically in *COMPUTE!'s Gazette*, so please let us know if we've missed you or if you have a new group forming. Write to:

COMPUTE!'s Gazette
P.O. Box 5406
Greensboro, NC 27403
Attn: Commodore Users Groups

ALABAMA

Huntsville Alabama Commodore Komputer Society (HACKS)
c/o Hal Carey
9002 Berclair Rd.
Huntsville, AL 35802
(205)883-0223

CALIFORNIA

Commodore Users Group
c/o Gilbert Vela
4237 Plumeria Ct.
Santa Maria, CA 93455
(805)937-4174

PALS
c/o Jo Johnson
886 So. K
Livermore, CA 94550

PET-On-The-Air
c/o Max J. Babin, Secretary
525 Crestlake Dr.
San Francisco, CA 94132

San Fernando Valley Commodore Users Group (SFVCUG)
c/o Thomas Lynch
21208 Nashville
Chatsworth, CA 91311
(213)709-4736 (h)
(213)889-2211 ext. 2015 (w)

San Luis Obispo VIC-20/64 Computer Club
1766 9th St.
Los Osos, CA 93402
(805)528-3371

FLORIDA

Brandon User Group
c/o Paul Daugherty
108 Anglewood Dr.
Brandon, FL 33511
Paul Daugherty, President
(813)685-5138
Chris Jackey, Vice President
(813)681-6850

Central Florida Commodore Users Group
c/o Stephen K. McHaney
P.O. Box 15949
Orlando, FL 32858
(305)298-4709

Commodore Computer Club
c/o Chuck Fechko
P.O. Box 21138
St. Petersburg, FL 33742

Gainesville Commodore Users Group
c/o Louis Wallace
P.O. Box 14716
Gainesville, FL 32604

Miami 64 Users Group
c/o Dr. Eydie Sloane
P.O. Box 561689
Miami, FL 33256
(305)274-3501

South Sarasota County User Group
c/o Frank Topping
1859 Neptune Dr.
Englewood, FL 33533
(813)474-6359

VIC/64 Heartland User Group
c/o Tom Keough
1220 Bartow Rd. #23
Lakeland, FL 33801
(813)666-2132

GEORGIA

VIC Educators User Group
c/o Dr. Al Evans
Cherokee County Schools
110 Academy St.
Canton, GA 30114

IDAHO

Commodore Users
c/o Leroy Jones
548 E. Center
Pocatello, ID 83201
(208)233-4294

S.R.H.S. Computer Club
c/o Barney Foster or Bryan Bagley
Salmon River High School
Riggins, ID 83549

ILLINOIS

ASSM/TED Users Group
c/o Brent Anderson
200 S. Century
Rantoul, IL 61866
(217)893-4577

Commodore 64 Users Group
c/o Gus Pagnotta
P.O. Box 572
Glen Ellyn, IL 60137
(312)790-4320

PET VIC CLUB (PVC)
c/o Paul Schmidt
40 S. Lincoln
Mundelein, IL 60060
(312)566-8685

Regional Association of Programmers (RAP 64/20)
c/o Gene A. Meyers
7358 W. 108th Place
Worth, IL 60482
(312)448-0485

INDIANA

Commodore Hardware Users Group (C*H*U*G)
c/o Tim Renshaw
9651 E. 21st St.
Indianapolis, IN 46229
(317)899-2003
(317)898-3800

Northern Indiana Commodore Enthusiasts (NICE)
c/o Eric Bean
927 S. 26th St.
South Bend, IN 46615
(219)288-2101

PET/64 Users
c/o Jerry Brinson
10136 E. 96th St.
Indianapolis, IN 46256

VIC Indy Club
P.O. Box 11543
Indianapolis, IN 46201
Fred Imhausen
(Impair Sales and Service)
(317)357-6906

IOWA

Commodore Computer Users Group of Iowa
P.O. Box 3140
Des Moines, IA 52808
Curtis L. Shiffer, President
(515)282-1388
Laura Miller, Secretary
(515)287-1378

Quad City Commodore Computer Club
c/o John N. Yigas
1721 Grant St.
Bettendorf, IA 52722
(319)355-2641

Siouxland Commodore Club
c/o Gary Johnson
2700 Sheridan St.
Sioux City, IA 51104
(712)258-7903

KENTUCKY

The Commodore Connection
c/o Jim Kemp
1010 S. Elm
Henderson, KY 42420
(502)827-8153

LOUISIANA

Commodore PET Users Group
5064 Bowdon St.
Marrero, LA 70072
Wayne Lowery, President
(504)341-5305
Stan Pape, Parliamentarian
(504)394-4928

MARYLAND

Capitol Area PET Enthusiasts
(VIC-20)
c/o William Spillane
P.O. Box 1602
Rockville, MD 20850
(301)340-7417

Hagerstown User Group (HUG XX)
c/o Joseph Rutkowski
23 Coventry Ln.
Hagerstown, MD 21740
Joseph Rutkowski, President
(301)797-9728
Greg Steward, Secretary
(301)790-0968
Ken Schultz, Technical Advisor
(301)797-4150

Long Lines Computer Club
c/o Tom Davis
323 N. Charles St.
Room 201
Baltimore, MD 21201
(301)547-2570

VIC & 64 Users Group
c/o Tom DeReggi
21000 Clarksburg Rd.
Boyds, MD 20841
(301)428-3174

MASSACHUSETTS

MASSPET Commodore User Group
c/o David Rogers
P.O. Box 307
East Taunton, MA 02718
(617)823-1974
MASSPET Bulletin Board
(617)824-4878 (7 p.m. - 9 a.m. M-F, 24 hours on weekends)

Eastern Mass VIC-20 Users Group
c/o Frank Ordway
6 Flagg Rd.
Marlboro, MA 01752
(617)485-4677

The Boston Computer Society
c/o Commodore User Group Director
Three Center Plaza
Boston, MA 02108
(617)367-8080

MICHIGAN

South Computer Club
c/o Ronald Ruppert
South Junior High School
45201 Owen
Belleville, MI 48111

Southeast Michigan PET User Group (SEMPUG)
c/o Norm Eisenberg
32800 W. 12 Mile Rd.
Farmington Hills, MI 48018

VIC for Business
c/o Michael Marotta
6027 Orchard Ct.
Lansing, MI 48910
(517)394-2345

MINNESOTA

Minnesota Users of PET (MUPET)
c/o Jon T. Minerich
P.O. Box 179
Annandale, MN 55302
(612)963-5056 (h)
(612)274-8246 (w)

MISSOURI

The Commodore Users Group of St. Louis, Inc. (formerly "PET SET")
P.O. Box 6653
St. Louis, MO 63125
Dan Weidman, General Information
Irwin Feldenberg, VIC-20 Subgroup Dir.
(314)991-0655
Mark Cureton, C64 Subgroup Dir.
(314)752-1681

Kansas City PET Users Group (KCPUG)
c/o Sal Cerda or Rick West
P.O. Box 36492
Kansas City, MO 64111
User Group Hotline (816)252-7628
(24 hours, 7 days a week)
Bulletin Board (KCPUG) (816)257-2502
(24 hours, 7 days a week)
Rick West – Sysop voice (816)257-5058 (after 8 p.m.)

Mid-Missouri Commodore Club
1804 Vandiver Dr.
Columbia, MO 65201
(314)474-4511

NEBRASKA

The National VIC-20 Users Group
c/o George F. Kaywood, Director
P.O. Box 34575
Omaha, NE 68134

NEW JERSEY

ACGNJ PET/VIC/CBM User Group
c/o Joseph M. Pylka
30 Riverview Terrace
Belle Mead, NJ 08502

VIC Software Development Club
c/o H. P. Rosenberg
77 Fomalhaut Ave.
Sewell, NJ 08080

VIC Times
c/o Thomas R. Molnar
46 Wayne St.
Edison, NJ 08817

NEW MEXICO

New Mexico Commodore Users Group
6212 Karlson N.E.
Albuquerque, NM 87113
Danny or Betsy Byrne (505)821-5812
Dr. Richard Kotomori (505)298-9675

NEW YORK

Capitol District Commodore 64/VIC-20 User Group
c/o William Pizer
363 Hamilton St.
Albany, NY 12210
(518)436-1190

Folklife Terminal Club
c/o Bob Krebs
P.O. Box 2222-R
Mt. Vernon, NY 10551

Hudson Valley Commodore Club
1 Corwin Place
Lake Katrine, NY 12449
John G. Rogers, President
(914)246-8936
Frank S. Goh, Secretary
(914)679-2817
J. Ric Wright, Newsletter
(914)382-1561

KINGCOMP (Commodore User Group)
c/o Dr. Lewis Levitt
1250 Ocean Ave.
Brooklyn, NY 11230
(212)859-3030

National VIC Association
c/o Michael Kleinert
9 Crabapple Ln.
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New York, NY 10025

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151-28 22nd Ave.
Whitestone, NY 11357

VIC Information Exchange Club
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336 W. 23rd St.
Deer Park, NY 11729

VIC-20/Commodore 64 Users Group
c/o Pete Lobl
31 Maple Dr.
Lindenhurst, NY 11757
(516)957-1512

VIC User Group
c/o Robert Wurtzel
Stony Brook Learning Center
1424 Stony Brook Rd.
Stony Brook, NY 11790
(516)751-1719

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Commodore 64 Research Triangle Users Group
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Raleigh, NC 27609
Doug Latta (919)787-5748

Commodore User Group
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Talton's Select Business Equipment
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Durham, NC 27702
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Amateur Radio PET Users Group
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Boonville, NC 27011

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(919)787-4137

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Hickory, NC 28601
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Temperance, MI 48182
(313)847-0426

Commodore 64 and VIC-20 User Group
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Cleveland, OH 44113
(216)696-5093 (ask for Bill)

Dayton Area Commodore Users Group
c/o Bernie Worby
4154 Tareyton Dr.
Bellbrook, OH 45305
(513)848-2065

Licking County 64 User Group
323 Schuler St.
Newark, OH 43055
(614)345-1327

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Tulsa Computer Society
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Tulsa, OK 74101
(918)627-8994

Southwest Oklahoma Computer Club (S.W.O.C.C.)
c/o Gary Crowell
P.O. Box 6646
Lawton, OK 73505
(405)355-9798 (evenings/weekends)

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Oregon Commodore Computer Users Group (OCCUG)
c/o John F. Jones
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Portland, OR 97213
(503)281-4908

(This group includes 21 independent chapters, which are listed below.)

Combined Groups

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Rt. 3, Box 75
Astoria, OR 97103
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Don Singer (503)357-4140
Bill Krieger (503)357-8008

Gresham VIC/64 Users Group
c/o Bob Brown
625 NW Battaglia
Gresham, OR 97030
(503)666-4131

Lake Oswego PET/C64 Users Group
c/o John Jones
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Portland, OR 97213
(503)281-4908
or Jeff Andrews (503)775-9089

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584 Sierra
Eugene, OR 97402
(503)688-1537

Longview, WA Commodore Users Group
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626 26th Ave.
Longview, WA 98632
(206)577-8317

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Alan Paget (503)235-0932

Mt. Hood Community College PET/64 Users
c/o Ted Scheinman
4044 N.E. Couch
Portland, OR 97232
(503)667-7196

Tillamook VIC/C64 Users Group
c/o George Shiveley
1009 5th St.
Tillamook, OR 97141
(503)842-4515

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Don Irving (206)892-3923

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Sheridan, OR 97378
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Albany, OR 97321 (503)928-5099
or Steve Johnson
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Corvallis, OR 97330 (503)752-7614

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Portland, OR 97217
(503)287-1433

Salem VIC Users Group
John Ingram (503)370-8775

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P.O. Box 42082
Portland, OR 97242

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c/o Jim Meyers
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Molalla, OR 97038
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(503)829-5083 (h)

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(fire fighters only)
1927 S.E. 174th
Portland, OR 97233
Harley Cissna (503)668-6520
Gary Houghton (503)256-3426

Portland Airbase Officers Club VIC and C64
(must be member of Portland Airbase Officers Open Mess or guest)
c/o Frank Chase
P.O. Box 17511
Portland, OR 97217
(503)289-4331 (after 9:30 p.m.)

Salem PNB VIC Users Group
(Pacific NW Bell employees only)
P.O. Box 106, Room 452
Salem, OR 97308
Bill Black (503)399-4850
Rod Small (503)399-4578

Tektronics Employees VIC Users
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Rick Simonsen (503)639-5451
Alan Roberts (503)682-2731

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440 Manatawny St.
Pottstown, PA 19464

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c/o Norman McCrary, Club Secretary
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Horsham, PA 19044
(215)441-2708

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Pittsburgh, PA 15235

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3021 Ben Venue Dr.
Greensburg, PA 15601
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Newport, RI 02840
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P.O. Box 1406
Chattanooga, TN 37401
(615)875-6676

Metro Knoxville 64 User Group
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Knoxville, TN 37921
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Nashville, TN 37212
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(713)376-7000

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14311 River Glen Dr.
Sugarland, TX 77478

Southeast Houston VIC User Group
11423 Kirk Valley Dr.
Houston, TX 77089
(713)481-6653

VIC Users Group
c/o Robert Massengale
3817 64th Dr.
Lubbock, TX 79413

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Commodore VIC-20 Users Group
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652 W. 700 N.
Clearfield, UT 84015
Rodney Keller (801)776-3950

Commodore 64 Users Group
c/o Rodney Keller
652 W. 700 N.
Clearfield, UT 84015
(801)776-3950

The Utah Commodore Users Group
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Clearfield, UT 84015
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P.O. Box 324
Locust Grove, VA 22508

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c/o Dick Rossignol
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Lynchburg, VA 24501

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Elk Creek, VA 24326
(703)655-4144
or Brian Billings
Rt. 1, Box 209C
Elk Creek, VA 24326
(703)655-4001

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or H. Thomas Baise III
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Virginia Beach, VA 23455

VIC-20 & CBM Users Club
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Richmond, VA 23226
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or Kermit R. Woodall, Sec./Treas.
(804)329-9465

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Donald H. Sims (206)675-0301

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2565 Dexter N. #203
Seattle, WA 98109
(206)284-9417

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c/o Ken Tong
1800 Taylor Ave. N.
Seattle, WA 98109

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W. 1918 Boone Ave.
Spokane, WA 99201
(509)327-7202

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P.O. Box 224
Oregon, WI 53575
(608)835-5538

VIC-20 Software Exchange Group (V.S.E.G.)
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P.O. Box 224
Oregon, WI 53575
(608)835-5538

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Dartmouth, Nova Scotia, Canada B2W 2P9 (902)434-1524

Toronto PET Users Group
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1912A Avenue Rd., Suite #1
Toronto, Ontario, Canada M5M 4A1
(416)782-9252

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VIC-Club of Norway
Rolf Öberg
Liljegt.4
1750 Halden Norway

New Products For Commodore At Comdex/Spring

Tom R. Halfhill, Editor

Software and hardware support for Commodore 64 and VIC-20 computers is growing rapidly, judging from the new products exhibited at the Comdex/Spring computer show in Atlanta. Here's a sample of what's soon going to be in the stores.

According to one recent estimate, Commodore is making more than 110,000 computers a month, including at least 70,000 VIC-20s, and is the leading home computer manufacturer in terms of market share. Sold nearly everywhere at barebones prices, Commodore computers are developing into a large and lucrative market for independent makers of software and accessories.

So it's not surprising that entrepreneurs and established companies alike are jumping into this potential market with new products. Many of these firms were exhibiting their wares at the recent Comdex/Spring computer show in Atlanta. Although Comdex is business-oriented, with emphasis on more expensive microcomputers, this spring's show seemed to have a larger minority of home computer exhibitors. Commodore itself and the other home computer manufacturers were not there, but plenty of independent (or "third-party") companies had merchandise to display. Two welcome trends in evidence are growing software support for the VIC-20 and Commodore 64, and lower-priced peripherals to match the lower prices of computers.

Most of these products should be available by the time this issue appears. Here's a summary of the most interesting items we spotted:

Low-Cost Printers

• Gorilla Banana, from Leading Edge Products, Inc., Canton, Massachusetts. This is the product behind those recent, mysterious, full-page gorilla ads in magazines. Leading Edge, best-known for its Elephant Memory diskettes, says the Banana is only the first in a new line of low-cost peripherals for home computers.

At $249.95, the Banana is an 80-column (full-size paper) printer for informal word processing and general use. Features include a dot-matrix print head (characters are formed out of tiny dots); tractor feed (requiring tractor-feed paper with tear-off perforations along the edges); unidirectional printing (the head prints left to right only, and returns to the left for each new line); printing speed of 50 characters per second; four character sets (U.S., British, German, and Swedish); double-width print mode (characters are printed twice as wide, 40 columns per line); and upper/lowercase without true descenders (the "tail" on letters such as g, j, p, k, and y does not dip below the line). There's also a graphics mode with a density of 63 by 60 dots per square inch. Special programs can make pictures or charts in this mode by individually printing these dots.

The Banana hooks up directly to any computer with a Centronics parallel interface (an industry-standard connection). Since the Commodore 64 and VIC-20 lack this interface, Leading Edge also introduced a $29.95 adapter. For another $29.95, you can get a cartridge that lets the Banana print the special Commodore graphics characters, which most printers besides Commodore's own cannot handle.

• STX-80, from Star Micronics, Inc., of Dallas, Texas. Another 80-column dot-matrix printer, the STX-80 is even less expensive at $199. But it differs from most of its 80-column cousins in that it's a thermal printer. The print head uses hot wires

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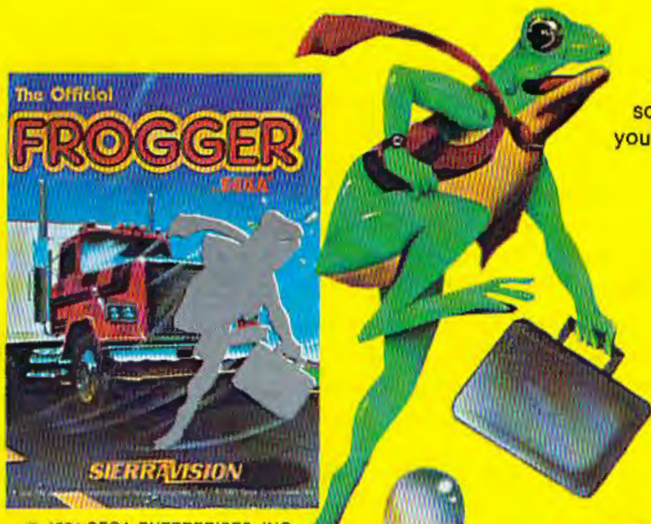

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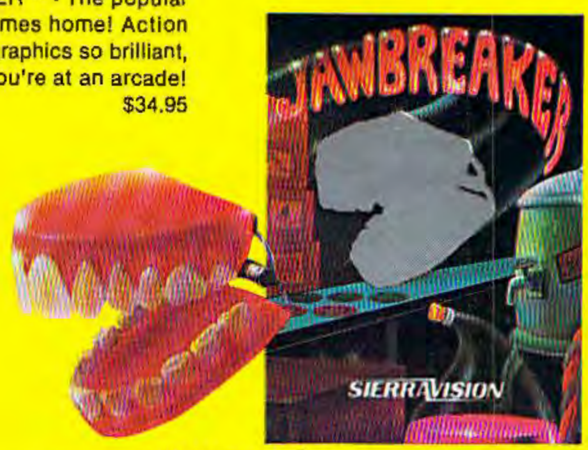

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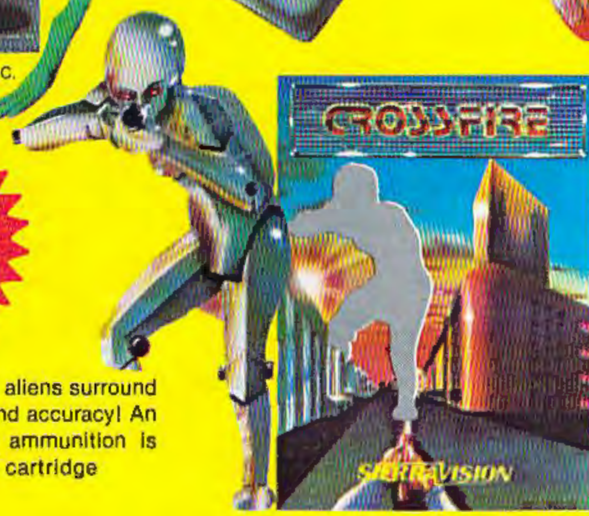

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and special heat-sensitive paper instead of an inked ribbon to form its characters. Unlike most thermal printers, however, the STX-80 does not use the shiny silver thermal paper which can sometimes be hard to read. Instead, it uses white thermal paper with sharp black lettering, remarkably similar to standard typing paper.

Like the Banana, the STX-80 is unidirectional, but manages a slightly faster printing speed of 60 characters per second. It has upper/lowercase with true descenders, a double-width text mode, a dot graphics mode, block graphics characters, European characters, and a Centronics-standard parallel interface. Although Star Micronics did not have its own parallel adapter for hooking up the STX-80 to Commodore computers, such adapters are available from other third-party companies. At Comdex, Star Micronics had an STX-80 attached to a Commodore 64 with an interface available for $79.95 from Cardco, Inc., of Wichita, Kansas.

• DP-8240, also from Star Micronics. The DP-8240 is a 40-column (half-width paper) printer with an inked ribbon and dot-matrix print head. It prints at 50 characters per second, has tractor or friction feed, upper/lowercase without true descenders, graphics characters, European and scientific characters, dot graphics, and a parallel interface. Suggested retail is $250.

• Impact Printer, from Fidelity Electronics, Ltd., of Miami, Florida. This was not only the least expensive printer we found at Comdex, but also the only low-cost unit designed specifically for the Commodore 64 and VIC-20. It hooks up to either computer with no additional interface. Although the Impact Printer has only a 24-column line, it uses standard adding machine roll paper and is suitable for program listings and other informal output. Other features include a printing speed of 30 characters per second, upper/lowercase, graphics characters, inverse characters, and a dot graphics mode. Price is $129.99.

Instant Expansion

Want to expand your computer's memory or capabilities? A number of quick plug-in accessories were shown at Comdex:

• Supermother for VIC-20, from Compuscope, Inc., Tillamook, Oregon. The Supermother – short for "super-motherboard" – is the largest expansion board now available for the VIC. As you know, expanding the VIC to larger amounts of memory with 8K or 16K cartridges presents a problem, since the computer has but one cartridge slot. The Supermother plugs into this slot and adds eight additional slots, each one selectable with a switch. This means you can plug in several memory cartridges, program cartridges, and other accessories all at once, and use one or more of them at a time by flipping the appropriate switches. Since you're not constantly plugging and unplugging cartridges, it also saves wear on the edge connectors.

The Supermother also has a system reset button, which can sometimes rescue you from a jam by clearing the VIC if you've made a serious programming error. Another button freezes program execution without interfering with anything else. This would be especially handy for games which lack a pause feature. There's also a switch that lets you make backup copies of cartridges on tape or disk, but the backup will not run without the Supermother. The Supermother sells for $149.95.

• Super 16K, Super 8K for VIC-20, also from Compuscope. These memory expansion cartridges work with the Supermother, or singly on the unexpanded VIC. The Super 16K, at $79.95, and the Super 8K, at $49.95, both have low power consumption for more reliable operation, external block switching, and write-protection circuitry. Some of these features will be most useful to advanced programmers. For instance, with external block switching, you can change the cartridge to work in different memory configurations. The write-protection circuitry allows these Random Access Memory (RAM) cartridges to simulate Read Only Memory (ROM), so that information stored there cannot be accidentally erased. An interesting feature of the Super 8K is its four empty chip sockets inside the cartridge. If you want to upgrade to 16K expansion later, you can buy memory chips and add them yourself without soldering.

• VIGOR for VIC-20, from Microtek, Inc., San Diego, California. VIGOR stands for "VIC's Grand Old RAM-cage" and is a three-slot expansion board that sells for $39.95. Like other boards of this type, it allows you to plug in memory expanders, games, and other program cartridges simultaneously. Microtek already makes 8K and 16K expanders for the VIC. Two 16K cartridges plugged into VIGOR will fully expand a VIC-20 and still leave one slot free for another accessory.

• CC-2064 for VIC and 64, also from Microtek. This cable plugs into a VIC or 64 and allows it to operate Centronics-standard parallel printers, like those detailed above. The cable comes with special software on cassette which is necessary to complete the interface. Price is $70.

• Accessories for VIC and 64, from Oceans International Ltd., Bensenville, Illinois. This company exhibited a wide line of hardware and software for both computers, including: Textview, a plug-in module that lets the VIC display 40 or 80 characters per screen line in addition to the standard 22 characters, $199; the Joy II adapter, which allows two joysticks on a VIC or three on a 64, $19.95; the RS-232 Bidirectional Interface, so VICs and 64s can be attached to modems, printers, and other devices which use the RS-232-standard serial interface, $39.95; three-slot expansion boards for both the VIC and 64, $49.95; and a parallel printer interface for the VIC, $99.95.

• VIC/64 Switch, manufactured in Sweden and distributed in the United States by Computer Marketing Services, Inc., Cherry Hill, New Jersey. This device lets you plug up to eight VICs and/or 64s into a single disk drive and printer – ideal for classrooms and users groups. The VIC/64 Switch constantly scans the computers for input/output commands. If more than one computer tries to access the disk drive or printer at once, the Switch handles the commands in sequential order (first come, first served). It works with the VIC-1540/1541 disk drive and a serial printer. Price is $149.95.

• VIC/64 Relay Cartridge, also from Computer Marketing Services. This device plugs into the user port of a VIC or 64 and lets the computer control lights, heaters, air conditioners, burglar alarms, coffee pots, or almost anything else. It has six relay outputs and two optocouplers for controlling appliances. Price is $59.95.

New VIC And 64 Software

Here are some of the more interesting new software products that were exhibited at Comdex:

• "Wizware," from Scholastic, Inc., Englewood Cliffs, New Jersey. Widely known among schoolchildren and parents for its *Weekly Reader*, Scholastic is entering the field of educational and entertainment software with a line of programs for the Apple, Atari, Texas Instruments, and VIC-20 computers. So far, VIC-20 selections include *Electronic Party*, interactive party games for birthdays and other occasions (age six and up); *Square Pairs*, a memory-match game (age eight and up); *Turtle Tracks*, using turtle graphics to teach elementary computer programming (age eight and up); and *Your VIC-20*, an introduction to the VIC for young people. Each is on cassette for $29.95.

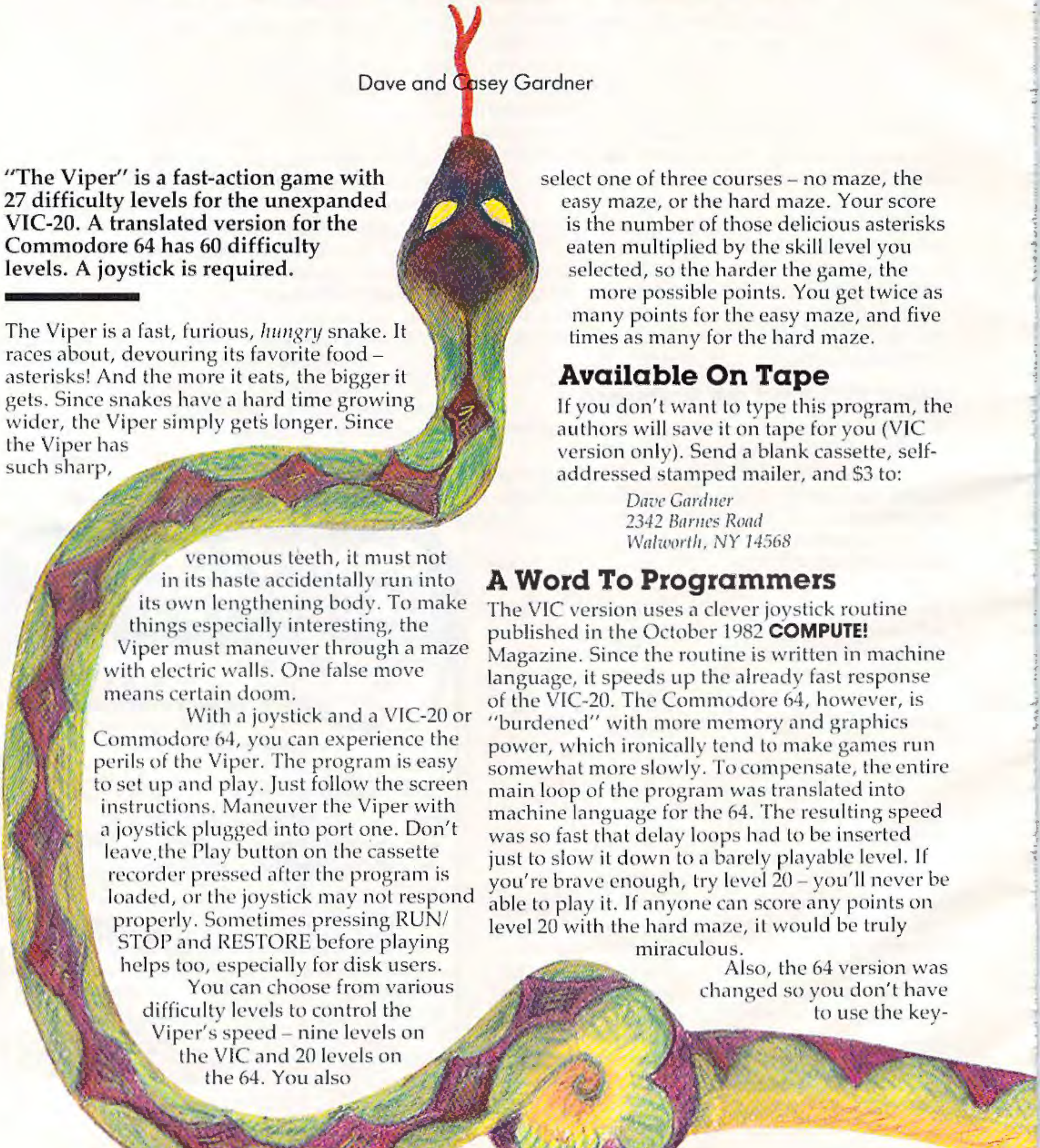
• Commodore 64 software, from Tri Micro, Orange, California. Tri Micro, a new company, introduced a very broad line of software which includes *Scriptimus*, a word processor, $39.95; *Easy DB*, a data base file manager for storing and sorting names and addresses, inventories, book catalogs, etc., $39.95; *The Trilogy Series*, an integrated word processing, data base, and spreadsheet system, $149.95; *Tri Count*, a small-business program with general ledger, inventory, accounts receivable, and accounts payable, $149.95; *Tri-Sys*, a tool for BASIC programmers which adds an enhanced screen editor, extended commands, a statistics module, and other utilities, $59.95; *Tri Graph 1.0*, for creating high-resolution graphics, $29.95; *Tri Forth 1.0*, a fig-FORTH language with extensions for the Commodore 64, $59.95; *Easy Tutor*, a ten-lesson tutorial for beginning BASIC programmers, $34.95; *Tri Slugger Stats*, for keeping track of softball and Little League teams, $39.95; *The Bean Counter*, a home finance manager, $39.95; and two arcade-style games, *Shields Up* and *Krystals of Zong*, $39.95 each.

• VIC and 64 games, from Oceans International. In addition to the hardware accessories mentioned above, Oceans International also introduced a line of games for the VIC and 64: *Dot Gobbler, Frogman, Tank Wars, Close Encounters, Amazing Maze*, and *Space Ric-O-Shay*, $32.95 each. *Blackjack* and *Blockbuster* are available for the VIC only.

• VIC and 64 software and languages, from Computer Marketing Services. This company exhibited a line of programs and languages for both computers (plus the hardware already covered above). These include: *Vanilla PILOT* (VIC and 64), a disk- or cassette-based language with turtle graphics recommended especially for children, $29.95; *64-Forth* (64 and VIC), a fig-FORTH operating system and language with special extensions, $59.95; *64 Mailing List* (64 only), $29.95 tape or $34.95 disk; *64-STAT* (64 and VIC), a cartridge that adds 19 statistics and graphics commands to BASIC, $49.95; *Script-64* (64 only), a full-featured word processor with a built-in dictionary expandable to 20,000 words, $139.95; and *Calc Result*, a sophisticated disk-based spreadsheet for the 64 which leaves about 41K free memory for data, $149.95.

THE VIPER

Dave and Casey Gardner



"The Viper" is a fast-action game with 27 difficulty levels for the unexpanded VIC-20. A translated version for the Commodore 64 has 60 difficulty levels. A joystick is required.

The Viper is a fast, furious, *hungry* snake. It races about, devouring its favorite food – asterisks! And the more it eats, the bigger it gets. Since snakes have a hard time growing wider, the Viper simply gets longer. Since the Viper has such sharp, venomous teeth, it must not in its haste accidentally run into its own lengthening body. To make things especially interesting, the Viper must maneuver through a maze with electric walls. One false move means certain doom.

With a joystick and a VIC-20 or Commodore 64, you can experience the perils of the Viper. The program is easy to set up and play. Just follow the screen instructions. Maneuver the Viper with a joystick plugged into port one. Don't leave the Play button on the cassette recorder pressed after the program is loaded, or the joystick may not respond properly. Sometimes pressing RUN/STOP and RESTORE before playing helps too, especially for disk users.

You can choose from various difficulty levels to control the Viper's speed – nine levels on the VIC and 20 levels on the 64. You also select one of three courses – no maze, the easy maze, or the hard maze. Your score is the number of those delicious asterisks eaten multiplied by the skill level you selected, so the harder the game, the more possible points. You get twice as many points for the easy maze, and five times as many for the hard maze.

Available On Tape

If you don't want to type this program, the authors will save it on tape for you (VIC version only). Send a blank cassette, self-addressed stamped mailer, and $3 to:

Dave Gardner
2342 Barnes Road
Walworth, NY 14568

A Word To Programmers

The VIC version uses a clever joystick routine published in the October 1982 **COMPUTE!** Magazine. Since the routine is written in machine language, it speeds up the already fast response of the VIC-20. The Commodore 64, however, is "burdened" with more memory and graphics power, which ironically tend to make games run somewhat more slowly. To compensate, the entire main loop of the program was translated into machine language for the 64. The resulting speed was so fast that delay loops had to be inserted just to slow it down to a barely playable level. If you're brave enough, try level 20 – you'll never be able to play it. If anyone can score any points on level 20 with the hard maze, it would be truly miraculous.

