A Buyer's Guide To Modems

COMPUTE!'s GAZETTE

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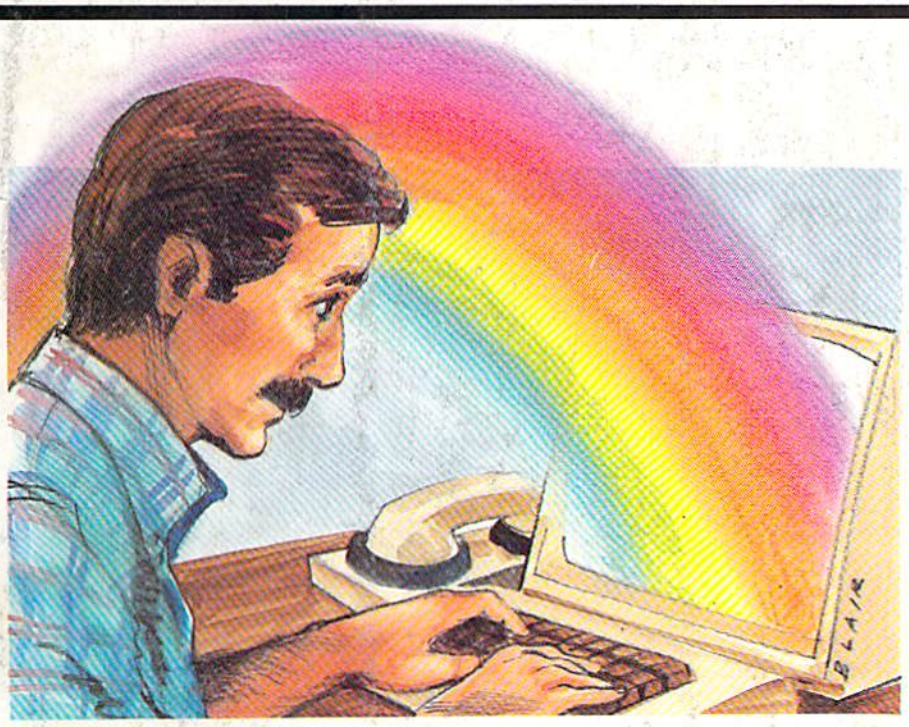
For Owners And Users Of **Commodore VIC-20**™ And **64**™ Personal Computers



Bulletin Board Fever

A look at the growth of telecommunications networks geared to Commodore owners.

Disk Auto Load For The 64

A handy utility that automatically loads and runs your BASIC or machine language programs.

C/G Term

Talk to other VIC and 64 users with the Color/Graphics Terminal program, the first in a series of integrated telecommunications software. Designed especially for ease of use.

Horizons:64

How does the new Plus/4 stand up to the 64? A revealing look at Commodore's new computer.

Also In This Issue:

Function Key

Machine Language For Beginners: A VIC/64 Assembler

Programming Sound And Graphics With The Super Expander 64

Plus an expanded reviews column

Bagdad

Stay on your magic carpet and fend off the evil genies. Put them back in their bottles, but don't let them escape. A challenging arcade-style game for the VIC and 64.

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The Nice Family: Bill, Janet, Tom and Marybeth.

Once upon a time (it was 1984, in fact) and not so far away (right in your neighborhood), there lived a Nice Family: Bill and Janet Nice, and their children, Tom and Marybeth. The Nices owned a home computer, and they liked what they could do with it. But something was wrong. Every time they went to the store to buy a new game, no one was ever happy. ● "Oh no," said Janet Nice. "This won't do at all! These games are not for us!"

"You're right," said Bill. "They're just not nice." You see, all the games were about war and killing and hurting for no good reason. Things that the Nices didn't want the Nice children doing or even thinking about doing. So Mr. and Mrs. Nice decided to buy educational programs. But that made Tom and Marybeth unhappy, because they thought educational programs were—you know—B-o-r-i-n-g. What were these Nice people to do? ● Then, one day, they found some new games called *Adventures in Narnia*, part of the new LifeWare™ line from Word Publishing. The first two games were *Narnia* and *DawnTreader*, and they were based on the classic fantasies by C.S. Lewis. ● The Nice kids were happy because these games were loaded with action, adventure, excitement

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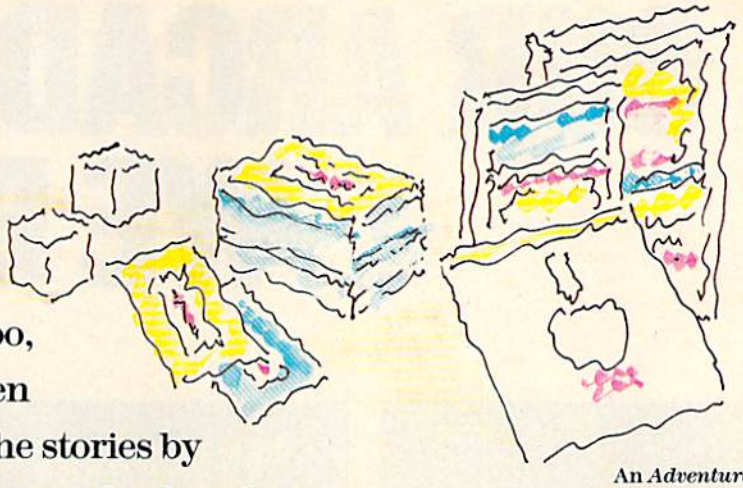
In Texas, call toll-free 1-800-792-3270.

and challenge. Why, they even included things usually found in board games! So everyone in the family could get in on the fun! ● Mr. and Mrs. Nice were happy with *Adventures in Narnia* games, too, because they made their children *think*. And, of course, because the stories by C.S. Lewis present sound concepts and values (no other computer games do). "It's as if these games had our name on them!" said Janet Nice. ● Which brings us to the end of the story. It might be too much to say this family lived happily ever after. But they did live more happily with their computer—and with each other. ● And what could be nicer than that?



An *Adventures in Narnia* game includes diskette, a guide to Narnia, a free C. S. Lewis paperback book and playing pieces usually found in board games.

The End.

But not really. Your family's ***Adventures in Narnia*** are waiting for you at your local computer store or Waldenbooks store. Ask for *Narnia* and *DawnTreader*—the first two games in the ***Adventures in Narnia*** interface series—they're compatible with Apple II series® and Commodore 64™ home computers.

LIFEWARE™

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Available at all stores nationwide.

Waldenbooks

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OUR ARCADE GAMES WE BROUGHT

Bally Midway's Spy Hunter puts you in the driver's seat of the hottest machine on four wheels. You're after enemy spies. The situation is life and death. You'll need every weapon you've got – machine guns, and guided missiles, oil slicks and smoke screens. But the enemy is everywhere. On the road, in the water, even in the air. So you'll have to be more than fast to stay alive in Spy Hunter. You'll need brains and guts, too.

Do you have what it takes?

Bally Midway's Tapper would like to welcome you to the fastest game in the universe.

You're serving up drinks in some of the craziest places you've ever seen. And the service better be good, or else. You'll work your way through the wild Western Saloon to the Sports Bar. From there to the slam dancing Punk Bar and on into the Space Bar full of customers who are, literally, out of this world.

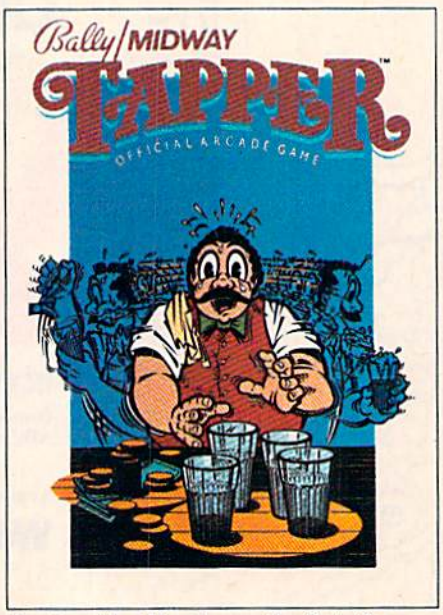
Are you fast enough to play Tapper? If you have to ask, you probably already know the answer.

Bally Midway's Up 'N Down by Sega. In this game, a crash is no accident.

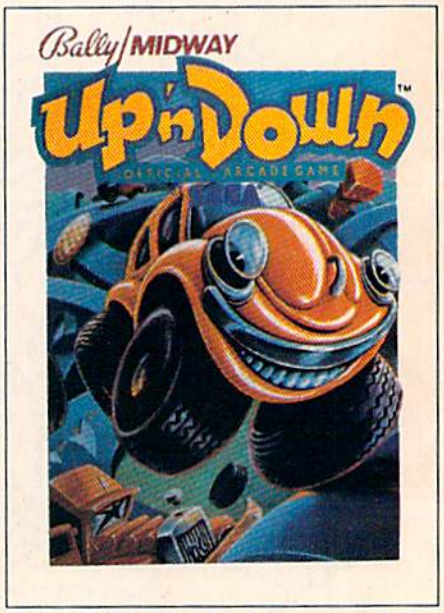
In fact, it's the whole object of the game. You'll race your baja bug over some of the worst roads south of any border. Leap dead ends, gaping canyons and oncoming traffic in a single bound. And if anyone gets in your way, crush 'em.

Crashing, bashing Up 'N Down. It's one smash hit that really is a smash.

The #1 Arcade Game of 1984.



Nominated as Most Innovative Coin-Op Game of 1984 by *Electronic Games* magazine.



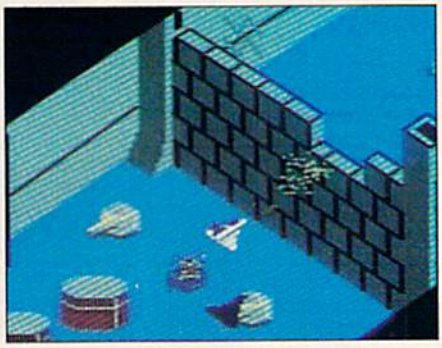
#1 Arcade Hit, *Play Meter* Conversions Poll, 8/1/84.

WERE SUCH BIG HITS, THEM HOME.

Sega's Congo Bongo rocked the home game world when it shot up to Number 3 on the Billboard chart this summer.

And now it's available for even more home systems. So check the chart and get ready for jungle action. You'll pursue the mighty ape Congo up Monkey Mountain and across the Mighty River. Do battle with dangerous jungle creatures. Ride hippos, dodge charging rhinos and try to avoid becoming a snack for a man-eating fish.

Congo Bongo. It's fast and it's fun. But be careful. It's a jungle in there.

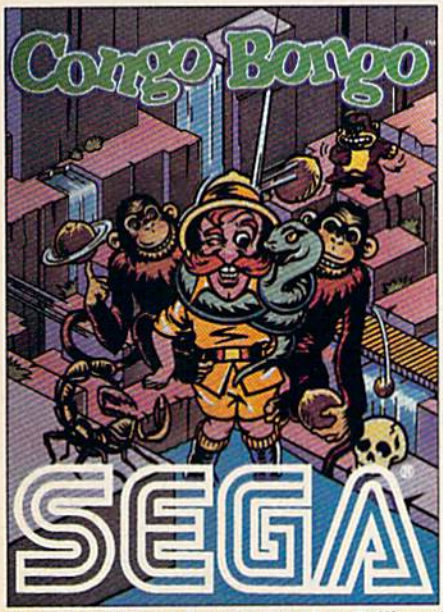


Sega's Zaxxon. If you haven't played Zaxxon, you must have been living on another planet for the past few years.

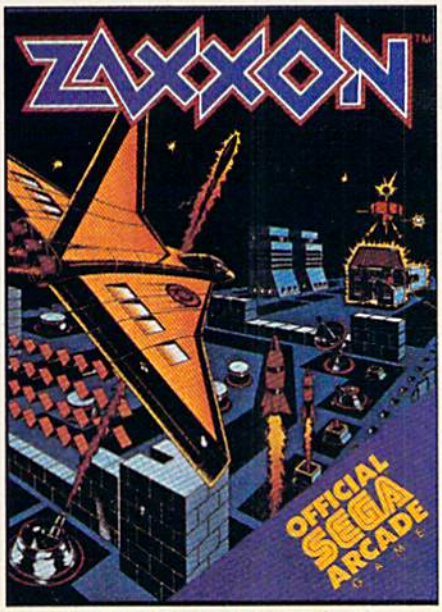
And now the ultimate space combat game is available for even more home systems. You'll pilot a space fighter through force fields and enemy fire on your way to do battle with the mighty Zaxxon robot. Countless others have gone before you in this Hall of Fame game. But this time your life is in your own hands.

Zaxxon killed them in the arcades. But compared to what it will do to you at home, that was child's play.

	SPY HUNTER	TAPPER	UP 'N DOWN	CONGO BONGO	ZAXXON
Atari 2600 cartridge	✓ NEW	✓ NEW	✓ NEW	✓	✓
Atari 5200 cartridge				✓	✓ NEW
Atari Computers* cartridge	✓ NEW	✓ NEW	✓ NEW	✓	✓ NEW
Atari Computers† diskette	✓ NEW	✓ NEW	✓ NEW		✓
ColecoVision & ADAM cartridge	✓ NEW	✓ NEW	✓ NEW	✓ NEW	✓
Commodore 64 cartridge	✓ NEW	✓ NEW	✓ NEW	✓	✓ NEW
Commodore 64 diskette	✓ NEW	✓ NEW	✓ NEW	✓ NEW	✓
Apple II, IIe, IIc diskette	✓ NEW	✓ NEW	✓ NEW	✓ NEW	✓
IBM PC diskette	✓ NEW	✓** NEW	✓ NEW	✓** NEW	✓** NEW



Arcade and Home Smash. Hit #3 on *Billboard* magazine's Top Video Games survey.



One of only ten games ever to make *Electronic Games'* Hall of Fame.

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*Atari 400, 800, 600XL, 800XL and 1200XL. (Congo Bongo cartridge: 400, 800 and 800XL.)
†Atari 800, 600XL, 800XL and 1200XL.
**Also available for IBM PCjr.
All new games are scheduled to be in your stores for Christmas. Check your local dealer.
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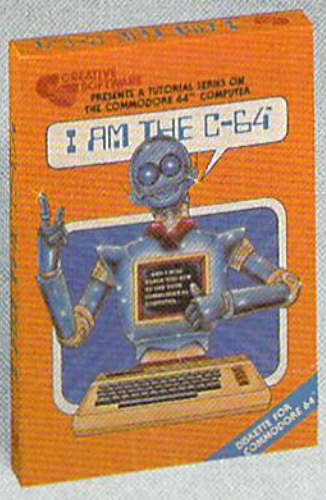
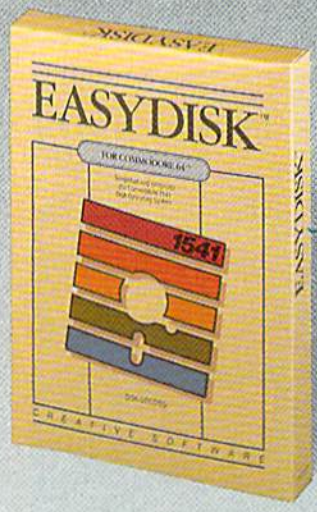
I AM THE C-64 provides you with a friendly and patient private tutor. This series is the perfect guide to learning all the power your Commodore 64 has to offer.

- Complete six-volume series.
- Each operation you can perform is explained in simple terms right on the screen; no more struggling with confusing manuals.
- Includes overall introduction to the Commodore 64 and its keyboard.
- Learn BASIC programming language as well as advanced programming techniques.
- Advanced series guides you through music and sound effects and sprite graphics.



EasyDisk eliminates disk based aggravation. It saves time and adds extra features, all at the touch of a key. A must for all Commodore 64 disk drive owners.

- Simplifies the Commodore 1541 Disk Operating System.
- Organizes all the commands in a simple, easy-to-follow menu.
- Allows you to select and execute commands with just a few simple keystrokes.
- Provides full disk backup (using just one drive).
- Doesn't interfere with the normal operation of your computer; it's simply there when you need it.



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

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THE EDITOR'S *notes*

GAZETTE *Editor Lance Elko contributes a guest editorial this month.*

Robert Lock, Editor In Chief

At last June's Consumer Electronics Show, the prototype of a very powerful, new personal computer was demonstrated inside a closed, invitation-only suite. The computer was manufactured by a small Silicon Valley company, the Amiga Corporation, previously known only as a manufacturer of joysticks. Amiga was looking for capital to finish developing the rough prototype and move it into mass production.

Code-named *Lorraine*, the computer wowed the few who saw it. Although it houses the same microprocessor found in Apple's Macintosh—the 16/32-bit Motorola 68000 chip—it could leave the Mac in the dust. Consider that the Amiga was designed to come with 128K of RAM (expandable to 512K internally and several *megabytes* externally); a built-in 320K double-sided disk drive (IBM-compatible), expandable to several more floppy drives and a hard disk; built-in speech software and modem; four sound channels with synthesizer capabilities similar to the Commodore 64's; medium- and hi-res graphics (with an astonishing 4096 colors); eight sprites (with up to 16 colors each); standard parallel and serial interface ports; outputs for TV, composite video, and two types of RGB monitors; and a lot more. Plus, original plans called for it to be bundled with its own operating system, word processor, and spreadsheet.

The retail price? With all the above features, Amiga claimed the Lorraine would sell for under $1400.

Although the power of this new machine surprised many industry watchers, what surprised them more was the August announcement that Commodore had purchased the Amiga Corporation—and what could be the most powerful personal computer yet developed.

Not to be denied, Atari, under Jack Tramiel's new leadership, filed a $100 million suit against Amiga, contending that Atari had already made a deal with Amiga to obtain the new custom chips which make the Lorraine possible. This lawsuit came several weeks after Commodore had filed litigation against a group of engineers who left Commodore to join Atari. Commodore claims the engineers took with them some of Commodore's computer design secrets. An interesting game of one-upmanship, perhaps?

As one Commodore source noted during this writing, no court injunctions have been granted in either case, and Commodore is continuing with its plans to market the Lorraine—possibly for under $1000.

Whatever the results of the suits and countersuits, Commodore and Atari seem to be planning more powerful and less costly computers for the future. The outcome may depend on home computer sales this Christmas. Commodore leads in the under-$1000 market by a wide margin, but with Tramiel now heading Atari and the Japanese preparing to distribute MSX-based computers, we can expect renewed activity on the price/features front in 1985.

Telecommunications Software Series

Beginning with this issue, we're introducing a series of integrated telecommunications software, which includes a terminal program and a bulletin board. "C/G Term," which starts on page 38 in this issue, is designed for the VIC and 64 and is easy enough for a novice to use.

What makes this terminal program unique is that it eliminates nearly all the cryptic codes and tedious chores normally associated with the operation of terminal software. For example, you don't have to worry if you're sending or receiving a letter, program, or color graphics screen. The program figures it out and does the hard work.

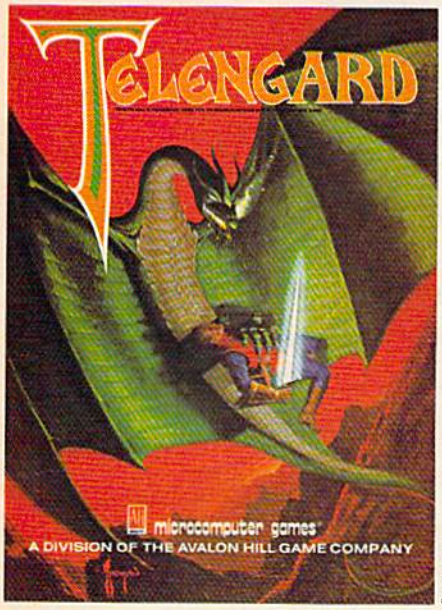
Next month, we'll publish the first half of the listing for the bulletin board system, designed for the Commodore 64 and for use with C/G Term. The remaining half will appear in the January issue.

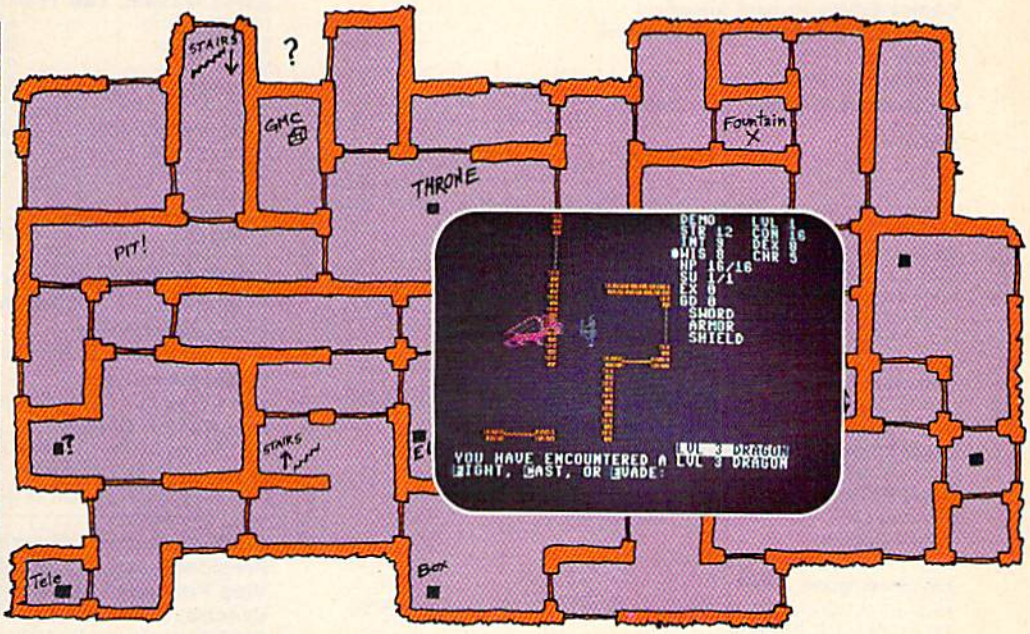
Until next month, enjoy your GAZETTE.

Lance Elko
Editor

In the October issue, page 132, we incorrectly noted the phone number of the *Modem Times*. The correct number is (303) 578-5405.

Be Amazed!





Telengard: How low can you go?

We've created a subterranean monster. Fifty stories low.

That's the number of levels in the TELENGARD dungeon.

Each labyrinthine level holds hundreds of dark chambers and tomb-like corridors for the mighty adventurer to explore. It goes without saying that a shifting collection of hideous monsters with unpredictable behavior patterns can make life in the TELENGARD maze quite interesting—and frequently quite short!

Using wits, magic and true grit, your character delves deeper and deeper into the depths of TELENGARD in this realtime fantasy role-playing game. Available on cassette for Commodore® 64, Atari® Home Computers (40K), for a ghoulish $23.00. 48K diskettes for Apple® II, Atari®, Commodore® 64 and TRS-80® available also, for $28.00.

AND FOR THOSE WHO DON'T DIG UNDERGROUND GAMES . . . There's **B-1 NUCLEAR BOMBER,** a nail-biting solitaire simulation of a manned B-1 on a mission over the Soviet Union. Your plane is equipped with six Phoenix Missiles, a one megaton warhead and orders to retaliate! Cassette for Commodore 64, Atari Home Computers (32K), TI99/4 & 4A (16K), VIC-20 (16K), Timex/Sinclair 1000 (16K), and TRS-80 Mods. I/III (16K) are available for an explosive $16.00. Diskette versions for Apple (48K), TRS-80 (32K), Atari (24K) and IBM (48K) just $21.00.

NUKEWAR: Defend your country by massive espionage efforts, or by building jet fighter bombers, missiles, submarines and ABM's. Your cold and calculating computer will choose its own strategy! Cassette for Commodore 64, VIC-20 (16K), TRS-80 Mods. I/III (16K) and Atari Home Computers just $16.00.

FOOTBALL STRATEGY: Animated action on a scrolling field. A head-to-head challenge or solitaire as you select the best offensive or defensive plays in response to your opponent. Commodore 64, Atari Home Computers (32K) and TRS-80 Models I/III/IV (16K) cassette for $16.00. Atari (32K), IBM (64K) and TRS-80 Models I/III/IV (32K) diskettes available at $21.00.

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

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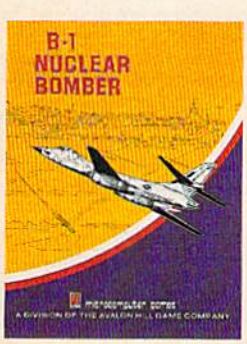
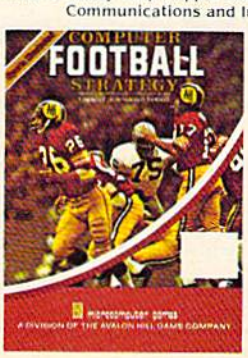
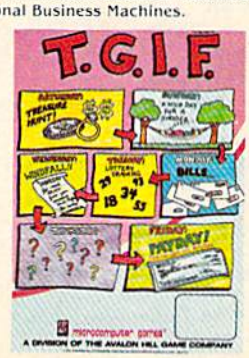


AH QUALITY





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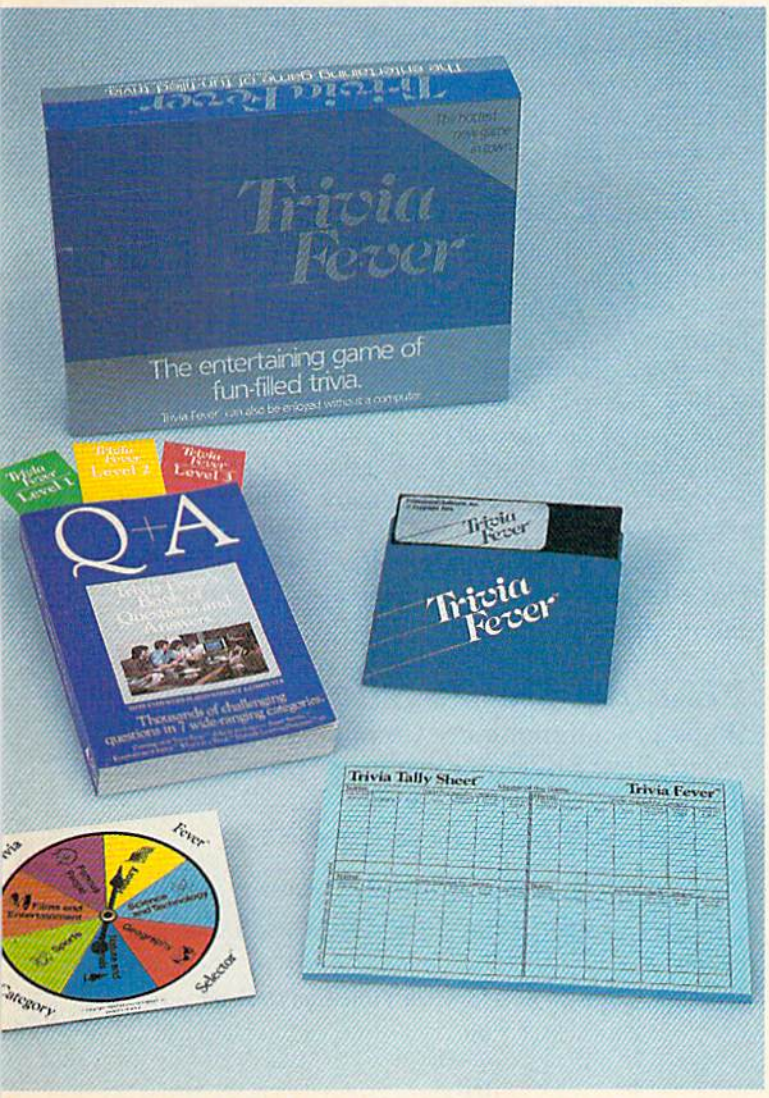

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Do you have a question or a problem? Have you discovered something that could help other VIC-20 and Commodore 64 users? Do you have a comment about something you've read in COMPUTE's GAZETTE? We want to hear from you. Write to Gazette Feedback, COMPUTE's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

Better Pictures

In most of your programs, the graphics tend to be significantly better for the VIC-20 than they are for the 64. Can you explain why this is?

Eric Miller

Very simply, the reason is because of the difference in size of the characters. The VIC has 22 characters per screen line, while the 64 has 40. This means that the VIC's characters are larger and sharper. Hence, the better picture.

Mysterious DATA Statements

In some of your programs, you have lines such as: *DATA John,Jerry*. What exactly does that mean? What do DATA statements really do in a program?

Brian Dempsey

DATA statements are used to store information within a program. Data stored in this fashion is an integral part of the program, as opposed to being stored externally on a disk or tape.

DATA statements themselves are not executed. When a program is running and it comes upon a DATA statement, it skips to the next BASIC command. For this reason, it's best to place them at the end of the program.

The information in DATA statements is accessed with the READ statement. Data can be either numeric or string, although there are a few characters (commas and quotation marks, for example) which can cause problems. Multiple items of data within one DATA statement are separated by a comma. A DATA statement containing both numeric and string data might look like this:

```
10 DATA 1,2,3,Charles,Todd,Kathy
```

The READ statement retrieves data within a DATA statement from left to right, in sequential order. The DATA statement with the lowest BASIC line number is read first. Enter and run this example, which will READ and PRINT names from a DATA statement:

```
10 READA$:IF A$="END" THEN END
20 PRINTA$
30 GOTO 10
40 DATA TOM,GEORGE,DICK
50 DATA HARRY,FRED,PERCY
60 DATA END
```

Also, we've covered this subject in depth in past issues. See especially November 1983, page 150.

What's Zero Page?

I've often come across the term *zero page*. I'd like to know what this term means, and what it's used for.

Rob Gronemann

In the terminology of machine language, a page *is 256 continuous bytes of memory. There are 256 pages of memory (64K) in a Commodore 64 or VIC-20; some are RAM and some ROM, although in an unexpanded VIC some pages are empty.*

Since programmers begin counting at zero, zero page *is the first page of memory, locations 0–255. This area of memory is especially important to machine language programmers because there are many ML instructions which work only on the contents of zero page locations. For example, the BASIC language itself, which is actually a collection of machine language routines, makes use of almost all of the locations in zero page.*

PEEKing The Joystick

While programming my Commodore 64, I've found these PEEKs for use in programs that use the joystick. Use this formula:

PEEK(56321) AND *A* for joystick port 1
or
PEEK(56320) AND *A* for joystick port 2

where *A* is one of the numbers in the table listed below.

Value of *A*	Joystick Function Desired
1	up
2	down
4	left
5	up and left
6	down and left

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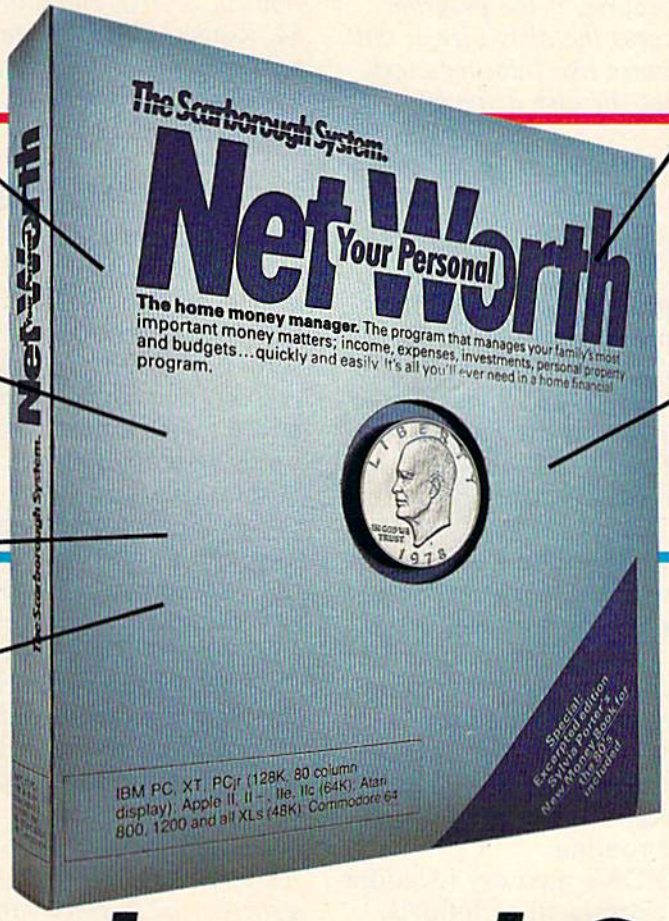

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8	right
9	up and right
10	down and right
16	fire
17	up and fire
18	down and fire
20	left and fire
21	up, left, and fire (diagonally)
22	down, left, and fire (diagonally)
24	right and fire
25	up, right, and fire (diagonally)
26	down, right, and fire (diagonally)

For example, to test whether the fire button is being pressed on the joystick connected to port 2, you could use a line like the following:

```
IF PEEK(56320) AND 16 THEN PRINT "FIRE"
```

Mike Sudduth

Hot Drives

I often load a program or a game that I know will be played for hours. However, I don't like to leave the disk drive on because it might heat up. Is it safe to turn off the drive after it has finished loading the program?

Ilse Herrmann

Once a game is loaded, it's fine in most cases to turn off the disk drive. Of course, if the program you're running needs to access the disk, then it will have to be left on. Some games like Infocom's text adventures continuously use the disk drive while the game is in play.

If you are going to turn the drive off, be sure to remove the disk first.

Cursor Controls

I've discovered a technique for simple cursor control. In many of the programs I study, the cursor is positioned prior to printing with cursor control characters: {DOWN}, {LEFT}, etc. There is a much easier way to position the cursor. An added plus to this technique is that you don't need to know the current cursor position to move to the new position.

There is a Kernal routine called *PLOT* that can be accessed easily from BASIC or machine language. The subroutine (starting at address 65520) requires that the desired row number be placed in the X register and the desired column number in the Y register, and that the accumulator carry flag be cleared (set to 0). At first glance, this looks complicated, but the X and Y register values can be easily loaded from BASIC before calling this Kernal routine.

To set the registers, POKE memory locations 781–783. These bytes are arranged as follows:

Location	Register
781	X
782	Y
783	status register

To use the PLOT function, first POKE the registers with the desired row and column values. For example, if you wanted to print the word TEST starting at the sixth row down and the eleventh column over, you would: POKE 781,5: POKE 782,10. (Remember, the computer calls the top horizontal line of characters row 0, and the leftmost vertical line of characters column 0).

Next, the carry flag of the status register must be cleared. Bit 0 of the status register is the carry flag. When this bit has a value of zero, the carry flag is clear. To set the carry flag:

```
POKE 783,PEEK(783) OR 1
```

and to clear the flag:

```
POKE 783,PEEK(783) AND 254
```

Using the above example, the program to print TEST would look like:

```
10 POKE 783,PEEK(783)AND254:POKE 781,5:PO
   KE782,10:SYS65520:PRINT"TEST"
```

Jack K. Bonge

This can be a useful technique for simulating the PRINT@ (print at) statement common in other versions of BASIC, and will work on both the VIC and 64. Readers should remember to begin counting at zero. The upper-left corner is row zero, column zero, which is why you POKE a 5 to get row 6 and a 10 to get column 11.

Interfacing With The SX-64

I own a Commodore SX-64, and I have a Cardco interface and a Gemini printer. In the recent article, "Selecting a Printer Interface," you stated that interfaces which draw power from the cassette port will not work with the SX-64. This is correct, but with a soldering iron, a bit of solder and a joystick port connector (available at your local electronics store), you can remedy the problem quickly and easily.

First, remove the original connector designed to plug into the cassette port. Solder the end of the wire to pin 7 (see figure) of a joystick plug (*not* the joystick port of the SX-64), and cover the solder connection with electrical tape, or cover the back of the connector with a specially designed hood (also available at electronics stores). To power up the interface, simply insert the connector into the joystick port and turn on your computer.

Patrick Spence

This is a good solution. However, if you aren't experienced in electronics, consult a specialist. Be careful not to void your warranty. Also, some interface manufacturers claim there is insufficient current available from the joystick port to drive their interfaces. Contact the interface manufacturers

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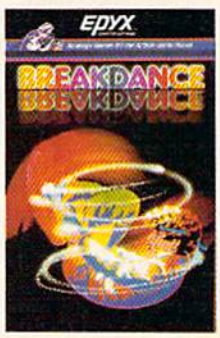

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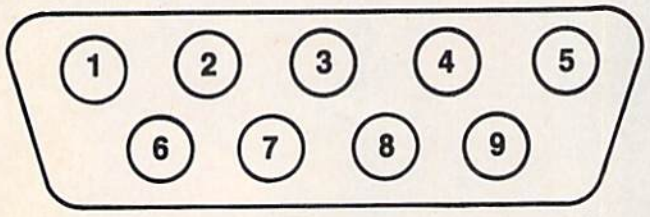
for further information.

Also, see page 139 of the SX-64 User's Guide *for information on the joystick port. Readers should be sure not to use the original joystick plug connector.*

Joystick Plug (Rear View)



WordPro 3 Plus/64 Modification

We've received several letters regarding incompatibility between WordPro for the 64 and the Commodore 1526 printer. Professional Software, distributor of WordPro, has a fix and will send information on the modifications on request. Contact them at:

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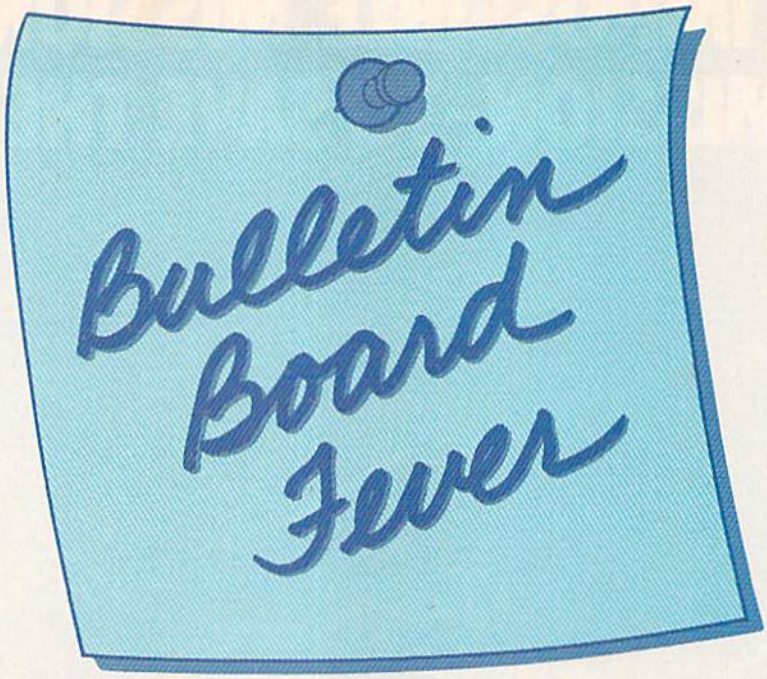

Kathy Yakal, Editorial Assistant

Get used to hearing busy signals: Telecommunications networks are tied up a lot these days. And bulletin board systems specifically designed for Commodore owners are popping up daily around the world. Here's a look at what's happening.

A modem is a rather unremarkable-looking piece of equipment. Plastic housing, maybe a couple of lights or switches, occasionally a wire or cable attached to one end. Nothing magical.

But when you connect it to your computer and dial certain phone numbers, remarkable things do happen. *Telecommunications networks* offer help with technical problems, up-to-date news, movie reviews, public domain software, shopping catalogs, and, sometimes, new friends.

CompuServe and The Source are probably two of the best-known national networks. They are *multi-user systems* which can be used by more than one caller at a time. They charge a subscription fee and an hourly on-line charge. Most large cities (population of 50,000+) have a local number, so you can avoid long-distance charges.

Of course, you don't have to call an established telecommunications service to communicate with your modem. If you and a friend each have modems, you can call each other and "type" to each other, or send software, instead of talking. Though that can be fun for a while, the novelty soon wears off (and the phone bills add up if it's long- distance).

Another telecommunications alternative that's fast gaining popularity is the bulletin board system (BBS). Some of the original boards went on-line in the late seventies, and were run by computer user group members. They were used primarily for posting messages.

Over the past year, BBSs aimed specifically at Commodore owners have popped up all over the country—even in many foreign countries.

It's not hard to see why they call them electronic bulletin board systems. Think of what you most often see tacked up on regular bulletin boards. Notices of time and place for upcoming meetings. Items wanted, or items available for sale or swap. Funny cartoons or articles clipped out of newspapers and magazines. People needing assistance of some sort.

That's the kind of interaction you'll find on Commodore bulletin boards. Only your interaction won't be limited to the bulletin board hanging at the laundromat or on the office wall: You'll have access to people literally all over the world.

Let's walk through your first call to a BBS. Once you've received an answer and a terminal tone, and answered with your own, you'll probably see a message welcoming you. If nothing happens in the first ten seconds or so, try hitting the RETURN key a couple of times. Some systems require you to give them a couple of carriage returns to signal the software that someone is on-line.

After the welcome message and maybe a couple of bulletins from the *system operator* (sysop),

Illustration: Stephen Jobe

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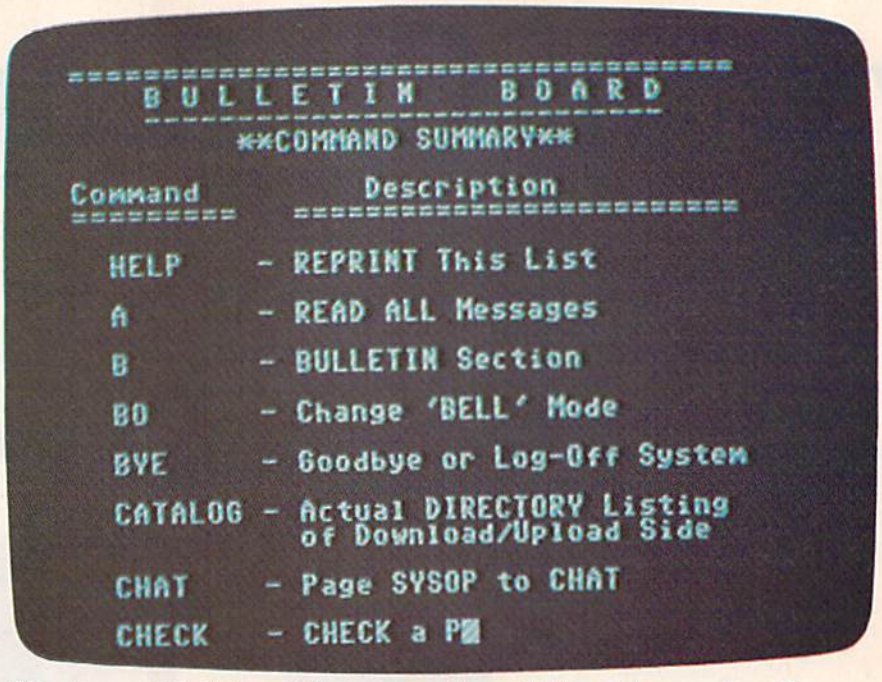
you'll be asked for your name and the city and state you're calling from. You may also be required to make up a password you'll have to remember and use each time you call. This insures that no one can post fake messages using your name. Make sure you write down your password.

Because of the tremendous number of calls that BBSs get, and the tendency of some users to try to crash boards, you may get no farther than this. Many Commodore bulletin boards have been forced to go private in the last year or two. If this is the case, you'll be given an address and/or telephone number to call to inquire about gaining access to the board. Some require modest membership fees, others just want more information about you.

In any case, have a piece of paper and pencil handy. Once the system's menus come rolling by, you may want to take notes, though most systems offer commands that let you stop the action for awhile. Watch for a message that says something like, "Hit S to pause. Once paused, hit S to restart, A to abort." Remember those commands. You'll want to use them once you've become familiar with a BBS and to skip over the opening bulletins.

Command level is where things start happening. You reach this level when all of the sign-on procedures and opening bulletins are completed and the BBS software wants to know what you'd like to see.

It's a good idea to *download* a system's main menu and print out a copy of it (though you must have software that allows downloading to do that). You'll probably become familiar enough with the features that you use most often to remember the commands, but you may also be missing out on some other features.



This is a partial listing of the commands available on Commodore Communications, *a Commodore BBS located in St. Louis.*

Once you've chosen a command and entered it (usually just one or two letters), the system will give you instructions on how to proceed. For example, if you want to enter a message to an individual or for everyone to read, it will prompt you all the way through the process, then give you options to edit or abort the message if you've made a mistake. (If you're brand new to the board, you may have restricted access—allowed to read messages but not leave any—until you sign up as a member.) Most bulletin board systems are user-friendly, as long as you stay alert for command menus and prompts.

Try to complete your business as soon as possible. Bulletin boards are not multi-user systems: While you're on-line, everyone else trying to call is getting busy signals.

One of the commands you must remember is the one to log off. Most often, it's G (goodbye), Q (quit), or just OFF. If you disconnect your modem without first logging off the system, it will take longer for the next person to gain access. You may even wreak some havoc with the BBS software. Some bulletin boards will automatically log you off if there is no activity for five (or ten or fifteen) minutes. If the board is very popular, the sysop may decide to limit calls to thirty minutes per person per day, to prevent callers from monopolizing board time.

The two most common uses of Commodore bulletin board systems, say many sysops, are *electronic mail* and program *downloading*.

Users leave messages about all kinds of things: selling or trading equipment, advice on what kind of software to buy, questions about technical problems, opinions about movies and books and TV personalities, and even debate about political issues. Some of the debates get so heated, in fact, that the sysop will occasionally intervene and put an end to the discussion.

Besides the public forum that electronic mail provides for all to see, a lot of messages are sent privately on BBSs. (You're always given this option when entering a message.)

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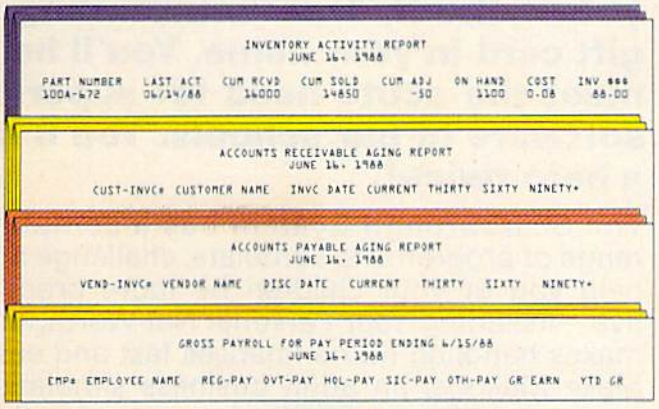

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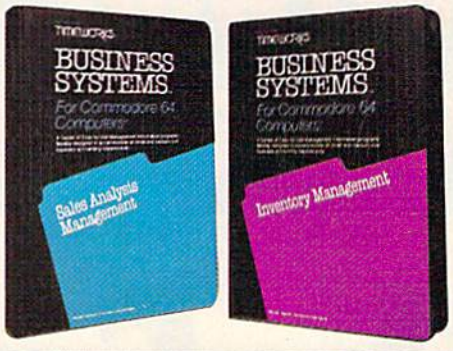

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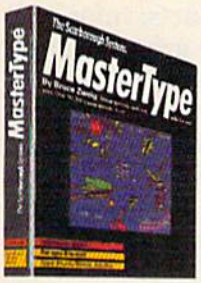

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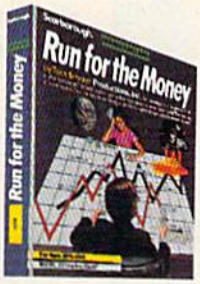

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The Indispensable Sysop

Kathy Yakal, Editorial Assistant

For one sysop, starting a bulletin board system was a leisure-time hobby, an entertaining way to learn about computers. For another, it was an important factor in recovering from a decade of serious illness. Tony Ott and Bob Shannon tell contrasting stories about their histories as sysops and authors of BBS software.

A good way to learn something, it's often said, is to teach it to someone else. In order to explain a concept, you must understand it much more fully than if you were just trying to understand it yourself.

Tony Ott had such a theory when he decided to start a Commodore bulletin board system over two years ago. "By establishing a BBS, I thought I would triple my learning time about computers," he says. "The board has done that."

Ott, who travels frequently in his job as a management consultant, runs the BBS from his St. Louis home in his spare time. He has written several telecommunications-oriented programs which are in the public domain, and recently completed a software program for BBSs that runs on the Commodore 64. He plans to market that, as well as set up a second board using it.

Ott went on-line in the pre-Commodore 64 days, when only PETs and VIC-20s were available. "Initially, one had to be somewhat wealthy to set up a Commodore system," he says. "CBMs were still selling at $1795, 4040s and 8050s [disk drives] were $1795, and the IEEE modem cost $395.

"Then you had to build your own auto-answer circuit, which was another $75–$100. That's a tidy sum, but it was really worth it. It's an amazing learning tool for someone who's really serious about it."

During the last year or so, it's become possible to start a BBS using only a Commodore 64 or VIC-20, a 1541 disk drive, an auto-answer modem, and BBS software. "There are at least 50 BBS programs in the public domain, but they all have enormous problems," says Ott.

Which may be one reason why so many boards perish quickly. Several systems have gone on-line and disappeared, the victims of inadequate software, equipment failures, lack of funds to maintain two phone lines (one for the BBS, one for personal use), or pranksters bent on crashing boards. Ott uses Steve Punter's BBS software, modified for his own use.

Some bulletin board systems store hundreds of *public domain* programs, software that is not copyrighted and can be shared freely. Users are encouraged to upload public domain programs, or programs they have written themselves. Sysops will often put a limit on the number of programs you can download without having uploaded some already, just to keep the program disks full.

Other common features include:

**Bulletins*. News about the latest Commodore hardware and software products; information about user group meetings; miscellaneous industry news.

**Delete* a message or program you uploaded.

**Expert Mode*. Lets you skip over new user information, explanations, and menus.

**System Usage Log*. Gives you a list of who has been using the system.

**Summary of Available Messages*. Lets you scan over message headings and only read the ones you want.

**Other BBS numbers*. Lists telephone numbers of other bulletin board systems. This is the most up-to-date way of finding other BBSs to call.

**Chat Mode*. Allows you to "chat" on-line with the sysop (if he or she is available).

You might wonder what's on the other end of the line when you call a bulletin board system. Occasionally it's the back room of a computer store, but often, it's an individual's living room or bedroom. Usually, the sysop is a Commodore dealer or a user group member.

The hardware that runs the BBS may be no more complicated than your own set-up. All you need to start a BBS is a computer, disk drive, monitor, auto-answer modem, BBS software—and a lot of time and patience. Sysops spend anywhere

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The biggest problem with being a sysop, according to Ott, is lack of time. "It's an enormous responsibility," he says. "I get from ten to twenty-five messages a day, addressed to me, people wanting help." And the only way he can get logged onto the BBS to answer those questions is by auto-dialing the system from another computer in his home.

Beyond that, he has received thousands of letters over the last several months, as well as a steady stream of phone calls. "There was a period there when my phone bill was running about $400 a month, just from returning calls to people who had questions," he says.

Why his BBS's activity picked up so dramatically last fall and hasn't stopped yet is a mystery to Tony Ott. "I kind of wish I could bring back the old days sometimes. It loses the personal touch when there are so many people," he says. Ott's board averages around 70 calls per day, with callers staying on for 10 to 20 minutes.

Though the personality of his BBS hasn't changed, the age of the callers has. "The old PET-CBM people—the ones that bought the old 8K PETs—still call, but they're in the minority today," he says. "Most of the activity is with youngsters."

Nor has Ott's role as sysop changed. "I'm still doing the same thing now as I was two years ago, providing a lot of information and answering a lot of questions.

"There's something mystical about this, and I don't know why. I think it's sort of a security blanket to a lot of people in small towns that call because they don't have a dealer in their town and there isn't even a K-mart for a hundred miles. They know that if I don't know the answer, that someone I come into contact with over a week's period of time will know it."

For the present, Ott considers his work with bulletin boards and software a hobby, though it certainly could be a full-time job. "It's really a release from my high-pressure job," he says.

"Beyond that, the consistency of staying on-line and growing is a big thing. So many boards come and go. I'm just enthralled and fascinated by it now."

Halfway across the country from Tony Ott, Bob Shannon lives and works in a house on the beach near Fort Bragg, California, about 150 miles north of San Francisco. He's the sysop of *Electric Magazine*, a BBS designed in a magazine format. Callers can get updates on local news, read and leave messages, and read columns on a number of topics.

from 2 to 20 hours a week on board maintenance, doing things like answering mail, deleting outdated messages, updating bulletins, and modifying software.

Why do they do it? Toronto resident Steve Punter, author of the *WordPro* word processing package and one of the longest-running Commodore sysops, says he's always had a fascination with communication. "Computers are another way of communicating," he says. "And being at the center of a communications network like a bulletin board is fascinating.

"People think that running a board is simple. They soon find out that it's a lot of work."

Another sysop, 14-year-old Matt Peterson, of San Francisco, found that out when someone crashed his board and destroyed his software. He's trying to reconstruct the program, feature by feature. It's slow going.

But it's better than a $100 phone bill every month, which is what prompted Peterson to start his own BBS. "I wanted to have people start calling me instead of having to call them," he says.

Many user groups start BBSs as a service to their members, instead of, or in addition to, a monthly newsletter. Some, like the Commodore Club of Augusta, Georgia, have equipment donated to them or get it at wholesale cost. Club president David Dumas says that having a bulletin board system simplified the task of distributing public domain software to club members.

Tim Renshaw, a Commodore dealer in Indianapolis, was simply intrigued by the idea of bulletin boards. He had been calling an Apple board in the area, then found out that Steve Punter had written a BBS program for Commodore computers. Renshaw's BBS went

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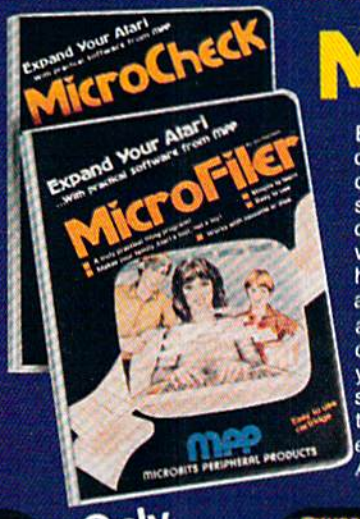

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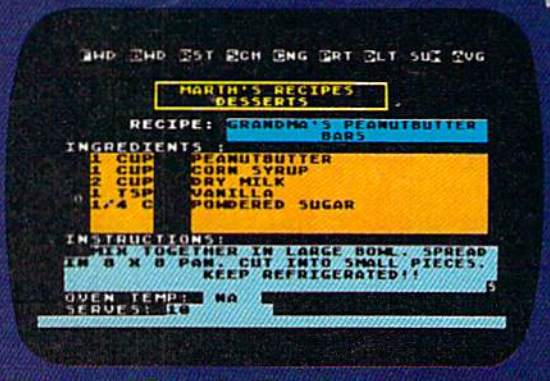

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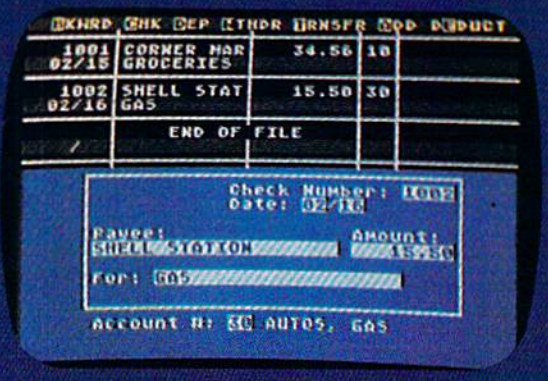

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Shannon has sold his BBS software to almost 400 people, and keeps in close contact with his sysops through phone calls and a monthly newsletter. He charges $39.95 for the software, unless it's requested by someone who plans to use it for communications between the handicapped. His most recent donation went to a group in Israel, who plan to translate it into Hebrew and set up a BBS for the deaf.

"Because it's so much fun, I probably spend more time on upkeep of the board than most sysops do," says Shannon. "It's fun because of the contact with people, and because I'm making enough money to start my own little business."

Five years ago, Shannon wasn't even able to consider such things. Severely brain-damaged from an industrial accident in the late sixties, he was confined to his home for ten years.

Thanks to advances in psychiatric medication, Shannon started to recover a few years ago. He bought a Commodore 64 and began teaching himself to program. "I had read Toffler's *The Third Wave* about three years ago, and remembered how he talked about new entrepreneurships with home computers," he says. Shannon began to wonder if he could do something with computers that was fulfilling and profitable.

He contacted the State Department of Rehabilitation, which told him about a program called PASS (Plan to Achieve Self-Support). By enrolling in it, he could still receive his Social Security disability pay for three years while trying to start a business.

Shannon had logged on to a number of bulletin board systems, and was intrigued by the idea of writing his own. He wrote his own program in about two weeks and went on-line last November using a Commodore 64, a 1541 disk drive (which has run perfectly ever since), and an auto-answer modem.

His BBS software has sold so well, he thinks, "because it's a 14K BASIC program, very easy to tailor. I think its simplicity is kind of a selling point. The board can develop the personality of the sysop. You could look at my boards running all over the country and they don't look at all like mine."

With the money he's made from the sale of his program, Shannon is in the process of setting up his own software store in Fort Bragg. But he has no plans to abandon the *Electric Magazine*, or the daily contact he has with his sysops. "After so many years of disability, it's terribly enjoyable."

on-line August 11, 1982, and has been running ever since.

Sysops report a dramatic increase in activity on their bulletin board systems in the last year. Five calls a day have grown to 75. Message sections of the boards, which used to have months-old mail on them, now have to be cleaned out weekly. More women are calling. Public messages, which used to be all computer-related, have turned to all kinds of topics.

Such a jump has to be related, in part, to increased modem sales. Tim Renshaw thinks the movie *War Games* had a lot to do with that. "That movie opened up a whole new world for people who had computers and didn't know what modems are all about," he says.

But there's another reason, believes Renshaw. "In one light, it's kind of taken the place of CB radio. It's a chance for people to chat with each other and maintain a little bit of anonymity," he says.

Matt Peterson agrees. "You can say what you want without people knowing who you are."

Telephone numbers for BBSs mentioned here (all are operational 24 hours a day unless noted):

AVC Commodore Bulletin Board
(Tim Renshaw, sysop)
(317) 898-5027

Commodore Club of Augusta
(David Dumas, sysop)
(404) 863-7733

Commodore Communications
(Tony Ott, sysop)
(314) 867-6950

The Electric Magazine
(Bob Shannon, sysop)
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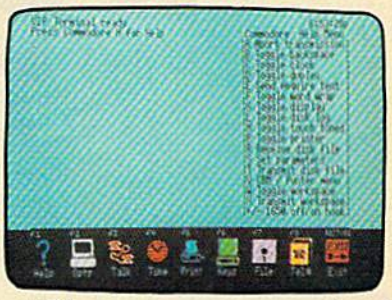

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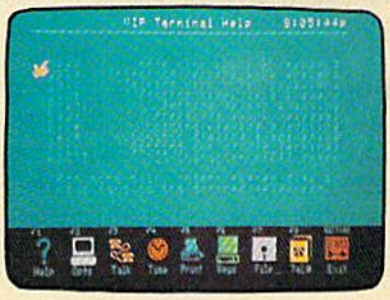

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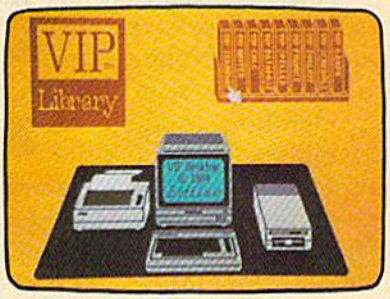

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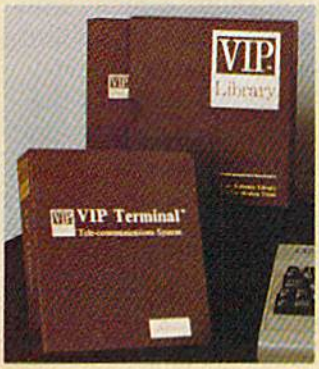

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A Buyer's Guide To Modems

Sharon Darling, Research Assistant

Telecommunicating with other users, data bases, information networks, bulletin boards, and buying services opens up a fascinating world of possibilities. All you need is a modem, but there's a variety to choose from, with a wide range of prices and features. Here's a look at what's available for Commodore users.

Talking to other computers, whether they're across town or across the world, is easy. All it takes is a computer, a telephone, a *modem*, and a *terminal software program*.

A modem (MOdulator-DEModulator) simply translates the numeric digital data from your computer into analog signals (which sound like high-pitched whistles) that can be carried by your telephone. Another modem then reverses the conversion at the receiving end. Terminal software is the program that tells your computer *how* to talk with other computers.

Although modems are primarily signal converters and translators, there are numerous features which bear individual consideration. Modems range in capabilities from the quite simple to the complex. Before buying one, you must decide which features are important to you, and how much you're willing to spend for those extras.

Compatibility is the first thing to be concerned with when modem shopping. The modem you buy must be capable of working on your computer.

That's a little trickier than it sounds, where the Commodore 64 and VIC-20 are concerned. While many modems are equipped with an RS-232 interface, and your Commodore computer has an RS-232 port on the back, it's not as simple as plugging it in.

The Commodore RS-232 port is not compatible with the industry standard RS-232, so unless a modem is designed to work specifically with the 64 or VIC, you'll need an adapter (available from Commodore) to make it work.

Your next consideration should be what kind of phone system you have. Telephone lines are incapable of transmitting the digital bips and beeps sent out by computers, so, again, compatibility is a factor. On some modems, the special features such as automatic dialing will work only with touch tone telephones, while others will work with either pulse (rotary) or touch tone models. Check before you buy to see what kind you need.

Connectors are available to convert your phone's signal to one that will work with the modem you want to buy, should you have your heart set on a particular brand.

Price becomes a consideration when deciding whether you want a *direct-connect* or *acoustic* modem.

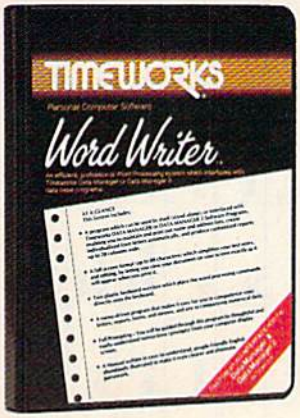
With acoustic modems, which are generally less expensive than direct-connect models, you place the handset of your telephone into soft rubber cups on the modem. One of the cups contains a speaker, which generates audio tones, while the other cup acts as a microphone to receive tones from the other modem.

While you'll save money with this kind of modem, you'll probably sacrifice some quality, as the connection generally is not as good as with a direct-connect modem. And room noises can interfere if the phone handset is not sealed tightly in the cups.

With direct-connect models, the modem plugs directly into the telephone through a modular phone jack. Some direct-connect modems, such as the VICmodem, are cartridges that plug into a port on the computer.

Still other models are stand-alone units that can be placed directly underneath the phone and plugged in.

IF YOU CAN FIND A BETTER WORD PROCESSOR OR DATA BASE SYSTEM WE'LL BUY IT FOR YOU.



Outrageous offer? Not really. For your Commodore 64, we're putting our money where our mouth is, because the Timeworks Word Writer and Timeworks Data Manager 2 are so complete—so extremely easy to use, we think nothing beats them at any price. (Our suggested retail prices are: $49.95 for Word Writer. $49.95 for Data Manager 2.)

Word Writer

This menu-driven system includes:

A program which can be used by itself (stand-alone), or interfaced with Timeworks' Data Manager or Data Manager 2, enabling you to maintain and print out name and address lists, create individualized form letters automatically, and produce customized reports up to 20 columns wide, which can be incorporated into any text produced by the Word Writer.

Two plastic keyboard overlays which place the word processing commands directly onto the keyboard.

A full screen format (up to 80 characters) which simplifies your text entry and editing.

All the essential features—plus some exclusive Timeworks extras—making this system completely functional for most home & business requirements.

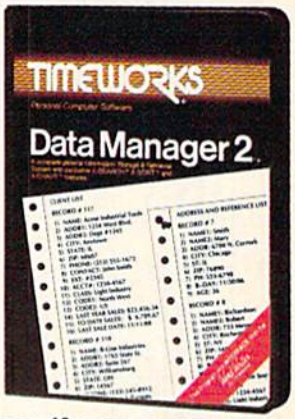
Data Manager 2

This system includes:

A menu-driven program that easily lets you store information on a wide variety of subjects—from general name and address lists, to research data. This program will also calculate and store any corresponding numerical data.

Quick access to important information. Items can be easily retrieved and printed by category, name, index code, date range, amount range, or any category of information stored in the system.

Timeworks exclusive X-Search,™ X-Sort™ and X-Chart™ features allow you to easily cross-search any of the categories. Or arrange your stored items in increasing or decreasing order, alphabetically, numerically or by date. Break down statistical information by up to ten indexed categories of your choice—and graphically review your results.



Arithmetic calculation of your mathematical data is possible, allowing you to perform Payroll calculation, cost estimates and more. Data Manager 2 also produces the Sum, Average and Standard Deviation of statistical data entered into the system, along with Frequency Charts.

When interfaced together, these programs:

Generate customized data reports, which can be incorporated into any written text produced.

Individually address and print form letters automatically.

Print your name and address file onto standard mailing labels.

Transfer and print text information onto labels and tags.

Calculated numerical data from column to column, giving these programs spread-sheet capabilities.

So, if you can find anything better, simply send us your Word Writer or your Data Manager 2, your paid receipt, and the name of the program you want, along with your check or money order for any price difference. If it's available, we'll buy it for you.**

Now at your favorite dealer. Or contact Timeworks, Inc., P.O. Box 321, Deerfield, IL 60015. Phone 312-948-9200.

TIMEWORKS

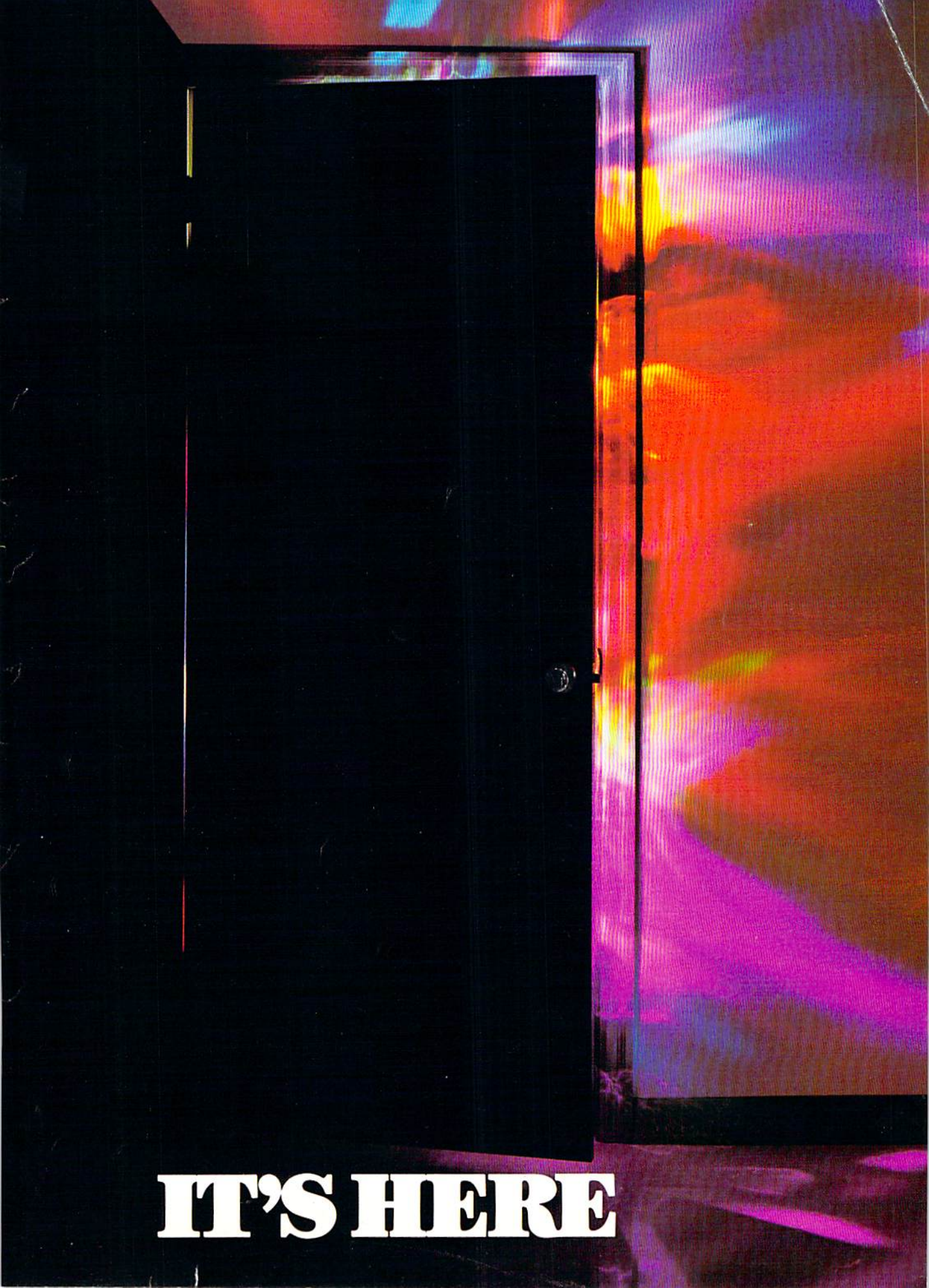
SOFTWARE WITH SUBSTANCE.

**Now for the small print. Offer applies to Commodore only, with maximum suggested retail prices of $125.00 each for any exchanged program. Offer expires 45 days after date of your purchase.

*Registered Trademark of Commodore Computer Systems © 1983 Timeworks, Inc. All rights reserved.

A Buyer's Guide To Modems

Modem	Manufacturer/ Distributor	Compatibility	Interface Required?	Communication Standard	Coupling Method	Baud Rate	Duplexing	Auto-Answer	Auto-Originate	Self-Test	Carrier Detection Indicator	Power Supply	Cables/ Connectors Included?	Terminal Software Included?	Warranty	Price
Westridge 64-20	Anchor Automation, Inc.	Commodore 64, VIC-20	no	Bell 103	direct-connect	300	full/half	yes	yes	no	light	host computer	yes	yes	2 years	$99
1650 Automodem	Commodore Business Machines	Commodore 64	no	Bell 103	direct-connect	0-300	full/half	yes	yes	no	LED	host computer	plugs into computer	no	90 days	$79
VICmodem	Commodore Business Machines	VIC-20 and Commodore 64	no	Bell 103	direct-connect	0-300	full	no	no	no	LED	host computer	plugs into computer	yes	90 days	$49
Smartmodem 300	Hayes Microcomputer Products, Inc.	RS-232	yes	Bell 103	direct-connect	0-300	full/half	yes	yes	yes	LED	AC	yes	no	2 years	$289
HesModem 1	Human Engineered Software	Commodore 64, VIC-20	no	Bell 103	direct-connect	0-300	full/half	no	no	no	light	host computer	yes	yes	90 days	$74.95
HesModem 2	Human Engineered Software	Commodore 64	no	Bell 103	direct-connect	110-300	full/half	yes	yes	no	on screen	host computer	some	yes	90 days	$109.95
Clear Signal 300-Baud Modem	Inmac	RS-232	yes	Bell 103	direct-connect	300	full	no	no	yes	LED	AC	some	no	1 year	$99
Intec 300	Intec Corporation	RS-232	no	Bell 103	direct-connect	0-300	full/half	yes	yes	no	LED and on screen	AC	yes	yes	1 year	$189
MFJ-1237	MFJ Enterprises, Inc.	VIC-20, Commodore 64	no	Bell 103	direct-connect	300	full	yes	yes	no	LED	host computer	yes	yes (program listing in manual)	1 year	$49.95
MFJ-1233	MFJ Enterprises, Inc.	RS-232	no	Bell 103	acoustic or direct-connect	300	full	no	no	yes	LED	AC	no	no	1 year	$129.95
Microconnection R1A	The Micro-peripheral Corp.	RS-232	no	Bell 103	direct-connect	300	full/half	yes	yes	no	LED	AC	yes	yes	90 days	$199
Microconnection Auto-Print	The Micro-peripheral Corp.	RS-232	no	Bell 103	direct-connect	300	full/half	yes	yes	no	LED	host computer	yes	yes	90 days	$179.95
ATV	The Micro-peripheral Corp.	Commodore 64	no	Bell 103	direct-connect	300	full/half	yes	yes	no	LED	AC	yes	yes	90 days	$179.95
Cat	Novation, Inc.	RS-232	yes	Bell 103	acoustic	0-300	full/half	no	no	yes	LED	AC	yes	no	1 year	$189
D-Cat	Novation, Inc.	RS-232	yes	Bell 103	direct-connect	0-300	full/half	no	no	yes	LED	AC	yes	no	1 year	$199
J-Cat	Novation, Inc.	RS-232	yes	Bell 103	direct-connect	0-300	full	yes	yes	yes	LED	AC	yes	no	1 year	$149
103 Smart-Cat	Novation, Inc.	RS-232	yes	Bell 103	direct-connect	0-300 & 110	full	yes	yes	yes	LED	AC	yes	no	1 year	$249
Operator 103	TNW Corporation	RS-232	yes	Bell 103	direct-connect	0-300	full/half	yes	yes	yes	beep	AC	some	no	2 years	$169
UDS-103JLP	Universal Data Systems	RS-232	yes	Bell 103	direct-connect	0-300	full	yes	no	no	light	telephone line	some	no	1 year	$165
UDS-103O/ALP	Universal Data Systems	RS-232	yes	Bell 103	direct-connect	0-300	full	no	no	no	light	telephone line	yes	no	1 year	$125
Mitey Mo	USI Inc.	RS-232	no	Bell 103	direct-connect	300	full/half	yes	yes	yes	on screen	host computer	yes	yes	3 years	$99.95


IT'S HERE

COL

INTRODUCING OKIMATE 10... THE FIRST

The printer in a class by itself.