Also, the 64 version was changed so you don't have to use the key-

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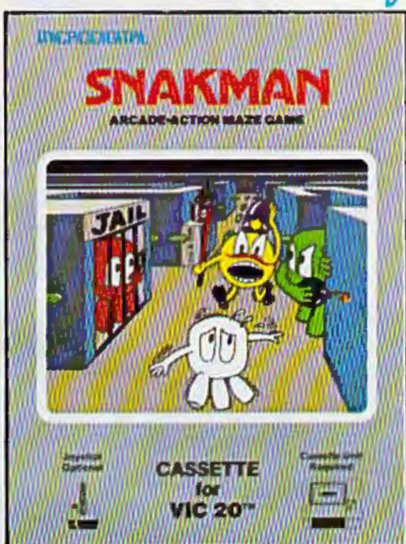

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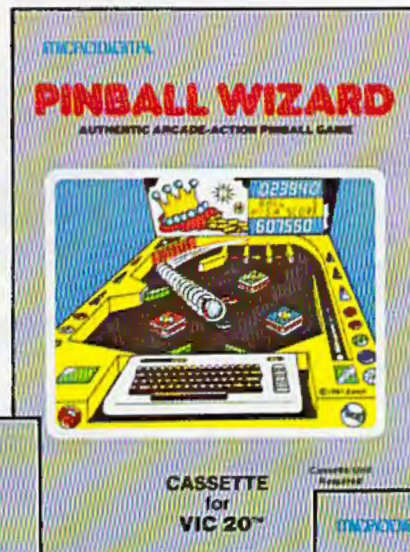

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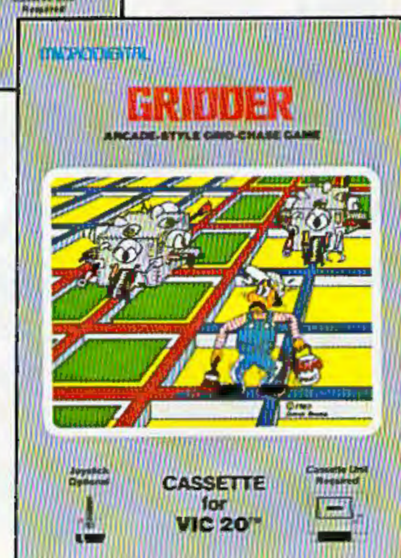

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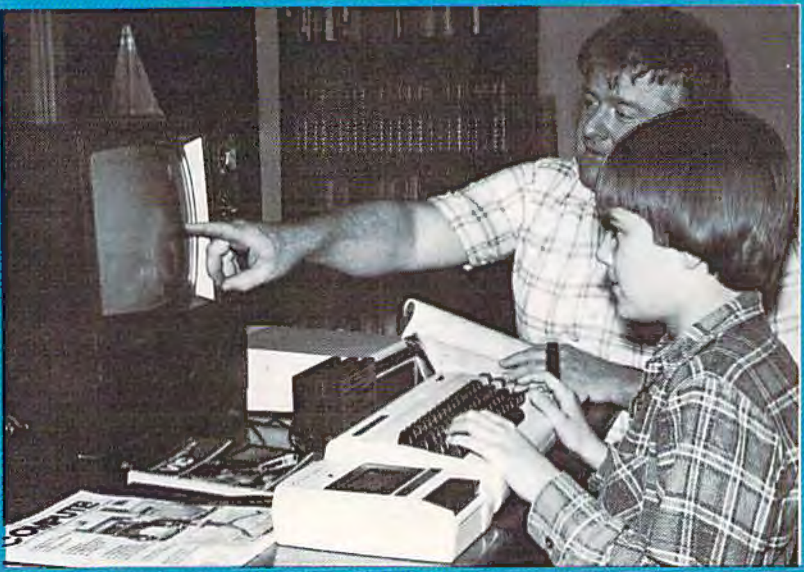
Father-Son Programming

John Blackford, Assistant Features Editor

"The Viper" was created by a father-son programming team, Dave Gardner and his son Casey, age 11. They've had their VIC-20 only a little more than a year, but they are planning to write even more programs together, using any proceeds to pay for new computer equipment. Their earnings for The Viper, for example, will help purchase a disk drive.

Gardner learned BASIC on the VIC and decided to try his hand at game programming to hone his skills. The idea of making a snake that grows longer as it eats occurred to him after watching a similar game on an Apple computer. Gardner did the actual programming, while Casey dreamed up new ideas and helped with the design.



Dave Gardner and his son, Casey.

Gardner didn't plan how he was going to implement the game. "I just sat down at the keyboard and started working on it," he says. "First I got the screen set up, then defined the snake." Next came the snake's movement and the interaction with the asterisks it gobbles up. After Gardner had refined the movement of the Viper, he added skill levels by making the snake move faster in each of nine stages. Then he worked out scoring routines that award more points in the higher levels.

As the game progressed, Casey and his father would talk about it and try to improve the concept. Casey came up with the notion of having a maze for the snake to move through and that became his special project.

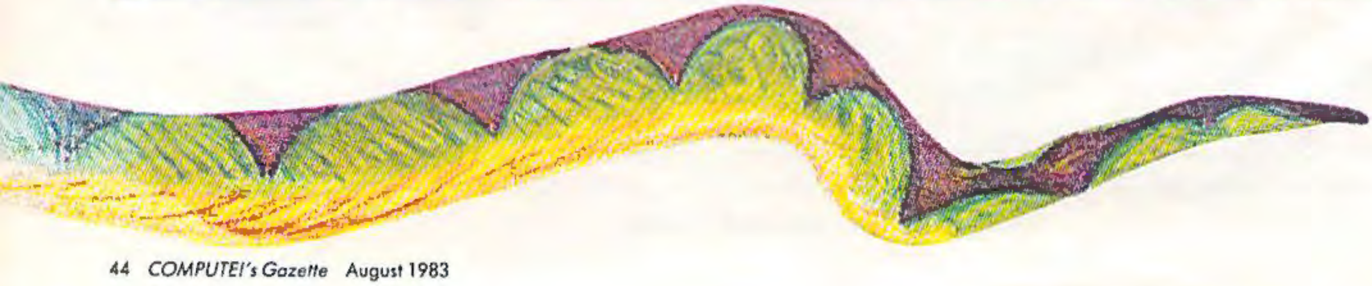
After his father showed him how to use graph paper to represent the computer's screen, Casey began to draw various possible mazes. "He did about eight designs," says Gardner. "We talked over what would be the most playable – and the most achievable with the computer." Then, they chose the version that seemed best.

Once they had the basic game, they decided to increase the number of skill levels by offering two mazes, one easy, the other hard. Including the option of no maze at all, there are a total of 27 skill levels.

The whole process of creating the game – including writing the program description – took only about two weeks, working an hour or two on weekdays and six or more hours each day on the weekends.

Creating the game was intense, but that has only whetted their appetite. Their current project is an adventure game with quality graphics. Casey has shown particular aptitude for the visual side. "He tends more toward the artistic aspects," says Gardner. Casey, who likes to sit at the computer and work out new character sets, has already designed the title page for the new game.

They haven't decided what they'll do after that, but they enjoy working together and hope to produce many more games as a team.



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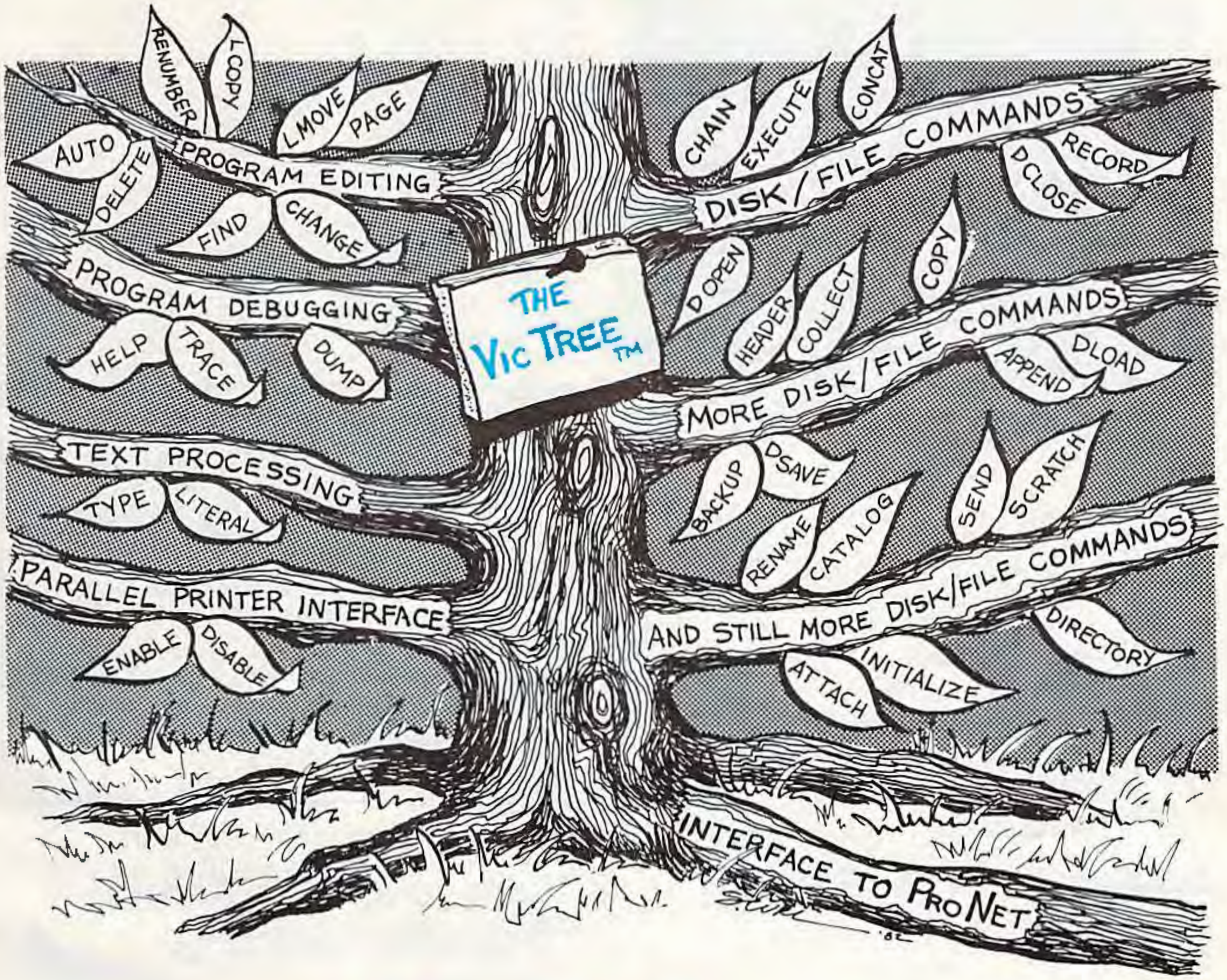

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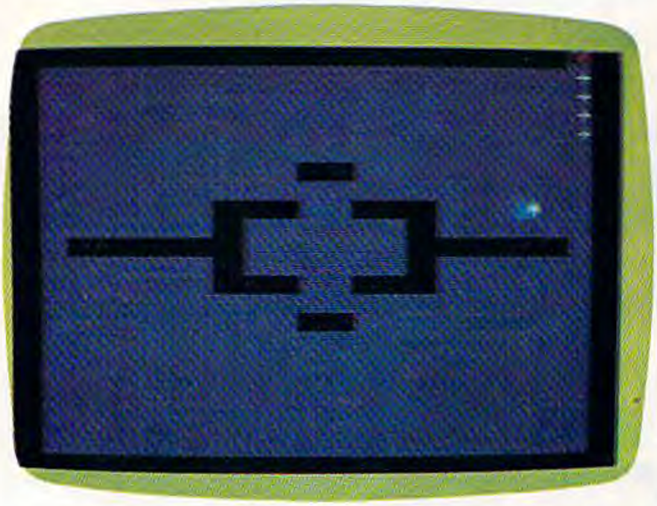


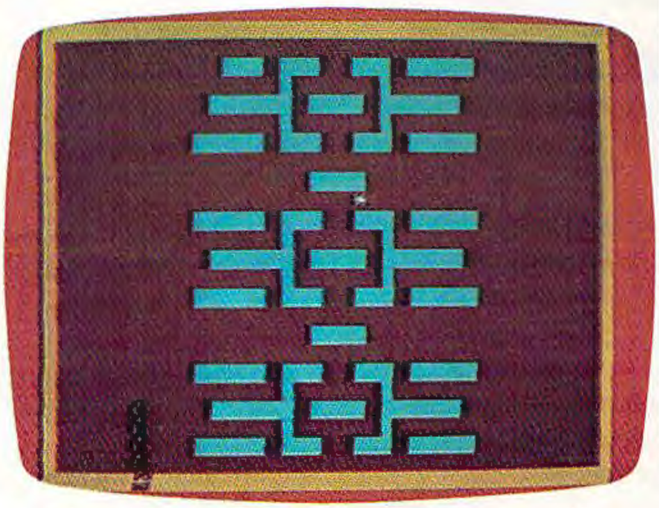
The Viper has just crashed into a wall in the upper-right corner – VIC-20 version, easy maze.

board after typing RUN. This lets you sit back in your chair and make all your selections (such as skill level) with the joystick. This technique may be handy when you write your next program.

Another feature in the 64 version is the word "VIPER" that moves about on the title screen. No, it's not high-resolution graphics, and it's not made of sprites, but rather from simple character graphics found on the keyboard. The movement works with programmable INSerts and DELetes. Again, look it over. You may be able to use the technique for animation in your next game.

Breakdown Of VIC Version

Line(s)	
10-60	Initialize variables, DIMension arrays, POKE machine language routine into cassette buffer, set screen and border colors, GOSUB to title page and instructions.
70-100	Place border.
110-160	Randomly place first asterisk and Viper.
170-200	Read joystick.
210	Check if Viper has hit anything.
220	Check if asterisk is missing.
240	Check if Viper has eaten asterisk.
250	Place new asterisk.
260-320	Update tail location.
330	Viper noise.
350	Move Viper.
360	Control Viper's speed.
370-420	Title page.
430-560	Display instructions and set skill level.
570	Place hard maze.
590	Place easy maze.
600-690	End of game, display score, start over.
700-720	Find location for new asterisk.
730-750	Machine language routine.
760-780	Maze DATA.



The Viper collides with the lower wall – Commodore 64 version, hard maze.

See program listings on page 116.

Cylon Zap
For VIC-20 And Commodore 64

Mark Dudley

"Cylon Zap" is an arcade-style game for the 8K expanded VIC-20 and the Commodore 64. A space station in the center of the screen, which you must defend at all costs, is attacked continually by Cylon ships. You must shoot them before they dive (kamikaze-style) into the space station.

To defend against the Cylons, you have two weapons. First, the joystick is moved up, down, right, or left to fire lasers in any of these four directions. Second, the fire button detonates a "smart bomb," which immediately clears the screen of all visible attackers. Smart bombs should be used sparingly, for there are only three available at the beginning of play.

The score and the number of remaining bombs are continually updated at the upper-left corner of the screen. When the score reaches 30, the flank attackers begin to increase speed. When your score reaches 50, the attackers from the top and bottom increase their speed. If your score excedes 60, you win bonus smart bombs.

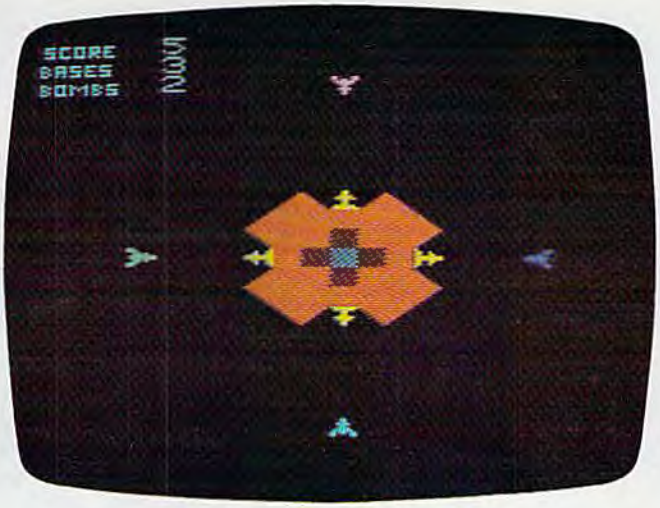
If your point total is a high score since the program was first loaded, you enter your initials with the joystick. Moving the stick right or left steps through the alphabet forward or backward. When the correct letter is found, select it with the fire button. Be sure not to hold the fire button down too long when selecting your initials, or you may inadvertently choose the wrong letters.

The VIC-20 version of Cylon Zap is in three parts. The first part redefines the start of BASIC to allow room for the redefined character set. It also loads the second part, which puts the special characters into memory and prints instructions. The third part contains the game itself. Each part must be typed in separately and then saved to tape. When saved in sequence, the game will load smoothly. If you use a disk drive, you must load the second and third programs manually when the prompt "Press Play On Tape" appears on the screen.

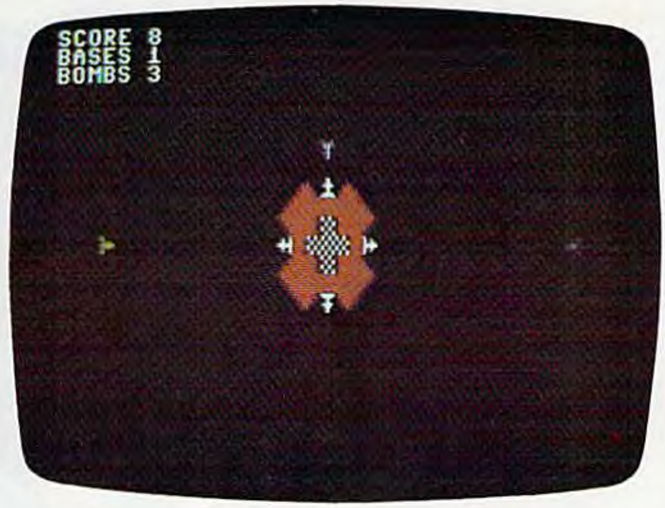
The Commodore 64 version of Cylon Zap consists of only one section because of the 64's larger memory. Otherwise, the game is essentially the same.

Breakdown Of The VIC Version

Here are brief explanations of what's going on in the VIC version of Cylon Zap. This information is for programmers who are interested in studying the techniques used.



Attacking Cylon ships surround the player's space station in "Cylon Zap," VIC-20 version.



An enemy Cylon nears its target in "Cylon Zap," Commodore 64 version.

Program 1: Set-up (VIC-20)

Sets the start of BASIC pointer.
Sets both end-of-memory pointers.
Sets beginning of BASIC to 0.
Prints "bytes free" message.
Puts LOAD command into keyboard buffer.

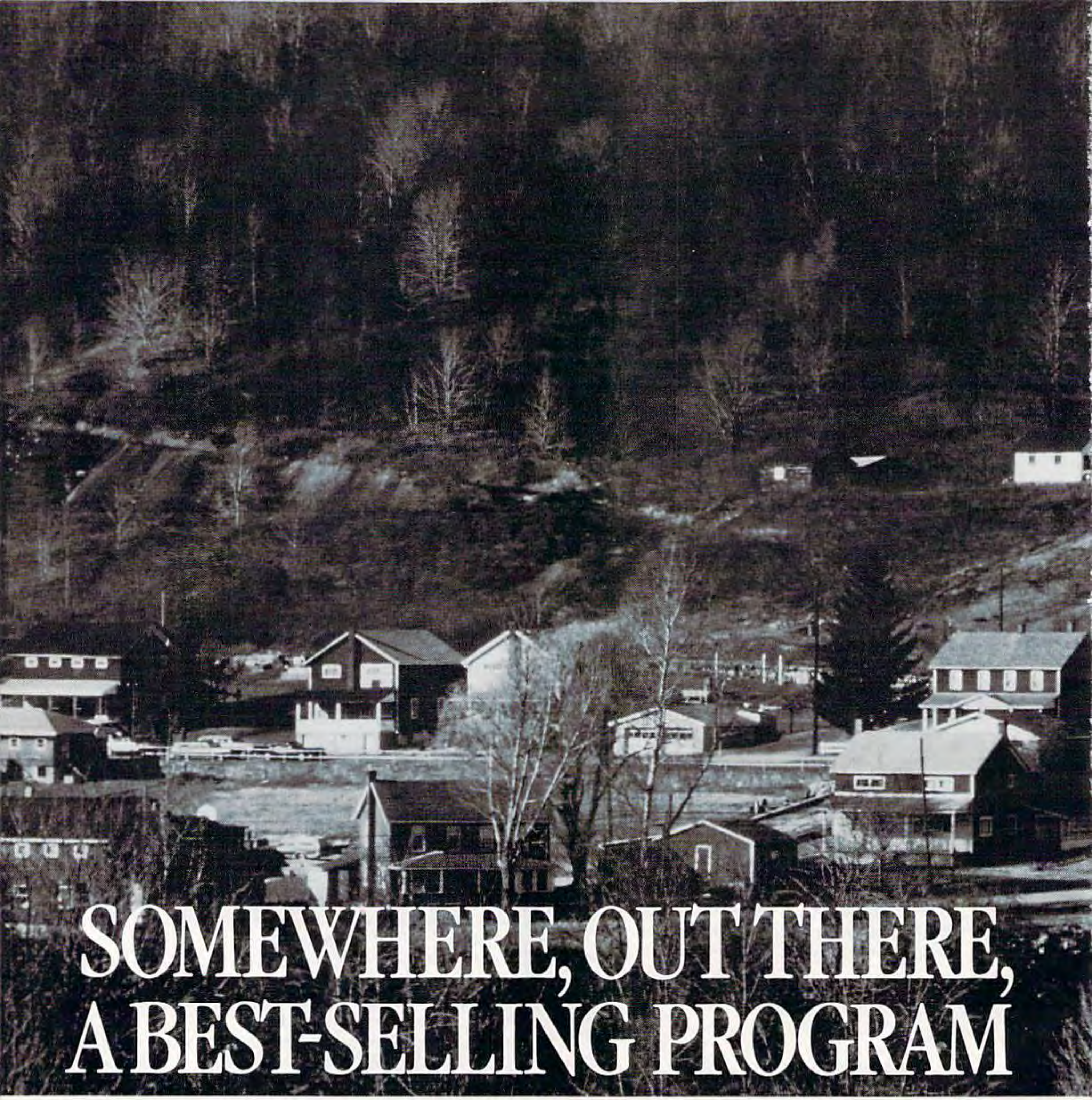
Program 2: Special Instructions (VIC-20)

30	Clear screen, set screen color, lowercase.
35	Display title.
40-70	Load characters.
75	Load machine language routine, ask for instructions.
90	POKE LOAD command into keyboard, clear screen.
95-125	DATA statements for characters.
130-160	Instructions.
165	RETURN to continue message.
170-180	Instructions, return to LOAD command.
190-230	Subroutine for "Hit RETURN To Cont" message.
235-290	Opening title.
300-310	Routine to move title across screen.
400-513	Routine to enter machine language.

Program 3: Cylon Zap (VIC-20)

35-50	Initialize variables.
55	Set screen color, clear screen, display high scores.
60	Set beginning of play variables.
65	Set character pointer.
70-80	Clear screen, draw base.
90	Print score, bases, bombs in upper-left corner.
150-225	Enemy ship appear, move, hit.
230	No bases left, display scores.
233	Score 50 or more, ships appear faster.
235	GOTO beginning of joystick routine.
240-315	Draw base.
320-340	Fire laser up.
345-365	Fire laser down.
370-390	Fire laser left.
395-415	Fire laser right.
420-465	Music for entering initials.
470-475	DATA for song.
480-525	Explosion for hit on enemy ship, add score.
530-580	Bonus base and bomb routine.
585-615	Base explodes.
620-650	If score is one of high scores, rearrange other scores.
655-685	Print high scores and to play again.
690-725	Base explode graphics.
730-815	Enter initials routine.
820-850	Print scores and title.
855-895	Smart bomb explosion and scoring.
900	Ship alarm sound.
905-925	Enter initials print routine.

See program listings on page 119.



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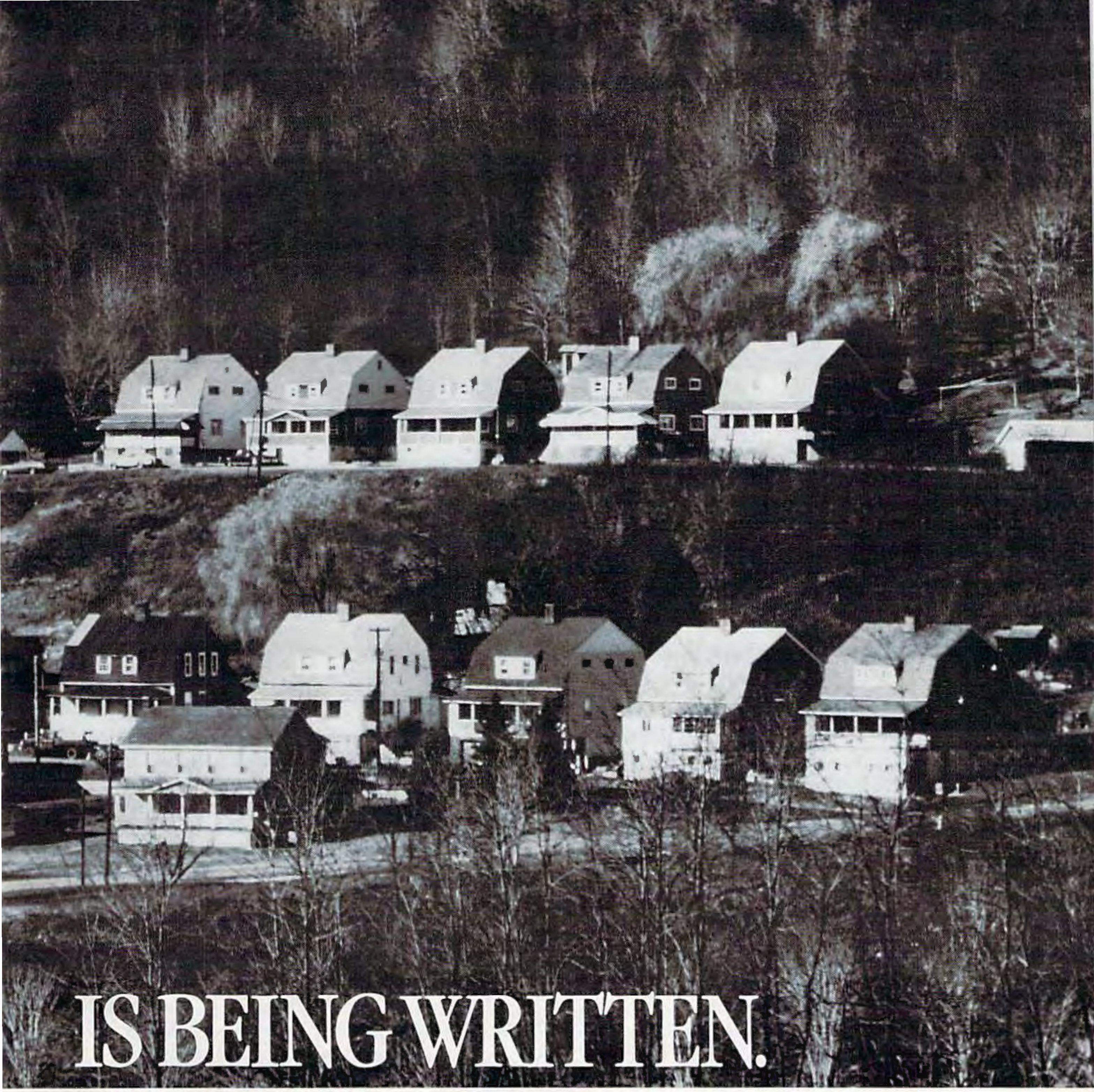

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Jeff Minter:

The Programmer Behind *Gridrunner* And *Attack of the Mutant Camels*

John Blackford, Assistant Features Editor

Jeff Minter, British author of the hot-selling game *Gridrunner*, started his own software company after he was forced to drop out of college. In the year since, he's produced more than a dozen popular games and a couple of best sellers. Here, he talks about his work and his approach to game programming.

Jeff Minter is excited about his newest game, *Attack of the Mutant Camels*, an extension of his popular *Gridrunner*. It was premiered in June by Human Engineered Software (HES), the U.S. distributor. HES is gearing up a national advertising campaign featuring "camel consciousness." Minter has every hope that his latest effort will affirm the success of *Gridrunner*.

The popularity of *Gridrunner* – the Commodore 64 version is No. 2 on the *COMPUTE!'s Gazette* HOTWARE list and the VIC version is No. 7 – has established Minter as a successful game programmer in the U.S. market. Until now, his reputation was limited to the United Kingdom.

Like a surprising number of professional game programmers, Minter never intended to become a game programmer. He started programming in college on an early 8K version of the Commodore PET, the one with the calculator-style keyboard. He programmed games in BASIC, and his friends critiqued them. He found his classmates hard to please, forcing him to learn fast.

Minter studied math, physics, and computer science at several colleges in the United Kingdom, including Oxford Polytechnical, before a serious illness forced him to drop out. But then he had time to get seriously into game programming in machine language. (Because it runs so fast, machine language is the choice of nearly all commercial software authors.)

Since leaving school, Minter has become one of the most popular game programmers in the United Kingdom, and quite successful in the United States. He doesn't regret having to give up college because he enjoys inventing games – and now he gets to do it full time, and for money. He sets his own pace at Llamasoft, his London-based software company.

Llamasoft (so named because Minter likes llamas) distributes cassette and disk versions of his games overseas, while HES handles all cartridges and exclusive rights to distribution in the United States and Canada.

Minter says there are so many inexpensive cassette-based games available in Britain that consumers have a hard time knowing what's good. But in the United States, he says, the quality of commercial software is much more consistent, and consumers can be fairly sure of getting a reliable, playable game. In the United Kingdom, buyers often go by the reputation of an individual programmer – and Minter's reportedly is excellent.

Defending the Earth in Jeff Minter's Gridrunner *(VIC-20 version).*

Minter's first United States hit, *Gridrunner*, is about alien Droids in the year 2190 who are stealing electricity from Earth's orbiting power station, the "Grid." To stop them, a combat ship patrols the Grid. In the game, the Grid is a large lattice on the screen, and Earth's combat ship moves along the lower portion, firing on segmented Droids, dodging the X/Y Zappers, and eliminating mutating yellow pods which sometimes lodge in the lattice.

The action in *Attack of the Mutant Camels* is similar, but there are several different grids and a challenging array of traps and hazards. *Attack of the Mutant Camels* is the most ambitious of Minter's games to date. In the higher levels, some grids are diagonal, and sometimes the grid is not visible at all. To make the levels more challenging, Minter added new problems rather than merely speeding up the action. The mutant camel is one of the additions. And there are pods to be destroyed before they mutate (as in *Gridrunner*), as well as other pods that destroy you if you fire on *them*. Deflectors in increasing numbers also start bouncing your laser beams around unpredictably.

In addition, *Attack of the Mutant Camels* has some traps for those who have become proficient at *Gridrunner*. "There are ways to beat *Gridrunner*," notes Minter. "Some people try to stay in one place. Others get to the edge of the screen. But in *Attack* there are nasties to keep you from doing things like that. For example, there is the Traitorous Humanoid. If you stay in one spot too long, he points you out, and the X/Y Zappers blast you.

"The hardest part of *Attack of the Mutant Camels* was to get a game that plays coherently," he says. "That's the hardest part of any game."

To get the game just right, Minter spent four or five weeks working out the program. Then he took the game to some computer shows and let kids try it out, on the theory that the best way to debug a game is to let people play it.

You might be wondering how he dreamed up the strange title. It seems that while visiting California recently, talking to the people at HES, Minter grew fond of the radio station KMEL. When he spotted the camel logo on the station's T-shirts, he decided to incorporate camels into his next game. A camel appears in some of the higher skill levels, and you get 106 points for shooting it. Station KMEL just happens to be located at 106 on the FM band.

Like many game programmers – especially those working for the limited-memory VIC-20 – Minter breaks down the action of a new game program into small modules. He carefully works out the bugs in each one before adding it to the main program. Each of the modules forms a subroutine. A main loop defines the screen and calls up the appropriate subroutine to move the ship, fire the lasers, and create sounds.

In the past, Minter has programmed all his games with the VICMON, a utility for machine language programming that is somewhat limited by professional standards. Now he has a Commodore 64 assembler-editor with such features as the ability to relocate lines of code and to add memos to his programs (similar to REM statements in BASIC). But despite the new equipment, he uses the same programming style he developed with the VICMON. "You add very small pieces, one at a time. I've developed a very disciplined style."

Encouraged by the sales of *Gridrunner* and the positive reception of *Attack of the Mutant Camels*, Minter has even more games in the works. "I look forward to working on new games," he says. "Writing them is really fun. And I'm getting better all the time."

REVIEWS

Vanilla Pilot For VIC And 64

Charles Brannon, Program Editor

Your VIC-20 or Commodore 64 has a lot of powerful features including color, sound, graphics, and the processing power of the 6500 series microprocessor. But without the proper "recipe," or program, your computer will merrily blink its cursor, forever awaiting instructions from *you*.

Commodore computers have a powerful built-in programming language, BASIC, which has an English-like style and about 50 commands. With the commands you can build almost any program. But since it is such a general-purpose language, it may take you a while to learn all its subtleties and variations.

There are other languages, however. A universal rule is that you can program the same idea (*algorithm*) in any programming language.

A Teacher Tool

PILOT, an acronym for Programmed Inquiry, Learning, Or Teaching, was first created as an "authoring language." It was designed to allow teachers to create computerized lessons, quizzes, tests, etc. PILOT's strength is in word manipulation. Properly programmed, it can tell what a student meant to say, not the verbatim response that most programs require.

PILOT is very easy to learn, since it has relatively few, single-character commands. See if you can follow the program below (T: means Type, similar to PRINT in BASIC. A: (Accept) is like INPUT):

```
T: WHAT IS YOUR NAME?
A:
T:PLEASED TO MEET YOU.
E:
```

When RUN, it will print the message "WHAT IS YOUR NAME?" and will await entry from the person RUNning the program. With PILOT, you don't have to say where the answer will be stored in the computer. PILOT will temporarily "remember" it. E: is for End.

Since PILOT is so easy to learn, it has become the vehicle for language extensions which make it an ideal beginner's language, and a powerful graphics language. Graphics usually consist of "turtle graphics," in which you direct an invisible turtle to raise and lower an imaginary pen, draw lines, turn, move without drawing, etc. A sample turtle command to draw a box would be:

```
4 (DRAW 10 ; TURN 90)
```

This tells the turtle to draw a line ten units long, rotate 90 degrees, and repeat the sequence four times. The result would be a box. Looks simple, huh? Turtle graphics is a fascinating, complex field in itself.