It's here! The new OKIMATE 10 Personal Color Printer. The first color printer that lets you show off and tell all. The printer that lets you print all the information you can create with your Atari® or Commodore® computer. But with the remarkable ability to create original drawings and graphics as well, in over 26 beautiful colors.

A class act! The OKIMATE 10 gives you crisp, clean term papers, school reports and homework. Word processing capability means everything you do can be printed letter quality in minutes, instead of typed in hours. OKIMATE 10 color gives you the opportunity to print graphs, charts and pictures from popular graphics and drawing programs. OKIMATE 10's brilliant color means you'll shine, every time.

OKIMATE 10 feels right at home. Anywhere.

A special PLUG 'N PRINT™ package lets you plug your new OKIMATE 10 into your Atari or Commodore computer. And print. It's that easy. In minutes you'll be printing everything from soufflé recipes to needlepoint patterns. Party invitations to kitchen inventory. Love letters to gardening directions. At 240 remarkable words per minute. And not just in black and white, but in over 26 brilliant colors!

Financial statements will keep you tickled pink for very little green.

If you use your personal computer to keep track of mortgage payments, tuition payments, balance your checkbook or jump ahead of the Dow Jones', there's good news for you. You'll find that the new OKIMATE 10 gets down to business quickly. And easily.

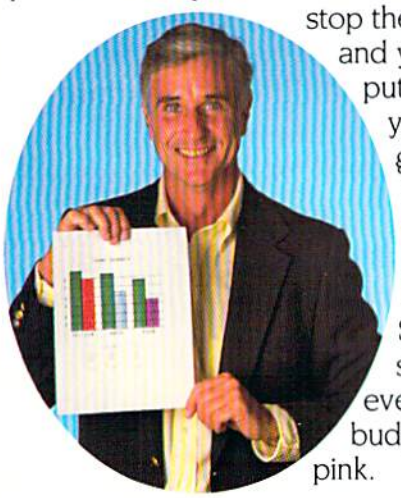
A "Learn-to-Print" diskette and tape shows you how to set up your new personal color printer and start printing. A complete OKIMATE 10 Handbook will show you how you can take your imagination to places it's never been before.

*Atari is a registered trademark of Atari Inc. *Commodore is a registered trademark of Commodore Business Machines, Inc.

OR

PERSONAL COLOR PRINTER UNDER $250.

And while your imagination is soaring, you'll be glad to know that your new printer can keep right up with it! The new OKIMATE 10 is built with the same tradition of quality and manufacturing excellence that has made Okidata the most respected name in computer printers. Okidata craftsmen specially designed and engineered the new OKIMATE 10 to be incredibly small and lightweight. And they made it quiet as a whisper. But their imagination didn't stop there. To help you and your personal computer keep within your personal budget, they made the OKIMATE 10 available at retailers everywhere for less than $250. Something that should make every personal budget tickled pink.



Color your world.

If you've been playing games on your personal computer, now you can get serious and still have fun. The new OKIMATE 10 is completely compatible with a variety of software packages that will run on your Atari and Commodore with a simple disk drive. Just load and you're off and running. Plotting charts. Designing special graphs. Creating original illustrations and pictures. Drawing special graphics. And printing them all beautifully for everyone. On most kinds of paper. In over 26 beautiful colors!

QUESTIONS & ANSWERS

Q: Why do I need a printer?

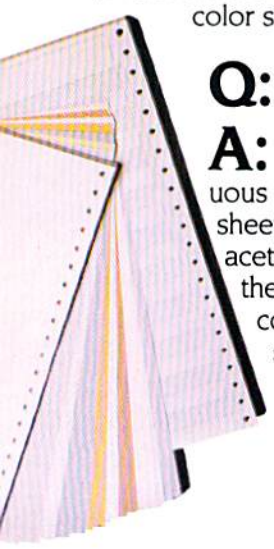
A: You might as well ask, "Why do I need crayons?" When it comes to communicating, "putting it on paper" is still the best way to get your message across. You can have lots of computer equipment, but without the OKIMATE 10, it doesn't mean very much. Unless you get your letter, report, term paper or party invitation off the screen and down on paper, nobody's going to see it.

Q: What makes the OKIMATE 10 better than any other printer?

A: Because the OKIMATE 10 is unlike any other printer. First, it prints in COLOR. Up to 26 beautiful colors. Second, it prints up to 240 words a minute, so quietly you can talk in a whisper right next to it and still hear every word! And third, it prints letter quality, every time.

Q: What about graphics and pictures?

A: The OKIMATE 10 does it all. Graphs, charts, symbols, pictures, illustrations, and special drawings! With a compatible drawing package, anything you create on your screen can be printed in full color; a disk drive is required for color screen printing.



Q: What kind of paper can I use?

A: Just about any kind of smooth paper you want. From continuous feed computer paper to single sheets. From mailing labels to plastic acetate for overhead transparencies, the OKIMATE 10 prints crisp, clean, colorful images you'll be proud to send to friends, teachers, business associates, or frame and hang right in your own living room!

Q: Is the OKIMATE 10 easy to use?

A: As easy as "PLUG 'N PRINT!" No other printer is easier to use than the OKIMATE 10. Connecting the printer to your Commodore or Atari computer is, literally, a snap. The exclusive PLUG 'N PRINT package snaps into the printer. One cable connects it directly to your computer or disk/tape drive. Turn it on and you're in business. Once your OKIMATE 10 is up and running, the "Learn-to-Print" software program (included) teaches you printer basics—the "Color Screen Print" disk (also included) automatically prints everything on the screen in a single stroke. As a matter of fact, most of your printing can be done with just one command.

Q: What's the printer like in operation?

A: In one word: easy! Incredibly easy! The ribbon comes in a "Clean Hands" cartridge. So it's as easy to change as the tape in your audio cassette player.

Q: What about reliability?

A: Okidata has built the reputation of its complete line of printers on quality, dependability and rugged construction. The OKIMATE 10 is no exception. Don't let its light weight and compact size fool you. This printer is not a toy. It's a workhorse.

OKIDATA
an OKI AMERICA company

Available at retailers everywhere.

Modem Manufacturers And Distributors

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

Anchor Automation, Inc.
6913 Valjean Avenue
Van Nuys, CA 91406

Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380

Hayes Microcomputer Products, Inc.
5923 Peachtree Industrial Boulevard
Norcross, GA 30092

Human Engineered Software
150 N. Hill Drive
Brisbane, CA 94005

Inmac
2465 Augustine Drive
Santa Clara, CA 95051

Intec Corporation
P.O. Box 5164
West Bloomfield, MI 48033

MFJ Enterprises, Inc.
921 Louisville Road
Starkville, MS 39759

The Microperipheral Corporation
2565 152nd Avenue N.E.
Redmond, WA 98052

Novation, Inc.
20409 Prairie Street
Chatsworth, CA 91311

TNW Corporation
3444 Hancock Street
San Diego, CA 92110

Universal Data Systems
5000 Bradford Drive
Huntsville, AL 35805

USI
71 Park Lane
Brisbane, CA 94005

Any modem you buy will be capable of full, half, or both types of *duplexing*. With a half duplex modem, only one computer can "talk" at a time, while full duplexing allows both the sender and receiver to transmit at the same time, much like a normal conversation. Full duplexing is pretty standard on most bulletin boards; when you type something, it goes over the phone lines and the receiving computer echoes it back to your TV screen or monitor.

When you access a bulletin board system, it will usually tell you what type of duplexing is needed, as well as the *baud rate*, or speed at which you can transmit information.

Most of the modems in this buyer's guide have baud rates from 0–300, which roughly translates to 0–30 characters per second. Some of the more expensive models have a baud rate of 1200 or more.

The *communication standard* of your modem also tells you the baud rate. Those listed as Bell 103 allow information to be sent at 300 baud; some can go as fast as 600 baud. Bell 202 and 212A standards allow for faster transmission rates.

Extras to consider for your modem are whether you want one that can automatically dial and answer the telephone, and whether the modem is capable of a *self-test* to make sure everything is hooked up and working properly.

One essential item, as we noted, is *terminal software*. Some modems come with their own software; if yours doesn't, you'll have to purchase a terminal program, or type one in from a manual or magazine. (For a Commodore-specific terminal program, see "C/G Term" elsewhere in this issue.)

The accompanying chart gives specifications for many brands of modems for the 64 and VIC, each priced under $300.

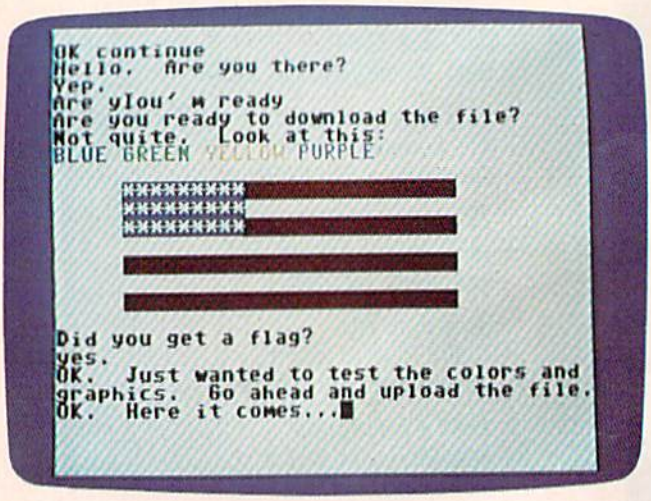
GAZETTE Telecommunications Software

Part 1: C/G Term

Robert Sims

The first in a series of integrated telecommunications software, "C/G Term" (Color/Graphics Terminal program), is tailor-made for VIC (with 16K expansion) and 64 users. It's easy to use and includes a number of transparent features which take care of the time-consuming and tedious chores normally involved in telecommunicating. Written entirely in machine language for speed and efficiency, no knowledge of ML is required for its use.

C/G Term offers upload and download capabilities and makes full use of Commodore's color and keyboard graphics. Next month, we'll continue with the C/G Bulletin Board System. Although C/G Term is designed for use with the bulletin board, it can be used as a stand-alone terminal program for instant two-way telecommunication. A disk drive and modem are required.



Telecommunicating in color with C/G Term.

"C/G Term" is a lot like having a two-way typewriter and a chalkboard plugged into your telephone.

This terminal program makes your computer work in much the same way as when you are typing in a BASIC program or using a word processor: Whatever you type on the keyboard is displayed on the screen. But C/G Term also transmits your words and graphics characters, in color, over the phone line, and displays incoming characters as well.

Two people with telephones, modems, and copies of C/G Term can communicate in several

LAST NIGHT WE EXCHANGED LETTERS WITH MOM, THEN HAD A PARTY FOR ELEVEN PEOPLE IN NINE DIFFERENT STATES AND ONLY HAD TO WASH ONE GLASS...

That's CompuServe, The Personal Communications Network For Every Computer Owner

And it doesn't matter what kind of computer you own. You'll use CompuServe's Electronic Mail system (we call it Email™) to compose, edit and send letters to friends or business associates. The system delivers any number of messages to other users anywhere in North America.

CompuServe's multi-channel CB simulator brings distant friends together and gets new friendships started. You can even use a scrambler if you have a secret you don't want to share. Special interest groups meet regularly to trade information on hardware, software and hobbies from photography to cooking and you can sell, swap and post personal notices on the bulletin board.

There's all this and much more on the CompuServe Information Service. All you need is a computer, a modem, and CompuServe. CompuServe connects with almost any type or brand of personal computer or terminal and many communicating word processors. To buy a Starter Kit, see your nearest computer dealer. To receive our informative brochure or to order direct, call or write:

CompuServe

Consumer Information Service
5000 Arlington Centre Blvd., Columbus, OH 43220

800-848-8199
In Ohio call 614-457-0802.

An H&R Block Company

ways. They can talk, type messages back and forth, or swap programs and text files automatically, with only a few keystrokes.

C/G Term can also be used off-line, to create graphics screens and messages for later use. And it's designed to communicate with the Color/Graphics Bulletin Board System, to be published next month.

For Commodore Only

Most bulletin board systems (BBSs) and information utilities (like CompuServe or Delphi) are designed to work with a wide variety of computers and modems. For this reason, most use standard seven-bit ASCII. Terminal programs generally do not allow you to send Commodore graphics characters, which do not have a standard ASCII equivalent.

To send graphics and color requires a new Commodore-specific protocol. For this reason, you cannot use this terminal program to call CompuServe or most bulletin boards. The computer you call must be running C/G Term or next month's Color/Graphics Bulletin Board.

The incompatibility with CompuServe is offset by C/G Term's color and graphics capabilities, as well as the reliable and easy-to-use upload/download features which allow you to trade files with friends.

Typing Over The Phone

The program automatically handles most of the technical aspects of personal telecommunications, allowing you to concentrate on your message, rather than on the transmission medium.

To use the program for two-way communication, connect your modem to the computer's user port *while the power is off.*

One party must set the O/A switch on the modem to O (originate) while the other party must use A (answer). If you're using the Commodore Automodem, set the H/F switch to F (full duplex), and set the D/T switch to T (telephone).

Load C/G Term and run it. An initialization prompt will appear on the screen:

```
Press any key
to start, or
CTRL-C to
bypass handshake
```

This means the computer is on hold. If you're calling a friend, you can go ahead and press CTRL-C to bypass the handshaking routine (which is more important for the C/G Bulletin Board). When the other party answers, unplug the cord from the telephone handset and plug it into the VICmodem (or move the Automodem D/T switch to D for data). The two programs will then complete the connection, and you'll see the "OK continue" prompt.

The program starts in *terminal mode,* which simply means the computer is ready to communicate with another VIC or 64. Once the connection is made, you can switch back and forth from modem to voice communication without disturbing the program. To talk, unplug the cord from the VICmodem and plug it into the handset (or move the Automodem D/T switch from D to T). When you're through talking, just move the Automodem switch back to D (on the VICmodem, plug the handset cord back into the modem), and resume typing.

The program makes use of the standard keyboard, with a few exceptions. The CLR key is disabled, the function keys (f1–f8) perform specific tasks, and the CTRL key has a special significance. Also, as you type in responses to prompts, you may notice that some keys don't seem to work. For example, if you are asked for a filename, the program will only accept letters, numerals, and the period. All other characters are ignored. Or, if the program asks for a number, alphabetical characters are ignored.

As a general rule, if you press a key and nothing appears on the screen, the key has been ignored.

Function Key Assignments

Key	Terminal Mode	Message Mode
f1		load a message file
f2		send message to bulletin board
f3	change border color	change border color
f4	change background color	change background color
f5		save screen into a message file
f6	clear the screen	clear the screen
f7	not used	
f8	go to message mode	go to terminal mode

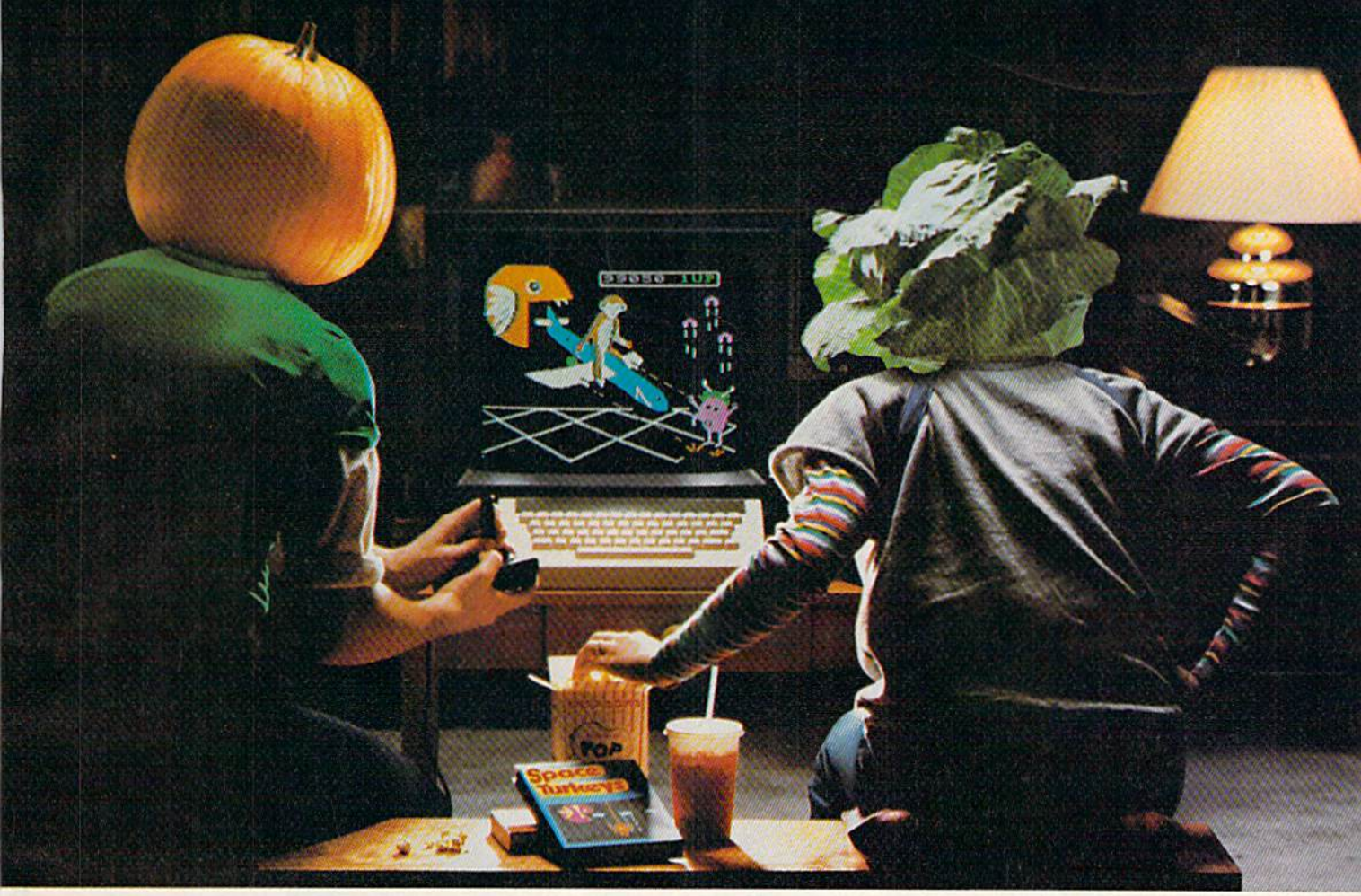
Color And Graphics Keys

In terminal mode, you have full control over screen and character colors, and the full set of keyboard graphics characters is available.

Border and background colors are usually changed with POKEs. But C/G Term lets you change the border color by pressing the f3 function key; to change the background color, use f4. The f3 and f4 keys change only *your* screen's colors; they are not transmitted over the phone line to the other party.

However, character color *is* transmitted, so be careful not to change your character color to the same color as the other party's background and cause your message to be invisible.

As you might expect, character color is



You bought a computer to cultivate your kids' minds. Make sure it's bearing fruit, not growing vegetables.

Introducing a whole crop of Learning Adventure games from Spinnaker.

When it comes to cultivating adventurous young minds, the computer's potential is endless.

Unfortunately, the search for software that makes the most of that potential has been endless, too.

That is, until Spinnaker created the Learning Adventure Series. A unique collection of games that reward curiosity with hours of adventure and learning. So the time kids spend with our games will help them develop valuable skills. Instead of just tired thumbs.

But what really makes our Learning Adventure games unique – educational value aside – is how much fun they are. Which isn't too surprising when you consider you can do things like bargain with aliens, search a haunted house, or build your own railroad empire.

In fact, our games are so much fun, kids will really enjoy developing some very important skills. Deductive reasoning, note taking, and problem solving, for instance.

So, if you're in the market for software that will truly cultivate young minds, pick the Spinnaker Learning Adventure Series.

It's the best way to be sure your search will be fruitful.

Spinnaker Learning Adventure games are available for Apple,® Atari,® IBM® and Commodore 64™ home computers.

It's New! TRAINS.™
You're in charge of an old-time railroad – and whether it turns into a bonanza or a bust depends on how well you run it. But either way you'll find that working on this railroad is a challenge – and a lot of fun! **Ages 10-Adult.**

It's New! ADVENTURE CREATOR.™
Design a challenging adventure game that you or a friend can tackle – or let the computer design one for you. It's complex, exciting – utterly addictive! **Ages 12-Adult.**

IN SEARCH OF THE MOST AMAZING THING.™
It isn't easy to find – even in your B-liner. But you'll have help from your Uncle Smoke Bailey as you search the universe to find the Most Amazing Thing. **Ages 10-Adult.**

SPINNAKER™
We make learning fun.

Disks for: Apple, Atari, IBM, and Commodore 64.
Cartridges for: Atari and Commodore 64 – (ADVENTURE CREATOR only).

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IT'S YOUR TIME AND BOTTOM LINE!

COMMODORE OWNERS now have an alternative to the frustrating LOAD ... wait ... UNLOAD ... wait ... RELOAD ... wait procedure. The NEW MSD DUAL DISK DRIVE ... SUPER DISK II will eliminate those hours wasted during task performance and time lags that inflate expensive labor costs and deflate your bottom line.

One SUPER DISK II will copy, format, and verify in less than two minutes ... a procedure that normally takes 30 to 40 minutes using 2 single drives. Yes, SUPER DISK II is TWENTY TIMES FASTER!

MSD provides quality craftsmanship that is backed by an exceptional six month warranty. The SUPER DISK II workhorse drive never overheats, so why be aggravated by the loss of time and money?

Invest today in SUPER DISK II, the SMART disk drive which contains its own microprocessor and memory enabling the computer to command the drive and then continue. SUPER DISK II does the work quickly so that you can get on with your program.

As for the money you will save in unproductive labor costs ... perhaps you will invest it in a daisychain of SUPER DISKS. These workhorse drives will allow you to connect up to four drives for maximum speed and reliable, continued performance.

SUPER DISK II DESIGN ASSETS

- Sturdy sheet metal casing and heat sink
- Vertical load for ergonomic space efficiency
- Key latch secures disk position
- Smart disk contains microprocessor and memory in each drive
- Status lights to display which drive is in use
- Three steel bands for repeated accuracy of alignment
- Flexible use of serial or parallel communication
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TIME TO FORMAT	17 seconds. (Compare to 1 min/20 sec. with 1541).
SERIAL BUS	YES, 2 connectors.
PARALLEL BUS	YES, for enhanced speed, IEEE for Commodore compatibility.
DAISYCHAIN	Up to 4 drives
OPERATIONAL SUPPORT	• Power-on diagnostics to ensure proper disk drive operation. • LED status lights display where error is occurring. • Easy to understand instruction manual.
OVERHEAT TIME	NONE. Tested for weeks of continual operation.
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MSD SUPER DISK DRIVE TECHNICAL SPECIFICATIONS

STORAGE*

Total Capacity	174848 bytes per diskette
Sequential	168656 bytes per diskette
Relative	167132 bytes per diskette 65535 records per file
Directory Entries	144 per diskette
Blocks	683 total per diskette 664 available per diskette
Tracks	35 per diskette
Sectors	17 to 21 per track
Bytes	256 per sector
Diskettes	Standard 5¼", single sided single density

*NOTE: The SD-2 contains two disk drive mechanisms and can therefore handle two times the above capacities (one for each diskette).

SOFTWARE

16K Bytes Operating System
4K RAM buffer area (6K for the SD-2)
Microprocessor based disk controller (6511Q)
Commodore Compatible Serial Bus Interface
Commodore Compatible IEEE Parallel Bus Interface

PHYSICAL DIMENSIONS

	SD-1	SD-2
Height	6.2" (157 mm)	6.2" (157 mm)
Width	4.2" (107 mm)	5.9" (150 mm)
Depth	13.3" (338 mm)	13.3" (338 mm)

INTERFACE

Dual Commodore compatible Serial Bus
Commodore compatible IEEE Parallel Bus
Jumpers for selecting device number 8, 9, 10 or 11.

ELECTRICAL REQUIREMENTS

Voltage	110 or optiona 220 VAC
Frequency	50 or 60 Hertz
Power	50 Watts

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changed by pressing the CTRL key in combination with the number keys. If you have a 64, you can also hold down the Commodore key and press one of the number keys. (For a discussion of changing character color, see the User's Guide that came with your computer.) Character color may cause problems for a VIC owner communicating with a 64. The VIC will not properly receive the eight extra colors generated by the 64's Commodore key. So, if you have a 64 and are talking to a VIC, use only the CTRL key to change your character color.

To clear the screen, press f6 (SHIFT-f5).

The graphics characters on the front of the keys are generated by pressing the appropriate key while holding down the Commodore key (for the character on the left of the key) or the SHIFT key (for the character on the right).

When the program starts, the keyboard is in lowercase mode. This means that when you press SHIFT, you get uppercase letters instead of graphics characters. But the graphics characters associated with the Commodore key will work in lowercase mode.

You can toggle between lowercase and uppercase/graphics modes by pressing the SHIFT and Commodore keys at the same time, just as in normal operation. In the uppercase mode, you get uppercase letters, the graphics associated with the Commodore key, and the SHIFTed graphics as well.

File Transfers

C/G Term provides for automatic disk-to-disk transfer of either sequential files or program files. The files may contain any type of data, whether a BASIC or machine language program, graphics characters, a *SpeedScript* document, or data created by some other word processor.

You can use C/G Term as your own private electronic mail carrier. For example, you can write a letter with *SpeedScript* and save it to disk. Then you can call a friend, connect your computers using C/G Term, and upload the letter. Later, your friend can use his or her copy of *SpeedScript* to read the letter. The long-distance charge may be more than a 20-cent stamp, but your letter arrives immediately.

If you want to send a file to the other party, then you are the *uploader* and the other party is the *downloader*. The uploader sends an existing file to the downloader's disk drive, where it is stored as a new file.

Easy Uploading

To transmit a file, the uploader types CTRL-U (press U while holding down the CTRL key). C/G Term then takes over. Each party will see the messages searching for the filename and loading. The downloader's filename will appear as $0:@!%!, which is a dummy filename for reading a directory off the disk. This can be ignored, as the program handles the exchange automatically. The uploader is prompted for the name of the existing file to be transmitted, while the downloader is prompted for a new filename so the incoming file can be stored onto disk.

Once the respective filenames have been typed in, the two programs perform several *handshakes* (communications exchanges) in which information is exchanged on whether there is room on the receiving disk for the incoming file, whether the file type is sequential or a program, and when to start transmitting. All of this is performed automatically by the program.

The file is then taken from the disk of the sending computer, transmitted, and stored on the disk of the receiving computer.

An *image* of this process is displayed on the screen. You'll see a series of lines consisting of a colon followed by 76 numbers or letters, comprising a hexadecimal image of the file's contents.

Uploading becomes a simple process. The uploader presses CTRL-U and the name of the program. The downloader just invents a filename. C/G Term does the rest (of course, your disk drive has to be on, with a disk inserted).

Checking For Accuracy

There will be a brief pause after each line is sent, while the receiving computer calculates a *checksum* to insure that the line was transmitted correctly. If not, the line is sent again. When the transfer is complete, the message "OK continue" is displayed, and the program returns to terminal mode.

Even though file transfer is automatic, it is not failsafe. For example, if the uploader fails to type in the filename exactly as it appears in the disk directory, an error message is printed and the operation is cancelled. An error message and cancellation also occur if the downloader types in the name of an existing file.

To avoid these errors, it's good practice to make a copy of the disk directory before you go on-line, so you'll know exactly what's on the disk. Or, make up a name you know is not on the disk (like QWERTY).

If a mistake is made, though, no harm is done. The program returns to terminal mode, and you can try again.

Other problems are not so simply solved. No error-trapping routine can overcome noisy phone lines or hardware failures. Even though such

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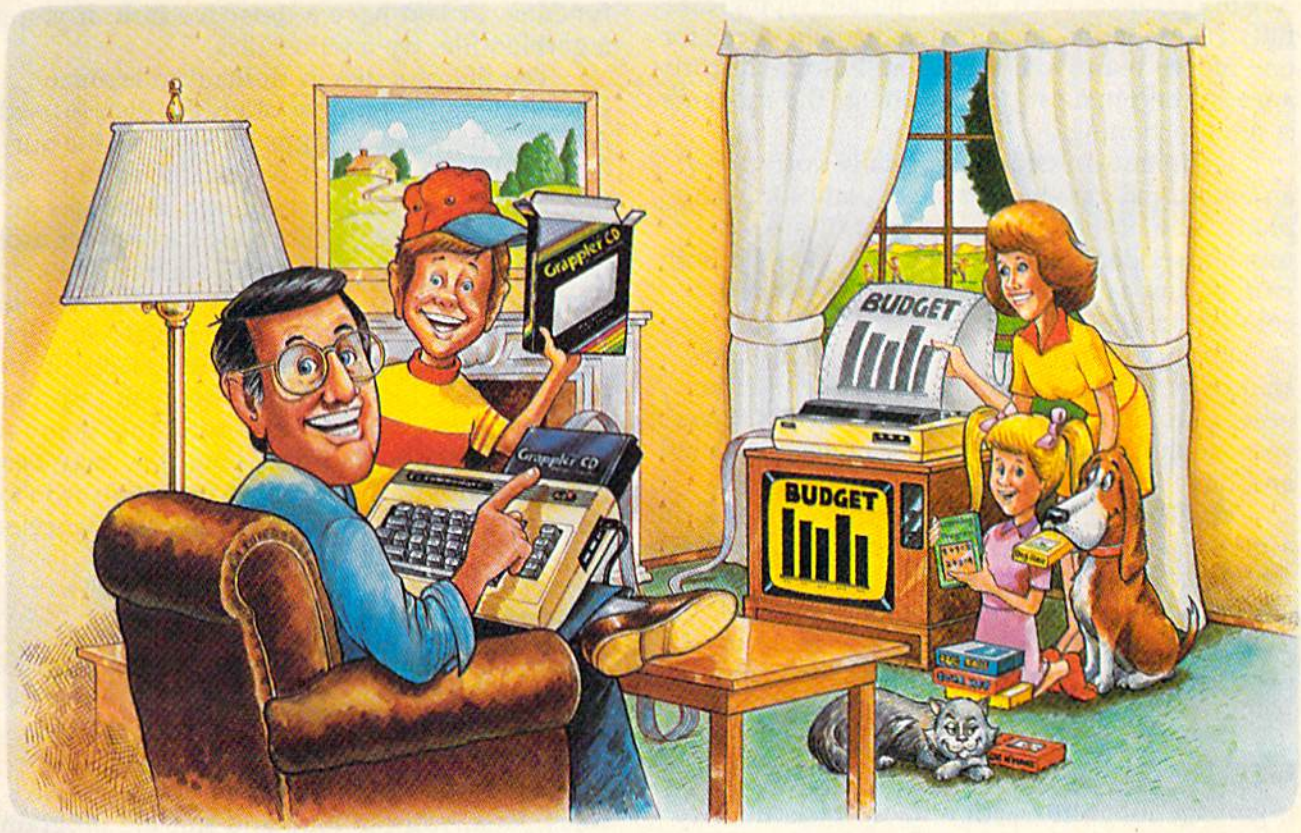

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problems are rare, you can make the best of a bad situation if you know what to expect.

Garbage On The Line

Sometimes you'll get strange characters on your screen (garbage) even when you are typing carefully. These garbage characters usually occur for one of two reasons: Either there is some disturbance in the phone signal, or one of the modems is malfunctioning.

If the transmission is normally correct, but an occasional garbage character comes in, the phone line probably is the culprit. If a transmission suddenly turns to total garbage for both parties, you can probably blame the phone connection again.

But if you experience such problems constantly, or if you're getting garbage while the other party is receiving without difficulty, take your modem back to the dealer or service center and have it checked.

If garbage is mixed into an image line during a file transfer, the line will be retransmitted up to five times before the program aborts the transfer, closes the disk files, and returns to terminal mode. The first two characters will be an up arrow followed by a capital R when a section is being retransmitted.

Crash Insurance

If garbage interferes with a handshake, the two programs may go into an infinite loop, waiting for a signal that's never coming. This is highly unlikely, but if it happens you'll notice that the image display has stopped, without an error message.

Also, the red light on the drive will remain on, indicating that a disk file is still open.

The solution is for both parties to go offline by holding down RUN/STOP and pressing RESTORE. Then type:

```
CLOSE 15:OPEN 15,8,15:CLOSE 15
```

to close the file. Next, initialize the disk:

```
OPEN 15,8,15,"I0":CLOSE 15
```

Then run C/G Term again (the 64 version requires a SYS), press RETURN, enter a CTRL-C, and your connection should be restored. If it isn't, then both parties must reload their programs and run them again to restart the handshaking.

Disk Problems

Another potential problem (though very rare) involves the disk drive and disk. C/G Term cannot evaluate the data; the program takes whatever data the drive sends. If the drive is out of alignment, if the read/write head is dirty, or if the disk surface is worn or damaged, then it's possible that bad data can be transferred.

If you find garbage in a transferred file, check the original file. If the original was clean, chances are good there's been a drive malfunction, or you have a defective disk. If you get a garbled file, try another disk.

The life of a disk is difficult to estimate, since it depends on how often the disk is used. Also, it's hard to see signs of wear on the surface, and most disks are so reliable as to give the impression that they last forever. But disks do wear out, and even a tiny flaw can render a disk useless. To be safe, if the disk surface looks worn, replace it. If you can't remember how long ago you started using the disk, replace it.

Avoid using a disk that's full, or nearly full (less than 100 blocks free). When you begin an on-line session, you can't be sure how many files you may download or how long they may be. If there's plenty of room on the disk, you won't need to worry about having a transfer canceled with a "FILE WON'T FIT" message.

Creating Graphics Files

Besides transmitting programs and text files, C/G Term has a message mode that lets you create graphics screens or brief messages, and save them to disk for uploading later.

You can enter the message mode in two ways. First, you can load and run the program without hooking up your modem. When the initialization message is displayed, press CTRL-C, which puts you into terminal mode without going through the on-line handshaking sequence. To get to message mode from here, press f8. The screen will clear and "message mode" will be displayed.

You can also get to message mode while on-line by pressing f8. Keep in mind, though, that the other party will be ignored while you're in message mode.

To create a screen, simply type in the graphics or message contents. You can move freely around the screen, but are not allowed to type anything on the last screen line. There are two reasons for this limitation: First, it prevents your message from scrolling up the screen. And the bottom screen line is used to display prompts and error messages which otherwise would destroy your design.

When you're satisfied with your screen, press f5. You'll be prompted for a filename. If you have a VIC, this filename must contain fewer than 10 characters, since the screen will scroll and destroy your design if you type beyond the end of the line. Enter the filename, press RETURN, and your graphics screen will be

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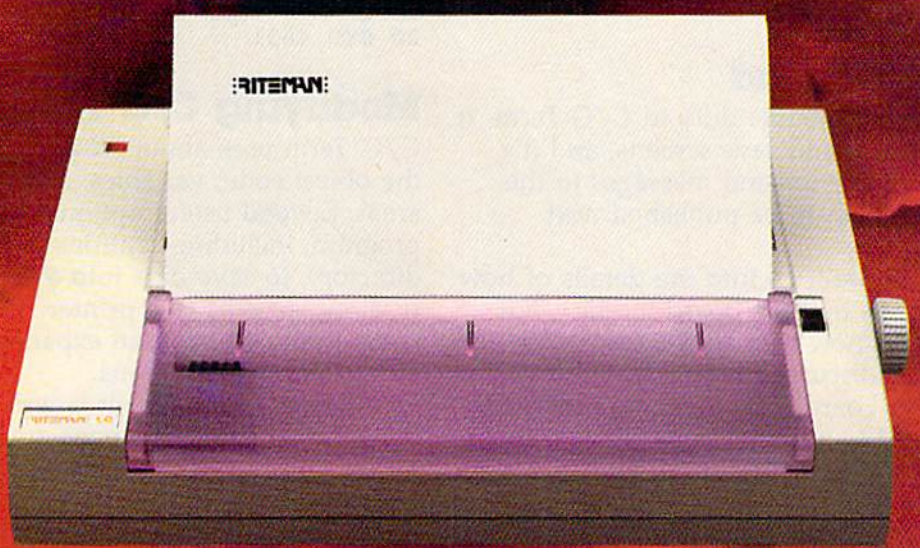

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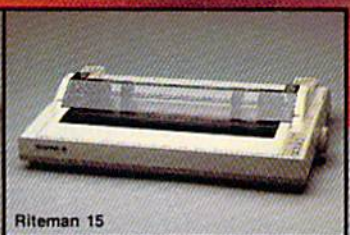

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saved to disk.

As with downloading, you must not use the name of an existing file.

In message mode, you also can load a screen file, edit it, and save it back to disk. But again, be sure to save it under a new filename to avoid an error message.

To erase a screen and start over, press f6. To return to terminal mode from message mode, press f8.

Another use for CTRL-C at the initialization prompt is to help you learn to use C/G Term without going on-line.

CTRL-C puts you in terminal mode even though your modem is not connected. You can learn to change colors, type graphics characters, and experiment freely with cursor movement. If you first try out C/G Term on your own, you will avoid delays and errors when you do go on-line with another person.

You can practice with any feature except uploading. If you press CTRL-U without being connected to another computer, the program will lock up because it's trying to shake hands and nobody's shaking back. If this happens, hold down RUN/STOP and press RESTORE. Then load the program and run it again.

The Bulletin Board

Message mode does double duty in C/G Term. It allows you to create and save screens, and it's the routine you'll use to send messages to the bulletin board system to be published next month.

In that issue, we'll go into the details of how C/G Term and the bulletin board interact. For now, you should know that all the color and graphics features discussed here also will work with the bulletin board. Together, the programs allow you to read public messages, leave messages for others, to send and receive private electronic mail, and to upload or download files.

Typing In With MLX

To type in C/G Term for either the VIC (16K expansion required) or 64, first type in MLX, elsewhere in this issue, and save it to disk. Before beginning, read the instructions for using MLX.

Next, turn your computer off and then on and enter this line:

POKE 642,45: SYS 58260 (Commodore 64)
POKE 642,45: SYS 58232 (VIC-20 with at least 16K expansion)

This POKE and SYS relocate the beginning of BASIC so MLX will run above the section of memory used by C/G Term. Now you can load MLX back into your VIC or 64.

Enter RUN and you'll be prompted for a starting and ending address. The starting address is 4609, the ending address is 11262. Commodore 64 users should type in the listing exactly as shown in the back of the magazine. VIC users should also type in the same listing, but replace the last three lines of the program with these:

```
11245 :234,234,022,132,015,017,123
11251 :227,016,021,022,023,020,060
11257 :022,021,234,234,234,234,204
```

After the program is saved to disk, VIC users can load the program by typing LOAD"CGTERM",8. Then simply type RUN as you would for a BASIC program. (Of course, this assumes that you used the filename CGTERM when you saved the machine language you typed in using MLX.) Load the 64 version by typing "CGTERM",8,1. To run, type SYS 4621. Alternatively, 64 owners who don't want to have to remember the SYS address can use the following short boot program. When run, this program will load in and start the machine language:

```
10 IF A=0 THEN A=1:LOAD "CGTERM",8,1
20 SYS 4621
```

Modifying C/G Term

C/G Term uses about 8K of memory, including the object code, variables, and temporary storage areas. Several useful options can be added to the program, including routines to read the disk directory, to save data into a capture buffer, and to dump screens to a printer. There is plenty of room in the 64 or in an expanded VIC for refinements and modifications.

However, because it is written entirely in machine language, changes are difficult to make unless you have the source listing. And the listing is too long to print here. It would take up more space than the MLX listing.

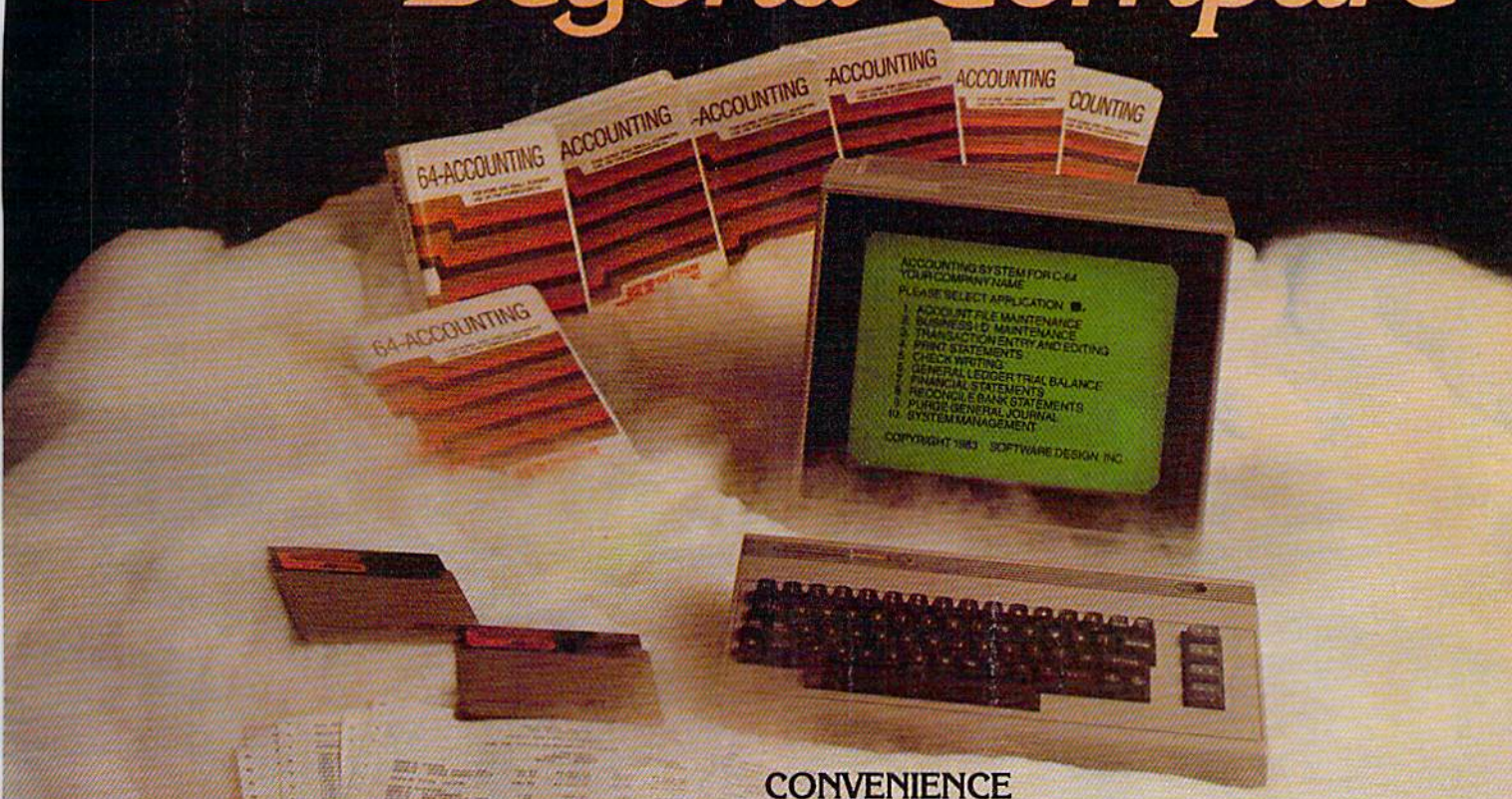
If you wish to modify the program or study any of the routines, or you'd just rather not type it in, you can get a copy of the source listing in PAL/LADS format (and the machine language program itself—the object code) on disk by sending a SASE (a padded disk mailer is preferable), a blank disk, and $3, to:

Robert Sims
100 Lee Street
Jamestown, NC 27282

My CompuServe ID# is 75005,1553. On Delphi, it's BOZART.

See program listing on page 199.

64 Software Beyond Compare



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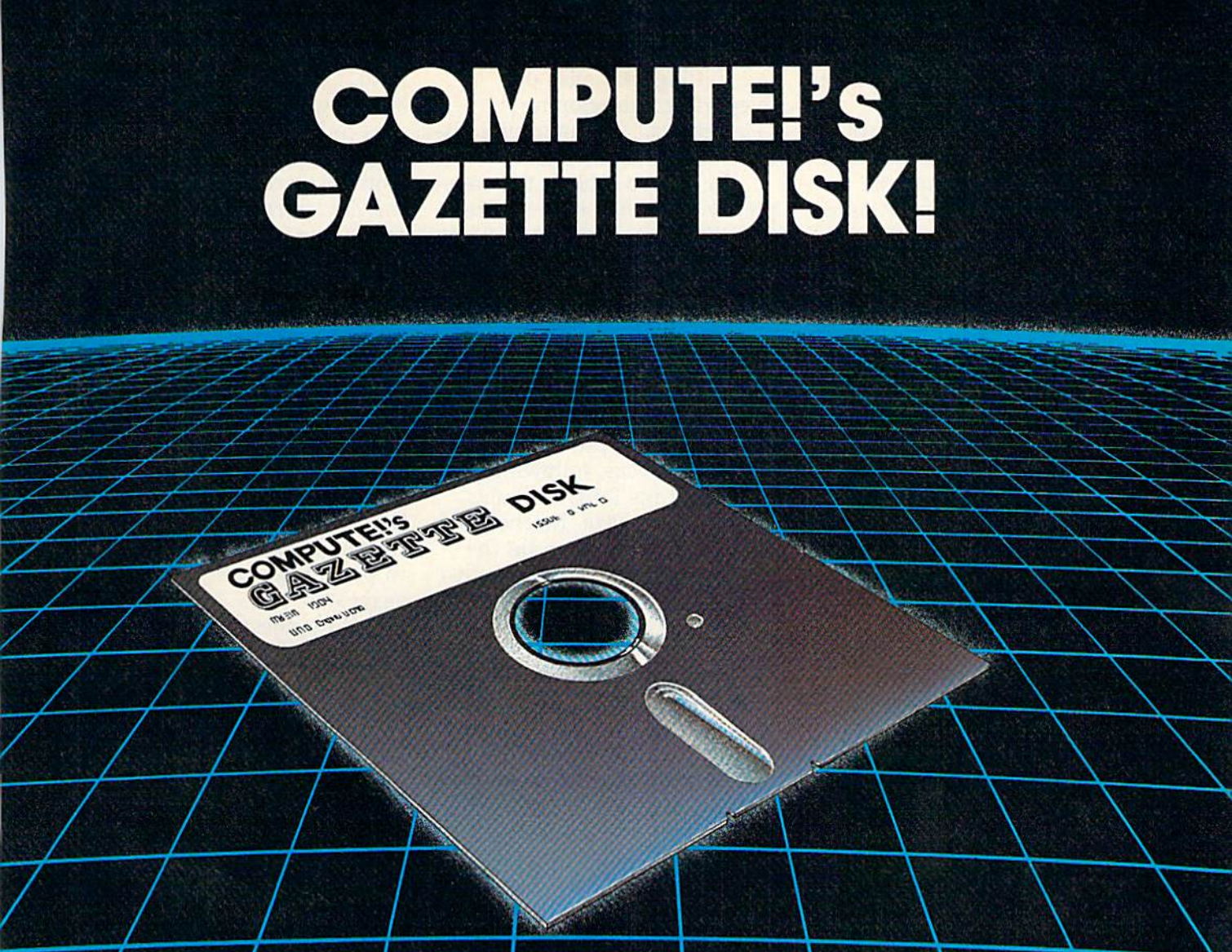
Free Fall Associates: The Designers Behind *Archon* and *Archon II: Adept*

Selby Bateman, Features Editor

Free Fall Associates: Jon Freeman and Anne Westfall.

Emerging from the avalanche of a thousand computer games came *Archon*, 1983's popular and unique mixture of strategy and action, good and evil, light and dark. Now, *Archon's* creators bring you the sequel—and the fight between Order and Chaos is on again.

COMPUTE!'s GAZETTE DISK!



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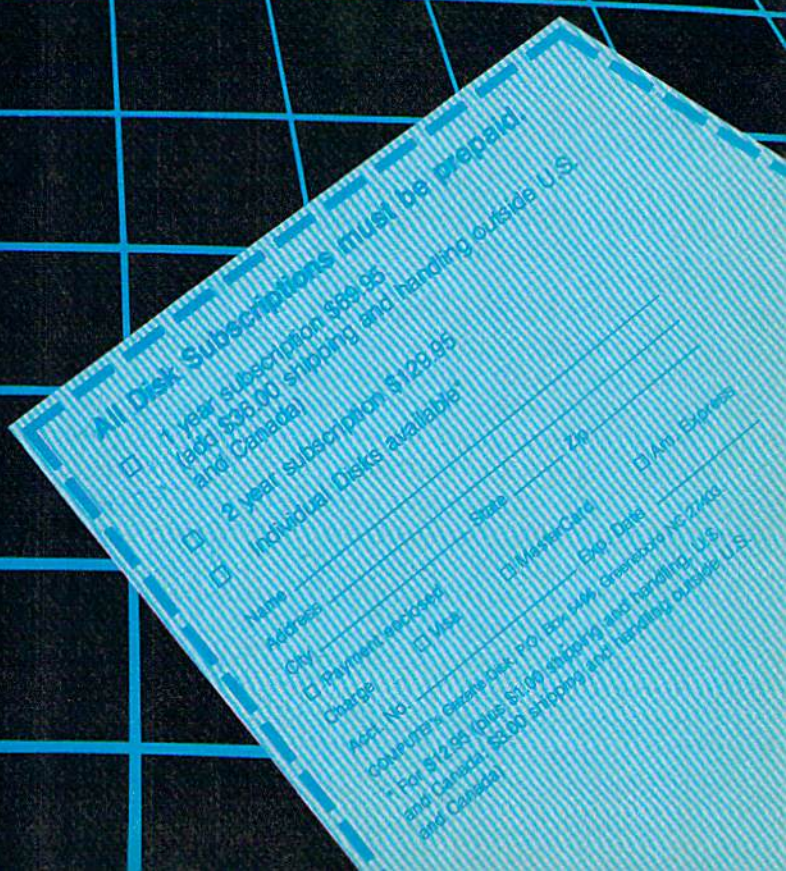


Magic is subtle. Magic is sly.

Our ancient and enduring fascination with things magical stems chiefly from that strange interplay between illusion and reality. And at the heart of that fascination is the human imagination.

"We have some pretty wild imaginations," admits Jon Freeman, laughing and smiling at his wife and collaborator, Anne Westfall.

"But in our wildest dreams we did not anticipate a sequel when we created *Archon*. It was just not the kind of game that suggested to us a sequel. We didn't want to just do the same game with a little teeny bit of difference and then resell it."

Freeman and Westfall (hence, Free Fall Associates) and *Archon* co-creator Paul Reiche III faced a dilemma in 1983. The game was so successful that seemingly everyone was asking them for a sequel. And that included Trip Hawkins, a big fan of *Archon* and the president of Electronic Arts, the company that published the game.

Hawkins kept asking them about a follow-up game. And Freeman, Westfall, and Reiche kept saying to themselves, "Sequel? Good grief!"

"First, we had to convince ourselves that it seemed like a reasonable thing to do," says Freeman.

They began to study the components of their own creation, trying to isolate the magical elements that made *Archon* a very different game from any that had appeared before.

The fundamentals were engaging in their own right: A chess-like strategy game which dissolves at times into a fierce arcade-action battlefield. Enough wizards, dragons, goblins, golems, and djinnis to fill a medieval alchemist's nightmare. The struggle to conquer and hold five "power points." And the shifting subtleties of teleporting, summoning "elementals," learning luminosity cycles, and the like.

In fact, to look at the complexity of *Archon* is to realize that the creators of the game are certainly not newcomers to game design or programming.

Paul Reiche III (pronounced RICH-EE), for example, has been involved with the creation of fantasy role-playing games since high school. He worked for TSR, which publishes *Dungeons & Dragons*, following production of his D&D module, *Temple of Poseidon*. Reiche also worked with Freeman on the creation of programs for Automated Simulations (later renamed Epyx), which Freeman cofounded.

Westfall, who took up computer programming at the age of 30, soon found that her talents in that area were considerable. After a couple of years producing complex technical software, she joined Freeman at Automated Simulations and began her efforts in game programs. It was her programming expertise that turned the game designs by Freeman and Reiche for *Archon* and *Adept* into substance.

No name is more associated with excellence in computer game design than that of Jon Freeman. Among the numerous games he developed at Automated Simulations was the award-winning *Temple of Apshai* (for which he designed the Dunjonquest System) and *Star Warrior*. He is also the author of *The PLAYBOY Winner's Guide to Board Games*, *The Complete Book of Wargames*, a variety of stories and articles, and more than a dozen game manuals. With *Adept*, Freeman has now published 17 games.

It was in late 1981 that Freeman and Westfall formed Free Fall Associates, located a couple of miles from the Stanford University campus in Palo Alto, California, and began working with Reiche on what was to become *Archon*. The trio also designed an earlier Electronic Arts release, *Murder on the Zinderneuf*, a murder mystery game which is one of Freeman's personal favorites.

"With *Adept*, what we wanted to do—this is an oversimplification, but—while preserving the mechanics and the general *feel* of *Archon*, mostly the mixture of strategy and tactics, we wanted to do as many things differently as we could," says Freeman. "To do things that we couldn't do in *Archon* for one reason or another. And to put things in that people had suggested."

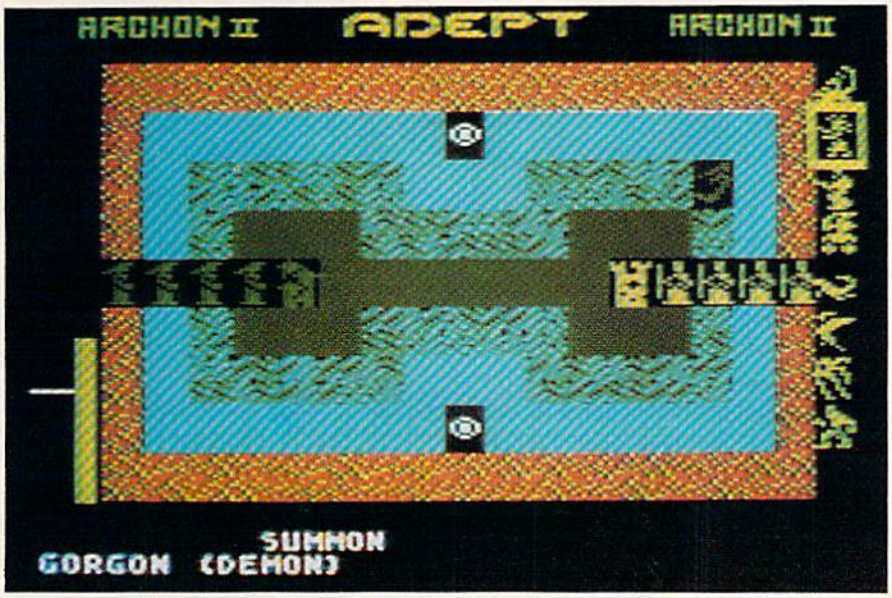
Why doesn't *Archon* have varying difficulty levels, some players have asked?

Well it does, Freeman replies with a smile, but then admits that the function is subtle and has never been mentioned before. "There's a built-in, self-adjusting difficulty factor in *Archon* so that if the computer keeps beating up on you, it will get easier and easier.

"But most people don't know that because it goes in little tiny increments. By the time it really starts kicking in, players think, 'Oh, I'm just getting better.' Well, they are, partly; but partly it's because the computer is not being as good," he adds, laughing. "But nobody knows that's there. It's not something we advertise, but we were aware of the problem.

"Just like chess: How do two unequal players play chess? Well, not very well. And there's not really a great deal you can do about it. If you start taking pieces away, you change the game so radically that you're not playing chess anymore. *Archon* is the same way. So we said, we want to do a game in which we *can* do that without screwing it up," he says.

Other ardent *Archon* fans suggested that the game should



An Adept of Order summons a Gorgon (in box at upper right) for placement on Fire, Air, Water, or Earth in the Electronic Arts' game, Archon II: Adept.

allow you to be able to build your own armies, to play some of your opponent's types of pieces, to use magic spells more often, and to limit the edge given to players who happen to be agile with a joystick—without slowing down the game. Those ideas and much more have been incorporated into *Adept*.

In the game, you use your four Adepts—something akin to powerful wizards—to conjur and then maneuver monsters, cast spells against the enemy, and ultimately win by occupying the six flashing—*and moving*—power points.

While the basics are in many ways similar to the original game, *Adept* is a different game and has a number of interesting features: Energy must be monitored and expended carefully; the health of individual Adepts is crucial to your chances, and the various gorgons, wraiths, firebirds, sirens, juggernauts, giants, and other monsters are more or less effective depending on which of the four elemental bands on the game board they occupy: fire, air, water, or earth.

There is even an Apocalypse spell which at certain times can be used to begin the battle that ends the game.

"At the start, there are only four pieces on a side, the Adepts," says Freeman. "Everything else you add.

"You can concoct your own army to suit yourself. For instance, if you have trouble mastering certain pieces or you need practice on them, you don't have to use them. Don't summon them. Or, if you like some particular piece, that's all you can have. Or you can have a little of everything," Freeman adds.

"This is a game of, in part, resource management. You can cast as many spells as you want as often as you want. You can summon pieces from now to kingdom come—as long as you can pay for them. You pay in magical energy, and you get magical energy by occupying power points, which cycle from element to element each turn."

In designing *Adept*, the three creators came up with a particular piece which is especially nice for beginners not used to conducting battles with a joystick: the Siren.

"All you have to do with the Siren is push the joystick button—you don't aim, you don't move—just push the button," says Freeman. "And as long as you push the button, she sings. And as long as she sings, the other person's lifeline goes down.

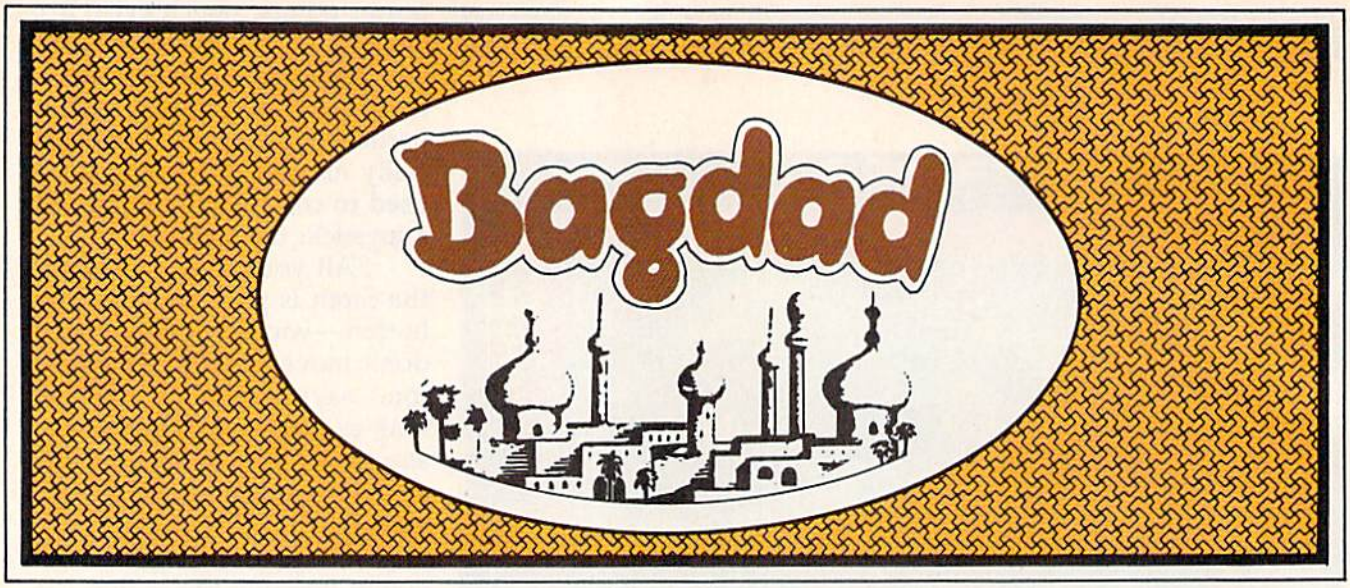
"But you can't move while you're pressing the button, so you can't dodge. Whenever [an opponent] fires something and you think it's going to hit, you have to let go of the button and run. As soon as the missile's passed, you go back to holding down the button. For beginners, this piece is overwhelming. After a while, when you get used to everything else, then it's not nearly as good," he says.

On the other hand, the Chimera may be the most difficult piece in *Adept* to learn, Freeman adds. "The Chimera has three different attacks. It breathes fire, snorts a cloud of poison gas, and has a poison stinger in its tail. And all three of those attacks do different amounts of damage and require different ranges.

"That's a hard piece to learn. Beginners have trouble with it. But in *Adept*," says Freeman, "they don't have to use it until they've practiced."

Adept, now available for the Commodore 64 as well as Atari computers at a suggested retail price of $40, is not by any means the last program from Free Fall Associates. Now that they've recovered from the creation of *Adept*, there is already a list of possible projects a mile long, Freeman admits.

But there are only twenty-four hours in a day. Not even an Adept can change that.



Bryan Files

Beware of the evil genies determined to knock you from your magic carpet. With a little strategy and skill, you can trap them in bottles—but work quickly before they re-emerge. A lively arcade-style game for the VIC, we've added a version for the 64. A joystick is required.

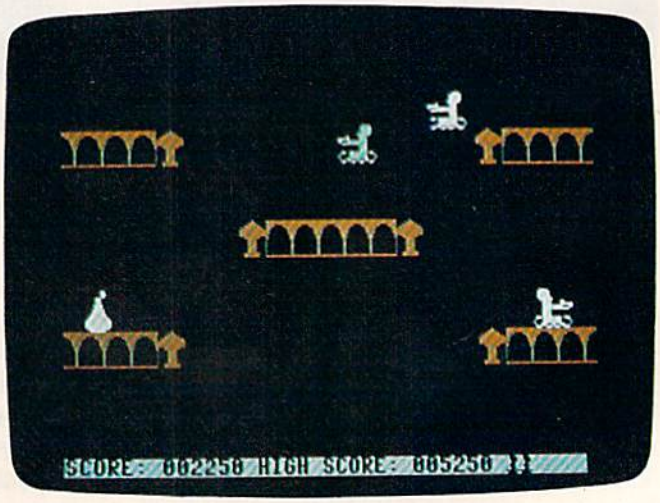
Flying through Bagdad on your magic carpet, you're suddenly accosted by some rug-riding evil genies bent on knocking you off—literally and figuratively. Your only defense is to knock them off first, and this takes some tricky maneuvering. First, you must trap each genie in a bottle. Then collect the bottles before the genies have a chance to escape. If you fail to collect a bottle in time, the lid opens and your battle resumes.

The Calm Before The Storm

Ridding the city of enemy genies gives you a brief rest before the next wave of more numerous and determined genies. Only white genies are encountered during the first four waves, but the fifth wave brings a new, more aggressive menace —the blue genies. (The 64 version plays a bit differently—see 64 Notes below.)

If you manage to reach the ninth wave, white, blue, and the dreaded purple genies emerge for a fast and furious battle.

Twelve is the maximum number of genies that will appear, but the difficulty increases with each higher level. You begin with four green genies (one on the screen, three in reserve), and a new one is added for each 4000 points scored. For each bottle collected, 250 points are awarded.



The player must swoop down to retrieve the bottle before the genie within escapes (64 version).

Current score and high score are continuously displayed in the VIC version.

Flying The Magic Carpet

To start a new game, push the joystick forward. Move the joystick (port 2 in the 64) left or right to move your genie correspondingly. Press the fire button to fly up, and release it to allow gravity to pull you down. Hovering requires alternately pressing and releasing the fire button. If you reach the top of the screen, your genie will bounce, however, he will wrap around the screen at the left and right edges.

Strategic positioning is extremely important. When two genies hit at the same level, they bounce off each other. You have to use your carpet to hit the other genies. If you're at a higher level when you collide, the edge of your carpet knocks the genie off his rug. The falling genie

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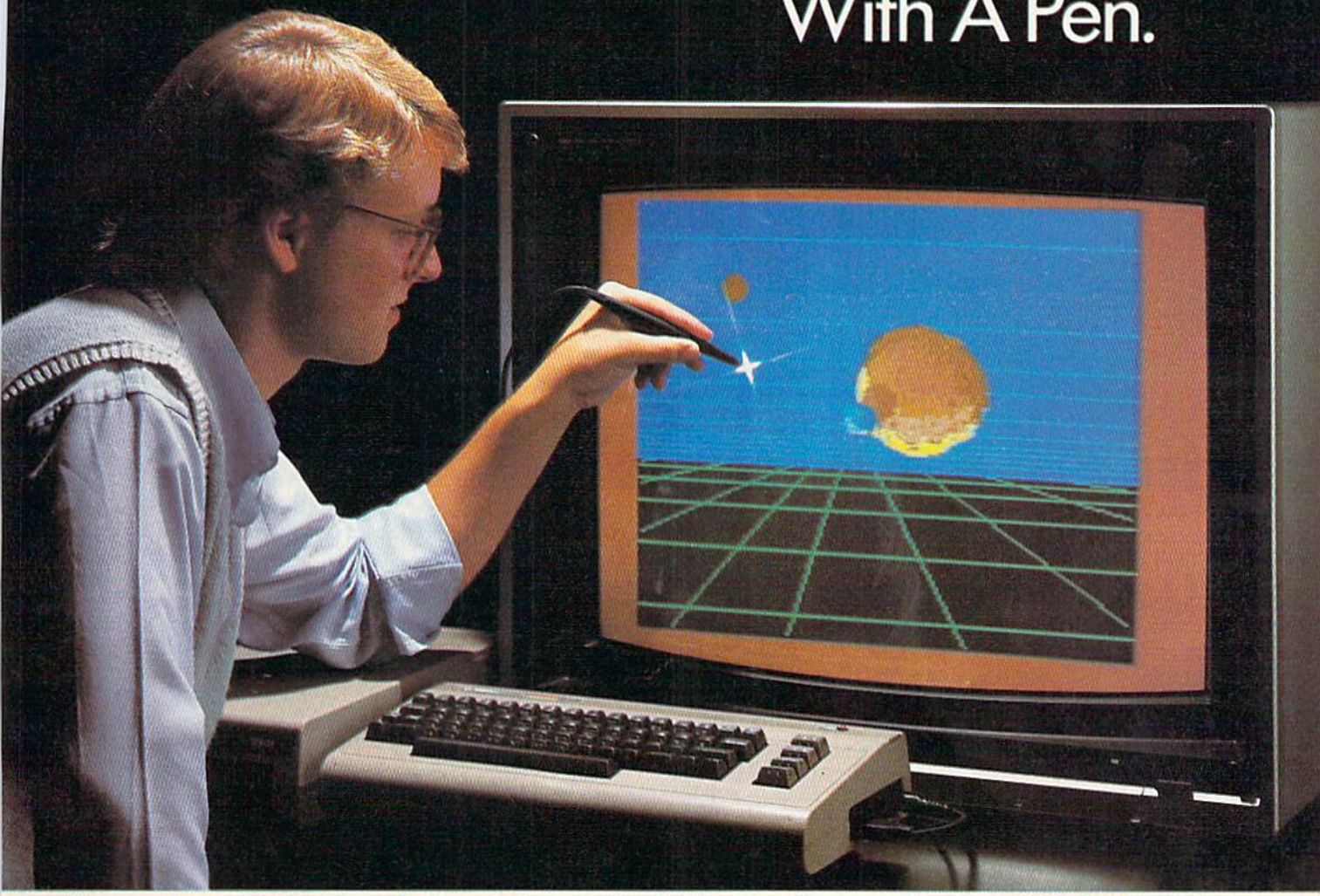

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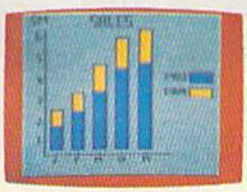

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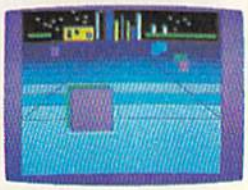

Zoom in for 320 x 200 resolution. "Rubber band" lines and shapes.

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Do you have what it takes?

Bally Midway's Tapper would like to welcome you to the fastest game in the universe.

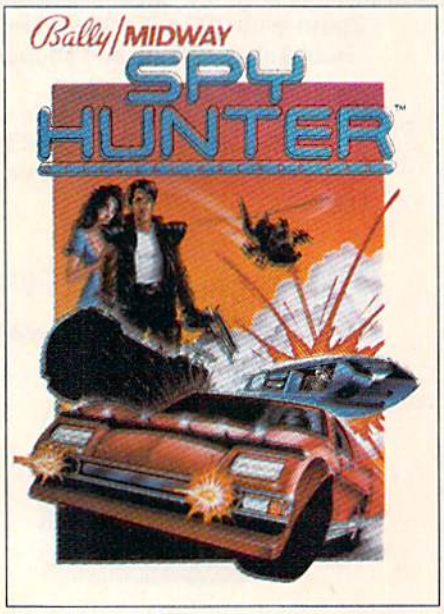
You're serving up drinks in some of the craziest places you've ever seen. And the service better be good, or else. You'll work your way through the wild Western Saloon to the Sports Bar. From there to the slam dancing Punk Bar and on into the Space Bar full of customers who are, literally, out of this world.

Are you fast enough to play Tapper? If you have to ask, you probably already know the answer.

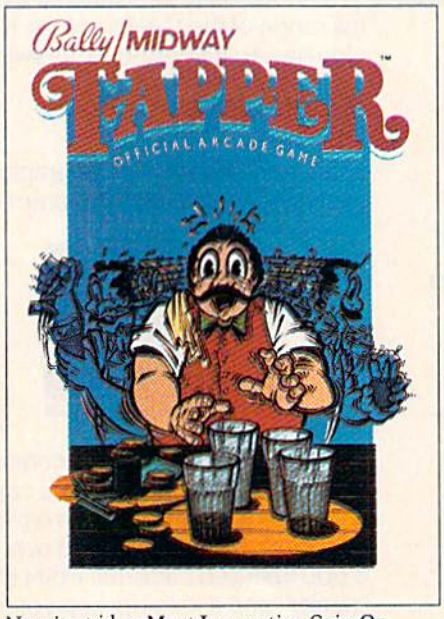
Bally Midway's Up 'N Down by Sega. In this game, a crash is no accident.

In fact, it's the whole object of the game. You'll race your baja bug over some of the worst roads south of any border. Leap dead ends, gaping canyons and oncoming traffic in a single bound. And if anyone gets in your way, crush 'em.

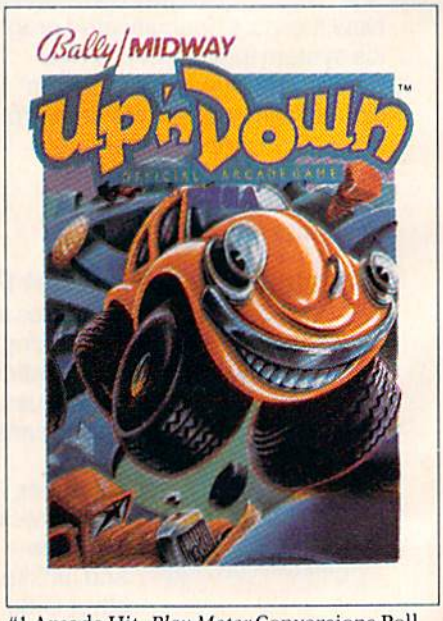
Crashing, bashing Up 'N Down. It's one smash hit that really is a smash.



The #1 Arcade Game of 1984.



Nominated as Most Innovative Coin-Op Game of 1984 by *Electronic Games* magazine.



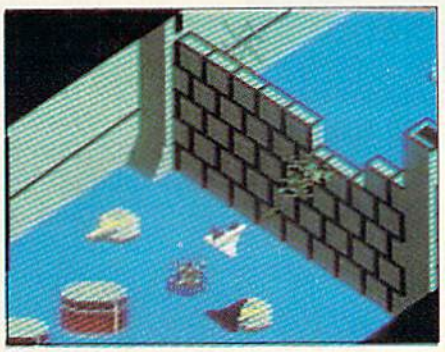
#1 Arcade Hit, *Play Meter* Conversions Poll, 8/1/84.

WERE SUCH BIG HITS, THEM HOME.

Sega's Congo Bongo rocked the home game world when it shot up to Number 3 on the Billboard chart this summer.

And now it's available for even more home systems. So check the chart and get ready for jungle action. You'll pursue the mighty ape Congo up Monkey Mountain and across the Mighty River. Do battle with dangerous jungle creatures. Ride hippos, dodge charging rhinos and try to avoid becoming a snack for a man-eating fish.

Congo Bongo. It's fast and it's fun. But be careful. It's a jungle in there.



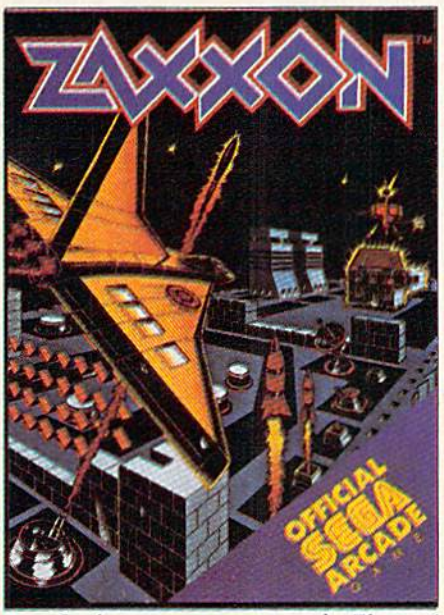
Sega's Zaxxon. If you haven't played Zaxxon, you must have been living on another planet for the past few years.

And now the ultimate space combat game is available for even more home systems. You'll pilot a space fighter through force fields and enemy fire on your way to do battle with the mighty Zaxxon robot. Countless others have gone before you in this Hall of Fame game. But this time your life is in your own hands.

Zaxxon killed them in the arcades. But compared to what it will do to you at home, that was child's play.

	SPY HUNTER	TAPPER	UP 'N DOWN	CONGO BONGO	ZAXXON
Atari 2600 cartridge	✓ NEW	✓ NEW	✓ NEW	✓	✓
Atari 5200 cartridge				✓	✓ NEW
Atari Computers* cartridge	✓ NEW	✓ NEW	✓ NEW	✓	✓ NEW
Atari Computers† diskette	✓ NEW	✓ NEW	✓ NEW		✓
ColecoVision & ADAM cartridge	✓ NEW	✓ NEW	✓ NEW	✓ NEW	✓
Commodore 64 cartridge	✓ NEW	✓ NEW	✓ NEW	✓	✓ NEW
Commodore 64 diskette	✓ NEW	✓ NEW	✓ NEW	✓ NEW	✓
Apple II, IIe, IIc diskette	✓ NEW	✓ NEW	✓ NEW	✓ NEW	✓
IBM PC diskette	✓ NEW	✓** NEW	✓ NEW	✓** NEW	✓** NEW

Arcade and Home Smash. Hit #3 on *Billboard* magazine's Top Video Games survey.



One of only ten games ever to make *Electronic Games*' Hall of Fame.

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†Atari 800, 600XL, 800XL and 1200XL.
**Also available for IBM PCjr.
All new games are scheduled to be in your stores for Christmas. Check your local dealer.
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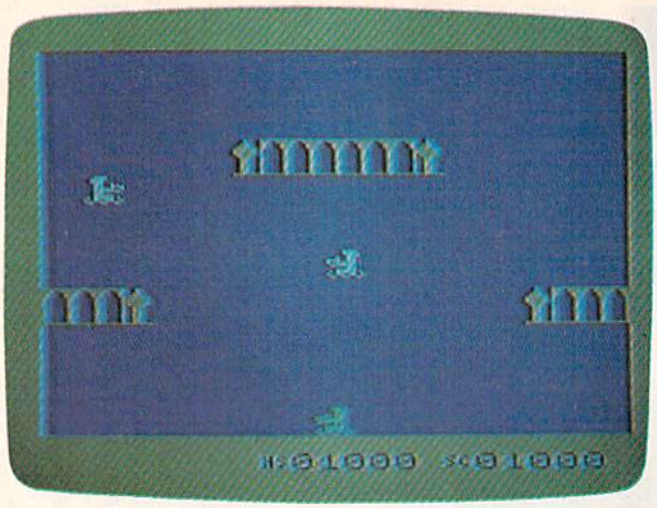

The evil genies hover while the good genie is reincarnated (VIC version).

then crawls back into his bottle, which falls to the ground (or to one of the intermediate levels).

Once in the bottle, the evil genie begins to work his way out again. The only way to get rid of him is to fly down and pick up the bottle.

If you hit a genie when you're at a lower level, you're the loser. You don't have a bottle, you simply lose one of your genies. You'll reincarnate at the bottom of the screen, providing you have at least one life remaining. During the three or four seconds the genie is flashing, he cannot be defeated by enemies. However, if no genies are nearby, you can terminate the flashing and begin play by moving the joystick.

Important VIC Instructions

Since "Bagdad" uses the entire memory of the unexpanded VIC (including the stack and screen memory), it must be entered in three parts. Program 1 is written in BASIC and is entered in the normal manner. Program 2 represents replacement lines for tape users (see below), and Programs 3 and 4 are written in machine language and require the use of MLX (elsewhere in this issue). *At least 8K memory expansion is required to run MLX.*

Follow these instructions carefully to enter and save the program:

1. Type in and save Program 1. If you're using tape, replace lines 32–59 of Program 1 with those shown in Program 2. After saving, *do not rewind the tape*, but remove it from the Datassette. You might want to save a copy onto two different tapes or disks.

2. Turn your VIC off and back on to reset the machine. Install your 8K (or greater) memory expander.

3. Type the following statement in immediate mode (no line number) then press RETURN:

```
POKE 648,26:SYS 58648:POKE 44,28:POKE
7168,0:NEW
```

This moves screen memory to 6656, and puts the beginning of BASIC just above the screen, to leave room for the ML program.

4. Load and run the VIC MLX program. Answer the MLX prompts as follows:

```
starting address: 4096
ending address: 6144
```

5. Enter and save the second part of Bagdad (Program 3). Disk users must save the program with the filename "B" (make sure you don't already have a file with this name). If you're using tape, save the data on the same tape you used for Program 1, immediately following that program. Again, do not rewind the tape, but remove it from the Datassette.

6. Turn your VIC off and on to reset the machine. Leave the 8K expander in place.

7. Type the following statement with no line number, then press RETURN:

```
POKE 44,33:POKE 8448,0:NEW
```

Screen memory is now back at 4096, and BASIC begins at a location in the memory expander, to free up memory for the second ML program.

8. Load and run MLX again and answer the prompts as follows:

```
starting address: 6144
ending address: 8192
```

9. Enter and save the third part of Bagdad (Program 4). If you're using disk, you must save this data with the filename "C". For tape, use the same cassette you used for the first and second parts, and save the data immediately following the previous part (Program 3).

You now have all the programs necessary to play Bagdad. Turn off the computer and remove your memory expander. Bagdad is now configured to run only on the unexpanded VIC. To begin, simply load and run the first program. After viewing the game instructions, the remaining machine language will be loaded automatically. If you'd rather not type in the programs, I'll make a copy (VIC version only) on receipt of a blank tape, self-addressed stamped mailer, and $3. Write to:

Bryan Files
404 Eastbrook Lane
O'Fallon, MO 63366

64 Notes

The 64 version of Bagdad is somewhat different from the VIC version, although the game concept is the same. You begin with three lives (compared to four in the VIC version). The maximum number of enemy genies in one wave is seven, and a new life is added every 5000 points. The *tenth* level introduces the first blue genie, and the *fourteenth* level debuts the sinister purple genie. High score is displayed only at the end of each game.

As in the VIC version, MLX is required for typing in Bagdad (Program 5). Follow these instructions carefully:

1. After turning your 64 on, type POKE 44,32:POKE 32*256,0. Press RETURN.
2. Type NEW, press RETURN, then load and run MLX.
3. Respond to the prompts with:

   starting address: 2049
   ending address: 6020

4. Type in Program 5, save it, turn off the computer to reset the pointers, then load and run.

See program listing on page 178.

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Jump!

Fernando Ciccarelli and Marcel Ferreira

Fire your laser and defend your planet from the invading Ryiads in this keyboard-controlled game for the VIC and 64.

"Jump!" pits you against an invader who's trying to blast both you and your planet. He's wily and you must use your laser in defense.

When you hit the invader, a Ryiad, you get 50 points and 25 energy units. When a Ryiad shot hits the surface of your planet, the point of impact is illustrated by reversing the damaged character. When he hits it a second time, a crater is formed. If he hits the same spot a third time, it disappears and you lose 25 points.

You can move over the undamaged and slightly damaged areas of the surface, but you lose a turn if you try to move over craters or pits. Move left by holding down the Z key. To move right, hold down the C key.

Avoiding The Pits

You can bypass craters and pits by jumping over them. Pressing SHIFT Z allows you to jump over an empty spot to your left. To jump to the right, press SHIFT C. Fire your laser by pressing X, SPACE, or RETURN.

As you play, you'll notice that your energy units are constantly ticking away. Standing still costs one energy unit per second, moving costs five, and jumping costs ten. You get a total of three turns.

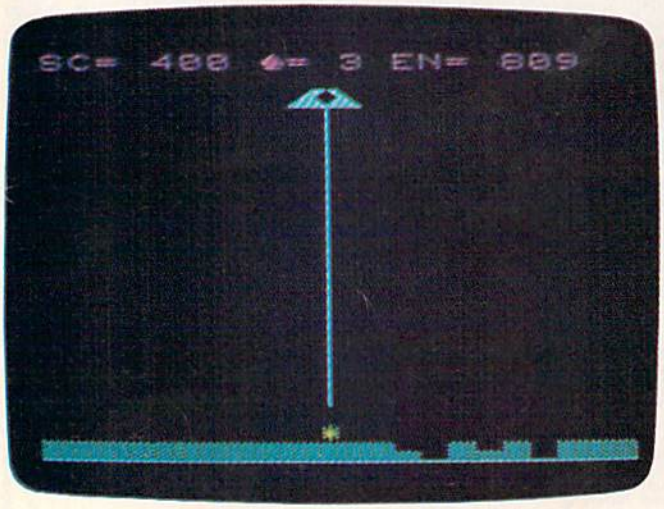
Five Difficulty Levels

There are five difficulty levels: Beginner, Rookie, Pro, Expert, and Random. Try Beginner just to see how the game plays. When you're comfortable with that level, go on to Rookie. Pro is the major level; it gives you a fair game. At the Expert level, the Ryiad is smart and fast. In the Random level, the difficulty factor is chosen randomly for each invader.

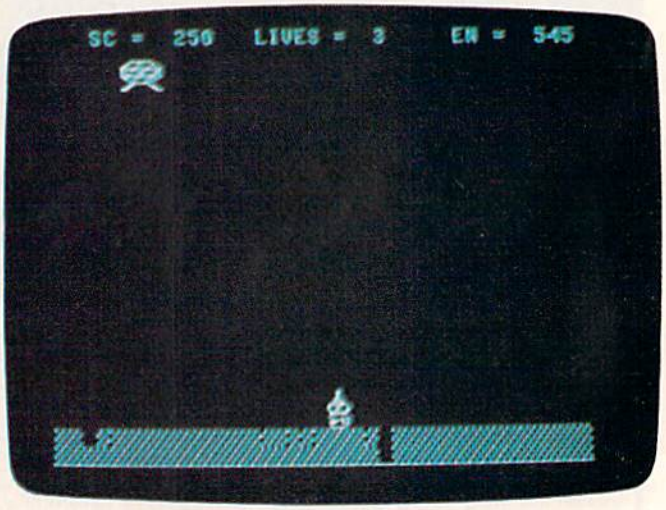
If you would like a copy of the program (VIC version only), send a SASE with a blank tape and $3 to:

Fernando Ciccarelli
14 Poplar Place
New Rochelle, NY 10805

See program listings on page 173.



A life is lost during this direct hit in the VIC version.



To cross either of the holes made by the invader, you must remember to jump (64 version).

F-15 STRIKE EAGLE

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F-15 STRIKE EAGLE is available for Commodore 64, ATARI (48K), and Apple II (64K) computers. Suggested retail price is only $34.95. Find STRIKE EAGLE at your local retailer, or call or write for MC/VISA, or COD orders. Add $2.50 for Postage and Handling (Int'l add $4.00USD). MD residents add 5% sales tax.

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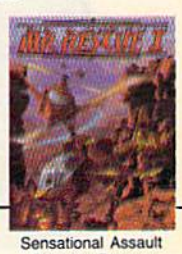

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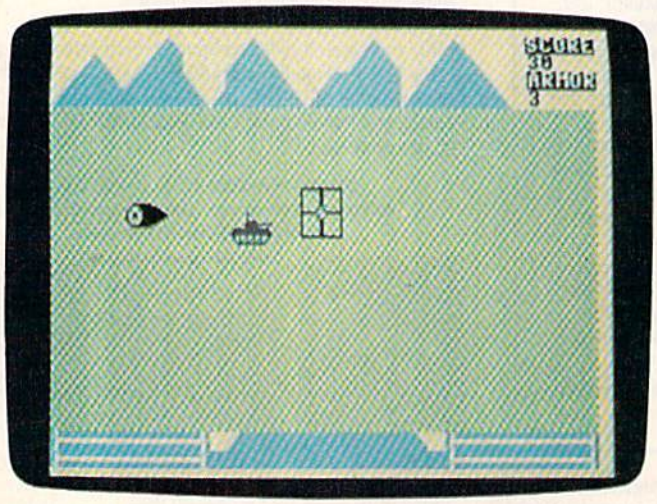
Supertank

Boris Litinsky

In this unusual action game for the 64, your goal is to prevent hostile tanks from crossing into your territory. By aiming carefully and avoiding direct hits, you may make it to the rank of Marshal.

Your orders are to stop the enemy tanks. But in the back of your mind, you know there's more to it than just following orders. You know that if you don't stop them, they'll stop you. Your goal is simply to survive.

Your commander has been kind enough to give you a choice of three different tanks. The Tiger has strong armor, which is great for helping you survive, but it moves sluggishly. The T-34 has moderate armor and speed, but lacks firepower. If you choose the Sherman, you'll have a quick tank with a good cannon, but almost no defense (armor). If you're a new recruit, you might want to choose the T-34 because of its defensive capabilities. Advanced players who are sure of their abilities may prefer the Sherman, although a single hit by the enemy can be devastating.



A missile flies toward the opposing tank.

Controlling The Tank

After you are outfitted, your tank moves onto the battlefield. Enemy tanks move across the screen from left to right. Using the joystick to control the crosshairs of your cannon, get the tank in your sights, and press the button to fire a salvo. Remember that it takes time for the missiles to travel; you'll have to adjust your shots accordingly, shooting slightly in front of your target.

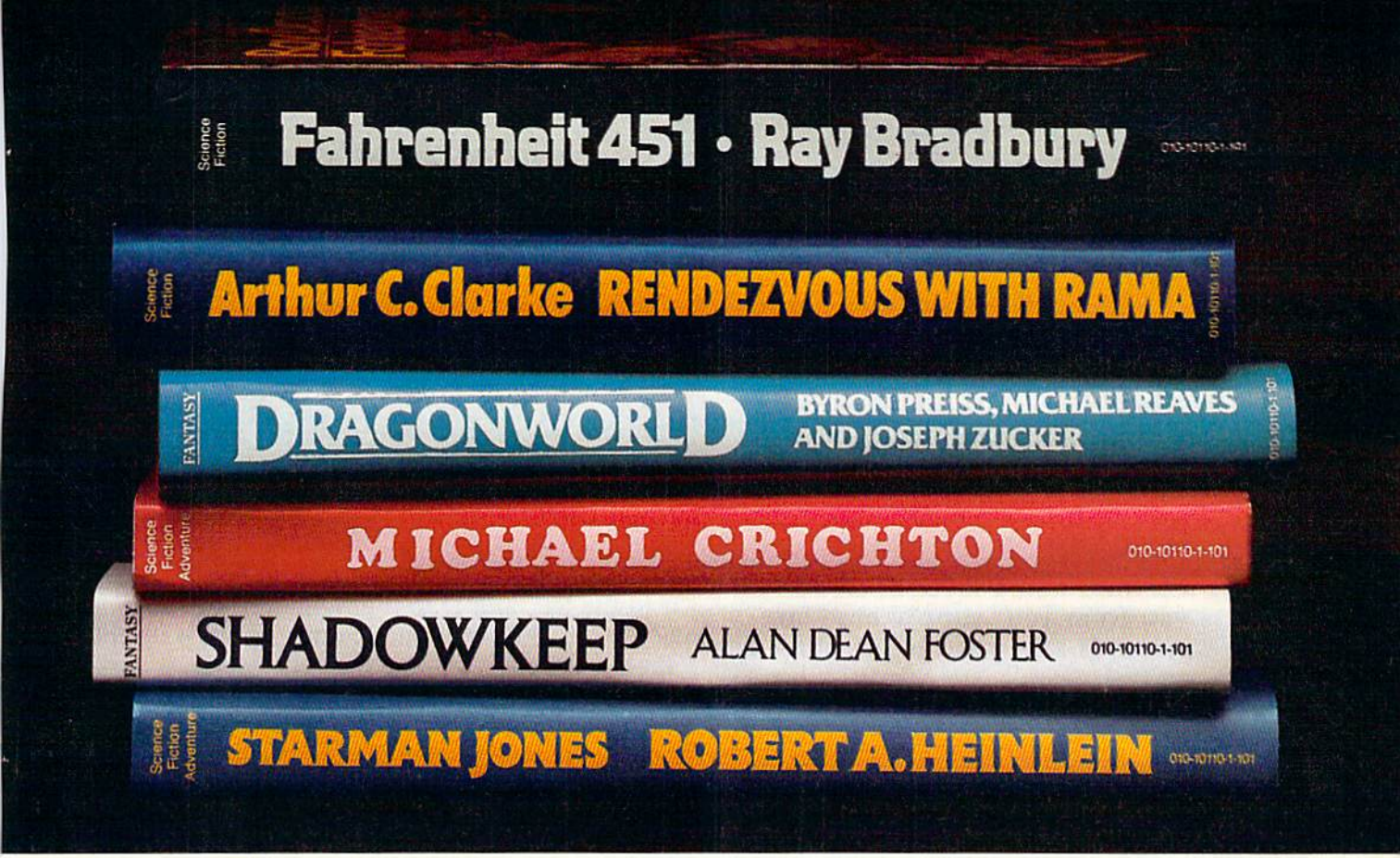
After pressing the fire button, you'll see the missile fly (from the left edge of the screen). If it misses, nothing will happen. But if it hits its target, the enemy tank will explode and the screen will change color, to simulate new terrain and new weather. You score ten points for each successful shot.

If you miss, you become the target. The enemy tank will turn toward you and fire. The enemy rarely misses—and you'll lose one armor point when you get hit. In the upper right corner is a status indicator which displays how many points you've scored and how much armor you have left. When your defenses reach zero, your tank is destroyed. The windshield cracks, and the tank is reduced to scrap.

Extra Chances

Losing a tank is not a total catastrophe, however. You manage to escape by the skin of your teeth, and make your way back to headquarters. Based on performance, you are awarded a rank from Private (less than 50 points scored) to Marshal (over 1000). But if no points are scored, you're branded a Traitor. Whatever your rank, you are given another chance to go forth and do battle. Choose another tank and the game begins again; you may yet earn the exalted rank of Marshal.

See program listing on page 170.



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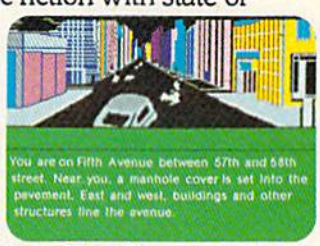

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Descent To Kaylon

Steve Stiglich

Gliding asteroids and a layer of clouds separate you from your supply base on Planet Kaylon. Is safe passage possible? For the VIC and 64.

Cruising over Planet Kaylon in your spaceship, you spot a supply base below. But as soon as you send off a shuttle ship to the base, a cluster of asteroids sails across its path. Darting quickly through the asteroids and clouds, your shuttle narrowly escapes collision before touching down on Kaylon.

This fast paced, arcade-style game uses the full potential of the unexpanded VIC, and is entertaining on the 64 as well. There are as many levels of play as you can master, and the program automatically records the high score after each game.

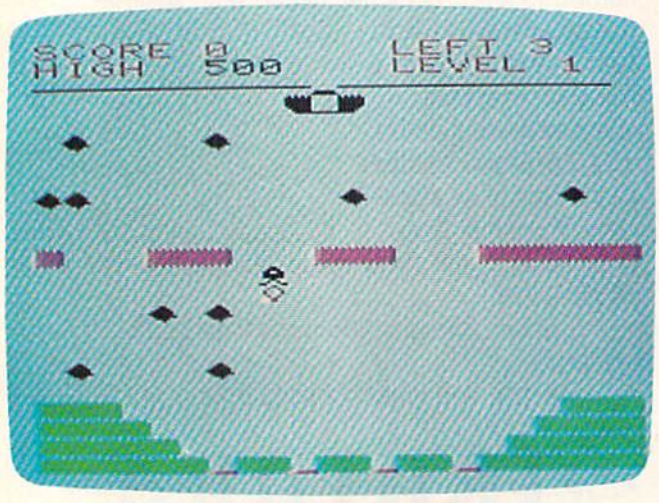
"Descent To Kaylon" begins with your spaceship moving across the top of the screen. To release a shuttle, press the space bar. Your shuttle will begin moving downward through the layers of asteroids and clouds. Pressing A moves it to the left, and D to the right. You can also hold your shuttle at one latitude by pressing the space bar.

There are four landing pads on Kaylon. For each shuttle that you safely land, you earn 100 points. Landing four shuttles on the base advances you to the next level, and adds to your score a bonus of 100 points times your level. With each increasing level, more asteroids are added to the screen.

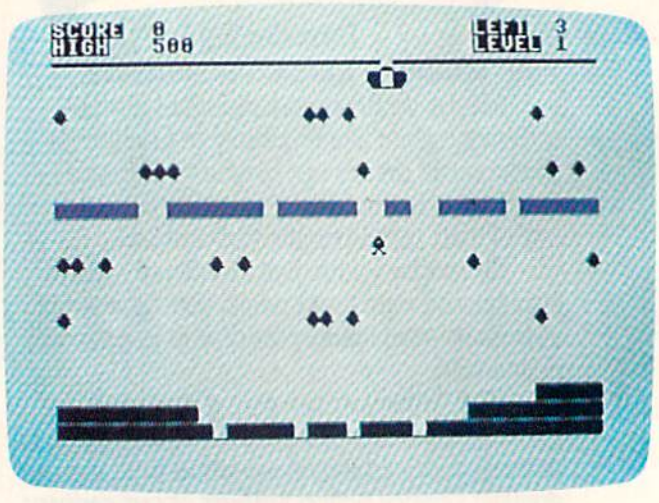
If your shuttle collides with a cloud or asteroid, you can start again at the top of the screen. After three of your shuttles have collided, though, the game ends. With the demise of your last shuttle, the instructions are reprinted, the high score is updated, and you're given a chance to replay.

Variable Names

V	= Volume for sound generators (VIC version only)
S1	= Sound generator for VIC
SD	= Sound generator for 64



Having traversed the layer of clouds, this shuttle must now dodge some asteroids (VIC Version).



In the higher levels, more asteroids move across the screen (64 version).

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LF	= Number of ships left
PO	= Position of shuttle
C	= Location of color RAM under screen position
M$(1) and M$(2)	= Two characters used to make the strings of asteroids
A$, B$, C$	= Three strings of asteroids printed on the screen
HI	= High Score
LV	= Level of play

Program Description (VIC Version)

0–1	Reserves character set; changes screen color; enters special character mode.
6–30	Resets most variables.
49–59	Creates strings of asteroids, with increasing difficulty at each level of game.
98–106	Sets up play screen.
190–192	Moves spaceship across the top of screen; checks keyboard for input.
219	Moves the strings of asteroids in the appropriate direction.
227–233	Checks keyboard for input.
350	Collision check.
500	Determines what you have collided with.
510–511	After collision with obstacles, decreases remaining shuttles by one. If no shuttles remain, GOTO 1200.
600–603	Increments score when you land on base.
700–712	Calculates bonus according to level of play.
1200	Sets high score.
1201–1215	Prints Game Over message and instructions.

See program listing on page 176.

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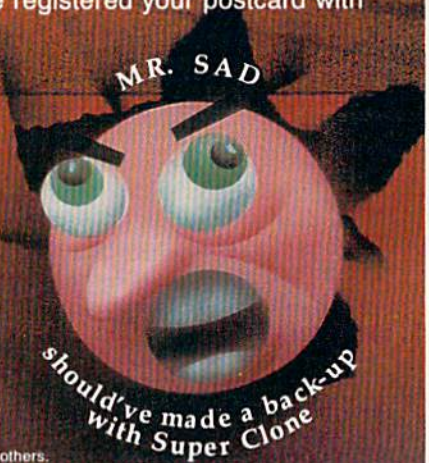

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A Look At New Books From "Reggie" D'Ignazio

Fred D'Ignazio, Associate Editor

A Peek In The Mirror

I'm a magazine columnist. That means that every month I get the opportunity to climb up a mountain, grab a bullhorn, and harangue thousands of GAZETTE readers.

Some months I take a look at new products that have caught my fancy. Other months I tell you about all the foolishness that goes on around my house, with our kids and computers. And some months I get philosophical, and spin off ideas and opinions I hope will stimulate and provoke you.

Until a couple weeks ago, when I got up and made my speech to you each month I never thought about how I must look to you. Then I got a letter from Dallas Denny of Nashville, Tennessee. Dallas enclosed the June 1984 issue of the *Nashville Commodore Users Group (NCUG) Magazine*. On page 5 was a piece by Dallas entitled, "On the Road with Reggie D'Ignazio." The title of the piece comes from my column in COMPUTE! magazine entitled. "On the Road with Fred D'Ignazio." And the piece parodies my columns in various COMPUTE! publications. I'd like to share it with you here:

On the Road with Reggie D'Ignazio

There is a place in my house where you or I can go zooming into the sky like a jet fighter pilot with a fine mustache, or feed peanuts to the elephants at the zoo, or figure out our budget for Christmas presents for Aunt Patsy and Uncle Roger, or play tic-tac-toe with someone who lives in a cloud. It is a magical, exciting place. It does not have fancy curtains or decorations, or even a rug on the floor, but in it my neighbor's children have killed nasty green aliens from space, and in it they have made friends with men in red-and-white-striped balloons. It is a place where there is a television screen, but where television never comes. It is a place which is filled with wonderful sights and sounds.

The place that I am talking about has a lot of outlets to plug things into. You can plug things into slots in the floor or the wall, or dangle them from the lightbulbs on the ceilings. It has a desk with lots of interesting things: there are pencils without erasers and pens without caps, staples, rulers, ink, paper clips, rubber bands, razor blades, harmonicas, matchbooks from faraway places, batteries, note pads, stamps, out-of-date prescriptions, envelopes, guitar picks, pocketknives, screws, rolls of tape, and expired identification cards.

On the desk in my place sits a computer. It is not a particularly big computer, or a particularly tiny computer; it is just a computer. But my computer is a ticket on Lufthansa Airlines. It is a letter from my grandmother. It is a vacation trip to Disneyland. My computer is a lifetime subscription to National Geographic Magazine. *It is a paper cup telephone that connects me with my friends. It is a notebook on which I can scribble my thoughts. It is dinner for two at Andre's. It is a reunion with an old friend, it is a coloring book, it is a safari to Africa.*

There are places with computers like mine all over America, all over the world. Magic places. And ... who knows? Maybe there are similar places on Betelguese, Sirius, or Proxima Centauri. If there are, do you think we could arrange a software exchange?

When I read Reggie's "column," I laughed and winced—at the same time. Do I really sound like Reggie to you readers out there?

I would welcome hearing more from Reggie and from any other "Fred D'Ignazio" clones and lookalikes that you can invent. In the future, I

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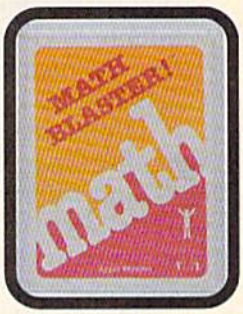

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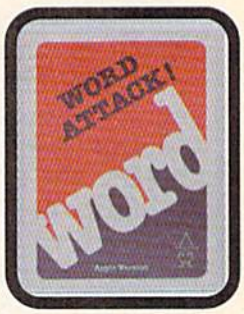

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plan to publish the best "columns" I receive. Then I'll ask you if you can tell the difference between the real Fred D'Ignazio and his artful imposters. I have the embarrassing suspicion that separating Freddie and Reggie D'Ignazio will not be that easy.

A Potpourri Of Books

Every month I receive dozens of books about computers, robots, and high technology. I read through the ones that look like they would interest me. I'd like to share the best of these with you.

I've grouped the books by topic. First, *introductory books*. There are thousands of these on the market. One of the most current and most readable is George Beekman's *The Commodore 64 Home Companion* (Datamost, 1984, $19.95, 359 pages, index, appendices).

Unlike many so-called "beginner's" manuals, Beekman's book is truly accessible, attractive, and *inviting*—for the entire family. It's a great alternative to a user's manual. It should appeal to both the young and old non-technical members of the family.

Also, the book is comprehensive. It begins by introducing you to the applications home computers can perform. Then it takes you, step by step, into buying software and hardware, setting up a system on your own, programming, and dealing with peripherals like modems and printers. The book ends up with a solid index, a list of user groups, and a handy pull-out summary card with BASIC commands, how to LOAD and RUN a program, how to SAVE a program, how to view the disk directory, how to format a disk, how to control the screen, and how to use a modem.

The second introductory book I'd like to recommend is *Computer FUNdamentals*, by Barbara Kurshan and Nancy Healy (Reston, 1984, $16.95, 208 pages oversized).

Computer FUNdamentals is a big activity book, equally suitable for families and schools. Each chapter begins with a brief look at such topics as computer history, programming, and computer applications. Most of each chapter, however, consists of activities, and *many of the activities don't require a computer*. For example, you can assemble your own computer out of an egg carton and write programs for it. Or you can create a junk robot out of shoe boxes, bits of tin foil, and markers. There are dozens of activities. All are attractive and easy to do, and they all teach some aspect of using computers. At the end of the book is a "keys and answers" section that gives the solutions to computer problems in the book.

Computer FUNdamentals makes an excellent introduction to the broader, more practical aspects of "computer literacy" for children ages 8 to 13.

As a companion to *FUNdamentals*, I would recommend *The Beginner's Computer Dictionary* by Elizabeth S. Wall and Alexander C. Wall (Avon/Camelot, 1984, $2.25, 80 pages, paperback). This is a straightforward reference book and complete guide to computer terms for children grades 4 and up.

For younger children, I'd recommend *The Computer Alphabet Book* by Elizabeth S. Wall (Avon/Camelot, 1984, $2.25, unpaged).

This is a sprightly little book designed to be used by beginning readers in 1st, 2nd, and 3rd grade, and to be read by parents to younger children. When you browse through the book, you see that on the left side you have a big letter of the alphabet, followed by a computer term and a brief explanation. On the right side (on the facing page) is a cartoon of a silly, Snoopy-like dog learning about computers.

This book has a laudable, secondary purpose. As parents read it to their children, they may also be acquiring a painless dose of computer literacy themselves, including information about the computer's memory, programming languages, computer parts, computer applications, and fundamentals about how people actually use computers. If you find other computer manuals too scary and technical, then this is the book for you.

A companion package to Wall's *Alphabet Book*, or a possible alternative, is a book/software package, *Qwerty's Alphabet Adventure* by Shadow Lawn Press (Hayden, 1984, $19.95, 4-color unpaged book, Commodore 64 diskette).

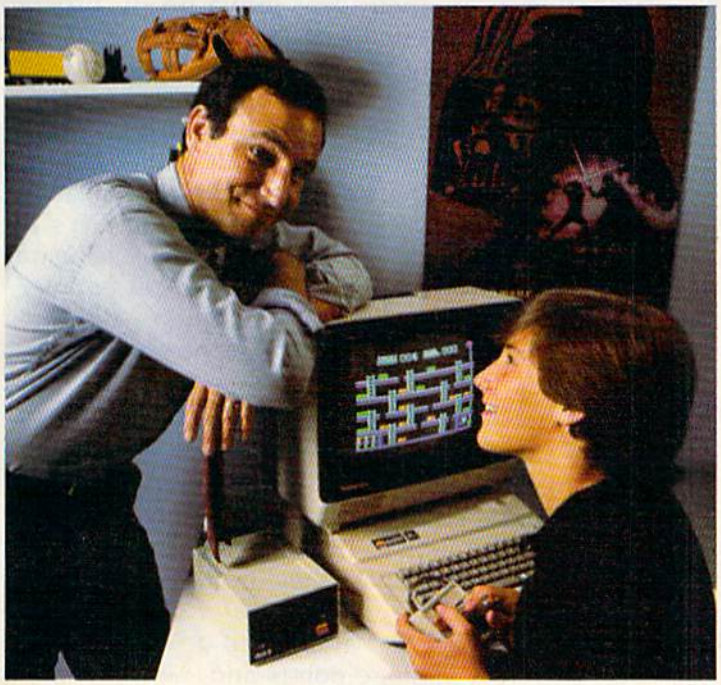
Qwerty is a cute little caterpillar who takes your child on a journey through the letters of the alphabet. The pictures on the computer screen are extremely simple, but the Qwerty character and the illustrations in the Qwerty book compare favorably with other alphabet books for children.

I like Elizabeth Wall's *Alphabet Book* and *Qwerty's Adventure* because picturebooks, stories, and cartoon characters are a familiar and comfortable way for young children and their parents to begin learning about computers. In addition, the Qwerty package combines storytelling and books with a hands-on introduction to the computer keyboard.

Puzzles And Adventures

Computers can act like workhorses and number crunchers, but they can also stimulate our imagination, and help strengthen our thinking skills. I welcome any books and programs that open up this dimension of computers to new users—especially children.

Give your children more than the advantage of a computer. Give them the Scholastic Advantage.



You probably realize the computer is only the first step. Now you need Scholastic Software to turn it into both a powerful and entertaining learning tool for your child.

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At Scholastic, we've put everything we've discovered about how youngsters learn into our new software line. It's the result of over 60 years' experience making learning both challenging and fun. In fact, you probably grew up reading Scholastic books and magazines in school. Nobody else knows kids like we do and it shows in our new family of products. That's the Scholastic Advantage.

Our software family includes *Agent U.S.A.,* which turns geography into an exciting adventure trip around the country; *Story Maker,* a program that helps kids create their own illustrated story book, and *Math Man,* an action game that makes learning math fun. *Microzine* is America's most popular classroom software, featuring four fun learning programs on one disk. *Story Tree* is both a creative writing tool and a word processor, and *Operation: Frog* is a fascinating simulation of a biology lab.

So give the Scholastic Advantage. You'll be surprised how fast the computer becomes one of your child's favorite—and most exciting—teachers.

Agent U.S.A. available in Apple, Atari, Commodore and IBM. Story Maker and Microzine available in Apple. Math Man and Story Tree available in Apple and IBM. Operation: Frog available in Apple and Commodore. Spelldiver available in Apple, Atari and Commodore.

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The Commodore Puzzle Book: BASIC Brainteasers by Gordon Lee and Nevin B. Scrimshaw (Birkhauser, 1983, $7.95, 125 pages, paperback) and *At the Heart of the Mountain: A BASIC Adventure for the Commmodore 64* (Birkhauser, 1984, $9.95, 170 pages) are two good books that emphasize using the computer to strengthen your thinking skills *and* your imagination.

The *Puzzle Book* is filled with 50 brainteasers and their answers (at the back of the book). The book gives various programming solutions to the puzzles and emphasizes that there are many different ways to write a program that solves a problem.

In *Heart of the Mountain*, you spend an adventurous summer with Erin in the White Mountains of New Hampshire and learn about the Commodore 64 along the way.

Heart and the *Puzzle Book* are for children ages 10 and up. If your children are younger, you might look into the *Micro Adventure Series* from Scholastic. The first book in the series, *Space Attack* by Eileen Buckholtz and Ruth Glick (Scholastic, 1984, $1.95, 123 pages) lets your children use their computer to decode alien messages and become a member of ACT (the Action Computer Team). On the way they enter, use, and modify eight computer programs written in BASIC.

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In another book, *BASIC FUN with Adventure Games* by Susan Drake Lipscomb and Margaret Ann Zuanich (Avon/ Camelot, 1984, $2.95, 96 pages), children get to go on a spy mission using their computer. Then they get to devise an adventure game of their own. The book teaches them how to construct a plot, define the solution, and determine all the obstacles and hazards that the gameplayer must face. Then it shows them how to translate their ideas into a BASIC program.

For older members of the family—teens and adults—you might want to look at *The Book of Adventure Games* by Kim Schuette (The Arrays, Inc., 1984, $19.95, 341 pages oversized). This book is a bargain if you and your family spend your computer time wandering through mazes, dungeons, and caves in adventure games. It's a reference book full of evaluations, maps, illustrations, and clues for over 75 of the most popular games. The book takes the frustration—not the challenge—out of computer adventure games.

Armchair Computer Literacy

As we all know, computer literacy is more than learning about bits and bytes. To become truly literate about computers we need to be able to step back and look at them from a distance and try to assess the impact they are having on our world.

Three books that attempt to do this take very different vantage points and, hence, complement each other nicely.

Patricia Marks Greenfield, in *Mind and Media* (Harvard University Press, 1984, $4.95, 210 pages, index, paperback) tries to assess the effects of television, video games, and computers on children. Anxious parents and teachers, concerned with their children's social and intellectual development, will find lots of fresh ideas in this book.

Glenn M. Kleiman, in *Brave New Schools* (Reston, 1984, $14.95, 207 pages, index, paperback) takes a close look at the computer in the classroom and at the many ways it can be used as a valuable learning tool. If you are wondering what your kids are doing with computers in school—or what they *ought* to be doing—you should read Kleiman's book.

Last, Sherry Turkle, in *The Second Self: Computers and the Human Spirit* (Simon & Schuster, 1984, $17.95, 362 pages, index, hardcover), looks at the way computers affect the way we think—especially the way we think about ourselves. Turkle spent four years investigating the influence computers have on the psychology and development of preschoolers, elementary-age children, and teenagers. According to Turkle, the question is not what will the computer be like in the future, but what will *we* be like?

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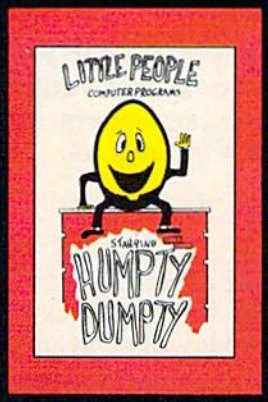

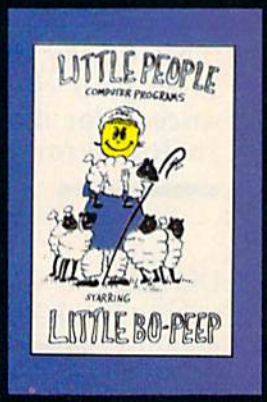

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Robert M. Pineau

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6. VACAtion
7. MEDIcal
8. BOOK (subscriptions or entertainment)
9. CHGE (store charge account)
10. MISCellaneous

The total balance is kept in a separate account, CHBK.

Start With The Date

Budgeteer first asks you for the current date. Your input may be in just about any format you wish: July 4 1984; Jul. 4 1984; 7-4-84; or 7/4/84. The date format, however, must not contain commas unless the entire date is enclosed in quotes. In the INPUT statement, commas are reserved to separate variables.

After a brief pause, the program asks you to insert your data tape or disk. If you keep your data files on a separate tape or disk from programs, then there's no danger of data files overwriting your programs or vice versa. When the program continues, it will then read the account balances written during the previous session.

The very first time you run the program you'll need to establish zero balances for all the accounts, since a data file does not yet exist. When the program asks you to insert the data tape or disk, press RUN/STOP–RESTORE and add the following temporary extra program line:

24 GOTO 40 (VIC version)
260 GOTO 360 (64 version)

This causes the program to skip the read routine. This feature is also useful when the balances recorded in CHBKFILE are outdated and need to be erased. Remember to delete this line when the account is established.

Plenty Of Prompts

The program provides visual and audio prompts along the way. When you want a transaction, the choice is between making a deposit, writing a check, or transferring funds between accounts. A deposit is credited to the MISCellaneous account as well as added to the CHBK balance. When you write a check, enter the amount followed by the number of the account from which the money will come. For temporary convenience, individual account balances may be negative. Negative balances are corrected by transferring money from an account which has ample funds, usually the miscellaneous account, where deposits are credited.

The input to be made for each transaction and the required order with quantities separated by commas are:

- amount when making a deposit
- amount from account # when writing a check
- amount from account #, to account # when transferring funds.

There are built-in safeguards against some possible errors. Checks written for the wrong amount must be corrected by writing an extra check if the first was too small, or by redepositing the check amount before writing a smaller check if the first was too large. If errors cannot be readily corrected by depositing extra money, writing extra checks, or transferring between accounts, you should stop the program, type the extra GOTO line (as mentioned before), and start again with zero balances.

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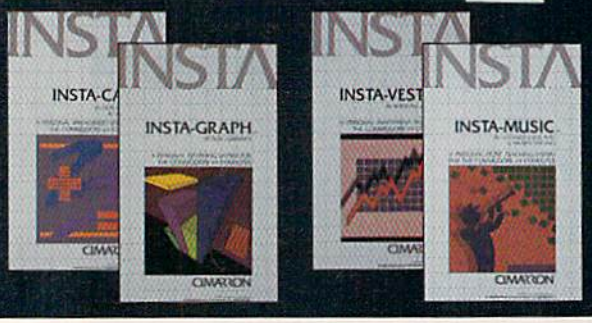

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The amount of the last transaction is displayed at the top of the table of balances. An asterisk identifies the two accounts involved in the last transaction. After your final transaction, a response of N to the TRANSACTION? query will cause your updated CHBKFILE balance file to be recorded for the next session. If you are using tape, there will be a pause for you to rewind the cassette if you have not already done so. After writing the new file, you get a final display of balances and the number of transactions executed replacing the amount of the last transaction.

VIC Instructions

The VIC version has no POKEs to screen or color memory, so it will run with any or no expansion.

After running the instructions (Program 1), you have the option of repeating them if you wish. When you are finished with the instructions, the main program (Program 2) is loaded and starts running automatically. The program can be used with either tape or disk.

For the load-and-run feature to work properly, Program 2 must be saved with the filename B2. Tape users should save Program 2 immediately following Program 1 on the same tape. To modify Program 1 to work with disk, change the ,1 in line 118 to ,8. Program 2 will work with either tape or disk, depending on the value of X in line 2. If X=0, Program 2 will read and write the data file CHBKFILE on cassette; X=1 directs the program to read and write on disk.

64 Specifics

The 64 version (Program 3) operates in the same manner as the VIC version. You can select between tape and disk filing by changing the value of X in line 100 (0 for tape, 1 for disk).

See program listing on page 189.

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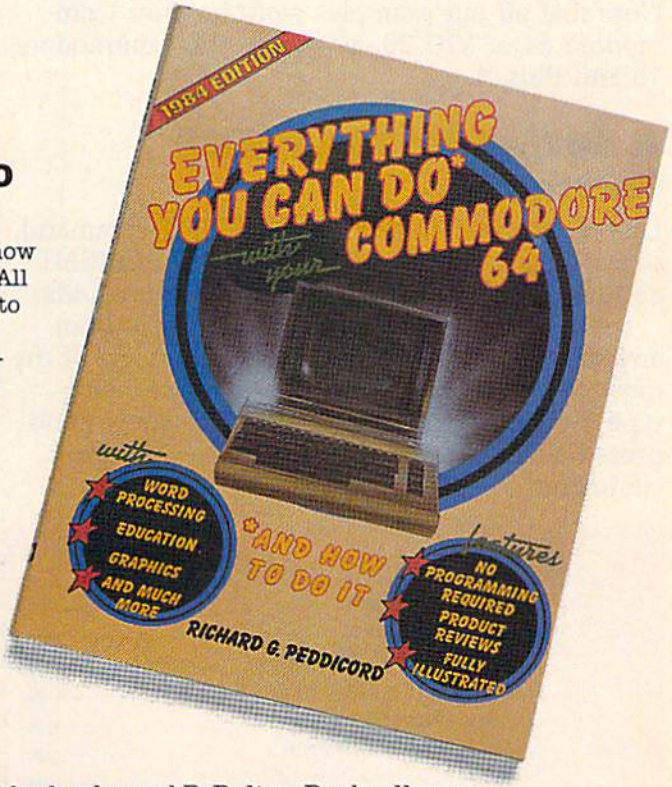

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Michael S. Tomczyk

The Four Most Important BASIC Commands

Did you ever think to yourself, "There must be some shortcuts in BASIC programming that'll let me get started sooner?" After all, young children don't have to learn the whole dictionary before they start talking. Most kids communicate quite well with just a few words. BASIC is no different. You can write some very sophisticated programs with just a few commands.

In BASIC, there are four special commands that form the basis for the entire language: PRINT, GOTO, FOR–NEXT, and INPUT. I call them the "four sizzlers" because they're the four most important BASIC commands in computing. Note that all our examples work on your Commodore 64 or VIC-20, as well as the Commodore 16 and Plus/4.

A Review Of The PRINT Command

Last month, we introduced the PRINT command, so we'll start with a very brief review of PRINT and launch right into the next three commands.

The PRINT statement has more uses than any other command. Here's a quick review of the most common uses. To try the examples, just type the PRINT command exactly as shown and press RETURN after each line to execute the command:

Note: Refer to the article "How To Type In COMPUTE!'s GAZETTE Programs" if you do not understand how to type the characters in braces ({}).

The GOTO Command

Whenever you type RUN, your computer starts at the lowest numbered line and continues line by line to the highest. The GOTO command tells the computer to GO TO another line in the BASIC program, to break out of the usual pattern. The most common example looks something like this:

```
10 PRINT"BASIC MAGIC"
20 GOTO 10
```

This two-line program displays the same message over and over again, in a vertical column. To see how it works, type both lines as shown, then type RUN and press RETURN. To stop the program, press RUN/STOP.

If we add a semicolon (;) at the end of line 10, the messages will display horizontally instead of vertically. To make this change, type the word LIST and press RETURN, then move the cursor to the end of line 10 and type a semicolon, like this:

```
10 PRINT"BASIC MAGIC";
```

You could retype the line if you like, but with Commodore's on-screen editing you can just list

Uses Of The PRINT Command	Examples
Display messages	`PRINT"E.T. COME HOME"`
Display graphics	`PRINT"QQQQQQQQQQ"`
Display reverse characters	`PRINT"{RVS}HI{OFF} BYE"`
Calculate numbers	`PRINT(5+15)*(7-2)`
Change character colors	`PRINT"{GRN}THIS IS GREEN"`
Clear (erase) the screen	`PRINT"{CLR} NEW MESSAGE"`
Move the cursor "home"	`PRINT"{HOME}THIS IS THE HOME POSITION"`

Set position on the screen (Use with cursor keys or the TAB or SPC commands)	`PRINT TAB(155)"HELLO"`
	`PRINT SPC(40)"HELLO"`
	`PRINT"{2 RIGHT} HI{2 SPACES}"`

PRINT blank rows	`PRINT"ROW1":PRINT:PRINT"ROW3"`
Calculate and PRINT variables	`X=170:PRINTX` `X=170:PRINTX+5`

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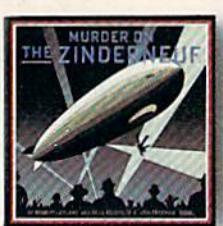

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the line, make the change, and press RETURN. Line 20 stays the same. Now, cursor down to a blank area of the screen (past line 20) and type RUN and press RETURN. Oops—the message is moving a little too fast. How do we slow it down? We'll use our next command, the FOR–NEXT loop.

The FOR–NEXT loop is a two-part command which lets you do two things: create time delays and repeat actions. A time delay slows down any activity in a program—for example, when you want to print a message and leave it on the screen for a few seconds. Repeating actions is the second major function of the FOR–NEXT loop, but first let's see how the time delay works.

A FOR–NEXT delay loop tells the computer to stop where it is and count to some number (one that you choose) before going on to the next part of your program. You can insert this line almost anywhere when you want to slow things down. Here's what it looks like:

```
FOR T=1 TO 500:NEXT
```

The key number here is 500, because that's how far the computer counts before going on. If you make this number smaller, the delay is shorter and the program moves faster. If you make it higher, the delay is longer and the program moves more slowly. The variable T can be any other letter of the alphabet (we'll use T here to stand for Time). The word NEXT tells the computer to go on to the next number.

Let's slow down the GOTO example we just typed in the previous program. We'll do this by adding a FOR–NEXT loop just after the PRINT message. This will make the computer display the message, then count to 500 before going on. Enter the line shown below. (First, type LIST and press RETURN to see our original program.) To see what it does, type RUN and press RETURN:

```
15 FOR T=1 TO 500:NEXT
```

Presto! The program runs slower. To see how different numbers change the speed, LIST your program and change the 500 in line 15 to a larger or smaller number.

Two Flashing Messages

Here's another example. Type NEW and press RETURN, then enter this program:

```
10 PRINT"{CLR} WELCOME TO"
20 PRINT"{CLR} BASIC MAGIC"
30 GOTO 10
```

After entering, cursor down past line 30 and type RUN.

Too fast, right? To slow down this program, we need *two* delay loops—one after each message. First, press RUN/STOP, then type LIST. Now enter these two lines:

```
15 FOR T=1 TO 700:NEXT
25 FOR T=1 TO 700:NEXT
```

Here's a timesaving tip: Since the lines are identical (except for the line number), you can type all of line 15, press RETURN, and then cursor up and change the 15 to a 25, and press RETURN.

Now LIST your program again. Notice that the computer has automatically inserted line 15 between lines 10 and 20, and line 25 between lines 20 and 30. Your new program should look like this:

```
10 PRINT"{CLR} WELCOME TO"
15 FOR T=1 TO 700:NEXT
20 PRINT"{CLR} BASIC MAGIC"
25 FOR T=1 TO 700:NEXT
30 GOTO 10
```

Type RUN and press RETURN to see a new and slower program. You can use this little program to flash a message or title at the top of the screen. But what if you wanted to flash the message just a certain number of times—eight times, for instance?

Using FOR–NEXT To Repeat Actions

The most important use of the FOR–NEXT loop is to repeat actions in your program. To repeat an action, simply put the FOR part of the loop at the *beginning* of the action, and put the word NEXT at the *end* of the action, like this:

```
FOR X=1 TO 8:(THE ACTION YOU WANT TO REPE
  AT):NEXT
```

The computer will repeat everything between the FOR part of the command and the word NEXT. The numbers 1–8 mean the action will be repeated 8 times. (The computer is counting again, just like in our time loops.) Of course, you can use any number in place of the 8, depending on how often you want to repeat the action. The variable X, like the variable T in our previous example, can be any letter of the alphabet. If you use more than one repeat-action loop in a program, you should use different variable letters for each loop.

To make our blinking message flash eight times, we put the first part of the loop in front of the actions we want to repeat, and the word NEXT at the end. Note that we don't need the GOTO command here because we don't have to "go back" to repeat the action. The FOR–NEXT loop *surrounds* the action and makes it repeat. To see how this works, let's edit our previous program by adding line 5 and retyping line 30. The new program looks like this:

```
5 FOR X=1 TO 8
10 PRINT"{CLR} WELCOME TO"
15 FOR T=1 TO 700:NEXT
```

[OH NO, NOT AGAIN.]

SON of ARCHON.

Jon Freeman, Paul Reiche III and Anne Westfall created Archon, the 1983 "Game of the Year" according to Softline and Creative Computing. Recent evidence, however, indicates they were not satisfied with this.

If you took all the hours spent by all the people who've played Archon and put them together, there's a good chance it'd amount to more human effort than it took to put a man on the moon.

The Archon Dragon.

What does this mean? Is it a good thing? And why, in light of this, did the people pictured here decide to issue a scorching sequel named *Archon II: ADEPT*?

For starters, we don't really know what it means. Except that a lot of people who had a pretty good time with *Archon* are about to get more of what they like. And people who've yet to experience the best-selling, award-winning, knuckle-whitening original have *two* good things coming their way.

The Archon Basilisk.

Point two: If there's a moral issue here, we see it this way: A wise man once said, "I ain't never had too much fun." We agree. And we think that once you get your hands on *Archon II: ADEPT*, you'll see his point.

Now for the third question. Why a sequel? Well, there are sequels and there are sequels. The good ones happen because people just haven't had enough of a good thing. Obviously we're here to tell you that *Archon II: ADEPT* falls into the right category.

The ADEPT Chimera.

Where Archon took inspiration from chess, fantasy role-playing characters and arcade combat, *ADEPT* comes more from a world of its own making. Like *Archon*, it pits the forces of good against those of evil. But in place of the chessboard motif there is a map of elements—Earth, Air, Fire and Water. The role of magic is greater. The strategies are deeper. Things move faster. And the hidden algorithms that control the computer's play are considerably smarter.

The ADEPT Thunderbird.

Having already spent the better part of a month playing *ADEPT* (in order to write this ad, of course), we're quite confident it will seduce you too.

And if, by some strange chance, there is a parallel universe in which computer simulations come to life, we are confident that a large part of its population has Jon Freeman, Paul Reiche III and Anne Westfall to thank for their brief and miserable existence.

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MACHINE REQUIREMENTS: *Archon* is available on the Apple II, II+, IIe & IIc, IBM-PC, PCXT & PCjr, Commodore 64 and Atari. *Archon II: ADEPT* is available on the Commodore 64 and Atari.

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```
20 PRINT"{CLR} BASIC MAGIC"
25 FOR T=1 TO 700:NEXT
30 NEXT
```

Type RUN, press RETURN, and the message will blink eight times. Notice that we have both PRINT statements *and* time delay loops between the FOR and the NEXT in our repeat-action loop. Yes, you can put loops inside of loops. Anything you put between the FOR and NEXT will be repeated: a sound effect, a graphics symbol, or a programming action. Loops can be tricky, though. Just remember that your loop has to completely surround the action(s) you want to repeat.

You can also use the FOR–NEXT command to repeat a graphics symbol to make a border, a design, or to draw a line, like this:

```
FOR X=1 TO 22:PRINT"C";:NEXT
```

In this line, the action between the FOR and the NEXT is repeated 22 times—in other words, the horizontal line graphics symbol is printed 22 times. Let's see how we could use this in a BASIC program. Type NEW and press RETURN, then enter this short program, which demonstrates how to make a title with a line under it:

```
10 PRINT"{CLR}BASIC MAGIC:4 COMMANDS"
20 FOR X=1 TO 22:PRINT"C";:NEXT
```

If you have a 40-column computer (such as the Commodore 64) and you want the line to go all the way across the screen, change the 22 to a 40. And if you're wondering why we put the semicolon in line 20, that's so the graphics line characters all print next to each other across the screen. If you remove the semicolon, you'll get 22 short lines running down the screen.

A Flashing Title

Now that we know how to slow down our BASIC programs, and how to repeat actions using the FOR–NEXT loop, let's try something a little fancier. First, we'll see how to make a long message appear on the screen and keep repeating using the GOTO command. Then we'll see how to make the message repeat five times and stop. Type NEW and press RETURN to erase the last program and type in this program exactly as shown:

```
10 PRINT"{CLR}"
20 PRINTTAB(92)"BASIC MAGIC"
30 FOR T=1 TO 700:NEXT
40 PRINTTAB(92)"TEACHES YOU"
50 FOR T=1 TO 700:NEXT
60 PRINTTAB(92)"EASY COMPUTING"
70 FOR T=1 TO 700:NEXT
80 PRINT"{CLR}":FOR T=1 TO 700:NEXT
90 GOTO 20
```

Type RUN and press RETURN. Now let's take a look at how this program works, line by line.

Line 10 prints the CLEAR character, which clears the screen.

Line 20 introduces the TAB command, which is used to position information on the screen. PRINT TAB(92) "BASIC MAGIC" tells the computer to "tab" over 92 spaces from the top lefthand corner of the screen, then print the message. Notice that the tab portion of the line is outside the quotation marks but is still a part of the PRINT statement.

Line 30 is a time delay loop that leaves the first message (BASIC MAGIC) on the screen while the computer counts to 700 before continuing.

Line 40 moves one line below the BASIC MAGIC line, then tabs over 92 spaces from the left edge of the screen, and prints the next message (TEACHES YOU).

Line 50 is another time delay loop, identical to line 30, that makes the computer wait a few seconds before moving on to print the next message.

Line 60 is another TAB and PRINT combination which positions and displays the final portion of our message (EASY COMPUTING).

Line 70 is another time delay loop, again, identical to line 30.

Line 80 is interesting. It clears the screen, then uses a time delay loop to leave the screen blank for a count of 700. Notice that you have to use a colon (:) to separate commands when you use more than one on the same program line like we did here.

Line 90 is our old friend the GOTO command. This tells the computer to go back to line 20 and print the messages all over again. Notice we don't have to GOTO line 10 and clear the screen because we already took care of that in line 80: We can go directly to line 20.

There's only one thing wrong with this program. The GOTO command traps you in an endless loop. It keeps going and going and going. What if you want to go on to something else in your program?

If we use the FOR–NEXT command to repeat the title five times, the computer will automatically go on to the next part of the program after the title is displayed the fifth time. To change our title program, we just have to include a new line 5, retype line 90, and add line 95. Here's how the modified program should look:

```
5 FOR X=1 TO 5
10 PRINT"{CLR}"
20 PRINTTAB(92)"BASIC MAGIC"
30 FOR T=1 TO 700:NEXT
40 PRINTTAB(92)"TEACHES YOU"
50 FOR T=1 TO 700:NEXT
60 PRINTTAB(92)"EASY COMPUTING"
70 FOR T=1 TO 700:NEXT
80 PRINT"{CLR}":FOR T=1 TO 700:NEXT
```

["Hi, we're from Europe. Where's the gold?"]

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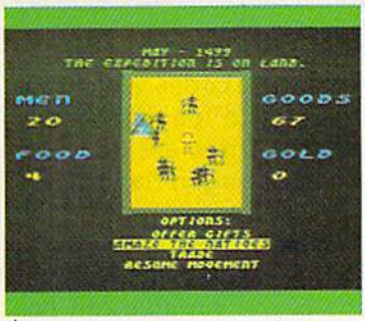
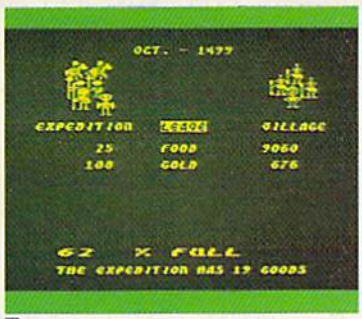
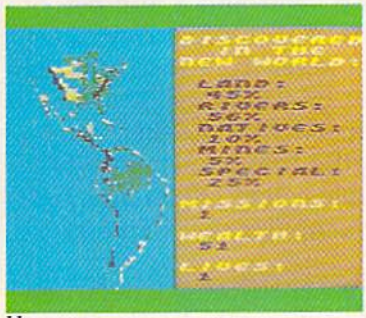


Animated natives surround you. They have no reason to trust you. The drum beat quickens.



Trading with the Aztecs is tricky. You could wind up with enough gold to build an empire. Or as soup.



Home again you view your maps, pat yourself on the back, and consider your place in history.

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```
90 NEXT
95 PRINT"{CLR} THE REST OF YOUR PROGRAM G
   OES HERE"
```

Try experimenting with your own messages, or print some graphics designs instead of words. You might also want to experiment with the TAB command to position your messages in different places on the screen.

REM: *The TAB command is used with the PRINT statement to position information on the screen or on your printer. You can tab from 1 to 255 spaces, but if you want to tab farther than that, you'll need to combine two TAB commands next to eaeh other like this:*

```
PRINTTAB(255)TAB(20)"HELLO"
```

The SPACE command, abbreviated SPC, works the same way except instead of tabbing over to a column position, the computer inserts the number of spaces shown in parentheses:

```
PRINTSPC(20)"20 SPACES"
```

Many programmers use the TAB and SPC commands as a shortcut to position characters on the screen. It's a lot easier and faster than trying to print a number of cursor-right and cursor-down commands, which is the other method of positioning.

A Peek At Variables

Variables are shortcut alphabetic codes which are used in BASIC programs to stand for numbers, words, or graphics characters. There are two types: numeric variables and string variables.

Numeric variables are used to represent numbers. The number can be a fraction (.5), a large number (99,589,870), or even a negative number (−15). The name of the variable can be a single letter, such as A, B, C, D; two letters, such as AB, QR, ZZ; or a letter and a number, such as H5, H6, J1. Note that the first character of a variable is always a letter from A–Z and the second has to be a letter or a number. You can use longer variable names if you like, but your computer looks only at the first two characters. So if you use one variable called HIGH and another called HIT, your computer will think they are the same (HI).

String variables represent words, letters, sentences, and graphics characters. Their names are similar to numeric variables (the first character is a letter, the second is a letter or number), but they are always followed by a dollar sign ($). Here are a few examples: A$, B$, C$, PQ$, HH$, F1$, F2$, G9$. String variables are easy to remember because the dollar sign looks like the letter S for "string."

There is also a special kind of numeric variable called an integer variable (A%, for example) which is limited to whole numbers. But we won't deal with that quite yet.

In BASIC programming, variables are substituted for words, phrases, and numbers because they are a faster, easier way to work with information. They're especially good in calculations and in the INPUT statements we'll see in a moment.

When you type RUN, all the variables are emptied out. Numeric variables are set to equal zero and string variables are set to a null (nothing) string. FOR–NEXT loops can put values into variables (as we've seen above). Or you can assign a value using the LET command. If you tell the computer LET A=5, you're saying from now on you want the variable A to hold the value 5. But LET is optional as you see here:

```
A=192:PRINT A                    (PRINTA is the
                                 same as PRINT192)
A=2:B=3:PRINT A+B                (PRINTA+B is the
                                 same as PRINT2+3)
R=1:PRINT R:R=R+1:PRINT R        (R=R+1 is the same
                                 as R=1+1)
C$="MESSAGE":PRINT C$            (PRINTC$ is the
                                 same as
                                 PRINT"MESSAGE")
```

The INPUT Command

The INPUT command can make your computer seem like it's intelligent. This command lets the computer ask questions and then respond to the answers you type in from the keyboard.

Here's an idea for a program to show how the INPUT command works:

1. Clear the screen
2. Print a prompt message (a question or instruction)
3. Type the INPUT command with a numeric or string variable
4. Process the information that was INPUT

Let's take a look at a short program that uses this format. Type NEW and press RETURN, then enter this program:

```
10 PRINT"{CLR}"
20 PRINT"PLEASE TYPE YOUR NAME AND PRESS
   {SPACE}RETURN"
30 INPUT N$
40 PRINT"{CLR} HELLO, "N$"...HOW ARE YOU?
   "
50 FOR T=1 TO 1500:NEXT
60 FOR X=1 TO 100:PRINTN$" IS A NICE NAME
   !":NEXT
```

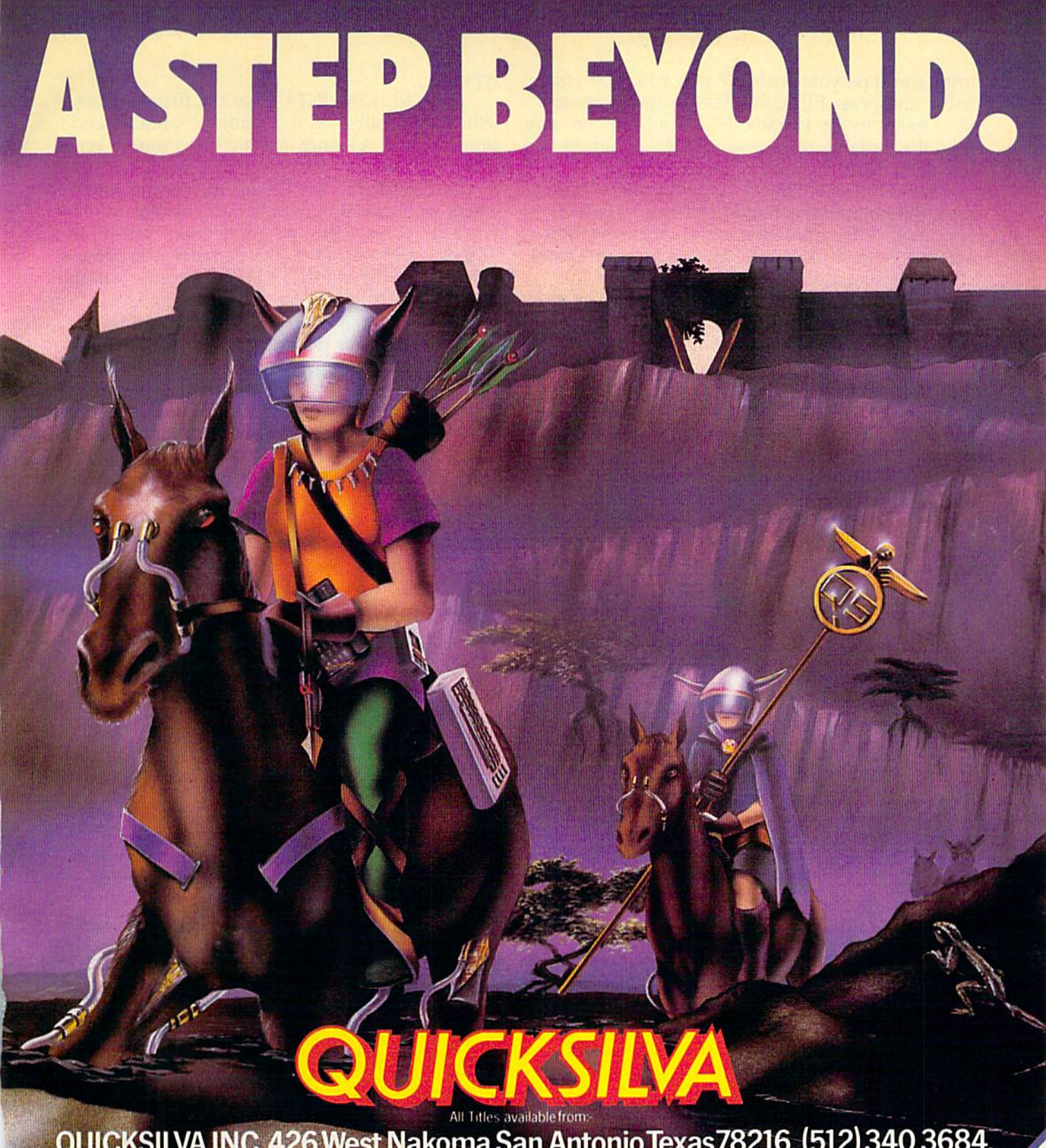
Type RUN and press RETURN. Follow the instructions on the screen and you'll see that you've just taught your computer to recognize your name. Here's a line-by-line explanation of how the program works:

Line 10 clears the screen.

Line 20 prints a message, asking the user to type his or her name.

Line 30 contains the INPUT command, which makes the computer automatically display a question mark (also called a prompt) and wait

A STEP BEYOND.



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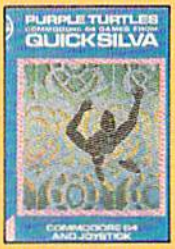

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until you type your name. When you type your name and press RETURN, the computer assigns your name to the variable N$. From now on, any time the variable N$ appears in this program, it's the same as using your name.

Line 40 clears the screen and prints a message containing your name. The word "HELLO" is printed *inside* quotation marks, then the variable N$ (which is already defined as your name) is *outside* quotation marks, and the rest of the message "...HOW ARE YOU?" is *inside* quotation marks. This is a little clumsy, but it's necessary because words are always printed inside quotation marks and variables are always used outside quotation marks.

Line 50 is a time delay loop which leaves the HOW ARE YOU message on the screen for a count of 1500.

Line 60 is a repeat-action loop, which prints another message, using your name, 100 times. Again, the N$ variable (your name) is outside quotation marks and the message itself is inside quotes.

The Magic Adding Machine

Let's try another example. This time we'll use numbers. We'll call this the "magic adding machine" because it lets you enter two numbers, then automatically gives you the answer. Because this example uses numbers instead of words, the INPUT variables will be *numeric variables* (no dollar sign) instead of string variables.

```
10 PRINT"{CLR}MAGIC ADDING MACHINE"
20 FOR X=1 TO 20:PRINT"D";:NEXT
25 FOR T=1 TO 1500:NEXT
30 PRINT"{CLR}ENTER TWO NUMBERS AND PRESS
   RETURN AFTER EACH NUMBER"
40 INPUT A
50 INPUT B
60 PRINT A"PLUS"B"EQUALS"A+B
```

Type RUN and press RETURN, then type in two numbers as requested and watch the magic adding machine work. By changing line 60 slightly, this can also be a magic multiplication, subtraction or division machine. Here's how it works:

Line 10 clears the screen and prints the opening title.

Line 20 is a repeat-action loop that draws a 20-column line across the screen under the title. Again, the semicolon makes the lines print across the screen (instead of vertically).

Line 25 is a time-delay loop that leaves the title on the screen a few seconds.

Line 30 clears the screen again and prints the prompt message, which tells you what to do—in this case, enter two numbers and press RETURN after each entry. (Prompt messages are very important. Don't assume that users will know they're supposed to press RETURN after typing.)

Line 40 is the INPUT for the first number, which we'll call A. A is a numeric variable and from now on A stands for the first number typed in by the user.

Line 50 is the INPUT for the second number, which we'll call B. B now stands for that number.

Line 60 uses the two numbers (A and B) in a PRINT statement. First, the variable A is printed, followed by the word "PLUS". Then the variable B is printed, followed by the word "EQUALS". Next, a calculation is printed (A+B) and the computer displays the answer. All of this information is included in the same PRINT statement, but the variables A and B and the calculation A+B are printed *outside* quotation marks.

Remember: Numbers, numeric variables and calculations are always printed outside the quotation marks, so if you want to mix words and numbers or calculations as we did in this example, you'll have to pop in and out of quotation marks.

If you want to try a different type of calculation, such as a Magic Multiply Machine, you'd change the title in line 10, and change line 60 to:

```
60 PRINT A"TIMES"B"EQUALS"A*B
```

The asterisk (*) is used to multiply in BASIC because the normal multiplication sign (×) is too easily confused with the letter X and the X-shaped graphics symbol.

The Magic Nonsense Story

Our last example is a silly little nonsense story. You make your own story by filling in the words and numbers. You can probably think of some longer examples to try, but here's a short program to get you started:

```
10 PRINT"{CLR}TYPE A NUMBER 1 TO 12 AND P
   RESS RETURN":INPUT N
20 PRINT"{CLR}ENTER A NOUN AND PRESS RETU
   RN":INPUT N$
30 PRINT"{CLR}ENTER A VERB AND PRESS RETU
   RN":INPUT V$
40 PRINT"{CLR}ENTER AN ADJECTIVE AND PRES
   S RETURN":INPUT A$
50 PRINT"{CLR}IT WAS"N"O'CLOCK AND THE "A
   $" "N$" WAS "V$"ING ALL OVER THE PLACE
   !"
```

Type RUN and press RETURN, then answer the questions and read the one-line "story."

The only tricky part in typing in the program is inserting spaces in the right places so the sentence looks right when it's printed. Note the spaces in line 50. They're important because they make the sentence read correctly.

Until next month, practice with these commands and techniques. You'll find there's a lot you can do with these four important BASIC commands.

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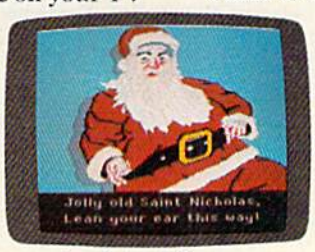

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Changes

The Honeywell Commodore Users Club has a new president and address. The club can be reached care of Art Witbeck, Honeywell Inc., Marine Systems Division, 5303 Shilshole Ave. NW, Seattle, WA 98107.