Vanilla PILOT is a well-developed PILOT language which will run on all current Commodore computers (the VIC-20 needs an additional 16K RAM cartridge). It comes with a complete editor that lets you enter programs as easily as in BASIC. In addition, there are commands that generate line numbers, return to BASIC, search the program for some text, save and load programs to tape or disk, delete program lines, LIST your program in a format, display all the variables you are using, trace the program line by line, renumber your program, and even un-NEW a cleared-out program.

PILOT Extensions

In addition to "core PILOT," *Vanilla PILOT* adds scores of new commands to make programming more powerful and fun. The B: (Beep) command supports all the voices on the VIC, and most synthesizer options on the Commodore 64. The variables are a little limited, only A through Z and two strings: the answer field and the name field, so called because you'll probably store the user's name in it. H: (Halt) will stop your program. One strange limitation of the J: (Jump) command is that you cannot place a label by itself on a line. The N: command will place a random number from 0 to 99 in a selected variable. The P: (Pause) command will freeze the computer for a multiple of 0.2 seconds, maximum 2.7 seconds. The R: (Remark) lets you comment on your program. W: (Wait) is like GET in BASIC, and will look for a keystroke.

One small fault is that the T: (Type) command does not automatically wrap words at the screen margin. This is a standard feature in most versions of PILOT, since it prevents a word

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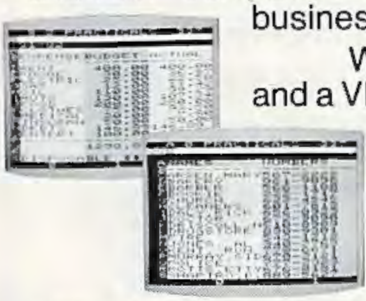

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from being split at the margin.

There are two powerful commands that have their own subcommands: S: (Screen), and G: (Graphics). The Screen command lets you move the cursor under program control without using the often confusing cursor controls. You can also clear the screen, home the cursor, set line spacing, reverse the whole screen, and reverse all following T: (Type) statements.

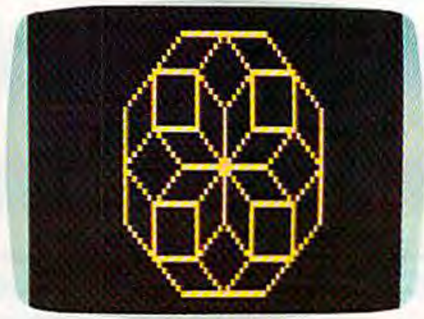
G: Is For Graphics

The G: (Graphics) command and its subcommands are powerful, but a little disappointing. First, *Vanilla PILOT* uses different names for the turtle graphics commands from other PILOTs or Logos. Second, instead of using high-resolution graphics, it uses quarter-square graphics to get a rather crude 80 x 50 resolution on the Commodore 64 and only 44 x 46 on the VIC-20. However, this does leave more memory to work with on the VIC.

Since the screen colors are set four 4 x 4 squares at a time, the color control is inaccurate. Another minor discrepancy is that the X, Y coordinates start 0,0 at the upper-left corner of the screen instead of the center, which is the standard of most other turtle graphics languages. Despite these features, you can still learn a lot about turtle graphics with *Vanilla PILOT*, and have a lot of fun drawing with the turtle.

PILOT Vs. BASIC

Additional commands read the joystick and the fire button, which is much easier than the PEEKs and POKEs BASIC re-



With Vanilla PILOT*'s "turtle graphics," it's easy to create geometric screen displays.*

quires. This is a strong advantage of PILOT vs. BASIC, especially with the B: (Beep) command that "tames" the Commodore 64 sound synthesizer chip.

...Does Not Compute

The error messages of *Vanilla PILOT* will help you pinpoint the cause of any mistakes, but they can be as cryptic as BASIC's messages. Instant syntax checking on entry would be a nice feature for beginners.

Documentation

The 112-page manual, although lacking an index, is a good tutorial on PILOT, so you can learn as you go. Because it covers all the versions of *Vanilla PILOT*, however, it can be somewhat confusing.

The manual is full of illustrative sample programs. There is a short quiz at the end of each chapter, a proven technique, but there are no sample answers. Appendices in the back provide a quick reference to the commands, a nicety so few provide. However, there are occasional typos that will frustrate beginners. Although I've generated my own programs with *Vanilla PILOT*, there is still one program in the book that I can't get to run.

Vanilla PILOT will not be the only PILOT available for Commodore computers. Commodore itself is said to be readying a PILOT for the 64. It will be interesting to compare features when it becomes available. There was also a ready-to-type, small PILOT interpreter published in the December 1982 issue of **COMPUTE!** Magazine.

Overall, I feel that *Vanilla PILOT* is a good value for the money, especially if you're an educator who would like to write programs that will run on all Commodore machines.

Vanilla PILOT
Tamarack Software
Darby, MT 59828
$29.95

Kickman For Commodore 64

Jason Lex Thomas, Jr.

Kickman is among the first in a series of new games Commodore has released for its 64 computer. This game is adapted from the Bally/Midway arcade game of the same name.

The 64 version, which comes in the form of a convenient plug-in cartridge, resembles its arcade predecessor in many ways. You control a clown who rides the streets of a city on a unicycle. Your task is to gain points by positioning the clown under rows of balloons falling from the sky. You must not let any balloons touch the ground. Instead, you must catch them. As you catch more and more balloons, they begin stacking up atop the clown's head. It gets quite tricky when the stack gets four balloons high and the remaining balloons begin dropping twice as fast.

Intermixed with the balloons floating overhead are the familiar stars of the *Pac-Man* video game. Yes, it's Mr. Pac-Man and his ghosts. Every so often, Mr. Pac-Man will drop from the sky and gobble up the balloons which are balanced on your clown's head.

The Faster They Fall

Catching the balloons is easy – at first. But as the game progresses, the balloons fall faster. Eventually, you will miss one. Luckily, if you're fast enough, you can *kick* the balloon back up into the air for a retry. (Hence the name *Kickman*.) This works fine, but now you have to catch the balloon that was already beginning to fall *and* the one you just kicked back up in the air. Catching two balloons at once takes a little practice.

Kickman is both fun and challenging. It can be played with a joystick or the keyboard. And unlike some computer games, *Kickman* does not lose any playability when using the keyboard.

A nice feature of *Kickman* is the ability to freeze the game at any point. You'll really appreciate this when the doorbell rings or when your hands grow tired. Also, when RESTORE is pressed, the game resets itself to the beginning. This is handy when you get off to a poor start.

The Sound Of Colliding Balloons

The graphics in *Kickman* are quite acceptable, and the sound effects of the balloons colliding are great. It really sounds as if the balloons are rubbing against each other. However, the music throughout the game could take more advantage of the 64's excellent sound capabilities.

Overall, *Kickman* demonstrates that the 64 is, among other things, a good game machine. And I'm sure *Kickman* will offer most players lots of enjoyment.

Kickman
Commodore Business Machines, Inc.
1200 Wilson Drive
West Chester, PA 19380
$39.95

Frogger For The 64

Dan Gutman

Hardcore video junkies may find helping frogs cross the street to be a task unworthy of their attention. But even they, I believe, will get some mellow enjoyment out of Sierra On-Line's *Frogger*, which may be the first arcade adaptation to actually surpass the arcade version.

This 1981 Sega arcade game came out hot on the heels of *Pac-Man* and followed the *Pac-Man* formula better than any other game: Make it less violent to attract a more diverse audience. Make it simple to learn (you can play the game with just one hand, and all screen movement is either horizontal or vertical), but difficult to master.

The arcade game was a smash, the Parker Brothers Atari VCS version was a smash, and Sierra On-Line's computer version is at the top of the Softsel Hot List, where it has been residing for 34 consecutive weeks.

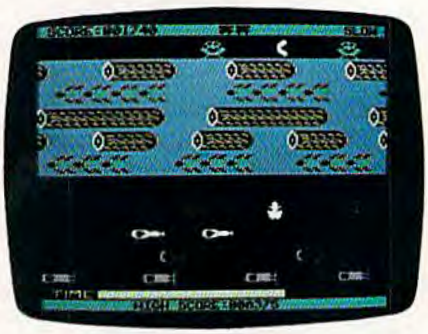
If you're not familiar with the game, basically you're a frog. You have to cross a street and then a river five times. The street is filled with motorists who most definitely do not have "I BRAKE FOR AMPHIBIANS" bumper stickers.

The river is swimming with logs, snakes, crocodiles, otters, and diving turtles. You can jump on the logs (all the time), the diving turtles (when they're not diving), the crocodiles (but just their stomachs), and the otters (if you want to expire). And just to make things interesting, every so often you can pounce on a wandering lady frog and bring her home.

At first glance the game seems too simple, but with all these elements it is very challenging and does keep you interested over the long haul.

Play With Or Without Music

The Commodore 64 version of *Frogger* is, frankly, spectacular. After choosing the four keys that will represent up, down, left, and right (you can use a joystick instead), you are greeted not only with the *Frogger* theme song, but also *Yankee Doodle*, *Old MacDonald Had A Farm*, and a few other ditties I didn't recognize. This may be the best video game soundtrack yet. The music, like the game, is bright and cheerful – enjoyable to listen to even when you're not playing.



"Froggy" (right center) hops across the busy highway toward the river in Frogger.

However, the music does become monotonous after a while. Designer Chuck Benton kindly took care of this by giving us the option of removing the music temporarily – and not by turning down the volume. Hitting the F5 key stops the music, but other sounds – such as frog-hopping and frog-drowning – will remain. Another option lets you choose a fast- or slow-moving game, and hitting the F7 key will freeze the game indefinitely while you answer the telephone or converse with lady frogs. Other sounds in the game, such as the splash of Froggy accidentally leaping into the drink, and the "*nnnyeauuuu*" that signals he got home safely, have been carried out very well.

Except for a few points, the graphics are very good. The diving turtles could use some more work, but the frogs, the logs, the cars, and the crocodiles are colorful and clearly defined. However, the five docks where you are trying to park your frog are almost invisible. The slots are black, as is the entire strip of ground that surrounds them. It takes a bit of squinting to get those frogs home. This was not a problem in the arcade version.

The play action of the game is excellent, both with the joystick and the keyboard. You have slightly better control with the keyboard, but it takes a little while to memorize which keys you selected to maneuver the frog.

Frogger is a good, basic, classic game and, at this point, one of the best offerings for the Commodore 64. If the game has a drawback, it is that *Frogger* is now two years old, and you may have already overdosed on this game in the arcades. If not, I recommend *Frogger*.

Frogger
Sierra On-Line, Inc.
Coarsegold, CA 93614
(209)683-6858
$34.95

VIC Music Composer

Gregg Peele,
Programming Assistant

Musicians have coped with the problems of writing and rewriting music passages before Beethoven ever scribbled his scores on parchment. Many an eraser has been demolished while writing music, and many early versions of great masterpieces have ended up in the trash simply because there was no simple way to edit music.

With the advent of word processing, many writers no longer write text over and over again, discarding earlier versions for later improved versions. They simply edit their text to their liking on a screen and then use only the final version. Why not transfer what we have for text editing to the composition of music? The *VIC Music Composer* does just this – providing a dynamic method of composing, editing, and playing music passages. It provides a creative tool which makes simple music composition a much less frustrating task.

Composing Options

When you first turn on the computer (with the *VIC Music Composer* cartridge in the expansion port), a menu appears on the screen, prompting you to select one of four modes of operation: Compose, Play, Save, or Load. If you select the Compose mode, you can choose among any of the three tone generators for composition. Next, you are asked whether you want to clear the memory of all the notes that you have previously composed. You are then asked to specify a key signature and the time signature for your composition.

After these preliminary choices are made, the screen displays the grand staff, including both treble and bass clefs. A large red cursor flashes at the bottom of the screen, and seven notes – each with a different time duration value – are displayed. By placing the cursor over the desired note value and pressing RETURN, you can "lock" the note value directly over an arrow which defines its horizontal position on the screen. The note is then moved up or down the grand staff by using the up/down cursor key. To select the final position of the note, press RETURN once more.

Once the note is fixed in its position, the screen returns to its original display, plus the note that you have just added. In the same way, you can add rests, bar lines, and dotted notes. The delete key removes any note on the screen. Notes can be inserted merely by moving the arrow to the appropriate place and entering your choice. The number keys (1-6) choose the volume (one is softest; six is loudest).

Instant Playback

Since music on paper (or on the screen) gives the composer only a rough idea of how the music actually sounds, *VIC Music Composer* includes a Play mode so you can hear the composition performed. Since the program can display only one voice at a time (although it can play all three at a time), the Play mode

Composing music on the screen with VIC Music Composer.

asks you which voice should be displayed during playback. Then you select one of nine different tempos, and the music begins to play.

Other options in *VIC Music Composer* allow you to save and retrieve music on tape or disk. The program uses all the normal VIC prompts for loading and saving. Once the cartridge is in place, however, there is no way to call the disk directory. If by accident you load a BASIC program instead of a music file, the system may act unpredictably.

The *VIC Music Composer* transforms the VIC into an enjoyable instrument for simple music composition. With this tool, music students can create compositions with up to three separate voices and achieve the immediate gratification of hearing their music performed directly after composition.

VIC Music Composer
Thorn EMI Video
1370 Avenue of the Americas
New York, NY 10019
$39.95

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by APROPOS

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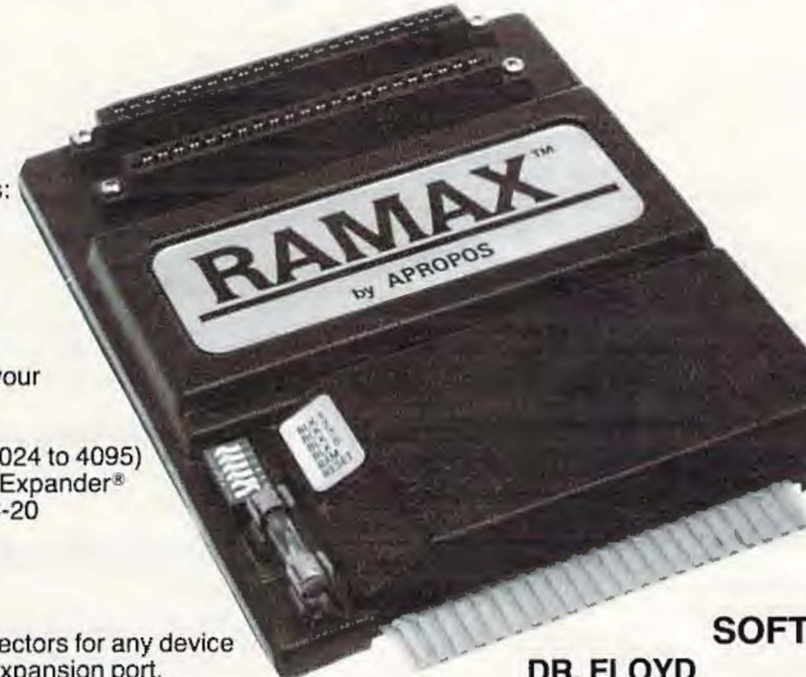

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"WORDPLAY" is a collection of programs which allow the user to make original stories, write a form of Japanese poetry, play the fun game of Animal (children love this one), and create jargon. A bonus secret message (cypher) program is also included. In a word, "WORDPLAY" is a bargain.
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$14.95 shipping included.

All software is on high quality cassettes and is replacement guaranteed.

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APROPOS TECHNOLOGY

350 N. Lantana Ave., Suite 821
Camarillo, CA 93010

COMPUTING for kids

FRED D'IGNAZIO,
ASSOCIATE EDITOR

Build A Computer Friend

What kind of personality does your computer have?

Is your computer a dull, dreary nerd – all technical and stuffy? Or is it a fast-talker, full of jokes, riddles, puzzles, and ideas?

You can give your computer any personality you want by writing a "Computer Friend" program.

Alicia's "Barney"

Recently I was at the West Coast Computer Faire in San Francisco. The Faire is a computer *carnival*. Almost 50,000 people were crammed into a giant arena stuffed with talking, beeping computers, wandering robots, and the BOOM! BOOM! BOOM! of laser cannons and photon torpedoes.

I was at the **COMPUTE!** Magazine booth trying to answer people's questions and tell them about our new **COMPUTE! Books** and the new *COMPUTE!'s Gazette.*

Two people walked up to me. They were, they said, the parents of Alicia Lawless. Alicia had just translated a computer friend program I'd written in **COMPUTE!** so it would run on the Commodore VIC-20. I said I'd like to see the program.

The next day Alicia's parents returned and gave me a cassette with the program on it. They also had a letter from Alicia:

> Dear Mr. D'Ignazio:
>
> My name is Alicia Lawless. I am twelve years old.
>
> I go to Saint Simons School in Los Altos. I entered the Science Fair there and used your program from **COMPUTE!** Magazine (September 1982).
>
> I changed the program so that it would work on the Commodore 64 computer and the VIC-20. I added a small amount of color and changed the face and words.
>
> In my Science Fair project, I compared your Pet Friend (which I renamed Alicia's Barney) in two computer languages: BASIC and PILOT.
>
> My mother told me that you would like to publish my program in the *Gazette*. I'm sending you a cassette with Alicia's Barney on it.
>
> Thank you very much.
>
> Sincerely,
> Alicia Lawless

Taming The Friend

My "Friend" program in **COMPUTE!** was huge – the listing took up several pages in the magazine. Alicia's Barney is much shorter. It's easier to understand and enter into your computer. The VIC-20/64 listing is on page 115.

How Barney Works

Lines 3-20

Lines 3 through 7 begin with the REM (Remark – or "remember") command. REM commands are ignored by the computer. They are for us humans. They tell – in English – what the program does.

Line 10 erases any leftover picture on the TV screen.

Line 20 is a "kill time" loop. The commands FOR and NEXT make the computer spin around in a circle 800 times. The computer counts while it is spinning. It puts its current number into a number cubbyhole (a *variable*) called "P." When the computer gets to 800, it stops counting and jumps to line 30 for the next command. (And it isn't even dizzy!)

Lines 30-80

These lines don't look like computer commands. GOSUB makes them sound like commands to submarines. It appears that you are telling five submarines to Go! Go! Go! (Go where?)

Actually, these commands tell the computer to take a flying leap into other parts of the program – lines 670, 100, 260, 480, and 260. The command GOSUB is an abbreviation for "go to a subroutine." A subroutine is a helper program. It helps the main Barney program do a particular job – like clear the screen, make Barney's eyes wink, or make him "talk":

GOSUB 670	Draws Barney's mouth.
GOSUB 100	Draws Barney's face and makes Barney wink.
GOSUB 260	Makes Barney "talk."
GOSUB 480	Makes Barney accept messages (such as your name).
GOSUB 260	Makes Barney talk again.

Alicia Lawless and "Barney."

Line 90

On line 90, the program prints four blank lines on the TV screen, then jumps to line 940 (GOTO 940).

Lines 940 to 980

On line 940, the computer once again goes around in circles counting up to 2500. Then it erases the picture screen, and, near the middle of the screen, it prints out "***PRESS ANY KEY***."

The computer sits there waiting for you to do something. When you do, it jumps to line 980. Line 980 tells the computer to RUN the Barney program again. This way, Barney keeps coming back on stage, over and over, until you press the RUN/STOP button.

"Alicia's Barney" program on a Commodore 64. (VIC-20 similar).

Bringing Barney To Life

After you have typed Barney into your computer, type RUN and press the RETURN button. Barney appears in the upper-left corner of your screen. At first he is sound asleep. Then he wakes up and winks at you. "I'M BARNEY THE CLONE," he says. "YOUR NAME?"

You type your name (lets say it's CRAB FOOT), and Barney says, "GREAT NAME, CRAB FOOT!"

Then he says, "THANKS FOR PLAYING!" and he vanishes.

A moment later the message "***PRESS ANY KEY***" appears. When you press a key, Barney reappears, wakes up, winks, and asks you your name again.

Adding To Barney

Right now, Barney is a pretty simple-minded fellow. But you can add things to him to make him seem more real. You can make him "talk" using sound effects. You can make him tell jokes or ask riddles. You can change his face and make him look different. You can change Barney into Barbara or into Banana.

I'd like to see your programs and ideas for Barney. Send them to me:

Fred D'Ignazio
c/o COMPUTE!'s Gazette
P.O. Box 5406
Greensboro, NC 27403

I'll print the best Barney programs and ideas in one of my upcoming articles. Have fun playing with your computer friend!

See program listing on page 115.

VIC/64 Mailing List

Joseph J. Shaughnessy

With a few simple changes you can make yourself, this program will work on either the VIC-20 or Commodore 64, with either disk or tape. Expansion memory is not required on the VIC, but will greatly increase the capacity of the mailing list.

The following program is a modified and expanded version of a utility program from the Toronto PET Users Group, called "Addresses" and originally written in Dutch by Andy Finkel. The program has been translated into English and a printer option added. Using a Commodore printer, it can print the entire list or individual mailing labels.

The accompanying program listing is for the VIC-20 and 1540/1541 disk drive, but it can easily be modified to operate with the cassette recorder by changing the SAVE statement in line 55 to read SAVER$. This program also works on the Commodore 64 by inserting extra spaces in the PRINT statements in lines 19 and 60 (to center the title display), changing the DATA statement in line 16 to "64 Mailing List", and by either deleting the POKE statement in line 16 or replacing it with the appropriate POKE statements to set the 64's screen color. (Screen color is green with black letters, but this is your choice.)

Each address field is set up to receive eight items of information, as shown in lines 17 and 18. These items can be changed to anything you want (for instance, to set up a filing system instead of a mailing list), but you are limited to eight items because of the size of the keyboard buffer (line 28). Also, since the DATA statements are printed on the screen as part of the procedure for adding them to the program, you must be careful not to make your items of information so wordy that printing eight DATA statements would cause the first few lines to scroll off the screen and thereby be lost.

At one point, I had a version of this program that used upper- and lowercase letters, but I found this too inconvenient when using the "search" function. I often forgot to use appropriate capital letters either when entering the original information or when inputting the search value.

To aid in searching, names are entered and stored last name first, but they are sent to the printer first name first. Do not use commas when entering your mail list items.

This program will fit into any memory size VIC-20, but memory expansion is necessary to store very many addresses. (For instance, I have 65 names stored, and it takes about 12K of memory.) If you need space for more names (and have the memory) just add more "dummy" DATA statements to the end of the program.

The program prints mailing labels in a single column. Further work could be done to print the labels two or three across the width of the paper, and the formatting could be changed to match the layout of adhesive labels.

I addressed my Christmas cards with this program (tape version) and found it a big timesaver, even though I had to use scissors and tape to put the labels on the envelopes.

A disk drive or printer will certainly enhance the program's usefulness, but they are not essential. The program can probably be modified to run on other computers, depending on the size of the keyboard buffer.

If you don't want to type this program, please send a blank cassette or disk and $3 with a stamped, self-addressed envelope to:

Joe Shaughnessy
4703 Country Club Drive
Pittsburgh, PA 15236

See program listing on page 111.

COMPUTING for grownups

FRED D'IGNAZIO, ASSOCIATE EDITOR

Revolution In The Nursery

There is a computer revolution afoot. It is not a revolution in computer hardware or software. It is a revolution in computer *learning*. Like a classic revolution, it is starting at the grassroots, with the smallest kids. But it is percolating upward through our society like an erupting volcano. All of us will feel its impact: parents and teachers, of course, but also office workers, managers, professionals, and eventually, presidents of corporations and countries.

We are only just beginning to recognize the true power of the computer as a catalyst for learning in the home, classroom, and workplace. Current learning methods such as CAI (Computer-Aided Instruction), computer drills, simulations, and learning games are just the tip of the iceberg.

The computer will soon alter the way family members spend their time together. It will have a bigger impact on daily family life than the TV.

Wave Of Computer Kids

Kids who use computers almost from birth were nonexistent just a few years ago. Now there are thousands of them, scattered through our society. These kids are acquiring models of personal behavior, learning, and views of the world that are profoundly different from those of kids without an early, rich experience with computers.

These kids are now the privileged few, but in just a few years they will be the norm. What happens when this wave of kids hits the schools? Will kindergarten be ready for kids who have been working with numbers and words for years? Will first grade be ready for kids who have been conducting science experiments, programming robot "pets," creating advanced geometric designs, and role-playing in advanced simulations? Will schools be able to offer the rich computer-learning environment the kids are accustomed to at home? Or will there be only one or two computers for 30 or 60 kids? And will the computers and the school curriculum be locked into pre-computer teaching philosophies and methods?

We are at the threshold of a riot of new learning. That's what it will be, too: a riot – rampant, disjointed, and uncontrolled. Each kid will be different. No two kids will be at the same level when they enter the kindergarten. Many kids will have had a rich computer-learning environment since birth. Some will have had no computer experience.

Among those kids who have had exposure to computer learning, there will be a kaleidoscope of backgrounds. Some kids will have used only computer drills, others advanced simulations. Some kids will have had an array of computer tools – light pens, microphones and headsets, robots, musical keyboards, videodiscs, etc. Other kids will have used only a computer, a TV, and a cassette recorder.

The "home computer curriculum" will be completely hodgepodge, dictated by each family's budget, interests, and informal educational philosophy. Computer kids will know a lot, but what they know may be thin and spotty. They may have skills of sixth- and seventh-graders, they may be accomplished readers and whizzes at figures, but there may be no structure, discipline, or order to what they know. They may know advanced concepts, but they may lack basic skills.

This revolution will come, no matter what we do. And it is coming fast. It will soon spread past the homes, past the schools, and into the workplace.

Kids Teaching Adults

"User-friendly" is a buzzword connected with office-automation software. But the real "user-

friendly" programs now in use are not available in the office. They are in the classroom and, especially, in the home. They abandon traditional teaching methods, but they make learning rewarding, exciting, and fun. *And they have universal appeal*. The other night, my seven-year-old daughter was playing with a *Sesame Street* program from Children's Computer Workshop. I came in to watch her. Then her three-year-old brother arrived, then her mother. Pretty soon we were all working with the program, and cheering, squabbling, laughing, and crying. Our involvement with the program – and with each other – was intense. I felt as if we were in front-row seats at an exciting basketball game. Only we weren't spectators, we were all *participants*.

The *Sesame Street* program is unusual, but it will soon be typical of a new generation of computer learning programs that involve the whole family. And the learning will be happening at all levels. The program will be teaching everyone. The adults will be teaching the kids. The kids will be teaching the adults. The kids will be teaching the kids, the adults teaching the adults, and everyone teaching the computer. That night was a rare, exhilarating moment of family interaction, but I believe it will become more and more commonplace as new and better software is introduced.

On The Front Line

This is a wonderful time to be alive. It is a wonderful time to work with children – as teachers in the classroom, and as parents in the home. It is a time that holds great dangers but also great promise.

I'd like to be a reporter on the front line of the revolution in computer learning. Each month, in this column, I'll send you back dispatches from the front. One month I'll be slogging through the mud, along with the peasants and foot soldiers of the revolution. The next month I'll be in the trenches. The month after that, I'll visit the headquarters of the revolution's leaders and talk with the revolution's grand visionaries and strategists.

As teachers and parents (and kids!), you are on the front line, too. So I'd like you to be my eyes and ears. I encourage you to write me and tell me what you see and hear. Most important, share your thoughts and ideas with me. You can reach me by writing:

Fred D'Ignazio
2117 Carter Road
Roanoke, VA 24015

It may take me some time, but I will always try to write back. Also, I will publish your ideas and thoughts in this column – and give you credit.

Taming The Revolution

I will cover a lot of ground in this column, but I will be returning to the two issues I started with above. First, what are the new methods of learning that the computer is opening up to us? How do they compare with the old methods?

Second, how can we coordinate computer learning in both the classroom and the home? How can we tame the revolution and exploit its full potential rather than let it become disruptive and go wild, as revolutions are prone to do?

Exploring New Frontiers

I will use this column as a forum for people interested in computer learning to air and debate their views. But I will also use it as a pipeline to bring you the latest resources in computer learning. I will review and evaluate the latest magazines, books, and software on computer learning – especially materials that are useful to you as VIC-20 and Commodore 64 computer owners. I will try to get the inside scoop on the newest resources, then pass the information on to you. When something new comes out, I'd like to be able to brag that you read it here first.

You can help. If you come across a lead, let me know. I'll track it down and get back to you. Then I'll share it with everyone. This way we can form a computer-learning network, a clearinghouse for new ideas and materials on educational computing.

Around The World In 80 Microseconds

A lot is happening in computer learning. But not all of it is happening in the United States. Much of it (most of it?) is happening overseas, especially in West Germany, Great Britain, Denmark, France, and Japan.

This May I taught a course on computers and robots in London, England. My students were teachers drawn from countries all over the world. Upon completion of the course, each student returned to his or her country to start computer and robotics literacy programs there.

London, in particular is a hotbed of computer learning. And while I was in London, I attended two international conferences – one on robotics and one on computers in education.

In future columns, I'll pass on to you what I learned.

Who Am I?

Who am I? What gives me the right to become your correspondent at the computer-learning front?

Perhaps my best credentials are that I am a parent – a concerned parent. I have two little kids – Catie (7) and Eric (3). Catie has been working closely with computers since before she was two. Eric has been banging, sitting on, and dropping computers since he was less than a year old. (For more on Eric and Catie's adventures with computers, see my "World Inside The Computer" columns in **COMPUTE!** in July and August 1982, and in February 1983.)

I have been getting kids and computers together ever since I carted a briefcase-sized portable terminal into an elementary school classroom in Washington, D.C., early in 1974. The kids and I plugged the terminal into a telephone, dialed up a huge mainframe computer in Chicago, and spent most of the morning playing *Hunt The Wumpus*.

Since then I have written 15 books about kids and computers, including *Katie and the Computer* (Creative Computing Press, 1979), *The Creative Kid's Guide to Home Computers* (Doubleday, 1981), *Chip Mitchell: The Case of the Stolen Computer Brains* (Dutton/Lodestar, Spring 1983), and *The Star Wars Question & Answer Book About Computers* (Random House/Lucasfilm, June 1983).

I've done a lot of exploring on my own, and now I'd like to do some exploring with you. So, climb aboard. I can use all the help I can get.

Wordspell

Richard Herrmann

"Wordspell" is an educational program for spelling practice designed for the unexpanded VIC-20, and translated for the Commodore 64.

"Wordspell" makes good use of what is called the "dynamic keyboard" technique. This allows a program to modify itself as it is running. In Wordspell, the practice spelling words you enter become part of the program. At the beginning of the program, you are prompted to enter 20 words. After the words are entered, the dynamic keyboard routine merges them into the program as line-numbered DATA statements. This permits you to SAVE the program with the words included so they will not have to be reentered for the next practice session.

Once the spelling list is entered, it is presented one word at a time. The words are quickly spelled letter by letter and then disappear. You then type in the word, and you are told if it is correct – or you're shown the correct spelling if it is wrong. At the end of the program, a score is displayed, as well as a list of the misspelled words. The user now has the option of quitting the program, running the same words or entering new words.

Notes On The Program

REM statements point out major routines.

DATA statements are created as lines 1, 5, 9, 13, and 17.

Main variables:

A$( ) – DATA array
B$( ) – Create word list array
W$( ) – Misspelled words array
A$ – INPUT of user spelling

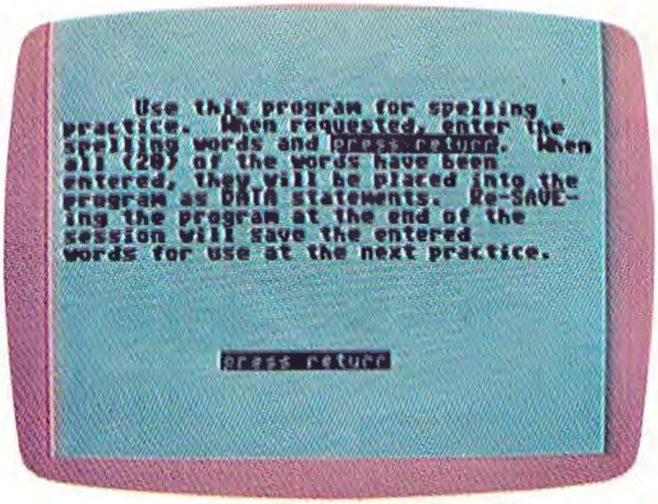
With a little work, the program could be modified to accept more or fewer than 20 words.

Color and sound responses (lines 81 and 82, VIC version) could be altered to suit personal taste.

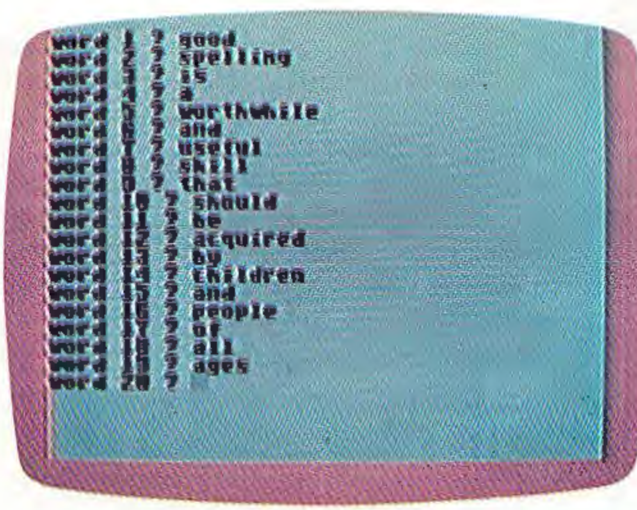
Timing loops (lines 37 and 46, VIC version) for viewing letters and responses may be easily altered to adapt Wordspell to different age groups. My nine-year-old son finds the default values suitable.

The VIC version of this program also works on Upgrade ROM Commodore PET computers if you change POKEs 198 and 631 (lines 57 and 58) to 158 and 623, respectively, and adjust the PRINT statements for the proper appearance on the PET 40-column screen.

See program listings on page 114.



A sample screen of "Wordspell" on the Commodore 64 (VIC-20 screen similar).



Entering a list of practice spelling words.

VICreations

DAN CARMICHAEL, ASSISTANT EDITOR

This month we'll talk about the proper care, handling, and maintenance of disk drives, diskettes, cassette recorders, and tape cassettes.

Everyone who has worked with computers for some time knows the empty feeling of having lost a valuable program or data file. It might have been stored on a cassette tape that was creased when it became entangled inside the cassette recorder. The program is lost forever, along with the time it took to create it.