The Corpus Christi Commodores have a new phone number, (512) 852-4426. Bob McKelvy is the contact person.

University VIC-Commodore User Support System also has a new contact person, D. Wade, who can be reached at (216) 673-9261.

Correspondence for Computer Operators (C.O.M.P.) should be sent to Brian Pringle, president, at 7514 Puttgutt Road, Richmond, MI 48062. The phone number is (313) 329-2625.

The Silver State Commodore Users Group has a new address: P.O. Box 81075, Las Vegas, NV 89180.

The phone number for the WICOMICO C64 Club is (301) 749-3573.

Southern Maine 64 Users Group has a new address: Edward Moore, 9 Lynda Road, Portland, ME 04103.

Ark-La-Tex Commodore 64 Club has a new president and address. Correspondence should be sent in care of Bill Walker, 5515 Fairfax, Shreveport, LA 71108. The phone number is (318) 636-3611.

The National Science Clubs of America/ Commodore User Division is no longer in existence.

The new address and contact person for 64-B.U.G. (Boise User's Group), is Cheryl Ohnsman, 403 Thatcher St., Boise, ID 83702.

The Calgary Commodore Users Group has a new president and mailing address: Lloyd E. Norman, 810 Canfield Way SW, Calgary, Alberta, T2W 1K1, Canada.

The Commodore VIC-20 user group of Malden, MA, is now the Commodore Users Group of the Boston Area (CUGOBA). The Commodore 64 has been added as an area of interest. The club can be contacted through Patrick Rooney, 63 Whitman St., Malden, MA 02148.

The new address for the Bay Commodore Users' Group is P.O. Box 3187, Panama City, FL 32401.

The Fire 10 VIC User Group of Portland, OR, has reorganized and is no longer in existence. A new club in Portland is Rose City C-64 Club, Gary Getch, 5830 SW Kelly, Portland, OR 97201.

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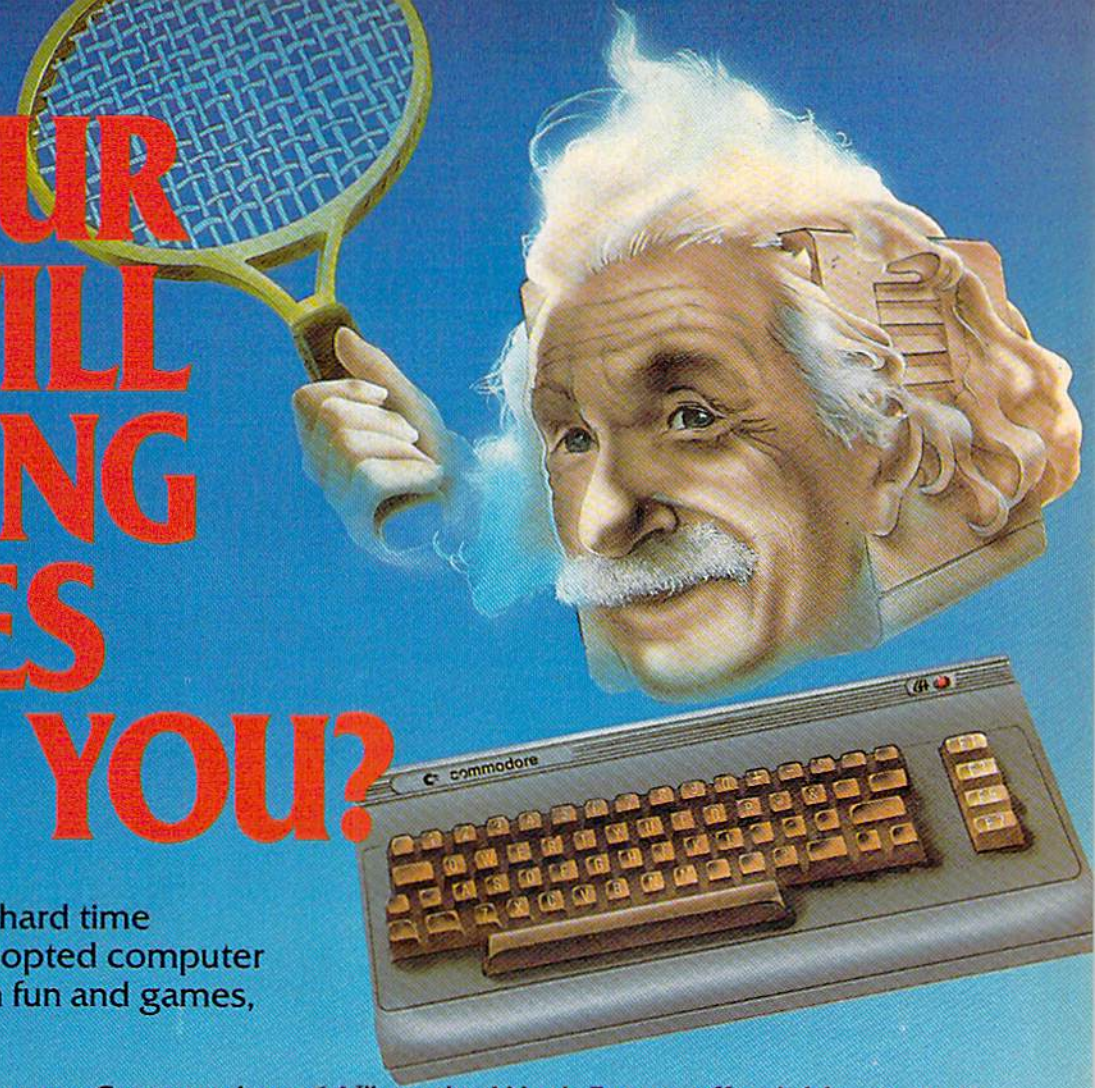

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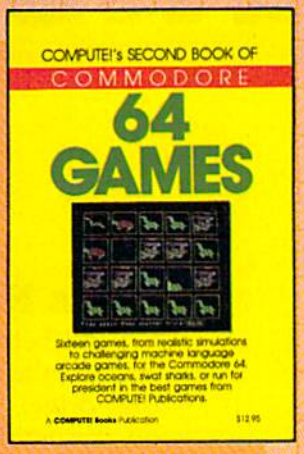

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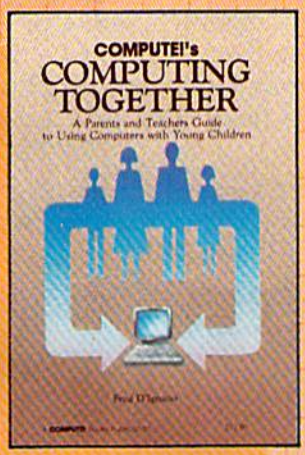

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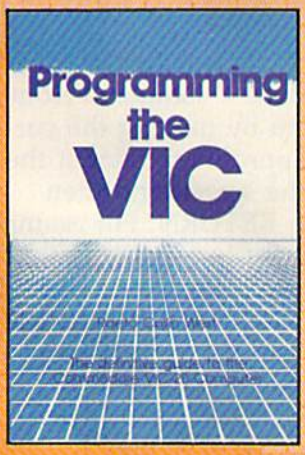

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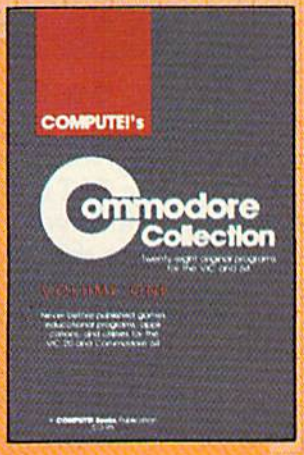

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REVIEWS

EasyDisk

Harvey B. Herman,
Associate Editor

The Commodore 1541 disk drive is a "smart" peripheral. It has its own microprocessor and the Disk Operating System (DOS) is permanently installed in the 1541's memory. Some computers require that a memory reducing program be loaded into the computer before normal disk operations are possible. Not so the 64/1541 combination. Internally, the 1541 contains a sophisticated and unique operating system which requires no additional programming effort from the 64. You can load or save BASIC programs, and interact with the disk drive as soon as the system is turned on.

As you might expect, there is a catch. The disk commands can be clumsy and non-intuitive. They are easy to forget if you haven't used them in a while. Years ago, when the PET disk first came out (with the same disk commands), I purchased an off-brand disk drive, rather than learning the following:

```
open 15,8,15
print#15,"rO:newname=old
name"
close 15
```

I am reminded of the times when I see beginners gnashing their teeth. It's not easy to explain the RENAME command (or any of the others) to someone who has recently taken their first computer out of the box.

All Is Not Lost

Several better ways are now available to interact with the disk drive. The Wedge, included on the demonstration disk that comes with a new 1541, is a good example. Using the Wedge considerably shortens the above rename sequence to:

```
>rO:newname=oldname
```

This program surely has been a boon to beginners. However, you still must remember the awkward syntax and be aware of the published tricks which allow the wedge to be saved on another disk.

SOS For DOS

EasyDisk, supplied on a protected disk (no backups allowed), is an inexpensive aid for befuddled disk beginners. I was in that category at one point, and I would have welcomed this program then. To quote the 11-page manual, "If you've ever had trouble remembering or using the Commodore 64's disk drive commands, then you'll be glad you have *EasyDisk*." I concur.

Here's what you see when you load and run *EasyDisk* with your 1541 disk drive:

```
EASYDISK BY D. POHORYLES (C) 1984
LOAD      VIEW      REPLACE   PRINT     SAVE
VERIFY    BACKUP    RENAME    DELETE    COMBINE
RESTART   VALIDAT   NEWDISK
Diskname                                Blocks free
                Directory Entries
F1: HELP      F3: NEXT      F5: PREV      F7: CANCEL
F2: BASIC     F4: SETUP     F6: OPTIONS
```

My favorite method for renaming is contained in BASIC 4.0, which was developed for the PET/CBM a number of years ago. It was designed to help the user with disk commands. The RENAME command is intuitive in this version of BASIC:

```
rename "oldname" to "newname"
```

A few companies are now offering BASIC 4.0 for the Commodore 64, but I wouldn't recommend this approach to everyone—the additional hardware is fairly expensive, and the interaction is still not really very friendly.

You choose a command from the menu by moving the cursor to the appropriate item at the top of the screen and then pressing RETURN. For example, if you want to rename a file on disk, put the cursor on the RENAME command. Press RETURN and move the cursor to the filename you want to change. Press RETURN and you will then be prompted for the new name. What could be simpler?

If you forget what a command does, simply press the f1 key for help or the f6 key for the sub-commands available. It really is easy.

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Commands And Options

There are a total of 24 commands, including options. Space does not permit a complete discussion of each one, but two will serve as examples—loading a BASIC program and printing a disk file.

Let's say you've already loaded *EasyDisk* and want to load a BASIC program. First, you would insert the disk with the desired program, type D and press RETURN. *EasyDisk* is now running and you are looking at its menu of commands. Now, press f4 to display an alphabetized directory from the inserted disk. (It is essential that you use the SETUP function, f4, whenever disks are changed.) Move the cursor to the LOAD command and press RETURN. Move the cursor to the program name which you wish to load and press RETURN. Exit to BASIC with f2. Your program is now ready to go. Re-entry to the *EasyDisk* menu can be done at any time by pressing D. Additional options are RELOCATE and APPEND, which allow you to load at another address and combine two BASIC programs, respectively.

If you have a Commodore 1525 (or compatible) printer, you can print program listings directly from a disk file. This procedure will not erase a BASIC program currently in memory. Enter the *EasyDisk* menu (again, with D). Press f4 if the listed program is on a new disk. Put the cursor on the PRINT command and press RETURN. Find the desired program in the directory and press RETURN. A listing will be sent to the printer. Options include FROM, UNTIL, and FROM-UNTIL, which print just a selected line range rather than the entire file. You may stop the printing at any time by pressing RUN/STOP.

EasyDisk is a fine program for beginners who have difficulty with disk commands. It simplifies the operation of the Commodore 1541 disk drive by presenting all the commands in an easy-to-follow menu. And it includes options not provided with the 1541 disk operating system.

On the negative side, a few minor points should be noted: The disk is copy-protected and only a 90-day warranty is

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But if you're really serious about programming, the *1541 FLASH!* is a gold mine. The manual will show you how to write software allowing data transfer to and from the 1541 disk drive at speeds up to *10 times* the normal.

For programs that usually load with a " *",8,1" command, just hit Shift/Run-Stop. A spreadsheet program like BUSICALC 3 then loads in about 25 seconds.

The *1541 FLASH!* even adds 21 extra commands for the Commodore 64 user. Some of these include editing, programming and loading commands, as well as "DOS Wedge" commands. You can ignore all these commands, though, and just enjoy the rapid disk operations.

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offered. Personally, I don't care to see so many leading zeros in listings. Also, there appears to be a minor bug in the VIEW command. Listings to the screen of lines greater than 80 characters can temporarily disturb the bottom list of function key options. However, this happens only rarely.

Overall, *EasyDisk* is a fine product, especially for those just getting started, and for those who find that the lack of "friendliness" is interfering with their enjoyment of the Commodore 64 and 1541 disk drive.

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MusiCalc

Arthur B. Hunkins

In SID (Sound Interface Device), the Commodore 64 has the most powerful built-in sound generating capability on the market today. With the advent of *MusiCalc*, SID now has a sophisticated, flexible, and open-ended software system that realizes the lion's share of its sound-generating capability. Together, SID and *MusiCalc* make an excellent performance package which will appeal not only to serious hobbyists, but also to some professionals. *MusiCalc* is far and away the best music performance software that I've seen for the 64.

All of which is not to say that *MusiCalc* is either accessible or easy to use. Quite the contrary; sophistication comes at the expense of approachability. Be prepared to spend *days* exploring the potential of this package. Above all, be sure to work through the three tutorials first. Otherwise, you may find yourself thoroughly lost and frustrated. It took me the first day to get any sound at all, even though I knew music was supposed to be playing. Once I got the volume turned up, it took me another day to get the music to stop—quite a different matter from turning down the level.

The problem is not with the documentation, which—though somewhat scattered—is very good and thorough. It's very important to follow the manual because nothing is obvious, and there are no HELP screens (except for *MusiCalc3*, which we'll look at later).

An Open-Ended System

MusiCalc is a disk-based system, and the *MusiCalc1* disk is the heart of the system (there's a *lot* of software on it). A color monitor is recommended, but not required, since many functions—such as mode and voice selection—involve color coding.

But the system is powerful because it's open-ended. It interfaces with a number of external supporting programs (furnished), as well as numerous data files, some included on the system disk, others available as extra-cost "templates" (African/Latin Rhythm and Rock/New Wave are current titles.) And, of course, you make and store your own "songs" (compositions) along with up to 32 instruments to play them.

In addition to the master and template disks, there is another disk in the series, one capable of stand-alone operation: *MusiCalc3—Keyboard Maker*. This program turns the 64's keyboard into a one-voice musical instrument. The various files on the disk simply program the four rows of keys as four octaves (or more) of various scales. Its limitations are the single voice, the single staccato tone quality (one "instrument"), and distressingly slow keyboard response (you always have to think in advance of the sound). If you play too fast, some notes are skipped altogether. *MusiCalc3*'s primary utility comes in furnishing scales to *MusiCalc1* in Keyboard mode.

It's difficult in a review of modest proportions to convey an adequate impression of the variety of *MusiCalc*'s features. Clearly it was designed for future expansion: *MusiCalc4* will offer software and a keyboard; and *MusiCalc2: Scorewriter*, has been announced. The latter will allow music entered into *MusiCalc1* to be viewed or printed in actual notation, and—perhaps more importantly—will overcome the rather severe length limitations of *MusiCalc1* (16 × 15 total event/beats, each voice's pitch or rest counting as a separate event). *MusiCalc2* will extend compositional length by "chaining" several scores together.

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A Programmable Synthesizer

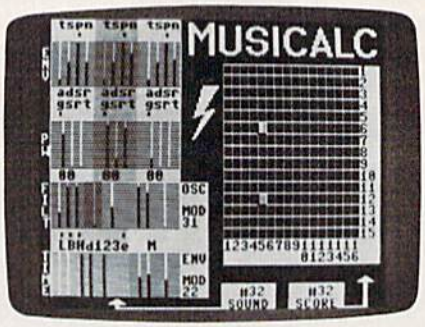
MusiCalc1 is a combination of *electronic synthesizer*—a SID chip parameter programmer—and *digital sequencer*, a timer/gate/pitch programmer. It is a three-voiced instrument that can be programmed to create a wide variety of electronic sounds, and that will play a sequence of these sounds with rhythmically independent voices according to pitch information stored in the sequencer (the "score"). The three synthesizer voices thus perform the three lines of a programmed composition ("song") contained in a sequencer file.

One of the more noteworthy features of *MusiCalc*—either a strength or weakness depending on intended use—is its "looping"; voices never actually stop, they just link, backward or forward, from one point to another. All links are absolute; no conditions are allowed. Thus, a set of notes cannot be played just twice, for example.

Nor can several voices play the same passage, exiting at different points to different destinations. For any "jumping off point" there is only one destination. Each voice has its own set of links, but the options basically boil down to infinite repetition or composing out each recurrence.

This linking method should appeal to arrangers who work with simple patterns, particularly those who want SID to be an accompaniment or backup for improvised solos. Other applications include commercials, background sound, and rhythmic music for dancing. It might also work well for composers of slow-moving, ostinato-based process music (manually varying parameters during performance, as described below). For more conventional composer/arrangers, the unconditional linking will seem more like a severe creative straightjacket.

It is possible, however, to program a composition to stop (or at least to seem to stop). The solution is to end each voice (they all loop independently) with a rest, and loop the rest back to itself. The only annoyance here is the clicking sound every time the sequence clock advances. (This click is soft, and is only noticeable when there is no sound.)



Visual Music

Each performance file contains 32 sets of instrument definitions and 32 scores; any score can be played by any of the 32 instrument combinations. The main *MusiCalc* display consists of a synthesizer panel with pots and switches on the left, and a 16 × 15 sequencer grid (for notes and rests) on the right. (See the accompanying photograph.) When a score/instrument file is called up, you can see the synthesizer settings and observe the voices and notes stepping through their position stages while the piece is playing.

During performance, there are a number of real-time options that can be exercised manually: You can change instrument definitions, tempo, volume; you can stop, start, or reset any and all voices (combinations allow the voices to get out of sync, which lead to fascinating interactions); you can also silence one voice, substituting (optionally recording) the keyboard as the third voice while the other two accompany.

Notes may be recorded a voice at a time, either by the keyboard in real time, or step by step (note by note); or—more like traditional notation—using a note name/octave, matrix system (a "score screen"). Furthermore, any of the three methods may be used later to edit a score.

As mentioned earlier, score capacity is presently limited. The maximum number of event/beats that can be stored per composition is 16 × 15 (240), where each event is a single pitch. Each event, or sequence step, is set to the lowest common rhythmic denominator. In other words, if you want to have a sixteenth note anywhere in your piece, the rhythmic beats (steps) must all be sixteenth notes, and all rhythms must be multiples of sixteenth notes (no triplets). Fast notes

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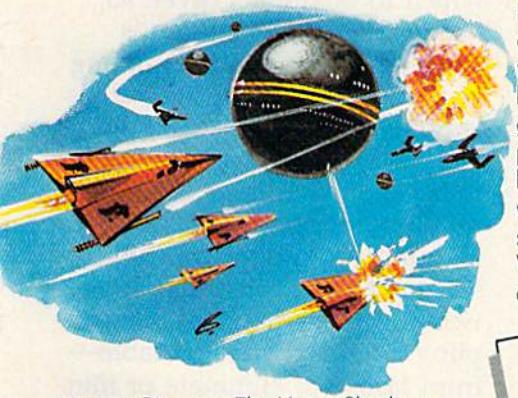

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mean short pieces.

The tempo, along with all aspects of sound—instrument definitions, volume levels—are preset, and cannot be programmed to change during performance. (As mentioned, parameters may be changed manually, though this method is both limited and cumbersome.) Only pitches can change, and these solely at the beginning of sequence steps. Rests, ties, and slurs are easily specified, but the latter two cannot be entered in Keyboard mode—a real limitation.

Keyboard note entry is facilitated by the variety of scales resident on the master disk (there are many more on *MusiCalc3*). (Different tuning, transposition, even "tune up to your group" options are also included.) As in *MusiCalc3*'s stand-alone mode, however, keystroke action is markedly slow, and notes must be considerably anticipated to register at the next sequence point.

When the keyboard is used to record a voice, slurs and ties must later be edited in using the notationally-oriented matrix method. Additionally, keyboard rests are ungainly in that they must be entered by hitting the space bar. (Notes don't stop when keys are released; they sound until the next key is pressed, and keep restriking at sequence steps.)

Indeed, there seems to be a general limitation whenever GATE OFF is involved. The only way to program a rest is to specify a pitch in the zero octave. Here, as with SPACE bar usage in Keyboard mode, the frequency apparently goes to zero, but there is no GATE OFF. This causes an immediate cessation of sound, without any Release. It is most unfortunate that whenever an instrument with a positive Sustain level is followed by a rest, the Release is truncated. (This qualifies as a "bug" which should be corrected.)

Ring modulation, sync, and test bit switching are all nicely implemented (Glissandos—slides—are not.) So also is a method for using the envelope and waveform values of Oscillator 3 for modulation purposes (filter, frequency, amplitude, etc.). (Audio output from Oscillator 3 can be switched on or off at will.) Each modulation type may control only one parameter. Implementation of modulation via the envelope shape is simple and straightforward; that using the waveform of Oscillator 3 is not.

There are several problems here. First, there is no flexible way to specify sub-audio "pitches" (frequencies) with which to modulate. (Even so, narrow, fairly fast vibrato is possible.) Second, the sampling of modulation waveform values is done at a high sub-audio rate of speed which is constant and non-variable; at large modulation amplitudes (modulation amounts are programmable) the steps are very noticeable. It would be very useful if the sampling rate itself were variable—from faster (to eliminate or minimize stepping) to very slow, for simulation of sub-audio sample/hold effects commonly available on analog synthesizers.

A Variety Of Good Features

Finally, here's a sampling of other notable features. Among the numerous supporting programs are those that show how to interface *MusiCalc* with user programs in BASIC, both while music is playing (*MusiCalc* is interrupt-driven) and while it is not. Complete disk management is possible from within *MusiCalc*. Instrument and score files can be merged and interchanged in various ways. There are random play, random linking routines. (A bonus, hidden in a supplementary score/instrument file, and unmentioned in the manual, is a selection of Christmas carols.) The

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package is attractively produced (disks come in handsomely designed jackets), and the glossary and appendices are very informative.

In short, this is a first-class, substantial music package that is thoughtfully conceived and packed with useful features. If you want to perform on or with the 64's SID chip, seriously consider *MusiCalc*. You couldn't make a wiser choice.

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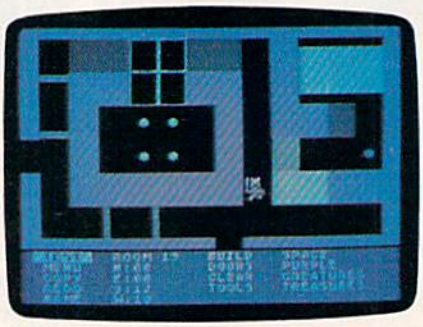
Adventure Creator

C. Regena

Adventure Creator for the Commodore 64, a cartridge-based program from Spinnaker, is a good introduction to what "adventure" programs are all about. We opened up the package one evening, and for the rest of the week I couldn't use the computer because my children were playing this game.

Adventure Creator comes in a colorful, vinyl case which holds the cartridge and a 26-page manual. You *must* read the instructions before you can play or design a game. The manual explains the flashing objects and barriers which drain your energy. Also, you need to read what the various "tools" are and how to use them with all the different types of creatures you may meet.

Dale Disharoon is the author of *Adventure Creator*, and this program, in my opinion, is a vast improvement over his earlier *Hey, Diddle, Diddle*. He also wrote the popular *Alphabet Zoo*. But Dale has some really innovative and fun ideas in *Adventure Creator*.



It's Your Choice

When the program starts, there is a main menu screen with the options AUTO, PLAY, SAVE, NEW, EDIT, and LOAD. Use a joystick to make your selection. AUTO gives you an adventure game to play. You then select B for Beginning or A for Advanced.

The computer then generates an adventure with a particular quest: Either find a certain treasure or gather a certain amount of wealth before the energy runs out. You use the joystick to move among the rooms and open treasure chests while avoiding energy-zapping traps and various creatures.

Each room is slightly different from the rest, so the game stays interesting. The program has good graphics and fun sound effects. There are distinctive sounds for opening treasure chests, going through flashing energy traps, shooting a ferret, meeting creatures, and ending the game.

The main feature of this program, however, is not just playing adventure games the computer generates, but creating your own adventure game. This is what classifies *Adventure Creator* as a "learning game." You may either EDIT an AUTOmatic game, or you can start fresh and design your own game. Once you create a masterpiece (or if you get interrupted and must continue later), you can easily save your game on tape or disk and load it later.

Designing Your Own Adventure

You'll probably want to start by sketching a map of rooms with numbers—from each room you may move north, south, east, and west—and you specify the room numbers of each connecting room. You can create up to 100 rooms. The program is designed well enough so that you cannot do things which are unacceptable to the program. For example, when you use doors, the computer keeps the doors on the walls where doors are acceptable, and there can be only one door per wall.

My favorite part was designing creatures. First, select CREATURES from the editing menu, and press the fire button. A Creature Lab screen appears

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with one creature separate from the other ten—that's the one you get to design. With the joystick, move among the other ten shapes to choose the lower body and legs, then after choosing, press the fire button. Your shape takes on the body and legs you chose. Next, follow this same process to choose a head.

Selections then appear on the left side of the screen. COLOR determines the color of your creature. When you get the color you want, move to the next part of the designing process. The next word says OFF, but as you press the fire button, the choice cycles through OFF, SLOW, NORMAL, and FAST. This determines the speed of your creature. The creature you are designing moves as you change the word so you can select the exact speed you want.

The next choice to make is from BOUNCE, RANDOM, GUIDED, CHASE, HIDE, or STAND, so you can dictate how your creature will move in the room. The last selection is POP, TALK, ASK, TRADE, GIVE, ACCEPT, or ZAP, which determines whether your creature will be a helpful one or an enemy when it meets you in the game. If you select TALK, you can then type in the message the creature will say. If you select ASK, you must type in the question, and then the acceptable answer.

Pressing the space bar ends the creation. RETURN shows the creature in a test room so you can try out the movement of your creature.

The "Funnest" Computer Game

The *Adventure Creator* package suggests it's for ages 8 to adult, but the advertisements recommend ages 12 to adult. My family felt the latter rating is more reasonable because of the complexity of the game (and because you have to be able to read and understand the instructions). However, once an older person designed a game, my eight-year-old enjoyed playing it. Younger children can also

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have fun playing the game and getting through the rooms looking for treasure, but they may not fully understand all the intricacies of the rooms and the tools.

My 13-year-old son said it was time-consuming but fun to build adventures. He enjoyed making his own creatures and changing the names of treasures. Although he favors arcade games, where he can put his initials in for top scores, he said *Adventure Creator* is the "funnest" computer game he has played.

Adventure Creator
Spinnaker Software
One Kendall Square
Cambridge, MA 02139
$39.95 (cartridge)

DROL And *Spare Change* For The Commodore 64

George Miller, Assistant Technical Editor

Brøderbund has recently released *DROL* and *Spare Change*, two new arcade-style games for the 64. Fast-paced and richly animated, these multilevel games will amuse arcade game players of any age group.

The Fantasy World Of *DROL*

A demonic witch doctor has lured a girl and a boy, their mother, and their pet lizard and crocodile into a strange and mesmerizing fantasy world. To rescue them, you must take on this world and its inhabitants, protected only by your trance-resistant, anti-gravity suit and an unlimited supply of reality pellets. From the onset your mission is fraught with peril. Scorpions, flying turkeys, and a magnet-tossing witch doctor—not to mention a honking vacuum cleaner—are among your numerous assailants.

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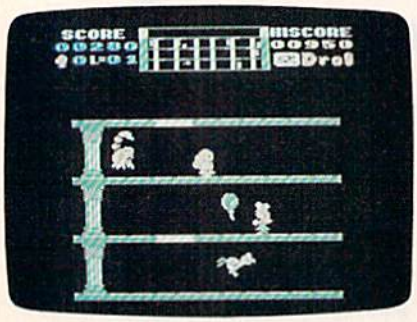
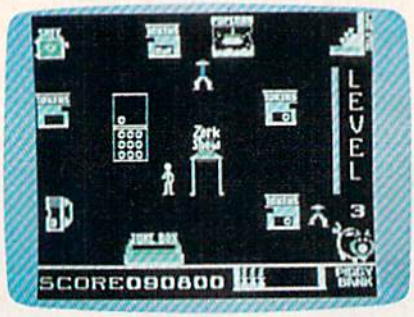


A scorpion is about to end this round of Drol.



The Zerks head for the popcorn machine in Spare Change.

DROL takes place in a four-tier maze, with trap doors allowing passage between tiers. Using your joystick, you roam up, down, and between the tiers, searching for the captive family and firing reality pellets at hallucinatory monsters. To help avoid ambush, you can refer to the radar scope at the top of the screen, which diagrams the movements of your bewitching adversaries.

There are seven levels of play. Within each level, you have three missions to accomplish. First, you must find the girl and her pet lizard (who wears a rocket pack). In the second mission, you must rescue the boy and the crocodile (also wearing a rocket pack). Then, if you've survived the onslaught of monsters and spells throughout these two missions, you'll find the mother tied up and anxiously awaiting rescue in the next level.

You begin with five lives. If you use up all of your lives before completing the three missions, you can start again at the first level. But if you successfully complete the three missions, you'll be rewarded with an extra life and a charming cartoon before advancing to the next level.

Because of the amount of graphics data in the program, there's a 30–45 second wait between missions and levels. This may dampen your momentum slightly; or it may provide a refreshing pause in a very fast-paced game.

Those who like intense action and unusual animation will find challenge and amusement in *DROL*.

Spare Change: The Frenzied Arcade

Another new release from Brøderbund is *Spare Change*, a nonviolent game that's especially fun for younger children. In this game, you are the harried owner of a video arcade, whose most popular characters—the Zerks—are threatening to retire. But, in order to leave, they must first pilfer five game tokens from your machines and place them in their piggy bank. So, as you scurry about collecting tokens from your machines and depositing them in your token bin, you must be on guard lest the Zerks snatch up any of your tokens.

The game begins with two tokens in each machine. Using either the joystick or the keyboard, you dash from machine to machine, collecting tokens and warding off Zerks. As the machines empty, you can refill them with money from the cash register; when the cash register runs low, you can fetch a money bag from the safe.

Since you alone are up against two Zerks—Ozzie and Zeke—it's not hard for them to outmaneuver you in their quest for tokens. But don't get discouraged: The Zerks are easily distracted. Play their favorite song on the jukebox, and they'll go over to it. Or put a token in the pay phone; when it rings, they'll race to answer it. Or they can easily be lured to the popcorn machine.

To adjust the level of difficulty in *Spare Change*, press f1. This calls up the "Zerk Control Panel," with which you can modify the Zerks' behavior to suit the player's skill. On the least demanding settings, my four year old can keep himself entertained for hours, something I've rarely seen on most other games. But other levels proved challenging enough for my ten year old and even myself.

Oddly, *Spare Change* is not a game which you can clearly

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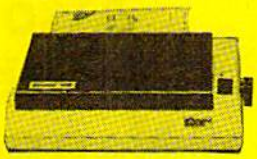

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win. If the Zerks get five tokens in their piggy bank, you lose; but if you get nine money bags in the bank, you simply move into a new round of play.

Excellent sound effects and delightful animation make *Spare Change* fascinating for younger children, while its strategy and variety can provide entertainment for others in the family as well.

DROL *and* Spare Change
Brøderbund Software
17 Paul Drive
San Rafael, CA 94903
$34.95 each, on disk

Also Worth Noting

Raid On Bungeling Bay

This addicting, yet frustrating, game pits your maneuverable attack helicopter against strong defenses. Your targets are six factories scattered across an archipelago. You must bomb the factories into rubble. But defending those factories are anti-aircraft guns, jet fighters, and even a battleship under construction. Convoys of small supply ships keep the factories producing, and jet bombers try to sink your base, an aircraft carrier. The pace is fast and frantic. There are so many things going on simultaneously that you almost need prescience to win.

Graphically, the game is excellent. Horizontal and vertical scrolling allow you to smoothly crisscross the island chain. The detail of the landscape below is extraordinary, complete with small buildings, roads, radar stations, ports, and drydocks. The missiles, fighters, bombers, tanks, ships, and even light gunfire flashes make this game a pleasure to watch.

But winning is difficult. Once you've destroyed one factory, jet fighters pursue your helicopter. After three factories are eliminated, heat-seeking missiles launch from the anti-aircraft positions and trail you for miles. And if the battleship sets sail, bound for your carrier, it's almost impossible to sink. Crashing your spinning helicopter onto its deck seems to be the best bet. *Raid on Bungeling Bay* is an arcade game in the classic sense—it's so hard to win that you end up playing it again and again, if only to say that you *can* beat the computer. If you win, you are treated to a front-page newspaper story describing

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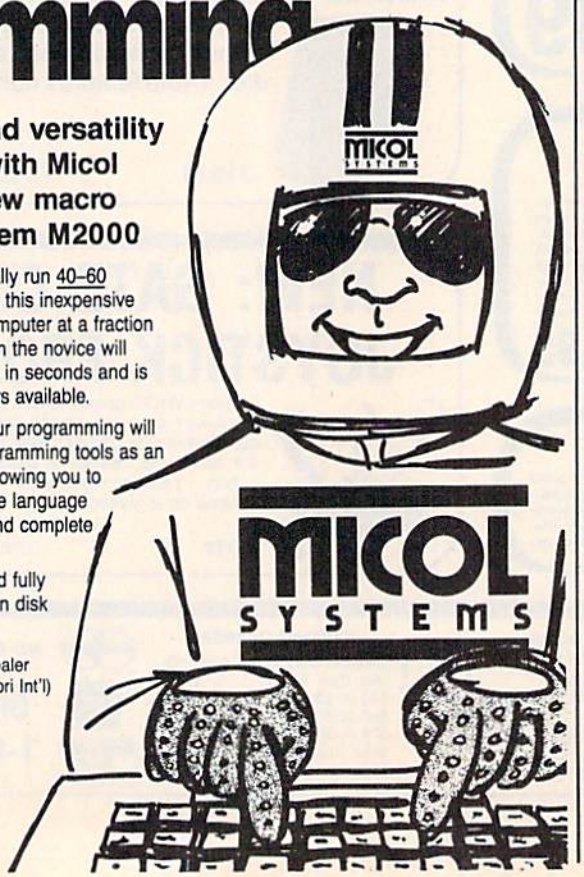

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Puzzle buffs will love this brain teaser from Epyx. It's a well-designed package from Ken Uston which offers eleven games, each with one to six levels. You can select any game and level or try to solve the MetaSequence, a master puzzle which requires that each game on every level be solved *in the right order*. The clues for each game are embedded within the game and the sequence itself is yet another puzzle. A joystick is required.

The games have a childlike appeal, although younger children may miss the nuances (but can enjoy the play). The animation is superb, as is the color. Sound and music, also well done, accompany each game. One of the more delightful—and puzzling—games we've seen.

Epyx
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Gumball

In this entertaining strategy-action game from Brøderbund, you're a worker in a gumball factory. As various gumballs are produced and dropped down a chute, you open and close valves (with the fire button) in an intricate network of pipes and chutes. You must guide each color-coded gumball into its color-corresponding bin. Bins are guided with a joystick.

If that isn't enough, you must also meet your day's quota before the 5:00 whistle or start over. There are five levels, each progressively more difficult with higher quotas and more gumballs and bins to manage.

There are also a lot of comical features such as the plant manager stalking out and dumping the gumballs out of your bin if you erroneously guide a gumball into the wrong one. At the end of each completed level, you are promoted (foreman, supervisor, etc.) and rewarded with an interim cartoon screen which depicts your character walking home to a bigger and better house.

Gumball is a lot of fun, and also has value as a teacher of logic and hand-eye coordination. For all ages.

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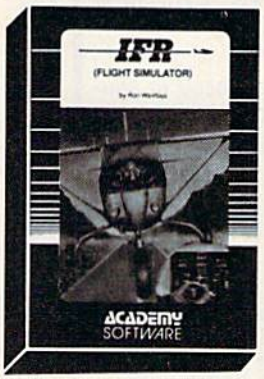

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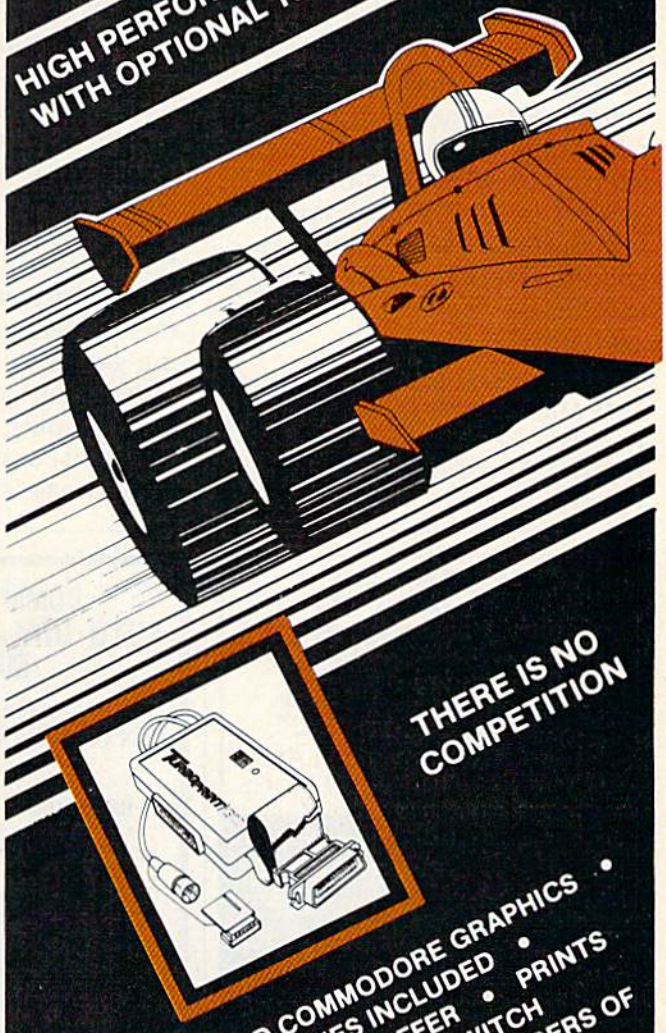

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Montezuma's Revenge has the best elements of such climbing games as *Jumpman* (rapid movement, good joystick control, jumping ability, a variety of obstacles) and of graphic adventure games (a complex maze of rooms, nine difficulty levels, special tools, and rewards to help you advance). The game *can* be frustrating in its difficulty, but there's extended play value in the challenges.

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Commodore has created a first-rate conversion of the popular Bally/Midway arcade game, *Satan's Hollow*, for the 64. Such translations from powerful

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arcade machines to home computers are never easy and often disappointing. But *Satan's Hollow* is quite good.

As you listen to the synthesized strains of Wagner's *Ride of the Valkyrie*, you attempt to build a bridge over a river of fire in order to reach the bonus round and fight Satan himself. Attacking you are waves of demons and other creatures—including a "Devil's Head," which shoots broad streams of fire. The background becomes progressively darker as the game continues and the demons are more difficult to see when night falls. The action is limited to two screens, and consists of rapid firing and quick dodging while you carry parts of the bridge from one side of the screen to the other.

If you enjoy fast-action "alien-invader" arcade games, you'll appreciate *Satan's Hollow*. One word of warning: On some monitors we found the color combinations made it difficult to see the main character on a portion of the bonus round's screen; not enough of a problem to ruin the game, but a limiting factor.

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MACHINE LANGUAGE FOR BEGINNERS

Richard Mansfield, Senior Editor

Getting Started

If you've never programmed in machine language (ML) because you thought it was too complicated, here's your chance. There are some new concepts and techniques to study. They seem strange at first, but they're essentially just new words and punctuation to instruct the computer to accomplish the same things you've been doing all along in BASIC. Loops are still loops. Branching is still branching.

Programming, ultimately, is programming—whatever the language. Give machine language a try; it's easier than you think and runs astonishingly fast.

Your Main Tool

This month we'll provide your main tool, an *assembler* program, and we'll use it to write a simple VIC and 64 program which lets you view some interesting places in your computer's memory. (You'll need at least 8K memory expansion on a VIC.) Ironically, this assembler (the tool you use to create ML) is written in BASIC. However, for beginners, it is a good learning tool. You can write short routines and test them on the spot.

If you type in the assembler (Program 1) on a Commodore 64, be sure to use standard Commodore abbreviations in line 244 so it will fit; this isn't a problem on the VIC with its longer program lines. Use ? for PRINT, P SHIFT-O for POKE (but don't abbreviate the word POKE where it appears within quotes), and G SHIFT-O for GOTO. This is the only line you need to worry about.

Machine language programs are written in very small steps. You enter a single command at a time, usually followed by a number. This number represents the address affected by the command.

For example, the purpose of the first few lines in the ML programs below is to fill color memory. On the 64, we want to POKE the number 7 into the entire color memory; on the VIC we want to POKE a 5. So we first "load" a 7 or 5 into the Accumulator (a temporary storage area in the 6502/6510 chip) by using the command LDA #7 or LDA #5. This sets things up so that we can keep POKEing over and over without having to reload the original number. It's like a POKE submachine gun.

VIC Memory Display Routine

```
830 LDA #5
832 LDY #0
834 STA 37888Y
837 STA 38144Y
840 DEY
841 BNE 834
843 LDX #0
845 LDA 0X
847 STA 4096X
850 LDA 512X
853 STA 4352X
856 DEX
857 JMP 845
```

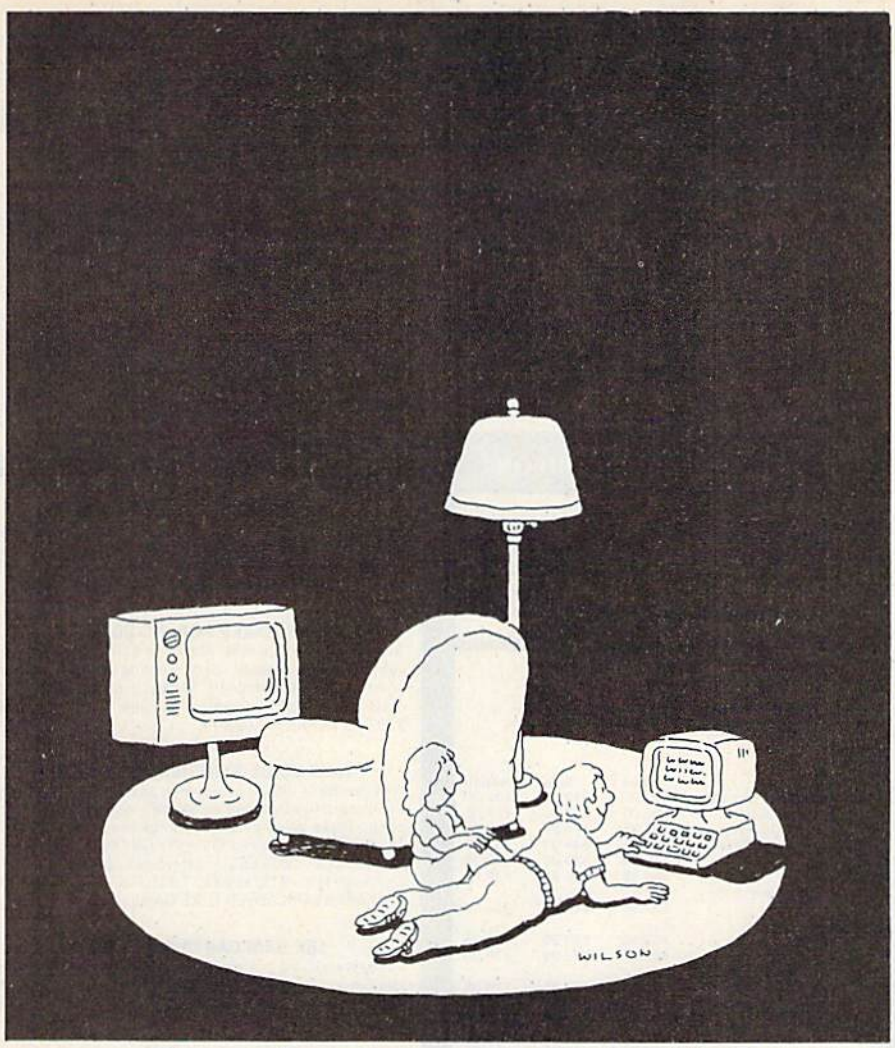
64 Memory Display Routine

```
830 LDA #7
832 LDY #0
834 STA 55296Y
837 STA 55552Y
840 STA 55808Y
843 STA 56064Y
846 DEY
847 BNE 834
849 LDX #0
851 LDA 0X
853 STA 1024X
856 LDA 512X
859 STA 1280X
862 LDA 53248X
865 STA 1536X
868 LDA 56320X
871 STA 1792X
874 DEX
875 JMP 851
```

Addressing Modes

The # symbol is an *addressing mode*. The 6502 chip inside our computers understands a variety of addressing modes. When you precede a number with the # symbol you are telling the chip toload the actual number 5 rather than whatever happens to be in *address* 5. LDA 5 would, by contrast, look at your RAM memory and put whatever it found in this byte into the Accumulator.

Let's use the VIC disassembly, as our example as we learn a few ML techniques. (A *disassembly* is an ML program listing. You can see a disassembly by using a disassembler program.) After putting the 5 into the Accumulator, we



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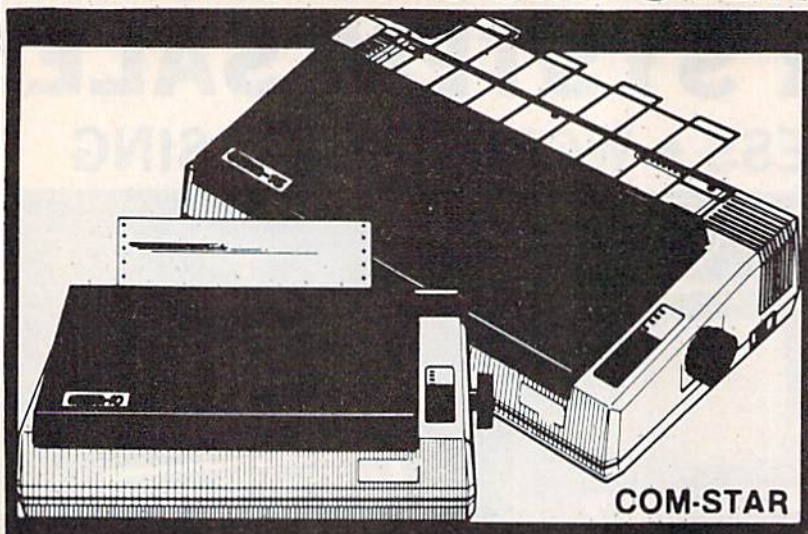

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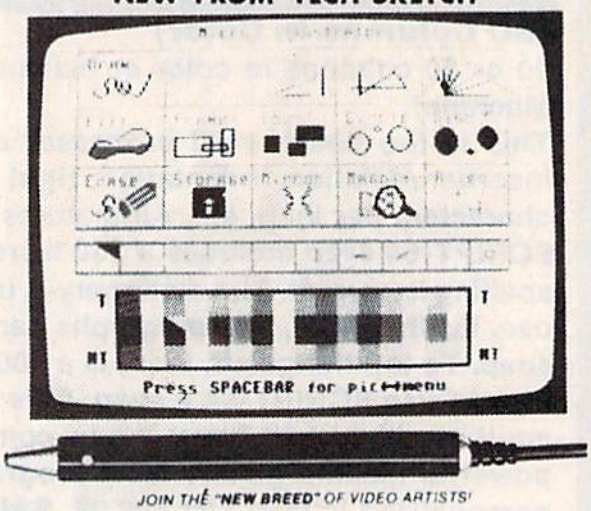

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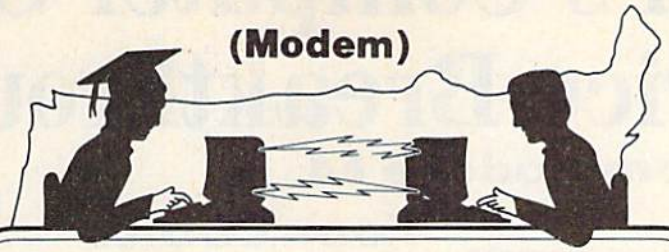

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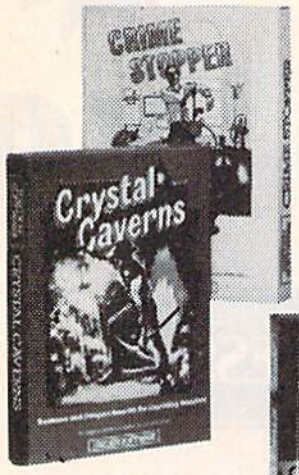

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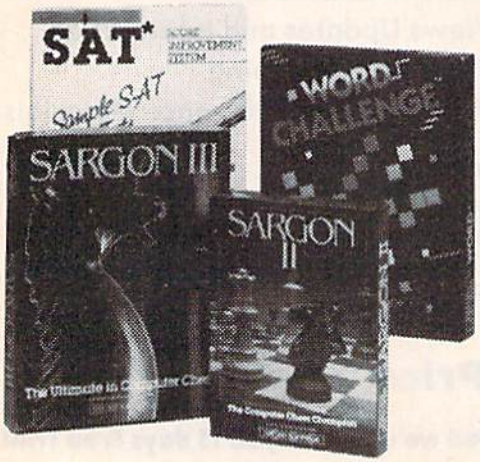

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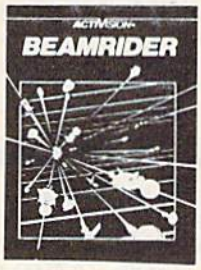

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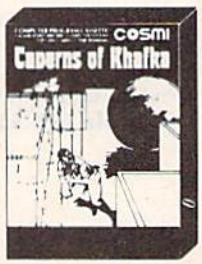

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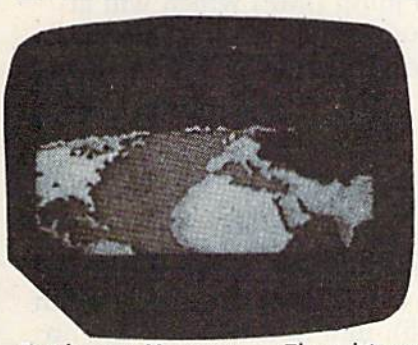
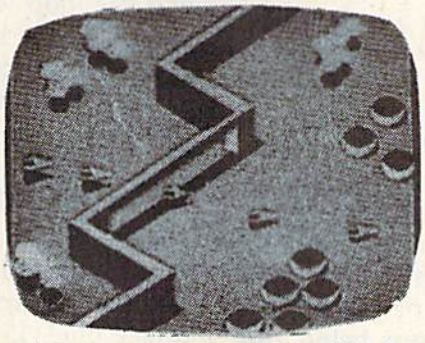
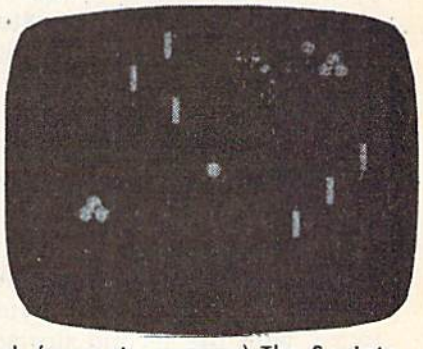

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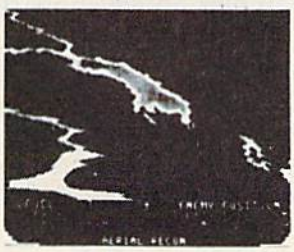
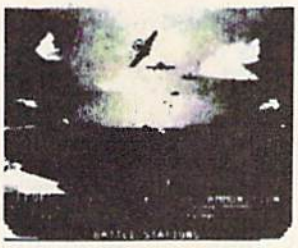
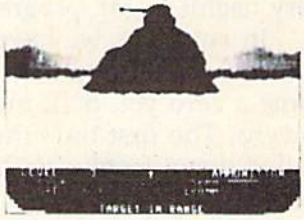

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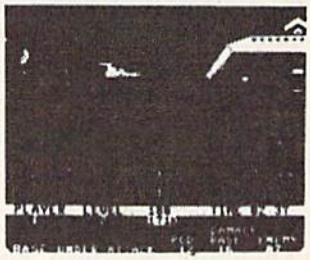

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then put a zero into the Y register. The Y register is like the Accumulator, but it is usually used the way FOR I = 1 TO 200 would be in BASIC—it counts events and can also act as an offset for storage. Notice line 834. We are storing the 5 in the Accumulator at address 37888 (the start of color memory). However, since we have attached the Y to the end of this number, it means that we are using another special addressing mode. This mode will store what's in the Accumulator into the number given (37888 in this example) *plus* whatever number is in the Y register. At this point, zero is in the Y register, so a 5 is POKEd into address 37888 + 0. This is how Y can be used as an offset.

Likewise, we also POKE the 5 into 38144 which is halfway up the color memory. In effect, we are going to fill color memory in two chunks, two stages. That's because the Y register can only count up as high as 255 and then it resets itself to zero. To fill an area like the color memory, which is larger than 256 bytes, we need to store twice, with the second storage address being 256 bytes higher than the first (see lines 834 and 837).

How Registers Reset Themselves

At this point, the Y register is decremented with the DEY command. It's the same as saying, in BASIC, Y = Y − 1, except that in ML a register cannot go below zero. Instead, it clicks down to 255 when you take it below zero. If you lower it through zero, it looks like this: 4,3,2,1,0,255,254, etc. (This also happens at the other end. If you add 1 to the Y register when it is holding 255, it will become a zero: 254,255,0,1,2, etc. The fact that the registers reset themselves like this is very useful in ML programming.)

In any case, we lower the Y register with the DEY command and then test to see if it has become a zero yet. BNE means Branch if Not Equal to zero. The first time through this loop, Y was pulled down from 0 to 255 so the computer is forced to branch back to line 834. 255 is not zero. This time around, the POKEs will go into different addresses within color memory than they did the first time. Now Y (added to the 37888 or 38144) will produce a different target address for the POKE. By continuing through this loop until Y has been decremented to zero, we manage to fill the entire color memory with the number 5.

After going through the loop 256 times in this way, Y has finally counted down to zero and so we won't, for once, be forced to branch from line 841. Instead, we fall through to line 843 which puts a 0 into the X register, which acts much like the Y register. In the next loop, we're going to use the X register as an offset.

Making An Endless Loop

Now that color memory is set up, we create a second loop which is functionally identical to the first except that this time our purpose is to move sections of the computer's memory to the screen. We're going to send the 256 bytes which start at address 0 and another 256 bytes which start at address 512. This time we'll use a +X addressing mode to load the Accumulator as well as store the Accumulator (LDA and STA). Rather than use a branch instruction, however, this time we end the loop with a jump (JMP) which will always send us back up to the start of the loop. This endless loop will continually display memory on screen until you press RUN/STOP and RESTORE.

Using The Assembler

When you are using this assembler (Program 1) you should follow the addressing mode conventions which appear on screen whenever you run it (see lines 150–185). In a nutshell, you use no commas or $ symbols. Not only is this easier to type, but also it allows the assembler to use a simple INPUT statement to receive your program lines. Many 6502 assemblers require that you separate numbers from symbols with a comma, as in: STA 37888,Y. They also require that you use hexadecimal numbers which are preceded by the $ symbol. If you should want to use hexadecimal with this assembler, just change line 10 so that H = 1. If you don't know what hexadecimal is, it's just as well. That's a subject for a future lesson. You can program in ML without it anyway.

The disassembly examples above show the format for entering ML commands into the assembler. To make all this clear, let's type in and run the example ML program.

1. Load the assembler program (Program 1) and make sure line 10 says H = 0 because we'll be typing in ordinary decimal numbers, just as they appear in the disassembly listing.

2. Run the assembler. After reminding you of its addressing conventions, it will ask you for the starting address. Answer 830 and press RETURN. That's the address where the ML program will be assembled in your computer's RAM memory. It's in the cassette buffer and will be safe there during assembly. When we've finished, you can type SYS 830 and see the results of our efforts.

3. Now, if your assembler is working correctly, it will clear the screen and list the 830 address with a question mark. It's waiting for your first ML instruction. If you have a VIC, type in the first instruction in the VIC disassembly listing. (If you use a 64, type in the instructions

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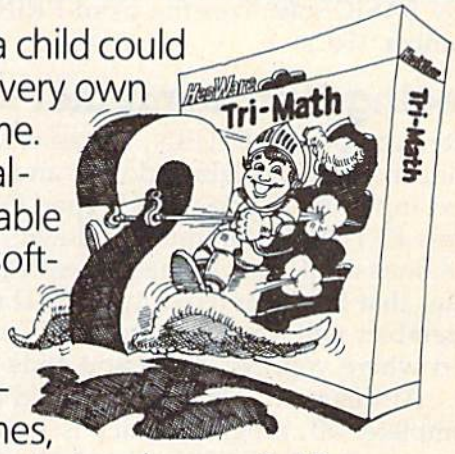

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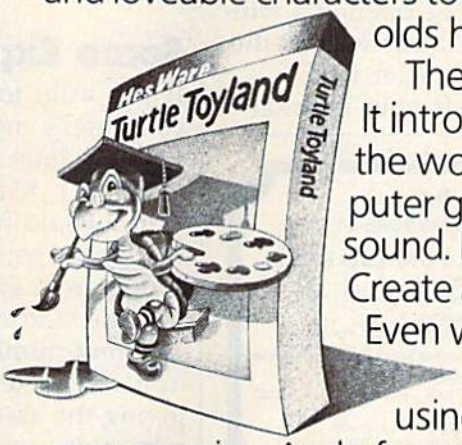

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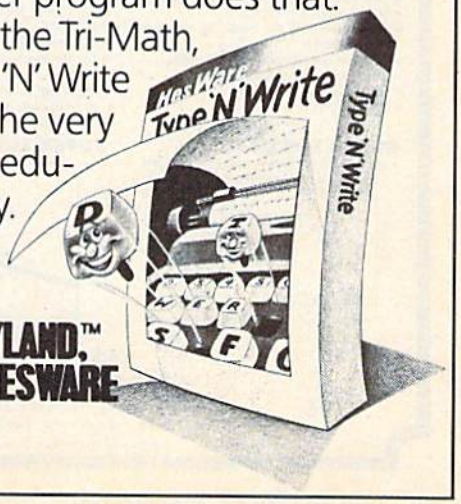

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For the Commodore 64

from the 64 disassembly instead. Otherwise, follow the same process.) Type: LDA #5 and press RETURN. The assembler will pause briefly and then store two numbers (169 and 5) into memory as well as displaying them on screen. (169 is the computer's code for LDA # and 5 is, of course, 5. The purpose of an assembler is to take the commands like LDA which are easy for us to remember and turn them into numbers like 169 which the computer can obey. It's something like the way BASIC tokenizes the word PRINT into the number 153.)

Seeing Your Computer's Clock

After you press RETURN, the assembler will print the next available address and await your next input. Now you would type LDY #0 and press RETURN. Continue on down, typing in all the lines until you've finished with JMP 845. After that line is entered, type END and the assembler will return you to BASIC mode and report where your ML starts and ends in memory.

At this point, you have created a tiny, but complete, ML program which is waiting for you to test it. Just SYS 830 and you should see a screenful of odd characters. We've opened a window to the first 256 bytes in RAM as well as the BASIC keyboard buffer. The character which seems to be constantly rotating is your internal clock. And if you type on the keyboard, you can see it coming into the keyboard buffer (up to a maximum of ten entries). To exit the program, press RUN/STOP and RESTORE. For a different view, type ?CHR$(14) to set lowercase mode and SYS 830 again. Try holding down the SHIFT, Commodore, and function keys to see the effects. Since there is more room on the 64 screen, we have opened two extra windows, to show the video and interface chips, in the bottom half of the 64 screen.

Now, break out of the ML program again with RUN/STOP–RESTORE and type LIST. There's the assembler program, still in memory, unaffected by all the excitement. Let's assume you want a different color. Just type RUN. When the assembler fires up, give it 830 as your starting address again and then enter:

```
LDA #8
```

and press RETURN. Now type END to stop assembling. You have just caused the assembler to POKE over the previous LDA #5. The rest of the ML program remains the same. Try it. SYS 830 to see the effect.

Some Experiments To Try

If you want to observe different parts of your computer's memory, fiddle with the addresses given in lines 845 and 851 of the disassembly (lines 851, 856, 862, and 868 in the 64 version). What would happen if you had the contents of the screen sent *to* the screen? How about sending things from an address just slightly above or below the start of screen memory? What if you put different numbers into the Y registers with LDY? You can make any adjustments you like by just giving the assembler the starting address of where you want to write over something and typing END when you're finished.

Programs 2 and 3 are ordinary BASIC. They contain, in DATA statements, the VIC and 64 versions of this same program. If you have problems assembling, you could just type the loaders in, run, and then SYS 830 to see the same effects. Remember that the assembler changed our LDA #5 into 169 5 which it then POKEd into RAM memory? Notice the first two numbers in the DATA statements of Program 2. This should clarify how BASIC loader programs can create ML programs. A BASIC loader just holds a prewritten, freeze-dried ML program in DATA which it then POKEs into some spare RAM memory. There is no particular advantage to a BASIC loader except that on the VIC and 64, you can more easily save and load such programs to or from tape or disk.

See program listing on page 197.

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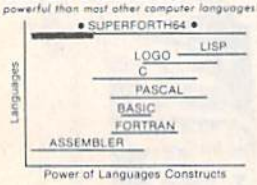

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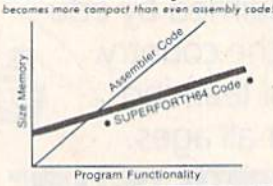

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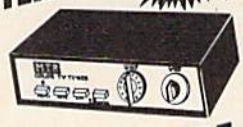

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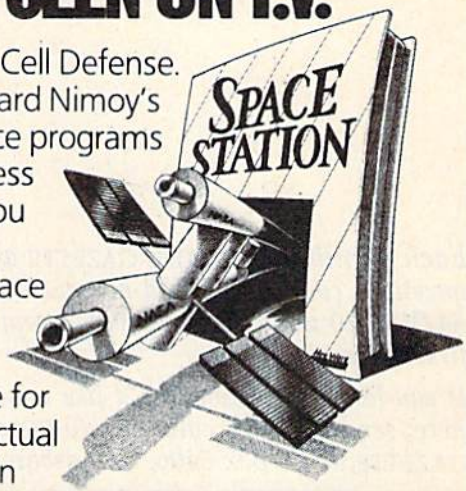

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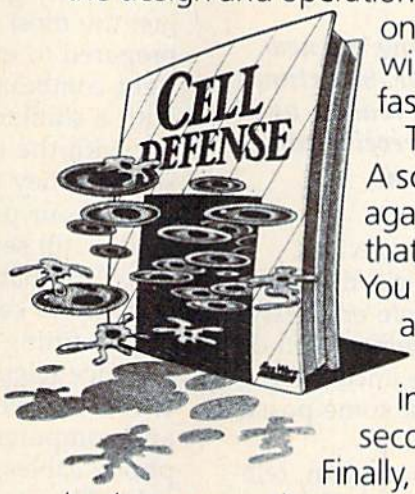

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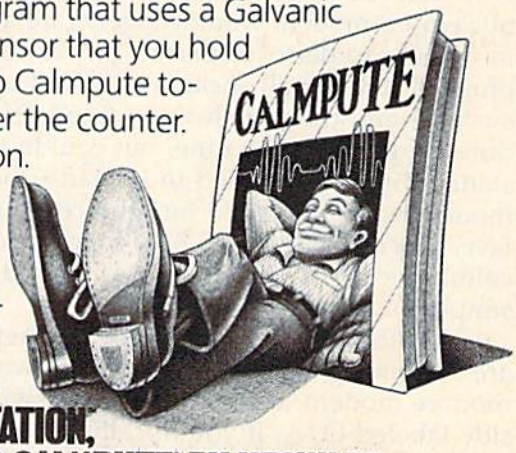

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Q A

Tom R. Halfhill
Staff Editor

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

If you have a question you'd like to see answered here, send it to this column, c/o COMPUTE!'s GAZETTE, *P. O. Box 5406, Greensboro, NC 27403.*

Q. ***I've had some trouble getting my new modem to work with my computer. Sometimes the phone link disconnects for no reason, and other times everything I send or receive comes across as garbage. What's going on?***

A. Modems can be very finicky devices. Some people are lucky enough to get them working right away, while others struggle endlessly with all kinds of mysterious problems. We'll discuss some of the difficulties we've encountered in our own experience and suggest some possible solutions.

To begin with, make sure the modem, telephone line, and computer are all hooked up properly. Even if you're positive everything is correct, review the instructions and check again. One time we spent ten minutes trying to figure out why a modem wouldn't generate a carrier tone, only to discover that its power cord was plugged into a wall socket controlled by a light switch—and the switch was turned off. Another time we got a carrier tone, but couldn't understand why a file refused to upload—the sending modem wasn't plugged into the computer interface. You'd be surprised how many telecommunications troubles can be traced to such simple mistakes.

Another thing to watch for is whether you are *originating* or *answering*. If you own a Commodore modem, there should be a switch on the side labeled O/A. If you're calling a commercial bulletin board, you're originating the call and the switch should be set to O. If you're calling a friend, one of you will be originating, the other answering.

Be certain the terminal program you're using is compatible with the modem. Then be sure you've adjusted the program correctly for the computer and modem at the *other end* of the phone line. Some computers require different parameters for parity, stop bits, word length, and so on. Any good terminal program lets you adjust the most important of these parameters. Be prepared to experiment for awhile to find just the right combination. If possible, find someone else with a similar setup who's already communicating with the remote computer and find out what settings they use.

If your program is adjusted properly and you're still sending or receiving garbage characters, it probably means there is "noise" on the line. Noise can be caused by anything from poorly fitting cables to the static of a weak long-distance telephone connection. Keep extension cables between the telephone socket, modem, and computer as short as possible. Keep the phone cables away from power transformers, color TV sets and monitors, and other devices emitting strong magnetic fields. If you hear static on the phone line when you hold a receiver to your ear, the connection may be too poor for reliable telecommunications.

If you're using an acoustic modem instead of a direct-connect, use a phone with a standard handset that fits tightly inside the rubber cups. Don't make any loud noises near an acoustic modem. Remember, modems transmit information over phone lines by sending audible tones. If either modem "hears" any extraneous sounds, it might interpret them as tones and attempt to translate them into characters. One time we were puzzled by occasional garbage characters in a file we were downloading from a distant computer. When we turned off the music playing in the same room, the garbage disappeared.

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possibility, you can have the lines checked by your local phone company. However, phone companies aren't always very cooperative in these cases. They don't certify standard residential lines for telecommunications purposes, so they may not feel obligated to check and repair your lines if they work for regular voice transmissions. Also, if they check your lines and find that something else is to blame, they might charge you for the service call.

If you've succeeded in establishing a link with the remote computer, but the connection is occasionally disrupted, two common problems are party lines and call-waiting services. You should lease a private line if you'll be doing much telecomputing. Otherwise your links will be interrupted everytime someone else on the party line picks up the phone to make a call. The same goes for call-waiting services: The audible click which is your signal that another caller is trying to reach you will confuse the modem and disrupt the link.

Sometimes a modem problem will be so mysterious that you'll never solve it. This happened to one of our editors. His new direct-connect modem on his home system refused to receive anything but garbage. Step by step we eliminated the possibilities: Everything was hooked up properly; the software was compatible; the communications parameters were correct; and the modem even worked perfectly with the same computer and software on other people's phones around town. Therefore, it seemed that the phone lines were to blame. But when the local phone company finally agreed to check the lines, it declared nothing was wrong.

Then we discovered that another editor's old acoustic modem worked fine on the stubborn system. It didn't make sense—both modems were transmitting at 300 baud and were hooked up exactly the same way, except the new one was direct-connect and the old one was acoustic-coupled. Nobody could explain why one worked and the other didn't. Our final "solution": Since the direct-connect modem worked fine on the other editor's system, they simply traded modems.

Another acquaintance with similar problems discovered that his 64 and modem worked on the telephone in the living room, but did not work on the extension in the family room (where the computer was originally set up). Since one phone line was apparently cleaner, the simple solution was to move the computer.

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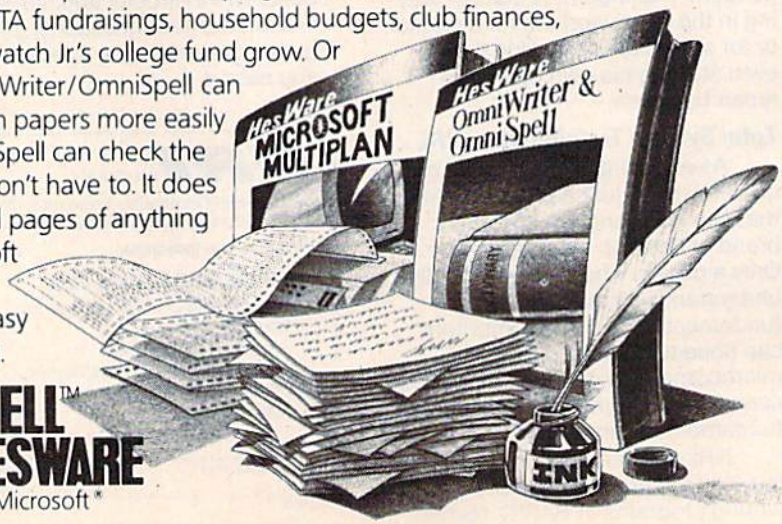

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SLOWPOKE

Daniel R. Widyono

This very short machine language program, from a twelve-year-old author and programmer, allows you to control the speed of the PRINT command. We've added some suggestions for using this unique routine. For the VIC and 64.

When a Commodore 64 or VIC-20 is printing something or listing a program, you can slow it down by pressing the CTRL key. You have a choice of two speeds, regular and slow. If you've ever used an Apple II, you probably know that it gives you a wider choice; there are 256 printing speeds.

Can a similar feature be added to the VIC or 64? You could use a BASIC subroutine, although it would be rather complicated. You would have to define a string, do a FOR-NEXT loop for the length of the string, use MID$ to pull out a character, print the character, use another FOR-NEXT loop for the delay, then continue until the message is done. The subroutine would work only as part of a program. You'd still have to press CTRL to slow down program listings.

A Better Way

There's a short, simple, and effective machine language alternative to the BASIC subroutine.

Enter and save the following program:

```
10 CK=0:POKE251,0
20 FORJ=679TO703:READA:CK=CK+A:POKEJ,A:NE
   XT
25 IFCK<>3615THENPRINT"CHECK DATA STATEME
   NTS":END
30 DATA72,138,72,152,72,8,166,251,240,8,1
   60,255,136,208,253,202,208,248,40
40 DATA104,168,104,170,104,76
50 IFPEEK(807)<>2THENPOKE704,PEEK(806):PO
   KE705,PEEK(807)
60 POKE806,167:POKE807,2
```

Now run the program and type LIST. It lists as you would expect. Type:

```
POKE 251,255:LIST
```

and you'll see a very slow listing. The program takes more than a minute to list (compared to less than a second at the regular speed). POKE a 0 into 251 and the computer returns to normal.

You now have 256 different printing speeds, from zero, the fastest, to 255, the slowest. There's no need to use a BASIC subroutine or to SYS. Just POKE the speed you want into memory location 251. It works within programs and also in immediate mode. It even slows down error messages and the READY prompt. If you use a printer while "Slowpoke" is on, it will wait in between lines (but not between characters). You'll notice, however, that it does not affect your typing; the computer still reads the keyboard at the regular speed.

Pressing RUN/STOP-RESTORE disables Slowpoke. To get it back, you have to either RUN the loader program again or type:

```
POKE 806,167: POKE 807,2
```

(If you use these POKEs, make sure you put them on the same line, separated by a colon.)

How It Works

I was looking through a memory map and discovered a *vector* at 806–807 which points to the character out (CHROUT) routine in the operating system. The Kernal CHROUT vector (in ROM, which cannot be POKEd) uses this vector (in RAM, where it can be changed) to find the routine which sends a character out to screen memory, to a printer, or to a tape or disk file.

When the computer gets an instruction to PRINT, it checks the Kernal vector, goes to this vector, and finally ends up at the instructions for printing. The computer has to look up the address for every character it prints, even if the characters are part of a long string. The address is stored in the usual low byte/high byte format.

Vectors are like highway signs pointing the way to a destination (in this case, the character out routine). By changing the numbers in memory locations 806 and 807, we can change the route, adding a slight detour, a machine language delay loop. When the computer tries to PRINT or LIST, the vector at 806–807 sends it to the delay loop, which is followed immediately by a jump to the usual CHROUT part of the operating system.

Since machine language is so fast, we need two delay loops, one inside the other. First, the X register is loaded from location 251. If 251 holds a zero, the rest of the loop is skipped (using BEQ, Branch if EQual to zero). Then the Y register is loaded with the number 255. Y is decremented (DEY) until it becomes zero. Next, X is decremented and a BNE instruction (Branch

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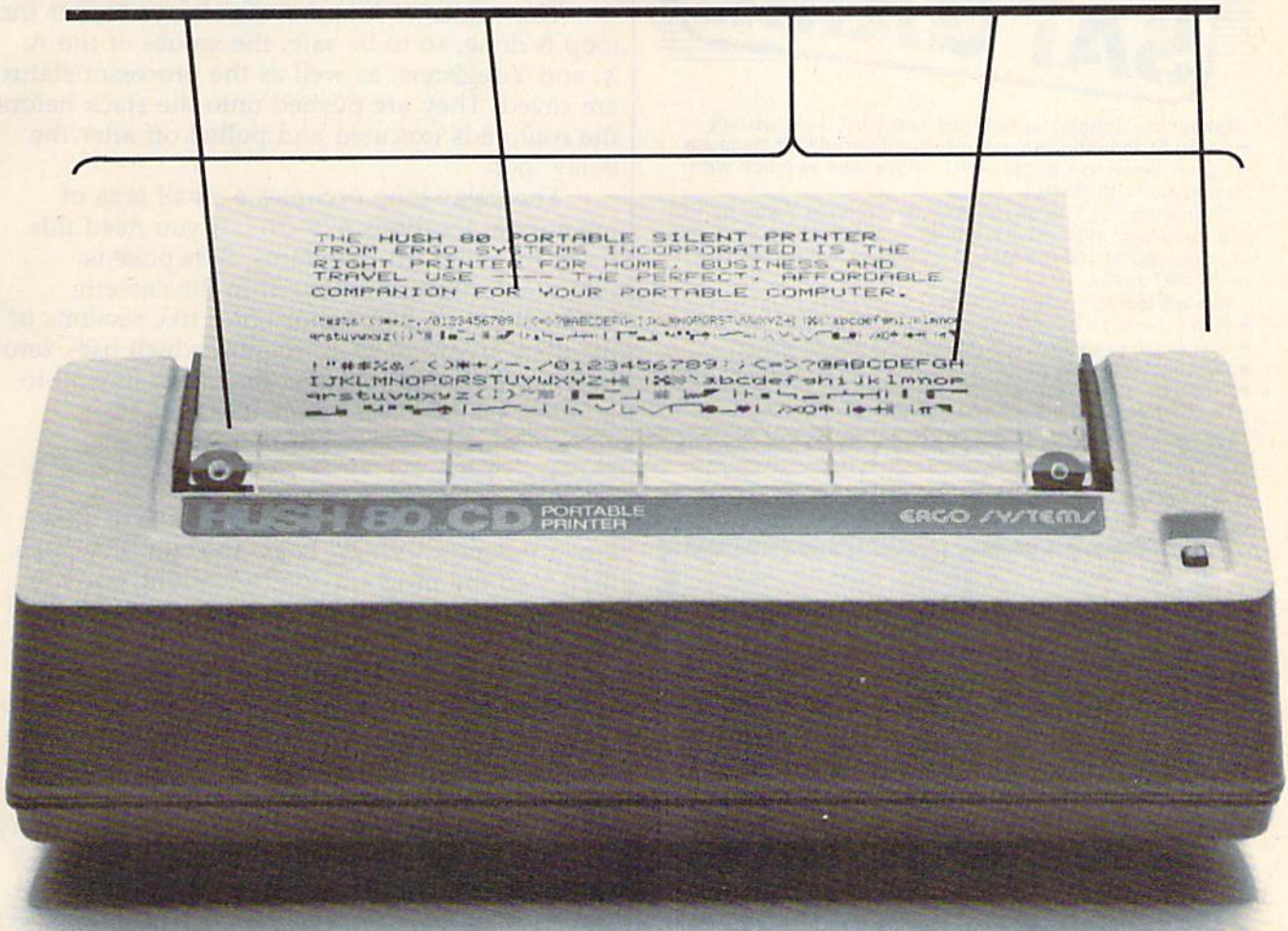

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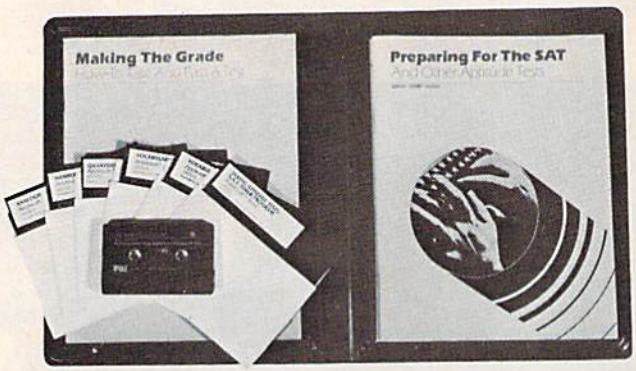

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if Not Equal) loops back to the DEY loop. The higher the number in 251, the longer the loops take. At the slowest printing speed, X has to be decremented 255 times, while Y is decremented 255 × 255 (over 65,000) times.

The values of X and Y are always 0 after the loop is done, so to be safe, the values of the A, X, and Y registers, as well as the processor status, are saved. They are pushed onto the stack before the routine is executed and pulled off after the delay loop.

The delay loop occupies a small area of memory at locations 679–767. If you need this RAM for other ML programs, Slowpoke is relocatable. You can move it to the cassette buffer (location 828 on) or other free sections of memory. If you have a program which uses zero page location 251, change the 251 in line 30 to another available zero page location.

Some Ideas

One useful application of Slowpoke is to slow down program listings. Load and run Slowpoke, then load the program you're working on. You can control the speed of the listing with a single POKE.

If you are working on a game and the rules take up a couple of screens, you can use this program to make them slowly scroll up, rather than the usual method of printing a screen and waiting for the user to press a key to get the next page. This same idea could be adapted to a story program; at the end of the story, roll the credits (just like at the movies). Many programs which put a lot on the screen could use a printing speed control.

The program is a good debugging tool if you are having problems getting the screen graphics just right. You should note, though, that only the PRINT command is affected; POKEing to screen memory is not any slower than usual.

Slowpoke could be very useful with a program which examines tape or disk files. You would open the file, read an item, print it to the screen, then use a GET statement to see if a key has been pressed. If not, then continue with the next item. If f1 is pressed, speed up the printing; if f7 is pressed, make it slower. It might even be adapted to a speed reading program.

Finally, if you're familiar with machine language programming, you could make a slight modification to add sound effects. Just before the delay loop, turn on the noise generator and turn it off at the end of the loop. Each time you printed something, you would hear, say, the clicking of a typewriter. If you wanted to get really fancy, you could add a bell sound at the end of each line.

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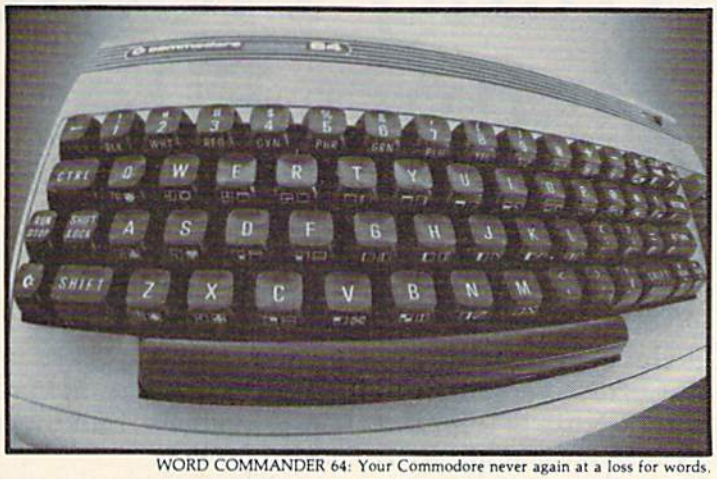

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Creating Program Listing Files

Richard N. Wilfong

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Did you know you can LIST programs on your VIC or 64 to tape or disk files? The results are completely different from using SAVE, and there are a variety of interesting applications for this technique.

The Problem: Adding Comments To ML Programs

Micromon is a good machine language monitor, but you end up short of good documentation. Micromon's assembly feature doesn't allow comments (which are similar to BASIC REMark statements). You can send a disassembled program listing to a printer, but if you want comments you have to write them out on paper.

It becomes a problem when you start to work on a machine language program written months earlier. The original notes might help a little, but you usually end up disassembling the program line by line. (Here's an FFD2, which means print. Next, there's an LDA indexed by Y —where did Y get its value?—and now a loop where the accumulator is rotated.) It can be a mess.

The problem can be solved with an unusual application of CMD. You may know how to print BASIC program listings using CMD (OPEN 4,4: CMD 4: LIST). This BASIC command diverts output from the screen to a previously opened file. CMD 4 sends the program listing to logical device number 4 (in this case the printer) instead of the screen.

Now let's try the same thing, using a disk file to receive the disassembly of an ML program. First, load Micromon and your ML program. In the immediate mode (without a line number), enter:

```
OPEN 2,8,2,"DISKFILE,S,W": CMD 2: SYS 49152
```

First, a sequential file is opened for writing. CMD 2 then tells the computer to send everything to this file instead of the screen. The SYS enables Micromon (assuming you're using Micromon installed at location $C000 on the 64). If you're using another machine language monitor—Supermon or VICMON, for example—change the SYS value accordingly. And, of course, you can call the file something other than *diskfile*.

If you have a tape drive, change the first part to **OPEN 2,1,1,"TAPEFILE"**.

Now use the D command, with a beginning and ending address, to disassemble your ML program. For example, if you have a program in the cassette buffer, you would enter **.D 033C 03FB**. Your disk or tape drive will run for a few moments. You now have to close the file. Exit from Micromon (using the X command) and type:

```
PRINT#2: CLOSE2
```

The newly created file contains an ASCII disassembly, which can be read (and edited) using *EasyScript*. If you use *SpeedScript* (or *WordPro*), you'll have to change the sequential ASCII file to *SpeedScript* format, using the conversion program in "SpeedScript Revisited" (COMPUTE's GAZETTE, May 1984). Choose option three: *Commodore ASCII to SpeedScript*.

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LISTing BASIC Programs To A File

Although I originally used this technique to add comments to a Micromon disassembly, it also works on BASIC listings. Follow these steps:

1. LOAD the BASIC program
2. Enter **OPEN2,8,2, "DISKFILE,S,W": CMD 2: LIST**
3. Next, **PRINT#2: CLOSE2**

Tape users should change step 2 to **OPEN2,1,1, "TAPEFILE": CMD 2: LIST.**

A Few Suggestions

It's possible to read through a saved BASIC program by OPENing the file and using GET# to extract pieces of the program byte by byte. Unfortunately, the program will seem to be jumbled. The most confusing thing is that all BASIC commands are in token form. PRINT, for example, appears in program files as a 153 (you can test this by PEEKing a program when it is in memory).

Listing a program converts the tokens to the corresponding BASIC words. A 153 is translated to the five letters P, R, I, N, T. This same process of detokenization happens when you create a tape or disk file with the OPEN, CMD, LIST sequence. The one byte tokens are expanded to the full BASIC commands.

Once the program has been listed to tape or disk, you can do some interesting things.

Assuming you have a word processor and a printer, you can call up the program listing file and edit it as if it were a text file. To make a BASIC program more readable, add some blank lines in between the major routines and subroutines. Believers in structured programming can indent all FOR-NEXT loops and clean up the format.

Machine language programmers using a monitor like Micromon can add (previously unavailable) comments, to clarify the logic of the program. With a SEARCH or HUNT function, you can find all instances of JSR $FFD2 and replace it with the easier to understand JSR PRINT. You can label subroutines and tables.

With a multifont printer, you could add bold, italic, or expanded print headlines to your program.

You can also use program listing files to create much more readable listings on your printer. **OPEN 4,4: CMD 4: LIST** is the most common and simplest way to list to a printer. But certain characters are hard to understand—a reverse heart for "clear screen," a reverse Q for "cursor down," and so on.

Program listing files can help eliminate these difficult characters. First, load the program you want to list. Create a sequential listing file (using the technique described above). Type NEW and enter the following program:

```
1 OPEN1,8,2,"FILENAME,S,R"
2 GET#1,A$:IFA$="{CLR}"THENPRINT"[CLR]";:
  GOTO4
3 PRINTA$;
4 IF ST<>64THEN2
5 CLOSE1
```

Tape users should change line 1 to **OPEN 1,1,1,"FILENAME"**. Make sure that when you type line 2, the first CLR is the SHIFT–CLR/HOME character (reverse heart) and the second CLR is spelled out, inside square brackets.

This program banishes the reverse heart from your program listings. Instead, you see [CLR]. As it is written, it lists to the screen. To adapt it to a printer, you'll have to OPEN a file to the printer and change PRINT to PRINT#. You can expand this lister program to replace inverse function key characters, cursor controls, color characters, and so on. Just add some more IF-THEN checks.

Line 4 is important because it checks the status variable (ST). When ST is 64, it means you've reached the end of the file. The file is then closed and the lister program ends.

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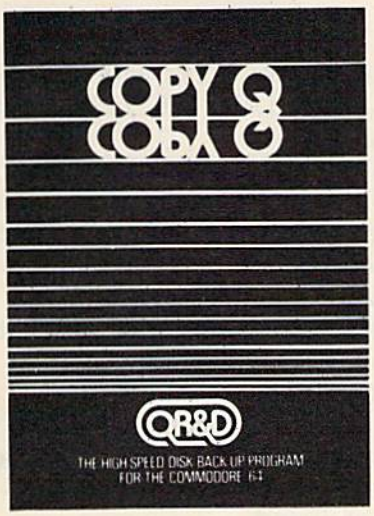

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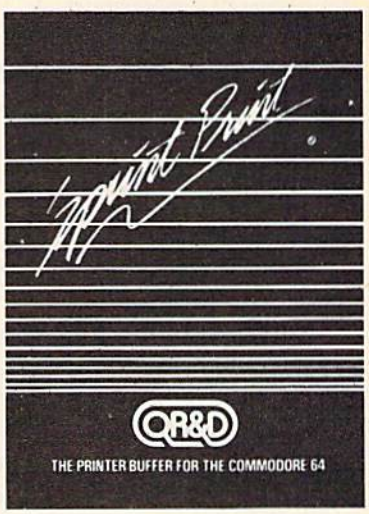

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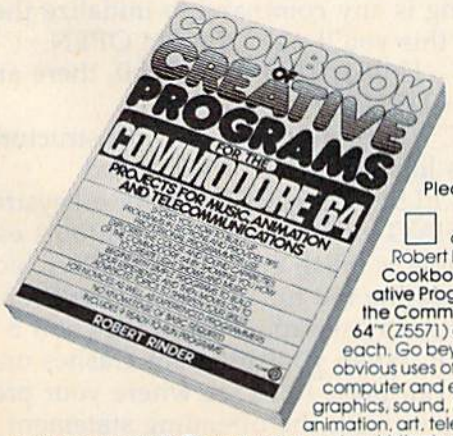

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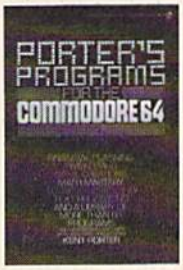

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HORIZONS: 64

Charles Brannon
Program Editor

The nearest cousin to the 64 is Commodore's new Plus/4 computer. An evaluation model arrived recently, so let's take an in-depth look at this new machine. It might be well worth your time to compare the features of your 64 to those of this new "productivity" machine before deciding if the Plus/4 is a worthy replacement or significant addition.

Physically, the Plus/4 is tiny, with barely enough room for the keyboard. But packed inside this small box is a complete 64K computer with color graphics, sound, built-in BASIC, and "productivity software." The keyboard's layout is much like the 64's, with a few keys moved around and some extra functions added. The keys are half as high, with a shorter stroke, almost identical to the keyboard of the portable SX-64. The cursor keys are shaped like arrows and arranged in a special cursor pad. Four small rectangular buttons above the keyboard provide eight function keys, with function 8 labeled as HELP. A second CONTROL key replaces the RESTORE key found on the 64 and VIC.

Along the right side of the computer is a power switch and a chip reset button. The reset button performs a cold reset, wiping out your program as if you turned the power off and on. If you hold down the RUN/STOP key as you press the reset button, you call up the built-in machine language monitor, where you can type X to exit to your unharmed BASIC program. When you hold down RUN/STOP as you turn the power on, the Plus/4 goes straight into the ML monitor with BASIC mapped out, giving you a full 64K of memory. By the way, the Plus/4 uses a 6502-compatible microprocessor. Thanks to the Kernal, many useful ROM calls used on the VIC and 64 will also work unchanged on the Plus/4.

The left side of the computer reveals a TV connector and channel 3/4 switch (called H-L). On the back is a square power connector, a standard round serial bus port, a small round cassette port, a user port, a cartridge slot labeled "memory expansion," two small round joystick ports, and an eight-pin round video socket. The serial bus will accept any VIC/64 serial peripheral, so if you already have a 64, you can use your existing disk drive, printer, and most printer interfaces with the Plus/4. The video socket works with a standard video monitor or the 1701/1702/1703 monitor via the rear connections.

Most irksome are the joystick and cassette ports. Even though the same circuitry is used, the connectors have been changed, so you can't just plug in your Datassette or any of dozens of joysticks. Printer interfaces that draw power from the 64's cassette board have no place to plug into the Plus/4. Commodore may well have chosen the smaller connectors to more easily pass FCC regulations (smaller, unexposed connectors may transmit less RF interference). It shouldn't be too hard to rig up an adaptor, if a plug for these strange sockets can be found.

A Powerful BASIC

The Plus/4 has a powerful BASIC, with features of disk BASIC 4.0 teamed with Super Expander graphics, and 60K available for BASIC programming. At last, you can access almost every graphics feature without resorting to PEEKs, POKEs, and machine language. SHIFT-RUN/STOP defaults to loading the first program from disk. No more LOAD "$",8 or OPEN 15. Commands like DIRECTORY, SCRATCH, and RENAME make disk operations smooth and easy. Additional disk commands are: DLOAD, DSAVE, HEADER (New), BACKUP (works only with dual drives), COLLECT (Validate), and COPY.

Missing is any command to initialize the drive. For this you'll need the old OPEN 15,8,15,"I". Unlike CBM BASIC 4.0, there are no DOPEN or DCLOSE commands.

BASIC has been enhanced with structured statements like DO:LOOP UNTIL and IF/THEN..ELSE. GETKEY waits for a keystroke. PRINT USING makes formatted printouts easy. Programming is much easier with KEY, which lets you redefine the function keys. Functions 1-7 can type out any stream of keys. Function 8 types HELP. When your program crashes on an error, you can press f8 to see where your program stopped, with the offending statement flashing. You can DELETE a range of lines, RENUMBER your program, or enter AUTOmatic line-numbering mode. In TRON (TRace ON) mode, the line number is shown as the line executes. TROFF turns off the trace.

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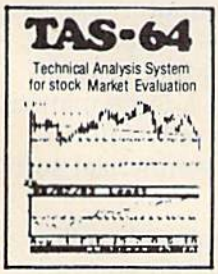

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Sound And Music

Once you've heard the SID chip, the Plus/4's sound is rather disappointing. Still, it has 10-bit resolution, two clear voices, and white noise capability—something of an improvement on the VIC-20 sound chip. It acts like the sound chip used in the TI-99/4A. VOL controls the volume, from 0 (off) to 8 (loud). SOUND x,y,z plays pitch y on voice x for z sixtieths of a second. Using VOL, you can simulate a crude ADSR envelope. It's a usable sound device, with no frills, and it's a lot easier to program than the mighty SID. For games, it should produce acceptable bleeps, blats, whirs, and explosions. The sound is good enough for music. If only we hadn't been spoiled by the SID chip.

121 Colors

The Plus/4 has almost the same text and graphics modes as the 64, but with a plus—121 colors. The basic 16 colors—except black, of course—can be displayed in any of eight brightness levels. This gives you eight grays, or a red ranging from a summer sunset to a flamingo pink; a muddy brown to a lemon-yellow. Since the three grays available on a 64 are replaced by the eight different shades of white, there are some new colors, including blue-green and yellow-green. You have all 121 colors available in text mode. In addition, text can be displayed in reverse color or flashing at the same rate as the cursor. All the Commodore graphics characters are supported, including upper/lowercase mode.

This BASIC is a graphics extravaganza. There are two bit-mapped modes: high resolution and multicolor. High resolution gives you 320 × 200 dots. Each 8 × 8 pixel zone (the same area as a single character) can have its own foreground color. When two colored lines intersect, the conflicting region is only one of the colors. You have much better color control but half the horizontal resolution in multicolor, with four non-interfering colors and 160 × 200 resolution. There are separate memory locations for each color, which you can set with the COLOR statement. Additionally, if you change the third color register, anything drawn in that color will instantly change, letting you make large areas of the screen flash and glow.

The GRAPHIC command selects whether you want high-resolution or multicolor. Two of the modes have a five-line text window at the bottom, so you can try out graphics in direct mode. A fault with the text window is that it's easy to move the cursor out of the window and "under" the graphic screen where you can't see it. You can also elect whether or not to clear the screen when you change modes. After a GRAPHIC call, BASIC is moved above the graphics screen, and 10K of memory is lost from BASIC to be allocated to graphics. GRAPHIC CLR will return the memory after you are finished with graphics. The text mode is GRAPHIC 0.

Graphics Commands

The DRAW command lets you draw points and connected lines. CHAR is used to place text on either the text screen or on the graphics screen at any X,Y position. BOX can draw any rectangular shape at any angle. The CIRCLE command lets you draw round circles, ovals, arcs, or polygons, in color and at any angle of rotation. PAINT fills in any area of the screen. It can fill any strange shape, as long as it's completely enclosed.

There are no commands for sprites, simply because there are no sprites. How can you program games in BASIC without sprites? Well, you could draw and erase shapes in the graphics modes, which is what GSHAPE and SSHAPE seem to be for. SSHAPE stores a rectangular area of the screen into a string. Since a string can only hold 255 bytes, there is a limit to how big a shape you can grab. GSHAPE can then draw the shape anywhere on the screen. With the Exclusive-OR option of GSHAPE, you can move small objects without disturbing the background, but it's too slow for fast action games. Looks like we'll need turbo-coded machine language for game programming. Another option is character animation, which is fast, but coarse.

Productivity Software: 3 + 1

The built-in word processor, spreadsheet, data base, and bar charts are supposed to be the clincher. Who needs sprites when you have these? When you turn on the computer, pressing f1 switches on the software. It's a big package, with a huge manual. You'd think that easy-to-use software wouldn't need such a large manual. Having used this software, I can only say it's mediocre compared to the best commercial software for the 64.

The word processor comes up with yellow text on a black background, although you can change the colors to a more pleasing combination. It gives you a maximum of 99 lines, not a lot of text, which makes it more appropriate as a letter or memo processor. Horizontal scrolling gives you more than 40 characters per line. It has a lot of features and commands, but is very hard to learn and use. The command TS jumps to the spreadsheet. As spreadsheets go, this one isn't bad, but it is slow. You can split the screen and have the word processor in the top half and the

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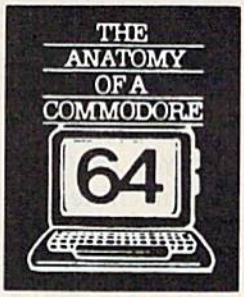

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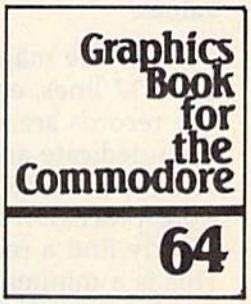

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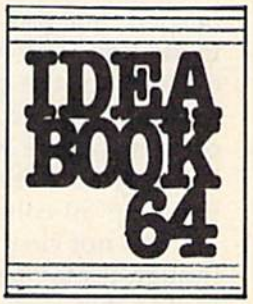

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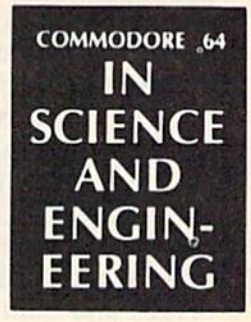

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spreadsheet at the bottom. You can move values from the spreadsheet to the word processor, or move text the other direction.

The so-called graphics option can turn a column of the spreadsheet into a scaled bar chart. The bar chart is several vertical lines made up of # signs, inserted into the word processor. You use the word processor to type in labels and values.

The file manager lets you create records with up to 17 lines, each holding up to 38 characters. The records are stored on their own disk. You must dedicate an entire disk to your data base. You can sort the data, even merge it with the word processor. A search command lets you quickly find a record or series of similar records. This is a minimal program, but it works.

In general, the built-in software is useful, but lacks flair. Instead of being menu driven or activated with keystrokes, the software is controlled in command mode, where you type several characters (the name of the command). Writing or calculating requires you to memorize a list of cryptic sequences. The word processor is clumsy. INST/DEL affects the entire document, not just one paragraph, unless you set a pointer to the current line. INST/DEL works up to a pointer, so you can set and clear pointers as needed, but you have to switch to command mode first. The horizontal scrolling can drive you crazy, since the cursor wraps around at the left margin. It's hard to write when you can't see half of what you've written. The horizontal scrolling is handy for business use, though, making it easier to set up 80-column charts and tables.

It's not clear who will buy this machine, though it may sell well. Software houses are concerned that they can't sell a word processor, spreadsheet, or data base to owners of this machine. They needn't worry. Only a little work is needed to improve on the built-in software. If the Plus/4 succeeds, a translation of *SpeedScript* would be a natural. With the new super-fast parallel disk drive, the SFS 481, which works only with the Plus/4, perhaps small businesses can use the machine. Even though it lacks many game features, the machine has an excellent BASIC and built-in machine language monitor, making it a good machine for teaching and learning programming. The built-in software will at least permit anyone to use the machine right out of the box. Finally, the price is fairly low, just under $300.

What's intriguing is that this machine costs more than a 64, but *must* be cheaper to produce. In hardware, the most expensive parts are the chips. The Plus/4's single TED chip integrates a video chip, sound chip, a timer, and keyboard circuitry. All you need is a microprocessor, memory, and a few support chips to make the Plus/4. The case is small, the keyboard probably is cheaper than the 64's, and it uses the less expensive sockets. All in all, Commodore could probably sell this machine for around $100 and still do well. Perhaps this is their secret plan. The 64 first sold well at $600, and gobbled up the home computer market like a voracious Pac-Man at $200. And if the Plus/4 could sell for $100, why give up your 64? Buy a Plus/4 and you have *two* computers, without re-investing in disk drives and printers.

You can't use much of your 64 software on this machine, except those BASIC programs that don't use POKEs, PEEKs, or machine language. (Can you think of any that don't?) If you own both a VIC and a 64, you'll have some idea of the compatibility problems. But the Plus/4 is an interesting machine.

Warp Drive For Your Disk Drive?

You might be interested in a program that lets you load programs three times as fast from your 1541. First mentioned in our CES story, *Kwik-Load* is a simple and effective product. When you load *Kwik-Load* into memory, program LOADs proceed at a bearable pace. It really works. We loaded "Campaign Manager" in 7 seconds with *Kwik-Load* versus the normal 21 seconds. High-resolution screens come in a line at a time. It seems that this is the solution to 1541 "wait states."

But *Kwik-Load* has many limitations. It cannot load most commercial software or programs like *SpeedScript* which take over the entire machine. Apparently, *Kwik-Load* requires a little space at the tail end of the reserved block $C000-$CFFF, which isn't a very safe space after all.

However, *Kwik-Load* includes a highly useful menu-driven disk program. You can copy disks three times as fast, and format disks at more than twice normal speed. You can scratch, rename, or validate a disk. Also included is a disk speed check. If a 1541 is having trouble, alignment, not speed, is the thing to check first, but a proper speed of 300 rpm is important, too. A disk sector editor that lets you read and write hexadecimal and ASCII data directly to the disk is a handy tool for learning about a disk, or recovering damaged files. Given this bonus, and despite the limitations, *Kwik-Load* is a good buy at $19.95.

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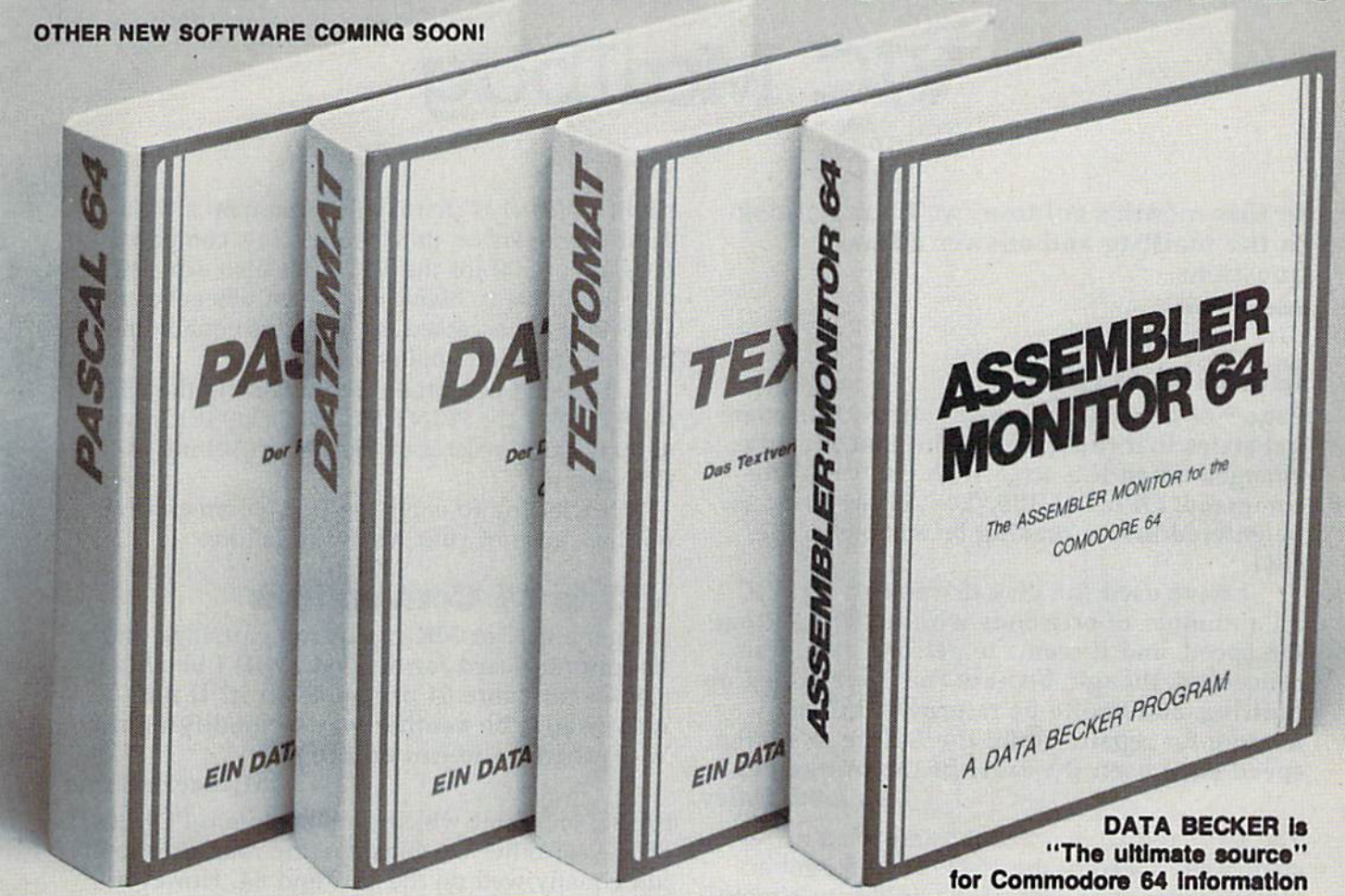

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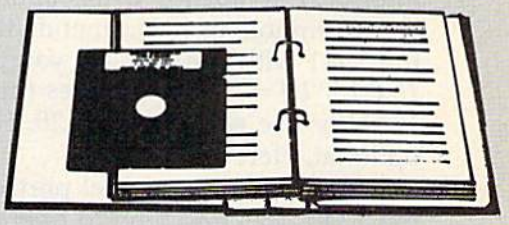

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Dan Carmichael, Assistant Editor

VIC Mailbag

In this month's column, we'll take a look in the mailbag and answer a few questions.

Shifting Gears

Page 9 of the 1541 disk drive instruction manual states that the speed of the 1541 must be changed when it is used with the VIC. The command: OPEN 15,8,15,"UI-" is supposed to be entered before reading or writing to the 1541.

I have used the disk drive with my VIC on a number of occasions without first setting the speed, and it seems to perform fine. I am concerned, though, because the drive ended up quitting, and had to be returned to Commodore for repair. Could the failure to set the speed have been the cause of the breakdown?

Timothy Haley

The UI− and UI+ commands are used to change the speed of the 1541. They do not actually change the speed of the disk drive's motor, but instead change the speed at which the drive internally accepts or writes data.

Commodore recommends that before using the 1541 with the VIC-20, you type *OPEN 15,8,15,"UI−"*. This changes the speed of the 1541 for use with the VIC-20. However, this is optional. Here's why.

The disk drive model previous to the 1541, the 1540, was designed to operate with the VIC-20, and transferred data at a faster rate than the newer 1541.

The biggest misunderstanding of the UI−, UI+ command is that UI− (because of the minus sign) slows the speed of the 1541. In fact, it speeds up the rate of transfer, and emulates the faster speed of the 1540.

This is the reason the 1541 performs adequately with the VIC-20, even when the UI− command is not entered. On the other hand, the Commodore 64 is set to accept data at a slower rate (UI+), and might experience problems if it's used with a 1540 or a 1541 set at the faster speed. One of the main reasons that the 64 is slightly slower is that it must maintain a thousand characters on its video display, compared to only about 500 for the VIC. This also explains why 64s have to blank the screen whenever cassette files are accessed, as timing is equally important in cassette operations.

It should be noted that initializing the 1541 (OPEN 15,8,15: PRINT#15,"I0":CLOSE15) will automatically reset it to the default setting of the slower speed.

Neglecting to enter the UI− command was not the cause of your hardware failure.

VIC to 64 Conversions

If I get a 64K or 32K expansion cartridge and a 40-column board for my VIC, will I be able to run Commodore 64 programs on it? If not, what would be another way of modifying my VIC programs to run on the 64?

Michael Scarola

BASIC programs which do not contain POKEs, PEEKs, or other machine specific routines should run equally well on the VIC and 64. However, because most programs contain POKEs and/or PEEKs, the answer is generally no.

It makes no difference if the VIC's memory is expanded or unexpanded. The lack of compatibility stems from the differences in memory locations, *not* memory size. For example, changing screen and border colors in the VIC is done with a single POKE to 36879, while in the 64 it takes two POKEs to memory locations 53280 and 53281. Also, producing sound with the 64's sophisticated SID (Sound Interface Device) chip is more complicated and requires many more POKEs than is necessary to produce sound on the VIC. This list of differences goes on.

The only way to convert VIC programs to run on the 64 is to go through them line by line, and change all the machine specific routines, POKEs, and PEEKs.

Mysterious POKEs

At the beginning of many programs for the VIC-20, I have seen two memory locations (36869 and 36879) POKEd with different

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numbers. I'd like to know what these memory locations are used for.

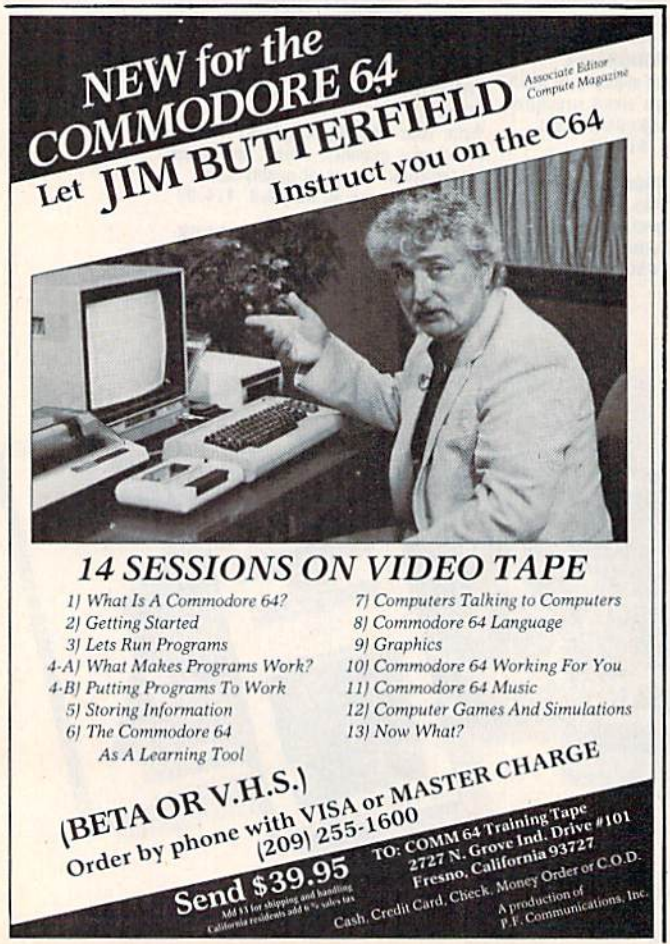
Jim Walunas

Memory location 36879 is used to set the screen and border colors and to toggle the character set between the inverted and normal mode. By POKEing various values here you can change the screen and border colors or turn on/off the reversed character set. The first three bits (0–2) give you eight border colors, bit 3 turns the inverse screen on or off, and the top four bits control the sixteen available screen colors.

Memory location 36869 is used to control the screen and character memory addresses.

Bits 0–3 of this byte point the VIC (Video Interface Chip) chip to the character set. The normal value of these four bits is 0. Changing this value causes the VIC chip to look elsewhere for the character set information. This is done when, for example, you want to use a custom character set you have put in RAM.

Bits 4–7 in combination with bit 7 of memory location 36866 are used to determine the beginning address of screen memory. To change the location of screen memory, the value of these bits must be changed as well as the value of memory location 648, which tells the computer's operating system where to look for screen memory.

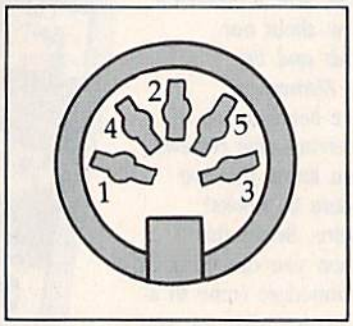


Adding Sound

I have a VIC-20 and a BMC monitor. I've figured out which pins are used to connect the monitor, but I am unsure how to hook up the sound. Is there a way to hook up a speaker at the same time?

David Grant

Yes. On the rear of your VIC, there is a 5-pin DIN plug that is used for audio/video connections . The wiring for the 5 pins is as follows:



1. +5 volts reg.
2. ground
3. audio
4. video low
5. video high

To hook up your sound, connect one speaker wire each to pins 2 and 3. It should be noted, however, that driving a speaker straight from the plug might damage the VIC chip. For this reason, you should connect the two pins to the input of an amplifier, and connect the speaker to the amplifier output.

You should be able to find a small utility amplifier at your local electronics dealer. Another suggestion might be to hook pins 2 and 3 up to your stereo amplifier. The auxiliary input jacks are good for this purpose.

When wiring to your stereo, be careful with the polarity of the connections.

The Incompatible 1526

My VIC-20 and Commodore 1526 printer don't seem to get along. I have not been able to print a program listing. When I enter the standard OPEN 4,4: CMD4: LIST commands, I only get about three lines of the program, then the printer shuts off. What am I doing wrong?

Bob Le Beau

According to Commodore, the latest versions of the 1526 are for use with the Commodore 64 only. A few problems have arisen with incompatibility between the VIC and this printer. These stem from serial bus allocation problems, especially when the tape drive is used with the VIC.

If you are using a 1526 and a tape drive, try this: Immediately after any cassette activity, including LOADs or SAVEs, type *SYS64490*. This Kernal routine clears the serial bus, and prepares it for use with the printer.

Programming Sound And Graphics With The *Super Expander 64*

Lee Noel, Jr., Assistant Editor, Art & Design

Tired of endless PEEKing and POKEing to get the sound and graphics you want on your 64? This cartridge offers some alternatives.

The programming capabilities of *Simons' BASIC* have drawn considerable attention from 64 owners. But Commodore's *Super Expander 64*, while less well known, is a powerful and flexible tool which offers several useful features not found in *Simons' BASIC*.

The *Super Expander 64* (which sells for about $50) is a ROM cartridge—a program frozen in the memory of a computer chip.

Unlike the widely used *Super Expander* for the VIC-20, this cartridge does not provide any additional memory for the 64. In fact, it consumes some, leaving 30719 bytes free for BASIC programming. However, the many powerful features more than compensate for the lost memory.

Essentially, the *Super Expander 64* extends the 64's BASIC programming language, giving the user more direct control over the computer's sound and graphics. Among its features are ten different preprogrammed instrument sounds, a built-in sprite editor, and direct mode control of all its features—none of which are available in *Simons' BASIC*.

The Language Of The Expander

Since the *Super Expander 64* is a program in ROM, it's immediately and permanently available to you as soon as you turn on your computer. To use it, you have only to learn some new BASIC keywords and include them in your programs.

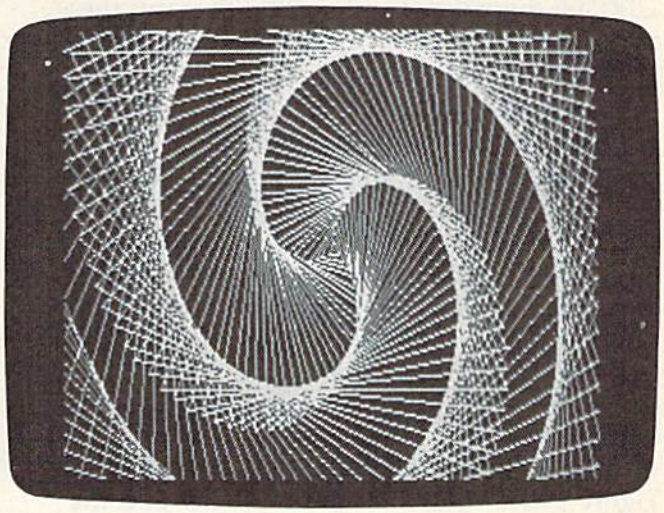


Figure 1

The expander adds 32 new words to BASIC: BOX, CHAR, CIRCLE, COLINT, COLOR, DRAW, FILTER, GRAPHIC, GSHAPE, KEY, LOCATE, MOVSPR, PAINT, RBUMP, RCLR, RDOT, RGR, RJOY, RPEN, RPOT, RSPCOL, RSPPOS, RSPR, SCALE, SCNCLR, SPRCOL, SPRDEF, SPRITE, SPRSAV, SSHAPE, TEMPO, and TUNE.

While this is a fairly lengthy list, it's still quite manageable by comparison to *Simons' BASIC's* 100-plus new words—more than 40 of which are needed to cover the sound and graphics features offered by the expander.

Many of the words are self-explanatory. For example, BOX draws a box, PAINT fills a shape with color, TEMPO sets the general speed for music and sound effects, and so on. Even the odd looking words were carefully devised. Words

starting with R return information to the program, GSHAPE (G for GET) puts a previously saved area of bitmap back on the screen, and SSHAPE is the command that saves a piece of bitmap. For the most part, the new words are readily comprehensible, and brief experiments tend to clear up any problems very quickly.

These keywords, termed *commands* and *functions*, are combined with additional elements, *parameters* and *arguments*, to form statements in the extended BASIC.

To help you master the expander, there is a 65-page manual that explains in relatively plain English how to use the program. But as often happens in documentation of this kind, there are a few minor errors. In the manual, each command or function is followed by a combination of numbers and punctuation marks in a set group—not unlike BASIC commands.

But for those using the manual, a word of warning is in order. Using the expander word CIRCLE, here's a sample of the the way the manual charts a keyword and its attendant parameters.

CIRCLE[source],[X1,Y1]<,X-rad>[,[y-rad][,[start][,[end][,[angle][,[inc]]]]]]

This is difficult enough to type; let alone comprehend. Not surprisingly, the manual itself misses the occasional bracket. Just ignore this system—all you have to do is count the number of parameters and figure out what each of them does. You'll very quickly come to understand them on your own terms.

How does all this work in practice? Let's look at a graphics display generated with the aid of the expander. The complex shape shown in Figure 1 was drawn by the expander and the following program.

```
10 GRAPHIC2,1:COLOR0,7,,,0:SCNCLR
20 FORI=0TO300STEP4
30 CIRCLE1,160,100,I,I,,,I,120
40 NEXT
```

To see how *Super Expander 64* BASIC works, let's take a brief look at this program. First, it clears the screen and makes it entirely black. Next, drawing in yellow, the program makes a small triangle near the center of the screen. (By choosing appropriate parameters, the CIRCLE command can be used to draw squares, ellipses, regular or irregular polygons, triangles, and even straight lines.) It then increases the size of the triangle and draws it again, but tilted slightly to the right. This process is repeated over and over again, until the triangle is much larger—parts of it don't even appear on the screen—and has been turned 300 degrees from its original position. That's all there is to this complex picture.

A Lot For A Little

The language of the expander is not only powerful, it's succinct. It's doubtful whether an equally brief program written in *Simons' BASIC* could produce identical results. On the other hand, once you had written a slightly longer version, *Simons' BASIC* structured programming would enable you to call it by name every time you wanted to use it as part of a longer program. With the expander, you'd be stuck with going to a numbered subroutine.

The expander offers another significant advantage over *Simons' BASIC*. All keywords and parameters may be entered in direct mode—directly from the keyboard, without being in a program. This feature, which can offer distinct advantages to the programmer, is not available in *Simons' BASIC*. As a matter of fact, the entire program we just looked at can be entered in direct mode: The three commands in line 10 are typed in as a unit, then the entire FOR/NEXT loop—all without the need for line numbers.

Graphics Made Easy

The expander's GRAPHIC command offers four types of screen display. In addition to the high-res screen used above, there's a multicolor bitmap mode, a mode for normal text, and a combination of high-res with a five-line text window.

SSHAPE and GSHAPE can pick up sections of the screen display and move them. This is accomplished by transferring the necessary visual information into a string variable and then retrieving it.

CHAR allows easy formatting of text display in all graphics modes. A simple column-row coordinate system allows characters to be placed without the usual trial-and-error methods.

There are many other graphics commands, but they all work in a similar way.

Of course, the *Super Expander 64* offers a lot more than graphics.

The KEY command allows easy programming of the function keys, especially useful considering that expander keywords cannot be abbreviated—they must be typed out in full. KEY can be used to assign any eight keywords to the function keys. There they'll be available at the touch of a key or two. When first turned on, the expander automatically provides one such group of useful words.

Three words, RJOY, RPEN, and RPOT, allow the easy reading of information from joysticks, lightpens, and game paddles. Not only does this considerably simplify the programming of games that use these devices, but also it opens up the possibility of writing serious programs for users

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who have an aversion to the keyboard. Many people, for example, find pressing the fire button on a joystick more understandable than pressing the RETURN key.

Simplified Sound

The *Super Expander 64* has only three sound keywords—TEMPO, TUNE, and FILTER—but they perform a variety of functions. Like most *Super Expander 64* words, these, too, must be accompanied by parameters. However, sound is so well arranged on the expander that there's initially no need to alter any parameters.

When the computer is first turned on, the expander has already set up ten instrument-like sound forms. These include piano, drum, flute, organ, and six other sounds. For those primarily interested in creating game sounds, the drum sound will be particularly useful.

Playing music and making sound becomes simple. First, the SID chip is turned on by either PRINT CHR$(6); or PRINT"CTRL-F";. Next, sound information is assigned to strings in much the same way that screen information is treated for GSHAPE and SSHAPE. In this case, though, the programmer makes up a string of control numbers and ordinary letters. The strings are then played by simply PRINTing them. That's right, the normal BASIC PRINT command is used by the expander to play music.

To avoid confusion in *Super Expander 64* programs, it's a good idea to reserve the PRINT command for just music and sound, and to use the CHAR command to place characters or text on the screen.

The semicolons next to CHR$(6) and CTRL-F are extremely important. They indicate to the expander that the next suitable characters it finds in a PRINT string are to be treated as sound. Careful use of semicolons will mean that the SID chip needs only to be activated once in a program.

PRINTing CHR$(6) or CTRL-F a second time will shut the SID off; and, of course, there's no need for semicolons when the synthesizer is not active.

Here's an example which illustrates what we've seen so far:

```
PRINT CHR$(6);:PRINT"CDEFGABC":PRINT
CHR$(6)
```

This will play a familiar scale, and can be entered in program or direct mode. If you try it without the semicolon, you'll immediately see why the punctuation must be used.

Programming sound with the *Super Expander 64* is straightforward and a rewarding experience, far less complex than programming sound with *Simons' BASIC*.

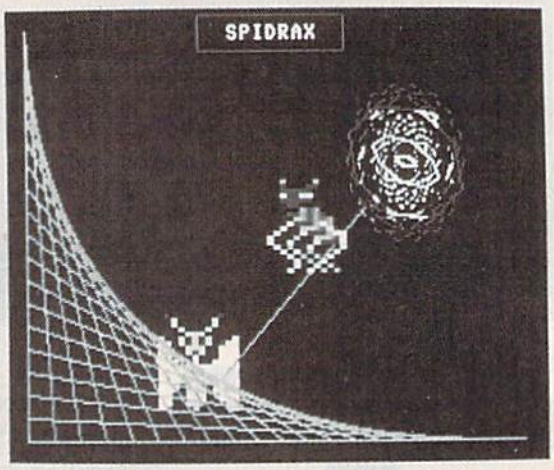

Figure 2

Sprite Programming

The expander offers six keywords for creating sprites. These give complete but simple control over sprite programming. You can specify color, size, and priority, and detect and respond to sprite collisions easily. As usual, there is a string variable system for saving and transferring sprite information. About the only limitation on expander sprites is that they can't be used on a normal text screen.

One of the sprite keywords, SPRDEF, is a good sprite editing program which is built right into the expander. This keyword allows you to define all eight available sprites and put them into memory. You can even define many more than eight sprites and transfer them into strings for later use, filling up your 64 with hundreds of sprite definitions if you want to. And you can use SPRDEF in direct mode to define your sprites before you even start programming.

There is one drawback, though. SPRDEF offers no way to save the sprites it creates so easily. Since a sprite definition is a series of 63 numbers, there's no reason we can't save those numbers. Here's a short program that will display the 63 numbers making up a sprite designed by SPRDEF.

```
5 SN=Ø:REM SN (SPRITE NO.) MUST BE
   THE NO. YOU ENTER IN SPRDEF MODE.
1Ø SPRDEF
2Ø SPRSAVSN,A$
3Ø PRINT "{CLR}"
4Ø FORI=1TO61STEP3
5Ø N$=MID$(A$,I,1):X=ASC(N$):PRINTX,
52 O$=MID$(A$,I+1,1):Y=ASC(O$):PRINTY,
54 P$=MID$(A$,I+2,1):Z=ASC(P$):PRINTZ
6Ø NEXT
```

To use this program, just type it in while the expander is in your computer. Then RUN it. When SPRDEF prompts you, type in 0 (see line 5 of the program). When you're happy with your sprite, press SHIFT RETURN to save it, and then press RETURN to go on with the program. Almost immediately, you'll see the 63 bytes of sprite data appear on your screen. (These numbers are arranged in a format that corresponds to the shape of the sprite.) If you wish, you can copy this information down and use it later. You can rerun this program as many times as you like, but always enter 0 when SPRDEF prompts you.

Once you have the numbers making up a sprite, they can be read back into the machine quite easily. This program shows how this can be done.

```
5 SN=Ø:TH$=CHR$(Ø)
1Ø FORI=1TO63
15 READN
2Ø TH$=TH$+CHR$(N)
3Ø NEXT
4Ø A$=RIGHT$(TH$,63)
5Ø SPRSAVA$,SN
6Ø SPRDEF
```

Sixty-three numbers from your own sprite definition can be appended (starting after line 60) in the form of DATA statements. When RUN, the program will transfer your design into A$ and then into sprite number zero. You'll then return to the SPRDEF mode. Once again, enter 0 and you'll see the sprite you designed.

These two programs could be used repeatedly, by changing sprite numbers and destination strings, to load a large number of sprites into a 64 with the expander inserted, obviously a time-consuming and cumbersome process. The programs are mainly given to show that it is possible to extract sprite data from the *Super Expander 64* environment.

The sprite commands and functions can be combined with the other expander keywords in various creative ways. Figure 2 is typical of results that can be easily achieved.

The *Super Expander 64* is a powerful device which frees the programmer from much of the tedium of creating sound and graphics on the 64. Although it invites comparison with *Simons' BASIC*, neither is really competing with the other.

Simons' BASIC performs well in a wide variety of situations, and the *Super Expander 64* is specialized in focus. But if your interest is in sound and graphics, the *Super Expander 64* may be a shortcut to some effective programming.

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Function Key

Willie Brown

The function keys can be extremely useful if you know how to program them. This short utility program for the VIC and 64 allows you to define each function key and save your newly defined keyboard to tape or disk.

Turn your computer on, type some letters, and you'll see them appear on the screen. But press one of the function keys and you'll see nothing. They are mentioned almost in passing in a short paragraph in the User's Guide, which says they can be programmed to perform many different functions. The question is, how do you program them?

The most common method of using the function keys is to set up a GET statement followed by an IF-THEN. The keys can be used in a program to start a game, change the border color, or almost any other function you can think of, as long as you type them in quote mode.

It would be nice, though, if they could be used outside of a program, in direct (or immediate) mode. You might want f1 to LIST the program, f3 to RUN it, f5 to SAVE, and so on—a collection of eight one-stroke commands.

"Function Key" lets you decide how you want to define the keys and use them.

Defining New Functions

After entering the program and SAVEing it, type RUN. A short machine language program is then POKEd into memory. To turn it on, type SYS 52115 (64 version). The entry point for the VIC version will vary depending on how much additional memory you are using; the appropriate SYS number will appear on the screen.

The program is now activated. To assign a value to one of the function keys, type fx=(BASIC command), where x is a number from one to eight and any legal BASIC statement follows the equal sign. Press RETURN and the computer should respond with OK. If you get a SYNTAX ERROR, check the logic of the BASIC line. For example, f1=LIST defines the f1 key as LIST. Any time you type f1, LIST will be printed on the screen. Of course, LIST won't be activated until you press RETURN. To simulate this, add a left arrow (the key directly above CTRL): f1=LIST←.

You can define all eight function keys with whatever commands you find most useful. But here are a few items to be noted. First, each key is limited to a maximum of 16 characters. If you exceed the limit, the extra letters will be ignored. Second, if you want a BASIC command to be executed, the last character has to be a left arrow. RUN/STOP–RESTORE resets the computer and will eliminate the function key definitions. Simply use the appropriate SYS to return to "Function Key." Finally, this utility is disabled whenever you run a program. It will work only in immediate mode. This allows you to use the function keys from within your program and still have your favorite commands available with one keystroke while editing the program.

Note that "Function Key" will not work with other programming utilities which use the same locations in memory (in the 64 version, locations 52115 and up).

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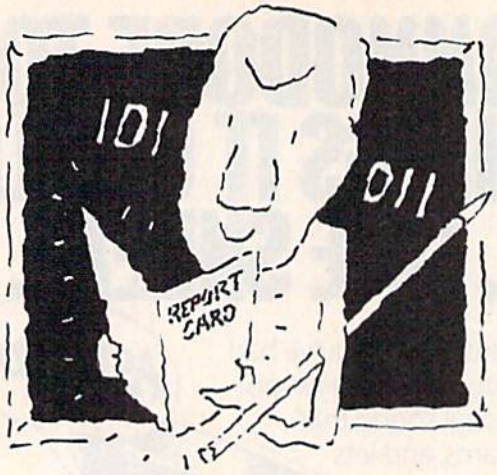

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Creating A Mini-Toolkit

It would be tedious to have to define all eight function keys every time you want to use this utility. You can create your own mini-toolkit with an f9 option, which allows you to save your function key definitions to tape or disk. You can then load your selected functions into memory at the beginning of a programming session.

When you have all the keys defined and want to keep them for future use, type f9=*filename*,8 (for disk) or f9=*filename*,1 (for tape), where *filename* is anything of your choice. But don't put *filename* in quotes. If you want to save another set of function definitions, be sure to use a different filename.

To load the functions back into memory, type LOAD"*filename*",8,1 for disk or LOAD "*filename*",1,1 for tape. The secondary address of 1 is crucial: It tells the computer to load the program into the same area of memory it originally occupied. After the program is loaded, type NEW and then the appropriate SYS. The eight functions you previously saved will be available for use whenever you need them.

See program listing on page 192.

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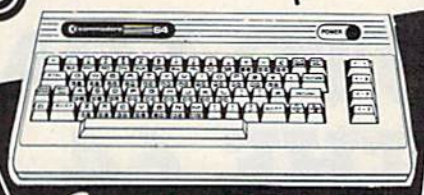

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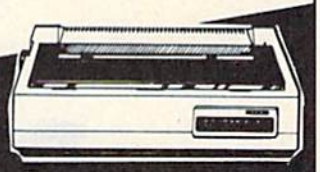

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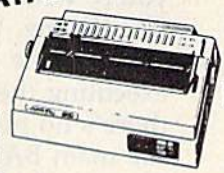

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DISK AUTO LOAD FOR THE 64

Dan Carmichael, Assistant Editor

Have you ever wanted to type LOAD"*",8,1 and have your favorite program automatically load and run itself like commercial software packages do? "Disk Auto Load" for the 64 will create a program to do just that.

When using commercial programs, you've probably noticed that most automatically load and start the program running without having to enter RUN. The first program loaded into memory is known as a *boot program*. It's this program that loads and executes other programs on the disk.

There are a number of different techniques that can accomplish this, such as overwriting the stack or changing *vectors*. (A vector is a pointer to the starting location of a machine language subroutine.) "Disk Auto Load" uses the latter method.

Manipulating The Vectors

In the Commodore 64, there is an area of unused memory from locations 679 to 767 ($02A7–$02FF). Like the cassette buffer, this 89-byte area is perfect for holding small machine language programs.

Just past this area of memory is a table of important vectors. In the 64, these vectors are two bytes each, using the low-byte/high-byte format. By changing the values of these pointers, you can redirect the system to your own programs.

The vector we'll be using for Disk Auto Load is the *BASIC Warm Start Vector* at 770–771 ($0302–$0303), which points to the main BASIC program loop. This one loop is executed more often than any other routine of BASIC. It checks the keyboard again and again, waiting for input. When a key is pressed, the character is printed on the screen. Pressing RETURN sends this routine into action. It looks at the beginning of the line for a number. If it finds one, it assumes you're writing a program and enters it as a BASIC line. When no line number is found, it executes the statement in immediate mode. After executing the program (or the statement, if there's no number), the computer goes back to the main BASIC program loop, waiting patiently for more from the keyboard.

This vector is also used when loading a program. After a program is loaded into the computer, the system returns to the BASIC program mode by looking at this pointer and going to the BASIC warm start program at 42115 ($A483).

By changing the values in this vector, the computer can be directed to execute a machine language program other than the usual BASIC warm start. In Disk Auto Load, the pointer value is changed by loading a program (which includes the new pointer values) on top of it.

Disk Auto Load puts the automatic boot program into the area from 679–750 ($02A7–$02EE). Before the boot program is saved, the warm start vector is changed to point to the start of the autoboot program at 679 ($02A7). Then the program and the pointer (locations 679–771, $02A7–$0303) are saved to disk as one module.

This becomes our autoboot program. Here's how it works:

The autoboot program (along with the vector with the changed values) is loaded into memory. If it's the first program in the disk's directory, it can be loaded with the LOAD "*",8,1 format. After the LOAD is finished, the computer looks at the BASIC warm start vector. Because the vector now points to the start of the autoboot program (location 679), that program is executed instead of the normal BASIC warm start routine. The autoboot program, in turn, loads in and executes the program you have specified.

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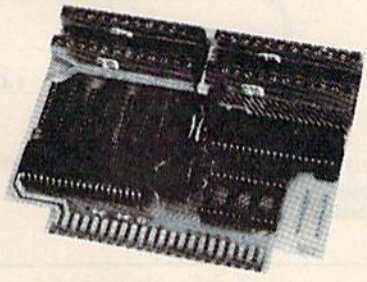

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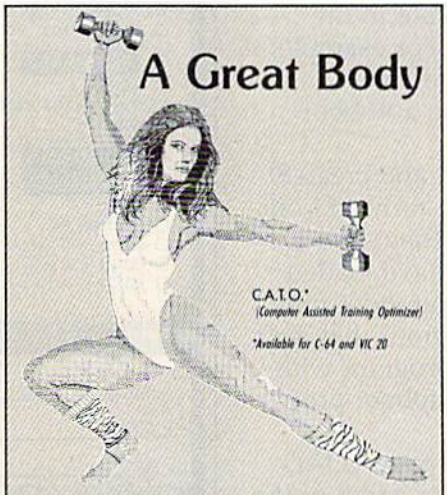

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A Newly Created Program

Enter, save, and run Disk Auto Load. It's a BASIC program which POKEs a machine language program into memory. The machine language program creates the autoboot program, and then saves it to disk.

If you wish to autoboot a program using the LOAD "*",8,1 syntax, format a new disk and don't save any files on it until after you've created the autoboot program. This will ensure that the autoboot program is the first entry in the disk directory.

The first prompt asks if the program you want to be automatically loaded and run is in BASIC or machine language. Press B or M. If you press M for machine language, you are asked to supply the beginning address of the ML program. This is the SYS address that starts the ML program running. Enter a number, then press RETURN.

Next, enter the name of the program you want to be automatically loaded. The program then instructs you to insert a newly formatted disk into the drive. Actually, the disk needs to be freshly formatted only if you wish to use the LOAD "*",8,1 syntax. Saving the autoboot program to a disk that contains other files is fine.

Enter the name you wish to give to the autoboot program you will be creating. For future reference, you might want to indicate in the filename that it's a boot program. For example, if you want to automatically load and run SPACEGAME, you could name the autoboot program SPACEGAME.BOOT.

After Disk Auto Load has run and created the autoboot program on the disk, turn off your 64 to reset the system. Be sure to then save a copy of the program you wish to have loaded and run on the same disk as the autoboot program. (It can't load and run a program that isn't there.) Be sure that you save the program with the same filename you told the autoboot program to look for.

To use the autoboot program, type LOAD *"filename"*,8,1 where *filename* is the name of the autoboot program you created, *not* the name of the program that autoboot is to load and run. For example, typing LOAD "SPACEGAME.BOOT",8,1 will automatically load and run "SPACEGAME". If everything is in order, the program you specified will automatically run.

If you wish to load and run more than one program, you can write your own boot program. Have Disk Auto Load load and run your program, and it, in turn, will load any programs you want.

See program listing on page 193.

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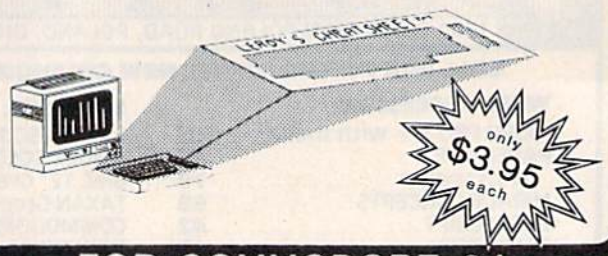

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MLX Machine Language Entry Program

For Commodore 64 And VIC-20

Charles Brannon, Program Editor

MLX is a labor-saving utility that allows almost failsafe entry of machine language programs published in COMPUTE!'s GAZETTE. You need to know nothing about machine language to use MLX—it was designed for everyone. There are separate versions for the Commodore 64 and expanded VIC-20 (at least 8K).

MLX is a new way to enter long machine language (ML) programs with a minimum of fuss. MLX lets you enter the numbers from a special list that looks similar to BASIC DATA statements. It checks your typing on a line-by-line basis. It won't let you enter illegal characters when you should be typing numbers. It won't let you enter numbers greater than 255 (forbidden in ML). It won't let you enter the wrong numbers on the wrong line. In addition, MLX creates a ready-to-use tape or disk file. You can then use the LOAD command to read the program into the computer, as with any program:

```
LOAD "filename",1,1   (for tape)
LOAD "filename",8,1   (for disk)
```

To start the program, you enter a SYS command that transfers control from BASIC to machine language. The starting SYS number always appears in the appropriate article.

Using MLX

Type in and save the correct version of MLX for your computer (you'll want to use it in the future). When you're ready to type in an ML program, run MLX. MLX asks you for two numbers: the starting address and the ending address. These numbers are given in the article accompanying the ML program.

You'll see a prompt corresponding to the starting address. The prompt is the current line you are entering from the listing. It increases by six each time you enter a line. That's because each line has seven numbers—six actual data numbers plus a *checksum number*. The checksum verifies that you typed the previous six numbers correctly. If you enter any of the six numbers wrong, or enter the checksum wrong, the computer rings a buzzer and prompts you to reenter the line. If you enter it correctly, a bell tone sounds and you continue to the next line.

MLX accepts only numbers as input. If you make a typing error, press the INST/DEL key; the entire number is deleted. You can press it as many times as necessary back to the start of the line. If you enter three-digit numbers as listed, the computer automatically prints the comma and goes on to accept the next number. If you enter less than three digits, you can press either the SPACE bar or RETURN key to advance to the next number. The checksum automatically appears in inverse video for emphasis.

To simplify your typing, MLX redefines part of the keyboard as a numeric keypad:

```
    U I O              7 8 9
  H J K L   become 0   4 5 6
    M , .              1 2 3
```

MLX Commands

When you finish typing an ML listing (assuming you type it all in one session) you can then save the completed program on tape or disk. Follow the screen instructions. If you get any errors while saving, you probably have a bad disk, or the disk is full, or you've made a typo when entering the MLX program itself.

You don't have to enter the whole ML program in one sitting. MLX lets you enter as much as you want, save it, and then reload the file from tape or disk later.

MLX recognizes these commands:

SHIFT-S: Save	**SHIFT-N: New Address**
SHIFT-L: Load	**SHIFT-D: Display**

When you enter a command, MLX jumps out of the line you've been typing, so we recommend you do it at a new prompt. Use the Save command to save what you've been working on. It will save on tape or disk as if you've finished, but the tape or disk won't work, of course, until you finish the typing. Remember what address you stop at. The next time you run MLX, answer all the prompts as you did before, then insert the disk or tape. When you get to the entry prompt, press SHIFT-L to reload the partly completed file into memory. Then use the New Address command to resume typing.

To use the New Address command, press SHIFT-N and enter the address where you previously stopped. The prompt will change, and you can then continue typing. Always enter a New Address that matches up with one of the line numbers in the special listing, or else the checksum won't work. The Display command lets you display a section of your typing. After you press SHIFT-D, enter two addresses within the line number range of the listing. You can abort the listing by pressing any key.

What if you forgot where you stopped typing? Use the Display command to scan memory from the beginning to the end of the program. When you reach the end of your typing, the lines will contain a random pattern of numbers. When you see the end of your typing, press any key to stop the listing. Use the New Address command to continue typing from the proper location.

See program listings on page 194.

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 words within braces which spell out any special characters: {DOWN} would mean to press the cursor down key. {5 SPACES} would mean to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key would be underlined in our listings. For example, S would mean to type the S key while holding the shift key. This would appear on your screen as a "heart" symbol. If you find an underlined key enclosed in braces (e.g., {10 N}), you should type the key as many times as indicated (in our example, you would enter ten shifted N's).

If a key is enclosed in special brackets, ⟦x⟧, 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:
{CLR}	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}	SHIFT + f1	
{LEFT}	SHIFT + CRSR ←		{YEL}	CTRL + 8		{F3}	f3	
{RIGHT}	CRSR →		⟦1⟧	C= + 1		{F4}	SHIFT + f3	
{RVS}	CTRL + 9		⟦2⟧	C= + 2		{F5}	f5	
{OFF}	CTRL + 0		⟦3⟧	C= + 3		{F6}	SHIFT + f5	
{BLK}	CTRL + 1		⟦4⟧	C= + 4		{F7}	f7	
{WHT}	CTRL + 2		⟦5⟧	C= + 5		{F8}	SHIFT + f7	
{RED}	CTRL + 3		⟦6⟧	C= + 6				

The Automatic Proofreader

"The Automatic Proofreader" will help you type in program listings from COMPUTE!'s Gazette without typing mistakes. It is a short error-checking program that hides itself in memory. When activated, it lets you know immediately after typing a line from a program listing if you have made a mistake. Please read these instructions carefully before typing any programs in COMPUTE!'s Gazette.

Preparing The Proofreader

1. Using the listing below, type in the Proofreader. The same program works on both the VIC-20 and Commodore 64. Be very careful when entering the DATA statements — don't type an l instead of a 1, an O instead of a 0, extra commas, etc.

2. SAVE the Proofreader on tape or disk at least twice *before running it for the first time*. This is very important because the Proofreader erases this part of itself when you first type RUN.

3. After the Proofreader is SAVEd, type RUN. It will check itself for typing errors in the DATA statements and warn you if there's a mistake. Correct any errors and SAVE the corrected version. Keep a copy in a safe place — you'll need it again and again, every time you enter a program from COMPUTE!'s Gazette.

4. When a correct version of the Proofreader is RUN, it activates itself. You are now ready to enter a program listing. If you press RUN/STOP-RESTORE, the Proofreader is disabled. To reactivate it, just type the command SYS 886 and press RETURN.

Using The Proofreader

All VIC and 64 listings in COMPUTE!'s Gazette now have a *checksum number* appended to the end of each line, for example ":rem 123". *Don't enter this statement when typing in a program.* It is just for your information. The rem makes the number harmless if someone does type it in. It will, however, use up memory if you enter it, and it will confuse the Proofreader, even if you entered the rest of the line correctly.

When you type in a line from a program listing and press RETURN, the Proofreader displays a number at the top of your screen. *This checksum number must match the checksum number in the printed listing.* If it doesn't, it means you typed the line differently than the way it is listed. Immediately recheck your typing. Remember, don't type the rem statement with the checksum number; it is published only so you can check it against the number which appears on your screen.

The Proofreader is not picky with spaces. It will not notice extra spaces or missing ones. This is for your convenience, since spacing is generally not important. But occasionally proper spacing *is* important, so be extra careful with spaces, since the Proofreader will catch practically everything else that can go wrong.

There's another thing to watch out for: if you enter the line by using abbreviations for commands, the checksum will not match up. But there is a way to make the Proofreader check it. After entering the line, LIST it. This eliminates the abbreviations. Then move the cursor up to the line and press RETURN. It should now match the checksum. You can check whole groups of lines this way.

Special Tape SAVE Instructions

When you're done typing a listing, you must disable the Proofreader before SAVEing the program on tape. Disable the Proofreader by pressing RUN/STOP-RESTORE (hold down the RUN/STOP key and sharply hit the RESTORE key). This procedure is not necessary for disk SAVEs, *but you must disable the Proofreader this way before a tape SAVE.*

SAVE to tape erases the Proofreader from memory, so you'll have to LOAD and RUN it again if you want to type another listing. SAVE to disk does not erase the Proofreader.

Since the Proofreader is a machine language program stored in the cassette buffer, it will be erased during a tape SAVE or LOAD. If you intend to type in a program in more than one sitting or wish to make a safety SAVE, follow this procedure:

1. LOAD and RUN the Proofreader.
2. Disable it by pressing RUN/STOP–RESTORE.
3. Type the following three lines in direct mode (without line numbers):

```
A$="PROOFREADER.T":B$="{10 SPACES}":FO
RX=1TO4:A$=A$+B$:NEXTX
FORX=886 TO 1018:A$=A$+CHR$(PEEK(X)):N
EXTX
OPEN1,1,1,A$:CLOSE1
```

After you type the last line, you will be asked to press RECORD and PLAY. We recommend you start at the beginning of a new tape.