While some may take it for granted, data storage and retrieval may be one of the more important aspects of computing. After all, think of how inconvenient it would be for the computerist if there were no storage media. To run your favorite program or game, you would have to retype it every time you sat down at your keyboard – that or leave your computer on 24 hours a day. Or consider how large and expensive a computer would have to be if you couldn't retrieve data from an external device such as a disk drive, and it all had to be stored inside the computer.

Because input and output storage devices are so crucial to computing, the proper handling and care of these devices is especially important.

Cassette Decks And Tapes

Although quite a bit slower than disk drives, cassette decks are dependable storage devices. The obvious advantage of cassettes is cost – about $65 for the new Commodore C2N cassette deck compared to about $350 for the Commodore VIC-1541 disk drive. Also, blank cassette tapes are relatively inexpensive, small, and easy to store in their protective plastic cases.

When using cassette decks, it is important that you follow the manufacturer's instructions. For instance, Commodore recommends that you place the cassette deck at least two feet away from your TV set or monitor. Never place the cassette next to or on top of the TV. This is because most TVs, radios, and monitors emit magnetic fields and radio frequency signals (called RF). These fields and signals interfere with the normal operation of the cassette deck and might cause errors while saving or loading programs with the VIC. Another important point to watch is temperature. As is true with all computer equipment, do not expose the cassette deck to extreme hot or cold temperatures or moisture. These can be most damaging.

Cleaning the cassette deck heads, capstan pinch roller (the little black rubber roller inside the cassette deck), and tape guide is also important. Commodore recommends that you clean the deck after every 10 to 20 hours of use. You should refer to the instruction manual for complete instructions, but these additional tips may help. Never use alcohol or any solvent that might hurt or damage the plastic or rubber parts in the deck. It is recommended that you use a regular tape cassette head cleaner. These cleaners are widely available at audio stores. When applying the cleaner, do not use the type of cotton swab that is so soft it will leave particles of cotton on the tape heads. Even a tiny speck of cotton on the head can cause tape errors. After cleaning, you should always wait a few minutes before inserting a tape cassette into the deck to be sure that any remaining cleaner has dried. The head cleaning solvent could damage the magnetic tape.

The type of magnetic tape you use is also very important. As is true with audio applications, the better-quality magnetic tapes will give you better performance. For most purposes, audio quality tapes found at your local stereo store will suffice for data recording purposes. Commodore recommends that you *do not* use digital-quality recording tapes. Digital-quality tapes are often advertised as being specifically for use with computers, and are sometimes referred to as certified tapes. Also avoid magnetic tape with other than normal bias, such as high bias chromium dioxide tape.

The latest Commodore manuals suggest using cassettes that are 12 to 30 minutes in length, warning that longer tapes can strain the recorder. Commodore also recommends rewinding the tape back to the leader before placing it in its protective plastic case. Leaving the magnetic tape exposed could subject it to damage. Remember to always store tapes in their plastic cases.

Disk Drives And Diskettes

Floppy disk drives are the most efficient medium for data storage and retrieval with home computers. Disk drives such as Commodore's VIC-1540/1541 provide reliability, speed, and ease of operation. But the disk drives and diskettes are very delicate and demand the utmost in care and handling. Here are some hints and tips that should help you achieve many years of error-free performance.

Although there is very little the untrained person should do to the disk drive, there are a few minor things the home computerist can perform.

Proper care of your equipment is a must for reliable operation.

One is keeping the drive clean. Disk drive cleaning kits are available at your local computer shop. These kits contain instructions on the care of disk drives, cleaning fluid, and a special floppy diskette that is composed of a cloth-like material. To clean the disk drive, you place a little cleaning fluid on the cloth diskette, then insert it into the disk drive. As the diskette spins, it acts as a sort of spinning cotton swab, cleaning the magnetic heads in the drive and any other surface that comes into contact with the floppy disks. Although the instructions recommend that you use the cleaning kit once a week, for most home applications once a month should do.

Another bit of preventive maintenance you might perform at home is removing the dust from inside the disk drive. The easiest way to accomplish this is to carefully remove the cover from the disk drive and blow out the dust with compressed air. You can purchase canned compressed air at your local camera store. This air is specifically made for removing dust.

However, there is a word of caution to be observed here. If the canned air is handled wrong, it can spray moisture that could harm your disk drive. Read all directions carefully, and keep the can level at all times. Never use a vacuum cleaner or any other such device to remove dust. This maintenance should be performed about once every six months. Unlike most manuals, the 1541 manual does not warn that opening the disk drive cover will void the warranty. In fact, it recommends opening the drive for other purposes, such as changing the device address number for multiple-drive systems.

Using And Storing Diskettes

Commodore 1540/1541 disk drives can store up to 144 directory entries and 174,848 bytes on each floppy diskette. Should one of your diskettes become damaged, it would take a lot of work to recreate this much information. This is why the handling and storage of floppy diskettes is so important.

When handling floppy diskettes, observe the following tips. Always keep the diskette in its protective sleeve. Even if you remove the diskette from the drive for a brief second, return it to its protective sheath before laying it down. Never touch the shiny (magnetic coating) part of the diskette, because the oils on your fingers could contaminate it. Don't bend the diskette. If it should become even slightly bent, it will not spin properly in the disk drive. Always insert it and remove it from the disk drive carefully. Never force it.

Always store diskettes at least 12 inches away from the TV set or any other magnetic source. Always store diskettes in a vertical position; never stack them atop each other. Store them away from a direct source of heat, or any other temperature extremes. Most manufacturers of floppy diskettes recommend that you store them between 50 and 125 degrees Fahrenheit (10 to 52 degrees Centigrade).

If you observe these rules, your data storage devices should supply you with many years of enjoyable, productive performance.

Global Scan For VIC And 64

Lee Wimbs

Written in straightforward BASIC, this program will work on both the VIC-20 and Commodore 64 without modification.

Does the thought of navigating the open seas in a sailboat set your pulse racing? Is geography your thing? Do you have a child who needs map-reading practice? Or do you simply like to know the distance between two locations when you're traveling? If any of your answers are yes, then here is the program you've been waiting for.

Given two locations by latitude and longitude, "Global Scan" can supply:

1. The distance between the two locations in miles;

2. The distance between the two locations in kilometers;

3. The direction in degrees from true north.

This BASIC program will run with little or no modification on most computers, including the unexpanded VIC-20 and Commodore 64. There's nothing fancy or complicated about this program – just type it in and RUN. When asked for the name of location A, enter the first city or location. Press RETURN. You will then be asked for the latitude position, in degrees. Enter and press RETURN. Follow the same procedure for the minutes and the seconds.

The program will then ask if the information is correct. If you enter an N, the program will cycle back to the first entry for degrees so you can

An Introduction To Map-Reading

"Global Scan" asks for both the *latitude* and *longitude* of the two locations you select. For this you will need a good map, atlas, or globe (most road maps do not include this information). Latitude and longitude are imaginary lines which circle the globe east-west and north-south. For centuries, navigators and geographers have used these lines to pinpoint locations all over the Earth.

Latitude lines run east-west and are used to measure distances between north and south.

Longitude lines run north-south and are used to measure distances between east and west.

Both latitude and longitude are calculated from two other imaginary lines which circle the Earth east-west and north-south. The east-west line, which girdles the globe like a belt around a waist, is the *equator*. The north-south line, which circles the globe through the north and south poles, is the *prime meridian*. Sometimes the prime meridian is called the *Greenwich line* because it passes through Greenwich, England.

Latitude and longitude are measured in *degrees* from the equator and Greenwich line. The equator is zero degrees latitude, and the Greenwich line is zero degrees longitude. On maps and globes which have latitude and longitude lines, the degrees are usually marked on the sides of the map or along the lines themselves.

Global Scan also asks you for *minutes* and *seconds* for each location. These are fractions of degrees used for finer positioning. Each degree is divided into 60 minutes; each minute is divided into 60 seconds. If your map or globe is not detailed enough to have this information, you can estimate it. For example, Detroit, Michigan, lies between 42 degrees and 43 degrees north latitude. It is about one-third of the way north of the 42-degree line. When Global Scan asks for the latitude of Detroit, you could enter 42 degrees, 20 minutes (one-third of 60), and 1 second (note that the program will not accept a zero entry). Naturally, the more exact your input, the more accurate will be the program's results.

For further information about map-reading, consult a good encyclopedia or geography book.

correct your entries. If you enter a Y, the program will request the information for the second location. If all of your input is correct, the program will display the proper results on the screen.

Here is a brief summary of how the program works:

Lines 30 - 110 obtain the name and latitude of location A.

Lines 120 - 170 obtain the longitude of location A.

Lines 190 - 270 obtain the name and latitude of location B.

Lines 280 - 330 obtain the longitude of location B.

Lines 360 - 450 print the distance between A and B.

Lines 480 - 620 do the math.

Lines 660 - 760 ask if input is correct and check for zero input.

Remember to enter degrees, minutes, and seconds separately. The program will not allow a zero to be entered. If a zero is entered, lines 710-730 will send the computer to line 810 to indicate the operator should reenter the coordinate containing the zero.

If you wish to print the results of this program to keep as a record, a subroutine can be inserted after line 350. This would take the readout from lines 360 to 450 and send it to the printer.

I have used this program to help my father plot his trips at sea, to help my son with his homework, and to plot microwave paths at work (I'm an engineer at a TV station). With a little time and imagination, you can find many helpful and exciting uses for this program.

See program listing on page 113.

Young People

COMPUTE!'s Gazette wants to know what today's young people are doing with computers. We want our readers to know, too. If you've written an interesting program for the VIC-20 or Commodore 64, share it with us. See the Author Guide elsewhere in this issue, and tell us your age when you submit an article.

MACHINE LANGUAGE FOR BEGINNERS

RICHARD MANSFIELD, SENIOR EDITOR

The Easy Way

Don't let anyone tell you that there's something impossibly complex about machine language. It *can* be harder to debug (locate and fix errors) than BASIC is, but it's not inherently more difficult to learn or to write.

You just need to memorize some new commands; obtain and practice with some new tools (assemblers, disassemblers, monitors); and pick up a few new programming techniques. In the next several months, we'll cover these commands, tools and techniques, step by step, in the hope that you'll discover for yourself that machine language can be an easy – and fascinating – way to communicate with your computer.

"RAMtest," the program below with versions for the 64 and the VIC, is an example of one of the most common ways that machine language routines are printed in magazines. This kind of program is called a *BASIC loader*. The value of loaders is that the user need not understand anything about the machine language program. It's the easy way to use machine language. Just type in the BASIC program as it appears, type RUN, and the machine language (the numbers in the DATA statements) is POKEd into memory for you.

Strange Strings

RAMtest is a useful program: it tests your Random Access Memory (RAM) to be sure that every cell is operating correctly. RAM chips are generally quite reliable, but you might have one fail on you. There are various odd things that can happen during a program RUN as the result of a faulty RAM chip. One sign would be the sudden appearance of strange strings. For example, you might type A$="ABCDEFG" and when you asked to see A$ (by typing ?A$), you would get ABC)EFG or something.

Here's how to use RAMtest:

1. Type in whichever version applies to your machine, VIC or 64.

2. Type SAVE (to keep a copy on tape or disk).

3. Type RUN. The data will be loaded into a safe area of your computer which is not part of BASIC RAM. We're loading the machine language program into decimal address 828-1019. This is the cassette buffer RAM, and it's unused by BASIC except during Datassette operations. We can't store the machine language program into normal BASIC RAM because we're going to fill each memory cell with all 256 possible numbers as our test. That would cause the program to test – and thereby obliterate – itself. The cassette buffer is a popular, safe place to put machine language since it is out of BASIC's way.

4. After you see READY on screen, your machine language is sitting down in lower RAM memory (decimal 864-995), waiting for you to activate it. You send control of the computer to a machine language program by using BASIC's SYS command. However, machine language programs do not necessarily start with the first number in their sequence. The *entry point* could be anywhere within the routine. Unlike BASIC, which always begins with the lowest line number, machine language might store text messages or other information below the entry point. That's the case in the RAMtest program. To start it going, type SYS 884.

A Vibrating Square

If all your DATA numbers were correctly typed in, you should now see two things happening on screen. Up in the left corner you'll see a vibrating square. This is a visual demonstration of what's happening to each of your RAM memory cells in turn. As each number from zero to 255 is POKEd into each cell of the computer, it's also being POKEd into the first screen memory cell so you can see it happening. (Machine language POKEs are called "STA," meaning STore the Accumulator.)

The other thing you'll notice is that the decimal address range currently being tested appears on screen. The Commodore 64 version tests cells from 2048 up to address 40960. The VIC test is designed to run on an unexpanded VIC and will go from 4096 up to 7936. At the conclusion, the words "TEST OVER" will signify that every memory cell tested has correctly stored every possible number.

Now, type LIST. You can see the effect of our mass POKEs. For a line number you get 65535. (However, for technical reasons, you can't actually use line numbers larger than 63999 in BASIC.) Line numbers are always stored in two-byte units, and this is the biggest number that the computer can hold within two memory bytes. Following that are more than 200 pi symbols. This is the symbol you get by typing ?CHR$(255). We're not seeing screen RAM memory when we ask for a LIST. Instead, we see a translation of a BASIC program. The series of 255's appear, after this translation, as pi symbols. It means that each of these cells – you're looking at the bottom of BASIC RAM where BASIC programs start – is now holding a number 255 after having held everything from zero up to 255 during the test.

If you want to regain control and return to normal BASIC conditions after this test, you'll need to POKE 2048,0 on the 64; POKE 4096,0 on the VIC. The very first cell in BASIC RAM must contain a zero for things to work correctly.

Most likely, your RAM memory passed the test. Just to see what would happen if there were a bad cell, we can make the test try to POKE into Read Only Memory (ROM). It will try, but ROM is protected against being written over, so the attempted POKE will fail and it will appear to the RAMtest program that there is a bad cell. To try this, LOAD RAMtest from your disk or tape. Then RUN. Then type POKE 885,245. This will set the testing to start at memory cell 62720, and you'll see the results when you start the test with SYS 884.

Next Month: Disassembly

You could write a program in BASIC to perform this same test, but you'd need to start the test higher up in memory and you'd need to leave it RUNning overnight. The great speed of machine language execution makes it ideal for large tasks like RAM testing.

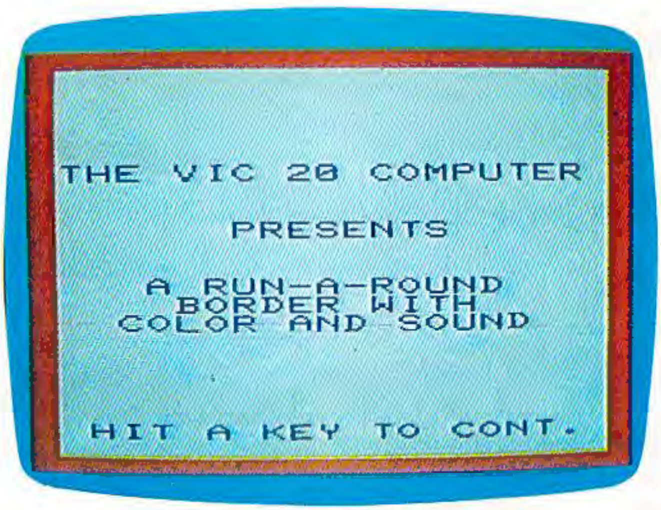
We've loaded in and used a machine language program; we've even modified it by POKEing in a different start address for the test. Save RAMtest on tape or disk. Next month we'll take a closer look at how RAMtest was programmed. To do that, we'll need to type in a BASIC program called a *disassembler*, which will translate raw machine language into a listing called a *disassembly*. That will let us see what RAMtest looks like and how it works.

See program listings on page 125.

VIC Title Screens

Harry E. Watts

Drawing a run-around border with color and sound can add interest to any program title. As a teacher and novice in computer programming, I developed programs on a VIC-20 for use in my classes. After critiquing my work, it was apparent that the programs needed a nice-looking title screen. The demonstration program shows how a border can enhance your title and give a professiohal touch to any program. The border subroutine can also be used for directions, ending programs, or wherever emphasis is needed.



The example program lets you create title screens such as this.

Line 10 is the start of the program, which branches to the border subroutine at line 1000, which clears the screen and sets the border color. The color is defined by the variable C. Remember that the character color is one number less than the keyboard color keys.

Line 1010 sets the volume for the speaker and starts the loop for the top border. Line 1020 POKEs in the screen characters. The demonstration program uses a reverse space (160) to achieve a solid border. A border can be customized to the content of the program by using any screen display code. Many interesting effects can be achieved. Line 1030 POKEs in the screen character color, and line 1040 adds the sound. The program plays low to high notes on a musical scale. Line 1050 creates a short duration period for each musical note and completes the main loop for the top border. Lines 1060 to 1200 generate the right, bottom, and left borders in the same manner. Line 1210 turns off the speaker and sets the volume to 0. Line 1220 RETURNs to the main program.

At this point the title will pop on the screen, giving a dramatic effect. Notice the proper spacing of the title. Remember that the screen display is 20 characters wide by 21 lines with the border. A GET statement in some form should be used to prevent the cursor from crashing the border. The demonstration program uses a simple "Hit a key to cont."

Random colors can also be used in the border subroutine by substituting the following for C in line 1000:

```
DEF FNA(C)=INT(RND(1)*8)
```

Then change C in lines 1030, 1080, 1130, and 1180 to read FNA(C).

```
10 GOSUB 1000
20 PRINT"{5 DOWN}{RIGHT}THE VIC 20 COMPU
   TER"
30 PRINT"{2 DOWN}{6 RIGHT} PRESENTS"
40 PRINT"{2 DOWN}{3 RIGHT} A RUN-A-ROUND
   "
50 PRINT"{5 RIGHT}BORDER WITH"
60 PRINT"{3 RIGHT}COLOR AND SOUND"
70? PRINT"{5 DOWN}{RIGHT} HIT A KEY TO CO
   NT."
80 GET A$:IF A$=""THEN 80
100 END
1000 PRINT"{CLR}":C=2
1010 POKE 36878,15: FOR L=0 TO 21
1020 POKE 7680+L,160
1030 POKE 38400+L,C
1040 POKE 36876,155+L
1050 FOR J=1TO25:NEXTJ,L
1060 FOR L=0TO440 STEP 22
1070 POKE 7723+L,160
1080 POKE 38443+L,C
1090 POKE 36876,176+(L/22)
1100 FOR J=1TO25:NEXTJ,L
1110 FOR L=21 TO 0 STEP-1{2 SPACES}
1120 POKE 8164+L,160{2 SPACES}
1130 POKE 38884+L,C
1140 POKE 36876,219-L
1150 FORJ=1TO25:NEXT J,L
1160 FORL=440TO0 STEP-22
1170 POKE 7702+L,160
1180 POKE 38422+L,C
1190 POKE 36876,241-(L/22)
1200 FORJ=1TO25:NEXTJ,L
1210 POKE 36876,0:POKE 36878,0
1220 RETURN
```

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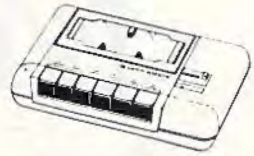

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Hi-Res Graphics Made Simple

Paul F. Schatz

One of the Commodore 64's intriguing features is a *high resolution graphics mode,* which divides the screen into 64,000 dots, or *pixels.* By turning these pixels on and off, you can create finely detailed pictures and charts. But because BASIC lacks special graphics commands, only more advanced programmers could use this mode – until now. This article is a breakthrough in that it shows how to add simple graphics commands to BASIC which anyone can use.

Although the high resolution graphics potential of the Commodore 64 is outstanding, accessing and plotting on the hi-res bitmap (320- by 200-pixel resolution) is inefficient and cumbersome from BASIC.

First, BASIC subroutines for calculating and turning on a specific bit can be confusing and intimidating, especially to novice programmers, since the routines require PEEKs, POKEs, ANDs, and ORs. Second, the routines are slow; many BASIC commands need to be interpreted and executed to plot one point. Third, the bitmap has to be located in memory otherwise used by BASIC. The BASIC program space is limited since it is chopped up and some areas are unusable for BASIC programs.

One solution to all of the above shortcomings is to add some new commands to BASIC which drive the high resolution graphics. This article will describe a method for adding four commands.

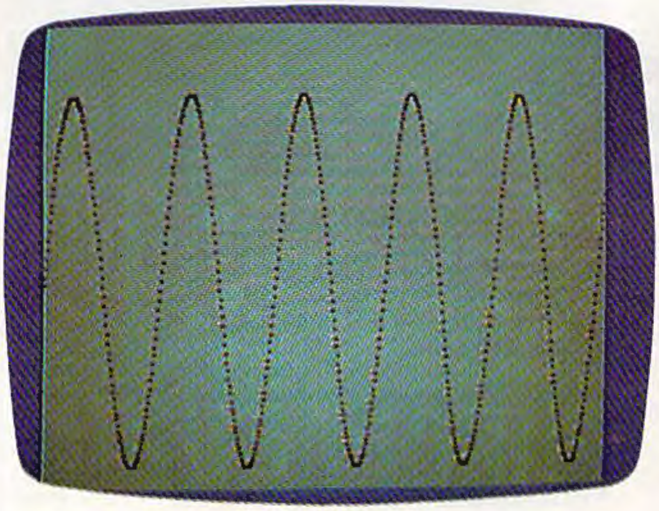
Modifying BASIC

Since there is Random Access Memory (RAM) under the BASIC Read Only Memory (ROM), we can copy an image of BASIC into RAM and then modify it to suit our needs. I have modified BASIC by substituting four new commands, HUE, PLOT, WIPE, and SCREEN, in place of four seldom-used commands, LET, WAIT, CONT, and VERIFY.

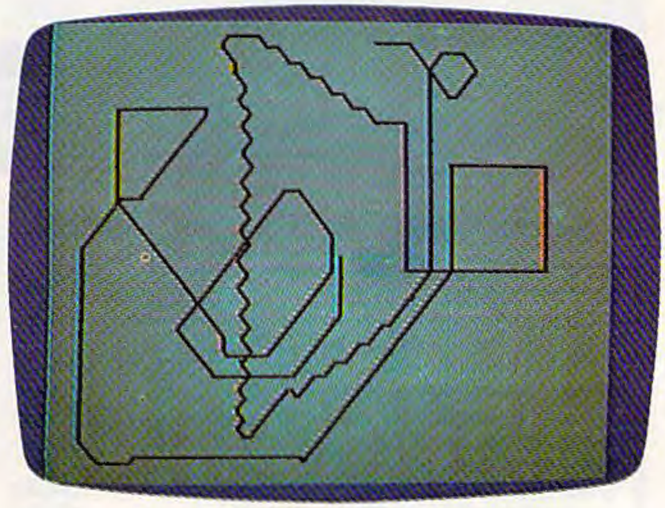
Briefly, here's how the new commands were added to BASIC. First, notice that the new keywords are the same length as the keywords they replace. A new keyword has to be mapped exactly into an old keyword's spot in the keyword lookup table. Next, the pointers to the old BASIC routines are changed to point to the routines for the new keywords. Finally, the error message routine is modified so the computer switches to the normal character display if an error is encountered during execution of a program.

A Note To Programmers

The graphing routines were developed with an eye on giving up as little of the BASIC program memory as possible. Not a byte has been lost. This was accomplished by using the RAM memory under the Kernal ROM for the bitmap. Bitmap plotting at this location can only be done properly using machine language routines, since the interrupts have to be turned off and the Kernal ROM switched out to PEEK at the RAM memory. The video matrix, used for the background and foreground color nybbles, is located at \$C000 and the machine language graphing routines extend from \$C400 to \$C545.



A sine wave plotted on the Commodore 64's high resolution graphics screen with Program 2.



Joystick doodles in hi-res graphics with Program 3.

The New Commands

The four new commands, SCREEN, HUE, WIPE, and PLOT, are explained below.

• SCREEN <number>

This statement turns on and off the high resolution bitmap. If the number is 1, the bitmap is displayed. If the number is 0, the normal character screen is displayed. Any value other than 1 or 0 will give an ILLEGAL QUANTITY ERROR.

• HUE <number>, <number>

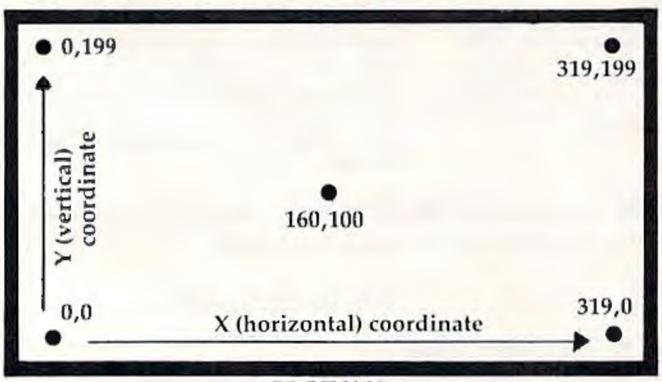
This statement determines the colors displayed on the bitmap. The first number defines the foreground color (color displayed for bits set to 1). The second number defines the background color. A number 16 or greater will give an ILLEGAL QUANTITY ERROR. The color codes are:

0 Black	4 Purple	8 Orange	12 Gray2
1 White	5 Green	9 Brown	13 Light Green
2 Red	6 Blue	10 Light Red	14 Light Blue
3 Cyan	7 Yellow	11 Gray1	15 Gray3

• WIPE

This statement causes a high-speed clear of the bitmap. All the bits are set to zero and the screen is cleared.

Coordinates For PLOT



PLOT X,Y

• PLOT <number>, <number>

This statement sets a bit on the bitmap, causing the corresponding pixel on the screen to be displayed in the foreground color. A coordinate system with an origin (0, 0) at the lower-left corner is used (see the figure). The first number is the horizontal position relative to the origin, and the second number is the vertical position relative to the origin. The first number can have values from 0 to 319, and the second number can have numbers from 0 to 199. Numbers outside these ranges give an ILLEGAL QUANTITY ERROR.

Loading In The New BASIC

The new BASIC is loaded into the Commodore 64 by entering and running Program 1. When entering the program, be accurate, since an incorrect number may cause the computer to crash (forcing you to switch it off and on to clear it). To be safe, SAVE the program before running it for the first time. A checksum is included to warn if there is a mistake somewhere in the DATA statements. It will take the computer a minute or two to run the program. To enable the new BASIC, enter:

```
POKE 1,54
```

The new BASIC can be disabled by pressing the RUN/STOP and RESTORE keys simultaneously or by entering:

```
POKE 1,55
```

When entering programs using the new graphics commands, the new BASIC must be enabled so the tokenizing routine will recognize them. The commands they replaced will no longer work unless the new BASIC is disabled.

Some Simple Programs

We are now ready to enter and run a couple of simple programs using the new BASIC. First, a simple sine wave. Load and run the new BASIC, type NEW, switch on the new BASIC, and enter Program 2.

Now type RUN and watch the sine wave appear. Wasn't that easy? Compare this program with the one in the *Commodore 64 Programmer's Reference Guide* (pp. 122-26) for ease of programming and speed of execution.

Now, how about a joystick-driven doodle pad? Be sure Program 2 is saved. Then type NEW and enter Program 3. Plug a joystick into port two.

Only The Beginning

Programs written with the new BASIC can be loaded and saved in the normal fashion (but remember, we did away with VERIFY). My purpose was to provide a useful rudimentary graphing tool and to demonstrate the ease with which BASIC can be modified to include new commands. There are numerous extensions of both aspects which could be implemented. For example, a high-speed line drawing command, LINE; or a new command similar to the ON-GOTO statement but with the branching determined by the joystick position, i.e., JOYGOTO, or JOYGOSUB....

See program listings on page 111.

The Four-Speed Brake

Dan Carmichael, Assistant Editor

Here's a short program to vary the speed of your listings without using any BASIC programming memory.

One small inconvenience of programming with the VIC-20 or Commodore 64 (if you don't have a printer) is the limitation of being able to display only relatively small sections of your programs on the screen at one time. If you have a large BASIC program, listings of the program can be hard to follow. Even slowing down the LIST command with the CTRL key isn't much help at times; the BASIC lines still pass by at a reasonably fast rate, and because of the way the lines "jump," they can be hard to follow.

The short programs that follow (one for the VIC and another for the 64) will help slow things down for you. It is a "Four-Speed Brake" that will let you vary the speed of your listings from reasonably slow to a complete stop. The program is written in machine language, and normally sits undisturbed in some available memory called the *cassette buffer*. Once it is POKEd into memory, it will use none of your available BASIC programming memory. The VIC version works with either the unexpanded or expanded VIC.

How To Use The Program

First, load your BASIC program into the computer, then either append this program onto it, or type it in after your program. Before running the program for the first time, verify it carefully, and save it to tape or disk. An error in this (or any) machine language program can cause your system to "crash," forcing you to turn your computer off/on to reset. After verification, type RUN 60000 and press RETURN to POKE the machine language program into the cassette buffer. Then type SYS828 and press RETURN. The Four-Speed Brake is now running.

The program is controlled by the special function keys. The chart illustrates what the function keys do.

To stop Four-Speed Brake, press RUN/STOP-RESTORE; to restart, enter SYS828.

After the Four-Speed Brake has been successfully POKEd into memory and tested, you may, if you wish, delete lines 60000-60040. Also, the CTRL key will still work as it normally does in slowing down your listings, and might be considered a "fifth speed," a little faster than the F-1 key.

The Four-Speed Brake also has another important benefit. It will slow down or stop the running of your BASIC program just as it slows the LIST command. This can be a very useful tool for debugging your BASIC program. To do this, use the Four-Speed Brake in the same manner as you would for the LIST command; enter SYS828 then run your program. The function keys will then slow down or stop your BASIC program in the same fashion.

Special Function Keys

F-1	fastest speed
F-3	medium speed
F-5	slowest speed
F-7	complete stop

Words Of Caution

First, this program runs in the cassette buffer, and as is true with all programs in this buffer, you cannot use the tape cassette while this program is running. Second, because of the way the computer outputs the lines while listing programs, you will encounter a glitch every now and then. It will appear as if one line repeats itself. If you continue to hold down the function key and let the screen scroll, it will take care of itself. You can observe why this happens if you list a program while holding down the F-5 key.

For you machine language programmers, the Four-Speed Brake will also work for you, both in listing and running your ML programs. To use, enter SYS828, then SYSXXX into your ML monitor as usual, or SYSXXX into your machine language program. However, a word of caution is needed here. The Four-Speed Brake uses all three registers (A, X, and Y), so you'll have to be careful when using these registers in your own program.

See program listings on page 125.

Disk Menu

Wayne Mathews

"Load-and-go" disk menu programs are popular with users of all types of computers. Now there's a version for the VIC-20 and Commodore 64.

The VIC-1540/1541 Disk Drive is a great boon to computing. But when you have a large number of programs on a single disk, the task of loading and listing the directory to find a certain program leaves much to be desired. I originally started this program to create a neater directory display, and then added the autoload and autorun features. The program is easy to use and self-explanatory.

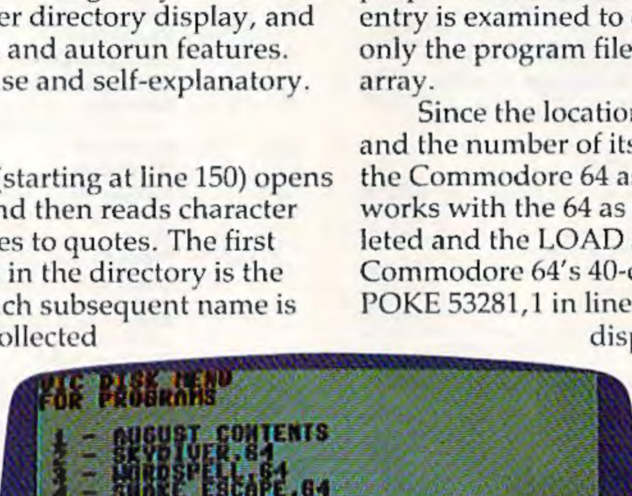
How It Works

The "directory peeper" (starting at line 150) opens the "$" (directory) file and then reads character by character until it comes to quotes. The first word enclosed in quotes in the directory is the name of the disk, and each subsequent name is that of a file. These are collected in the P$ array.

To load or load and run programs, first the LOAD statement is printed on the screen. Then the cursor is moved up three lines so that it falls on the line of the LOAD statement after the program ends. Line 510 shortens the file name so that the load statement fits on one line if the name is long. The rest of the program automatically executes a RETURN (for the load option), or a RETURN-RUN-RETURN (for load and run). The program then ends, the keyboard buffer is emptied, and the program is loaded. If load and run was selected, the keyboard buffer continues to empty, and the program is run.

The program does not discriminate between programs and other types of files. For my own use, this is an advantage because I can examine the names of data files with the menu program. If you don't want data files listed, the directory peeper can be modified so that byte 0 of each file entry is examined to determine the file type, and only the program files will be loaded into the P$ array.

Since the locations of the keyboard buffer and the number of its characters are the same in the Commodore 64 as in the VIC, this program works with the 64 as well. Line 510 could be deleted and the LOAD statement would fit on the Commodore 64's 40-column screen. Also add POKE 53281,1 in line 110 for a more readable display on the 64.



The Disk Menu as it appears on a Commodore 64 (VIC-20 screen similar). Programs can be loaded and run at the touch of a key.

The current menu will hold 100 programs. If this number is not suitable, you should change the value 100 in lines 140 and 330.

The autorun can also be used to chain programs, with one program loading the next, or loading a menu which ties together several related programs.

If the menu program is saved as the first program on the disk, it can be loaded using the statement LOAD "*",8.

See program listing on page 113.

Using A 1540 Disk Drive And Commodore 64

Bobby Williams

This is the second in a continuing series of short utilities and routines which use machine language to enhance the power and usefulness of your computer's BASIC. This article lets you create a machine language utility (with BASIC) that makes the adjustments for using a 1540 disk drive with a Commodore 64.

Do you want to use a VIC-1540 disk drive with the Commodore 64? Normally they won't work together reliably, but there's a way around that problem. I'll also give you a short machine language program which will make the necessary adjustments for you automatically.

Some background: Commodore makes two models of disk drives for its home computers – the VIC-1540 and the VIC-1541. Outwardly, these drives are identical, except for their model numbers. Inside, though, one chip is different. The 1540 drive is intended only for the VIC-20 computer, and normally this chip must be replaced before the 1540 can be used with the Commodore 64. The newer model 1541 drives basically are 1540s with this new chip factory-installed. The 1541 works with either computer.