You now have a new version of the Proofreader (PROOFREADER.T, as renamed in the above code). Turn your computer off and on, then LOAD the program you were working on. Put the cassette containing PROOFREADER.T into the tape unit and type:

OPEN1:CLOSE1

You can now get into the Proofreader by typing SYS 886. To test this, PRINT PEEK (886) should return the number 173. If it does not, repeat the steps above, making sure that A$ (PROOFREADER.T) contains 13 characters and that B$ contains 10 spaces.

The new version of Automatic Proofreader will load itself into the cassette buffer whenever you type OPEN1:CLOSE1 and PROOFREADER.T is the next program on your tape. It will not disturb the contents of BASIC memory.

Automatic Proofreader For VIC And 64

```
100 PRINT"{CLR}PLEASE WAIT...":FORI=886TO
    1018:READA:CK=CK+A:POKEI,A:NEXT
110 IF CK<>17539 THEN PRINT"{DOWN}YOU MAD
    E AN ERROR":PRINT"IN DATA STATEMENTS.
    ":END
120 SYS886:PRINT"{CLR}{2 DOWN}PROOFREADER
     ACTIVATED.":NEW
886 DATA 173,036,003,201,150,208
892 DATA 001,096,141,151,003,173
898 DATA 037,003,141,152,003,169
904 DATA 150,141,036,003,169,003
910 DATA 141,037,003,169,000,133
916 DATA 254,096,032,087,241,133
922 DATA 251,134,252,132,253,008
928 DATA 201,013,240,017,201,032
934 DATA 240,005,024,101,254,133
940 DATA 254,165,251,166,252,164
946 DATA 253,040,096,169,013,032
952 DATA 210,255,165,214,141,251
958 DATA 003,206,251,003,169,000
964 DATA 133,216,169,019,032,210
970 DATA 255,169,018,032,210,255
976 DATA 169,058,032,210,255,166
982 DATA 254,169,000,133,254,172
988 DATA 151,003,192,087,208,006
994 DATA 032,205,189,076,235,003
1000 DATA 032,205,221,169,032,032
1006 DATA 210,255,032,210,255,173
1012 DATA 251,003,133,214,076,173
1018 DATA 003
```

Supertank

(Article on page 64.)

BEFORE TYPING...

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

```
10 PRINT"{CLR}{HOME}":RESTORE:V=53248:POK
   EV+32,0:POKEV+33,1:POKEV+17,PEEK(V+17)
   AND247                              :rem 174
15 PRINTTAB(53)"{BLU}{RVS}W*E*L*C*O*M*E!"
   :PRINTTAB(59)"{RED}{RVS}TO"         :rem 147
17 PRINTTAB(55)"{RED}{RVS}SUPERTANK!":PRI
   NT                                  :rem 158
20 FORQ=1TO4:PRINTTAB(14)"{5}{N}":NEXT
                                       :rem 50
22 PRINTTAB(14)"{N}{RVS}£{8 SPACES}{*}":
   PRINTTAB(14)"{RVS}£ Q Q{2 SPACES}QQQ
   {SPACE}{*}{OFF}{2 I}{8 O}{3 I}"
                                       :rem 209
24 PRINTTAB(13)"{RVS}£{2 SPACES}Q Q
   {3 SPACES}M{3 SPACES}{OFF}{2 U}{8 Y}
   {3 U}"                              :rem 207
26 PRINTTAB(13)"{RVS}{3 SPACES}QQQ
   {2 SPACES}QQQ{2 SPACES}{OFF}"       :rem 79
28 PRINT"{3 SPACES}{RVS}£{30 SPACES}{*}
   {OFF}"                              :rem 103
30 PRINT"{2 SPACES}{RVS}£{32 SPACES}{*}
   {OFF}"                              :rem 96
32 PRINT"{GRN}{2 +}{5}{RVS}{34 SPACES}
   {OFF}{GRN}{3 +}"                    :rem 236
34 PRINT"{3 +}{5}M W{RVS}£ {*}{OFF}W
   {RVS}£ {*}{OFF}W{RVS}£ {*}{OFF}W
   {RVS}£ {*}{OFF}W{RVS}£ {*}{OFF}W
   {RVS}£ {*}{OFF}W{RVS}£ {*}{OFF}WN
   {GRN}{4 +}"                         :rem 255
36 PRINT"{4 +}{5}M {RVS} Q {OFF} {RVS} Q
   {SPACE}{OFF} {RVS} Q {OFF} {RVS} Q
   {OFF} {RVS} Q {OFF} {RVS} Q {OFF}
   {RVS} Q {OFF}N{GRN}{5 +}"           :rem 148
38 PRINT"{5 +}{5}M{*}{RVS} {OFF}£W{*}
   {RVS} {OFF}£W{*}{RVS} {OFF}£W{*}
   {RVS} {OFF}£W{*}{RVS} {OFF}£W{*}
   {RVS} {OFF}£W{*}{RVS} {OFF}£{GRN}
   {6 +}"                              :rem 31
40 PRINT"{6 +}{5}{26 Y}{GRN}{7 +}"
                                       :rem 239
42 FORQ=1TO2:PRINT"{39 +}":NEXT        :rem 175
43 GOSUB800                            :rem 127
48 S=54272:FORL=STOS+24:POKEL,0:NEXT
                                       :rem 14
50 PRINT"{CLR}{HOME}{WHT}":POKEV+32,1:POK
   EV+33,0:PRINTTAB(120)               :rem 187
52 GOSUB1000                           :rem 168
60 PRINT"{CLR}{HOME}{WHT}":PRINTTAB(90)"T
   ANK SPECIFICATIONS"                 :rem 192
62 PRINTTAB(49)"{RVS}{GRN} STRONG {OFF}
   {3 SPACES}{RVS}{YEL} MEDIUM {OFF}
   {2 SPACES}{RVS}{WHT} WEAK {OFF}"
                                       :rem 65
64 PRINTTAB(40)"{GRN}{RVS}1.TIGER{OFF}
   {4 SPACES}ARMOR{5 SPACES}{YEL}FIRE
   {5 SPACES}{WHT}SPEED"               :rem 30
66 PRINTTAB(40)"{YEL}{RVS}2.T-34{OFF}
   {5 SPACES}{GRN}SPEED{5 SPACES}{YEL}ARM
   OR{4 SPACES}{WHT}FIRE"              :rem 44
68 PRINTTAB(40)"{WHT}{RVS}3.SHERMAN{OFF}
   {2 SPACES}{GRN}FIRE{6 SPACES}{YEL}SPEE
   D{4 SPACES}{WHT}ARMOR":PRINTTAB(120)
                                       :rem 62
70 PRINT:INPUT"{HOME}{15 DOWN}{3 SPACES}W
   HICH TANK DO YOU CHOOSE";TA         :rem 214
72 IFTA<1ORTA>3THEN80                  :rem 56
78 PRINT"{4 DOWN}{13 SPACES}GET READY !":
   FORQ=1TO500STEP.5:NEXT:GOTO85       :rem 10
80 PRINT"{HOME}{15 DOWN}{10 SPACES}YOU CA
   N'T DO THAT!{4 SPACES}":GOSUB1300:GOTO
   70                                  :rem 210
85 V=53248:GOSUB1100                   :rem 130
90 PRINT"{CLR}{HOME}":POKEV+32,0:POKEV+33
   ,1                                  :rem 56
92 PRINTTAB(7)"{RVS}{5}£{*}{OFF}
   {4 SPACES}{RVS}£{*}{OFF}{7 SPACES}
   {RVS}£{*}{OFF}{4 SPACES}{RVS}£{*}
   {OFF}{4 SPACES}{RVS}{BLK}SCORE" :rem 1
94 PRINT"{2 SPACES}{RVS}{5}£{*}{OFF}
   {2 SPACES}{RVS}£{2 SPACES}{OFF}
   {3 SPACES}{RVS}£{2 SPACES}{*}{OFF}
   {5 SPACES}{RVS}£{2 SPACES}{*}{OFF}
   {2 SPACES}{RVS}£{2 SPACES}{*}{OFF}
   {2 SPACES}{BLK}";SC                 :rem 52
96 PRINT" {RVS}{5}£{2 SPACES}{*}£
   {3 SPACES}{*}{OFF}{2 SPACES}{RVS}
   {4 SPACES}{*}{OFF}{2 SPACES}{RVS}£
   {5 SPACES}{OFF} {RVS}£{4 SPACES}{*}
   {OFF}{2 SPACES}{RVS}{BLK}ARMOR"
                                       :rem 171
98 PRINT"{RVS}{5}£{9 SPACES}{*}£
   {5 SPACES}{*}£{6 SPACES}£{6 SPACES}
   {*}{OFF}{BLK}";AR                   :rem 29
```


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```
100 FORQ=1TO17:PRINT"{RVS}{GRN}{39 +}":NE
    XT                                  :rem 64
110 PRINT"{RVS}{5}{Q}CCCCCCCCCC{W}{RIGHT}
    {13 SPACES}{*}{RIGHT}{Q}CCCCCCCCC
    {W}"                                :rem 65
112 PRINT"{RVS}{5}{Q}CCCCCCCCCC{W}
    {17 SPACES}{Q}CCCCCCCCC{W}"         :rem 129
114 GOSUB420                            :rem 172
120 CB=1:TI$="000000"                   :rem 34
150 POKEV+21,15:POKE2040,13:POKEV+39,0:PO
    KEV,170:POKEV+1,150:Y=170:X=150:SH=0
                                        :rem 27
151 POKE2042,193:POKEV+41,11:RF=0:UT=110:
    POKEV+42,0:POKE2043,195             :rem 206
152 POKE2041,14:POKEV+40,0:POKEV+2,X1:POK
    EV+3,Y1                             :rem 109
180 S=NOTPEEK(56321)AND15:U=SAND1:D=SAND2
    :L=SAND4:R=SAND8:Y1=0:X1=0          :rem 165
182 POKEV+23,0:POKEV+29,0               :rem 189
185 IFUTHENX=X-M1:IFX<110THENX=X+M1
                                        :rem 253
187 IFDTHENX=X+M1:IFX>180THENX=X-M1
                                        :rem 247
189 IFRTHENY=Y+M1:IFY>245THENY=Y-M1
                                        :rem 14
191 IFLTHENY=Y-M1:IFY<90THENY=Y+M1
                                        :rem 205
200 POKEV,Y:POKEV+1,X                   :rem 59
210 J=NOTPEEK(56321)AND16:IFJ=16THENGOSUB
    245                                 :rem 189
230 BO=BO+.5:GOSUB310:GOTO180           :rem 220
245 SH=SH+1:X1=X:MR=Y:HH=Y/2:GOSUB400
                                        :rem 64
247 FORDD=DDTOHHSTEP5:POKEV+2,DD:POKEV+3,
    X1:GOSUB330:NEXT                    :rem 224
250 POKE2041,15:FORDD=DDTOMRSTEP5:POKEV+2
    ,DD:POKEV+3,XJ:GOSUB330:NEXT        :rem 171
251 IF(PEEK(V+30)AND4)>0THENIF(PEEK(V+30)
    AND4)>0THENGOSUB253                 :rem 110
252 X1=0:DD=0:Y1=0:POKEV+2,X1:POKEV+3,MR:
    POKE2041,14:RETURN                  :rem 131
253 POKE2041,192:POKEV+23,2:POKEV+29,2
                                        :rem 184
254 POKEV+3,X1-10:POKEV+2,DD-12:GOSUB410:
    GOSUB495                            :rem 204
258 FORRE=1TO500:NEXT:POKEV+23,0:POKEV+29
    ,0                                  :rem 152
260 X1=0:DD=0:Y1=0:POKEV+2,X1:POKEV+3,MR:
    POKE2041,14:RETURN                  :rem 130
310 RF=RF+5:IFRF>215THEN350             :rem 95
315 POKEV+4,RF:POKEV+5,UT:RETURN        :rem 79
330 RF=RF+1.8:IFRF>215THENRF=0          :rem 48
333 IFRF=0THEN340                       :rem 243
335 POKEV+4,RF:POKEV+5,UT:RETURN        :rem 81
340 RF=0:UT=110:RS=INT(RND(0)*60):UT=UT+R
    S:GOTO330                           :rem 61
350 F1=RF:F2=UT:POKE2042,194:POKEV+6,F1:P
    OKEV+7,F2:GOSUB400                  :rem 77
355 FORQ=F2TO150STEP.4:POKEV+7,Q:NEXT:POK
    EV+29,8:POKEV+23,8:POKEV+6,F1-12
                                        :rem 55
360 F2=150:FORQ=F2TO230STEP.6:POKEV+7,Q:N
    EXT:GOSUB410                        :rem 73
390 POKEV+6,0:POKEV+7,0:POKEV+4,0:POKEV+5
    ,0:RF=0:POKEV+23,0:POKEV+29,0:rem 235
391 POKE2042,193:GOTO499                :rem 118
400 S=54272:FORL=STOS+24:POKEL,0:NEXT:POK
    ES+5,9:POKES+6,16:POKES+24,15       :rem 70
405 POKES+4,129:POKES+1,34:POKES,75:RETUR
    N                                   :rem 91
410 S=54272:FORL=STOS+24:POKEL,0:NEXT:POK
    ES+5,11:POKES+6,16:POKES+24,15
                                        :rem 112
415 POKES+4,129:POKES+1,54:POKES,111:RETU
    RN                                  :rem 133
420 S=54272:FORL=STOS+24:POKEL,0:NEXT:POK
    ES+5,11:POKES+6,56:POKES+24,15
                                        :rem 117
425 POKES+4,129:POKES+1,51:POKES,97:RETUR
    N                                   :rem 96
495 SC=SC+10:CB=0:RN=INT(RND(0)*15):CB=CB
    +RN:GOTO500                         :rem 95
499 AR=AR-1                             :rem 103
500 V=53248:PRINT"{HOME}":POKEV+32,0:POKE
    V+33,CB                             :rem 248
501 RF=0:UT=110:RS=INT(RND(0)*60):UT=UT+R
    S:RF=RF+1.5:                        :rem 211
502 PRINTTAB(7)"{RVS}{5}{*}{OFF}
    {4 SPACES}{RVS}{*}{OFF}{7 SPACES}
    {RVS}{*}{OFF}{4 SPACES}{RVS}{*}
    {OFF}{4 SPACES}{RVS}{BLK}SCORE"
                                        :rem 45
504 PRINT"{2 SPACES}{RVS}{5}{*}{OFF}
    {2 SPACES}{RVS}{2 SPACES}{OFF}
    {3 SPACES}{RVS}{2 SPACES}{*}{OFF}
    {5 SPACES}{RVS}{2 SPACES}{*}{OFF}
    {2 SPACES}{RVS}{2 SPACES}{*}{OFF}
    {2 SPACES}{BLK}";SC                 :rem 96
506 PRINT" {RVS}{5}{2 SPACES}{*}
    {3 SPACES}{*}{OFF}{2 SPACES}{RVS}
    {4 SPACES}{*}{OFF}{2 SPACES}{RVS}
    {5 SPACES}{OFF} {RVS}{4 SPACES}{*}
    {OFF}{2 SPACES}{RVS}{BLK}ARMOR"
                                        :rem 215
508 PRINT"{RVS}{5}{9 SPACES}{*}
    {5 SPACES}{*}{6 SPACES}{6 SPACES}
    {*}{OFF}{BLK}";AR                   :rem 73
509 IFAR=0THEN549                       :rem 254
510 RETURN                              :rem 118
549 LL=18:BL=12:BB=15                   :rem 169
550 PRINT"{HOME}":POKEV+32,0:POKEV+33,1
                                        :rem 214
558 FORQ=5TO7:PRINTTAB(Q)"{BLK}M"SPC(10)"
    M":NEXT                             :rem 41
560 PRINTTAB(7)"{BLK}N"SPC(11)"M"SPC(4)"N
    M"                                  :rem 29
561 PRINTTAB(6)"N"SPC(13)"M"SPC(2)"N"SPC(
    2)"M"                               :rem 58
562 PRINTTAB(5)"{BLK}N"SPC(15)"{BLK}MN"SP
    C(4)"M"                             :rem 177
563 PRINTTAB(5)"M"SPC(21)"N"SPC(3)"NM"
                                        :rem 142
564 PRINTTAB(6)"M"SPC(6)"NM"SPC(11)"N"SPC
    (3)"N"SPC(2)"M"                     :rem 136
565 PRINTTAB(7)"M"SPC(4)"N"SPC(2)"M"SPC(1
    0)"M"SPC(2)"N"SPC(4)"M"             :rem 52
566 PRINTTAB(8)"M"SPC(2)"N"SPC(4)"M"SPC(1
    0)"MN"SPC(6)"M"                     :rem 139
567 PRINTTAB(9)"MN"SPC(6)"M"SPC(17)"N"
                                        :rem 158
568 PRINTTAB(18)"M"SPC(15)"N":FORLB=1TO6:
    PRINTTAB(LL)"N"SPC(14)"N":LL=LL-1:NEX
    T                                   :rem 60
570 FORQ=1TO5:PRINTTAB(BL)"N"SPC(BB)"M":B
    L=BL-1:BB=BB+2:NEXT                 :rem 187
580 RESTORE:POKEV+23,0:POKEV+29,0:POKEV+2
    1,0:GOSUB420:FORQ=1TO500STEP.1:NEXT
                                        :rem 66
585 S=54272:FORL=STOS+24:POKEL,0:NEXT:GOS
    UB1200                              :rem 193
588 V=53248: BO=BO/10:XX=INT(BO):SC=SC+XX
    :IFSC>HSTHENHS=SC                   :rem 174
```

```
589 PRINT"{HOME}{CLR}":POKEV+32,0:POKEV+3
    3,1:POKE53281,1                    :rem 62
590 PRINTTAB(85)"{RVS}{2}B*O*N*U*S ";XX;S
    PC(3)"{RVS}SHOTS FIRED";SH:PRINTTAB(4
    5)"{RVS}YOUR";                     :rem 201
591 PRINT" SCORE";SC;SPC(3)"{RVS}HIGH SCO
    RE ";HS:PRINTTAB(49)"{RVS}YOUR RANK I
    S {BLK}";B$                        :rem 36
592 PRINTTAB(43)"{RVS}{2}YOUR TOTAL SURVI
    VING TIME ";TI$                    :rem 114
593 PRINTTAB(86)"{RVS}WANT TO PLAY AGAIN?
     (Y/N)"                            :rem 243
595 GETC$:IFC$=""THEN595               :rem 109
596 SC=0:B$="":IFC$="Y"THEN599         :rem 168
597 IFC$="N"THENSYS64738               :rem 164
598 C$="":GOTO595                      :rem 164
599 SH=0:SC=0:BO=0:XX=0:POKEV+32,1:POKEV+
    33,0:GOTO60                        :rem 172
800 S=54272:FORL=STOS+24:POKEL,0:NEXT:POK
    ES+5,9:POKES+6,0:POKES+24,15       :rem 19
801 READHF,LF,DR:IFHF=-1THENRETURN
                                       :rem 196
804 POKES+1,HF:POKES,LF:POKES+4,33:FORT=1
    TODR:NEXT:POKES+4,32:GOTO801       :rem 168
810 DATA18,209,1024,15,210,512,18,209,512
    ,16,195,1024,14,24,512,11,48,512
                                       :rem 45
811 DATA18,209,200,16,195,200,15,210,200,
    14,24,200,15,210,512,22,96,512
                                       :rem 178
812 DATA16,195,1024,11,48,1024,15,210,512
    ,14,24,200,12,143,200,11,48,200
                                       :rem 222
813 DATA10,143,200,11,48,200,12,143,200,1
    1,48,512,16,195,512,14,239,512
                                       :rem 185
814 DATA11,48,512,15,210,200,15,210,200,1
    4,24,200,12,143,200,11,48,200:rem 105
815 DATA10,143,200,11,48,200,12,143,200,1
    1,48,512,16,195,1024,22,96,512
                                       :rem 186
816 DATA18,209,1024,15,210,512,18,209,512
    ,16,195,1024,14,24,512,11,48,512
                                       :rem 51
817 DATA18,209,200,16,195,200,15,210,200,
    14,24,200,15,210,512,22,96,512
                                       :rem 184
818 DATA16,195,1024,11,48,1024,15,210,512
    ,14,24,200,12,143,200,11,48,200
                                       :rem 228
819 DATA10,143,200,11,48,200,12,143,200,1
    1,48,512,16,195,512,14,239,512
                                       :rem 191
820 DATA11,48,512,15,210,200,15,210,200,1
    4,24,200,12,143,200,11,48,200:rem 102
821 DATA10,143,200,11,48,200,12,143,200,1
    1,48,512,11,48,1024,-1,0,0         :rem 210
900 DATA255,255,255,128,24,1,128,24,1,128
    ,24,1,128,24,1,128,24,1,128,24,1
                                       :rem 35
905 DATA128,24,1,128,36,1,128,66,1,255,12
    9,255,128,66,1,128,36,1,128,24,1,128
                                       :rem 1
910 DATA24,1,128,24,1,128,24,1,128,24,1,1
    28,24,1,128,24,1,255,255,255       :rem 93
915 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,31,254,0,49,255,192,96,255
                                       :rem 88
920 DATA240,196,127,252,206,127,255,206,1
    27,255,196,127,252,96,255,240,49,255
                                       :rem 35
925 DATA192,31,254,0,0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0                          :rem 109
926 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,63,240,0,103,252,0,195,255
                                       :rem 66
927 DATA0,219,255,192,195,255,0,103,252,0
    ,63,240,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                                       :rem 207
928 DATA0,0,0,0,0,0,0,0                :rem 113
930 DATA0,0,2,34,128,4,0,64,2,146,128,16,
    0,16,10,73,32,64,0,4,17,140,96,64,0,4
                                       :rem 2
935 DATA17,17,16,64,0,4,8,136,136,64,0,4,
    17,17,16,32,0,8,8,136,128,16,0,16,2,7
    2                                  :rem 80
940 DATA128,4,0,64,0,0,0               :rem 184
945 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,64,0,0,
    64,0,0,64,0,0,64,0,0,126,0,0,255,255,
    0                                  :rem 221
947 DATA255,0,63,255,252,127,255,254,255,
    255,255,100,68,70,37,85,84,20,68,72
                                       :rem 243
950 DATA15,255,240,0,0,0,0,0,0,0,0,0,0
                                       :rem 228
955 DATA0,2,0,0,2,0,0,2,0,0,2,0,0,58,0,0,
    70,0,0,186,0,0,130,0,0,254,0,1,255,0
                                       :rem 128
960 DATA3,255,128,7,255,192,0,124,0,15,18
    7,224,8,186,32,15,187,224,8,130,32,15
                                       :rem 52
965 DATA131,224,0,0,0,0,0,0,0,0,0,0       :rem 83
970 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
    ,0,0,60,0,0,126,0,0,255,0,0,255,0,0
                                       :rem 41
975 DATA126,0,0,60,0,0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                                       :rem 178
1000 FORA1=832TO894:READQ1:POKEA1,Q1:NEXT
                                       :rem 22
1010 FORA2=896TO958:READQ2:POKEA2,Q2:NEXT
                                       :rem 38
1015 FORA3=960TO1022:READQ3:POKEA3,Q3:NEX
     T                                 :rem 70
1020 FORA4=12288TO12350:READQ4:POKEA4,Q4:
     NEXT                              :rem 226
1025 FORA5=12352TO12414:READQ5:POKEA5,Q5:
     NEXT                              :rem 228
1030 FORA6=12416TO12478:READQ6:POKEA6,Q6:
     NEXT                              :rem 239
1035 FORA7=12480TO12542:READQ7:POKEA7,Q7:
     NEXT                              :rem 241
1090 RETURN                            :rem 170
1100 IFTA=1THENAR=5:IFTA=1THENM1=1
                                       :rem 111
1105 IFTA=2THENAR=3:IFTA=2THENM1=2
                                       :rem 117
1110 IFTA=3THENAR=1:IFTA=3THENM1=3
                                       :rem 114
1150 RETURN                            :rem 167
1200 IFSC=0THENB$="TRAITOR"            :rem 144
1201 IFSC>0ANDSC<51THENB$="SOLDIER"
                                       :rem 138
1202 IFSC>52ANDSC<101THENB$="SERGEANT"
                                       :rem 53
1204 IFSC>101ANDSC<201THENB$="LIEUTENANT"
                                       :rem 3
1206 IFSC>201ANDSC<401THENB$="CAPTAIN"
                                       :rem 15
1208 IFSC>401ANDSC<601THENB$="MAJOR"
                                       :rem 142
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1210 IFSC>60ANDSC<80THENB$="COLONEL"
                                    :rem 30
1212 IFSC>80ANDSC<100THENB$="* GENERAL
     {SPACE}*"                      :rem 145
1214 IFSC>100THENB$="** MARSHAL **"
                                    :rem 179
1216 RETURN                         :rem 170
1232 GOTO500                        :rem 150
1300 FORI=1TO1500:NEXT:RETURN        :rem 94
```

Jump!

(Article on page 62.)

BEFORE TYPING...

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

Program 1: Jump!—VIC Version

```
3 GOTO2500                          :rem 51
5 CLR:Q=7680:GOSUB1000:N=8 :POKE36879,N:S
  1=36878:S4=36876:POKES1,15:S=0    :rem 175
10 POKE36879,N:W=3:PRINT"{CLR}"     :rem 186
20 A=8131:B=A:M=1:AC=1:A1=7798:A2=7801:Q2
   =1000                             :rem 5
22 PRINT"{CLR}{HOME}{GRN}SC=";L;"{WHT}A
   {GRN}=";W;"EN=";Q2               :rem 146
25 PRINT"{HOME}{21 DOWN}{22 +}";    :rem 47
30 FORX=8164TO8185:POKEX,99:NEXT     :rem 3
40 POKEB,32:POKEA,65:B=A            :rem 161
50 C=PEEK(197):D=PEEK(653):B=A:POKES1,15
                                    :rem 68
51 PRINT"{HOME}{23 SPACES}"         :rem 74
52 Q2=Q2-2:IFQ2<=0THENQ2=0          :rem 29
53 PRINT"{HOME}{PUR}SC=";L;"A=";W;"EN=";Q
   2;""                             :rem 221
54 IFQ2<0THEN480                    :rem 178
55 IFC=34THENA=A+1:GOTO300           :rem 48
60 IFC=33THENA=A-1:GOTO300           :rem 45
65 IFC=32ORC=15ORC=26THENE=A-22:GOTO400
                                    :rem 121
75 IFM>=5THEN90                     :rem 144
80 K=INT(18*RND(0)+7727)             :rem 38
85 POKEK,218:POKEK+1,223:POKEK-1,233
                                    :rem 87
86 IFAC=5THENAC=1:RETURN             :rem 46
87 M=5:GOTO50                         :rem 6
90 O=0:O=INT(64*RND(0)+1)           :rem 124
91 Z=K:M=5                           :rem 69
92 IFK<7728THENAZ=1:GOTO200         :rem 150
93 IFK>7743THENAZ=-1:GOTO200        :rem 195
94 IFO<P1THENQ=K+22:GOTO105         :rem 168
96 IFO>45THENK=K+1:POKEZ,32:POKEZ+1,32:PO
   KEZ-1,32:GOTO85                  :rem 232
97 IFO>25THENK=K-1:POKEZ,32:POKEZ+1,32:PO
   KEZ-1,32:GOTO85                  :rem 233
98 M=5                               :rem 48
99 IFAC=5THENAC=1:RETURN             :rem 50
100 GOTO50                           :rem 47
105 S=128:FORX=QTO8119STEP22:QX=X+22:IFPE
    EK(QX)=65THENPOKEX+22,42:POKE30742+X,
    7:GOTO500                       :rem 163
106 S=S+1:POKES4,S                   :rem 69
107 POKEX,93:NEXT                    :rem 48
108 POKES4,0:S=0:IFPEEK(QX)=90THENB=A:GOT
    O500                             :rem 42
109 POKEQX,93                        :rem 10
110 X=QX+22:T=PEEK(X):IFT=90THENFORX=QTO8
    141:POKEX,32:NEXTX:GOTO500       :rem 83
115 IFT=102THENPOKEX,230:POKEX-22,32
                                    :rem 164
120 IFT=230THENPOKEX,104:POKEX-22,32
                                    :rem 162
125 IFT=104THENPOKEX,32:POKEX-22,32:L=L-2
    5:IFL<=0THENL=0                 :rem 192
130 IFT=32THENPOKEX,32:POKEX-22,32:FORF=1
    TO10:NEXT:POKEX,32:POKEX-22,32
                                    :rem 202
155 FORX=QTO8119STEP22:POKEX,32:NEXT
                                    :rem 73
160 IFAC=5THENAC=1:RETURN            :rem 87
165 GOTO50                           :rem 58
200 Z=K:K=K+AZ                       :rem 71
205 POKEZ,32:POKEZ+1,32:POKEZ-1,32:GOTO85
                                    :rem 243
210 POKEK,218:POKEK+1,223:POKEK-1,233
                                    :rem 125
215 M=5:GOTO50                       :rem 47
300 IFD<>0ANDA<8140THENA=A-22:GOTO325
                                    :rem 185
301 AC=5:GOSUB75                    :rem 176
302 IFA<8120THENA=A+1:GOTO75         :rem 149
303 IFA>8141THENA=A-1:GOTO75         :rem 157
305 G=PEEK(A+22)                     :rem 98
310 IFPEEK(A)<>32THEN500            :rem 125
315 IFG=32ORG=104ORG=100THENPOKEA+22,42:P
    OKE30742+A,7:POKEB,32:GOTO500:rem 189
320 Q2=Q2-4:GOTO40                   :rem 16
325 IFA<8098THENA=A+23:GOTO50        :rem 213
326 IFA>8120THENA=A+20:GOTO50        :rem 199
328 Q2=Q2-9:AC=1:IFPEEK(A)<>32THEN500
                                    :rem 149
329 POKEB,32:POKEA,65:B=A            :rem 219
330 IFC=34THENA=A+24                 :rem 139
331 IFC=33THENA=A+20                 :rem 135
334 IFA<8120THENA=A+2                :rem 188
335 IFA>8141THENA=A-2                :rem 196
340 AC=5:GOSUB75:G=PEEK(A+22)        :rem 183
345 IFPEEK(A)<>32THEN500            :rem 133
350 IFG=32ORG=104ORG=100THENPOKEA+22,42:P
    OKEA+30742,7:POKEB,32:GOTO500:rem 188
352 POKEB,32:POKEA,65:B=A            :rem 215
355 GOTO90                           :rem 63
400 S=255:FORFC=ETO7746STEP-22:S=S-1:POKE
    S4,S:POKEFC,93:NEXTFC           :rem 170
402 POKES4,0                         :rem 168
405 J=FC:H=PEEK(J):IFH=32THEN410    :rem 159
407 GOTO450                          :rem 109
410 POKEJ,93:POKEJ-0,93               :rem 78
415 FORFC=ETO7724STEP-22:POKEFC,32:NEXTFC
                                    :rem 85
420 GOTO75                           :rem 59
450 POKEK,42:POKEK+1,42:POKEK-1,42
                                    :rem 235
455 FORCR=1TO150:NEXT                :rem 58
460 FORI=7724TO7745:POKEI,32:NEXT   :rem 17
465 Q2=Q2+25:L=L+50:M=1:U=U+P1:P=INT(U)
                                    :rem 45
470 IFP>25THENP=25                   :rem 66
475 GOTO415                         :rem 115
480 PRINT"{HOME}{10 DOWN}{3 RIGHT}OUT OF
    {SPACE}ENERGY !!":FORX=1TO2500:NEXT
                                    :rem 228
485 PRINT"{CLR}"                      :rem 5
500 FORI=1TO900:NEXT:POKES4,0       :rem 52
502 POKEK,32:POKEK+1,32:POKEK-1,32
                                    :rem 230
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503 FORFC=QTO8119STEP22:POKEFC,32:NEXT
                                    :rem 168
504 W=W-1:IFW>ØTHEN2Ø                :rem 1
505 IFL<1ØTHEN5Ø9                   :rem 223
506 IFL>9ANDL<1ØØTHEN51Ø            :rem 158
507 IFL>99ANDL<1ØØØTHEN511           :rem 9
508 IFL>999THEN512                  :rem 40
509 PRINT"{HOME}{9 RIGHT}Ø":GOTO513
                                    :rem 195
510 PRINT"{HOME}{1Ø RIGHT}Ø":GOTO513
                                    :rem 216
511 PRINT"{HOME}{11 RIGHT}Ø":GOTO513
                                    :rem 246
512 PRINT"{HOME}{12 RIGHT}Ø"         :rem 8
513 PRINT"{HOME}{1Ø DOWN}{6 RIGHT}GAME OV
    ER!"                            :rem 76
515 FORI=1TO25ØØ:NEXT               :rem 28
517 PRINT"{CLR}"                     :rem 1
520 B$="BATTLE AGAIN ?"             :rem 217
525 FORI=1TOLEN(B$):PRINT"{UP}"TAB(4)LEFT
    $(B$,I)                         :rem 230
530 FORK=1TO125:NEXT:NEXT           :rem 101
532 PRINT:PRINT:PRINT               :rem 181
535 B1$="(Y/N)"                     :rem 220
540 FORI=1TOLEN(B1$):PRINT"{UP}";TAB(8)LE
    FT$(B1$,I)                      :rem 132
545 FORK=1TO125:NEXT:NEXT           :rem 107
550 FORV=1TO1Ø:GETA$:NEXT            :rem 65
551 GETYN$:IFYN$=""THEN551           :rem 37
555 IFYN$="N"THENEND                :rem 206
560 GOTO5                            :rem 9
1000 PRINT"{CLR}DIFFICULTY LEVELS {DOWN}
     {18 LEFT}{18 T}{DOWN}"         :rem 133
1005 PRINT"{DOWN}1-BEGINNER"         :rem 80
1010 PRINT"{DOWN}2-ROOKIE"          :rem 204
1015 PRINT"{DOWN}3-PRO"             :rem 250
1020 PRINT"{DOWN}4-EXPERT"          :rem 222
1025 PRINT"{DOWN}5-RANDOM"          :rem 205
1030 GETDF$:DF=VAL(DF$):IFDF=1THENP1=1Ø
                                    :rem 68
1035 IFDF=2THENP1=12                :rem 161
1040 IFDF=3THENP1=14                :rem 160
1045 IFDF=4THENP1=16                :rem 168
1050 IFDF=5THENP1=RND(Ø)*16          :rem 52
1055 IFDF<1ORDF>5THEN1Ø3Ø           :rem 226
1060 RETURN                         :rem 167
2500 POKE36879,8:A$="{PUR}J{3 SPACES}U
     {3 SPACES}M{3 SPACES}P {GRN}"
                                    :rem 129
2510 PRINT"{CLR}":FORI=1TOLEN(A$)    :rem 60
2512 FORK=1TO155:NEXT                :rem 33
2515 PRINTTAB(4)"{UP}";LEFT$(A$,I):NEXT
                                    :rem 185
2520 PRINT"{3 DOWN}{3 SPACES}READY TO BAT
     TLE?":PRINT"{2 DOWN}{8 SPACES}{RVS}Y
     {OFF} / {RVS}N{OFF}"           :rem 43
2575 GETY$:IFY$=""THEN2575          :rem 249
2580 IFY$="N"THENEND                :rem 176
2590 GOTO5                          :rem 62
```

Program 2: Jump!—64 Version

```
100 GOSUB1160                       :rem 217
110 CLR:S=54272:LO=54296:GOSUB940:rem 180
120 C=PEEK(197):D=PEEK(653)         :rem 249
125 Q$=STR$(Q2)+"{2 SPACES}":IFQ2<=ØTHENQ
    $="Ø{3 SPACES}"                 :rem 244
130 PRINT"{HOME}{GRN}{3 SPACES}SC = ";L;"
    {2 SPACES}LIVES = ";WW;"{4 SPACES}EN
    {SPACE}= ";Q$                   :rem 23
140 IFQ2=<ØTHEN749                  :rem 35
150 IF(C=2Ø)AND(A+2+2*D<4Ø)THEN28Ø:rem 78
160 IF(C=12)AND(A-2-2*D>-1)THEN3ØØ:rem 73
170 IFC=23ORC=1ORC=6ØTHENQ2=Q2-2Ø:GOTO53Ø
                                    :rem 241
180 BZ=AZ+INT(55*RND(Ø))-3Ø:T1=SGN(BZ-AZ)
                                    :rem 150
200 IF (AZ-BZ) > (29-P1) THEN 630 :rem 70
210 IF BZ<3ØORBZ>31Ø THEN 18Ø       :rem 52
220 IF T1=1THENA1=AZ:A2=BZ:GOTO24Ø:rem 30
230 A1=BZ:A2=AZ                     :rem 101
240 FORI=A1TOA2STEPT1*6             :rem 172
250 IF I<256 THEN POKEV+16,PEEK(V+16)AND2
    54:POKEV,I:NEXT:AZ=BZ:GOTO12Ø:rem 231
260 POKEV+16,PEEK(V+16)OR1:POKEV,I-256:NE
    XT:AZ=BZ:GOTO12Ø                :rem 54
270 M=5:GOTO12Ø                     :rem 94
275 REM MOVE BASE SHIP               :rem 8
280 IF D<>ØTHEN39Ø                  :rem 226
290 A=A+2:B1=BX+16:GOTO32Ø          :rem 213
300 IF D<>ØTHEN46Ø                  :rem 217
310 A=A-2:B1=BX-16                  :rem 202
320 Q2=Q2-5:T1=SGN(B1-BX):IFT1=1THENA1=BX
    :A2=B1:GOTO34Ø                  :rem 68
330 A1=B1:A2=BX                     :rem 60
340 FORI=A1TOA2STEPT1*4             :rem 171
350 IF I<256 THEN POKEV+16,PEEK(V+16)AND2
    53:POKEV+2,I:NEXT:BX=B1:GOTO37Ø
                                    :rem 33
360 POKEV+16,PEEK(V+16)OR2:POKEV+2,I-256:
    NEXT:BX=B1                      :rem 101
370 IF PEEK(1904+A)<>32ANDPEEK(1905+A)<>3
    2THEN18Ø                        :rem 227
380 W=W-1:GOSUB 733:GOTO 12Ø        :rem 65
385 REM JUMP RIGHT                   :rem 62
390 A=A+4:FORI=BXTOBX+16STEP2:Y=Y-2
                                    :rem 192
400 IF I<256 THEN POKEV+16,PEEK(V+16)AND2
    53:POKEV+2,I:POKEV+3,Y:NEXT:GOTO42Ø
                                    :rem 55
410 POKEV+16,PEEK(V+16)OR2:POKEV+2,I-256:
    POKEV+3,Y:NEXT                  :rem 127
420 FORI=BX+16TOBX+32STEP2:Y=Y+2 :rem 240
430 IF I<256 THEN POKEV+16,PEEK(V+16)AND2
    53:POKEV+2,I:POKEV+3,Y:NEXT:GOTO45Ø
                                    :rem 61
440 POKEV+16,PEEK(V+16)OR2:POKEV+2,I-256:
    POKEV+3,Y:NEXT                  :rem 130
450 BX=BX+32:IF PEEK(1904+A)<>32ANDPEEK(1
    905+A)<>32THEN18Ø               :rem 29
455 GOSUB 731:GOTO 12Ø              :rem 191
458 REM JUMP LEFT                   :rem 236
460 A=A-4:FORI=BXTOBX-16STEP-2:Y=Y-2
                                    :rem 239
470 IF I<256 THEN POKEV+16,PEEK(V+16)AND2
    53:POKEV+2,I:POKEV+3,Y:NEXT:GOTO49Ø
                                    :rem 69
480 POKEV+16,PEEK(V+16)OR2:POKEV+2,I-256:
    POKEV+3,Y:NEXT                  :rem 134
490 FORI=BX-16TOBX-32STEP-2:Y=Y+2 :rem 40
500 IF I<256 THEN POKEV+16,PEEK(V+16)AND2
    53:POKEV+2,I:POKEV+3,Y:NEXT:GOTO52Ø
                                    :rem 57
510 POKEV+16,PEEK(V+16)OR2:POKEV+2,I-256:
    POKEV+3,Y:NEXT                  :rem 128
520 BX=BX-32:IF PEEK(1904+A)<>32ANDPEEK(1
    905+A)<>32THEN18Ø               :rem 29
525 GOSUB 731:GOTO 12Ø              :rem 189
530 A1=1Ø6:POKES+4,33               :rem 139
540 II=Ø:FORI=1784TO1144STEP-40:POKEI+A,A
    1:POKEI+A+S,1:POKES+1,II:II=II+3
                                    :rem 209
550 IFPEEK(V+31)=1THEN CR=1:NEXT:GOTO57Ø
                                    :rem 172
```

```
560 NEXT                                :rem 218
570 POKES+4,32:IF A1=32ANDCR<>1 THEN 180
                                        :rem 198
580 IF CR=1 AND A1=32 THEN 600          :rem 219
590 A1=32:CR=0:GOTO540                  :rem 250
600 POKEV+21,2:T1=INT((AZ-BX)/8)        :rem 89
610 FORI=1104+A+T1TO1104+A+T1+3:POKEI,42:
    POKEI+S,2:NEXTI:GOSUB740            :rem 178
615 FORI=1104+A+T1TO1104+A+T1+3:POKEI,32:
    POKEI+S,2:NEXTI:CR=0                :rem 157
620 L=L+50:Q2=Q2+45:POKEV+21,3:AZ=INT(RND
    (1)*200)+40:POKEV,AZ:GOTO 120       :rem 69
625 REM SHOOT AT BASE                   :rem 190
630 POKES+4,33:II=120:A1=106:T1=INT(AZ/8)
    -2                                  :rem 193
640 FORI=1144TO1864STEP40:POKEI+T1,A1:POK
    EI+S+T1,1:POKES+1,II:II=II-3        :rem 245
650 IF PEEK(V+31)=2THENCR=1:NEXT:GOTO670
                                        :rem 175
660 NEXT                                :rem 219
670 POKES+4,32:IFA1=32THEN 690          :rem 186
680 A1=32:GOTO 640                      :rem 191
690 IF CR=1 THEN GOSUB731:GOTO120:rem 129
710 W=PEEK(1904+T1):IFW=102THENPOKE1904+T
    1,230:GOTO120                       :rem 179
715 W=PEEK(1904+T1):IFW=230THENPOKE1904+T
    1,32:GOSUB740:GOTO120               :rem 223
720 W=PEEK(1944+T1):IFW=102THENPOKE1944+T
    1,32:GOSUB740:GOTO120               :rem 225
730 GOTO 800                            :rem 107
731 REM BASE DESTROYED                   :rem 77
733 POKEV+21,1:POKE1864+A,42:POKE1865+A,4
    2:POKE1864+A+S,2:POKE1865+A+S,2
                                        :rem 139
734 POKES+4,129:POKES+1,90              :rem 244
735 FORI=1TO300:NEXT:POKES+4,128:IF WW=1
    {SPACE}THEN 800                     :rem 122
736 WW=WW-1:POKE1864+A,32:POKE1865+A,32:P
    OKEV+31,0:CR=0                      :rem 240
737 A=0:POKEV+16,PEEK(V+16)AND253:POKEV+2
    1,3                                  :rem 67
738 FORA=0TO32STEP2:IFPEEK(1904+A)<>102OR
    PEEK(1905+A)<>102THENNEXTA          :rem 65
739 BX=A*8+24:POKEV+2,BX:RETURN         :rem 170
740 POKES+4,129:POKES1,30:FORI=1TO50:NEXT
    :POKES+4,128:RETURN                  :rem 21
749 PRINT"{HOME}{10 DOWN}{12 RIGHT}OUT OF
     ENERGY !!":FORX=1TO2500:NEXT:rem 241
750 PRINT"{CLR}"                         :rem 0
760 POKES4,0                            :rem 175
800 POKE53269,0:PRINT"{HOME}{10 DOWN}
    {15 SPACES}GAME OVER"               :rem 74
810 FORI=1TO1500:NEXT                   :rem 25
820 PRINT"{CLR}"                        :rem 254
830 POKEV+21,0:PRINT"{CLR}":B$="
    {5 SPACES}BATTLE AGAIN ?":B1$="
    {3 SPACES}(Y/N)"                    :rem 157
840 FORI=1TOLEN(B$):PRINT"{UP}"TAB(8)LEFT
    $(B$,I)                             :rem 234
850 FORK=1TO125:NEXT:NEXT               :rem 106
860 PRINT:PRINT:PRINT                   :rem 185
870 B1$="{8 SPACES}(Y/N)"               :rem 222
880 FORI=1TOLEN(B1$):PRINT"{UP}";TAB(8)LE
    FT$(B1$,I)                          :rem 139
890 FORK=1TO125:NEXT:NEXT               :rem 110
900 FORV=1TO10:GETA$:NEXT                :rem 64
910 GETYN$:IFYN$=""THEN910              :rem 35
920 IFYN$="N"THENEND                    :rem 202
930 GOTO110                             :rem 103
940 PRINT"{CLR}DIFFICULTY LEVELS{DOWN}
    {17 LEFT}{17 T}{DOWN}"              :rem 33
950 PRINT"{DOWN}1-BEGINNER"             :rem 40
960 PRINT"{DOWN}2-ROOKIE"               :rem 169
970 PRINT"{DOWN}3-PRO"                  :rem 211
980 PRINT"{DOWN}4-EXPERT"               :rem 188
990 PRINT"{DOWN}5-RANDOM"               :rem 167
995 PRINT"{2 DOWN} CHOOSE 1-5"          :rem 238
1000 GETP1$:P1=VAL(P1$)                  :rem 23
1040 IFP1=5THENP1=RND(0)*6              :rem 249
1050 IFP1<1ORP1>5THEN1000               :rem 200
1060 FORI=STOLO:POKEI,0:NEXTI:POKELO,15:P
     OKES+5,130:POKES+6,72              :rem 185
1070 V=53248:POKEV+21,7:POKE2040,13:POKE2
     041,14:POKE2042,14                  :rem 83
1080 POKEV+39,3                          :rem 68
1090 POKE V+28,1:POKEV+37,1:POKEV+38,5:PO
     KEV+39,2:POKEV+40,1:POKEV+4,150
                                        :rem 231
1100 POKE53280,0:POKE53281,0:W=3:PRINT"
     {CLR}"                             :rem 182
1110 A=0:BX=24:B=A:M=1:AC=1:A1=1232:A2=12
     35:Q2=1000:CO=V:AZ=200:B1=BX:Y=205
                                        :rem 18
1120 WW=3:FORX=1904TO1983:POKEX,102:POKEX
     +S,5:NEXTX                         :rem 207
1130 FORX=1984TO2023:POKEX,99:POKEX+S,1:N
     EXT                                :rem 245
1140 POKEV+16,0:POKEV,AZ:POKEV+1,60:POKEV
     +2,BX:POKEV+3,205                   :rem 46
1150 RETURN                             :rem 167
1160 POKE53281,0:POKE53280,0:A$="{PUR}J
     {3 SPACES}U{3 SPACES}M{3 SPACES}P
     {GRN}"                             :rem 51
1200 RESTORE:PRINT"{CLR}{3 DOWN}
     {8 SPACES}J";                      :rem 61
1210 FORK=0TO42:READQ:POKE832+K,Q:NEXT
                                        :rem 133
1220 PRINT"{6 SPACES}U";:FORK=43TO85:READ
     Q:POKE832+K,Q:NEXT                 :rem 95
1230 PRINT"{6 SPACES}M";:FORK=86TO127:REA
     DQ:POKE832+K,Q:NEXT:PRINT"{6 SPACES}
     P"                                 :rem 231
1250 PRINT"{4 DOWN}{11 SPACES}READY TO BA
     TTLE"                              :rem 177
1260 PRINT"{15 SPACES}{RVS}Y{OFF} / {RVS}
     N{OFF}"                            :rem 184
1280 GETY$:IFY$=""THEN1280              :rem 233
1290 IFY$="N"THENEND                    :rem 173
1300 RETURN                             :rem 164
1310 DATA000,000,000,000,000,000,000,000
                                        :rem 147
1320 DATA000,000,000,000,001,085,064,006
                                        :rem 178
1330 DATA190,144,026,190,164,085,085,085
                                        :rem 236
1340 DATA085,085,085,080,020,005,085,085
                                        :rem 230
1350 DATA085,085,085,085,031,235,244,007
                                        :rem 234
1360 DATA235,208,001,085,064,005,000,080
                                        :rem 209
1370 DATA020,000,020,080,000,005,000,000
                                        :rem 170
1380 DATA000,000,000,000,000,000,000,254
                                        :rem 165
1390 REM                                :rem 177
1400 DATA000,000,000,001,000,000,001,000
                                        :rem 149
1410 DATA000,001,000,000,003,128,000,003
                                        :rem 166
1420 DATA128,000,003,128,000,007,192,000
                                        :rem 193
1430 DATA015,224,000,031,240,000,127,252
                                        :rem 193
```

```
1440 DATA000,227,142,000,227,142,000,127
                                    :rem 197
1450 DATA252,000,063,248,000,096,012,000
                                    :rem 202
1460 DATA220,118,000,159,242,000,220,118
                                    :rem 204
1470 DATA000,096,012,000,063,248,000,255
                                    :rem 207
```

Descent To Kaylon

(Article on page 66.)

BEFORE TYPING...

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

Program 1:

Descent To Kaylon—VIC Version

```
0 POKE56,28:POKE52,28:CLR           :rem 225
1 POKE36869,255:POKE36879,25:PRINT"{BLK}
  {CLR}{RVS}{DOWN}WELCOME TO THE PLANET K
  AYLON":GOTO1202                   :rem 240
6 CL=.:V=36878:POKEV,15:S1=V-1:SR=1
                                    :rem 90
10 PRINT"{CLR}{BLK}":BS=4           :rem 149
20 FORD=7424TO7424+63:READY:POKED,Y:NEXT
                                    :rem 253
22 FORD=1TO6:READNO%(D):NEXT        :rem 252
30 LF=3:PO=7724+21:C=30720          :rem 147
31 TB$="{RVS}**********************"
                                    :rem 49
49 M$(1)=" ":M$(2)="$":CO=(LV+1)/50
                                    :rem 160
50 FORD=1TO3:MA$="":FORAS=1TO22     :rem 107
51 B=1:IFRND(TI)>.9-COTHENB=2       :rem 245
55 MA$=MA$+M$(B):NEXT               :rem 179
56 IFD=1THENA$=MA$                  :rem 47
57 IFD=2THENB$=MA$                  :rem 50
58 IFD=3THENC$=MA$                  :rem 53
59 NEXT                             :rem 173
98 PRINT"{HOME}{RED}{RVS}SCORE{8 SPACES}L
   EFT"                             :rem 42
99 PRINT"{RVS}HIGH{9 SPACES}LEVEL":PRINT"
   {BLK}{RVS}**********************
                                    :rem 248
* 100 PRINT"{HOME}{RED}{5 RIGHT}{RVS}"SC:PR
     INT"{HOME}{RVS}{RED}"TAB(17)LF:PRINT"
     {HOME}{DOWN}{RVS}{BLK}{5 RIGHT}"HI:PR
     INT"{HOME}{DOWN}{RVS}{RED}"TAB(18)LV+
     1                              :rem 23
  101 PRINT"{HOME}{BLK}{5 DOWN}"A$;:PRINT"
      {2 DOWN}"B$                   :rem 142
  103 PRINT"{PUR}{DOWN}{3 SPACES}{{
      {3 SPACES}{{{3 SPACES}{{{{{{{BLK}"
                                    :rem 79
  104 PRINT"{DOWN}"C$"{2 DOWN}"A$   :rem 169
  105 PRINT"{GRN}{{{"SPC(16)"{{{{{{{"SPC(14
      )"{{{{{{{{{"SPC(12)"{{{{{{{{{{{PUR}
      {RVS}{P}{OFF}{GRN}{";         :rem 108
  106 PRINT"{GRN}{{PUR}{RVS}{P}{OFF}{GRN}{{
      {PUR}{RVS}{P}{OFF}{GRN}{{{PUR}{RVS}
      {P}{OFF}{GRN}{{{{{";:POKE8185,33:POKE
      8185+C,5                      :rem 17
  185 PRINT"{BLK}";:PO=7724+21      :rem 178
  189 FORX=2TO20:POKEPO+X,34:POKEPO+C,CL
                                    :rem 164
  190 PRINT"{HOME}{DOWN}{BLK}{DOWN}"LEFT$(T
      B$,X)"{OFF}%{DOWN}{3 LEFT} '{RIGHT}&"
                                    :rem 91
  191 FORD=1TO20:P=PEEK(197):IFP=32THEN200
                                    :rem 147
  192 NEXT:NEXT:PRINT"{HOME}{2 DOWN}"TAB(X-
      2)"{RVS}*{DOWN}{2 LEFT}{3 SPACES}":GO
      TO189                         :rem 233
  200 PO=PO+X:PO=PO+22:POKEPO-22,228:POKEPO
      ,34:POKEPO+C,CL               :rem 1
  219 A$=RIGHT$(A$,21)+LEFT$(A$,1):B$=RIGHT
      $(B$,1)+LEFT$(B$,21)          :rem 5
  220 C$=RIGHT$(C$,1)+LEFT$(C$,21):PRINT"
      {HOME}{5 DOWN}"A$;:PRINT"{2 DOWN}"B$:
      PRINT"{4 DOWN}"C$"{2 DOWN}"A$:rem 215
  226 M=M+1:IFM>SRTHENM=.:POKEPO,32:PO=PO+2
      2:ON-(PEEK(PO)<>32)GOTO500:POKEPO,34
                                    :rem 60
  227 POKEPO+C,CL:OD=PEEK(PO):ON-((OD<>34)A
      ND(OD<>32))GOTO500            :rem 47
  230 P=PEEK(197):IFP<>32THEN233    :rem 248
  231 M=.:POKES1,200:LS=PEEK(PO+22):CM=(PEE
      K(C+PO+22))AND7               :rem 39
  232 POKEPO+22,35:POKEPO+22+C,2:POKEPO+22,
      LS:POKEPO+22+C,CM:POKES1,.:GOTO219
                                    :rem 100
  233 IFP>18THEN219                 :rem 233
  234 ON-(P=18)GOTO350              :rem 123
  235 ON-(P=17)GOTO300:GOTO219      :rem 133
  300 IFPEEK(PO-1)<>32THEN500       :rem 56
  302 POKEPO,32:PO=PO-1:POKEPO,34:POKEPO+C,
      CL:GOTO219                    :rem 226
  350 IFPEEK(PO+1)<>32THEN500       :rem 59
  352 POKEPO,32:PO=PO+1:POKEPO,34:POKEPO+C,
      CL:GOTO219                    :rem 229
  500 IFPEEK(PO)>128THEN600         :rem 215
  502 POKEV,.:POKES1,200:POKEPO-22+C,2
                                    :rem 134
  503 FORD=15TO.STEP-.5:POKEV,D     :rem 50
  504 POKEPO-22,219:FORS=.TO20:NEXT:POKEPO-
      22,214:FORS=.TO20:NEXT:NEXT:POKES1,.:
      POKEV,15                      :rem 231
  510 FORD=200TO150STEP-.5:POKES1-2,D:NEXT:
      POKES1-2,.:LF=LF-1            :rem 105
  511 ON-(LF<=.)GOTO1200:PRINT"{RVS}{HOME}
      {RED}"TAB(17)LF"{BLK}":IFPEEK(PO)=34T
      HENPOKEPO,32                  :rem 57
  513 POKEPO-22,32:PRINT"{HOME}{DOWN}{BLK}
      {DOWN}"LEFT$(TB$,X)"{RVS}*{DOWN}
      {3 LEFT}{4 SPACES}":GOTO185   :rem 70
  600 POKEPO,34:POKEPO+C,.:BS=BS-1:IFBS=.TH
      ENSC=SC+100:GOTO700           :rem 237
  602 SC=SC+100:POKES1-1,200:FORS=0TO200:NE
      XT:POKES1-1,.:PRINT"{HOME}{RIGHT}
      {RVS}{2 RIGHT}{RED}{2 RIGHT}"SC
                                    :rem 109
  603 PRINT"{HOME}{DOWN}{BLK}{DOWN}"LEFT$(T
      B$,X)"{RVS}*{DOWN}{3 LEFT}{4 SPACES}"
      :GOTO185                      :rem 28
  700 PRINT"{HOME}{RVS}{5 DOWN}{3 RIGHT}BON
      US LEVEL"LV+1"{LEFT}X":Q1=36876:Q2=36
      875:POKEV,15                  :rem 206
  702 FORX=1TO6:POKEQ1,NO%(X):POKEQ2,NO%(X)
                                    :rem 36
  703 FORT=1TO150:NEXT:IFNO%(X)=235THENFORT
      =.TO200:NEXT                  :rem 131
  704 NEXT:POKEQ1,.:POKEQ2,.        :rem 101
  710 SC=SC+((LV+1)*100):LV=LV+1:BS=4:FORD=
```

```
    .TO1000:NEXT:PRINT"{CLR}":GOTO31
                                        :rem 0
1000 DATA,,,,,,,                        :rem 15
1002 DATA170,255,255,255,255,255,255,170
                                        :rem 233
1004 DATA24,60,102,126,126,24,36,195
                                        :rem 18
1006 DATA24,36,66,66,36,24,24,0         :rem 33
1008 DATA24,60,126,254,127,60,8,0:rem 127
1010 DATA0,0,0,0,0,0,126,255            :rem 101
1012 DATA170,255,255,255,255,254,252,248
                                        :rem 236
1014 DATA85,255,255,255,255,127,63,31
                                        :rem 88
1015 DATA215,225,231,235,231,235        :rem 78
1200 IFSC>HITHENHI=SC:PRINT"{HOME}{DOWN}
     {5 RIGHT}{RVS}{RED}"HI             :rem 201
1201 PRINT"{CLR}{4 DOWN}{6 RIGHT}{RVS}
     {BLK}GAME OVER"                    :rem 18
1202 PRINT"{DOWN}{RVS}PRESS:{DOWN}":PRINT
     "{RVS}(SPACE) TO RELEASE.{3 SPACES}T
     HEN (SPACE) TO FIRE"               :rem 242
1203 PRINT"{RVS}RETRO-ROCKETS"          :rem 125
1204 PRINT"{RVS}(A)-TO MOVE LEFT
     {6 SPACES}(D)-TO MOVE RIGHT":rem 136
1212 PRINT"{DOWN}{RVS}{2 RIGHT}PRESS ANY
     {SPACE}KEY..."                     :rem 220
1214 POKE198,.:WAIT198,1:GETR$          :rem 241
1215 LV=.:SC=.:M=.:RESTORE:CO=.:GOTO6
                                        :rem 65
```

Program 2:

Descent To Kaylon—64 Version

```
5 POKE53281,13:POKE53280,13:PRINT"{CLR}"C
  HR$(142):POKE52,48:POKE56,48:CLR
                                        :rem 104
10 POKE51,0:POKE55,0                    :rem 129
15 POKE214,12:PRINT:POKE211,3:PRINT"{BLK}
   LOADING CHARACTERS.....PLEASE WAIT"
                                        :rem 90
20 POKE56334,PEEK(56334)AND254:POKE1,PEEK
   (1)AND251                            :rem 131
25 FORI=0TO511:POKEI+12288,PEEK(I+53248):
   POKEI+12800,PEEK(I+53760)            :rem 47
30 POKEI+13312,PEEK(I+54272):NEXT:rem 147
35 POKE1,PEEK(1)OR4:POKE56334,PEEK(56334)
   OR1                                  :rem 87
40 FORD=12544TO12544+63:READY:POKED,Y:NEX
   T                                    :rem 93
45 POKE53281,6:POKE53280,12:PRINT"{WHT}
   {CLR}{DOWN}{6 SPACES}{RVS}WELCOME TO T
   HE PLANET KAYLON{5 DOWN}"            :rem 52
50 SD=54272:FORL=SDTOSD+24:POKEL,0:NEXT:P
   OKESD+9,14                           :rem 200
55 POKESD+6,240:POKESD+24,15:HF=SD+1:FL=S
   D:GOTO440                            :rem 25
60 PRINT"{CLR}":CL=0:SR=1:BS=4:POKE53272,
   (PEEK(53272)AND240)OR12              :rem 92
65 LF=3:C=SD                            :rem 190
70 TB$="********************************
   **********"                         :rem 34
75 M$(1)=" ":M$(2)="$":CO=(LV+1)/50
                                        :rem 159
80 FORD=1TO3:MA$="":FORAS=1TO40         :rem 110
85 B=1:IFRND(TI)>.9-COTHENB=2           :rem 252
90 MA$=MA$+M$(B):NEXT                   :rem 178
95 ONDGOTO100,105,110                   :rem 153
100 A$=MA$:GOTO115                      :rem 239
105 B$=MA$:GOTO115                      :rem 245
110 C$=MA$                              :rem 232
115 NEXT                                :rem 214
118 POKE53280,1:POKE53281,1             :rem 241
120 D$="!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
    !!!!!!!"                           :rem 164
125 PRINT"{HOME}{RED}{RVS}SCORE{OFF}"TAB(
    31)"{RVS}LEFT{OFF}":PRINT"{RVS}HIGH
    {OFF}"TAB(31)"{RVS}LEVEL{OFF}":rem 18
130 PRINT"{BLK}************************
    **************"                   :rem 245
135 PRINT"{HOME}{RED}"TAB(6)SCTAB(36)LF:P
    RINT"{HOME}{DOWN}"TAB(6)HITAB(36)LV+1
                                        :rem 93
140 PRINT"{HOME}{BLK}{5 DOWN}"A$"{2 DOWN}
    "B$                                 :rem 143
145 PRINT"{PUR}!!!!!!!{2 SPACES}!!!!!!! !!
    !!!!{2 SPACES}!!{2 SPACES}!!!!! !!!!!
    !"                                  :rem 39
150 PRINT"{BLK}{DOWN}"C$"{2 DOWN}"A$:E$="
    {HOME}{20 DOWN}"                    :rem 197
155 PRINTE$"{43}!!!!!"SPC(30)"!!!!!";
                                        :rem 207
160 PRINT"{43}!!!!!!!!!!"SPC(20)"!!!!!!!!!
    !";:PRINT"{43}"D$;                  :rem 240
165 POKE1915,100:POKE1915+C,5:POKE1921,10
    0:POKE1921+C,5:POKE1925,100         :rem 79
170 POKE1925+C,5:POKE1930,100:POKE1930+C,
    5                                   :rem 95
175 PRINT"{BLK}":PO=1144:X=1:D=0        :rem 201
180 X=X+1:IFX>38THEN205                 :rem 114
185 POKEPO+C+X,CL:POKEPO+X,34:PRINT"
    {HOME}{DOWN}{BLK}{DOWN}"LEFT$(TB$,X)"
    {OFF}%{DOWN}{3 LEFT} '{RIGHT}&":GOSUB
    360                                 :rem 132
190 D=D+1:P=PEEK(197):IFP=60THEN210
                                        :rem 23
195 IFD>38THEN180                       :rem 227
200 GOTO190                             :rem 101
205 PRINT"{HOME}{2 DOWN}"TAB(X-1)"*{DOWN}
    {2 LEFT}{5 SPACES}":GOTO175         :rem 218
210 PO=PO+X:PO=PO+40:POKEPO-40,100:POKEPO
    ,34:POKEPO+C,CL                     :rem 247
215 A$=RIGHT$(A$,39)+LEFT$(A$,1):B$=RIGHT
    $(B$,1)+LEFT$(B$,39)                :rem 19
220 C$=RIGHT$(C$,1)+LEFT$(C$,39)        :rem 185
225 PRINT"{HOME}{5 DOWN}"A$;:PRINT"
    {2 DOWN}"B$;:PRINT"{4 DOWN}"C$"
    {2 DOWN}"A$                         :rem 193
230 PK=PEEK(PO):IFPK=35THEN240          :rem 80
235 IFPK<>34ANDPK<>32THEN295            :rem 193
240 M=M+1:IFM>SRTHENM=.:POKEPO,32:PO=PO+4
    0:IFPEEK(PO)<>32THEN295             :rem 18
245 POKEPO,34:POKEPO+C,CL:GOSUB375
                                        :rem 134
250 P=PEEK(197)                         :rem 59
255 IFP=60THENM=.:LS=PEEK(PO+40):LC=PEEK(
    PO+40+C)AND15:GOSUB380:GOTO215
                                        :rem 112
260 IFP=64THEN215                       :rem 229
265 ON-(P=18)GOTO285                    :rem 134
270 ON-(P=10)GOTO275:GOTO215            :rem 132
275 IFPEEK(PO-1)<>32THEN295             :rem 78
280 POKEPO,32:PO=PO-1:POKEPO,34:POKEPO+C,
    CL:GOSUB375:GOTO215                 :rem 60
285 IFPEEK(PO+1)<>32THEN295             :rem 77
290 POKEPO,32:PO=PO+1:POKEPO,34:POKEPO+C,
    CL:GOSUB375:GOTO215                 :rem 59
295 PK=PEEK(PO):IFPK=100THEN325         :rem 136
300 IFPK=33THENPO=PO-40                 :rem 155
305 POKEPO,91:POKEPO+C,0:POKEPO,86:POKEPO
    +C,2:GOSUB365:POKESD+24,15          :rem 191
310 LF=LF-1:ON-(LF=.)GOTO430:PRINT"{HOME}
    {RED}"TAB(36)LF"{RED}"              :rem 50
```

```
315 POKEPO,32                          :rem 248
320 GOSUB355:GOTO175                   :rem 194
325 POKEPO,34:POKEPO+C,.:BS=BS-1:IFBS=0TH
    ENSC=SC+100:GOTO340                :rem 243
330 SC=SC+100:PRINT"{HOME}{RED}"TAB(6)SC
                                       :rem 233
335 GOSUB355:GOTO175                   :rem 200
340 SC=SC+((LV+1)*100):BS=4:PRINT"{HOME}
    {RED}"TAB(6)SC                     :rem 244
345 PRINT"{HOME}{10 DOWN}{40 SPACES}"
                                       :rem 42
346 PRINT"{HOME}{10 DOWN}{13 SPACES}{RVS}
    BONUS LEVEL"LV+1:LV=LV+1           :rem 81
350 FORD=.TO1500:NEXT:PRINT"{CLR}":GOTO75
                                       :rem 141
355 PRINT"{HOME}{DOWN}{BLK}{DOWN}"LEFT$(T
    B$,X)"*{DOWN}{3 LEFT}{4 SPACES}":RETU
    RN                                 :rem 23
360 POKESD+4,17:POKEHF,INT(RND(0)*50)+50:
    POKEFL,250:POKESD+4,16:RETURN:rem 255
365 POKESD+4,129:FORMU=15TO0STEP-1:POKEHF
    ,100:POKESD+24,MU:FORLL=1TO5:NEXT
                                       :rem 233
370 NEXT:POKESD+4,128:RETURN           :rem 25
375 POKESD+4,33:POKEHF,100:POKEFL,250:POK
    ESD+4,32:RETURN                    :rem 210
380 POKEPO+40,35:POKEPO+40+C,2:POKEPO+40,
    LS:POKEPO+40+C,LC:RETURN           :rem 43
385 DATA,,,,,,,                        :rem 238
390 DATA170,255,255,255,255,255,255,170
                                       :rem 194
395 DATA24,60,102,126,126,24,36,195
                                       :rem 238
400 DATA24,36,66,66,36,24,24,0         :rem 238
405 DATA24,60,126,254,127,60,8,0       :rem 79
410 DATA0,0,0,0,0,0,126,255            :rem 56
415 DATA170,255,255,255,255,254,252,248
                                       :rem 194
420 DATA85,255,255,255,255,127,63,31
                                       :rem 40
425 DATA215,225,231,235,231,235        :rem 34
430 IFSC>HITHENHI=SC:PRINT"{HOME}{DOWN}
    {BLK}"TAB(6)HI                     :rem 204
435 PRINT"{CLR}{9 DOWN}{3 RIGHT}
    {12 SPACES}{RVS}{BLK}GAME OVER"
                                       :rem 232
436 PRINT"{DOWN}{15 SPACES}{RVS}{BLK}SCOR
    E"SC                               :rem 51
437 PRINT"{4 DOWN}{12 SPACES}PRESS {RVS}B
    {OFF} TO BEGIN":POKE198,0:GOTO455
                                       :rem 166
440 PRINT"{DOWN} PRESS (SPACE BAR) TO REL
    EASE AND FIRE{3 SPACES}RETRO-ROCKETS.
    "                                  :rem 56
445 PRINT"{DOWN} PRESS (A)-TO MOVE LEFT A
    ND (D)-TO MOVE{2 SPACES}RIGHT."
                                       :rem 235
450 PRINT"{DOWN}{RIGHT}PRESS {RVS}B{OFF}
    {SPACE}TO BEGIN...":POKE198,0      :rem 4
455 GETZ$:IFZ$<>"B"THEN455             :rem 16
460 LV=.:SC=.:M=.:RESTORE:CO=.:GOTO60
                                       :rem 66
465 P=PEEK(197):PRINTP:GOTO465         :rem 108
```

BEFORE TYPING...

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

Bagdad

(Article on page 56.)

Program 1:

Bagdad—VIC Version, Part 1

```
10 PRINT"{CLR}{2 DOWN}"SPC(8)"BAGDAD"
                                       :rem 45
11 PRINT"{4 DOWN}IS THIS ON A {RVS}C{OFF}
   OLOR TV OR {RVS}B{OFF}LACK AND WHITE?"
                                       :rem 43
12 GETG$:IFG$<>"C"ANDG$<>"B"THEN12
                                       :rem 179
13 POKE0,1:IFG$="B"THENPOKE0,0         :rem 1
14 PRINT"{CLR}{DOWN}YOU CONTROL THE GOOD"
   :IFG$="C"THENPRINT"GREEN";:GOTO16
                                       :rem 128
15 PRINT"GREY";                        :rem 169
16 PRINT" GENIE THAT":PRINT"APPEARS AT TH
   E BOTTOM OF THE SCREEN"             :rem 105
17 PRINT"{DOWN}USE JOYSTICK CONTROL
   {2 SPACES}TO MOVE LEFT AND RIGHT"
                                       :rem 30
18 PRINT"PRESSING FIRE BUTTON{2 SPACES}WI
   LL CAUSE YOUR GENIE TO FLY UPWARDS..."
                                       :rem 69
19 PRINT"{DOWN}RELEASING FIRE BUTTON WILL
    CAUSE YOUR GENIE TO FALL DOWNWARDS"
                                       :rem 195
20 PRINT"{DOWN}PUSH THE JOYSTICK
   {5 SPACES}FORWARD TO START A NEWGAME":
   GOSUB29                             :rem 133
21 PRINT"{CLR}{DOWN}YOUR OBJECTIVE IS TO
   {2 SPACES}KNOCK THE BAD GENIES
   {2 SPACES}OFF THEIR MAGIC"          :rem 146
22 PRINT"CARPETS AND BACK INTO THEIR BOTT
   LES"                                :rem 254
23 PRINT"{DOWN}YOU MUST THEN COLLECT THEI
   R BOTTLES BEFORE{2 SPACES}THEY EMERGE
   {SPACE}AGAIN"                       :rem 93
24 PRINT"{DOWN}YOU ONLY SCORE POINTS FOR
   {SPACE}GETTING BOTTLES"             :rem 246
25 PRINT"{DOWN}YOUR GENIE BEGINS WITHFOUR
    LIVES.{2 SPACES}AN EXTRA LIFE IS ADDE
   D FOR"                              :rem 233
26 PRINT"EVERY 4000 POINTS"            :rem 101
27 GOSUB29:PRINT"{CLR}{DOWN}THESE CHARACT
   ERS WILL CHANGE AS THE PROGRAM LOADS"
                                       :rem 58
28 PRINT"{2 DOWN}{5 SPACES}PLEASE WAIT":G
   OTO 32                              :rem 36
29 PRINT"{HOME}{22 DOWN}{6 SPACES}HIT ANY
    KEY{HOME}"                         :rem 142
30 GETG$:IFG$=""THEN30                 :rem 245
31 RETURN                              :rem 68
32 FORI=832TO989:READA:POKEI,A:NEXT:SYS83
   2                                   :rem 193
33 DATA 162,255,154,160,0,185          :rem 144
34 DATA 83,3,153,64,1,200              :rem 193
35 DATA 192,180,208,245,76,66          :rem 161
36 DATA 1,66,67,169,1,162              :rem 211
37 DATA 64,160,1,32,189,255            :rem 53
38 DATA 169,1,162,8,160,0              :rem 202
39 DATA 32,186,255,169,0,170           :rem 106
40 DATA 160,16,32,213,255,169          :rem 143
41 DATA 1,162,65,160,1,32              :rem 189
42 DATA 189,255,169,1,162,8            :rem 60
43 DATA 160,0,32,186,255,169           :rem 100
44 DATA 0,170,160,24,32,213            :rem 30
```

```
45 DATA 255,120,169,0,133,236      :rem 144
46 DATA 133,237,133,238,133,239    :rem 252
47 DATA 133,208,133,209,133,234    :rem 244
48 DATA 169,111,141,15,144,169     :rem 202
49 DATA 255,141,5,144,169,0         :rem 51
50 DATA 141,27,145,169,255,141     :rem 198
51 DATA 20,145,141,21,145,165      :rem 135
52 DATA 162,9,192,133,162,160      :rem 146
53 DATA 1,132,184,132,185,132      :rem 140
54 DATA 186,165,0,240,7,200         :rem 41
55 DATA 200,132,185,200,132,186    :rem 237
56 DATA 160,0,185,0,30,153         :rem 242
57 DATA 0,2,185,0,31,153           :rem 143
58 DATA 0,3,136,208,241,76         :rem 254
59 DATA 30,2                        :rem 73
```

Program 2:

Bagdad—Line Replacement For VIC Tape Users

```
32 FORI=832TO962:READA:POKEI,A:NEXT:SYS83
   2                                :rem 184
33 DATA162,255,154,160,128,185,80,3
                                    :rem 238
34 DATA153,63,1,136,208,247,76,64:rem 144
35 DATA1,169,0,32,189,255,169,1     :rem 43
36 DATA170,160,0,32,186,255,169,0:rem 134
37 DATA170,160,16,32,213,255,169,0
                                    :rem 181
38 DATA170,160,24,32,213,255,120,169
                                     :rem 24
39 DATA0,133,236,133,237,133,238,133
                                     :rem 26
40 DATA239,133,208,133,209,133,234,169
                                    :rem 131
41 DATA111,141,15,144,169,255,141,5
                                    :rem 226
42 DATA144,169,0,141,27,145,169,255
                                    :rem 242
43 DATA141,20,145,141,21,145,165,162
                                     :rem 15
44 DATA9,192,133,162,160,1,132,184
                                    :rem 182
45 DATA132,185,132,186,165,0,240,7
                                    :rem 185
46 DATA200,200,132,185,200,132,186,160
                                    :rem 110
47 DATA0,185,0,30,153,0,2,185      :rem 179
48 DATA0,31,153,0,3,136,208,241     :rem 21
49 DATA76,30,2                     :rem 225
```

Program 3:

Bagdad—VIC Version, Part 2

See instructions in article before beginning.