However, it is possible to trick the Commodore 64 into working with the 1540 drive. Before loading a program from disk, type:

POKE 53265,11 [Press RETURN]

This blanks out the screen. Next, working blindly (your keystrokes will not be displayed), execute the usual LOAD"file name",8 command. After the program is loaded, restore the screen by typing:

POKE 53265,27 [Press RETURN]

You may then proceed as usual. This trick works because the Commodore 64's screen interferes with 1540 disk drive operations unless it is shut off. But typing those POKEs all the time is tiresome.

Let The Computer POKE

Fortunately, computers are quite good at doing tiresome work. So, the solution is to write a short machine language program to do the POKEs for us. Then we can tuck the program into memory somewhere so it won't interfere with BASIC programs.

While we're at it, we can also let the utility program add the ,8 to our LOAD commands so they automatically default to the disk drive instead of the cassette recorder.

The following program, although listed in BASIC, creates the machine language utility and hides it away in memory. Carefully type and save this program before running it:

```
10 FOR I=704 TO 723:READ A:POKE I,A:NEXT
   :POKE 816,192:POKE 817,2
20 DATA 72,169,11,141,17,208,169,8,133,1
   86,104,32,165,244,169,27,141,17,208,96
```

Now, run the program and try loading a file from the 1540 disk drive. Remember to leave off the ,8. Example:

LOAD"file name" [Press RETURN]

This utility also works with the VERIFY command.

If you want to load a program from another device besides the 1540 (for instance, the cassette recorder), reset the computer by holding down the RUN/STOP key while pressing the RESTORE key, and then proceed normally. The utility is not lost and can be restored by typing:

POKE 816,192:POKE 817,2 [Press RETURN]

THE BEGINNER'S CORNER

C. REGENA

Playing Computer Music

Because of this month's topic – creating sound – The Beginner's Corner departs from its usual custom of covering both the VIC-20 and Commodore 64. Since sound is handled very differently on the 64 than on the VIC, this month's column deals only with the VIC.

Using your computer to play music can be a lot of fun. You may run a program to have your computer play a tune, then you can sing along with the computer. If you play a solo instrument, program the computer to play your accompaniment. If you are learning to play a difficult piece of music, have the computer play the piece so you can tell what it is supposed to sound like. Game programs can be enhanced with musical interludes. Educational programs can use music to reward correct responses. Music teachers and students can use music programs to improve the learning process. Any type of repetitious drill work can be done with the aid of the computer.

To program music on your computer, you need to consider volume (loudness), note (pitch), and duration (length of the note). The VIC-20 allows three *channels* or *voices* for music which may be played simultaneously, plus one voice for noises.

Different computers have different commands in BASIC to play music. Other microcomputers may use words such as SOUND and PLAY. In VIC programming the POKE command is used. POKE can be confusing because the form of the POKE statement is POKE *n1,n2*, where *n1* and *n2* are numbers and you need to know what type of numbers to use. *N1* is a *memory location* or *memory address* – a number from 0 to 65535 on the VIC. *N2* is a number that you put in the memory location. On the VIC this must be a number from 0 to 255. Depending on the numbers you use, the computer will act. Some POKE statements refer to graphics; others may change a type of computer operation such as speed or disabling certain keys.

Volume

To turn on the volume to play music, the location number is 36878, and the volume setting can be from 0 (off) to 15 (loudest). The volume is ordinarily turned off, so if you happen to forget this statement in your program you won't hear any music. POKE 36878,15 sets the volume to the highest level.

You may wish to let the numbers be variables:

```
100 V=36878
110 L=15
120 POKE V,L
 .
 .
 .
300 L=10
310 POKE V,L
 .
 .
 .
500 POKE V,0
```

Note Or Pitch

Even if the volume is turned on, you will not hear anything until you tell the computer to play a note. There are three locations that may be used for the sound channels: 36874, 36875, and 36876. Each voice has a different range of tones available. 36874 has the highest notes. The numbers you can POKE into these memory locations for sound purposes may range from 128 to 255, where 255 is the highest note in each range. There are charts in the book that comes with your computer and in the *VIC-20 Programmer's Reference Guide* that translate a note by letter name to the number necessary for computer language.

Let's try a few notes. Here is a short program to illustrate the commands necessary to play a note:

```
100 POKE 36878,10
110 POKE 36874,183
120 END
```

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BUG BLAST

TARGET COMMAND

COSMIC CRUZER

SPACE PAK

HEAD ON

RUN the program and you will hear the note A. Notice that even though the program ends, you still hear the note. You need to POKE 36874,0 to end the sound. You may also turn off the volume by the command POKE 36878,0, or by holding down the RUN/STOP key while pressing RESTORE.

Duration

The computer keeps playing a note until you change the note or tell the computer to stop. Your program may do calculations or draw pictures while the computer is playing notes (that's how sound effects are synchronized with graphics in games). There are several ways to make the computer play a note for a certain length of time and then change to a different note or stop.

One method of delay is to use a FOR-NEXT loop. A loop looks like this:

```
20 FOR D=1 TO 10
25 PRINT D
30 NEXT D
```

The FOR statement tells the computer to perform the loop the first time with D=1, the next time with D=2, the next time with D=3, and so on until D is greater than the limit 10 (the last loop will be with D=10). FOR-NEXT loops are a way of getting the computer to do something many times with only a few lines of instructions. Now, if you delete line 25 above, you will have a FOR-NEXT loop with no commands between, so the computer is just counting from 1 to 10. If you change the 10 to 100, you will notice the loop takes longer to perform. You can get different lengths of time by adjusting the loop limit number. Here is how loops can control the duration of sounds:

```
10 POKE 36878,12
20 POKE 36875,207
30 FOR D=1 TO 300:NEXT D
40 POKE 36875,201
50 FOR D=1 TO 300:NEXT D
60 POKE 36875,195
70 FOR D=1 TO 600:NEXT D
80 POKE 36875,0
90 POKE 36878,0
100 END
```

Keep in mind that with programming there are many ways to accomplish the same thing. Let's suppose we want to continue the tune in the program above and that most of the notes will use the delay loop of 300. We can use a GOSUB to save some typing and memory. GOSUB tells the computer to GO to a *SUBroutine* (a small program within your main program) to perform some lines, then RETURN to the statement following the GOSUB. Anytime you do a procedure a number of times, it may be better to make it a subroutine and use GOSUB. Here is an example:

```
10 POKE 36878,12
20 POKE 36875,207
30 GOSUB 200
40 POKE 36875,201
50 GOSUB 200
60 POKE 36875,207
70 GOSUB 200
80 POKE 36875,215
90 GOSUB 200
.
.
.
180 POKE 36875,0
190 POKE 36878,0
199 END
200 FOR D=1 TO 300
210 NEXT D
220 RETURN
```

To save typing numbers (and to save memory), you could let S=36875. Then every time you need 36875, just type S. In Commodore BASIC you may also leave off the variable in the NEXT statement, and you may combine lines by separating commands with a colon. You may also *tokenize* or abbreviate POKE by typing P, then SHIFT O. You may also leave out spaces to save memory.

The following program illustrates a way to use subroutines and FOR-NEXT loops for various note durations. I let GOSUB 56 represent the length I need for an eighth note. GOSUB 54 is twice as long and would represent a quarter note; GOSUB 52 is a dotted quarter note (equal to three eighth notes in time); and GOSUB 50 is used for a half note.

```
1 REM MELODY
2 POKE 36878,15
3 S=36876
4 T=200
5 POKE S,195:GOSUB 52
7 POKE S,187:GOSUB 56
9 POKE S,183:GOSUB 54
11 POKE S,175:GOSUB 54
13 POKE S,163:GOSUB 54
15 POKE S,175:GOSUB 54
17 POKE S,183:GOSUB 54
19 POKE S,163:GOSUB 54
21 POKE S,175:GOSUB 56
23 POKE S,183:GOSUB 56
25 POKE S,187:GOSUB 56
27 POKE S,175:GOSUB 56
29 POKE S,183:GOSUB 52
31 POKE S,175:GOSUB 56
33 POKE S,163:GOSUB 54
35 POKE S,159:GOSUB 54
37 POKE S,163:GOSUB 50
39 POKE S,0:POKE 36878,0
41 END
50 FOR D=1 TO T:NEXT
```

```
52 FOR D=1 TO T:NEXT
54 FOR D=1 TO T:NEXT
56 FOR D=1 TO T:NEXT:RETURN
60 END
```

Notice that line 4 sets T=200. If you wish to change the tempo of this tune, all you need to do is change this one line. For example, to make the melody play more slowly, change line 4 to T=350 and RUN the program. Now change line 4 to T=100 and RUN. All the note durations stay in the right proportion, but the speed is changed.

Following is a program for the same melody, but using DATA statements to READ in the note values and the duration factors. Line 4 still sets up a variable T so you can change the tempo. (I will explain using DATA and READ statements in more detail in a future column.)

```
1 REM MELODY2
2 POKE 36878,15
3 S=36876
4 T=200
5 READ N,A
7 IF N=-1 THEN 39
9 POKE S,N
11 FOR D=1 TO T*A:NEXT
13 GOTO 5
15 DATA 195,3,187,1,183,2,175,2,16
   3,2,175,2,183,2,163,2,175,1
17 DATA 183,1,187,1,175,1,183,3,17
   5,1,163,2,159,2,163,4,-1,-1
39 POKE S,0:POKE 36878,0
41 END
```

The best way to learn about the music capabilities of your computer is to write your own program. Experiment with the volume to accent certain notes. Try different durations to develop complex rhythms. Try different combinations of numbers with the three different speakers to hear the ranges of tones – and try using more than one voice at a time to harmonize.

Let's Learn Notes: The Keyboard

This program, "Keyboard," is designed for the beginning piano or organ student who is learning the letter names of the notes on the keyboard. A music teacher may use this program before or after a student's regularly scheduled lesson time.

The program introduces the letter names of the keys on a piano or organ keyboard. After the instruction screens, a quiz of ten keys is presented. One of two keyboards is chosen randomly, either keys starting with a group of two black keys or keys starting with a group of three black keys. A red asterisk appears randomly on one of the keys. The student must press the letter name of the key shown. If the response is correct, the tone will be

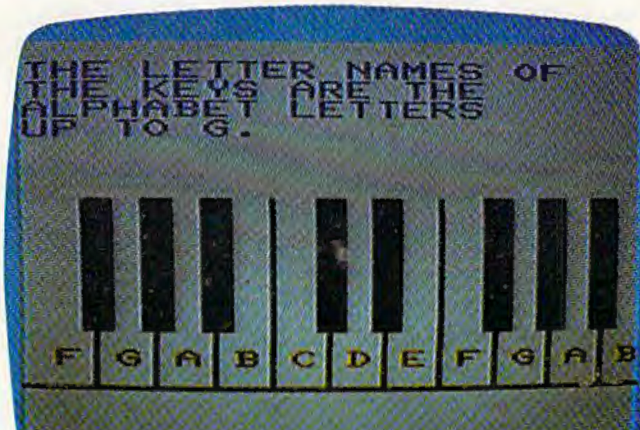
Program Explanation

Lines	
2	Set volume level to loudest; branch past subroutines.
3-16	Subroutines for the notes. AA$ is the letter name of the note. S is the tone number. CC is the column coordinate of the key on the keyboard. K may be 1 or 2 for the two possible keyboards.
20-23	Subroutines for graphics for drawing keyboards. RVS ON and RVS OFF are used to get the black and white keys.
50-51	Print title. SS is the speaker value 36876.
52-54	Using numbers from DATA, play a scale then branch to instructions.
55	Perform the quiz for ten keys.
56	Randomly choose, then draw one of two keyboards.
58-62	Randomly choose a note N. Depending on the keyboard and the note chosen, performs GOSUB to determine note name, tone, and coordinate.
64-66	Blink a red asterisk on the key chosen.
68	Wait for student to press a key.
70-72	If note is incorrect, sound a noise and return for another answer.
80	If note is correct, print name of note on key, play tone, go to next key.
90-94	Print option to try quiz again and branch appropriately.
104-106	Subroutines to draw graphics for keys.
108-111	Subroutine to print "PRESS RETURN" on an instruction screen and wait for student to respond.
150-152	Print first instruction screen.
154-160	Print second instruction screen.
164-168	Print third instruction screen; branch to quiz.
170	End.

played for that key. If the response is incorrect, there is a short noise and the student must try again.

This program uses graphics to help the instruction. The music capabilities of the computer allow the tones to be played so the student can hear the note as well as see the physical placement.

See program listing on page 125.



One of the sample programs shows how to translate the notes of a piano keyboard to make music with a VIC.

64 EXPLORER

LARRY ISAACS

In this month's column I will be reviewing the *Commodore 64 Programmer's Reference Guide* and discussing some topics involving the 1541 Floppy Disk Drive. I'll also introduce a handy disk copy program which will be included in next month's column.

Commodore 64 Programmer's Reference Guide

The *Commodore 64 User's Guide* which comes with the 64 is written to be an introductory manual. It keeps technical terms to a minimum and tries to keep each discussion on a very simple level. As a result, most topics are not covered in great detail. If you plan to do your own programming, this detail will be essential. Fortunately, a second book is published by Commodore to address this need: the *Commodore 64 Programmer's Reference Guide*. This book is available from Howard W. Sams & Co. Inc., of Indianapolis, Indiana, for $19.95. This may seem a bit expensive, but it is well worth the price.

The *Reference Guide* is written for both the experienced as well as the beginning to intermediate programmer. The information is divided into six chapters and 16 appendices. Six chapters may not seem like much, but a great deal is covered in each chapter, and the book totals 487 pages.

The first two chapters pertain to the BASIC language on the 64. The first chapter, "BASIC Programming Rules," gives a number of specific details about the BASIC interpreter. One of the most important topics covered in this chapter is a discussion of each operator available for arithmetic and relational expressions. The second chapter, "BASIC Language Vocabulary," is the primary reference in this book for the BASIC language itself. The majority of the chapter is devoted to describing each of the BASIC commands.

The third chapter covers graphics programming on the 64. This includes how to set up the different graphics screens, plus a very detailed discussion on the operation of sprites. Mostly this involves explaining how the hardware operates. The book does a good job of explaining these technical topics in simple terms. The example programs are written only in BASIC, but hexadecimal addresses for all the memory locations are provided for machine language programmers.

The fourth chapter deals with sound and music. Again, a technical subject, but one covered in fairly simple terms. Primarily this chapter discusses the different features of the 6851 SID (Sound Interface Device) chip. Like Chapter 3, the examples are all in BASIC.

The fifth chapter covers machine language programming on the 64. This includes a discussion of the 6510 instruction set for those who are not yet familiar with it (the 6510 is the main microprocessor chip of the 64). Also discussed are the various memory configurations possible by juggling Random Access Memory (RAM) and Read Only Memory (ROM). The most important part, in my estimation, is the section on the *Kernal* routines. These are routines which may be used by machine language programs to access various functions of the 64's operating system. I used this section quite a bit while developing the program presented later in this column.

The sixth chapter, "Input/Output Guide," discusses the different ways in which the 64 can communicate with the outside world. This includes output to the TV and other devices. It also describes how to use the game, user, and expansion ports. A discussion of the serial bus is included in this chapter as well.

The remaining fourth of the book contains the 16 appendices. These appendices range from a table of abbreviations for BASIC keywords to specifications for most of the special chips in the 64. Throughout, decimal and hexadecimal addresses are given for each important memory location.

If you run into a question about how something should be done, or how something works on the 64, the *Commodore 64 Programmer's Reference Guide* is a good place to start looking for the an-

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swer. This applies to beginning programmers as well as experienced ones. Again, it is well worth the price.

Cassette Versus Disk

Now to move on to the next topic. Before you can begin doing any serious programming, naturally you will need some way to save your work. With

If the 64 is your first computer, or if you are not sure whether to go with cassette or disk, I would recommend starting with the cassette.

the 64, you have two primary choices. These are the C2N Datassette tape recorder and the VIC-1541 Floppy Disk Drive. I won't take the time in this month's column to give an in-depth discussion of the relative merits of cassette versus disk. Future articles in *COMPUTE!'s Gazette* will cover this.

But briefly, the primary advantage of the cassette unit is its low cost (about $65-$75). What you get for the extra cost of the floppy disk drive (about $375) is primarily improved speed and reliability. It is also much easier to store many files on a floppy disk than on a cassette. Manipulating large data files may be impossible on cassette, but not that difficult if they are stored on floppy disk.

If the 64 is your first computer, or if you are not sure whether to go with cassette or disk, I would recommend starting with the cassette. Even if you later switch to the 1541 disk drive, the cassette unit will still come in handy from time to time. The primary reasons for switching from cassette to disk would be that the slowness of cassette is driving you crazy, or some program you write or buy requires the disk for data storage.

For those who have already chosen the disk drive, I will try to provide some information and advice to augment what you receive with your 1541. First, here is a little background information on the disk drive.

Giving Orders To A Disk Drive

In order for a disk drive to work with a computer, there must be some form of *Disk Operating System* (*DOS* – rhymes with *floss*). DOS consists of the programs and routines which manage and manipulate files on the disk drive. Naturally, this implies there must be some way for people to make their wishes known to the DOS. Usually the DOS is a program which runs in your computer, independent of other programs, allowing disk operations to be called for by the user or by programs.

Commodore, from the beginning, has taken a different approach. The majority of the DOS actually is run in the 1541 disk drive instead of the 64. The 64 contains only routines for the LOAD and SAVE commands, plus routines for some input-output commands (such as PRINT#) which permit transferring data to or from the 1541 disk drive.

To execute a DOS command – for instance, to delete a file or program – the command must be sent as data to the 1541 via a command channel. After receiving the command, the 1541 will try to perform the requested operation. If it is unsuccessful, the small red light on the front of the 1541 will begin to flash. For the computer to receive a signal indicating the command was completed, it must read data from the command channel of the 1541. Unfortunately, the extra work required to start up these channels and send the commands or read the error status can be a bit of a nuisance if you are trying to execute DOS commands directly from the keyboard.

Here is an illustration of what I mean. Suppose you wish to delete a file named "OLD FILE". The sequence of commands would be:

```
OPEN 15,8,15,"S0:OLD FILE"
INPUT# 15,EN,EM$,ET,ES
PRINT EN,EM$,ET,ES:CLOSE 15
```

This includes reading the *error status* to insure the file was deleted. Since the INPUT# command cannot be executed as a direct command, the middle statement above would have to be entered with a preceding line number and then RUN, just like any other program. This is a lot of typing just to delete a file.

The Wedge

Fortunately, there is a program on the Test/Demo disk that comes with your 1541 disk drive which will minimize the typing. It is called "DOS 5.1" and is accompanied by another program called "C-64 WEDGE." DOS 5.1 is a machine language program which loads in a free area of memory in the 64 (the 4K region of RAM at $C000 hex, 49152 decimal). Because it is a somewhat special program, you can't just LOAD and RUN it like a BASIC program. C-64 WEDGE is a very short BASIC program which will load and execute the DOS 5.1 program for you. You may simply LOAD and RUN the C-64 WEDGE program to start up the WEDGE.

When executed, the DOS 5.1 program will link, or *wedge*, an additional set of commands into the BASIC language. These commands provide a simple means of communicating with the 1541 disk drive without a lot of typing. Each of these DOS commands must have one of a small set of special characters as the first character of the command. These special characters are the greater-than sign (>), "at" sign (@), slash or divide character (/), up arrow (↑), percent sign (%), and left arrow (←). When one of these characters is found as the first character in a statement, DOS 5.1 will execute the command before BASIC misinterprets it as a typing error.

The ">" and "@" symbols serve the same purpose. At least one of these can be typed without holding down the SHIFT key on every Commodore computer. This is the "@" key on the 64, so it may be the easier to use. This symbol is used in several different DOS commands. If you type @ and press RETURN, DOS 5.1 will read and display the error status of the disk drive. The @ symbol may also be used to read and display the directory of the disk without destroying the program in memory (which ordinarily is not possible). Such a command would be:

```
@$
```

or

```
@$0: (file spec)
```

where (file spec) specifies a pattern to be matched if the filename is to be displayed. DOS commands also are sent using the "@" symbol. The command:

```
@ (command string)
```

would accomplish the same thing as:

```
OPEN 15,8,15
PRINT#15," (command string) "
CLOSE 15
```

A couple of miscellaneous commands use the "@" symbol as well. The command:

```
@#9
```

will change the 1541 device number from 8 to 9. This is useful when you have more than one drive to connect to the 64. However, DOS 5.1 will only access a 1541 addressed as device 8. And finally, the command:

```
@Q
```

will remove the DOS WEDGE commands from the BASIC language.

As for the other symbols, the "/" is used to load BASIC programs and other programs which are to load at location 2048. The command:

```
/MYPROGRAM
```

is equivalent to:

```
LOAD "MYPROGRAM",8
```

The "↑" symbol works the same as the "/" except that it runs the program as well.

The "%" symbol is used to load machine language programs, or other programs which are to be loaded at some other location than 2048. The command:

```
%MYCODE.OBJ
```

is equivalent to:

```
LOAD "MYCODE.OBJ",8,1
```

The "←" symbol is used to SAVE the BASIC program currently in memory. The command:

```
←NEWPROGRAM
```

is equivalent to:

```
SAVE "NEWPROGRAM",8
```

It is important to remember that this command isn't intended to save machine language programs, such as DOS 5.1 itself.

From the discussion above, you can see that DOS 5.1 can be a very handy program. Unless there were specific reasons not to, you would probably want to always have it running.

The Backup Problem

There are some additional programs on the 1541 Test/Demo disk you received with your drive. Since there is always at least a small possibility of having an "accident" with a disk, it is wise to make a backup copy of your important disks. Once a copy is made, you can store the original away in a safe place and use the copy. If something should happen to this copy, or if it wears out, you can always make another copy from the original.

You can copy most programs by loading them into memory and saving them back to another disk. But as you may have already discovered, this won't work with special programs which load via a non-relocating LOAD command, i.e., LOAD "FILE",8,1. The DOS 5.1 program falls into this category.

The Test/Demo disk contains a copy program called "COPY/ALL." However, this program works only if you have two 1541 disk drives. After a fair amount of searching, I was unable to find any information on how you would transfer DOS 5.1 or other such machine language programs to other disks. Actually, I consider it a major oversight for Commodore not to have provided some way to at least copy DOS 5.1, if not some program to copy all such files to other disks.

Since it is better to light a candle than curse the darkness, I wrote a single drive file copy program myself. In next month's "64 Explorer," I'll include a ready-to-type listing of this handy utility, full instructions on how to use it, plus a short program you can run to verify that you typed it in correctly. See you then.

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Official home version of the famous 3-D arcade adventure. Pilot your aircraft through the battlefield and to the showdown with the deadly armored robot. Sound effects and color graphics.
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NEWS& PRODUCTS

Education And Rescue

The Programmers Guild has released three tapes of educational games for the unexpanded VIC and a rescue game for the Commodore 64.

• *Math Escape* presents a series of math problems at graduated difficulty levels; $14.95.

• *Sea Word* teaches grammar, spelling, and vocabulary by having the player unscramble words to defeat the sea serpent. Upper levels require knowledge of the parts of speech; $9.95.

• In *Birthday Party* a clown leads players through a party complete with song, a cake with the correct number of candles, and games. On the same tape is *Story Time*, a game that allows children to fill in the blanks of a story, creating a variety of situations; $9.95.

• *Sub Rescue*, was designed to make use of the 64's sprite graphics and sound capabilities. The strategy game requires you to guide your submarine fleet to rescue stranded divers. Underwater mines and a relentless death ship add complications; $24.95.

Programmers Guild
P.O. Box 220
LaCrescent, MN 55947

Games, Games, Games

Brøderbund Software has converted several of its best-selling games for use on the VIC-20 and Commodore 64. Unless otherwise noted, the games are joystick controlled and sell for $39.95.

• *AE* places you in defense of Earth against squadrons of robot sting rays. The VIC-20 game includes four 3-D screens.

• *Sky Blazer* is the name of the WWIII plane you pilot as you attack the headquarters of the repressive Bungeling Empire. In this VIC game, you'll have to keep an eye on your fuel consumption and limited bomb load, and hope the supply plane arrives on time.

• *Seafox* is an underwater adventure game for both the VIC and 64. You must take on a convoy of enemy ships while dodging depth charges, mines, and torpedoes.

• In *Choplifter!*, a cartridge game for the 64, you fend off jet fighters, air mines, and tank fire to rescue hostages from behind enemy lines. The game, which sells for $44.95, features animation and 3-D graphics.

• *Serpentine*, for the 64, is an arcade action game with 20 levels of play. You, the snake, must dispose of the giant serpents before they dispose of you.

• *David's Midnight Magic* is a high-resolution pinball game that features dual flipper control and multiple ball play. The game, which is available on disk for the 64, does not require joysticks. It sells for $34.95.

Brøderbund Software, Inc.
1938 Fourth St.
San Rafael, CA 94901

Word Processor With Dictionary

Script 64 is a full-function Commodore 64 word processor with a built-in dictionary that can be expanded to 20,000 words. The program includes all normal editing functions plus the ability to hold 40 screen pages in memory at one time, automatic page numbering, headers and trailers, and a redefinable keyboard.

Script 64 works with the Commodore 1541 disk drive and the Commodore 1525 printer. Other serial printers can be used with an optional RS-232 interface.

The word processor, which sells for $139.95, can be used with other CBM disk drives and IEEE printers by using the C-64 Link, an IEEE interface. The C-64 Link also adds 15 BASIC 4.0 commands and allows eight 64s to be chained together to share time on a disk drive or common IEEE printer. The C-64 Link sells for $169.95.

Computer Marketing Services, Inc.
300 W. Marlton Pike
Cherry Hill, NJ 08002
(609)795-9480

Word Processor, Games, And Equipment

Micro-Ware Distributing has a number of new products available for the VIC-20, including *Word Wizard*, an all-machine language word processor.

Word Wizard requires memory expansion of at least 8K. It uses standard VIC-20 commands and includes search functions, page layout commands, flexible print routines, and routines to save to either tape or disk.

The program displays the amount of memory left for text input, and it allows a joystick to be used to scroll horizontally or vertically to view the entire document. *Word Wizard* is available on cassette for $34.95.

Micro-Ware's games include

Key-Quest, a high-resolution adventure, and *Triple Play*. In *Key-Quest*, you wander through a dungeon stealing treasures from the Gorbs. After you've accumulated enough booty, a magic key appears. Pick it up and unlock the passage to the next level. The game is available on cartridge for $34.95.

Triple Play is a tape loaded with three word games. "Crosswords," which requires an 8K expansion, includes five complete crossword puzzles. "Crypto-solve" is a message decoding game. Enter your own messages or work on one of the 50 puzzles provided with the program. "Hidden Words" generates a matrix of letters on the screen. Your job is to find a set of randomly placed words in the matrix. *Triple Play* is available for $29.95.

VIC-20 equipment available from Micro-Ware includes a parallel printer interface and a tape recorder interface, both produced by Tymac Controls.

The $19.95 parallel printer interface plugs into the user port to provide the necessary link between the VIC and almost any parallel printer. Included with the interface is a printer driver software listing.

The Universal Tape Recorder Interface and Duplicator allows you to use nearly any cassette recorder with your VIC. The unit includes an audio enhancement circuit and three LED indicators to allow you to monitor your interface at all times. The $49 interface also allows you to use two recorders to make backup tapes without loading the software into the computer.

Micro-Ware Distributing, Inc.
P.O. Box 113
Pompton Plains, NJ 07444

Cartridge Word Processor

A cartridge-based word processor for the VIC-20 is available from United Microware Industries.

Wordcraft 20 includes a page capacity of 66 lines of 99 characters, page format commands, automatic line centering, text highlighting, and tab stops. The program has automatic word wrap to eliminate broken words at the ends of lines. A demonstration tape is provided with the program.

The cartridge, which sells for $149.95, contains the 16K *Wordcraft* program on ROM chips. *Wordcraft 20 Plus*, which sells for $199.95, includes an additional 8K of memory.

Documents created with the program can be stored on either tape or disk.

United Microware Industries, Inc.
3503-C Temple Ave.
Pomona, CA 91768

Wordcraft 20 *is a plug-in word processor for the VIC-20.*

Sports Strategy

Two sports strategy games for the VIC-20 are available from Parr Programming. In each game, *Baseball Adversary* and *Football Adversary*, you are the team's manager or coach, and your opponent is the computer.

Baseball Adversary, which sells for $10.95, allows you to position your defense, and call in pinch hitters and relief pitchers. In *Football Adversary*, you select from a playbook of 31 plays. The game requires 8K expansion and sells for $14.95.

Parr Programming
2664 Tyler St.
Gary, IN 46407
(219)885-0611

Preschool VIC

Garden Valley Software has developed a set of VIC-20 games designed to teach a young child the alphabet, numbers, and basic math and reading skills.

The programs, designed for children ages 3 to 7, include *Copy Cats, ABC, First Numbers,* and *First Words.*

The entire set is available for $24.95.

Garden Valley Software
P.O. Box 23
Garden Valley, ID 83622

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.*

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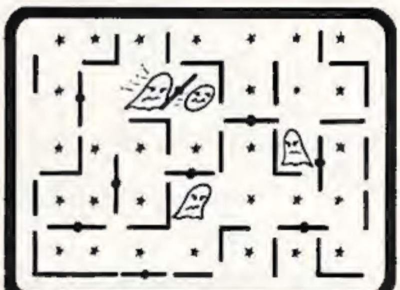

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A Beginner's Guide To Typing In Programs

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, <u>S</u> 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 <u>N</u>}), 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, [k], 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 Ø		[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				

Hi-Res Graphics

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs" and "A Beginner's Guide To Typing In Programs" that appear before the Program Listings.

Program 1: New BASIC

```
0 REM BASIC HI-RES
10 A=0:REM INTIALIZE CHECKSUM
20 REM MOVE BASIC ROM TO RAM
30 FORI=40960TO49151:POKEI,PEEK(I):NEXTI
40 REM CHANGE LET TO HUE
50 FORI=41150TO41152:READN:POKEI,N:A=A+N
   :NEXTI
60 READL,H:POKE40988,L:POKE40989,H:A=A+L
   +H
70 DATA 72, 85, 197, 75, 196
80 REM CHANGE WAIT TO PLOT
90 FOR I=41189TO41192:READN:POKEI,N:A=A+
   N:NEXTI
100 READL,H:POKE41008,L:POKE41009,H:A=A+
    L+H
110 DATA 80, 76, 79, 212, 130, 196
120 REM CHANGE CONT TO WIPE
130 FORI=41225TO41228:READN:POKEI,N:A=A+
    N:NEXTI
140 READL,H:POKE41024,L:POKE41025,H:A=A+
    L+H
150 DATA 87, 73, 80, 197, 53, 196
160 REM CHANGE VERIFY TO SCREEN
170 FORI=41201TO41206:READN:POKEI,N:A=A+
    N:NEXTI
180 READL,H:POKE41014,L:POKE41015,H:A=A+
    L+H
190 DATA 83,67,82,69,69,206,11,196
200 REM CHANGE ERROR MESSAGE ROUTINE
210 FORI=42042TO42044:READN:POKEI,N:A=A+
    N:NEXTI
220 DATA 76, 0, 196
230 REM READ IN NEW ROUTINES
240 FORI=50176TO50480:READN:POKEI,N:A=A+
    N:NEXTI
250 IFA<>39040THENPRINT"ERROR IN DATA ST
    ATEMENTS"
260 END
300 DATA 32, 24,196,138, 10,170, 76, 61,
    164, 80, 70, 83, 32,158,183,224, 1
310 DATA144, 5,240, 19, 76, 72,178,169,
    27,141, 17,208,169, 21,141, 24,208
320 DATA169,151,141, 0,221, 96,169, 59,1
    41, 17,208,169, 8,141, 24,208,169
330 DATA148,208,238,162, 32,169,224,133,
    252,160, 0,132,251,152,145,251,200
340 DATA208,251,230,252,202,208,246, 96,
     32,123,196,138, 10, 10, 10, 10,133
350 DATA 2, 32,253,174, 32,123,196,138,
    5, 2,160,192,132,252,160, 0,132
360 DATA251,162, 2,145,251,200,208,251,2
    30,252,202, 16,246,145,251,200,192
370 DATA232,144,249, 96, 32,158,183,224,
     16,176, 17, 96, 32,235,183,134, 2
380 DATA169,199, 56,229, 2,133, 2,201,20
    0,144, 3, 76, 72,178,165, 21,240
390 DATA 10,201, 1,208,245,165, 20,201,
    64,176,239,169, 0,133,251,169,224
400 DATA133,252,165, 20, 41,248, 24,101,
    251,133,251,165, 21,101,252,133,252
410 DATA165, 2, 41, 7, 24,101,251,133,25
    1,144, 2,230,252,165, 2, 74, 74
420 DATA 74, 10,170,189,247,196, 24,101,
    251,133,251,189,248,196,101,252,133
430 DATA252,165, 20, 41, 7,170,160, 0,12
    0,169, 52,133, 1,177,251, 29, 41
440 DATA197,145,251,169, 54,133, 1, 88,
    96, 0, 0, 64, 1,128, 2,192, 3
450 DATA 0, 5, 64, 6,128, 7,192, 8, 0, 1
    0, 64, 11,128, 12,192, 13, 0
460 DATA 15, 64, 16,128, 17,192, 18, 0,
    20, 64, 21,128, 22,192, 23, 0, 25
470 DATA 64, 26,128, 27,192, 28, 0, 30,1
    28, 64, 32, 16, 8, 4, 2, 1
```

Program 2: A Simple Sine Wave

```
10 SCREEN 1: REM TURN ON BITMAP
20 WIPE: REM CLEAR BITMAP
30 HUE 0,1: REM BLACK DOTS, WHITE SCREEN
40 FOR X=0 TO 319 STEP .5
50 Y=INT(90+80*SIN(X/10))
60 PLOT X,Y: REM PLOT POINT
70 NEXT X
80 GET A$: IF A$="" THEN 80: REM WAIT FO
   R KEYSTROKE
90 SCREEN 0: REM NORMAL SCREEN
```

Program 3: A Joystick-Driven Doodle Pad

```
10 SCREEN 1: WIPE: HUE 0,1
20 X=159: Y=99: PLOT X,Y
30 GOSUB 100: IF J=15 THEN 30
40 PLOT X,Y: GOTO 30
50 SCREEN 0: END: REM GRACEFUL EXIT
100 REM READ JOYSTICK
110 J=PEEK(56320) AND 15: REM PORT 2
120 IF (J AND 8)=0 THEN X=X+1: REM MOVE
    RIGHT
130 IF (J AND 4)=0 THEN X=X-1: REM MOVE
    LEFT
140 IF (J AND 2)=0 THEN Y=Y-1: REM MOVE
    DOWN
150 IF (J AND 1)=0 THEN Y=Y+1: REM MOVE
    UP
160 IF Y<0 THEN Y=0: REM STAY IN RANGE
170 IF Y>199 THEN Y=199
180 IF X>319 THEN X=319
190 IF X<0 THEN X=0
200 GET A$:IF A$=CHR$(147) THEN WIPE: RE
    M CLEAR SCREEN
210 IF A$=CHR$(136) THEN 50: REM F7 KEY
    TO EXIT
220 RETURN
```

VIC/64 Mailing List

```
8 REM VIC MAILING LIST PROGRAM-DISK VERS
  ION
10 REM{2 SPACES}MODIFIED & EXPANDED FROM
    A TPUG PUBLIC DOMAIN PROGRAM BY ANDY
    FINKEL
16 POKE36879,93:READR$,R:FORI=1TOR:READO
   $(I):NEXT:DATA"VIC MAILING LIST
17 DATA8,"NAME(LAST NAME FIRST)","STREET
    ADDRESS","CITY","STATE","ZIPCODE"
18 DATA"HOME PHONE NO.","COMPANY NAME","
```

```
   WORK PHONE NO."
19 PRINT"{CLR}{BLK}{A}
   *******************
   {S}":PRINT"-{2 SPACES}"R$" -":PRINT
   "{Z}
   *******************
   {X}
20 PRINT"{DOWN} 1. ADD NAME":PRINT"
   {DOWN} 2. REMOVAL{4 SPACES}":PRINT"
   {DOWN} 3. SEARCH":PRINT"{DOWN} 4. EXA
   MINE
21 PRINT"{DOWN}{SHIFT-SPACE}5. CHANGE":P
   RINT"{DOWN} 6. SAVE UPDATE":PRINT"
   {DOWN} 7. PRINT OPTION":PRINT"{DOWN}
   8. END"
22 RESTORE:PRINT"{2 DOWN}WHICH DO YOU WA
   NT
23 GETA$:IFA$=""THEN23
24 IFA$<"1"ORA$>"8"THEN23
25 READB$:IFB$<>"{-}"THEN25
26 A=VAL(A$):ONAGOTO29,34,37,47,54,55,60
   ,56
28 POKE198,10:FORI=0TO9:POKE631+I,13:NEX
   T:END
29 READA$:IFA$<>"{+}"THEN29
30 READA:PRINT"{CLR}INPUT 0 FOR UNKNOWNS
   {DOWN}"
31 PRINT"ITEM : "A"{DOWN}":FORI=1TOR:PRI
   NTO$(I):INPUTW$(I):PRINT:IFW$(1)=""TH
   EN19
32 NEXT:W$(0)="XX"+CHR$(34)+","+STR$(A):
   Z=A*10+500:K=0:PRINT"{CLR}{2 DOWN}"
33 FORI=ZTOZ+R:PRINTI;"DATA"CHR$(34)W$(K
   ):K=K+1:NEXT:PRINT"RUN{HOME}":GOTO28
34 B$="":PRINT"{CLR}WHICH ITEM TO REMOVE
    ":INPUTB$:IFVAL(B$)=0THEN19
35 PRINT"{CLR}{2 DOWN}":Z=VAL(B$)*10+500
   :PRINTZ"DATA"CHR$(34)"{+}"CHR$(34)"
   ,"VAL(B$)
36 FORI=Z+1TOZ+R:PRINTI:NEXT:PRINT"RUN
   {HOME}":GOTO28
37 INPUT"{CLR}SEARCH FOR ";B$:IFB$=""THE
   N19
38 H=0:READA$:IFA$="END"THEN19
39 IFA$="{+}"THENREADA:GOTO38
40 READA:FORI=1TOR:READA$(I):IFLEFT$(A$(
   I),LEN(B$))=B$THENH=1
41 NEXT:IFH=0THEN38
42 PRINT"{CLR}ITEM :"A"{2 DOWN}":FORI=1T
   OR:PRINT"{2 SPACES}"A$(I):NEXT:IFW=1T
   HENRETURN
43 PRINT"{2 DOWN}HIT ANY KEY TO PROCEED"
44 GETA$:IFA$=""THEN44
45 IFQ=1THENRETURN
46 GOTO38
47 A$="":INPUT"{CLR}WHICH ITEM";A$:IFA$=
   "."THEN19
48 A=VAL(A$):IFA=0THEN19
49 READA$:IFA$="END"THEN19
50 IFA<>VAL(A$)THEN49
51 READA$(1):IFA$(1)="{+}"THEN19
52 FORI=2TOR:READA$(I):NEXT:Q=1:GOSUB42:
   Q=0:IFW=1THENRETURN
53 GOTO19
54 W=1:GOSUB47:W=0:PRINT"{HOME}{2 DOWN}"
   :FORI=1TOR:INPUTW$(I):GOTO32
55 PRINT"{CLR}":SAVE"@0:"+R$,8:END
56 END
60 PRINT"{CLR}{2 DOWN}{RVS}{3 SPACES}PRI
   NTER OPTIONS{3 SPACES}"
62 PRINT"{DOWN}{RVS}1{OFF} ENTIRE LIST"
64 PRINT"{DOWN}{RVS}2{OFF} MAILING LABEL
   S"
66 PRINT"{DOWN}{RVS}3{OFF} INDIVIDUAL DA
   TA"
68 PRINT"{DOWN}{RVS}4{OFF} SINGLE MAILIN
   G LABEL";
70 PRINT"{DOWN}{RVS}5{OFF} RETURN TO PRO
   GRM"
72 GETZ$:IFZ$=""THEN72
73 Z=VAL(Z$)
74 IFZ<1ORZ>5THEN60
76 OPEN1,4:RESTORE
78 ONZGOTO82,98,106,106
80 GOTO19
82 READB$:IFB$<>"{-}"THEN82
84 READB$:IFB$="{+}"THENCLOSE1:GOTO19
86 IFB$="XX"THENREADA:PRINT#1,CHR$(10)CH
   R$(10)"ITEM";A:GOSUB92:GOTO84
88 PRINT#1,B$
90 GOTO84
92 READB$:FORI=1TO50
93 IFMID$(B$,I,1)=" "THENX=I:I=50
94 NEXTI
95 N2$=LEFT$(B$,X):N1$=RIGHT$(B$,LEN(B$)
   -X):PRINT#1
96 PRINT#1,N1$;" ";N2$:RETURN
98 READB$:IFB$<>"{-}"THEN98
99 READB$:IFB$="{+}"THENCLOSE1:GOTO19
100 IFB$<>"XX"THEN99
101 READA:PRINT#1,CHR$(10):GOSUB92:GOSUB
    102:GOTO99
102 FORI=1TO4:READA$(I):NEXT
103 PRINT#1,A$(1):PRINT#1,A$(2);", ";A$(
    3);"{3 SPACES}";A$(4)
104 RETURN
106 INPUT"{CLR}{DOWN}WHICH ITEM";Q:RESTO
    RE
107 READB$:IFB$<>"{-}"THEN107
108 READB$:IFB$="{+}"THENPRINT"NO SUCH
     ITEM ON FILE":FORX=0TO1500:NEXTX:CL
    OSE1:GOTO19
110 IFB$="XX"THENREADA:IFA=QTHEN114
112 GOTO108
114 PRINT#1,CHR$(10)CHR$(10)"ITEM";A:GOS
    UB92
116 IFZ=4THEN120
118 FORX=1TOR-1:READB$:PRINT#1,B$:NEXT:C
    LOSE1:GOTO60
120 GOSUB102:CLOSE1:GOTO60
500 DATA"{-}"
510 DATA"XX", 1
511 DATA"SHAUGHNESSY JOE
512 DATA"4703 COUNTRY CLUB DR
513 DATA"PITTSBURGH
514 DATA"PENNSYLVANIA
515 DATA"15236
516 DATA"412-882-4655
517 DATA"DICK COAL CORP.
518 DATA"412-664-8280
520 DATA"{+}",2
530 DATA"{+}",3
540 DATA"{+}",4
550 DATA"{+}",5
560 DATA"{+}",6
570 DATA"{+}",7
580 DATA"{+}",8
590 DATA"{+}",9
600 DATA"{+}",10
610 DATA"END"
```

Global Scan

BEFORE TYPING...
Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs" and "A Beginner's Guide To Typing In Programs" that appear before the Program Listings.

```
5 REM GLOBAL SCAN
1Ø GOTO84Ø
2Ø PRINT"
   **********************
   "
3Ø PRINT"NAME OF LOCATION A:"
4Ø INPUTA$
5Ø PRINT"{CLR}ENTER THE LATITUDE OF"
6Ø PRINTA$;":"
7Ø INPUTD,M,S
8Ø GOSUB65Ø
9Ø IFQ$="Y"THENGOTO11Ø
1ØØ GOTO5Ø
11Ø H3=D+(M/6Ø)+(S/36ØØ)
12Ø PRINT"{CLR}ENTER THE LONGITUDE:"
13Ø INPUTD,M,S
14Ø GOSUB65Ø
15Ø IFQ$="Y"THENGOTO17Ø
16Ø GOTO12Ø
17Ø L1=D+(M/6Ø)+(S/36ØØ)
18Ø PRINT
19Ø PRINT"{CLR}NAME OF LOCATION B:"
2ØØ INPUTB$
21Ø PRINT"{CLR}ENTER THE LATITUDE OF"
22Ø PRINTB$
23Ø INPUTD,M,S
24Ø GOSUB65Ø
25Ø IFQ$="Y"THENGOTO27Ø
26Ø GOTO21Ø
27Ø H4=D+(M/6Ø)+(S/36ØØ)
28Ø PRINT"{CLR}ENTER THE LONGITUDE:"
29Ø INPUTD,M,S
3ØØ GOSUB65Ø
31Ø IFQ$="Y"THEN33Ø
32Ø GOTO28Ø
33Ø L2=D+(M/6Ø)+(S/36ØØ)
34Ø P=3.14159:R=P/18Ø:W=18Ø/P
35Ø H3=H3*R:L1=L1*R:H4=H4*R:L2=L2*R:GOSU
    B47Ø
36Ø PRINT"{CLR}THE DISTANCE BETWEEN"
37Ø PRINTA$;" AND"
38Ø PRINTB$;" IS:"
39Ø PRINT
4ØØ PRINTM;"MILES"
41Ø PRINTK;"KILOMETERS"
42Ø PRINTX1;"DEGREES/NORTH"
44Ø PRINT
45Ø PRINT
46Ø GOTO2Ø
47Ø REMMATH
48Ø H1=.5*(H4-H3):H2=.5*(H4+H3):C=L1-L2
49Ø IFC=ØANDH1=ØTHENGOTO64Ø
5ØØ IFH1=ØTHENH1=1E-6
51Ø IFC=ØTHENC=1E-6
52Ø I1=ATN(1/(TAN(.5*C))*(SIN(H1))/(COS(
    H2)))
53Ø I2=ATN(1/(TAN(.5*C))*(COS(H1))/(SIN(
    H2)))
54Ø X=I2-I1:Y=I2+I1:Z=2*ATN((TAN(H1))*(S
    IN(I2))/SIN(I1))
55Ø Z1=Z*W:K=111.12*Z1:M=69.Ø48*Z1:X1=X*
    W:Y1=Y*W
56Ø IFL1<L2THENX1=36Ø+X1
57Ø IFL1<L2THENY1=-1*Y1
58Ø IFL2<L1THENY1=36Ø-Y1
59Ø K=INT(1ØØ*K+.5)/1ØØ
6ØØ M=INT(1ØØ*M+.5)/1ØØ
61Ø X1=INT(1ØØ*X1+.5)/1ØØ
62Ø Y1=INT(1ØØ*Y1+.5)/1ØØ
63Ø RETURN
64Ø X=Ø:Y=Ø:Z=Ø:GOTO55Ø
65Ø PRINT
66Ø PRINT"IS THIS CORRECT:"
67Ø PRINTD;"DEGREES"
68Ø PRINTM;"MINUTES"
69Ø PRINTS;"SECONDS"
7ØØ PRINT
71Ø IFD=ØTHENGOTO8ØØ
72Ø IFM=ØTHENGOTO8ØØ
73Ø IFS=ØTHENGOTO8ØØ
74Ø PRINT"{RVS}Y{OFF}ES OR {RVS}N{OFF}O"
75Ø GETQ$
76Ø IFQ$=""THEN75Ø
77Ø RETURN
78Ø PRINT"DO NOT ENTER A Ø,"
79Ø PRINT"PLEASE RE-ENTER-"
8ØØ PRINT
81Ø PRINT"PUSH {RVS}R{OFF} TO REDO-"
82Ø GOTO75Ø
83Ø END
84Ø REM
85Ø CLR
86Ø PRINT"{CLR}{8 DOWN}{5 RIGHT}PROGRAM
    FOR"
87Ø PRINT"{2 RIGHT}DISTANCE AND ANGLE"
88Ø PRINT"{2 RIGHT}BETWEEN TWO POINTS"
89Ø FORT=1TO4ØØØ:NEXT
9ØØ GOTO2Ø
```

Disk Menu For The VIC And 64

```
1ØØ REM VIC/64 DISK MENU
11Ø REM POKE 53281,1 FOR COMMODORE 64
12Ø CLR
13Ø PRINT"{CLR}{4 DOWN}{GRN}READING DISK
     DIRECTORY{BLU}"
14Ø DIMP$(1ØØ)
15Ø REM DIRECTORY
16Ø REM{2 SPACES}PEEPER
17Ø OPEN1,8,Ø,"$"
18Ø REM LOAD ARRAY P$
19Ø GET#1,B$:IFST<>ØTHEN27Ø
2ØØ IFB$<>CHR$(34)THEN19Ø
21Ø P$=""
22Ø GET#1,B$:IFB$<>CHR$(34)THENP$=P$+B$:
    GOTO22Ø
23Ø GET#1,B$:IFB$=CHR$(32)THEN23Ø
24Ø P$(X)=P$:PRINTX;"{UP}"
25Ø GET#1,B$:IFB$<>""THEN25Ø
26Ø IFST=ØTHENX=X+1:GOTO18Ø
27Ø CLOSE1
28Ø REM{2 SPACES}DISPLAY MENU
29Ø N=1Ø
3ØØ PRINT"{CLR}{RED}VIC DISK MENU"
31Ø PRINT"FOR ";P$(Ø);"{BLU}":PRINT
32Ø IFN<1ØTHENN=1Ø
```

```
330 IFN>100THENN=100
340 FORJ=(N-9)TON:PRINTJ;"- ";P$(J):NEXT
    J
350 PRINT:PRINT"PRESS{DOWN}{5 LEFT}{RED}
    N{BLU} FOR NEXT SCREEN"
360 PRINT"{RED}L{BLU} FOR LAST SCREEN"
370 PRINT"{RED}E{BLU} TO EXIT TO BASIC"
380 PRINT"{PUR}S{BLU} TO LOAD ONLY"
390 PRINT"{GRN}R{BLU} TO LOAD AND RUN"
400 Z$="":GETZ$:IFZ$=""THEN400
410 IFZ$="N"THENN=N+10:GOTO300
420 IFZ$="L"THENN=N-10:GOTO300
430 IFZ$="E"THENPRINT"MENU STILL PRESENT
    ":END
440 IFZ$="S"THENGOSUB470:GOTO570
450 IFZ$="R"THENGOSUB470:GOTO540
460 GOTO400
470 REM SELECT AND{12 SPACES}PRINT LOAD
480 PRINT"{DOWN}PROGRAM #";
490 INPUTS:PRINT"{17 DOWN}"
500 IFS<1ORS>XTHEN480
510 IFLEN(P$(S))>12THENP$(S)=LEFT$(P$(S)
    ,12)+"*"
520 PRINT"LOAD"+CHR$(34)+P$(S)+CHR$(34)+
    ",8{3 UP}"
530 RETURN
540 REM LOAD AND RUN
550 POKE631,13:POKE632,82:POKE633,85:POK
    E634,78:POKE635,13:POKE198,5
560 END
570 REM LOAD ONLY
580 POKE631,13:POKE198,1
```

Wordspell

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs" and "A Beginner's Guide To Typing In Programs" that appear before the Program Listings.

Program 1: Wordspell, VIC Version

```
0 PRINT"{CLR}":POKE36869,242:GOSUB61
21 PRINT"{CLR}{BLU}{4 DOWN}{3 SPACES}CRE
   ATE NEW LIST":INPUT"{2 DOWN}{4 RIGHT}
   {2 SPACES}(Y OR N)";R$:IFR$="Y"THEN50
22 IFR$<>"N"THEN21
23 V=36878:S=36876:SC=36879
24 DIMA$(19),W$(19)
25 FORP=0TO19:READA$(P):NEXT
26 FORP=0TO19
27 PRINT"{CLR}"
28 PRINTSPC(220)
29 PRINTTAB(INT(22-LEN(A$(P)))/2)
30 GOSUB35
31 GOSUB40
32 NEXT
33 GOTO71
34 REM PRINT OUT WORDS
35 FORX=1TOLEN(A$(P))
36 PRINTMID$(A$(P),X,1);
37 FORT=1TO300:NEXT
38 NEXT
39 RETURN
40 PRINT"{CLR}":PRINTSPC(220)
41 PRINTTAB((INT(22-LEN(A$(P)))/2)-2):IN
   PUTA$
42 IFA$=A$(P)THENPRINT"{CLR}":PRINTSPC(2
   26)"CORRECT !":GOSUB82:GOTO46
43 W$(P)="W":GOSUB81
44 PRINT"{CLR}":PRINTSPC(118):PRINT"WRON
   G{SHIFT-SPACE}!":PRINT:PRINT" CORRECT
   {SHIFT-SPACE}SPELLING{SHIFT-SPACE}IS:
   ":PRINT
45 PRINT:PRINT:PRINT:PRINTTAB(INT(22-LEN
   (A$(P)))/2)A$(P):K=K+1
46 FORT=1TO2000:NEXT
47 POKESC,27
48 RETURN
49 REM CREATE WORD DATA
50 PRINT"{CLR}":DIMB$(19)
51 FORI=0TO19:PRINT"WORD";I+1;:INPUTB$(I
   ):NEXT
52 PRINT"{CLR}{WHT}{2 DOWN}"
53 FORI=0TO17STEP4
54 PRINT1+I;"DA"CHR$(34)B$(I)CHR$(34);",
   "CHR$(34)B$(I+1)CHR$(34);
55 PRINT","CHR$(34)B$(I+2)CHR$(34);","CH
   R$(34)B$(I+3):NEXT
56 PRINT"GOTO1":PRINT"{HOME}"
57 POKE198,6
58 FORI=0TO5:POKE631+I,13:NEXT
59 END
60 REM INSTRUCTIONS
61 PRINT" USE THIS PROGRAM FOR SPELLING
   PRACTICE.{4 SPACES}WHEN REQUESTED, EN
   TER THE SPELLING";
62 PRINT" WORDS AND{RVS}PRESS RETURN
   {OFF}.{2 SPACES}WHEN{3 SPACES}ALL (20
   ) OF THE WORDS HAVE BEEN ENTERED";
63 PRINT" THEYWILL BE PLACED INTO
   {3 SPACES}THE PROGRAM AS DATA
   {3 SPACES}STATEMENTS.{2 SPACES}RE-SAV
   E"
64 PRINT"-ING THE PROGRAM AT{3 SPACES}TH
   E END OF THE SESSIONWILL SAVE THE ENT
   ERED WORDS FOR";
65 PRINT" USE AT THE{2 SPACES}NEXT PRACT
   ICE."
66 PRINT"{4 DOWN}{5 RIGHT}{RVS}PRESS RET
   URN{OFF}"
67 GETR$:IFR$=""THEN67
68 IFR$=CHR$(13)THENRETURN
69 GOTO67
70 REM PRINT OUT MISSPELLED WORDS AND SC
   ORE
71 PRINT:PRINT"{CLR}{RVS}MISSPELLED WORD
   S:{OFF}":PRINT
72 FORP=0TO19:IFW$(P)="W"THENPRINTTAB(4)
   A$(P)
73 NEXT
74 PRINT"{HOME}{19 DOWN}{RVS}SCORE ="100
   -K*5
75 PRINT:PRINT"{3 SPACES}AGAIN ? (Y OR N
   )
76 GETR$:IFR$=""THENGOTO76
77 IFR$="Y"THENRUN1
78 IFR$<>"N"THEN76
79 POKE36869,240:POKEV,0:POKES,0
80 GOTO59
81 POKESC,26:POKEV,15:FORX=180TO145STEP-
   1:POKES,X:NEXT:POKEV,0:RETURN
82 POKEV,15:FORX=220TO255:POKE36876,X:NE
   XT:POKEV,0:RETURN
```

Program 2: Wordspell, 64 Version

```
0 PRINT"{CLR}":PRINTCHR$(14):POKE53280,7
  :POKE53281,1:GOSUB61
21 PRINT"{CLR}{BLK}{4 DOWN}{3 RIGHT}
   {3 SPACES}CREATE NEW LIST":INPUT"
   {2 DOWN}{4 RIGHT}{2 SPACES}(Y OR N)";
   R$:IFR$="Y"THEN50
22 IFR$<>"N"THEN21
24 DIMA$(19),W$(19)
25 FORP=0TO19:READA$(P):NEXT
26 FORP=0TO19
27 PRINT"{CLR}"
28 PRINT"{9 DOWN}"
29 PRINTTAB(INT(40-LEN(A$(P)))/2)
30 GOSUB35
31 GOSUB40
32 NEXT
33 GOTO71
34 REM PRINT OUT WORDS
35 FORX=1TOLEN(A$(P))
36 PRINTMID$(A$(P),X,1);
37 FORT=1TO300:NEXT
38 NEXT
39 RETURN
40 PRINT"{CLR}":PRINT"{9 DOWN}"
41 PRINTTAB((INT(40-LEN(A$(P)))/2)-2):IN
   PUTA$
42 IFA$=A$(P)THENPRINT"{CLR}":PRINTSPC(2
   15)"{5 DOWN}CORRECT !":GOSUB90:GOTO46
43 W$(P)="W":GOSUB81
44 PRINT"{CLR}":PRINT"{4 DOWN}"SPC(17);"
   WRONG !":PRINT"{2 DOWN}"SPC(9)" CORRE
   CT{SHIFT-SPACE}SPELLING{SHIFT-SPACE}I
   S:"
45 PRINT:PRINT:PRINT:PRINTTAB(INT(40-LEN
   (A$(P)))/2)A$(P):K=K+1
46 FORT=1TO2000:NEXT
47 POKE 53280,7
48 RETURN
49 REM CREATE WORD DATA
50 PRINT"{CLR}":DIMB$(19)
51 FORI=0TO19:PRINT"WORD";I+1;:INPUTB$(I
   ):NEXT
52 PRINT"{CLR}{2 DOWN}{WHT}"
53 FORI=0TO19STEP4
54 PRINT1+I;"DA"CHR$(34)B$(I)CHR$(34);",
   "CHR$(34)B$(I+1)CHR$(34);
55 PRINT","CHR$(34)B$(I+2)CHR$(34);","CH
   R$(34)B$(I+3):NEXT
56 PRINT"GOTO1":PRINT"{HOME}"
57 POKE198,10
58 FORI=0TO5:POKE631+I,13:NEXT
59 END
60 REM INSTRUCTIONS
61 PRINT"{BLK}{3 DOWN}{6 SPACES}USE THIS
    PROGRAM FOR SPELLING":PRINT" PRACTIC
   E.{2 SPACES}WHEN";
62 PRINT" REQUESTED, ENTER THE":PRINT" S
   PELLING WORDS AND {RVS}PRESS RETURN
   {OFF}.{2 SPACES}WHEN"
63 PRINT" ALL (20) OF THE WORDS HAVE BEE
   N":PRINT" ENTERED, THEY WILL BE PLACE
   D";
64 PRINT" INTO THE":PRINT" PROGRAM AS DA
   TA STATEMENTS.{2 SPACES}RE-SAVE-"
65 PRINT" ING THE PROGRAM AT THE END OF
   THE":PRINT" SESSION WILL SAVE THE";
66 PRINT" ENTERED":PRINT" WORDS FOR USE
   AT THE NEXT PRACTICE."
67 PRINT"{5 DOWN}{12 RIGHT}{RVS}PRESS RE
   TURN{OFF}"
68 GETR$:IFR$=""THEN68
69 IFR$=CHR$(13)THENRETURN
70 GOTO68
71 PRINT:PRINT"{CLR}{RVS}MISSPELLED WORD
   S:{OFF}":PRINT:REM PRINT OUT MISSPELL
   ED WORDS,SCORE
72 FORP=0TO19:IFW$(P)="W"THENPRINTTAB(4)
   A$(P)
73 NEXT
74 PRINT"{HOME}{19 DOWN}{RVS}SCORE ="100
   -K*5
75 PRINT:PRINT"{3 SPACES}AGAIN ? (Y OR N
   )
76 GETR$:IFR$=""THENGOTO76
77 IFR$="Y"THENRUN1
78 IFR$<>"N"THEN76
79 POKE36869,240:POKEV,0:POKES,0
80 GOTO59
81 PRINT"{CLR}":POKE53280,2:S=54272:FORE
   =STOS+28:POKEE,0:NEXT
83 POKE54296, 15 :POKE54277, 18 :POKE542
   78, 242
85 POKE 54276, 33 :POKE 54273, 4 :POKE54
   272, 48
87 FORT=1TO 300 :NEXT:POKE54276, 32:FORT
   =1TO 400 :NEXT
89 RETURN:REM{14 SPACES}FORE=STOS+28:POK
   EE,0:NEXT:RETURN
90 S=54272:FORE=STOS+28:POKEE,0:NEXT
100 POKE54296, 15 :POKE54277, 42 :POKE54
    278, 250
110 POKE 54276, 33 :POKE 54273, 23 :POKE
    54272, 181
120 FORT=1TO 200 :NEXT:POKE54276, 32:FOR
    T=1TO 500 :NEXT
130 FORE=STOS+28:POKEE,0:NEXT
140 RETURN
```

Computing For Kids

Barney

```
3 REM:VIC-20/C64 BARNEY
4 REM:MODIFIED FROM
5 REM:TALKING HEAD
7 REM:COMPUTE! 9/82
10 PRINT"{CLR}"
20 FOR P=1 TO 800: NEXT P
30 N=1
40 GOSUB 670
50 GOSUB 100
60 GOSUB 260
70 GOSUB 480
80 GOSUB 260
90 PRINT:PRINT:PRINT:PRINT:PRINT:GOTO 94
0
100 GOSUB 530
110 GOSUB 730
120 GOSUB 630
130 FOR P=1 TO 800:NEXT P
140 GOSUB 750
```

```
160 FOR P=1 TO 600: NEXT P
170 GOSUB 700
180 FOR P=1 TO 100: NEXT P
190 GOSUB 750
200 FOR P=1 TO 800:NEXT P
210 RETURN
230 IF N=14 THEN RESTORE
250 N=N+1
260 READ SNUM
270 FOR K=1 TO SNUM
280 GOSUB 330
290 FOR P=1 TO 1000: NEXT P
300 GOSUB 780
310 NEXT K
320 RETURN
330 PY=1
340 PX=10
350 READ M$
360 IF M$="-1" THEN RETURN
370 IF M$="*" THEN M$=N$
380 PRINTTAB(10);
390 PRINT M$:GOSUB 670
400 FOR P=1 TO 50: NEXT P
410 GOSUB 630
420 FOR P=1 TO 100: NEXT P
440 PY=PY+2
450 GOTO 350
480 PRINT"{HOME}{3 DOWN}";TAB(10);:INPUT
    N$
490 FOR P=1 TO 75: NEXT P
500 GOSUB 780
510 RETURN
530 PRINT"{CLR}"
540 PRINT"{3 SPACES}@@@"
560 PRINT"{2 SPACES}@@@@@ "
570 PRINT" @=@=@=@"
580 PRINT"JK{5 SPACES}JK"
590 PRINT:PRINT"<:{2 SPACES}Q{2 SPACES}:
    >"
600 PRINT"{HOME}{7 DOWN}:{6 SPACES}:"
610 PRINT::PRINT{10 SPACES}" M{5 @}N"
630 PRINT"{HOME}{7 DOWN} :{4 SPACES}:"
640 PRINT"{HOME}{7 DOWN} : M{@}N :"
650 RETURN
670 PRINT"{HOME}{7 DOWN} : {3 @} :"
680 PRINT"{HOME}{7 DOWN} : --- :"
690 RETURN
700 PRINT"{HOME}{5 DOWN}JK Ø - JK"
710 FOR P=1 TO 1500: NEXT P
720 RETURN
730 PRINT"{HOME}{5 DOWN}JK - - JK"
740 RETURN
750 PRINT"{HOME}{5 DOWN}JK * * JK"
760 RETURN
780 PRINT"{HOME}"
790 FOR I=1 TO 5
820 PRINTTAB(10);"{11 SPACES}"
830 NEXT I
840 RETURN
860 DATA 3
870 DATA I'M BARNEY,-1
880 DATA THE{2 SPACES}CLONE,-1
885 PRINT
890 DATA YOUR NAME?,-1
900 DATA 3
910 DATA GREAT NAME,*,-1
920 DATA THANKS FOR,-1
930 DATA PLAYING!!!,*,-1
940 FOR X=1 TO 2500: NEXT X
950 PRINT"{CLR}"
960 PRINT"{11 DOWN} ***PRESS ANY KEY***"
970 GET A$:IF A$=""THEN GOTO 970
980 RUN
```

The Viper

ATTENTION PROGRAMMERS
Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs" and "A Beginner's Guide To Typing In Programs" that appear before the Program Listings.