```
4096 :208,003,076,219,016,201,211
4102 :001,208,003,076,240,016,038
4108 :076,009,017,169,000,133,160
4114 :240,165,242,041,001,201,140
4120 :001,208,004,169,008,133,035
4126 :240,165,241,041,001,201,151
4132 :001,208,007,165,240,024,169
4138 :105,004,133,240,165,240,161
4144 :024,101,243,133,240,070,091
4150 :241,070,242,032,114,016,001
4156 :160,000,165,244,145,003,009
4162 :165,240,145,001,024,105,234
4168 :001,133,240,200,165,244,031
4174 :145,003,165,240,145,001,009
4180 :024,105,001,133,240,160,235
4186 :022,165,244,145,003,165,066
4192 :240,145,001,024,105,001,100
4198 :133,240,200,165,244,145,205
4204 :003,165,240,145,001,096,246
4210 :169,030,133,002,165,241,086
4216 :133,001,164,242,240,016,148
4222 :165,001,024,105,022,133,064
4228 :001,165,002,105,000,133,026
4234 :002,136,208,240,165,001,122
4240 :133,003,165,002,024,105,064
4246 :120,133,004,096,070,241,046
4252 :070,242,032,114,016,160,022
4258 :000,169,032,145,001,200,197
4264 :145,001,160,022,145,001,130
4270 :200,145,001,096,169,000,017
4276 :141,019,145,169,127,141,154
4282 :034,145,173,032,145,041,244
4288 :128,208,002,169,002,133,066
4294 :245,169,255,141,034,145,163
4300 :173,017,145,073,255,041,140
4306 :060,005,245,041,127,074,250
4312 :133,245,096,160,003,169,254
4318 :060,153,117,030,153,120,087
4324 :030,153,029,031,153,048,160
4330 :031,169,061,153,139,030,049
4336 :153,142,030,153,051,031,032
4342 :153,070,031,136,208,225,045
4348 :169,058,153,117,030,153,164
4354 :124,030,153,033,031,153,014
4360 :048,031,192,022,208,001,254
4366 :096,160,022,169,059,208,216
4372 :233,000,160,062,189,002,154
4378 :001,201,041,240,002,160,159
4384 :060,132,204,076,195,023,210
4390 :000,000,165,180,074,074,019
4396 :168,185,184,000,160,022,251
4402 :145,003,096,133,235,230,124
4408 :233,216,169,009,032,009,212
4414 :019,169,062,160,045,153,158
4420 :205,031,136,208,250,164,038
4426 :233,240,008,169,037,136,129
4432 :153,229,031,208,250,169,096
4438 :038,141,236,031,169,039,228
4444 :141,243,031,160,004,185,088
4450 :234,000,074,074,074,074,116
4456 :024,105,040,153,235,031,180
4462 :185,234,000,041,015,024,097
4468 :105,040,153,236,031,185,098
4474 :235,000,074,074,074,074,141
4480 :024,105,040,153,242,031,211
4486 :185,235,000,041,015,024,122
4492 :105,040,153,243,031,136,080
4498 :136,208,204,169,040,141,020
4504 :248,031,141,241,031,096,172
4510 :169,064,044,029,145,240,081
4516 :251,173,020,145,169,096,250
4522 :141,021,145,169,000,133,011
4528 :210,165,208,240,023,197,195
4534 :209,048,019,133,209,169,201
4540 :000,160,005,132,210,136,063
4546 :153,010,144,208,250,169,104
4552 :015,141,014,144,169,000,171
4558 :133,208,165,209,201,002,100
4564 :240,015,201,003,240,035,178
4570 :201,005,240,070,201,006,173
4576 :240,095,076,089,018,165,139
4582 :210,240,004,169,236,133,198
4588 :212,198,212,165,212,141,096
4594 :011,144,201,232,208,004,018
4600 :169,000,133,209,096,165,252
4606 :210,240,008,169,005,133,251
```

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4612 :212,169,232,133,213,165,104
4618 :213,201,232,208,013,198,051
4624 :212,208,005,169,000,133,231
4630 :209,096,169,240,133,213,058
4636 :198,213,165,213,141,012,202
4642 :144,096,165,210,240,004,125
4648 :169,210,133,212,165,212,117
4654 :141,012,144,230,212,165,182
4660 :212,141,010,144,201,240,232
4666 :208,004,169,000,133,209,013
4672 :096,165,210,240,004,169,180
4678 :230,133,212,230,212,165,228
4684 :212,141,012,144,201,250,012
4690 :208,004,169,000,133,209,037
4696 :096,201,007,240,019,201,084
4702 :008,240,042,201,009,240,066
4708 :124,201,010,240,058,201,166
4714 :011,240,078,076,000,019,018
4720 :165,210,240,009,169,015,152
4726 :133,212,169,220,141,011,236
4732 :144,165,212,141,014,144,176
4738 :198,212,208,004,169,000,153
4744 :133,209,096,165,210,240,165
4750 :004,169,220,133,212,198,054
4756 :212,165,212,141,013,144,011
4762 :201,188,208,004,169,000,156
4768 :133,209,096,165,210,240,189
4774 :004,169,208,133,212,198,066
4780 :212,165,212,141,013,144,035
4786 :201,127,208,004,169,000,119
4792 :133,209,096,165,210,240,213
4798 :009,169,205,133,212,056,206
4804 :233,010,133,213,230,213,204
4810 :165,213,141,012,144,197,050
4816 :212,240,001,096,230,212,175
4822 :165,212,201,240,208,231,191
4828 :169,000,133,209,096,165,224
4834 :210,240,004,169,144,133,102
4840 :212,230,212,165,212,041,024
4846 :011,024,101,212,141,012,227
4852 :144,165,212,201,240,208,134
4858 :004,169,000,133,209,096,093
4864 :160,005,136,153,010,144,096
4870 :208,250,096,197,208,048,245
4876 :002,133,208,096,230,160,073
4882 :164,160,177,161,042,109,063
4888 :017,145,042,229,212,042,199
4894 :069,227,042,005,240,042,143
4900 :109,004,144,234,096,133,244
4906 :195,201,016,240,249,048,223
4912 :051,230,193,165,193,201,057
4918 :042,048,004,169,000,133,194
4924 :193,074,133,241,165,194,036
4930 :074,133,242,032,114,016,165
4936 :160,001,177,001,201,051,151
4942 :176,008,160,023,177,001,111
4948 :201,050,144,011,169,014,161
4954 :133,195,169,002,032,009,118
4960 :019,198,193,096,198,193,225
4966 :016,004,169,041,133,193,146
4972 :165,193,074,133,241,165,055
4978 :194,074,133,242,032,114,135
4984 :016,160,000,177,001,201,163
4990 :051,176,008,160,022,177,208
4996 :001,201,050,144,011,169,196
5002 :018,133,195,169,002,032,175
5008 :009,019,230,193,096,133,056
5014 :196,201,016,240,249,048,076
5020 :042,230,194,165,193,074,030
5026 :133,241,165,194,074,133,078
5032 :242,032,114,016,160,022,242
5038 :177,001,201,051,176,007,019
5044 :200,177,001,201,050,144,185
5050 :011,169,014,133,196,169,110
5056 :002,032,009,019,198,194,134
5062 :096,198,194,048,028,165,159
5068 :193,074,133,241,165,194,180
5074 :074,133,242,032,114,016,053
5080 :160,000,177,001,201,051,038
5086 :176,007,200,177,001,201,216
5092 :050,144,011,169,018,133,241
5098 :196,169,002,032,009,019,149
5104 :230,194,096,234,234,234,182
5110 :165,224,240,003,076,197,127
5116 :020,165,225,133,241,133,145
5122 :193,165,226,133,242,133,070
5128 :194,032,154,016,198,230,064
5134 :208,071,165,227,032,041,246
5140 :019,165,193,133,225,165,152
5146 :195,133,227,032,178,016,039
5152 :169,008,036,245,240,012,230
5158 :164,227,192,012,048,006,175
5164 :198,227,169,000,133,229,232
5170 :169,001,036,245,240,012,241
5176 :164,227,192,021,016,006,170
5182 :230,227,169,016,133,229,042
5188 :165,227,201,016,048,008,221
5194 :169,023,056,229,227,076,086
5200 :085,020,056,233,009,133,104
5206 :230,198,231,208,060,165,154
5212 :228,032,149,019,165,194,111
5218 :133,226,165,196,133,228,155
5224 :032,178,016,169,016,036,039
5230 :245,240,011,164,228,192,166
5236 :012,048,013,198,228,076,179
5242 :132,020,164,228,192,021,111
5248 :016,002,230,228,165,228,229
5254 :201,016,048,008,169,023,087
5260 :056,229,228,076,149,020,130
5266 :056,233,009,133,231,165,205
5272 :225,133,241,165,226,133,251
5278 :242,165,229,133,243,169,059
5284 :005,133,244,032,015,016,097
5290 :169,016,036,245,240,005,113
5296 :169,001,032,009,019,032,182
5302 :080,026,144,003,076,200,199
5308 :027,096,000,000,000,000,055
5314 :000,000,000,198,224,165,013
5320 :224,016,007,169,002,133,239
5326 :225,133,226,096,201,127,190
5332 :208,005,169,010,032,009,133
5338 :019,165,224,201,122,048,229
5344 :035,169,226,141,172,031,230
5350 :169,251,141,173,031,169,140
5356 :062,141,194,031,169,225,034
5362 :141,195,031,169,001,141,152
5368 :172,151,141,173,151,141,153
5374 :194,151,141,195,151,096,158
5380 :201,121,208,005,169,011,207
5386 :032,009,019,041,001,024,136
5392 :105,005,141,172,151,141,219
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5416 :140,173,031,200,140,194,150
5422 :031,200,140,195,031,165,040
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5434 :041,025,240,030,169,000,051
5440 :133,224,133,209,133,208,080
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5476 :000,000,000,000,151,169,164
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5488 :151,141,195,151,076,189,247
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5530 :178,197,180,240,003,076,004
5536 :195,023,165,179,240,005,199
5542 :198,179,076,195,023,032,101
5548 :016,019,041,003,133,176,048
5554 :169,000,133,183,165,176,236
5560 :010,168,185,248,027,133,187
5566 :181,185,249,027,133,182,123
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5578 :208,062,200,200,209,181,238
5584 :208,056,200,200,209,181,238
5590 :208,050,152,024,105,040,025
5596 :168,192,132,208,229,160,029
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5632 :133,179,169,005,032,009,015
5638 :019,076,022,017,230,176,034
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5662 :002,208,095,254,008,001,086
5668 :189,001,001,133,241,189,022
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5680 :133,243,165,180,074,074,149
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5698 :003,165,204,145,001,136,208
5704 :145,001,169,007,145,003,030
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5716 :003,076,195,023,222,002,093
5722 :001,189,008,001,201,004,238
5728 :208,243,254,000,001,169,203
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5740 :001,032,016,019,041,016,233
5746 :157,005,001,169,001,157,092
5752 :006,001,157,007,001,076,112
5758 :195,023,201,004,240,003,024
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5800 :017,160,044,145,003,169,194
5806 :035,145,001,076,210,022,151
5812 :160,000,177,001,201,034,241
5818 :208,004,169,032,145,001,233
5824 :160,022,169,033,145,001,210
5830 :234,032,040,017,160,044,213
5836 :177,001,201,051,176,013,055
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5848 :002,001,169,005,157,004,042
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5860 :222,007,001,208,013,169,080
5866 :007,032,009,019,254,000,043
5872 :001,169,096,157,006,001,158
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5884 :160,003,132,151,076,048,054
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5926 :001,160,044,177,001,201,110
5932 :035,208,004,169,032,145,125
5938 :001,169,037,032,059,023,115
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5962 :016,208,006,165,239,197,137
5968 :238,144,008,165,237,133,237
5974 :236,165,239,133,238,165,238
5980 :237,197,235,208,007,024,232
5986 :105,004,032,053,017,234,031
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6010 :074,133,242,198,242,032,019
6016 :114,016,169,036,160,022,133
6022 :145,001,165,180,074,074,005
6028 :168,185,184,000,160,022,091
6034 :145,003,032,080,027,176,097
6040 :035,169,005,032,009,019,165
6046 :222,002,001,222,002,001,096
6052 :169,001,157,006,001,157,143
6058 :007,001,169,016,157,003,011
6064 :001,157,004,001,169,003,255
6070 :157,000,001,076,195,023,122
6076 :076,246,022,201,003,240,208
6082 :024,138,024,105,016,170,159
6088 :230,180,165,180,201,012,144
6094 :240,003,076,143,021,096,017
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6106 :000,189,005,001,133,145,179
6112 :189,009,001,208,083,189,135
6118 :002,001,197,226,176,004,068
6124 :169,001,208,002,169,000,017
6130 :133,144,189,002,001,056,255
6136 :229,226,016,005,073,255,028
6142 :024,105,013,013,013,013,179
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Program 4:

Bagdad—VIC Version, Part 3

See instructions in article before beginning.

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6156 :169,016,208,002,169,000,064
6162 :197,229,208,017,165,180,246
6168 :201,004,144,011,189,009,070
6174 :001,208,006,165,229,073,200
6180 :016,133,145,032,016,019,141
6186 :201,250,144,007,189,005,070
6192 :001,073,016,133,145,076,236
6198 :247,024,201,001,208,008,231
6204 :189,002,001,201,016,076,033
6210 :234,023,201,002,208,073,039
6216 :189,002,001,160,000,221,133
6222 :011,001,016,003,234,160,247
6228 :001,132,144,160,000,189,198
6234 :003,001,048,002,160,016,064
6240 :132,145,169,026,056,253,109
6246 :003,001,133,176,189,001.093
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6276 :197,176,016,111,165,145,174
6282 :073,016,133,145,076,247,060
6288 :024,201,003,208,098,169,079
6294 :255,133,145,169,016,157,001
6300 :003,001,189,002,001,197,037
6306 :226,208,005,169,000,157,159
6312 :009,001,016,004,169,001,112
6318 :208,002,169,000,133,144,062
6324 :208,065,189,001,001,056,188
6330 :229,225,016,005,073,255,221
6336 :024,105,001,201,004,016,031
6342 :048,169,000,157,009,001,070
6348 :076,247,024,000,056,233,072
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6360 :105,001,133,240,096,000,023
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6372 :000,157,012,001,076,028,246
6378 :026,000,201,022,176,004,151
6384 :198,148,230,149,096,000,037
6390 :000,222,010,001,208,083,002
6396 :189,009,001,201,001,240,125
6402 :002,198,189,032,016,019,202
6408 :009,192,157,010,001,032,153
6414 :016,019,160,001,197,147,042
6420 :144,053,165,189,197,190,190
6426 :016,047,160,000,230,189,156
6432 :165,180,010,010,133,176,194
6438 :132,183,032,016,019,164,072
6444 :183,197,176,176,026,160,194
6450 :002,189,002,001,201,012,201
6456 :176,004,169,004,208,006,111
6462 :201,028,176,004,169,016,144
6468 :208,002,169,036,157,011,139
6474 :001,152,157,009,001,234,116
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6486 :002,001,133,194,222,006,132
6492 :001,208,092,189,003,001,074
6498 :032,041,019,201,003,208,090
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6522 :024,105,001,133,195,169,237
6528 :032,157,012,001,164,145,127
6534 :208,013,165,195,197,148,036
6540 :144,007,198,195,169,000,085
6546 :157,005,001,192,016,208,213
6552 :013,165,195,197,149,176,023
6558 :007,230,195,169,016,157,164
6564 :005,001,165,195,157,003,178
6570 :001,032,208,024,169,009,101
6576 :056,229,240,234,234,234,123
6582 :234,234,157,006,001,222,012
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6630 :002,198,196,076,248,025,207
6636 :169,034,024,101,180,074,050
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6774 :016,005,073,255,024,105,084
6780 :001,201,003,176,002,056,051
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6792 :192,192,208,200,024,096,024
6798 :165,224,208,190,234,234,117
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6816 :201,003,176,172,165,226,079
6822 :056,229,194,016,005,073,227
6828 :255,024,105,001,201,003,249
6834 :176,156,165,226,197,194,012
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7962 :184,150,200,192,004,208,196
7968 :240,141,189,150,141,190,059
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7980 :014,041,015,024,105,176,163
7986 :141,190,030,165,254,074,136
7992 :074,074,074,024,105,176,071
7998 :141,189,030,169,064,044,187
8004 :029,145,240,251,173,020,158
8010 :145,169,096,141,021,145,023
8016 :134,150,032,243,019,166,056
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8040 :141,013,144,198,205,208,245
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8106 :205,208,249,076,113,002,255
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8118 :000,000,000,000,000,000,182
8124 :000,000,000,000,227,228,131
8130 :231,232,232,231,231,228,043
8136 :228,227,228,231,232,237,047
8142 :231,232,228,000,000,000,129
8148 :151,129,150,133,032,000,039
8154 :000,000,000,000,076,236,018
8160 :024,000,169,000,141,010,056
8166 :144,141,013,144,169,015,088
8172 :141,014,144,165,253,076,005
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8184 :243,019,032,158,017,166,115
8190 :150,096,013,013,013,013,040
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Program 5: Bagdad—64 Version

Translation by Kevin Martin, Editorial Programmer

See instructions in article before beginning.

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2061 :076,066,008,000,002,002,167
2067 :045,002,002,000,000,000,068
2073 :000,000,000,000,000,004,029
2079 :252,000,013,000,000,000,040
2085 :000,000,000,000,000,000,037
2091 :000,000,000,000,003,000,046
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2109 :002,002,000,000,000,169,234
2115 :000,141,063,008,141,064,228
2121 :008,141,065,008,169,008,216
2127 :032,210,255,169,142,032,151
2133 :210,255,120,165,001,041,109
2139 :251,133,001,169,048,133,058
2145 :252,169,000,133,251,133,011
2151 :253,169,208,133,254,160,000
2157 :000,177,253,145,251,200,111
2163 :208,249,230,252,230,254,002
2169 :165,252,201,056,208,239,218
2175 :165,001,009,004,133,001,184
2181 :088,173,024,208,041,240,139
2187 :009,012,141,024,208,169,190
2193 :022,133,252,169,049,133,135
2199 :251,160,000,132,253,169,092
2205 :048,133,254,177,251,145,141
2211 :253,200,208,249,230,252,019
2217 :230,254,177,251,145,253,199
2223 :200,192,080,208,247,032,110
2229 :192,018,169,147,032,210,181
2235 :255,169,000,141,033,208,225
2241 :141,032,208,169,012,141,128
2247 :134,002,169,000,141,046,179
2253 :021,169,080,141,045,021,170
2259 :169,001,141,040,208,141,143
2265 :041,208,141,042,208,141,230
2271 :043,208,169,005,141,039,060
2277 :208,169,006,141,044,208,237
2283 :141,045,208,169,004,141,175
2289 :046,208,160,000,169,071,127
2295 :133,251,169,020,133,252,181
2301 :177,251,240,010,032,210,149
2307 :255,200,208,246,230,252,114
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2325 :224,017,208,248,169,160,023
2331 :141,231,007,169,012,141,216
2337 :231,219,169,009,141,134,168
2343 :002,169,004,141,000,021,120
2349 :074,141,211,020,141,229,093
2355 :020,169,000,141,031,008,164
2361 :141,047,008,141,035,021,194
2367 :169,002,141,036,021,032,208
2373 :073,018,162,000,076,078,220
2379 :009,162,001,169,013,157,074
2385 :248,007,169,000,157,022,172
2391 :008,157,212,020,157,024,153
2397 :021,232,224,008,208,235,253
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2409 :021,157,255,207,202,224,147
2415 :002,208,245,169,255,141,107
2421 :021,208,169,255,141,015,158
2427 :212,169,128,141,018,212,235
2433 :162,000,189,049,021,157,195
2439 :064,003,232,224,192,208,034
2445 :245,162,000,189,241,021,231
2451 :157,192,002,232,224,064,250
2457 :208,245,162,002,138,157,041
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2469 :248,173,035,021,240,008,122
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2481 :185,009,162,000,032,144,197
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2505 :076,189,010,076,198,010,248
2511 :165,162,041,031,240,009,087
2517 :189,248,020,141,238,020,045
2523 :076,109,010,173,212,020,051
2529 :201,003,208,003,076,058,006
2535 :010,173,027,212,201,065,151
2541 :144,011,201,129,144,031,129
2547 :201,193,144,067,076,098,254
2553 :010,138,010,168,185,031,023
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2565 :238,020,076,015,010,169,021
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2583 :004,021,237,004,021,141,195
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2619 :010,168,056,185,004,021,247
2625 :237,004,021,141,019,008,239
2631 :185,022,008,237,022,008,041
2637 :013,019,008,176,008,169,214
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2649 :010,169,008,141,238,020,163
2655 :076,103,010,169,000,141,082
2661 :238,020,173,238,020,157,179
2667 :248,020,165,161,205,239,121
2673 :020,240,009,141,239,020,014
2679 :173,027,212,157,240,020,180
2685 :173,212,020,201,003,240,206
2691 :027,189,240,020,048,033,176
2697 :138,010,168,185,005,021,152
2703 :205,005,021,144,011,169,186
2709 :002,013,238,020,141,238,033
2715 :020,076,184,010,169,001,103
2721 :013,238,020,141,238,020,063
2727 :076,184,010,138,010,168,241
2733 :185,005,021,205,005,021,103
2739 :144,223,076,159,010,173,196
2745 :238,020,041,015,142,228,101
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2775 :015,032,212,014,173,229,122
2781 :020,201,001,240,050,173,138
2787 :036,021,048,039,173,212,244
2793 :020,201,003,208,011,169,077
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2817 :225,255,240,003,076,166,198
2823 :009,169,000,141,021,208,043
2829 :096,032,228,014,076,183,130
2835 :008,238,000,021,173,000,203
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2853 :011,160,017,024,032,240,009
2859 :255,162,000,189,125,011,017
2865 :240,006,032,210,255,232,000
2871 :208,245,169,000,174,000,083
2877 :021,202,202,202,032,205,157
2883 :189,169,050,141,248,020,116
2889 :032,089,018,162,000,032,150
2895 :144,011,032,007,015,032,064
2901 :104,015,032,212,014,206,156
2907 :248,020,208,237,162,011,209
2913 :160,017,024,032,240,255,057
2919 :162,000,189,133,011,240,070
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2949 :149,146,069,070,069,070,194
2955 :069,070,069,070,000,189,094
2961 :000,220,041,012,141,210,001
2967 :014,189,000,220,041,016,119
2973 :208,008,173,210,014,009,011
2979 :002,076,172,011,173,210,039
2985 :014,009,001,141,210,014,046
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2997 :032,127,017,010,168,138,161
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3015 :178,014,072,096,076,211,078
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3033 :169,000,056,253,047,008,238
3039 :157,047,008,169,050,157,043
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3087 :013,169,004,141,018,008,112
3093 :138,074,168,189,004,021,103
3099 :056,237,017,008,141,020,250
3105 :008,185,022,008,233,000,233
3111 :141,021,008,056,173,020,202
3117 :008,233,024,141,019,008,222
3123 :173,021,008,233,000,013,243
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3135 :141,021,008,169,063,141,094
3141 :020,008,173,020,008,157,199
3147 :004,021,173,021,008,153,199
3153 :022,008,076,087,013,169,200
3159 :003,141,018,008,138,074,213
3165 :168,189,004,021,024,109,096
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3177 :022,008,105,000,141,021,146
3183 :008,056,173,020,008,233,097
3189 :064,141,019,008,173,021,031
3195 :008,233,001,013,019,008,149
3201 :144,010,169,000,141,021,102
3207 :008,169,024,141,020,008,249
3213 :173,020,008,157,004,021,012
3219 :173,021,008,153,022,008,020
3225 :076,087,013,032,217,012,078
3231 :138,074,168,185,212,020,188
3237 :208,003,076,016,013,096,065
3243 :032,246,012,076,159,012,196
3249 :032,217,012,138,074,168,050
3255 :185,212,020,208,238,076,098
3261 :050,013,032,246,012,076,106
3267 :180,012,032,217,012,189,069
3273 :031,008,240,005,016,088,077
3279 :076,073,013,096,032,246,231
3285 :012,076,200,012,189,047,237
3291 :008,201,248,240,008,222,122
3297 :047,008,189,047,008,016,028
3303 :029,056,169,000,253,047,017
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3315 :076,206,011,189,047,008,012
3321 :201,008,240,008,254,047,239
3327 :008,189,047,008,048,227,014
3333 :189,047,008,074,074,141,026
3339 :017,008,076,239,011,138,244
3345 :074,168,169,013,153,248,074
3351 :007,189,031,008,201,016,219
3357 :240,008,254,031,008,189,247
3363 :031,008,048,034,189,031,120
3369 :008,074,074,141,017,008,107
3375 :076,016,012,138,074,168,019
3381 :169,014,153,248,007,189,065
3387 :031,008,201,240,240,008,019
3393 :222,031,008,189,031,008,042
3399 :016,222,169,000,056,253,019
3405 :031,008,074,074,141,017,166
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3417 :008,138,074,168,185,212,106
3423 :020,201,003,208,001,096,112
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3453 :020,008,078,020,008,189,192
3459 :005,021,056,233,047,074,055
3465 :074,074,141,019,008,173,114
3471 :019,008,010,168,185,021,042
3477 :020,024,109,020,008,133,207
3483 :251,185,022,020,105,000,226
3489 :133,252,162,000,189,009,138
3495 :020,168,177,251,201,032,248
3501 :208,014,232,224,012,208,047
3507 :241,032,099,016,176,007,238
3513 :174,030,008,096,076,136,193
3519 :014,172,021,008,240,011,145
3525 :172,020,008,208,087,172,096
3531 :021,008,076,211,013,172,192
3537 :020,008,185,212,020,201,087
3543 :001,208,003,076,101,014,106
3549 :201,002,208,023,169,001,057
3555 :153,212,020,185,220,020,013
3561 :045,021,208,141,021,208,109
3567 :206,229,020,032,181,015,154
3573 :076,101,014,152,010,170,000
3579 :189,005,021,205,005,021,185
3585 :176,003,076,021,015,169,205
3591 :002,153,212,020,169,015,066
3597 :153,248,007,185,037,021,152
3603 :153,024,021,152,010,168,035
3609 :169,000,153,031,008,153,027
3615 :047,008,173,020,008,010,041
3621 :168,174,030,008,173,033,111
3627 :021,048,021,169,000,056,102
3633 :249,031,008,153,031,008,017
3639 :169,000,056,253,031,008,060
3645 :157,031,008,076,101,014,192
3651 :140,034,021,173,030,008,217
3657 :074,168,185,212,020,208,172
3663 :021,172,034,021,169,000,240
3669 :056,253,047,008,157,047,141
3675 :008,169,000,056,249,047,108
3681 :008,153,047,008,174,030,005
3687 :008,173,018,008,201,001,000
3693 :240,012,201,002,240,011,047
3699 :201,003,240,010,201,004,006
3705 :240,009,076,206,011,076,227
3711 :239,011,076,021,012,076,050
3717 :091,012,096,201,000,240,005
3723 :024,201,005,144,020,173,194
3729 :030,008,170,074,168,185,012
3735 :212,020,208,009,169,000,001
3741 :056,253,047,008,157,047,213
3747 :008,076,101,014,169,000,019
3753 :133,162,165,162,201,002,226
3759 :208,250,096,202,011,196,114
3765 :012,210,012,202,011,015,131
3771 :013,155,012,170,012,202,239
3777 :011,049,013,176,012,190,132
3783 :012,202,011,202,011,202,071
3789 :011,202,011,202,011,013,143
3795 :000,169,019,056,237,229,153
3801 :020,170,160,000,136,208,143
3807 :253,202,208,250,096,162,114
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3819 :008,240,005,176,009,076,237
3825 :006,015,202,048,016,076,092
3831 :230,014,162,000,189,001,075
3837 :021,157,063,008,232,224,190
3843 :003,208,245,096,162,000,205
3849 :189,004,021,157,000,208,076
3855 :232,224,016,208,245,096,012
3861 :169,003,141,212,020,169,223
3867 :000,141,004,021,141,005,083
3873 :021,141,022,008,169,050,188
3879 :141,035,021,206,036,021,243
3885 :048,009,174,036,021,232,053
3891 :169,160,157,224,007,032,032
3897 :221,018,174,030,008,096,092
3903 :173,000,220,041,016,240,241
3909 :014,238,039,208,206,035,041
3915 :021,240,006,162,000,032,024
3921 :127,017,096,169,005,141,124
3927 :039,208,169,000,141,035,167
3933 :021,141,212,020,141,031,147
3939 :008,141,047,008,096,162,049
3945 :008,169,000,029,022,008,085
3951 :202,048,004,010,076,108,047
3957 :015,141,016,208,096,162,243
3963 :000,189,024,021,201,000,046
3969 :240,043,222,024,021,208,119
3975 :038,189,248,007,201,011,061
3981 :208,021,169,013,157,248,189
3987 :007,169,000,157,212,020,200
3993 :138,010,168,169,015,153,038
3999 :031,008,076,174,015,169,120
4005 :011,157,248,007,169,100,089
4011 :157,024,021,232,236,211,028
4017 :020,208,200,096,169,000,102
4023 :153,024,021,120,248,024,005
4029 :173,001,021,105,080,141,198
4035 :001,021,173,002,021,105,006
4041 :002,141,002,021,173,003,031
4047 :021,105,000,141,003,021,242
4053 :216,056,173,002,021,237,150
4059 :045,021,141,047,021,173,155
4065 :003,021,237,046,021,013,054
4071 :047,021,144,037,173,036,177
4077 :021,201,007,176,030,238,142
4083 :036,021,169,000,174,036,167
4089 :021,157,224,007,248,173,055
4095 :045,021,024,105,080,141,159
4101 :045,021,173,046,021,105,160
4107 :000,141,046,021,216,088,011
4113 :162,000,032,026,016,174,171
4119 :030,008,096,173,003,021,098
4125 :074,074,074,074,024,105,198
4131 :176,157,199,007,173,003,238
4137 :021,041,015,024,105,176,167
4143 :157,200,007,173,002,021,095
4149 :074,074,074,074,024,105,222
4155 :176,157,201,007,173,002,007
4161 :021,041,015,024,105,176,191
4167 :157,202,007,173,001,021,120
4173 :074,074,074,074,024,105,246
4179 :176,157,203,007,173,001,032
4185 :021,041,015,024,105,176,215
4191 :157,204,007,096,160,000,207
4197 :173,030,008,074,141,021,036
4203 :008,140,020,008,204,021,252
4209 :008,208,003,076,021,017,190
4215 :152,010,170,185,212,020,100
4221 :201,001,208,003,076,021,123
4227 :017,189,004,021,141,208,199
4233 :020,189,005,021,141,210,211
4239 :020,185,022,008,141,209,216
4245 :020,173,030,008,170,074,112
4251 :168,056,173,208,020,253,009
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4263 :209,020,249,022,008,013,176
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4281 :208,020,185,022,008,237,097
4287 :209,020,141,209,020,076,098
4293 :218,016,056,173,208,020,120
4299 :253,004,021,141,208,020,082
4305 :173,209,020,249,022,008,122
4311 :141,209,020,056,173,208,254
4317 :020,233,025,141,019,008,155
4323 :173,209,020,233,000,013,107
4329 :019,008,176,040,189,005,158
4335 :021,205,210,020,176,013,116
4341 :056,173,210,020,253,005,194
4347 :021,141,210,020,076,012,219
4353 :017,056,189,005,021,237,014
4359 :210,020,141,210,020,173,013
4365 :210,020,201,017,144,016,109
4371 :240,014,172,020,008,200,161
4377 :204,211,020,240,003,076,011
4383 :108,016,024,096,173,208,144
4389 :020,205,210,020,176,007,163
4395 :169,128,141,033,021,056,079
4401 :096,169,000,141,033,021,253
4407 :056,096,160,000,169,238,006
4413 :133,251,169,018,133,252,249
4419 :177,251,240,010,032,210,219
4425 :255,200,208,246,230,252,184
4431 :208,242,173,063,008,141,146
4437 :001,021,173,064,008,141,237
4443 :002,021,173,065,008,141,245
4449 :003,021,162,019,032,026,104
4455 :016,169,000,141,004,021,198
4461 :141,005,021,141,001,021,183
4467 :141,002,021,141,003,021,188
4473 :162,000,032,026,016,096,197
4479 :072,138,010,168,185,005,193
4485 :021,240,003,076,071,018,050
4491 :224,000,240,111,165,162,017
4497 :041,064,205,032,021,208,204
4503 :003,076,047,018,141,032,212
4509 :021,173,027,212,041,007,126
4515 :201,004,144,030,201,004,235
4521 :240,039,201,005,240,048,174
4527 :201,006,240,062,169,040,125
4533 :153,004,021,169,166,153,079
4539 :005,021,169,001,157,022,050
4545 :008,076,008,018,169,175,135
4551 :153,004,021,169,118,153,049
4557 :005,021,076,008,018,169,246
4563 :045,153,004,021,169,078,169
4569 :153,005,021,076,008,018,242
4575 :169,040,153,004,021,169,011
4581 :078,153,005,021,169,001,144
4587 :157,022,008,076,008,018,012
4593 :169,045,153,004,021,169,034
4599 :166,153,005,021,076,008,164
4605 :018,169,175,153,004,021,025
4611 :169,222,153,005,021,140,201
4617 :030,008,152,072,138,072,225
4623 :032,099,016,008,104,141,159
4629 :020,008,104,170,104,168,083
4635 :173,020,008,072,040,144,228
4641 :013,169,000,153,004,021,137
4647 :157,022,008,153,005,021,149
4653 :104,104,224,000,240,020,225
4659 :173,027,212,048,005,169,173
4665 :015,076,063,018,169,241,127
4671 :153,031,008,169,004,153,069
4677 :047,008,104,096,173,000,241
4683 :220,041,001,208,249,169,195
4689 :147,032,210,255,032,057,046
4695 :017,096,160,000,185,125,158
4701 :018,240,022,141,000,212,214
4707 :200,185,125,018,141,001,001
4713 :212,200,185,125,018,170,247
4719 :032,165,018,200,076,091,181
4725 :018,141,000,212,141,001,118
4731 :212,096,180,004,007,071,181
4737 :005,007,152,005,011,071,124
4743 :005,011,180,004,011,001,091
4749 :000,003,180,004,007,071,150
4755 :005,007,152,005,007,012,079
4761 :007,007,071,005,007,152,146
4767 :005,007,180,004,012,000,111
4773 :152,072,142,048,021,162,250
4779 :000,032,144,011,032,007,141
4785 :015,032,104,015,032,212,075
4791 :014,206,048,021,208,237,149
4797 :104,168,096,169,024,141,123
4803 :024,212,169,017,141,005,251
4809 :212,169,240,141,006,212,157
4815 :169,000,141,000,212,141,102
4821 :001,212,169,033,141,004,005
4827 :212,096,162,255,142,001,063
4833 :212,160,000,200,208,253,234
4839 :202,208,245,142,001,212,217
4845 :096,019,013,013,013,013,148
4851 :013,013,149,070,069,070,115
4857 :069,070,069,070,065,066,146
4863 :029,029,029,029,029,029,173
4869 :029,029,029,029,029,029,179
4875 :029,029,029,029,029,029,185
4881 :029,029,029,029,065,066,008
4887 :069,070,069,070,069,070,184
4893 :069,072,071,072,071,072,200
4899 :071,072,067,068,029,029,115
4905 :029,029,029,029,029,029,215
4911 :029,029,029,029,029,029,221
4917 :029,029,029,029,029,029,227
4923 :029,029,067,068,071,072,139
4929 :071,072,071,072,071,017,183
4935 :017,017,029,029,029,029,221
4941 :029,029,029,029,029,029,251
4947 :029,029,029,065,066,069,114
4953 :070,069,070,069,070,069,250
4959 :070,069,070,065,066,013,192
4965 :029,029,029,029,029,029,019
4971 :029,029,029,029,029,029,025
4977 :029,067,068,071,072,071,235
4983 :072,071,072,071,072,071,036
4989 :072,067,068,013,013,013,115
4995 :013,013,070,069,070,069,179
5001 :070,069,070,065,066,029,250
5007 :029,029,029,029,029,029,061
5013 :029,029,029,029,029,029,067
5019 :029,029,029,029,029,029,073
5025 :029,029,029,065,066,069,192
5031 :070,069,070,069,070,069,072
5037 :072,071,072,071,072,071,090
5043 :072,067,068,029,029,029,217
5049 :029,029,029,029,029,029,103
5055 :029,029,029,029,029,029,109
5061 :029,029,029,029,029,029,115
5067 :029,067,068,071,072,071,069
5073 :072,071,072,071,013,013,009
5079 :013,013,013,152,018,083,251
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5085 :067,079,082,069,058,032,096
5091 :048,048,048,048,048,048,003
5097 :032,072,073,071,072,032,073
5103 :083,067,079,082,069,058,165
5109 :032,048,048,048,048,048,005
5115 :048,032,146,064,064,018,111
5121 :032,032,032,032,146,149,168
5127 :019,000,000,001,002,003,032
5133 :040,041,042,043,080,081,084
5139 :082,083,000,004,040,004,232
5145 :080,004,120,004,160,004,141
5151 :200,004,240,004,024,005,252
5157 :064,005,104,005,144,005,108
5163 :184,005,224,005,008,006,219
5169 :048,006,088,006,128,006,075
5175 :168,006,208,006,248,006,185
5181 :032,007,072,007,112,007,042
5187 :152,007,192,007,019,005,193
5193 :017,017,017,017,017,017,175
5199 :029,029,029,029,029,029,253
5205 :029,029,029,073,074,032,095
5211 :032,075,076,032,032,077,159
5217 :078,032,032,079,080,032,174
5223 :032,075,076,032,032,079,173
5229 :080,013,029,029,029,029,062
5235 :029,029,029,029,029,081,085
5241 :082,032,032,083,084,032,210
5247 :032,085,086,032,032,087,225
5253 :088,032,032,083,084,032,228
5259 :032,087,088,013,029,029,161
5265 :029,029,029,029,029,029,063
5271 :029,089,090,032,032,091,002
5277 :092,032,032,093,094,032,020
5283 :032,095,033,032,032,091,222
5289 :092,032,032,095,033,013,210
5295 :029,029,029,029,029,029,093
5301 :029,029,029,034,035,032,113
5307 :032,036,037,032,032,038,138
5313 :039,032,032,040,041,032,153
5319 :032,036,037,032,032,040,152
5325 :041,013,000,070,000,050,123
5331 :003,000,000,002,000,000,216
5337 :000,000,000,254,253,251,207
5343 :247,239,223,191,127,002,228
5349 :003,010,020,030,040,050,126
5355 :060,070,080,009,217,000,159
5361 :043,161,000,000,000,000,189
5367 :000,000,008,008,000,000,007
5373 :000,000,000,007,000,016,020
5379 :000,150,217,130,050,060,098
5385 :222,000,000,000,000,000,231
5391 :000,000,000,000,000,000,015
5397 :000,000,000,000,000,056,077
5403 :000,000,000,000,000,064,091
5409 :000,000,000,000,120,120,017
5415 :120,120,120,090,090,070,137
5421 :080,000,192,000,000,000,061
5427 :000,000,000,000,000,000,051
5433 :000,000,001,240,000,003,045
5439 :248,000,003,248,000,007,057
5445 :248,000,015,240,006,007,073
5451 :192,254,007,192,195,255,146
5457 :192,063,255,192,000,007,022
5463 :192,000,007,192,000,007,229
5469 :192,057,255,220,065,255,113
5475 :194,129,255,193,071,024,197
5481 :226,056,231,028,000,000,134
5487 :000,184,000,000,000,000,039
5493 :000,000,000,000,000,015,132
5499 :128,000,031,192,000,031,249
5505 :192,000,031,224,000,015,079
5511 :240,000,003,224,096,003,189
5517 :224,127,003,255,195,003,180
5523 :255,252,003,224,000,003,116
5529 :224,000,003,224,000,059,151
5535 :255,156,067,255,130,131,129
5541 :255,129,071,024,226,056,158
5547 :231,028,000,000,000,184,102
5553 :000,000,000,000,000,000,177
5559 :000,000,000,000,127,000,054
5565 :000,062,000,000,028,000,023
5571 :000,028,000,000,028,000,251
5577 :000,028,000,000,062,000,035
5583 :000,062,000,000,127,000,140
5589 :000,127,000,000,255,128,211
5595 :001,255,192,003,255,224,125
5601 :007,255,240,007,255,240,205
5607 :007,255,240,003,255,224,191
5613 :000,255,128,000,000,000,108
5619 :000,000,000,000,000,000,243
5625 :000,000,003,000,000,003,255
5631 :128,000,003,000,000,028,158
5637 :000,000,028,000,000,028,061
5643 :000,000,062,000,000,062,135
5649 :000,000,127,000,000,127,015
5655 :000,000,255,128,001,255,150
5661 :192,003,255,224,007,255,197
5667 :240,007,255,240,007,255,015
5673 :240,003,255,224,000,255,250
5679 :128,000,199,195,227,231,003
5685 :199,231,069,131,001,007,179
5691 :031,127,255,255,255,031,245
5697 :128,224,248,254,255,255,149
5703 :255,248,007,007,007,007,090
5709 :007,007,031,031,224,224,089
5715 :224,224,224,224,248,248,195
5721 :255,255,252,240,224,224,003
5727 :192,192,255,255,063,015,043
5733 :007,007,003,003,128,128,121
5739 :128,128,128,128,128,255,234
5745 :001,001,001,001,001,001,119
5751 :001,255,128,064,063,032,150
5757 :032,032,032,032,004,008,009
5763 :240,016,016,016,016,016,195
5769 :003,004,008,008,008,008,176
5775 :008,016,000,128,064,064,167
5781 :064,064,064,032,128,064,053
5787 :063,032,032,032,032,032,122
5793 :004,008,240,000,000,000,157
5799 :000,000,128,064,063,032,198
5805 :032,032,032,032,000,000,045
5811 :224,016,008,004,004,004,183
5817 :032,032,032,032,032,032,121
5823 :032,063,016,016,016,016,094
5829 :016,016,032,192,016,016,229
5835 :016,016,016,032,032,063,122
5841 :032,032,032,032,032,016,129
5847 :016,240,032,032,032,032,087
5853 :032,032,032,032,000,000,093
5859 :000,000,000,000,000,000,227
5865 :032,032,032,032,032,032,169
5871 :032,032,004,004,004,004,063
5877 :004,004,004,004,032,032,069
5883 :032,032,032,032,032,032,187
5889 :032,016,016,016,016,016,113
5895 :016,016,032,032,032,032,167
5901 :032,032,032,032,016,016,173
5907 :016,016,016,016,016,016,115
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5913 :032,032,032,032,032,032,217
5919 :032,032,112,016,016,016,255
5925 :016,016,016,016,032,032,165
5931 :032,032,032,032,032,032,235
5937 :000,000,000,000,000,000,049
5943 :000,000,004,004,004,004,071
5949 :004,004,004,004,032,032,141
5955 :032,032,032,063,064,128,162
5961 :016,016,016,016,016,240,137
5967 :008,004,032,032,032,032,219
5973 :032,032,064,128,016,016,117
5979 :016,016,016,016,008,004,167
5985 :032,032,032,032,032,063,064
5991 :064,128,016,016,016,016,103
5997 :016,240,008,004,032,032,185
6003 :032,032,032,063,064,128,210
6009 :004,004,004,008,016,224,125
6015 :000,000,013,013,013,013,179
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Budgeteer

(Article on page 76.)

BEFORE TYPING...

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

Program 1: Budgeteer—VIC Loader

```
10 T$="{CLR}{2 SPACES}{GRN}{RVS} {OFF}*
   {RVS} {OFF} BUDGETEER {RVS} {OFF}*
   {RVS} {OFF}{BLU}"                  :rem 37
12 PRINTCHR$(14)T$:PRINT              :rem 230
14 PRINT" USE THE PROGRAM TO{3 SPACES}REC
   ORD YOUR CHECKBOOK BALANCE AND ITS
                                      :rem 93
16 PRINT"ALLOCATION INTO ONE TOTEN ACCOUN
   TS SHOWING{2 SPACES}INTENDED USE.
                                      :rem 135
18 PRINT:PRINT" INCREASE BALANCE WITHDEPO
   SITS.                              :rem 100
20 PRINT:PRINT" WRITE CHECKS AGAINST ANY
   {SPACE}ACCOUNT.                    :rem 190
22 PRINT:PRINT" TRANSFER FUNDS FROM
   {2 SPACES}ONE ACCOUNT TO ANY{4 SPACES}
   OTHER.                             :rem 157
23 PRINT"{HOME}{19 DOWN}"             :rem 140
24 PRINT"INSTRUCTIONS?{2 SPACES}Y/N
                                      :rem 95
26 GETA$:IFA$=""THEN26                :rem 243
28 IFA$="N"THEN118                    :rem 246
30 IFA$<>"Y"THEN23                     :rem 2
32 PRINTT$:PRINT" AVAILABLE ACCOUNTS:":PR
   INT                                :rem 215
34 PRINT" 1.HOUS-ING                  :rem 191
36 PRINT" 2.UTIL-ITIES                 :rem 97
38 PRINT" 3.INSU-RANCE                 :rem 80
40 PRINT" 4.BANK:PMT OR SVGS          :rem 160
42 PRINT" 5.MC/V:BANK CARDS           :rem 208
44 PRINT" 6.VACA-TION                 :rem 253
46 PRINT" 7.MEDI-CAL                  :rem 154
48 PRINT" 8.BOOK:ENTERTAINMENT        :rem 196
50 PRINT" 9.CHGE:STORE ACCTS          :rem 199
52 PRINT"10.MISC-ELLANEOUS":PRINT:rem 143
54 PRINT"11.CHBK:TOTAL/BALANCE":PRINT
                                      :rem 124
56 PRINT"FOR THE DATE, USE ANY FORMAT WIT
   HOUT COMMAS.":GOSUB500             :rem 221
80 PRINT"DEPOSITS ARE ADDED TO THE CHECKB
   OOK BALANCE AND THE MISC ACCOUNT.":PRI
   NT                                 :rem 35
82 PRINT"LEAVE THEM IN MISC OR TRANSFER T
   HEM TO OTHERACCOUNTS AS YOU WISH.":PRI
   NT                                 :rem 147
84 PRINT"YOU GET PROMPTS ALONG THE WAY.":
   PRINT                              :rem 7
86 PRINT"YOU ARE PROTECTED MOSTOF THE TIM
   E AGAINST{3 SPACES}SLIP-UPS.":PRINT
                                      :rem 127
88 PRINT"NEGATIVE BALANCES ARE ALLOWED FO
   R TEMPORARY CONVENIENCE.":GOSUB500
                                      :rem 129
100 PRINT"WHEN YOU HAVE COMPLET-ED ALL YO
   UR TRANSACT- IONS, YOU WRITE NEW
                                      :rem 105
102 PRINT"FILE BALANCES.":PRINT       :rem 178
106 PRINT"HAPPY CHECKBOOK AND{3 SPACES}BU
   DGET BALANCING!":PRINT             :rem 232
108 PRINT:PRINT                       :rem 237
109 PRINT"{HOME}{9 DOWN}"             :rem 23
110 PRINT"WOULD YOU LIKE TO RE- PEAT THE
   {SPACE}INSTRUCTIONS?               :rem 212
112 GETA$:IFA$=""THEN112               :rem 75
114 IFA$="Y"THEN32                    :rem 248
116 IFA$<>"N"THENPRINT:GOTO109         :rem 97
118 S$="LO"+CHR$(34)+"B2"+CHR$(34)+",1:"+
   CHR$(131)                          :rem 112
120 REM CHANGE 1 TO 8 IN LINE 118 IF YOU
   {SPACE}AREUSING A DISK DRIVE       :rem 82
122 FORI=1TOLEN(S$):POKE630+I,ASC(MID$(S$
   ,I)):NEXT:POKE198,I:END            :rem 140
500 PRINT:PRINT"MORE?...PRESS ANY KEY
                                      :rem 229
502 POKE36878,15:POKE36875,240:FORM=1TO30
   0:NEXT:POKE36878,0:POKE36875,0
                                      :rem 210
504 GETA$:IFA$=""THEN504               :rem 85
506 PRINT"{CLR}"T$:RETURN             :rem 145
```

Program 2:
Budgeteer—VIC Main Program

```
2 X=0:REM MAKE X=0 FOR TAPE,OR X=1 TO USE
   DISK                               :rem 87
3 T$="{CLR}{2 SPACES}{GRN}{RVS} {OFF}*
  {RVS} {OFF} BUDGETEER {RVS} {OFF}*{RVS}
   {OFF}{BLU}":PRINTCHR$(14);:POKE36878,1
  5:S=36874                           :rem 145
4 DIMA$(11),A(11),B%(11):DEF FNR(X)=INT(X
  *100+.5)/100:PRINTT$:PRINT:PRINT
                                      :rem 203
5 PRINT:PRINT:INPUT"TODAY'S DATE";DD$:PRI
  NT:GOTO20                            :rem 51
6 PRINTT$:PRINT"DATE:"D$:PRINT"LAST AMT:$
  "A                                  :rem 70
7 GOSUB12:PRINT:FORR=1TO9:PRINT"{RED}"R"
  {LEFT}..{GRN}"A$(R)"..${BLU}"TAB(B%(R))
  A(R):NEXT                           :rem 236
8 PRINT"{RED}10..{GRN}"A$(10)"..${BLU}"TA
  B(B%(10))A(10):PRINT                :rem 245
9 PRINT"{RED}11..{GRN}"A$(11)".${BLU}"TAB
  (B%(11))A(11):PRINT:RETURN          :rem 230
10 POKES,212:FORM=1TO150:NEXT:POKES,0:FOR
   M=1TO100:NEXT                      :rem 211
11 POKES,201:FORM=1TO200:NEXT:POKES,0:RET
   URN                                :rem 95
```

```
12 FORR=1TO11                          :rem 15
13 IFABS(A(R))=>1THENB%(R)=16-LEN(STR$(IN
   T(ABS(A(R)))))                      :rem 153
14 IFABS(A(R))<1THENB%(R)=15           :rem 72
15 NEXT:RETURN                         :rem 191
20 FORR=1TO11:READA$(R):NEXT           :rem 229
21 DATA"HOUS","UTIL","INSU","BANK","MC/V"
                                       :rem 238
22 DATA"VACA","MEDI","BOOK","CHGE","MISC"
   ,"CHBK"                             :rem 178
25 GOSUB250                            :rem 126
28 IF X THEN OPEN1,8,2,"0:CHBKFILE,READ":
   GOTO 37                             :rem 220
30 PRINT"INSERT DATA CASSETTE{2 SPACES}AN
   D REWIND TO READ{4 SPACES}BALANCES.
                                       :rem 159
31 POKES,240:FORM=1TO300:NEXT:POKES,0
                                       :rem 75
32 PRINT:PRINT"READY?...PRESS Y        :rem 127
33 GETA$:IFA$=""THEN33                 :rem 239
34 IFA$="N"THENEND                     :rem 48
35 IFA$<>"Y"THEN30                      :rem 5
36 OPEN1,1,0,"CHBKFILE"                :rem 45
37 FORR=1TO11:INPUT#1,A(R):NEXT:INPUT#1,D
   $:CLOSE1                            :rem 80
40 GOSUB6                              :rem 26
50 PRINT"TRANSACTION?{2 SPACES}Y/N":POKES
   ,245:FORM=1TO200:NEXT               :rem 30
51 POKES,0:FORM=1TO100:NEXT:POKES,235:FOR
   M=1TO200:NEXT:POKES,0               :rem 241
52 GETA$:IFA$=""THEN52                 :rem 241
53 IFA$="Y"THEN70                      :rem 204
54 IFA$="N"THEN180                     :rem 244
55 GOSUB10:FORR=1TO3                    :rem 2
56 PRINT"{HOME}{17 DOWN}"SPC(14)"
   {3 SPACES}":FORM=1TO300:NEXT        :rem 219
58 PRINT"{HOME}{17 DOWN}"SPC(14)"Y/N":FOR
   M=1TO300:NEXT                       :rem 179
59 NEXT:GOTO52                         :rem 135
70 T=T+1:IFT=1THEND$=DD$               :rem 179
71 PRINT"{HOME}{17 DOWN}MENU: T=ACCT TRAN
   SFER                                :rem 75
72 PRINTSPC(6)"C=WRITE CHECK           :rem 238
73 PRINTSPC(6)"D=MAKE DEPOSIT           :rem 61
80 GETA$:IFA$=""THEN80                 :rem 243
81 IFA$="C"THEN100                     :rem 225
82 IFA$="D"THEN120                     :rem 229
83 IFA$="T"THEN140                     :rem 248
84 GOSUB10:FORR=1TO3                    :rem 4
85 PRINT"{HOME}{17 DOWN}"SPC(6)" ":rem 35
86 PRINTSPC(6)" ":PRINTSPC(6)" ":FORM=1TO
   300:NEXT                            :rem 175
88 PRINT"{HOME}{17 DOWN}"SPC(6)"T"
                                       :rem 250
89 PRINTSPC(6)"C":PRINTSPC(6)"D":FORM=1TO
   300:NEXT                            :rem 57
90 NEXT:GOTO80                         :rem 131
100 PRINT"AMT OF CHECK,ACCT #:":INPUTA,L
                                       :rem 222
101 IFL>10ORL<1ORL-INT(L)>0THENGOSUB10:PR
    INT"{2 UP}";:GOTO100               :rem 242
102 A(11)=FNR(A(11)-A):A(L)=FNR(A(L)-A):G
    OTO122                             :rem 61
120 PRINT"AMT OF DEPOSIT:":INPUTA      :rem 56
121 L=10:A(11)=FNR(A(11)+A):A(L)=FNR(A(L)
    +A)                                :rem 86
122 GOSUB6:E=L:F=12:GOTO160            :rem 125
140 PRINT"AMT,FROM #,TO #:":INPUTA,A1,A2
                                       :rem 191
141 XH=0:IFA1>10ORA2>10ORA1<1ORA2<1ORA1-I
    NT(A1)>0ORA2-INT(A2)>0THENXH=1:rem 40
142 IFXH=1THENGOSUB10:PRINT"{2 UP}";:GOTO
    140                                :rem 180
143 A(A1)=FNR(A(A1)-A):A(A2)=FNR(A(A2)+A)
                                       :rem 166
144 GOSUB6:E=A1:F=A2                   :rem 173
160 IFE>7THENPRINT"{HOME}"SPC(100)SPC(86+
    E*22-100)"*":GOTO162               :rem 150
161 PRINT"{HOME}"SPC(86+E*22)"*"       :rem 141
162 IFF>7THENPRINT"{HOME}"SPC(100)SPC(86+
    F*22-100)"*":GOTO164               :rem 156
163 PRINT"{HOME}"SPC(86+F*22)"*"       :rem 144
164 POKES,232:FORM=1TO200:NEXT:POKES,0:FO
    RM=1TO100:NEXT                      :rem 11
165 POKES,232:FORM=1TO150:NEXT:POKES,0
                                       :rem 135
166 FORM=1TO750:NEXT:PRINT"{HOME}
    {16 DOWN}":GOTO50                  :rem 253
180 IFT=0THEN200                       :rem 170
181 Z=0:FORR=1TO10:Z=Z+A(R):NEXT       :rem 249
182 IFABS(Z-A(11))=>.01THEN220         :rem 153
183 GOSUB 6:PRINT"ACCT BAL=CHBK BAL":GOSU
    B 250                              :rem 188
184 IF X THEN OPEN1,8,2,"@0:CHBKFILE,WRIT
    E":GOTO191                         :rem 239
185 PRINT"REWIND CASSETE TO{4 SPACES}WRIT
    E FILE.":POKES,240:FORM=1TO300:NEXT:P
    OKES,0                             :rem 93
186 PRINT:PRINT"READY?...PRESS Y       :rem 57
187 GETA$:IFA$=""THEN187               :rem 99
188 IFA$="N"THEN210                    :rem 38
189 IFA$<>"Y"THEN184                   :rem 121
190 OPEN1,1,1,"CHBKFILE"               :rem 95
191 R$=CHR$(13):FORR=1TO11:PRINT#1,A(R);R
    $;:NEXT                            :rem 122
192 PRINT#1,D$;R$;:CLOSE1              :rem 222
193 PRINTT$:PRINT"DATE:"D$:PRINT"HAD"T" T
    RANS.":GOSUB7                      :rem 132
194 PRINT"NEW FILE DONE.":POKE36878,0:END
                                       :rem 51
200 GOSUB6:PRINT"NO TRANSACTIONS.":PRINT"
    FILE NOT CHANGED.":END             :rem 252
210 GOSUB6:PRINT"BALANCES HAVE CHANGED."
                                       :rem 73
211 PRINT"WRITE NEW FILE?"             :rem 185
212 GETA$:IFA$=""THEN212               :rem 77
213 IFA$="N"THENEND                    :rem 95
214 IFA$<>"Y"THEN210                   :rem 100
215 GOTO40                             :rem 53
220 GOSUB6:PRINT"ERROR - NO BALANCE.":PRI
    NT"ACCT SUM="Z:PRINT"CHBK BALANCE="A(
    11)                                :rem 169
221 PRINT"DO YOU WISH TO":PRINT"CONTINUE?
                                       :rem 225
222 GETA$:IFA$=""THEN222               :rem 79
223 IFA$="N"THENEND                    :rem 96
224 IFA$<>"Y"THEN220                   :rem 102
225 GOTO40                             :rem 54
250 PRINT"INSERT DATA DISK OR{3 SPACES}TA
    PE. READY?(ANY KEY)"               :rem 81
251 GETA$:IFA$=""THEN251               :rem 83
253 RETURN                             :rem 122
```

Program 3: Budgeteer—64 Version

```
100 X=1:REM MAKE X=0 FOR TAPE,OR X=1 TO U
    SE DISK                            :rem 183
105 POKE 53280,12:POKE 53281,11:PRINTCHR$
    (14)                               :rem 206
110 T$="{CLR}{RVS}{7}{13 SPACES}{OFF}{8}
    {2 SPACES}BUDGETEER{2 SPACES}{RVS}{7}
    {14 SPACES}{8}"                    :rem 85
115 S=54272:FOR Q=S TO S+23:POKE Q,0:NEXT
                                       :rem 66
```

```
120 DIM A$(11),A(11),B%(11):DEF FNR(X)=IN
    T(X*100+.5)/100:PRINT T$"{6 DOWN}"
                                    :rem 70
130 PRINT"TODAY'S DATE";:GOSUB1080:INPUT
    {SPACE}DD$:PRINT:GOTO230        :rem 129
140 PRINT T$:PRINT"{8}{2 SPACES}DATE:{5}"
    D$:PRINT"{8}{2 SPACES}LAST AMOUNT:$
    {5}"A                           :rem 253
150 GOSUB190:PRINT:FOR R=1TO9:PRINT"
    {2 SPACES}{8}"R"{LEFT}.."A$(R)"..$"{5}
    "TAB(B%(R))A(R):NEXT            :rem 92
160 PRINT"{2 SPACES}{8}10.."A$(10)"..$"{5}
    "TAB(B%(10))A(10):PRINT         :rem 46
170 PRINT"{2 SPACES}{8}11.."A$(11)"..$"{5}
    "TAB(B%(11))A(11):PRINT:RETURN:rem 77
190 FOR R=1TO11                     :rem 70
200 IF ABS(A(R))=>1 THEN B%(R)=32-LEN(STR
    $(INT(ABS(A(R)))))              :rem 197
210 IF ABS(A(R))<1 THEN B%(R)=31    :rem 116
220 NEXT:RETURN                     :rem 237
230 FOR R=1TO11:READ A$(R):NEXT     :rem 24
240 DATA"HOUSING.......","UTILITIES.....
    ."                              :rem 193
243 DATA"INSURANCE.....","SERVICE CHARGE
    S"                              :rem 177
247 DATA"CREDIT{SHIFT-SPACE}CARDS..."
                                    :rem 205
250 DATA"VACATION.......","MEDICAL.....
    ."                              :rem 219
253 DATA"BOOKS&MAGAZINES","STORE CHARGES.
    ."                              :rem 145
257 DATA"MISCELLANEOUS..","TOTAL
    {SHIFT-SPACE}BALANCE.."         :rem 130
270 GOSUB1050                       :rem 223
280 IF X THEN OPEN1,8,2,"0:CHBKFILE,READ"
    :GOTO 350                       :rem 58
290 PRINT"INSERT DATA CASSETTE AND REWIND
     TO READ BALANCES.              :rem 215
300 PRINT:PRINT"READY?...PRESS Y    :rem 173
310 GET A$:IF A$="" THEN310         :rem 75
320 IF A$="N" THEN END              :rem 94
330 IF A$<>"Y" THEN290              :rem 107
340 OPEN1,1,0,"CHBKFILE"            :rem 91
350 FOR R=1TO11:INPUT#1,A(R):NEXT:INPUT#1
    ,D$:CLOSE1                      :rem 126
360 GOSUB140                        :rem 174
370 PRINT"{8}TRANSACTION?{2 SPACES}Y/N"
                                    :rem 225
375 GOSUB1080                       :rem 232
380 GET A$:IF A$="" THEN380         :rem 89
390 IF A$="Y" THEN450               :rem 50
400 IF A$="N" THEN740               :rem 33
410 GOSUB1160:FOR R=1TO3            :rem 148
420 PRINT"{HOME}{18 DOWN}"SPC(14)"
    {3 SPACES}":FOR M=1TO300:NEXT   :rem 23
430 PRINT"{HOME}{18 DOWN}"SPC(14)"Y/N":FO
    R M=1TO300:NEXT                 :rem 238
440 NEXT:GOTO380                    :rem 229
450 T=T+1:IF T=1 THEN D$=DD$        :rem 229
460 PRINT"{HOME}{18 DOWN}MENU: T=ACCT TRA
    NSFER                           :rem 142
470 PRINTSPC(6)"C=WRITE CHECK       :rem 32
480 PRINTSPC(6)"D=MAKE DEPOSIT      :rem 111
485 GOSUB1080                       :rem 234
490 GET A$:IF A$=""THEN490          :rem 93
500 IF A$="C"THEN590                :rem 26
510 IF A$="D"THEN620                :rem 22
520 IF A$="T"THEN650                :rem 42
530 GOSUB1160:FOR R=1TO3            :rem 151
540 PRINT"{HOME}{18 DOWN}"SPC(6)" "
                                    :rem 96
550 PRINTSPC(6)" ":PRINTSPC(6)" ":FOR M=1
    TO300:NEXT                      :rem 219
560 PRINT"{HOME}{18 DOWN}"SPC(6)"T"
                                    :rem 54
570 PRINTSPC(6)"C":PRINTSPC(6)"D":FOR M=1
    TO300:NEXT                      :rem 100
580 NEXT:GOTO490                    :rem 236
590 PRINT"{HOME}{21 DOWN}"          :rem 231
591 PRINT"AMT OF CHECK,ACCT #";:GOSUB1080
    :INPUT A,L                      :rem 112
600 IF L>10 OR L<1 OR L-INT(L)>0 THEN GOS
    UB1160:GOTO590                  :rem 2
610 A(11)=FNR(A(11)-A):A(L)=FNR(A(L)-A):G
    OTO640                          :rem 70
620 PRINT:PRINT"AMT OF DEPOSIT";:GOSUB108
    0:INPUT A                       :rem 136
630 L=10:A(11)=FNR(A(11)+A):A(L)=FNR(A(L)
    +A)                             :rem 91
640 GOSUB140:E=L:F=12:GOTO690       :rem 233
650 PRINT"{HOME}{21 DOWN}"          :rem 228
651 PRINT"AMT,FROM #,TO #";:GOSUB1080:INP
    UT A,A1,A2                      :rem 74
653 IF A1>10 OR A1<1 OR A1-INT(A1)>0 THEN
     GOSUB1160:GOTO650              :rem 159
660 IF A2>10 OR A2<1 OR A2-INT(A2)>0 THEN
     GOSUB1160:GOTO650              :rem 161
670 A(A1)=FNR(A(A1)-A):A(A2)=FNR(A(A2)+A)
                                    :rem 171
680 GOSUB140:E=A1:F=A2              :rem 17
690 IF E>6 THEN PRINT"{HOME}"SPC(255)SPC(
    198)SPC(E*40-255)"*":GOTO710    :rem 242
700 PRINT"{HOME}"SPC(198)SPC(E*40)"*"
                                    :rem 204
710 IF F>6 THEN PRINT"{HOME}"SPC(255)SPC(
    198)SPC(F*40-255)"*":GOTO730    :rem 239
720 PRINT"{HOME}"SPC(198)SPC(F*40)"*"
                                    :rem 207
730 FOR M=1TO750:NEXT:PRINT"{HOME}
    {17 DOWN}":GOTO370              :rem 64
740 IF T=0 THEN870                  :rem 185
750 Z=0:FOR R=1TO10:Z=Z+A(R):NEXT:rem 251
760 IF ABS(Z-A(11))=>.01 THEN940    :rem 164
770 GOSUB 140:PRINT"SUM OF ACCOUNTS=TOTAL
     BALANCE":GOSUB 1000            :rem 202
780 IF X THEN OPEN1,8,2,"@0:CHBKFILE,WRIT
    E":GOTO840                      :rem 242
790 PRINT:PRINT"READY?...PRESS Y    :rem 58
800 GET A$:IF A$=""THEN800          :rem 83
810 IF A$="N" THEN880               :rem 43
820 IF A$<>"Y" THEN780              :rem 115
830 OPEN1,1,1,"CHBKFILE"            :rem 96
840 R$=CHR$(13):FOR R=1TO11:PRINT#1,A(R);
    R$;:NEXT                        :rem 123
850 PRINT#1,D$;R$;:CLOSE1           :rem 223
855 PRINT T$:PRINT"DATE:"D$:PRINT"HAD"T"
    {SPACE}TRANS.":GOSUB150         :rem 232
860 PRINT"NEW FILE DONE.":END       :rem 94
870 GOSUB140:PRINT"NO TRANSACTIONS.":PRIN
    T"FILE NOT CHANGED.":END        :rem 104
880 GOSUB140:PRINT"BALANCES HAVE CHANGED.
    "                               :rem 181
890 PRINT"WRITE NEW FILE?"          :rem 198
900 GET A$:IF A$="" THEN900         :rem 85
910 IF A$="N" THEN END              :rem 99
920 IF A$<>"Y" THEN880              :rem 117
930 GOTO360                         :rem 110
935 GOSUB140:PRINT"ERROR - NO BALANCE.":P
    RINT"ACCT SUM="Z                :rem 219
940 PRINT"CHBK BALANCE="A(11)       :rem 157
950 PRINT"DO YOU WISH TO CONTINUE?":rem 1
960 GET A$:IF A$="" THEN960         :rem 97
970 IF A$="N" THENEND               :rem 105
980 IF A$<>"Y" THEN940              :rem 120
```

```
990 GOTO360                          :rem 116
1000 PRINT"INSERT DATA DISK OR TAPE"
                                     :rem 247
1002 PRINT"PRESSING 'STOP' WILL ABORT SES
     SION"                           :rem 231
1005 PRINT" (TRANSACTIONS WILL BE LOST)
                                     :rem 96
1008 PRINT" ANY OTHER KEY WILL SAVE DATA.
     "                               :rem 156
1009 GOSUB1080                        :rem 19
1010 GET A$:IF A$="" THEN1010        :rem 167
1030 RETURN                          :rem 164
1050 PRINT"INSERT DATA DISK OR TAPE"
                                     :rem 252
1055 PRINT"PRESS ANY KEY TO LOAD DATA."
                                     :rem 133
1058 GOSUB1080                        :rem 23
1060 GET A$:IF A$="" THEN1060        :rem 177
1070 RETURN                          :rem 168
1080 FOR Q=S TO S+22:POKE Q,0:NEXT
                                     :rem 165
1090 POKE S+5,0:POKE S+19,0          :rem 181
1095 POKE S+6,7:POKE S+20,7          :rem 193
1100 POKE S+24,15                    :rem 103
1110 POKE S+4,33:POKES+18,19          :rem 28
1120 POKE S,0:POKE S+1,75             :rem 82
1130 POKE S+14,1:POKE S+15,75         :rem 25
1135 POKE S+4,32:POKES+18,18          :rem 33
1140 FOR Q=1TO150:NEXT                :rem 30
1150 POKE S+1,0:POKE S+15,0:RETURN
                                     :rem 196
1160 FOR Q=S TO S+22:POKE Q,0:NEXT
                                     :rem 164
1170 POKE S+5,15:POKE S+12,15         :rem 25
1175 POKE S+3,4:POKE3+10,4           :rem 150
1180 POKE S+24,6                      :rem 63
1190 POKE S+4,65:POKES+18,65          :rem 42
1200 POKE S+1,12:POKE S+8,14         :rem 224
1210 FOR Q=1TO250:NEXT                :rem 29
1220 POKE S+1,0:POKE S+8,0:RETURN:rem 148
```

Function Key

(Article on page 160.)

BEFORE TYPING...

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

Program 1:
Function Key—64 Version

```
10 I=51712:SH=INT(I/256):SL=I-SH*256
                                     :rem 56
20 READ A:CK=CK+A:IF A=256 THEN 40:rem 53
25 IF A<0 THEN 100                    :rem 99
30 POKE I,A:I=I+1:GOTO 20            :rem 130
40 IFCK<>28195THENPRINT"ERROR IN DATA":ST
   OP                                :rem 191
50 PRINT"USE SYS"SH*256+SL+403"TO START":
   END                               :rem 150
100 IF A<-255 THEN A=ABS(A+256)+SH:GOTO 3
    0                                :rem 223
110 A=ABS(A+1)+SL:GOTO30             :rem 116
49152 DATA 0,0,0,0,0,0                :rem 27
49158 DATA 0,0,0,0,0,0                :rem 33
49164 DATA 0,0,0,0,0,0                :rem 30
49170 DATA 0,0,0,0,0,0                :rem 27
49176 DATA 0,0,0,0,0,0                :rem 33
49182 DATA 0,0,0,0,0,0                :rem 30
49188 DATA 0,0,0,0,0,0                :rem 36
49194 DATA 0,0,0,0,0,0                :rem 33
49200 DATA 0,0,0,0,0,0                :rem 21
49206 DATA 0,0,0,0,0,0                :rem 27
49212 DATA 0,0,0,0,0,0                :rem 24
49218 DATA 0,0,0,0,0,0                :rem 30
49224 DATA 0,0,0,0,0,0                :rem 27
49230 DATA 0,0,0,0,0,0                :rem 24
49236 DATA 0,0,0,0,0,0                :rem 30
49242 DATA 0,0,0,0,0,0                :rem 27
49248 DATA 0,0,0,0,0,0                :rem 33
49254 DATA 0,0,0,0,0,0                :rem 30
49260 DATA 0,0,0,0,0,0                :rem 27
49266 DATA 0,0,0,0,0,0                :rem 33
49272 DATA 0,0,0,0,0,0                :rem 30
49278 DATA 0,0,0,173,-1,-256          :rem 87
49284 DATA 240,30,166,198,224,11      :rem 51
49290 DATA 176,24,168,185,-1,-256:rem 103
49296 DATA 240,15,157,119,2,230       :rem 255
49302 DATA 198,238,-1,-256,173,-1 :rem 88
49308 DATA -256,41,15,208,3,141   :rem 246
49314 DATA -1,-256,108,-146,-257,32
                                     :rem 180
49320 DATA 72,235,173,-1,-256,208 :rem 88
49326 DATA 34,165,157,240,30,165      :rem 51
49332 DATA 212,208,26,166,198,202:rem 101
49338 DATA 189,119,2,201,133,144      :rem 51
49344 DATA 16,201,141,176,12,56   :rem 250
49350 DATA 233,133,10,10,10,10    :rem 174
49356 DATA 9,1,141,-1,-256,96     :rem 152
49362 DATA 166,122,189,0,2,201    :rem 199
49368 DATA 70,208,68,232,189,0    :rem 220
49374 DATA 2,201,49,144,60,201    :rem 197
49380 DATA 57,176,59,41,15,168    :rem 224
49386 DATA 185,-135,-257,168,232,189
                                     :rem 11
49392 DATA 0,2,201,61,240,5           :rem 40
49398 DATA 162,11,108,0,3,232     :rem 149
49404 DATA 189,0,2,201,13,240     :rem 140
49410 DATA 15,201,95,208,2,169    :rem 203
49416 DATA 13,153,-1,-256,200,152 :rem 77
49422 DATA 41,15,208,233,169,0    :rem 200
49428 DATA 153,-1,-256,160,107,32 :rem 86
49434 DATA 47,241,108,2,3,108     :rem 151
49440 DATA -144,-257,208,251,232,189
                                     :rem 247
49446 DATA 0,2,201,61,208,202     :rem 139
49452 DATA 232,138,72,160,0,189       :rem 3
49458 DATA 0,2,201,44,240,8           :rem 47
49464 DATA 232,200,192,15,208,243 :rem 95
49470 DATA 240,182,192,0,208,4    :rem 201
49476 DATA 162,8,208,176,232,189  :rem 70
49482 DATA 0,2,201,49,240,8           :rem 49
49488 DATA 201,56,240,4,162,9     :rem 161
49494 DATA 208,160,41,15,170,152  :rem 48
49500 DATA 72,160,0,138,32,186    :rem 200
49506 DATA 255,104,168,104,170,152
                                     :rem 147
49512 DATA 160,2,32,189,255,162       :rem 0
49518 DATA -1,134,251,169,-256,133
                                     :rem 144
49524 DATA 252,160,-257,169,251,162
                                     :rem 202
49530 DATA -227,32,216,255,169,13 :rem 97
49536 DATA 32,210,255,76,116,164  :rem 53
```

```
49542 DATA 0,1,65,17,81,33          :rem 1
49548 DATA 97,49,113,124,165,49     :rem 22
49554 DATA 234,162,-256,173,5,3     :rem 0
49560 DATA 201,-256,240,17,141,-145
                                    :rem 182
49566 DATA -257,173,4,3,141,-144    :rem 45
49572 DATA -257,169,-211,141,4,3    :rem 42
49578 DATA 142,5,3,173,21,3         :rem 55
49584 DATA 201,-256,240,19,141,-147
                                    :rem 192
49590 DATA -257,173,20,3,141,-146   :rem 90
49596 DATA -257,169,-130,120,141,20
                                    :rem 190
49602 DATA 3,142,21,3,88,173        :rem 102
49608 DATA 144,2,201,-256,240,19    :rem 41
49614 DATA 141,-170,-256,173,143,2
                                    :rem 136
49620 DATA 141,-169,-256,169,-168,120
                                    :rem 39
49626 DATA 141,143,2,142,144,2      :rem 195
49632 DATA 88,96,256                :rem 246
```

Program 2:

Function Key—VIC Version

```
10 I=PEEK(55)+256*PEEK(56)-512:SH=INT(I/2
   56):SL=I-SH*256                  :rem 176
20 READ A:CK=CK+A:IF A=256 THEN 40:rem 53
25 IF A<0 THEN 100                  :rem 99
30 POKE I,A:I=I+1:GOTO 20           :rem 130
40 IFCK<>28410THENPRINT"ERROR IN DATA":ST
   OP                               :rem 181
50 PRINT"USE SYS"SH*256+SL+403"TO START":
   POKE55,SL:POKE56,SH:END          :rem 207
100 IF A<-255 THEN A=ABS(A+256)+SH:GOTO 3
    0                               :rem 223
110 A=ABS(A+1)+SL:GOTO30            :rem 116
49152 DATA 0,0,0,0,0,0              :rem 27
49158 DATA 0,0,0,0,0,0              :rem 33
49164 DATA 0,0,0,0,0,0              :rem 30
49170 DATA 0,0,0,0,0,0              :rem 27
49176 DATA 0,0,0,0,0,0              :rem 33
49182 DATA 0,0,0,0,0,0              :rem 30
49188 DATA 0,0,0,0,0,0              :rem 36
49194 DATA 0,0,0,0,0,0              :rem 33
49200 DATA 0,0,0,0,0,0              :rem 21
49206 DATA 0,0,0,0,0,0              :rem 27
49212 DATA 0,0,0,0,0,0              :rem 24
49218 DATA 0,0,0,0,0,0              :rem 30
49224 DATA 0,0,0,0,0,0              :rem 27
49230 DATA 0,0,0,0,0,0              :rem 24
49236 DATA 0,0,0,0,0,0              :rem 30
49242 DATA 0,0,0,0,0,0              :rem 27
49248 DATA 0,0,0,0,0,0              :rem 33
49254 DATA 0,0,0,0,0,0              :rem 30
49260 DATA 0,0,0,0,0,0              :rem 27
49266 DATA 0,0,0,0,0,0              :rem 33
49272 DATA 0,0,0,0,0,0              :rem 30
49278 DATA 0,0,0,173,-1,-256        :rem 87
49284 DATA 240,30,166,198,224,11    :rem 51
49290 DATA 176,24,168,185,-1,-256:rem 103
49296 DATA 240,15,157,119,2,230     :rem 255
49302 DATA 198,238,-1,-256,173,-1   :rem 88
49308 DATA -256,41,15,208,3,141     :rem 246
49314 DATA -1,-256,108,-146,-257,32
                                    :rem 180
49320 DATA 72,235,173,-1,-256,208   :rem 88
49326 DATA 34,165,157,240,30,165    :rem 51
49332 DATA 212,208,26,166,198,202:rem 101
49338 DATA 189,119,2,201,133,144    :rem 51
49344 DATA 16,201,141,176,12,56     :rem 250
49350 DATA 233,133,10,10,10,10      :rem 174
49356 DATA 9,1,141,-1,-256,96       :rem 152
49362 DATA 166,122,189,0,2,201      :rem 199
49368 DATA 70,208,68,232,189,0      :rem 220
49374 DATA 2,201,49,144,60,201      :rem 197
49380 DATA 57,176,59,41,15,168      :rem 224
49386 DATA 185,-135,-257,168,232,189
                                    :rem 11
49392 DATA 0,2,201,61,240,5         :rem 40
49398 DATA 162,11,108,0,3,232       :rem 149
49404 DATA 189,0,2,201,13,240       :rem 140
49410 DATA 15,201,95,208,2,169      :rem 203
49416 DATA 13,153,-1,-256,200,152   :rem 77
49422 DATA 41,15,208,233,169,0      :rem 200
49428 DATA 153,-1,-256,160,107,32   :rem 86
49434 DATA 230,241,108,2,3,108      :rem 193
49440 DATA -144,-257,208,251,232,189
                                    :rem 247
49446 DATA 0,2,201,61,208,202       :rem 139
49452 DATA 232,138,72,160,0,189      :rem 3
49458 DATA 0,2,201,44,240,8         :rem 47
49464 DATA 232,200,192,15,208,243   :rem 95
49470 DATA 240,182,192,0,208,4      :rem 201
49476 DATA 162,8,208,176,232,189    :rem 70
49482 DATA 0,2,201,49,240,8         :rem 49
49488 DATA 201,56,240,4,162,9       :rem 161
49494 DATA 208,160,41,15,170,152    :rem 48
49500 DATA 72,160,0,138,32,186      :rem 200
49506 DATA 255,104,168,104,170,152
                                    :rem 147
49512 DATA 160,2,32,189,255,162      :rem 0
49518 DATA -1,134,251,169,-256,133
                                    :rem 144
49524 DATA 252,160,-257,169,251,162
                                    :rem 202
49530 DATA -227,32,216,255,169,13   :rem 97
49536 DATA 32,210,255,76,116,196    :rem 58
49542 DATA 0,1,65,17,81,33          :rem 1
49548 DATA 97,49,113,124,165,49     :rem 22
49554 DATA 234,162,-256,173,5,3     :rem 0
49560 DATA 201,-256,240,17,141,-145
                                    :rem 182
49566 DATA -257,173,4,3,141,-144    :rem 45
49572 DATA -257,169,-211,141,4,3    :rem 42
49578 DATA 142,5,3,173,21,3         :rem 55
49584 DATA 201,-256,240,19,141,-147
                                    :rem 192
49590 DATA -257,173,20,3,141,-146   :rem 90
49596 DATA -257,169,-130,120,141,20
                                    :rem 190
49602 DATA 3,142,21,3,88,173        :rem 102
49608 DATA 144,2,201,-256,240,19    :rem 41
49614 DATA 141,-170,-256,173,143,2
                                    :rem 136
49620 DATA 141,-169,-256,169,-168,120
                                    :rem 39
49626 DATA 141,143,2,142,144,2      :rem 195
49632 DATA 88,96,256                :rem 246
```

Disk Auto Load For The 64

(Article on page 164.)