Program 1: The Viper – VIC Version

```
10 DT=60:DIMMA(DT):DIMQ(100)
20 FORJ=0TO65:READJM:POKE828+J,JM:NEXT:F
   ORJ=1TODT:READMA(J):NEXT
30 PRINT"{WHT}{CLR}":POKE36864,4:POKE368
   79,111:POKE36878,15:S3=36877:C=30720:
   SC=7680
40 MZ=0:P=0:DR=0
50 V=36878:S1=36875:S2=36876:A=2:N=2:MM=
   0
60 GOSUB370
70 FORJ=7680TO7700:POKEJ+C,0:POKEJ,160:N
   EXT
80 FORJ=7701TO8185STEP22:POKEJ+C,0:POKEJ
   ,160:NEXT
90 FORJ=8184TO8164STEP-1:POKEJ+C,0:POKEJ
   ,160:NEXT
100 FORJ=8142TO7702STEP-22:POKEJ+C,0:POK
    EJ,160:NEXT
110 M=INT(RND(1)*506)+SC
120 IFPEEK(M)<>32THEN110
130 POKEM,42
140 S=INT(RND(1)*506)+SC
150 IFPEEK(S)<>32THEN140
160 POKES,90
170 SYS828
180 IFPEEK(1)-PEEK(2)=0THEN210
190 DR=PEEK(1)-PEEK(2)
200 IFDR=-21THENDR=1
210 IFPEEK(S+DR)=160ORPEEK(S+DR)=43THENP
    OKES,43:POKES+DR+C,2:POKES+DR,90:GOT
    O600
220 IFMM=1THENGOSUB700
230 SYS828
240 IFPEEK(S+DR)=42THENPOKES1,250:POKES2
    ,250:SYS828:P=P+1:N=N+2:MM=1:POKES1,
    0:POKES2,0
250 IFMM=0THENPOKEM,42
260 Q(A)=S+DR
270 SYS828
280 Z=A-N
290 IFZ<0THENZ=101+(A-N)
300 POKEQ(Z),32
310 A=A+1:SYS828
320 IFA>100THENA=0
330 POKES2,230:FORT=1TO2:NEXT:POKES2,0
340 SYS828
350 POKES,43:POKES+DR,90:S=S+DR:SYS828
360 FORT=1TOSK:NEXT:GOTO170
370 IFTR=1THENPRINT"{CLR}":GOTO450
380 N$="{24 SPACES}Z+++VIC-VIPER++++
    {3 SPACES}"
```

```
390 FORJ=1TO45:POKES2,230:FORT=1TO2:NEXT
    :POKES2,0
400 PRINT"{HOME}{4 DOWN}"MID$(N$,J,22)
410 FORT=1TO150:NEXT:NEXT
420 PRINT
430 FORT=1TO2000:NEXT:PRINT"{CLR}
    {4 DOWN} GET THE '*'S BUT{2 SPACES}
    {DOWN}{4 SPACES}DON'T HIT ANYTHING
    {DOWN}{3 SPACES}ELSE."
440 PRINT"{2 DOWN}{3 SPACES}USE JOYSTICK
    .
450 PRINT"{3 DOWN}{3 SPACES}ENTER SKILL
    LEVEL{2 SPACES}{DOWN}{3 SPACES}(EASY
    )1 - 9(HARD)"
460 GETA$:IFA$=""THEN460
470 IFA$<"1"ORA$>"9"THEN460
480 SK=(10-(VAL(A$)))↑2
490 IFTR=1THENPRINT"{CLR}":GOTO520
500 PRINT"{CLR}{DOWN} YOU WILL GET 2 TIM
    ES{DOWN}{2 SPACES}AS MANY POINTS WIT
    H{DOWN}{3 SPACES}AN EASY MAZE"
510 PRINT"{2 DOWN} YOU WILL GET 5 TIMES
    {DOWN}{2 SPACES}AS MANY POINTS WITH
    {DOWN}{3 SPACES}A HARD MAZE":TR=1
520 PRINT"{2 DOWN} HIT 'H' FOR HARD MAZE
    "
530 PRINT" HIT 'E' FOR EASY MAZE"
540 PRINT" HIT 'N' FOR NO MAZE"
550 GETB$:IFB$=""THEN550
560 IFB$="N"THENPRINT"{CLR}":RETURN
570 IFB$="H"THEN:PRINT"{CLR}":FORJ=1TODT
    :POKESC+MA(J)+C,0:POKESC+MA(J),160:N
    EXT:MZ=1:RETURN
580 IFB$<>"E"THEN550
590 PRINT"{CLR}":MZ=2:FORJ=1TO32:POKESC+
    MA(J)+C,0:POKESC+MA(J),160:NEXT:RETU
    RN
600 POKES3,230:FORJ=15TO0STEP-.05:POKEV,
    J:NEXT:POKES3,0
610 FORT=1TO1500:NEXT
620 IFMZ=1THENP=P*5
630 IFMZ=2THENP=P*2
640 R=P*(VAL(A$))
650 PRINT"{CLR}{2 DOWN}{YEL} YOUR SCORE:
    "R
660 IFR>HSTHENHS=R
670 PRINT"{2 DOWN} HIGH SCORE:"HS
680 FORT=1TO3000:NEXT
690 GOTO30
700 M=INT(RND(1)*506)+SC:MM=0:SYS828
710 IFPEEK(M)<>32THENMM=1
720 RETURN
730 DATA169,128,141,19,145,169,0,133,1,1
    33,2,169,127,141,34,145,162,119,236,
    32,145
740 DATA208,4,169,1,133,1,169,255,141,34
    ,145,162,118,236,17,145,208,4,169,22
    ,133,1
750 DATA162,110,236,17,145,208,4,169,1,1
    33,2,162,122,236,17,145,208,4,169,22
    ,133,2,96
760 DATA142,143,183,184,185,188,189,190,
    205,212,222,223,224,225,226,227,234,
    235,236,237
770 DATA238,239,249,256,271,272,273,276,
    277,278,318,319,141,144,177,178,179,
    180,181,192
780 DATA193,194,195,196,229,230,231,232,
    265,266,267,268,269,280,281,282,283,
    284,317,320
```

Program 2: The Viper – 64 Version

```
100 DT=60:DIM MA(DT),Q(100),I%(15)
110 I%(14)=-40:I%(13)=40:I%(11)=-1:I%(7)
    =1
120 I%(10)=-41:I%(6)=-39:I%(9)=39:I%(5)=
    41:JOY=56321
130 FORJ=1TODT:READMA(J):NEXT
140 PRINT"{WHT}{CLR}"CHR$(142):C=54272:S
    C=1024:POKE53281,2:POKE53280,8
150 MZ=0:P=0:DR=0
160 CURR=251:SPEED=49352:INDEX=SPEED+1:L
    NGTH=INDEX+1:RTN=LN+1
170 SID=54272:V=SID+24:S1=SID:S2=SID:S3=
    S2:A=2:N=2:MM=0:S4=SID+4
180 FORI=0TO24:POKESID+I,0:NEXT:POKESID+
    1,25:POKESID+5,6:POKESID+6,0
190 POKESID+24,15
200 GOSUB410:POKESID+5,6:POKESPEED,19-SK
210 FORJ=1024TO1063:POKEJ+C,7:POKEJ,160:
    NEXT
220 FORJ=1064TO2024STEP40:POKEJ+C,7:POKE
    J,160:NEXT
230 FORJ=2023TO1984STEP-1:POKEJ+C,7:POKE
    J,160:NEXT
240 FORJ=1983TO1063STEP-40:POKEJ+C,7:POK
    EJ,160:NEXT
250 M=INT(RND(1)*1000)+SC
260 IFPEEK(M)<>32THEN250
270 POKEM,42:POKEM+C,1
280 S=INT(RND(1)*1000)+SC
290 IFPEEK(S)<>32THEN280
300 POKE S,90:POKES+C,16*RND(1):IF(PEEK(
    56321)AND15)=15THEN300
310 S%=S/256:POKECURR,S-S%*256:POKECURR+
    1,S%:POKEINDEX,0
320 POKELNGTH,N:SYS49152+5:REM MAIN LOOP
     GOTO 170
330 HIT=PEEK(RTN)
340 IFHIT<>160ANDHIT<>214THEN360
350 S=PEEK(CU)+256*PEEK(CU+1):POKES,42:P
    OKES+C,7:GOTO770
360 IFHIT<>42THEN320
370 POKESID,0:POKESID+5,9:POKES4,128:POK
    ES4,129:P=P+1:N=N+2:FORT=1TO50:NEXT
380 POKES4,128:POKESID,0:POKESID+5,6:POK
    ESID+24,0:POKESID+24,15
390 GOSUB880:POKEM,42:POKEM+C,1:POKESID+
    24,0:POKESID+24,15
400 GOTO320
410 IFTR=1THENPRINT"{CLR}":GOTO470
420 GOSUB950
430 PRINT"{2 DOWN}{3 SPACES}GET THE '*'S
     BUT":PRINT"{3 SPACES}DON'T HIT ANYT
    HING ELSE"
440 PRINT"{2 DOWN}{3 SPACES}USE JOYSTICK
     IN CONTROL PORT ONE."
450 FORJ=1TO45:POKESID,230:POKES4,33:FOR
    T=1TO2:NEXT:POKES4,32:POKESID,0
460 POKESID+5,2
470 PRINT"{3 DOWN}"TAB(11)"ENTER SKILL L
    EVEL:"
480 PRINTTAB(10)"{8}{RVS}{9 SPACES}111
    1111112":SK=10
490 PRINT" {YEL}SLOW{WHT}{2 SPACES}<-
    {8}{RVS}12345678901234567890{OFF}
    {WHT} ->{2 SPACES}{6}FAST"
500 PRINTTAB(10)"{RVS}{WHT} -{CYN} -
    {PUR} -{GRN} -{YEL} -{1} -{6} -
    {7} -{BLU} -{3} -":PRINT
```

```
510 PRINT"{UP}"TAB(10+SK);"{WHT}↑{LEFT}"
    ;
520 J=15-(PEEK(56321)AND15):SK=SK+((JAND
    8)=8)*(SK<19)-((JAND4)=4)*(SK>0)
530 IF(PEEK(56321)AND16)=0 THEN560
540 IF TI<T THEN530
550 T=TI+5:PRINT" ":GOTO510
560 IFTR=1THENPRINT"{CLR}":GOTO610
570 PRINT"{CLR}{DOWN}{LOWER} YOU WILL GE
    T 2 TIMES":PRINT" AS MANY POINTS WIT
    H"
580 PRINT" AN EASY MAZE.
590 PRINT"{2 DOWN} YOU WILL GET 5 TIMES"
    :PRINT" AS MANY POINTS WITH"
600 PRINT" A HARD MAZE.
610 PRINT"{2 DOWN}{LOWER}{8} PRESS
    {WHT}LEFT{8} FOR HARD MAZE"
620 PRINT"{DOWN} PRESS {WHT}RIGHT{8} F
    OR EASY MAZE"
630 PRINT"{DOWN} PRESS {WHT}JOYBUTTON
    {8} FOR NO MAZE"
640 IFPEEK(56321)<>255 THEN640
650 MZ=0:J=PEEK(56321):IF(JAND16)=0THENP
    RINT"{CLR}"CHR$(142);:RETURN
660 IF(JAND15)=15 THEN650
670 PRINT"{CLR}"CHR$(142):IF(JAND4) THEN
    720
680 I=-1:PRINT"{HOME}{RVS}HARD MAZE"
690 FORJ=1TODT:POKESC+80+I*3{P}+MA(J)+C
    ,3:POKESC+MA(J)+80+I*320,160:NEXTJ
700 I=I+1:IFI<2 THEN690
710 MZ=1:RETURN
720 IF(JAND8)THEN570
730 I=-1:PRINT"{HOME}{RVS}EASY MAZE"
740 FORJ=1TO32:POKESC+MA(J)+C+80+320*I,3
    :POKESC+MA(J)+80+320*I,160:NEXT
750 I=I+1:IFI<2THEN740
760 MZ=2:RETURN
770 POKESID,0:POKESID+5,15:POKES4,129:FO
    RJ=15TO4STEP-.1:POKESID+24,J:NEXT
780 POKESID+24,15:FORT=1TO500:NEXT:POKES
    4,128:FORT=1TO200:NEXT:POKESID+5,6
790 IFMZ=1THENP=P*5
800 IFMZ=2THENP=P*2
810 R=P*(SK+1)
820 PRINT"{CLR}{2 DOWN}{YEL} YOUR SCORE:
    "R
830 IFR>HSTHENHS=R
840 PRINT"{2 DOWN} {CYN}HIGH SCORE:"HS
850 PRINT:PRINT"{WHT}PRESS {3}{RVS}JOY
    BUTTON{OFF} {WHT}TO PLAY AGAIN."
860 IF(PEEK(56321)AND16)THEN860
870 GOTO140
880 M=INT(RND(1)*1000)+SC:MM=0
890 IFPEEK(M)<>32THEN880
900 RETURN
910 DATA 259,260,336,337,338,341,342,343
    ,376,383,411,412,413,414,415,416
920 DATA 423,424,425,426,427,428,456,463
    ,496,497,498,501,502,503,579,580
930 DATA 258,259,330,331,332,333,334,345
    ,346,347,348,349,418,419,420,421
940 DATA 490,491,492,493,494,505,506,507
    ,508,509,578,581
950 PRINT"{CLR}{WHT} "CHR$(142);:FORI=2T
    O39:PRINT"*";:NEXT:PRINT:PRINT"
    {4 DOWN}"
960 PRINT" ";:FORI=2TO39:PRINT"*";:NEXT
970 PRINT"{HOME}{DOWN}{3 @} {@}
    {@} {3 @} {2 @} {3 @}"
980 PRINT"{2 SPACES}{RVS} E{OFF}E{RVS}
    E{OFF}E{RVS}E{OFF}E{RVS}E{OFF}
    E{RVS}E{OFF}E {RVS}E{OFF}E{RVS}
    E{OFF}E
990 PRINT" {T}{RVS} {OFF}E{RVS}E
    {OFF}E{RVS}E{OFF}E{2 T}{RVS}E
    {OFF}E{T}{RVS}E{OFF}E{*}{RVS}
    {*}"
1000 PRINT" {2 T} {T} {2 T}
     {2 SPACES}{2 T} {2 T} {3 T}
     {3 SPACES}":IFZZ=1THEN1070
1010 IFPEEK(900)<>232THENGOSUB1130
1020 FOR CO=3 TO 7:POKE894,CO:SYS893
1030 FORI=1TO20:PRINT"{HOME}{DOWN}"CHR$(
     148)" {DOWN}{LEFT}"CHR$(148)"
     {DOWN}{LEFT}"CHR$(148)" {DOWN}
     {LEFT}"CHR$(148)" {DOWN}{LEFT}"
1040 POKESID+1,CO*2+I:POKES4,33:POKES4,3
     2:NEXT
1050 FORI=1TO20:PRINT"{HOME}{DOWN} "CHR$
     (20)"{DOWN} "CHR$(20)"{DOWN} "CHR$(
     20)"{DOWN} "CHR$(20)"{DOWN} "
1060 POKESID+1,CO*2+20-I:POKES4,33:POKES
     4,32:NEXT:NEXT
1070 FORI=1TO10:PRINT"{HOME}{DOWN}"CHR$(
     148)" {DOWN}{LEFT}"CHR$(148)"
     {DOWN}{LEFT}"CHR$(148)" {DOWN}
     {LEFT}"CHR$(148)" {DOWN}{LEFT}"
1080 NEXT
1090 POKESID+1,60
1100 FORJ=15TO1STEP-1:POKE894,J:POKESID,
     J*10:POKES4,33
1110 SYS893:POKES4,32:POKESID+24,J:NEXT:
     POKESID+1,15:POKESID+24,15
1120 ZZ=1:RETURN
1130 FORI=893TO905:READA:POKEI,A:NEXT
1140 PRINT"{HOME}{8 DOWN}{RVS}READY TO P
     LAY IN 5 SECONDS..."
1150 DATA 169, 1, 162, 0, 157, 40, 216,
     232
1160 DATA 224, 160, 208, 248, 96
1170 FORI=49152TO49350:READA:CK=CK+A:POK
     EI,A:NEXT
1180 PRINT"{HOME}{8 DOWN}{30 SPACES}"
1190 IF CK<>29203 THEN PRINT"ERROR IN DA
     TA STATEMENTS!":POKE900,0:END
1200 RETURN
1210 DATA169,0,141,199,192,173,1,220
1220 DATA41,15,170,189,183,192,240,3
1230 DATA141,199,192,173,201,192,10,170
1240 DATA165,251,157,205,192,165,252,157
1250 DATA206,192,56,173,201,192,237,202
1260 DATA192,16,3,24,105,128,10,170
1270 DATA189,205,192,133,253,189,206,192
1280 DATA133,254,169,32,145,253,238,201
1290 DATA192,173,201,192,16,5,169,0
1300 DATA141,201,192,169,230,141,0,212
1310 DATA169,32,141,4,212,169,33,141
1320 DATA4,212,169,214,145,251,24,165
1330 DATA251,133,253,165,252,105,212,133
1340 DATA254,169,5,145,253,24,173,199
1350 DATA192,16,13,101,251,133,251,165
1360 DATA252,233,0,133,252,76,138,192
1370 DATA101,251,133,251,165,252,105,0
1380 DATA133,252,24,165,251,133,253,165
1390 DATA252,105,212,133,254,177,251,201
1400 DATA32,208,24,169,81,145,251,169
1410 DATA4,145,253,173,200,192,240,8
1420 DATA162,0,134,162,1977,162,208,252
1430 DATA76,5,192,141,203,192,96,0
```

```
1440 DATA0,0,0,0,41,217,1,0
1450 DATA39,215,255,0,40,216,0,0
```

Cylon Zap

> BEFORE TYPING...
> **Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs" and "A Beginner's Guide To Typing In Programs" that appear before the Program Listings.**

Program 1: Cylon Zap – Setup (VIC)

```
10 POKE52,56:POKE56,56:POKE44,28:POKE716
   8,0:POKE631,131:POKE198,1
20 PRINT"{CLR}**** CBM BASIC V2 ****":PR
   INT"{LEFT}"FRE(0);"BYTES FREE"
```

Program 2: Cylon Zap – Special Instructions (VIC)

```
10 REM***CYLON ZAP****
30 PRINT"{CLR}":POKE36879,8:POKE36869,19
   4
35 GOSUB235
40 PRINT"{3 DOWN}{2 SPACES}{RVS}LOADING
   {SHIFT-SPACE}CHARACTERS"
45 FORA=5120TO7167:POKEA,PEEK(A+27648):N
   EXT
50 FORA=5384TO5504
55 READD
60 IFD<>-1THENPOKEA,D:NEXT
65 FORA=5584TO5632:READD:IFD<>-1THENPOKE
   A,D:NEXT
70 FORA=5336TO5359:READD:POKEA,D:NEXT
75 GOSUB400:PRINT"{UP} INSTRUCTIONS{OFF}
   {RVS}Y{OFF} OR {RVS}N{OFF} "
80 GETA$:IFA$=""THENPOKE38342,INT(RND(1)
   *7+1):POKE38347,INT(RND(1)*7+1):GOTO8
   0
85 IFA$="Y"THENPOKE36869,192:GOSUB130
90 POKE36869,192:POKE198,1:POKE631,131:P
   RINT"{2 DOWN}{CLR}PLEASE WAIT WHILE G
   AMELOADS":END
95 DATA24,24,60,126,24,24,126,255,1,19,5
   1,255,255,51,19,1,128,200,204,255,255
   ,204,200
100 DATA128,255,126,24,24,126,60,24,24,2
    4,24,60,24,60,126,219,195,3,7,44,254
    ,254,44,7,3
105 DATA192,224,52,127,127,52,224,192,19
    5,219,126,60,24,60,24,24,16,8,16,8,1
    6,8,16,8
110 DATA145,74,44,113,142,52,82,137,0,0,
    0,170,85,0,0,0,-1
115 DATA0,0,0,119,68,116,20,119,0,0,0,11
    9,85,87,86,117,0,0,0,112,64,96,64,11
    2
120 DATA0,0,0,206,170,206,170,202,0,0,0,
    238,136,236,40,238,0,0,0,224,128,224
    ,32,224,-1
125 DATA0,0,0,206,170,202,170,206,0,0,0,
    139,218,171,138,139,0,0,0,56,160,56,
    136,56
130 PRINT"{CLR}{RED}WELCOME TO CYLON ZAP
    "
135 PRINT"YOU HAVE A BASE NAMED ALPHA"
    {10 SPACES}:PRINT
140 PRINT"{CYN}YOUR MISSION IS TO
    {4 SPACES}PROTECT THE":PRINT"NUCLEAR
    REACTOR"
145 PRINT"{PUR}FROM THE KAMIKAZE STAR":P
    RINT"{UP}FIGHTERS"
150 PRINT"{DOWN}{GRN}YOU HAVE 4 LASERS
    {5 SPACES}CONTROLLED BY THE
    {5 SPACES}JOYSTICK"
155 PRINT"{BLU}YOU ALSO HAVE SMART
    {3 SPACES}BOMBS LAUNCHED BY THE FIRE
    BUTTON"
160 PRINT"{DOWN}{YEL}ALL YOU DO IS POINT
    {3 SPACES}THE GUN AND THE LASER FIRE
    S AUTOMATICALLY"
165 GOSUB190
170 PRINT"{CLR}{PUR}{DOWN}THE FIGHTERS W
    ILL FLY FASTER AS MORE OF THEM
    {3 SPACES}ARE DESTROYED"
175 PRINT"{DOWN}{YEL}BONUS BASE AND BOMB
    AT60 POINTS"
180 PRINT"{BLU}{DOWN}{7 SPACES}{RVS}GOOD
    LUCK":GOSUB190:RETURN
185 GOTO2070
190 A$="{RVS}"
195 FORL=1TO1000
200 PRINT"{HOME}"
205 PRINTTAB(2)A$;"{CYN}{20 DOWN}HIT RET
    URN TO CONT"
210 GETR$:IFR$=CHR$(13)THENRETURN
215 FORI=1TO333:NEXT
220 IFA$="{RVS}"THENA$="{OFF}":GOTO230
225 IFA$="{OFF}"THENA$="{RVS}":GOTO230
230 NEXTL
235 A$="{RED}*** * * *{3 SPACES}*** *
    {2 SPACES}*":X=LEN(A$):Z$="{DOWN}":G
    OSUB295
240 A$="*{3 SPACES}* * *{3 SPACES}* * **
    *":X=LEN(A$):Z$="{2 DOWN}":GOSUB295
245 A$="*{4 SPACES}*{2 SPACES}*
    {3 SPACES}* * * **":X=LEN(A$):Z$="
    {3 DOWN}":GOSUB295
250 A$="***{2 SPACES}*{2 SPACES}*** ***
    *{2 SPACES}* ":X=LEN(A$):Z$="
    {4 DOWN}":GOSUB295
255 A$="{YEL}{2 SPACES}*** *** ***
    {2 SPACES}* *{2 SPACES}":X=LEN(A$):Z
    $="{7 DOWN}":GOSUB295
260 A$="{4 SPACES}* * * * *{2 SPACES}* *
    {3 SPACES}":X=LEN(A$):Z$="{8 DOWN}":
    GOSUB295
265 A$="{3 SPACES}*{2 SPACES}*** ***
    {2 SPACES}* *{3 SPACES}":X=LEN(A$):Z
    $="{9 DOWN}":GOSUB295
270 A$="{2 SPACES}*{3 SPACES}* * *
    {10 SPACES}":X=LEN(A$):Z$="{10 DOWN}
    ":GOSUB295
275 A$="{2 SPACES}*** * * *{4 SPACES}* *
    {2 SPACES}":X=LEN(A$):Z$="{11 DOWN}"
    :GOSUB295
280 PRINT:PRINT
285 A$="{YEL}{4 SPACES}BY M. DUDLEY
    {5 SPACES}":X=LEN(A$):Z$="{14 DOWN}"
    :GOSUB295
290 GOTO40
295 POKE36878,15
300 FORI=1TOLEN(A$)
305 PRINT"{HOME}{DOWN}"Z$;SPC(X)LEFT$(A$
    ,I):POKE36876,255-(I*7)
310 X=X-1:NEXT:POKE36876,0:RETURN
400 FORA=4700TO5000
420 READD
430 POKEA,D
```

```
440 NEXT
450 RETURN
500 DATA169,8,141,15,144,169,147,32,210,
    255,162,8,160,8,32,240,255,169,18,32
    ,210,255,169
501 DATA169,32,210,255,169,127,32,210,25
    5,169,146,32,210,255,169,32,32,210,2
    55,169,18,32
502 DATA210,255,169,169,32,210,255,169,1
    27,32,210,255,24,162,9,160,7,32,240,
    255,169,169
503 DATA32,210,255,169,160,162,5,32,210,
    255,202,224,0,208,248,169,127,32,210
    ,255,24
504 DATA162,10,160,7,32,240,255,169,146,
    32,210,255,169,127,32,210,255,169,18
    ,32,210,255
505 DATA169,160,162,5,32,210,255,202,224
    ,0,208,248,169,146,32,210,255,169,16
    9,32,210,255
506 DATA24,162,11,160,7,32,240,255,169,3
    2,32,210,255,169,18,32,210,255,169,1
    60,162,5,32
507 DATA210,255,202,224,0,208,248,169,14
    6,32,210,255,169,32,32,210,255,24,16
    2,11,160,7
508 DATA32,240,255,169,18,32,210,255,24,
    162,12,160,7,32,240,255,169,169,32,2
    10,255,169
509 DATA160,162,5,32,210,255,202,224,0,2
    08,248,169,127,32,210,255,24,162,13,
    160,7,32,240
510 DATA255,169,146,32,210,255,169,127,3
    2,210,255,169,18,32,210,255,169,160,
    162,5,32,210
511 DATA255,202,224,0,208,248,169,146,32
    ,210,255,169,169,32,210,255,24,169,1
    46,32,210
512 DATA255,24,162,14,160,8,32,240,255,1
    69,127,32,210,255,169,169,32,210,255
    ,169,32,32
513 DATA210,255,169,127,32,210,255,169,1
    69,32,210,255,24,96
```

Program 3: Cylon Zap, VIC Version

```
35 DEFFNA(A)=INT(RND(1)*X+A):TT=4348
40 V3=36876:N1=4106:N2=4590:N3=4338:N4=4
   359:V1=36876
45 CS=36879:S0=36878:C=33792:V4=36877:W1
   =30:W2=20:W3=10:W4=5:W5=1
50 A1$="D..":A2$="U..":A3$="D..":A4$="C.
   .":A5$="O.."
55 POKECS,8:PRINT"{CLR}":GOTO655
60 BASE=3:S1=1:S2=1:S3=1:S4=1:BOM=3:SC=0
65 POKE36869,205:X=15:Y=1:I=22
70 PRINT"{CLR}{WHT}":POKECS,8
75 DD=37154:P1=37151:P2=37152
80 GOSUB240
90 PRINT"{HOME}{CYN}:;<"SC:PRINT"{HOME}
   {DOWN}=>?"BA:PRINT"[b]"BOM
95 POKEDD,127:P=PEEK(P2)AND128
100 J0=-(P=0)
105 POKEDD,255:P=PEEK(P1)
110 J1=-((PAND8)=0):J2=-((PAND16)=0):J3=
    -((PAND4)=0):FB=-((PAND32)=0):G=42
115 POKETT,102
120 POKETT+C,INT(RND(1)*7+1)
125 IFJ3THEN320
130 IFJ1THEN345
135 IFJ2THEN370
140 IFJ0THEN395
145 IFFBANDBOM>0THEN855
150 A1=FNA(1)
155 A2=FNA(2)
160 A3=FNA(3)
165 A4=FNA(4)
170 IFA1=1ANDS1<>0THENS1=0:GOSUB900
175 IFA2=2ANDS2<>0THENS2=0:GOSUB900
180 IFA3=3ANDS3<>0THENS3=0:GOSUB900
185 IFA4=4ANDS4<>0THENS4=0:GOSUB900
190 IFS1=0ANDPEEK(N1+22)<>102THENN1=N1+I
    :POKEN1+C,4:POKEN1,40:POKEN1-I,32
195 IFPEEK(N1+22)=102THENGOSUB585
200 IFS2=0ANDPEEK(N2-22)<>102THENN2=N2-I
    :POKEN2+C,3:POKEN2,37:POKEN2+I,32
205 IFPEEK(N2-22)=102THENGOSUB585
210 IFS3=0ANDPEEK(N3+1)<>102THENN3=N3+Y:
    POKEN3+C,5:POKEN3,39:POKEN3-Y,32
215 IFPEEK(N3+1)=102THENGOSUB585
220 IFS4=0ANDPEEK(N4-1)<>102THENN4=N4-Y:
    POKEN4+C,6:POKEN4,38:POKEN4+Y,32
225 IFPEEK(N4-1)=102THENGOSUB585
230 IFBASE=0THENGOTO620
233 IFSC>50THENX=4
235 GOTO90
240 PRINT"{RED}":SYS4700
295 POKE4282+C,7:POKE4282,33:POKE4414+C,
    7:POKE4414,36:POKE4345+C,7:POKE4345,
    34
300 POKE4351+C,7:POKE4351,35
310 POKETT-1,102:POKETT+1,102:POKETT-22,
    102:POKETT+22,102
315 RETURN
320 POKEV4,245:POKES0,15
325 FORF=4282TO4106STEP-22
330 IFPEEK(F-22)<>40THENPOKEF+C,7:POKEF,
    41:FORT=1TO5:NEXT:POKEF,32:NEXT
335 IFPEEK(F-22)=40THENPOKEN1+C,2:POKEN1
    ,42:GOSUB480:POKEN1,32:N1=4106:S1=1
340 POKEV4,0:POKE4282,33:GOTO150
345 POKEV4,245:POKES0,15
350 FORF=4414TO4602STEP22
355 IFPEEK(F+22)<>37THENPOKEF+C,7:POKEF,
    41:FORT=1TO5:NEXT:POKEF,32:NEXT
360 IFPEEK(F+22)=37THEN:POKEN2+C,2:POKEN
    2,42:GOSUB480:POKEN2,32:N2=4590:S2=1
365 POKEV4,0:POKE4414,36:GOTO150
370 POKES0,15:POKEV4,245
375 FORF=4345TO4338STEP-1
380 IFPEEK(F-1)<>39THENPOKEF+C,7:POKEF,4
    3:FORT=1TO5:NEXT:POKEF,32:NEXT
385 IFPEEK(F-1)=39THENPOKEN3+C,2:POKEN3,
    42:GOSUB480:POKEN3,32:N3=4338:S3=1
390 POKEV4,0:POKE4345,34:GOTO150
395 POKES0,15:POKEV4,245
400 FORF=4351TO4359
405 IFPEEK(F+1)<>38THENPOKEF+C,7:POKEF,4
    3:FORT=1TO5:NEXT:POKEF,32:NEXT
410 IFPEEK(F+1)=38THENPOKEN4+C,2:POKEN4,
    42:GOSUB480:POKEN4,32:N4=4359:S4=1
415 POKEV4,0:POKE4351,35:GOTO150
420 POKES0,15:RESTORE
425 READP
430 IFP=-1THEN465
435 READD
440 POKEV3,P:POKEV1,P
445 FORN=1TOD:NEXT
450 POKEV3,0:POKEV1,0
455 FORN=1TO20:NEXT
460 GOTO425
465 RETURN
470 DATA217,200,213,200,223,200,227,100,
    234,100,230,200
475 DATA227,100,234,100,230,200,223,200,
    227,200,217,200,213,300,-1
480 POKES0,15
```

```
485 POKEV4,2ØØ
49Ø FORL=15TOØSTEP-1
495 POKESØ,L
5ØØ NEXT:POKEV4,Ø
5Ø5 SC=SC+1
51Ø IFSC=3ØTHENX=INT(X/2):Y=2
515 IFSC=5ØTHENX=4:I=44:BOM=BOM+1
52Ø IFSC=6ØORSC=11ØORSC=15ØTHENGOTO53Ø
525 RETURN
53Ø PRINT"{CLR}{1Ø DOWN}{9 SPACES}BONUS"
535 PRINT"{6 SPACES}BASE - BOMB"
54Ø POKEV4,Ø:POKE36878,15:L=Ø
545 FORT=1TO1Ø
55Ø POKE36876,22Ø
555 NEXT
56Ø FORT=1TO1Ø
565 POKE36876,23Ø
57Ø NEXT
575 IFL<6THENL=L+1:GOTO545
58Ø BOM=BOM+1:BASE=BASE+1:SC=SC+5:POKE36
    876,Ø:POKE36878,Ø:PRINT"{CLR}":GOSUB
    24Ø:GOTO51Ø
585 POKESØ,15:Q1=4348:Q2=4349:Q3=437Ø:Q4
    =4371:K=Ø:Q5=Q1-23:Q6=Q3+23:Q7=Q1+21
    :Q8=4372
59Ø POKEV4,2ØØ:KK=8
595 FORZ=15TOØSTEP-2
6ØØ POKESØ,Z:GOSUB69Ø:NEXT:POKECS,8:POKE
    V4,Ø
6Ø5 N1=41Ø6:S1=1:N2=459Ø:S2=1:N3=4338:S3
    =1:N4=4359:S4=1:PRINT"{CLR}"
61Ø BASE=BASE-1:IFBASE<>ØTHENGOSUB24Ø
615 RETURN
62Ø POKE36869,192:PRINT"{CLR}"
625 IFSC=>W1THENA5$=A4$:A4$=A3$:A3$=A2$
63Ø IFSC=>W1THENA2$=A1$:W5=W4:W4=W3:W3=W
    2:W2=W1:W1=SC:GOTO9Ø5
635 IFSC=>W2ANDSC<W1THENA5$=A4$:A4$=A3$:
    A3$=A2$:W5=W4:W4=W3:W3=W2:W2=SC:GOTO
    91Ø
64Ø IFSC=>W3ANDSC<W2THENA5$=A4$:A4$=A3$:
    W5=W4:W4=W3:W3=SC:GOTO915
645 IFSC=>W4ANDSC<W3THENA5$=A4$:W5=W4:W4
    =SC:GOTO92Ø
65Ø IFSC=>W5ANDSC<W4THENW5=SC:GOTO925
655 GOSUB82Ø:PRINT"{HOME}{YEL}{21 DOWN}
    {4 SPACES}TO PLAY HIT {RVS}{CYN}Y"
66Ø GETZ$:IFZ$=""THENFORCC=37897TO379ØØ:
    POKECC,INT(RND(1)*7+1):NEXT
665 POKE38366,INT(RND(1)*7+1)
67Ø IFZ$=""THEN66Ø
675 IFZ$="Y"THEN6Ø
68Ø IFZ$="N"THENPRINT"{CLR}{BLU}":POKECS
    ,27:END
685 GOTO655
69Ø K=K+1:M=23:N=22:O=21:R=INT(RND(1)*7+
    1):IFK>3ANDKK<11ØTHENPOKECS,KK:KK=KK
    +17
695 POKEQ1,G:POKEQ2,G:POKEQ3,G:POKEQ4,G:
    POKEQ5,G:POKEQ6,G:POKEQ7,G:POKEQ8,G
7ØØ POKEQ1+C,R:POKEQ2+C,INT(RND(1)*7+1):
    POKEQ3+C,R:POKEQ4+C,INT(RND(1)*7+1)
7Ø5 POKEQ5+C,R:POKEQ6+C,INT(RND(1)*7+1):
    POKEQ7+C,R:POKEQ8+C,INT(RND(1)*7+1)
71Ø FORT=1TO1Ø:NEXT
715 IFK>3THENG=46:PRINT"{CLR}"
72Ø IFK<8THENQ1=Q1-O:Q2=Q2-M:Q3=Q3+O:Q4=
    Q4+M:Q5=Q5-N:Q6=Q6+N:Q7=Q7-1:Q8=Q8+1
    :RETURN
725 PRINT"{CLR}":RETURN
73Ø PRINT"{3 DOWN}":CH=4171:E=1
735 POKEDD,127:P=PEEK(P2)AND128
74Ø JØ=-(P=Ø)
745 POKEDD,255:P=PEEK(P1)
75Ø J2=-((PAND16)=Ø)
755 FB=-((PAND32)=Ø)
76Ø IFJØTHENE=E+1
765 IFJ2THENE=E-1
77Ø IFE=ØTHENE=26
775 IFE=27THENE=1
78Ø POKECH,E:POKECH+C,7
785 FORT=1TO1ØØ:NEXT
79Ø POKECH+C,6
795 IFFBANDCH=4171THENN1$=CHR$(E+64):CH=
    CH+1:E=1:GOTO735
8ØØ IFFBANDCH=4172THENN2$=CHR$(E+64):CH=
    CH+1:E=1:GOTO735
8Ø5 IFFBANDCH=4173THENN3$=CHR$(E+64):CH=
    CH+1:E=32:GOTO735
81Ø IFCH=4174THENN5$=N1$+N2$+N3$:RETURN
815 GOTO735
82Ø PRINT"{CLR}{2 SPACES}{BLU} CYLON ZAP
     HEROS":PRINT:PRINT"{RED}{4 SPACES}B
    EST 5 SCORES{OFF}"
825 PRINT"{HOME}{DOWN}{CYN}{4 DOWN}
    {6 SPACES}"A1$"..."W1
83Ø PRINT"{PUR}{2 DOWN}{6 SPACES}"A2$"..
    ."W2
835 PRINT"{GRN}{2 DOWN}{6 SPACES}"A3$"..
    ."W3
84Ø PRINT"{BLU}{2 DOWN}{6 SPACES}"A4$"..
    ."W4
845 PRINT"{RED}{2 DOWN}{6 SPACES}"A5$"..
    ."W5
85Ø RETURN
855 POKESØ,15:POKEV4,22Ø
86Ø FORCO=127TO8STEP-17
865 POKECS,CO:POKESØ,CO/8-1
87Ø FORT=1TO1ØØ:NEXT:NEXTCO
875 IFS1=ØTHENSC=SC+1:GOSUB51Ø:POKEN1,32
    :N1=41Ø6:S1=1
88Ø IFS2=ØTHENSC=SC+1:GOSUB51Ø:POKEN2,32
    :N2=459Ø:S2=1
885 IFS3=ØTHENSC=SC+1:GOSUB51Ø:POKEN3,32
    :N3=4338:S3=1
89Ø IFS4=ØTHENSC=SC+1:GOSUB51Ø:POKEN4,32
    :N4=4359:S4=1
895 POKEV4,Ø:BOM=BOM-1:GOTO15Ø
9ØØ POKESØ,15:FORM=18ØTO235STEP2:POKEV3,
    M:NEXT:POKEV3,Ø:POKESØ,Ø:RETURN
9Ø5 PRINT"{HOME}#1 ENTER YOUR INITIALS":
    GOSUB42Ø:GOSUB73Ø:A1$=N5$:GOTO655
91Ø PRINT"{HOME}#2 ENTER YOUR INITIALS":
    GOSUB42Ø:GOSUB73Ø:A2$=N5$:GOTO655
915 PRINT"{HOME}#3 ENTER YOUR INITIALS":
    GOSUB42Ø:GOSUB73Ø:A3$=N5$:GOTO655
92Ø PRINT"{HOME}#4 ENTER YOUR INITIALS":
    GOSUB42Ø:GOSUB73Ø:A4$=N5$:GOTO655
925 PRINT"{HOME}#5 ENTER YOUR INITIALS":
    GOSUB42Ø:GOSUB73Ø:A5$=N5$:GOTO655
```

Program 4: Cylon Zap, 64 Version

```
1ØØ POKE52,48:POKE56,48:CLR
125 DATA28,149,1ØØ,25,3Ø,1ØØ,33,135,1ØØ,3
     7,162,5Ø,5Ø,6Ø,5Ø
13Ø DATA42,62,1ØØ,37,162,5Ø,5Ø,6Ø,5Ø,42,6
     2,1ØØ,33,135,1ØØ
14Ø DATA28,49,1ØØ,25,3Ø,1ØØ
145 FORX=1TO36:READRT:NEXT
15Ø PRINT"{CLR}":POKE53281,Ø:POKE5328Ø,Ø:
     PRINTCHR$(14)
16Ø GOSUB59Ø
17Ø PRINT"{3 DOWN}{11 SPACES}{RVS}LOADING
     {SHIFT-SPACE}CHARACTERS"
18Ø POKE56334,(PEEK(56334)AND254):POKE1,P
     EEK(1)AND251
```

```
190 FORA=0TO2047:POKE(A+12288),PEEK(A+532
    48):NEXT
200 FORA=12552TO12672
210 READD
220 IFD<>-1THENPOKEA,D:NEXT
230 FORA=12288TO14335:READD:IFD<>-1THENPO
    KEA,PEEK(A):NEXT
240 FORA=12504TO12527:READD:POKEA,D:NEXT
250 POKE1,55
260 POKE56334,PEEK(56334)OR1
270 GOSUB750:PRINT"{UP}{10 SPACES}INSTRUC
    TIONS{OFF} {RVS}Y{OFF} OR {RVS}N
    {OFF} "
280 GETA$:IFA$=""THENPOKE56079,INT(RND(1)
    *7+1):POKE56084,INT(RND(1)*7+1):GOTO
    280
290 IFA$="Y"THENPOKE53272,(PEEK(53272)AND
    240)+12:GOSUB380
300 GOTO1000
310 DATA24,24,60,126,24,24,126,255,1,19,5
    1,255,255,51,19,1,128,200,204,255,25
    5,204,200
320 DATA128,255,126,24,24,126,60,24,24,24
    ,24,60,24,60,126,219,195,3,7,44,254,
    254,44,7,3
330 DATA192,224,52,127,127,52,224,192,195
    ,219,126,60,24,60,24,24,16,8,16,8,16
    ,8,16,8
340 DATA145,74,44,113,142,52,82,137,0,0,0
    ,170,85,0,0,0,-1
350 DATA0,0,0,119,68,116,20,119,0,0,0,119
    ,85,87,86,117,0,0,0,112,64,96,64,112
360 DATA0,0,0,206,170,206,170,202,0,0,0,2
    38,136,236,40,238,0,0,0,224,128,224,
    32,224,-1
370 DATA0,0,0,206,170,202,170,206,0,0,0,1
    39,218,171,138,139,0,0,0,56,160,56,1
    36,56
380 PRINT"{CLR}{RED}WELCOME TO CYLON ZAP"
390 PRINT"YOU HAVE A BASE NAMED ALPHA"
    {10 SPACES}:PRINT
400 PRINT"{CYN}YOUR MISSION IS TO
    {2 SPACES}PROTECT THE":PRINT"NUCLEAR
     REACTOR"
410 PRINT"{PUR}FROM THE KAMIKAZE STAR ":P
    RINT" FIGHTERS"
420 PRINT"{DOWN}{GRN}YOU HAVE 4 LASERS
    {2 SPACES}CONTROLLED BY THE
    {4 SPACES}JOYSTICK"
430 PRINT"{BLU}YOU ALSO HAVE SMART BOMBS
     LAUNCHED BY THE FIRE BUTTON"
440 PRINT"{DOWN}{YEL}ALL YOU DO IS POINT
     THE GUN AND THE{6 SPACES}LASER FIRES
     AUTOMATICALLY"
450 GOSUB500
460 PRINT"{CLR}{PUR}{DOWN}THE FIGHTERS WI
    LL FLY FASTER THE MORE{3 SPACES}OF T
    HEM YOU DESTROY "
470 PRINT"{DOWN}{YEL}BONUS BASE AND BOMB
     AT 60 POINTS"
480 PRINT"{BLU}{DOWN}{9 SPACES}{RVS}GOOD
     LUCK":GOSUB500:RETURN
490 GOTO65535
500 A$="{RVS}"
510 FORL=1TO1000
520 PRINT"{HOME}"
530 PRINTTAB(2)A$;"{CYN}{20 DOWN}HIT RETU
    RN TO CONT."
540 GETR$:IFR$=CHR$(13)THENRETURN
550 FORI=1TO333:NEXT
560 IFA$="{RVS}"THENA$="{OFF}":GOTO580
570 IFA$="{OFF}"THENA$="{RVS}":GOTO580
580 NEXTL
590 A$="{RED}*** *{3 SPACES}* *{4 SPACES}
    ***{2 SPACES}*{2 SPACES}*":X=LEN(A$)
    :Z$="{DOWN}":GOSUB710
600 A$="*{4 SPACES}* *{2 SPACES}*
    {4 SPACES}* *{2 SPACES}** *":X=LEN(A
    $):Z$="{2 DOWN}":GOSUB710
610 A$="*{5 SPACES}*{3 SPACES}*{4 SPACES}
    * *{2 SPACES}* **":X=LEN(A$):Z$="
    {3 DOWN}":GOSUB710
611 A$="*{5 SPACES}*{3 SPACES}*{4 SPACES}
    * *{2 SPACES}* **":X=LEN(A$):Z$="
    {4 DOWN}":GOSUB710
620 A$="***{3 SPACES}*{3 SPACES}***
    {2 SPACES}***{2 SPACES}*{2 SPACES}*
    ":X=LEN(A$):Z$="{5 DOWN}":GOSUB710
630 A$="{YEL}{2 SPACES}***{2 SPACES}***
    {2 SPACES}***{2 SPACES}* *{2 SPACES}
    ":X=LEN(A$):Z$="{8 DOWN}":GOSUB710
640 A$="{4 SPACES}*{2 SPACES}* *
    {2 SPACES}* *{2 SPACES}* *{3 SPACES}
    ":X=LEN(A$):Z$="{9 DOWN}":GOSUB710
650 A$="{3 SPACES}*{3 SPACES}***
    {2 SPACES}***{2 SPACES}* *{3 SPACES}
    ":X=LEN(A$):Z$="{10 DOWN}":GOSUB710
660 A$="{2 SPACES}*{4 SPACES}* *
    {2 SPACES}*{10 SPACES}":X=LEN(A$):Z$
    ="{11 DOWN}":GOSUB710
670 A$="{2 SPACES}***{2 SPACES}* *
    {2 SPACES}*{4 SPACES}* *{2 SPACES}":
    X=LEN(A$):Z$="{12 DOWN}":GOSUB710
680 PRINT:PRINT
700 GOTO170
710 S=54272
711 POKE54296,15 :POKE54277,18:POKE54278,
    240
712 POKE 54276,33
720 FORI=1TOLEN(A$):POKE54273,I+40
721 PRINT"{HOME}{DOWN}{8 RIGHT}"Z$;SPC(X)
    LEFT$(A$,I):POKE54272,(I*2)+180
730 X=X-1:NEXT:FORG=15TO0STEP-1:POKE54296
    ,G:NEXT:POKES+4,16
735 FORE=STOS+28:POKEE,0:NEXT:RETURN
750 FORA=49152TO49453
760 READD
770 POKEA,D
780 NEXT
790 RETURN
800 DATA169,12,141,33,208,169,147,32,210,
    255,162,8,160,16,32,240,255,169,18,3
    2
810 DATA210,255,169
820 DATA169,32,210,255,169,127,32,210,255
    ,169,146,32,210,255,169,32,32,210
825 DATA 255,169,18,32
830 DATA210,255,169,169,32,210,255,169,12
    7,32,210,255,24,162,9,160,15,32
835 DATA 240,255,169,169
840 DATA32,210,255,169,160,162,5,32,210,2
    55,202,224,0,208,248,169,127
845 DATA 32,210,255,24
850 DATA162,10,160,15,32,240,255,169,146,
    32,210,255,169,127,32,210,255
855 DATA 169,18,32,210,255
860 DATA169,160,162,5,32,210,255,202,224,
    0,208,248,169,146,32,210,255
865 DATA 169,169,32,210,255
870 DATA24,162,11,160,15,32,240,255,169,3
    2,32,210,255,169,18,32,210
```

```
875 DATA255,169,160,162,5,32
880 DATA210,255,202,224,0,208,248,169,146
    ,32,210,255,169,32,32,210,255,24
885 DATA 24,162,11,160,7
890 DATA32,240,255,169,18,32,210,255,24,1
    62,12,160,15,32,240,255,169,169
895 DATA 32,210,255,169
900 DATA160,162,5,32,210,255,202,224,0,20
    8,248,169,127,32,210,255,24
905 DATA 162,13,160,15,32,240
910 DATA255,169,146,32,210,255,169,127,32
    ,210,255,169,18,32,210,255
915 DATA 169,160,162,5,32,210
920 DATA255,202,224,0,208,248,169,146,32,
    210,255,169,169,32,210,255,24
925 DATA 169,146,32,210
930 DATA255,24,162,14,160,16,32,240,255,1
    69,127,32,210,255,169,169,32
935 DATA 210,255,169,32,32
940 DATA210,255,169,127,32,210,255,169,16
    9,32,210,255,24,96
1000 RESTORE:CLR
1060 DEFFNA(A)=INT(RND(1)*X+A):TT=1482
1070 POKE53272,(PEEK(53272)AND240)+12
1080 N1=1042:N2=1922:N3=1464:N4=1502:V1=3
     6876
1090 CS=53281:C=54272:W1=30:W2=20:W3=10:W
     4=5:W5=1
1100 A1$="D..":A2$="U..":A3$="D..":A4$="C
     ..":A5$="O.."
1110 POKECS,1:PRINT"{CLR}":GOTO2190
1120 BASE=3:S1=1:S2=1:S3=1:S4=1:BOM=3:SC=
     0
1130 POKECS,12:X=15:Y=1:I=40
1140 PRINT"{CLR}{WHT}":POKECS,8
1150 GOSUB1450
1160 PRINT"{HOME}{WHT}SCORE"SC:PRINT"
     {HOME}{DOWN}BASES"BA:PRINT"{WHT}BOM
     BS"BO
1170 J0=15-(PEEK(56321)AND15)
1180 G=42:FB=(PEEK(56321)AND16)
1190 POKETT,102
1200 POKETT+C,INT(RND(1)*7+1)
1210 IFJ0=1 THEN1510
1220 IFJ0=2 THEN1570
1230 IFJ0=4 THEN1630
1240 IFJ0=8 THEN1690
1250 IFFB=0ANDBOM>0THEN2590
1260 A1=FNA(1)
1270 A2=FNA(2)
1280 A3=FNA(3)
1290 A4=FNA(4)
1300 IFA1=1ANDS1<>0THENS1=0: GOSUB2680
1310 IFA2=2ANDS2<>0THENS2=0: GOSUB2680
1320 IFA3=3ANDS3<>0THENS3=0: GOSUB2680
1330 IFA4=4ANDS4<>0THENS4=0: GOSUB2680
1340 IFS1=0ANDPEEK(N1+40)<>102THENN1=N1+I
     :POKEN1+C,4:POKEN1,40:POKEN1-I,32
1350 IFPEEK(N1+40)=102THENGOSUB2050
1360 IFS2=0ANDPEEK(N2-40)<>102THENN2=N2-I
     :POKEN2+C,3:POKEN2,37:POKEN2+I,32
1370 IFPEEK(N2-40)=102THENGOSUB2050
1380 IFS3=0ANDPEEK(N3+1)<>102THENN3=N3+Y:
     POKEN3+C,5:POKEN3,39:POKEN3-Y,32
1390 IFPEEK(N3+1)=102THENGOSUB2050
1400 IFS4=0ANDPEEK(N4-1)<>102THENN4=N4-Y:
     POKEN4+C,6:POKEN4,38:POKEN4+Y,32
1410 IFPEEK(N4-1)=102THENGOSUB2050
1420 IFBASE=0THENGOTO2130
1430 IFSC>50THENX=4
1440 GOTO1160
1450 PRINT"{RED}":SYS49152:POKECS,11
1460 POKE1362+C,1:POKE1362,33:POKE1602+C,
     1:POKE1602,36:POKE1479+C,1:POKE1479
     ,34
1470 POKE1485+C,1:POKE1485,35
1480 POKETT-1,102:POKETT+1,102:POKETT-40,
     102:POKETT+40,102
1490 POKETT-1+C,1:POKETT+1+C,1:POKETT-40+
     C,1:POKETT+40+C,1
1500 RETURN
1510 POKE54296,15:POKE54273,33:POKE54272,
     133:POKE54277,50:POKE54278,120
1520 POKE54276,129
1530 FORF=1362TO1042STEP-40
1540 IFPEEK(F-40)<>40THENPOKEF+C,1:POKEF,
     41:FORT=1TO5:NEXT:POKEF,32:NEXT
1550 IFPEEK(F-40)=40THENPOKEN1+C,2:POKEN1
     ,42:GOSUB1830:POKEN1,32:N1=1042:S1=
     1
1560 POKE54296,0:POKE1362,33:GOTO1260
1570 POKE54296,15:POKE54273,33:POKE54272,
     133:POKE54277,50:POKE54278,120
1580 POKE54276,129
1590 FORF=1602TO1944STEP40
1600 IFPEEK(F+40)<>37THENPOKEF+C,1:POKEF,
     41:FORT=1TO5:NEXT:POKEF,32:NEXT
1610 IFPEEK(F+40)=37THENPOKE2+C,2:POKEN2,
     42:GOSUB1830:POKEN2,32:N2=1922:S2=1
     -40
1620 POKE54296,0:POKE1602,36:GOTO1260
1630 POKE54296,15:POKE54273,33:POKE54272,
     133:POKE54277,50:POKE54278,120
1640 POKE54276,129
1650 FORF=1479TO1464STEP-1
1660 IFPEEK(F-1)<>39THENPOKEF+C,1:POKEF,4
     3:FORT=1TO5:NEXT:POKEF,32:NEXT
1670 IFPEEK(F-1)=39THENPOKEN3+C,2:POKEN3,
     42:GOSUB1830:POKEN3,32:N3=1464:S3=1
1680 POKE54296,0:POKE1479,34:GOTO1260
1690 POKE54296,15:POKE54273,33:POKE54272,
     133:POKE54277,50:POKE54278,120
1700 POKE54276,129
1710 FORF=1485TO1502
1720 IFPEEK(F+1)<>38THENPOKEF+C,1:POKEF,4
     3:FORT=1TO5:NEXT:POKEF,32:NEXT
1730 IFPEEK(F+1)=38THENPOKEN4+C,2:POKEN4,
     42:GOSUB1830:POKEN4,32:N4=1502:S4=1
1740 POKE54296,0:POKE1485,35:GOTO1260
1745 FORS0=54272TO54272+28:POKES0,0:NEXT
1750 POKE54296,15:POKE54277,53:POKE54278,
     69:POKE54276,33
1770 RESTORE:FORGB=1TO12:READHA,LA,DU:POK
     E54273,HA:POKE54272,LA
1780 FORT=1TODU:NEXTT
1790 NEXTGB:FORS0=54272TO54272+28:POKES0,
     0:NEXT
1800 RETURN
1810 DATA217,200,213,200,223,200,227,100,
     234,100,230,200
1820 DATA227,100,234,100,230,200,223,200,
     227,200,217,200,213,300,-1
1830 POKE54296,15:POKE54277,53:POKE54278,
     67:POKE54276,129
1840 POKE54272,200:POKE54273,33
1850 FORL=15TO0STEP-1
1860 POKE54296,L
1870 NEXT:POKE54276,0
1880 SC=SC+1
```

```
1890 IFSC=30THENX=INT(X/2):Y=2
1900 IFSC=50THENX=4:I=80:BOM=BOM+1
1910 IFSC=60ORSC=110ORSC=150THENGOTO1930
1920 RETURN
1930 PRINT"{CLR}{10 DOWN}{10 SPACES}BONUS
     ";
1940 PRINT" BASE - BOMB":L=0
1950 POKE54296,15:POKE54277,50:POKE54278,
     167:POKE54276,17
1960 FORT=1TO10
1970 POKE54272,230:POKE54273,33
1980 NEXT
1990 FORT=1TO10
2000 POKE54272,180:POKE54273,28
2010 NEXT
2020 IFL<6THENL=L+1:GOTO1950
2030 FORD=54272TO54272+28:POKED,0:NEXT
2040 BOM=BOM+1:BA=BA+1:SC=SC+5:PRINT"
     {CLR}":GOSUB1450:GOTO1890
2050 POKE54296,14:Q1=1482:Q2=1484:Q3=1522
     :Q4=1524:K=0:Q5=Q1-41:Q6=Q3+41:Q7=Q
     1+39
2060 Q8=1526:POKE54277,44:POKE54278,56:PO
     KE54276,129
2070 POKE54272,200:POKE54273,34:KK=8
2080 FORZ=15TO0STEP-2
2090 POKE54296,Z:GOSUB2260:NEXT:POKECS,8·
     POKE54276,0
2100 N1=1042:S1=1:N2=1922:S2=1:N3=1464:S3
     =1:N4=1502:S4=1:PRINT"{CLR}"
2110 BASE=BASE-1:IFBASE<>0THENGOSUB1450
2120 RETURN
2130 PRINT"{CLR}"
2140 IFSC=>W1THENA5$=A4$:A4$=A3$:A3$=A2$
2150 IFSC=>W1THENA2$=A1$:W5=W4:W4=W3:W3=W
     2:W2=W1:W1=SC:GOTO2730
2160 IFSC=>W3ANDSC<W2THENA5$=A4$:A4$=A3$:
     W5=W4:W4=W3:W3=SC:GOTO2750
2170 IFSC=>W4ANDSC<W3THENA5$=A4$:W5=W4:W4
     =SC:GOTO2760
2180 IFSC=>W5ANDSC<W4THENW5=SC:GOTO2770
2190 GOSUB2510:PRINT"{HOME}{BLK}{21 DOWN}
     {12 SPACES}TO PLAY HIT {RVS}{BLK}Y"
2200 GETZ$:IFZ$=""THENFORCC=55312TO55315:
     POKECC,INT(RND(1)*7+1):NEXT
2210 POKE56165,INT(RND(1)*7+1)
2220 IFZ$=""THEN2200
2230 IFZ$="Y"THEN1120
2240 IFZ$="N"THENPRINT"{CLR}{BLU}":POKECS
     ,27:END
2250 GOTO2190
2260 K=K+1:M=41:N=40:O=39:R=INT(RND(1)*7+
     1)
2270 IFK>3ANDK<110THENPOKECS,KK:KK=KK+31
2280 POKEQ1,G:POKEQ2,G:POKEQ3,G:POKEQ4,G:
     POKEQ5,G:POKEQ6,G:POKEQ7,G:POKEQ8,G
2290 POKEQ1+C,R:POKEQ2+C,INT(RND(1)*7+1):
     POKEQ3+C,R:POKEQ4+C,INT(RND(1)*7+1)
2300 POKEQ5+C,R:POKEQ6+C,INT(RND(1)*7+1):
     POKEQ7+C,R:POKEQ8+C,INT(RND(1)*7+1)
2310 FORT=1TO10:NEXT
2320 IFK>3THENG=46:PRINT"{CLR}"
2330 IFK<8THENQ1=Q1-O:Q2=Q2-M:Q3=Q3+O:Q4=
     Q4+M:Q5=Q5-N:Q6=Q6+N:Q7=Q7-1:Q8=Q8+
     1
2340 RETURN
2350 PRINT"{CLR}":RETURN
2360 PRINT"{3 DOWN}":CH=1160:E=1
2370 J0=15-(PEEK(56321)AND15)
2380 FB=PEEK(56321)AND16
2390 IFJ0=8THENE=E+1
2400 IFJ0=4THENE=E-1
2410 IFE=0THENE=26
2420 IFE=27THENE=1
2430 POKECH,E:POKECH+C,7
2440 FORT=1TO100:NEXT
2450 POKECH+C,1
2460 IFFB=0 ANDCH=1160THENN1$=CHR$(E+64):
     CH=CH+1:E=1:GOTO2370
2470 IFFB=0ANDCH=1161THENN2$=CHR$(E+64):C
     H=CH+1:E=1:GOTO2370
2480 IFFB=0 ANDCH=1162THENN3$=CHR$(E+64):
     CH=CH+1:E=32:GOTO2370
2490 IFCH=1163THENN5$=N1$+N2$+N3$:RETURN
2500 GOTO2370
2510 POKE53281,1
2520 PRINT"{CLR}{2 SPACES}{BLK}{9 SPACES}
     CYLON ZAP HEROS":PRINT:PRINT"{RED}
     {12 SPACES}BEST 5 SCORES{OFF}"
2530 PRINT"{HOME}{DOWN}{BLK}{4 DOWN}
     {14 SPACES}"A1$"..."W1
2540 PRINT"{BLU}{2 DOWN}{14 SPACES}"A2$".
     .."W2
2550 PRINT"{GRN}{2 DOWN}{14 SPACES}"A3$".
     .."W3
2560 PRINT"{PUR}{2 DOWN}{14 SPACES}"A4$".
     .."W4
2570 PRINT"{RED}{2 DOWN}{14 SPACES}"A5$".
     .."W5
2580 RETURN
2590 POKE54296,15:POKE54277,43:POKE54278,
     73:POKE54276,129
2600 FORCO=127TO8STEP-17
2610 POKECS,CO
2620 FORT=1TO100:NEXT:NEXTCO:POKECS,11
2630 IFS1=0THENSC=SC+1:GOSUB1890:POKEN1,3
     2:N1=1042:S1=1
2640 IFS2=0THENSC=SC+1:GOSUB1890:POKEN2,3
     2:N2=1922:S2=1
2650 IFS3=0THENSC=SC+1:GOSUB1890:POKEN3,3
     2:N3=1464:S3=1
2660 IFS4=0THENSC=SC+1:GOSUB1890:POKEN4,3
     2:N4=1502:S4=1
2670 FORS0=54272TO54272+28:POKES0,0:NEXT:
     BOM=BOM-1:GOTO1260
2680 S=54272:FORE=STOS+28:POKEE,0:NEXT
2690 POKE54296, 15 :POKE54277, 51 :POKE54
     278, 84
2700 POKE 54276, 17 :FORJ=1TO40STEP4:POKE
      54273,J:POKE54272,255-J-25:NEXT
2710 FORT=1TO 100 :NEXT:POKE54276, 32:FOR
     T=1TO 50:NEXT
2720 FORE=STOS+28:POKEE,0:NEXT:RETURN
2730 PRINT"{HOME}NUMBER 1 ENTER YOUR INIT
     IALS":GOSUB1745:GOSUB2360:A1$=N5$:G
     OTO2190
2740 PRINT"{HOME}NUMBER 2 ENTER YOUR INIT
     IALS":GOSUB1745:GOSUB2360:A2$=N5$:G
     OTO2190
2750 PRINT"{HOME}NUMBER 3 ENTER YOUR INIT
     IALS":GOSUB1745:GOSUB2360:A3$=N5$:G
     OTO2190
2760 PRINT"{HOME}NUMBER 4 ENTER YOUR INIT
     IALS":GOSUB1745:GOSUB2360:A4$=N5$:G
     OTO2190
2770 PRINT"{HOME}NUMBER 5 ENTER YOUR INIT
     IALS":GOSUB1745:GOSUB2360:A5$=N5$:G
     OTO2190
```

Beginner's Machine Language

> **BEFORE TYPING...**
> Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs" and "A Beginner's Guide To Typing In Programs" that appear before the Program Listings.

Program 1: RAMtest, VIC Version

```
800 FOR ADRES=864TO989:READ DATTA:POKE A
    DRES,DATTA:NEXT ADRES
864 DATA 84, 69, 83, 84, 32, 79
870 DATA 86, 69, 82, 32, 32, 66
876 DATA 65, 68, 32, 66, 89, 84
882 DATA 69, 32, 169, 16, 133, 58
888 DATA 169, 0, 133, 57, 160, 0
894 DATA 24, 141, 0, 30, 145, 57
900 DATA 209, 57, 240, 21, 152, 72
906 DATA 165, 58, 72, 32, 179, 3
912 DATA 104, 133, 58, 104, 168, 169
918 DATA 0, 230, 57, 208, 7, 230
924 DATA 58, 24, 105, 1, 208, 221
930 DATA 200, 208, 218, 32, 193, 3
936 DATA 230, 58, 165, 58, 201, 30
942 DATA 144, 207, 76, 203, 3, 162
948 DATA 10, 160, 0, 185, 106, 3
954 DATA 32, 210, 255, 200, 202, 208
960 DATA 246, 72, 152, 72, 32, 194
966 DATA 221, 104, 168, 104, 96, 169
972 DATA 13, 32, 210, 255, 160, 0
978 DATA 185, 96, 3, 32, 210, 255
984 DATA 200, 192, 10, 208, 245, 96
```

Program 2: RAMtest, 64 Version

```
800 FOR ADRES=864TO995:READ DATTA:POKE A
    DRES,DATTA:NEXT ADRES
864 DATA 84, 69, 83, 84, 32, 79
870 DATA 86, 69, 82, 32, 32, 66
876 DATA 65, 68, 32, 66, 89, 84
882 DATA 69, 32, 169, 8, 133, 58
888 DATA 169, 0, 133, 57, 160, 0
894 DATA 24, 141, 0, 4, 145, 57
900 DATA 209, 57, 240, 21, 152, 72
906 DATA 165, 58, 72, 32, 179, 3
912 DATA 104, 133, 58, 104, 168, 169
918 DATA 0, 230, 57, 208, 7, 230
924 DATA 58, 24, 105, 1, 208, 221
930 DATA 200, 208, 218, 32, 193, 3
936 DATA 230, 58, 165, 58, 201, 160
942 DATA 144, 207, 76, 208, 3, 162
948 DATA 10, 160, 0, 185, 106, 3
954 DATA 32, 210, 255, 200, 202, 208
960 DATA 246, 72, 152, 72, 169, 32
966 DATA 32, 210, 255, 32, 201, 189
972 DATA 104, 168, 104, 96, 169, 13
978 DATA 32, 210, 255, 160, 0, 185
984 DATA 96, 3, 32, 210, 255, 200
192, 10, 208, 245, 96, 0
```

The Four-Speed Brake

Program 1: Speed Brake For The 64

```
1 REM *** 4 SPEED BRAKE FOR THE C64 ***
60000 FORA=828TO894:READB:POKEA,B:NEXT:END
60010 DATA120,169,73,141,20,3,169,3,141,
      21,3,88,96,162,0,160,0,165,197,201
60020 DATA4,208,10,232,208,253,200,192,4
      8,208,248,160,0,201,5,208,6,232,20
      8
60030 DATA253,200,208,250,201,6,208,8,23
      2,234,234,208,251,200,208,248,32
60040 DATA159,255,165,197,201,3,240,247
      76,49,234
```

Program 2: Speed Brake For The VIC

```
1 REM *** 4 SPEED BRAKE FOR THE VIC ***
60000 FORA=828TO894:READB:POKEA,B:NEXT:E
      ND
60010 DATA120,169,73,141,20,3,169,3,141,
      21,3,88,96,162,0,160,0,165,197,201
      ,39,208,10
60020 DATA232,208,253,200,192,48,208,248
      ,160,0,201,47,208,6,232,208,253,20
      0,208,250,201
60030 DATA55,208,8,232,234,234,208,251,2
      00,208,248,32,159,255,165,197,201,
      63,240,247
60040 DATA76,191,234
```

The Beginner's Corner

Keyboard

```
2 POKE36878,15:GOTO50
3 AA$="C":S=131:CC=0:RETURN
4 AA$="D":S=145:CC=3:RETURN
5 AA$="E":S=158:CC=6:RETURN
6 AA$="F":S=161:IFK=1THENCC=8:RETURN
7 CC=0:RETURN
8 AA$="G":S=173:IFK=1THENCC=11:RETURN
9 CC=3:RETURN
10 AA$="A":S=181:IFK=1THENCC=14:RETURN
11 CC=6:RETURN
12 AA$="B":S=189:IFK=1THENCC=17:RETURN
13 CC=9:RETURN
14 AA$="C":S=192:CC=11:RETURN
15 AA$="D":S=200:CC=14:RETURN
16 AA$="E":S=206:CC=17:RETURN
20 FORKI=1TO10:PRINT" {BLK}{RVS}
   {2 SPACES}{OFF} {RVS}{2 SPACES}{OFF}
   B {RVS}{2 SPACES}{OFF} {RVS}
   {2 SPACES}{OFF} {RVS}{2 SPACES}{OFF}
   B":NEXT
21 FORKI=1TO3:PRINT"{2 SPACES}{G}
   {2 SPACES}{G} B{2 SPACES}{G}
   {2 SPACES}{G}{2 SPACES}{G} B":NEX
   T:RETURN
22 FORKI=1TO10:PRINT" {BLK}{RVS}
   {2 SPACES}{OFF} {RVS}{2 SPACES}{OFF}
   {RVS}{2 SPACES}{OFF} B {RVS}
   {2 SPACES}{OFF} {RVS}{2 SPACES}{OFF}
   B":NEXT
```

```
23 FORKI=1TO3:PRINT"{2 SPACES}{G}
   {2 SPACES}{G}{2 SPACES}{G} B
   {2 SPACES}{G}{2 SPACES}{G} B":NEX
   T:RETURN
50 PRINT"{CLR}{BLU}{3 DOWN}{2 SPACES}LET
   'S LEARN NOTES":PRINT"{2 DOWN}
   {4 SPACES}THE KEYBOARD{7 DOWN}"
51 PRINTTAB(5);"BY REGENA":SS=36876
52 DATA131,145,158,161,173,181,189,192
54 FORI=1TO8:READS:POKESS,S:FORD=1TO200:
   NEXTD,I:POKESS,0:GOTO150
55 FORI=1TO10
56 PRINT"{CLR}{BLK}":K=INT(RND(1)*2)+1:O
   NKGOSUB20,22:PRINT"{22 T}"
58 N=INT(RND(1)*7)+1:ONKGOTO60,62
60 ONNGOSUB3,4,5,6,8,10,12:GOTO64
62 ONNGOSUB6,8,10,12,14,15,16
64 POKE7944+CC,42:CS=38664+CC:FORD=1TO20
   :POKECS,7:POKECS,2:NEXT
66 PRINT"{BLU}{3 DOWN}NAME THE NOTE"
68 GETA$:IFA$=""THEN68
70 IFA$=AA$THEN80
72 POKE36877,128:FORD=1TO400:NEXT:POKE36
   877,0:GOTO68
80 POKE7944+CC,ASC(A$)-64:POKESS,S:FORD=
   1TO400:NEXTD:POKESS,0:NEXTI
90 PRINT"{3 DOWN}{GRN}TRY AGAIN (Y/N)"
92 GETA$:IFA$="Y"THEN55
93 IFA$<>"N"THEN92
94 PRINT"{CLR}{BLU}":END
104 FORI=1TO7:PRINT"{2 SPACES}{RVS}
    {OFF} {RVS} {OFF} {RVS} {OFF} B
    {RVS} {OFF} {RVS} {OFF} B {RVS}
    {OFF} {RVS} {OFF} {RVS} ":NEXT:RETUR
    N
106 FORI=1TO3:PRINT"{2 SPACES}B B B B B
    B B B B B":NEXT:PRINT"{22 Y} ":RET
    URN
108 PRINT"{2 DOWN}{GRN}PRESS RETURN";
109 GETA$:IFA$=""THEN109
110 IFASC(A$)<>13THEN109
111 PRINT"{CLR}{BLU}":RETURN
150 PRINT"{CLR}{DOWN}{BLU}A PIANO OR ORG
    AN":PRINT"KEYBOARD HAS GROUPS
    {3 SPACES}OF TWO BLACK ?KEYS"
152 PRINT"AND THREE BLACK KEYS. {2 DOWN}
    {BLK}":GOSUB104:GOSUB106:GOSUB108
154 PRINT"{DOWN}LOOK AT A SET OF":PRINT"
    TWO {BLK}BLACK{BLU} KEYS:":PRINT"
    {DOWN}THE NAMES OF THE KEYS ARE C, D
    , AND E."
156 PRINT"{BLK}{DOWN}":FORI=1TO7:PRINT"
    {3 SPACES}{H}{3 SPACES}{RVS}
    {2 SPACES}{OFF}{3 SPACES}{RVS}
    {2 SPACES}{OFF}{4 SPACES}{H}":NEXT
158 PRINT"{3 SPACES}{H}{4 SPACES}{H}
    {4 SPACES}{H}{4 SPACES}{H}
    {6 SPACES}{H} {RED}C{BLK}
    {2 SPACES}{H} {RED}D{BLK}
    {2 SPACES}{H} {RED}E{BLK}
    {2 SPACES}{H}":PRINT"{3 SPACES}
    {H}{4 SPACES}{H}{4 SPACES}{H}
    {4 SPACES}{H}"
160 PRINT"{22 Y}":GOSUB108
164 PRINT"THE LETTER NAMES OF{3 SPACES}T
    HE KEYS ARE THE{6 SPACES}ALPHABET LE
    TTERS{6 SPACES}UP TO G.{3 DOWN}{BLK}
    "
166 GOSUB104:PRINT"{2 SPACES}B
    {SHIFT-SPACE}B{SHIFT-SPACE}B
    {SHIFT-SPACE}B{SHIFT-SPACE}B
    {SHIFT-SPACE}B{SHIFT-SPACE}B
    {SHIFT-SPACE}B{SHIFT-SPACE}B
    {SHIFT-SPACE}B{2 SPACES}{RED}F{BLK}B
    {RED}G{BLK}B{RED}A{BLK}B{RED}B{BLK}B
    {PUR}C{BLK}B{PUR}D{BLK}B{PUR}E{BLK}B
    {RED}F{BLK}B{RED}G{BLK}B{RED}A{BLK}B
    {RED}B{BLK}";
168 PRINT"{2 SPACES}B{SHIFT-SPACE}B
    {SHIFT-SPACE}B{SHIFT-SPACE}B
    {SHIFT-SPACE}B{SHIFT-SPACE}B
    {SHIFT-SPACE}B{SHIFT-SPACE}B
    {SHIFT-SPACE}B{SHIFT-SPACE}B
    {SHIFT-SPACE}{22 Y}":GOSUB108:GOTO 55
170 END
```

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