```
5 PRINT"{CLR} PLEASE WAIT..."       :rem 18
10 B=679:C=767:TT=0                 :rem 51
20 FORA=BTOC:READD:TT=TT+D:POKEA,D:NEXT
                                    :rem 82
```

```
25 IFTT<>8554THENPRINT"CHECK DATA STATEME
   NTS";B;"TO";C:END                :rem 156
30 B=7168:C=7623:TT=0               :rem 147
40 FORA=BTOC:READD:TT=TT+D:POKEA,D:NEXT
                                    :rem 84
45 IFTT<>42577THENPRINT"CHECK DATA STATEM
   ENTS";B;"TO";C:END               :rem 209
50 PRINT "{CLR}{DOWN} AUTO-LOAD A {RVS}B
   {OFF}ASIC OR {RVS}M{OFF}ACHINE LANGUAG
   E{3 SPACES}PROGRAM?"             :rem 124
70 GETA$:IFA$=""THEN70              :rem 241
80 IFA$="M"THENGOSUB300             :rem 108
299 SYS7168:END                     :rem 138
300 PRINT"{CLR}{DOWN} ENTER STARTING ADDR
    ESS OF MACHINE LANG. PROGRAM.":rem 24
330 INPUTN:IFN<0ORN>65535THEN300    :rem 238
340 NN=INT(N/256):POKE722,N-(NN*256):POKE
    723,NN:POKE721,32               :rem 134
345 POKE693,1                       :rem 202
350 POKE718,32:POKE719,66:POKE720,166:POK
    E724,76:POKE725,116:POKE726,164:RETUR
    N                               :rem 184
679 DATA169,131,141,2,3,169,164,141
                                    :rem 245
687 DATA3,3,169,8,170,160,0,32      :rem 245
695 DATA186,255,169,2,162,239,160,2
                                    :rem 255
703 DATA32,189,255,169,0,166,43,164
                                    :rem 250
711 DATA44,32,213,255,32,231,255,165
                                    :rem 25
719 DATA174,133,45,133,47,165,175,133
                                    :rem 93
727 DATA46,133,48,234,169,82,141,119
                                    :rem 47
735 DATA2,169,213,141,120,2,169,13
                                    :rem 180
743 DATA141,121,2,169,3,133,198,96
                                    :rem 195
751 DATA0,0,0,0,0,0,0,0             :rem 107
759 DATA0,0,0,0,0,0,0,0,0           :rem 207
7168 DATA162,0,189,171,28,32,210,255
                                    :rem 38
7176 DATA232,224,98,208,245,162,0,32
                                    :rem 38
7184 DATA207,255,201,13,240,8,157,239
                                    :rem 87
7192 DATA2,232,224,16,208,241,142,186
                                    :rem 80
7200 DATA2,162,0,189,13,29,32,210:rem 123
7208 DATA255,232,224,59,208,245,162,0
                                    :rem 86
7216 DATA160,0,232,234,208,252,200,208
                                    :rem 116
7224 DATA249,165,197,201,64,240,250,169
                                    :rem 195
7232 DATA0,133,198,162,0,189,74,29
                                    :rem 198
7240 DATA32,210,255,232,224,85,208,245
                                    :rem 128
7248 DATA162,0,32,207,255,201,13,240
                                    :rem 19
7256 DATA8,157,200,29,232,224,16,208
                                    :rem 36
7264 DATA241,142,111,28,169,167,141,2
                                    :rem 82
7272 DATA3,169,2,141,3,3,169,0      :rem 241
7280 DATA162,200,160,29,32,189,255,169
                                    :rem 143
7288 DATA8,170,160,255,32,186,255,169
                                    :rem 106
7296 DATA167,133,251,169,2,133,252,169
                                    :rem 149
7304 DATA251,162,4,160,3,32,216,255
                                    :rem 229
7312 DATA32,231,255,169,131,141,2,3
                                    :rem 226
7320 DATA169,164,141,3,3,162,0,189
                                    :rem 188
7328 DATA159,29,32,210,255,232,224,41
                                    :rem 84
7336 DATA208,245,96,147,17,32,69,78
                                    :rem 12
7344 DATA84,69,82,32,78,65,77,69    :rem 129
7352 DATA32,79,70,32,13,80,82,79    :rem 102
7360 DATA71,82,65,77,32,84,72,65    :rem 110
7368 DATA84,32,73,83,32,84,79,32    :rem 114
7376 DATA66,69,13,65,85,84,79,77    :rem 134
7384 DATA65,84,73,67,65,76,76,89    :rem 136
7392 DATA32,66,79,79,84,69,68,46    :rem 135
7400 DATA13,17,32,77,65,88,73,77    :rem 107
7408 DATA85,77,32,76,69,78,71,84    :rem 128
7416 DATA72,32,61,32,49,54,13,67     :rem 97
7424 DATA72,65,82,65,67,84,69,82    :rem 122
7432 DATA83,46,17,17,13,147,17,80:rem 147
7440 DATA76,65,67,69,32,78,69,87    :rem 131
7448 DATA76,89,32,70,79,82,77,65    :rem 130
7456 DATA84,84,69,68,13,32,68,73    :rem 122
7464 DATA83,75,32,73,78,32,68,73    :rem 117
7472 DATA83,75,32,68,82,73,86,69    :rem 125
7480 DATA44,13,84,72,69,78,32,80    :rem 109
7488 DATA82,69,83,83,32,70,49,46    :rem 123
7496 DATA17,13,147,17,32,69,78,84:rem 167
7504 DATA69,82,32,78,65,77,69,32    :rem 120
7512 DATA79,70,32,66,79,79,84,13    :rem 117
7520 DATA80,82,79,71,46,32,157,84:rem 158
7528 DATA72,69,78,32,80,82,69,83    :rem 124
7536 DATA83,13,82,69,84,85,82,78    :rem 125
7544 DATA46,17,13,32,77,65,88,73    :rem 112
7552 DATA77,85,77,32,76,69,78,71    :rem 130
7560 DATA84,72,32,61,32,49,54,13     :rem 96
7568 DATA32,67,72,65,82,65,67,84    :rem 124
7576 DATA69,82,83,46,17,17,13,147:rem 165
7584 DATA17,32,18,84,85,82,78,32    :rem 115
7592 DATA67,79,77,80,85,84,69,82    :rem 138
7600 DATA32,79,70,70,47,79,78,13    :rem 108
7608 DATA84,79,32,82,69,83,69,84    :rem 131
7616 DATA32,86,69,67,84,79,82,83    :rem 130
```

MLX

(Article on page 167.)

BEFORE TYPING...

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

Program 1: MLX—VIC Version

```
10 REM LINES CHANGED FROM VIC MLX VERSION
    2.00 ARE 581,582,765            :rem 166
100 PRINT"{CLR}{PUR}";CHR$(142);CHR$(8);
                                    :rem 181
101 POKE 788,194:REM DISABLE RUN/STOP
                                    :rem 174
```

```
110 PRINT"{RVS}{14 SPACES}"          :rem 117
120 PRINT"{RVS} {RIGHT}{OFF}[*]£{RVS}
    {RIGHT} {RIGHT}{2 SPACES}[*]{OFF}[*]
    £{RVS}£{RVS} "                   :rem 191
130 PRINT"{RVS} {RIGHT} [G]{RIGHT}
    {2 RIGHT} {OFF}£{RVS}£[*]{OFF}[*]
    {RVS} "                          :rem 232
140 PRINT"{RVS}{14 SPACES}"          :rem 120
200 PRINT"{2 DOWN}{PUR}{BLK}MACHINE LANGU
    AGE":PRINT"EDITOR VER 2.02{5 DOWN}"
                                     :rem 192
210 PRINT"{BLK}{3 UP}STARTING ADDRESS":IN
    PUTS:F=1-F:C$=CHR$(31+119*F)     :rem 97
220 IFS<256ORS>32767THENGOSUB3000:GOTO210
                                     :rem 2
225 PRINT:PRINT:PRINT:PRINT          :rem 123
230 PRINT"{BLK}{3 UP}ENDING ADDRESS":INPU
    TE:F=1-F:C$=CHR$(31+119*F)       :rem 158
240 IFE<256ORE>32767THENGOSUB3000:GOTO230
                                     :rem 234
250 IFE<STHENPRINTC$;"{RVS}ENDING < START
    {2 SPACES}":GOSUB1000:GOTO 230
                                     :rem 176
260 PRINT:PRINT:PRINT                :rem 179
300 PRINT"{CLR}";CHR$(14):AD=S       :rem 56
310 A=1:PRINTRIGHT$("0000"+MID$(STR$(AD),
    2),5);":";                       :rem 33
315 FOR J=A TO 6                     :rem 33
320 GOSUB570:IFN=-1THENJ=J+N:GOTO320
                                     :rem 228
390 IFN=-211THEN 710                 :rem 62
400 IFN=-204THEN 790                 :rem 64
410 IFN=-206THENPRINT:INPUT"{DOWN}ENTER N
    EW ADDRESS";ZZ                   :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETHENPRINT"
    {RVS}OUT OF RANGE":GOSUB1000:GOTO410
                                     :rem 225
417 IFN=-206THENAD=ZZ:PRINT:GOTO310
                                     :rem 238
420 IF N<>-196 THEN 480              :rem 133
430 PRINT:INPUT"DISPLAY:FROM";F:PRINT,"TO
    ";:INPUTT                        :rem 234
440 IFF<SORF>EORT<SORT>ETHENPRINT"AT LEAS
    T";S;"{LEFT}, NOT MORE THAN";E:GOTO43
    0                                :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINTRIGHT$("000
    0"+MID$(STR$(I),2),5);":";       :rem 30
455 FORK=0TO5:N=PEEK(I+K):IFK=3THENPRINTS
    PC(10);                          :rem 34
457 PRINTRIGHT$("00"+MID$(STR$(N),2),3);"
    ,";                              :rem 157
460 GETA$:IFA$>""THENPRINT:PRINT:GOTO310
                                     :rem 25
470 NEXTK:PRINTCHR$(20);:NEXTI:PRINT:PRIN
    T:GOTO310                        :rem 50
480 IFN<0 THEN PRINT:GOTO310         :rem 168
490 A(J)=N:NEXTJ                     :rem 199
500 CKSUM=AD-INT(AD/256)*256:FORI=1TO6:CK
    SUM=(CKSUM+A(I))AND255:NEXT      :rem 200
510 PRINTCHR$(18);:GOSUB570:PRINTCHR$(146
    );                               :rem 94
511 IFN=-1THENA=6:GOTO315            :rem 254
515 PRINTCHR$(20):IFN=CKSUMTHEN530
                                     :rem 122
520 PRINT:PRINT"LINE ENTERED WRONG":PRINT
    "RE-ENTER":PRINT:GOSUB1000:GOTO310
                                     :rem 129
530 GOSUB2000                        :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):NEXT:rem 80
550 AD=AD+6:IF AD<E THEN 310         :rem 212
560 GOTO 710                         :rem 108
570 N=0:Z=0                          :rem 88
580 PRINT"[+]";                      :rem 79
581 GETA$:IFA$=""THEN581             :rem 95
582 AV=-(A$="M")-2*(A$=",")-3*(A$=".")-4*
    (A$="J")-5*(A$="K")-6*(A$="L"):rem 41
583 AV=AV-7*(A$="U")-8*(A$="I")-9*(A$="O"
    ):IFA$="H"THENA$="0"             :rem 134
584 IFAV>0THENA$=CHR$(48+AV)         :rem 134
585 PRINTCHR$(20);:A=ASC(A$):IFA=13ORA=44
    ORA=32THEN670                    :rem 229
590 IFA>128THENN=-A:RETURN           :rem 137
600 IFA<>20 THEN 630                 :rem 10
610 PRINTCHR$(146);:GOSUB690:IFI=1ANDT=44
    THENN=-1:PRINT"{LEFT} {LEFT}";:GOTO69
    0                                :rem 155
620 GOTO570                          :rem 109
630 IFA<48ORA>57THEN580              :rem 105
640 PRINTA$;:N=N*10+A-48             :rem 106
650 IFN>255 THEN A=20:GOSUB1000:GOTO600
                                     :rem 229
660 Z=Z+1:IFZ<3THEN580               :rem 71
670 IFZ=0THENGOSUB1000:GOTO570       :rem 114
680 PRINT",";:RETURN                 :rem 240
690 S%=PEEK(209)+256*PEEK(210)+PEEK(211)
                                     :rem 149
692 FORI=1TO3:T=PEEK(S%-I)           :rem 68
695 IFT<>44ANDT<>58THENPOKES%-I,32:NEXT
                                     :rem 205
700 PRINTLEFT$("{3 LEFT}",I-1);:RETURN
                                     :rem 7
710 PRINT"{CLR}{RVS}*** SAVE ***{3 DOWN}"
                                     :rem 236
720 F$="":INPUT"{DOWN} FILENAME";F$:IFF$=
    ""THEN310                        :rem 128
730 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"          :rem 228
740 GETA$:IFA$<>"T"ANDA$<>"D"THEN740
                                     :rem 36
750 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$:
    OPEN15,8,15,"S"+F$:CLOSE15       :rem 212
760 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                 :rem 3
762 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                     :rem 109
763 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                               :rem 69
765 K=S:POKE254,K/256:POKE253,K-PEEK(254)
    *256:POKE780,253                 :rem 17
766 K=E+1:POKE782,K/256:POKE781,K-PEEK(78
    2)*256:SYS65496                  :rem 235
770 IF(PEEK(783)AND1)OR(191ANDST)THEN780
                                     :rem 111
775 PRINT"{DOWN}DONE.":GOTO310       :rem 96
780 PRINT"{DOWN}ERROR ON SAVE.{2 SPACES}T
    RY AGAIN.":IFDV=1THEN720         :rem 171
781 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO720             :rem 103
782 GOTO720                          :rem 115
790 PRINT"{CLR}{RVS}*** LOAD ***{2 DOWN}"
                                     :rem 212
800 F$="":INPUT"{2 DOWN} FILENAME";F$:IFF
    $=""THEN310                      :rem 144
810 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"          :rem 227
820 GETA$:IFA$<>"T"ANDA$<>"D"THEN820
                                     :rem 34
830 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                     :rem 157
840 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                 :rem 2
```

```
841 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                    :rem 107
845 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                              :rem 70
850 POKE780,0:SYS65493              :rem 11
860 IF(PEEK(783)AND1)OR(191ANDST)THEN870
                                    :rem 111
865 PRINT"{DOWN}DONE.":GOTO310      :rem 96
870 PRINT"{DOWN}ERROR ON LOAD.{2 SPACES}T
    RY AGAIN.{DOWN}":IFDV=1THEN800
                                    :rem 172
880 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO800            :rem 102
1000 REM BUZZER                     :rem 135
1001 POKE36878,15:POKE36874,190     :rem 206
1002 FORW=1TO300:NEXTW              :rem 117
1003 POKE36878,0:POKE36874,0:RETURN
                                    :rem 74
2000 REM BELL SOUND                 :rem 78
2001 FORW=15TO0STEP-1:POKE36878,W:POKE368
     76,240:NEXTW                   :rem 22
2002 POKE36876,0:RETURN             :rem 119
3000 PRINTC$;"{RVS}NOT ZERO PAGE OR ROM":
     GOTO1000                       :rem 89
```

Program 2: MLX—64 Version

```
10 REM LINES CHANGED FROM MLX VERSION 2.0
   0 ARE 750,765,770 AND 860        :rem 50
20 REM LINE CHANGED FROM MLX VERSION 2.01
    IS 300                          :rem 147
100 PRINT"{CLR}{6}";CHR$(142);CHR$(8);:PO
    KE53281,1:POKE53280,1           :rem 67
101 POKE 788,52:REM DISABLE RUN/STOP
                                    :rem 119
110 PRINT"{RVS}{39 SPACES}";        :rem 176
120 PRINT"{RVS}{14 SPACES}{RIGHT}{OFF}{*}
    £{RVS}{RIGHT} {RIGHT}{2 SPACES}{*}
    {OFF}{*}£{RVS}£{RVS}{14 SPACES}";
                                    :rem 250
130 PRINT"{RVS}{14 SPACES}{RIGHT} {G}
    {RIGHT} {2 RIGHT} {OFF}£{RVS}£{*}
    {OFF}{*}{RVS}{14 SPACES}";      :rem 35
140 PRINT"{RVS}{41 SPACES}"         :rem 120
200 PRINT"{2 DOWN}{PUR}{BLK} MACHINE LANG
    UAGE EDITOR VERSION 2.02{5 DOWN}"
                                    :rem 238
210 PRINT"{5}{2 UP}STARTING ADDRESS?
    {8 SPACES}{9 LEFT}";            :rem 143
215 INPUTS:F=1-F:C$=CHR$(31+119*F)
                                    :rem 166
220 IFS<256OR(S>40960ANDS<49152)ORS>53247
    THENGOSUB3000:GOTO210           :rem 235
225 PRINT:PRINT:PRINT               :rem 180
230 PRINT"{5}{2 UP}ENDING ADDRESS?
    {8 SPACES}{9 LEFT}";:INPUTE:F=1-F:C$=
    CHR$(31+119*F)                  :rem 20
240 IFE<256OR(E>40960ANDE<49152)ORE>53247
    THENGOSUB3000:GOTO230           :rem 183
250 IFE<STHENPRINTC$;"{RVS}ENDING < START
    {2 SPACES}":GOSUB1000:GOTO 230
                                    :rem 176
260 PRINT:PRINT:PRINT               :rem 179
300 PRINT"{CLR}";CHR$(14):AD=S      :rem 56
310 A=1:PRINTRIGHT$("0000"+MID$(STR$(AD),
    2),5);":";                      :rem 33
315 FORJ=ATO6                       :rem 33
320 GOSUB570:IFN=-1THENJ=J+N:GOTO320
                                    :rem 228
390 IFN=-211THEN 710                :rem 62
400 IFN=-204THEN 790                :rem 64
410 IFN=-206THENPRINT:INPUT"{DOWN}ENTER N
    EW ADDRESS";ZZ                  :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETHENPRINT"
    {RVS}OUT OF RANGE":GOSUB1000:GOTO410
                                    :rem 225
417 IFN=-206THENAD=ZZ:PRINT:GOTO310
                                    :rem 238
420 IF N<>-196 THEN 480             :rem 133
430 PRINT:INPUT"DISPLAY:FROM";F:PRINT,"TO
    ";:INPUTT                       :rem 234
440 IFF<SORF>EORT<SORT>ETHENPRINT"AT LEAS
    T";S;"{LEFT}, NOT MORE THAN";E:GOTO43
    0                               :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINTRIGHT$("000
    0"+MID$(STR$(I),2),5);":";      :rem 30
451 FORK=0TO5:N=PEEK(I+K):PRINTRIGHT$("00
    "+MID$(STR$(N),2),3);",";       :rem 66
460 GETA$:IFA$>""THENPRINT:PRINT:GOTO310
                                    :rem 25
470 NEXTK:PRINTCHR$(20);:NEXTI:PRINT:PRIN
    T:GOTO310                       :rem 50
480 IFN<0 THEN PRINT:GOTO310        :rem 168
490 A(J)=N:NEXTJ                    :rem 199
500 CKSUM=AD-INT(AD/256)*256:FORI=1TO6:CK
    SUM=(CKSUM+A(I))AND255:NEXT     :rem 200
510 PRINTCHR$(18);:GOSUB570:PRINTCHR$(146
    );                              :rem 94
511 IFN=-1THENA=6:GOTO315           :rem 254
515 PRINTCHR$(20):IFN=CKSUMTHEN530
                                    :rem 122
520 PRINT:PRINT"LINE ENTERED WRONG : RE-E
    NTER":PRINT:GOSUB1000:GOTO310:rem 176
530 GOSUB2000                       :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):NEXT:POKE54
    272,0:POKE54273,0               :rem 227
550 AD=AD+6:IF AD<E THEN 310        :rem 212
560 GOTO 710                        :rem 108
570 N=0:Z=0                         :rem 88
580 PRINT"{£}";                     :rem 81
581 GETA$:IFA$=""THEN581            :rem 95
582 AV=-(A$="M")-2*(A$=",")-3*(A$=".")-4*
    (A$="J")-5*(A$="K")-6*(A$="L"):rem 41
583 AV=AV-7*(A$="U")-8*(A$="I")-9*(A$="O"
    ):IFA$="H"THENA$="0"            :rem 134
584 IFAV>0THENA$=CHR$(48+AV)        :rem 134
585 PRINTCHR$(20);:A=ASC(A$):IFA=13ORA=44
    ORA=32THEN670                   :rem 229
590 IFA>128THENN=-A:RETURN          :rem 137
600 IFA<>20 THEN 630                :rem 10
610 GOSUB690:IFI=1ANDT=44THENN=-1:PRINT"
    {OFF}{LEFT} {LEFT}";:GOTO690    :rem 62
620 GOTO570                         :rem 109
630 IFA<48ORA>57THEN580             :rem 105
640 PRINTA$;:N=N*10+A-48            :rem 106
650 IFN>255 THEN A=20:GOSUB1000:GOTO600
                                    :rem 229
660 Z=Z+1:IFZ<3THEN580              :rem 71
670 IFZ=0THENGOSUB1000:GOTO570      :rem 114
680 PRINT",";:RETURN                :rem 240
690 S%=PEEK(209)+256*PEEK(210)+PEEK(211)
                                    :rem 149
691 FORI=1TO3:T=PEEK(S%-I)          :rem 67
695 IFT<>44ANDT<>58THENPOKES%-I,32:NEXT
                                    :rem 205
700 PRINTLEFT$("{3 LEFT}",I-1);:RETURN
                                    :rem 7
710 PRINT"{CLR}{RVS}*** SAVE ***{3 DOWN}"
                                    :rem 236
715 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF}
     ALONE TO CANCEL SAVE){DOWN}":rem 106
```

```
720 F$="":INPUT"{DOWN} FILENAME";F$:IFF$=
    ""THENPRINT:PRINT:GOTO310      :rem 71
730 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"        :rem 228
740 GETA$:IFA$<>"T"ANDA$<>"D"THEN740
                                   :rem 36
750 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$:
    OPEN15,8,15,"S"+F$:CLOSE15     :rem 212
760 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256               :rem 3
762 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                   :rem 109
763 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                             :rem 69
765 K=S:POKE254,K/256:POKE253,K-PEEK(254)
    *256:POKE780,253               :rem 17
766 K=E+1:POKE782,K/256:POKE781,K-PEEK(78
    2)*256:SYS65496                :rem 235
770 IF(PEEK(783)AND1)OR(191ANDST)THEN780
                                   :rem 111
775 PRINT"{DOWN}DONE.{DOWN}":GOTO310
                                   :rem 113
780 PRINT"{DOWN}ERROR ON SAVE.{2 SPACES}T
    RY AGAIN.":IFDV=1THEN720       :rem 171
781 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO720           :rem 103
790 PRINT"{CLR}{RVS}*** LOAD ***{2 DOWN}"
                                   :rem 212
795 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF}
     ALONE TO CANCEL LOAD)"        :rem 82
800 F$="":INPUT"{2 DOWN} FILENAME";F$:IFF
    $=""THENPRINT:GOTO310          :rem 144
810 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"        :rem 227
820 GETA$:IFA$<>"T"ANDA$<>"D"THEN820
                                   :rem 34
830 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                   :rem 157
840 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256               :rem 2
841 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                   :rem 107
845 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                             :rem 70
850 POKE780,0:SYS65493             :rem 11
860 IF(PEEK(783)AND1)OR(191ANDST)THEN870
                                   :rem 111
865 PRINT"{DOWN}DONE.":GOTO310     :rem 96
870 PRINT"{DOWN}ERROR ON LOAD.{2 SPACES}T
    RY AGAIN.{DOWN}":IFDV=1THEN800
                                   :rem 172
880 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO800           :rem 102
1000 REM BUZZER                    :rem 135
1001 POKE54296,15:POKE54277,45:POKE54278,
     165                           :rem 207
1002 POKE54276,33:POKE 54273,6:POKE54272,
     5                             :rem 42
1003 FORT=1TO200:NEXT:POKE54276,32:POKE54
     273,0:POKE54272,0:RETURN      :rem 202
2000 REM BELL SOUND                :rem 78
2001 POKE54296,15:POKE54277,0:POKE54278,2
     47                            :rem 152
2002 POKE 54276,17:POKE54273,40:POKE54272
     ,0                            :rem 86
2003 FORT=1TO100:NEXT:POKE54276,16:RETURN
                                   :rem 57
3000 PRINTC$;"{RVS}NOT ZERO PAGE OR ROM":
     GOTO1000                      :rem 89
```

Machine Language For Beginners

(Article on page 116.)

BEFORE TYPING...

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

VIC/64 Assembler

```
10 H=0:REM IF H = 1 THEN ASSEMBLY IS IN H
   EX                              :rem 32
50 HE$="0123456789ABCDEF":SZ=1:ZO$="000"
                                   :rem 166
100 PRINT"{3 SPACES}SIMPLE{3 SPACES}ASSEM
    BLER{2 SPACES}CONVENTIONS:"    :rem 90
110 DIMM$(56),TY(56),OP(56)        :rem 181
120 FORI=1TO56:READM$(I)           :rem 160
122 ROP$=MID$(M$(I),4,1):TY(I)=VAL(ROP$)
                                   :rem 5
124 OP$=RIGHT$(M$(I),3):OP(I)=VAL(OP$)
                                   :rem 155
126 M$(I)=LEFT$(M$(I),3)           :rem 235
140 NEXTI: PRINT                   :rem 228
150 PRINT"IMMEDIATE{5 SPACES}LDA #15
                                   :rem 46
155 PRINT"ABSOLUTE{6 SPACES}LDA 1500
                                   :rem 64
160 PRINT"ZERO PAGE{5 SPACES}LDA 15
                                   :rem 218
165 PRINT"ACCUMULATOR{3 SPACES}ASL
                                   :rem 107
170 PRINT"INDIRECT X{4 SPACES}LDA (15X)
                                   :rem 209
175 PRINT"INDIRECT Y{4 SPACES}LDA (15)Y
                                   :rem 216
177 PRINT"ZERO PAGE X{3 SPACES}LDA 15X
                                   :rem 146
179 PRINT"ZERO PAGE Y{3 SPACES}LDX 15Y
                                   :rem 173
180 PRINT"ABSOLUTE X{4 SPACES}LDA 1500X
                                   :rem 238
185 PRINT"ABSOLUTE Y{4 SPACES}LDA 1500Y
                                   :rem 245
189 PRINT:PRINT"{4 SPACES}ENTER ALL NUMBE
    RS IN ";                       :rem 127
190 IFH=1 THENPRINT"HEX":GOTO200   :rem 201
195 PRINT"DECIMAL"                 :rem 95
200 PRINT:PRINT"PLEASE INPUT STARTING ADD
    RESS FOR ML PROGRAM":INPUT SA$ :rem 0
210 IFH=1THENH$=SA$:GOSUB5000:SA=DE:GOTO2
    20                             :rem 130
215 SA=VAL(SA$)                    :rem 85
220 TA=SA:PRINT"{CLR}":REM CLEAR THE SCRE
    EN                             :rem 190
230 IFH=1THENDE=SA:SZ=3:GOSUB4000:PRINTH$
    ;:GOTO240                      :rem 175
235 PRINTSA" ";                    :rem 58
240 INPUTMN$:PRINT"{UP}"SPC(20);:REM GO U
    P ONE LINE AND OVER 20 SPACES:rem 232
241 REM ADD NEW PSEUDO-OPS HERE    :rem 65
242 IFRIGHT$(MN$,7)="FORWARD"THENFB=SA
                                   :rem 90
```

```
243 IFRIGHT$(MN$,7)="RESOLVE"THENFR=SA-FB
    :POKEFB+1,FR-2:PRINT"{2 SPACES}OK":GO
    TO230                              :rem 72
244 IFRIGHT$(MN$,4)="POKE"THENPRINT"ADDR,
    NUMBER(DEC)";:INPUTADR,NUM:POKEADR,NU
    M:GOTO230                          :rem 116
250 IFMN$="END"THENPRINT:PRINT"{6 SPACES}
    PROGRAM IS FROM"TA"TO"SA:END       :rem 13
260 L=LEN(MN$):L$=LEFT$(MN$,3)         :rem 181
270 FORI=1TO56:IFL$=M$(I)THEN300       :rem 136
280 NEXTI                              :rem 34
290 GOTO850                            :rem 113
300 REM PRIMARY OPCODE CATEGORIES      :rem 59
301 TY=TY(I):OP=OP(I)                  :rem 20
305 IFFB=SATHENTN=0:GOTO2010           :rem 244
310 IFTY=0THENGOTO1000                 :rem 102
320 IFTY=3THENTY=1:IFL=3THENOP=OP+8:GOTO1
    000                                :rem 81
330 R$=RIGHT$(MN$,L-4):IFH=1THENGOSUB6000
                                       :rem 200
340 LR$=LEFT$(R$,1):LL=LEN(R$):IFLR$="#"T
    HEN480                             :rem 184
350 IFLR$="("THEN520                   :rem 88
360 IFTY=8THEN600                      :rem 15
370 IFTY=3THENOP=OP+8:GOTO1000         :rem 135
380 IFRIGHT$(R$,1)="X"ORRIGHT$(R$,1)="Y"T
    HEN630                             :rem 210
390 IFLEFT$(L$,1)="J"THEN820           :rem 44
400 TN=VAL(R$):IFTN>255THEN430         :rem 40
410 IFTY=1ORTY=3ORTY=4ORTY=5THENOP=OP+4
                                       :rem 133
420 GOTO2000                           :rem 145
430 H%=TN/256:L%=TN-256*H%:IFTY=2ORTY=7TH
    ENOP=OP+8:GOTO470                  :rem 92
440 IFTY=1ORTY=3ORTY=4ORTY=5THENOP=OP+12:
    GOTO470                            :rem 197
450 IFTY=6ORTY=9THEN470                :rem 214
460 GOTO850                            :rem 112
470 GOTO3000                           :rem 151
480 TN=VAL(RIGHT$(R$,LL-1))            :rem 58
490 IFTY=1THENOP=OP+8:GOTO2000         :rem 137
500 IFTY=4ORTY=5THENGOTO2000           :rem 44
510 GOTO850                            :rem 108
520 IFRIGHT$(R$,2)=")Y"THEN540         :rem 184
530 IFRIGHT$(R$,2)="X)"THEN570         :rem 187
540 TN=VAL(MID$(R$,2,LL-3))            :rem 243
550 IFTY=1THENOP=OP+16:GOTO2000        :rem 181
560 GOTO850                            :rem 113
570 TN=VAL(MID$(R$,2,LL-3))            :rem 246
580 IFTY=1THENGOTO2000                 :rem 113
590 GOTO850                            :rem 116
600 TN=VAL(R$):TN=TN-SA-2:IFTN<-128ORTN>1
    27THENPRINT"TOO FAR ";:GOTO850
                                       :rem 154
610 IFTN<0THENTN=TN+256                :rem 172
620 GOTO2000                           :rem 147
630 IFRIGHT$(R$,2)=")Y"THEN540         :rem 186
640 IFRIGHT$(R$,1)="X"THEN720          :rem 144
650 REM *ZERO Y                        :rem 66
660 TN=VAL(LEFT$(R$,LL-1)):IFTN>255THEN68
    0                                  :rem 249
670 IFTY=2ORTY=5THEN730                :rem 209
675 IFTY=1THEN760                      :rem 24
680 GOSUB770:IFTY=1THENOP=OP+24:GOTO710
                                       :rem 230
690 IFTY=5THENOP=OP+28:GOTO710         :rem 151
700 GOTO850                            :rem 109
710 GOTO3000                           :rem 148
720 TN=VAL(LEFT$(R$,LL-1)):IFTN>255THENGO
    SUB770:GOTO780                     :rem 136
730 IFTY=2THENOP=OP+16:GOTO760         :rem 145
740 IFTY=1ORTY=3ORTY=5THENOP=OP+20:GOTO76
    0                                  :rem 10
750 GOTO850                            :rem 114
760 GOTO2000                           :rem 152
770 H%=TN/256:L%=TN-256*H%:RETURN:rem 187
780 IFTY=2THENOP=OP+24:GOTO810         :rem 145
790 IFTY=1ORTY=3ORTY=5THENOP=OP+28:GOTO81
    0                                  :rem 19
800 GOTO850                            :rem 110
810 GOTO3000                           :rem 149
820 TN=VAL(R$)                         :rem 35
830 GOSUB770                           :rem 185
840 GOTO710                            :rem 109
850 PRINT"{RVS} ERROR ":GOTO230        :rem 18
1000 REM 1 BYTE INSTRUCTIONS           :rem 191
1010 POKESA,OP:SA=SA+1:IFH=1THEN 1030
                                       :rem 189
1020 PRINTOP:GOTO230                   :rem 247
1030 DE = OP:GOSUB4000:PRINTH$:GOTO230
                                       :rem 226
2000 REM 2 BYTE INSTRUCTIONS           :rem 193
2005 IFTN>256THENPRINT" INCORRECT ARGUMEN
    T. (#5 IN HEX IS #05)":GOTO230
                                       :rem 94
2010 POKESA,OP:POKESA+1,TN:SA=SA+2:IFH=1T
    HEN2030                            :rem 231
2020 PRINTOP;TN:GOTO230                :rem 213
2030 DE = OP:GOSUB4000:PRINTH$" ";:rem 90
2040 DE = TN:GOSUB4000:PRINTH$:GOTO230
                                       :rem 231
3000 REM 3 BYTE INSTRUCTIONS           :rem 195
3010 POKESA,OP:POKESA+1,L%:POKESA+2,H%:SA
    =SA+3:IFH=1THEN3030                :rem 172
3020 PRINTOP;L%;H%:GOTO230             :rem 77
3030 DE = OP:GOSUB4000:PRINTH$" ";:rem 91
3040 DE = L%:GOSUB4000:PRINTH$" ";:rem 46
3050 DE = H%:GOSUB4000:PRINTH$:GOTO230
                                       :rem 180
4000 REM{2 SPACES}DECIMAL TO HEX (DE TO H
    $)                                 :rem 8
4010 H$="":FORM=SZTO0STEP-1:N%=DE/(16↑M):
    DE=DE-N%*16↑M:H$=H$+MID$(HE$,N%+1,1)
                                       :rem 179
4020 NEXT:SZ=1:RETURN                  :rem 116
5000 REM{2 SPACES}HEX TO DECIMAL (H$ TO D
    E)                                 :rem 9
5010 D=0:Q=3:FORM=1TO4:FORW=0TO15:IFMID$(
    H$,M,1)=MID$(HE$,W+1,1)THEN5030
                                       :rem 221
5020 NEXTW                             :rem 93
5030 D1=W*(16↑(Q)):D=D+D1:Q=Q-1:NEXTM:DE=
    INT(D):RETURN                      :rem 41
6000 REM ACCEPT HEX OPCODE INPUT AND TRAN
    SLATE IT TO DECIMAL                :rem 57
6010 IFLEFT$(R$,1)="#"THENH$="00"+RIGHT$(
    R$,2):GOSUB5000:R$="#"+STR$(DE):RETU
    RN                                 :rem 234
6020 LS=LEN(R$):AZ$=LEFT$(R$,1):ZA$=MID$(
    R$,LS,1):IFAZ$<>"("THEN6050 :rem 126
6030 IFZA$="Y"THENH$="00"+MID$(R$,2,2):GO
    SUB5000:R$="("+STR$(DE)+")Y":RETURN
                                       :rem 30
6040 IFZA$=")"THENH$="00"+MID$(R$,2,2):GO
    SUB5000:R$="("+STR$(DE)+"X)":RETURN
                                       :rem 238
6050 IFZA$="X"ORZA$="Y"THEN6070        :rem 40
6060 H$=LEFT$(ZA$,4-LS)+R$:GOSUB5000:R$=S
    TR$(DE):RETURN                     :rem 30
6070 IFLS=5THENH$=LEFT$(R$,4):GOTO6090
                                       :rem 253
6080 H$="00"+LEFT$(R$,2)               :rem 186
```

```
6090 GOSUB5000:R$=STR$(DE)+ZA$:RETURN
                                    :rem 252
20000 DATAADC1097,AND1033,ASL3002,BCC8144
      ,BCS8176,BEQ8240,BIT7036,BMI8048
                                    :rem 96
20010 DATABNE8208,BPL8016,BRK0000,BVC8080
      ,BVS8112,CLC0024,CLD0216,CLI0088
                                    :rem 114
20020 DATACLV0184,CMP1193,CPX4224,CPY4192
      ,DEC2198,DEX0202,DEY0136,EOR1065
                                    :rem 184
20030 DATAINC2230,INX0232,INY0200,JMP6076
      ,JSR9032,LDA1161,LDX5162,LDY5160
                                    :rem 200
20040 DATALSR3066,NOP0234,ORA1001,PHA0072
      ,PHP0008,PLA0104,PLP0040,ROL3034
                                    :rem 185
20050 DATAROR3098,RTI0064,RTS0096,SBC1225
      ,SEC0056,SED0248,SEI0120,STA1129
                                    :rem 216
20060 DATASTX2134,STY2132,TAX0170,TAY0168
      ,TSX0186,TXA0138,TXS0154,TYA0152
                                    :rem 79
```

Telecommunications Software

(Article on page 38.)

BEFORE TYPING...

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

C/G Term For VIC And 64

(NOTE: VIC users must replace the last three lines of this listing as noted in the corresponding article.)

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4609 :011,008,010,000,158,052,240
4615 :054,050,049,000,000,000,160
4621 :032,231,255,162,000,142,067
4627 :255,043,169,000,133,251,102
4633 :169,044,133,252,172,255,026
4639 :043,169,000,145,251,032,159
4645 :251,029,174,255,043,224,245
4651 :204,208,239,166,252,224,056
4657 :046,144,233,162,000,142,008
4663 :255,043,032,110,041,169,193
4669 :006,141,147,002,173,239,001
4675 :043,201,022,208,008,169,206
4681 :032,141,018,145,076,085,058
4687 :018,169,032,141,003,221,151
4693 :169,002,162,002,160,255,067
4699 :032,186,255,169,001,162,128
4705 :147,160,002,032,189,255,114
4711 :032,192,255,032,246,040,132
4717 :032,204,255,169,163,141,049
4723 :098,039,169,043,141,099,192
4729 :039,032,086,039,169,000,230
4735 :141,131,044,032,204,255,166
4741 :032,128,041,174,131,044,171
4747 :224,000,208,013,032,204,052
4753 :255,032,228,255,201,000,092
4759 :240,228,141,131,044,173,084
4765 :131,044,201,003,208,006,238
4771 :032,076,041,076,029,019,180
4777 :174,239,043,224,022,208,055
4783 :006,173,016,145,076,185,008
4789 :018,173,001,221,041,016,139
4795 :201,000,208,234,173,239,218
4801 :043,141,131,044,032,246,062
4807 :021,032,214,021,173,131,023
4813 :044,201,002,208,008,169,069
4819 :001,141,049,043,076,229,238
4825 :018,201,019,208,003,076,230
4831 :229,018,201,022,208,218,095
4837 :032,204,255,032,228,255,211
4843 :201,000,208,246,173,239,022
4849 :043,141,131,044,032,246,110
4855 :021,032,076,041,076,029,010
4861 :019,032,246,040,032,204,058
4867 :255,174,118,044,224,000,050
4873 :240,018,169,158,141,098,065
4879 :039,169,044,141,099,039,034
4885 :032,086,039,162,000,142,226
4891 :118,044,032,193,020,162,084
4897 :000,142,198,044,142,131,178
4903 :044,032,204,255,032,128,222
4909 :041,174,131,044,224,000,147
4915 :208,010,032,228,255,141,157
4921 :131,044,201,000,240,051,212
4927 :162,001,142,198,044,173,015
4933 :131,044,201,028,176,036,173
4939 :201,013,240,032,201,020,014
4945 :240,028,201,020,144,006,208
4951 :032,000,021,076,018,022,000
4957 :201,017,176,014,201,014,204
4963 :240,010,201,005,240,006,033
4969 :032,000,021,076,018,022,018
4975 :076,148,019,032,204,255,077
4981 :162,002,032,198,255,032,030
4987 :228,255,201,000,240,159,182
4993 :141,131,044,032,238,020,223
4999 :174,189,044,224,000,208,206
5005 :228,032,204,255,076,068,236
5011 :019,173,131,044,201,147,094
5017 :208,008,169,000,141,131,042
5023 :044,076,037,020,174,198,196
5029 :044,224,000,240,123,173,201
5035 :131,044,201,134,208,024,145
5041 :174,239,043,224,022,208,063
5047 :006,032,175,041,076,193,194
5053 :019,238,032,208,169,000,087
5059 :141,131,044,076,037,020,132
5065 :201,138,208,024,174,239,161
5071 :043,224,022,208,006,032,230
5077 :200,041,076,221,019,238,240
5083 :033,208,169,000,141,131,133
5089 :044,076,037,020,201,139,230
5095 :208,013,169,001,141,117,112
5101 :044,169,000,141,131,044,254
5107 :076,037,020,201,135,208,152
5113 :014,234,234,234,234,234,153
5119 :234,169,000,141,131,044,206
5125 :076,037,020,201,136,208,171
5131 :011,234,234,234,234,234,168
5137 :234,169,000,141,131,044,224
5143 :201,140,208,010,162,001,233
5149 :142,114,044,169,000,141,127
5155 :131,044,032,224,020,173,147
5161 :131,044,201,000,208,003,116
5167 :076,136,020,173,198,044,182
5173 :201,001,208,031,032,204,218
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5185 :173,131,044,032,210,255,142
5191 :032,238,020,174,189,044,000
5197 :224,000,208,240,174,049,204
5203 :043,224,001,240,042,173,038
5209 :131,044,201,004,208,015,180
5215 :174,198,044,224,000,208,175
5221 :028,169,000,141,131,044,102
5227 :076,205,030,032,204,255,141
5233 :173,131,044,032,210,255,190
5239 :173,131,044,201,034,208,142
5245 :004,169,000,133,212,234,109
5251 :234,234,234,234,234,174,195
5257 :117,044,224,000,240,016,010
5263 :162,000,142,117,044,032,128
5269 :204,255,169,147,032,210,142
5275 :255,076,190,020,174,011,113
5281 :044,224,000,240,011,162,074
5287 :000,142,011,044,032,000,140
5293 :021,076,126,035,174,114,207
5299 :044,224,000,240,006,032,213
5305 :000,021,076,252,023,076,121
5311 :029,019,165,209,133,243,221
5317 :024,165,210,109,240,043,220
5323 :133,244,164,211,177,209,061
5329 :073,128,145,209,177,243,160
5335 :141,191,044,173,134,002,132
5341 :145,243,096,164,211,177,233
5347 :209,073,128,145,209,173,140
5353 :191,044,145,243,096,032,216
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5365 :044,096,032,183,255,041,128
5371 :064,141,189,044,096,032,049
5377 :204,255,169,146,032,210,249
5383 :255,032,204,255,096,173,254
5389 :150,044,201,058,144,015,113
5395 :041,015,024,105,009,010,223
5401 :010,010,010,141,151,044,135
5407 :076,043,021,041,015,010,237
5413 :010,010,010,141,151,044,147
5419 :096,169,003,032,195,255,025
5425 :032,204,255,169,000,032,229
5431 :144,255,169,128,032,144,159
5437 :255,169,003,162,008,160,050
5443 :000,032,186,255,169,007,204
5449 :162,020,160,043,032,189,167
5455 :255,169,000,162,060,160,117
5461 :045,032,213,255,032,128,022
5467 :039,174,118,044,224,000,178
5473 :240,001,096,162,000,142,226
5479 :145,044,032,204,255,174,189
5485 :145,044,189,060,045,201,025
5491 :066,240,013,238,145,044,093
5497 :174,145,044,224,000,208,148
5503 :236,076,108,021,238,145,183
5509 :044,174,145,044,189,060,021
5515 :045,201,076,240,006,238,177
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5527 :145,044,206,145,044,206,173
5533 :145,044,174,145,044,189,130
5539 :060,045,141,000,044,238,179
5545 :145,044,174,145,044,189,142
5551 :060,045,141,001,044,096,050
5557 :173,150,044,201,058,144,183
5563 :011,041,015,024,105,009,136
5569 :141,150,044,076,204,021,061
5575 :041,015,141,150,044,173,251
5581 :150,044,013,151,044,141,236
5587 :150,044,096,032,183,255,203
5593 :032,204,255,162,002,032,136
5599 :198,255,032,207,255,201,091
5605 :000,240,249,141,131,044,010
5611 :032,238,020,174,189,044,164
5617 :224,000,208,225,096,032,002
5623 :183,255,032,204,255,162,058
5629 :002,032,201,255,173,131,023
5635 :044,032,210,255,032,238,046
5641 :020,174,189,044,224,000,148
5647 :208,229,096,173,131,044,128
5653 :201,021,208,037,174,049,199
5659 :043,224,000,208,020,174,184
5665 :198,044,224,000,240,100,071
5671 :162,001,142,011,044,169,056
5677 :004,141,131,044,076,037,222
5683 :020,174,198,044,224,001,200
5689 :240,080,076,126,035,174,020
5695 :198,044,224,001,240,070,072
5701 :201,023,208,003,076,251,063
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5713 :049,043,224,001,208,052,146
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5725 :016,174,049,043,224,001,088
5731 :208,006,032,204,255,076,112
5737 :205,030,076,219,030,201,098
5743 :007,208,010,174,049,043,090
5749 :224,001,208,018,076,152,028
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5797 :224,022,208,006,032,033,178
5803 :042,076,197,022,032,015,043
5809 :042,076,197,022,174,239,159
5815 :043,224,022,208,006,032,206
5821 :042,042,076,197,022,032,088
5827 :024,042,032,214,021,174,190
5833 :239,043,224,022,208,006,175
5839 :032,215,041,076,221,022,046
5845 :173,131,044,041,015,141,246
5851 :032,208,032,214,021,174,132
5857 :239,043,224,022,208,006,199
5863 :032,227,041,076,245,022,106
5869 :173,131,044,041,015,141,014
5875 :033,208,032,204,255,076,027
5881 :029,019,032,204,255,169,189
5887 :147,032,210,255,032,057,220
5893 :040,162,000,142,145,044,026
5899 :032,228,255,240,251,201,194
5905 :020,208,014,174,145,044,110
5911 :240,242,206,145,044,032,164
5917 :210,255,076,011,023,201,037
5923 :013,240,074,201,032,240,067
5929 :008,201,048,144,221,201,096
5935 :058,176,035,032,210,255,045
5941 :174,190,044,224,000,240,157
5947 :003,076,179,023,174,145,147
5953 :044,157,017,044,238,145,198
5959 :044,174,145,044,224,026,216
5965 :208,188,032,142,042,076,253
5971 :251,022,201,065,144,178,176
5977 :201,091,144,213,201,097,012
5983 :144,170,201,123,144,205,058
5989 :201,193,144,162,201,219,197
5995 :144,197,076,011,023,032,078
6001 :210,255,174,190,044,224,186
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6007 :000,240,003,076,204,023,153
6013 :174,145,044,169,027,157,073
6019 :017,044,238,145,044,162,013
6025 :000,142,143,044,174,145,017
6031 :044,169,009,157,017,044,071
6037 :238,145,044,174,145,044,171
6043 :169,000,157,017,044,032,062
6049 :068,041,032,071,040,162,063
6055 :000,142,145,044,162,001,149
6061 :142,190,044,076,011,023,147
6067 :174,145,044,157,077,044,052
6073 :238,145,044,174,145,044,207
6079 :224,032,240,003,076,011,009
6085 :023,032,058,039,076,163,076
6091 :023,174,145,044,169,027,017
6097 :157,077,044,238,145,044,146
6103 :174,145,044,169,000,157,136
6109 :077,044,170,142,190,044,120
6115 :032,072,039,169,067,141,235
6121 :098,039,169,042,141,099,053
6127 :039,032,086,039,032,089,044
6133 :035,032,089,035,032,089,045
6139 :035,032,246,040,174,114,124
6145 :044,224,000,240,013,169,179
6151 :219,141,098,039,169,043,204
6157 :141,099,039,032,086,039,193
6163 :032,193,020,169,000,141,062
6169 :131,044,032,204,255,032,211
6175 :128,041,174,131,044,224,005
6181 :000,208,013,032,204,255,237
6187 :032,228,255,201,000,240,231
6193 :228,141,131,044,173,131,129
6199 :044,201,147,240,218,201,082
6205 :003,208,030,173,114,044,121
6211 :201,000,032,000,021,240,049
6217 :020,032,246,021,032,246,158
6223 :040,032,093,041,169,000,198
6229 :141,131,044,141,114,044,188
6235 :076,254,018,201,133,208,213
6241 :008,169,001,141,157,044,105
6247 :076,204,024,201,137,208,185
6253 :008,169,001,141,115,044,075
6259 :076,204,024,201,134,208,194
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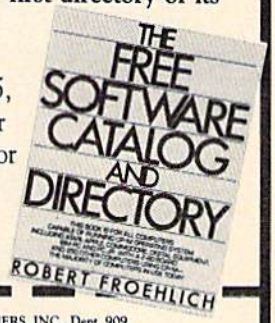

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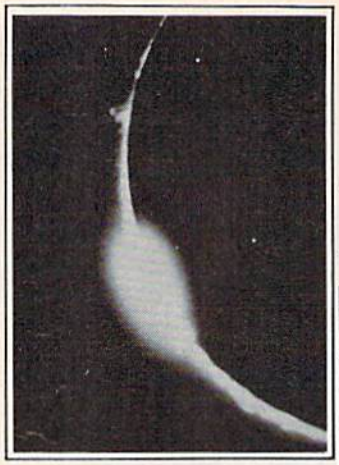

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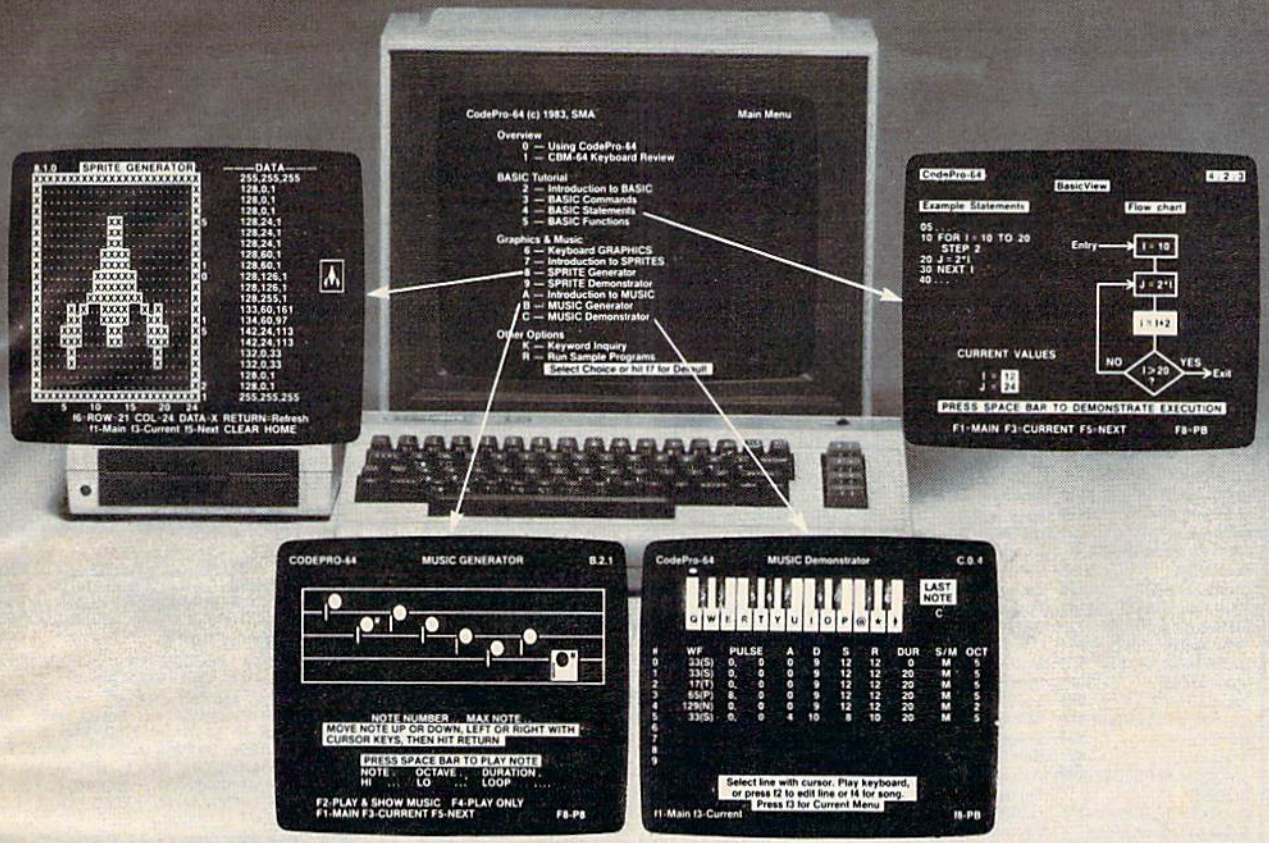

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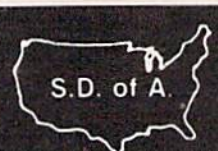

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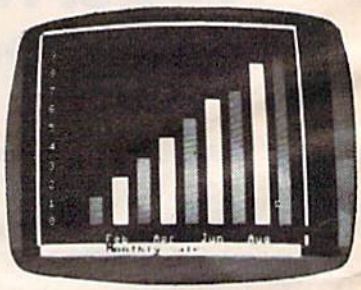

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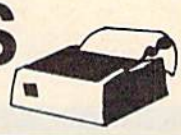

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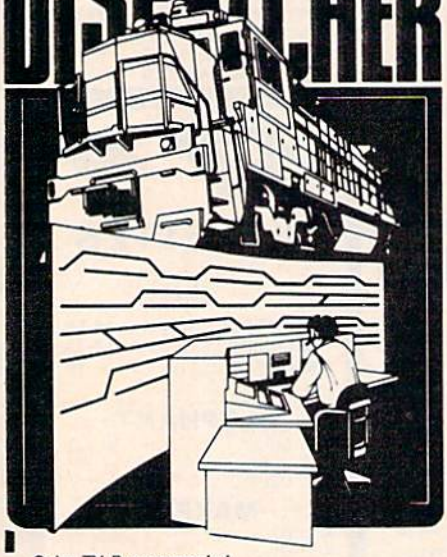

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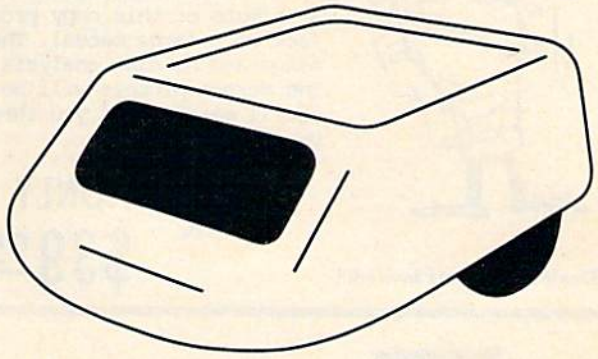

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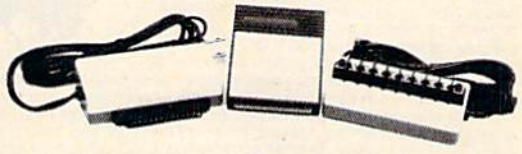

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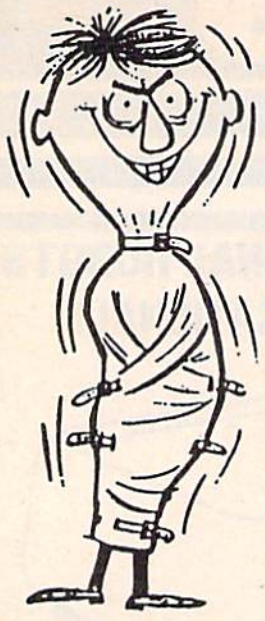

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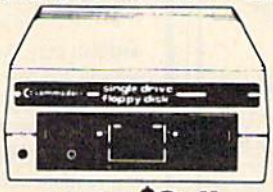

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Bug-Swatter:
Modifications And Corrections

• Programs 3 and 4 from "Disk Tricks" (September) were designed to scratch and unscratch (recover) files from a disk. Several readers have informed us that it is essential to use the Validate command after using either of these programs. **OPEN 15,8,15: PRINT#15, "V0" :CLOSE 15** properly validates the disk and updates the Block Allocation Map (BAM). You can validate in direct mode or from within the program, but it should be noted that this command can destroy random files (program, sequential, and relative files are safe). See the 1541 User's Manual for more information about validating.

Without this line, the scratch program will scratch a file, but not free up the disk space used by the program. More seriously, if a program is unscratched without validating the disk, subsequent SAVEs can overwrite the disk space used by the program.

For corrections to program 2 (Change Disk ID) see last month's Bug-Swatter.

• "Screen-80" (September) works as listed with a 64 and disk drive. However, tape users have had problems reloading the program after using MLX. This is not a flaw in Screen-80; it happens because MLX saves ML programs as *absolute* files, the equivalent of **SAVE "program",1,1**. Screen-80 is created at memory location 49152 but is meant to be relocated to the beginning of BASIC.

If you've typed in Screen-80 and saved it to tape, however, you won't have to retype it. Just load MLX and change line 763. The third POKE (POKE 782,1) should be changed to POKE 782,0. Change line 763 and enter RUN. Use the same starting address (49152) and ending address (52811). Use SHIFT-L to load Screen-80 from tape. Then SHIFT-S to save it to tape. The modification to line 763 will cause the newly saved program to be relocatable. You can then turn your 64 off and on, and load Screen-80. If you LIST it, you should see one line with a SYS command. Type RUN and you'll have 80 columns. We regret any inconvenience this error has caused our readers.

• Reader Ina Neiman uses the 64 version of "Spelling Critter" (June) in her classroom and has discovered that vocabulary words which are contractions (can't, won't, and so on) are not accepted by the program. The program allows only letters between A and Z. To include apostrophes, add the following line:

```
885 IF ASC(Z$)=39 THEN A=39:GOTO 920
```

• The 64 version of "Mystery At Marple Manor" (September) works as listed, but there are two minor corrections.

First, in line 27 the Automatic Proofreader number is correct, but the line is not. The last English pound sign (£) should have been underlined, to indicate a SHIFTed character. This typo affects only part of the graphics on the title screen.

Second, if you choose to stay in a room and type a letter which is not on the menu, the screen may go blank (although further input will be accepted). To reprint the menu after typing an incorrect letter, change lines 390 and 400, replacing all 387s and 398s in these lines with a 375 (the beginning of the routine which prints the menu).

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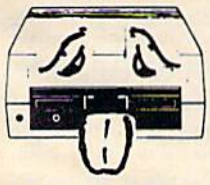

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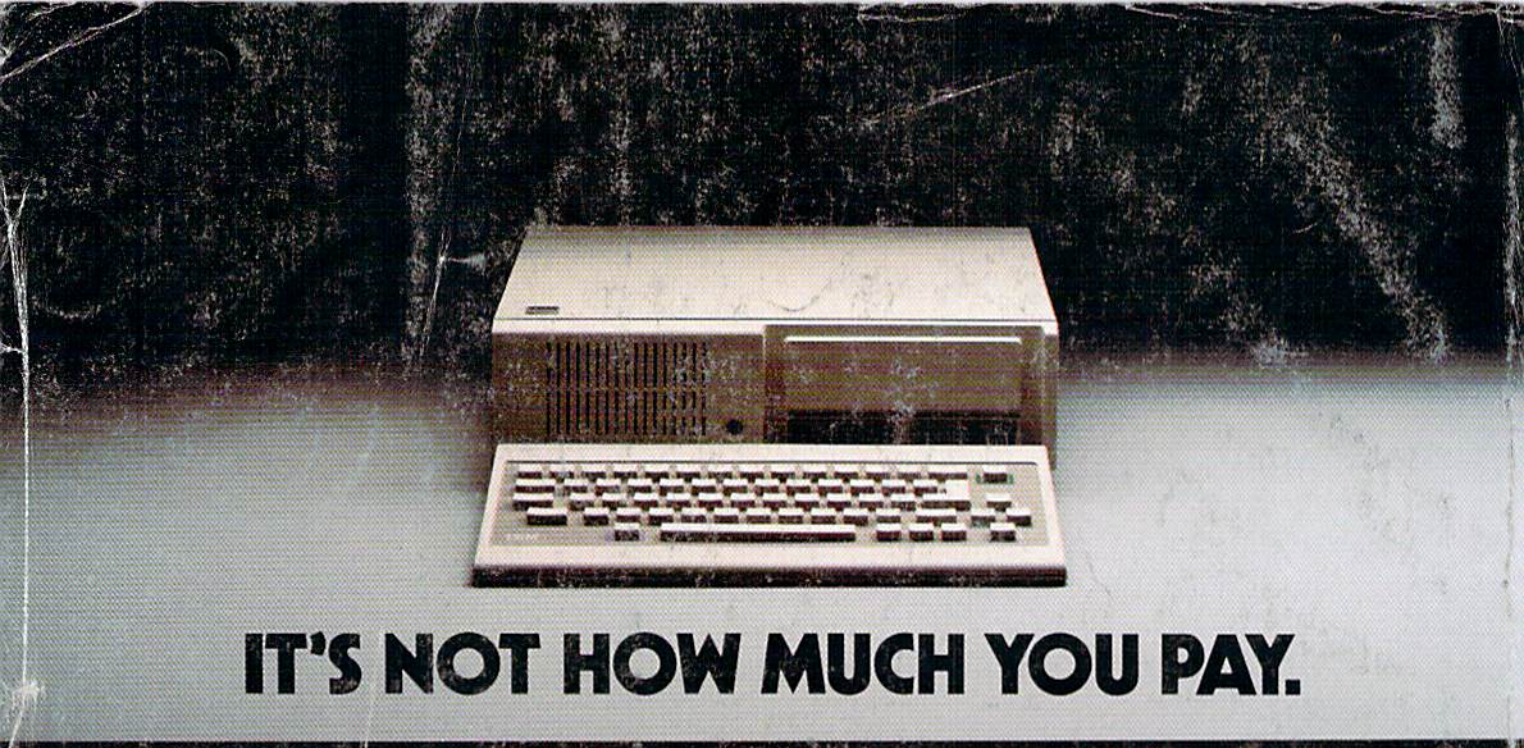

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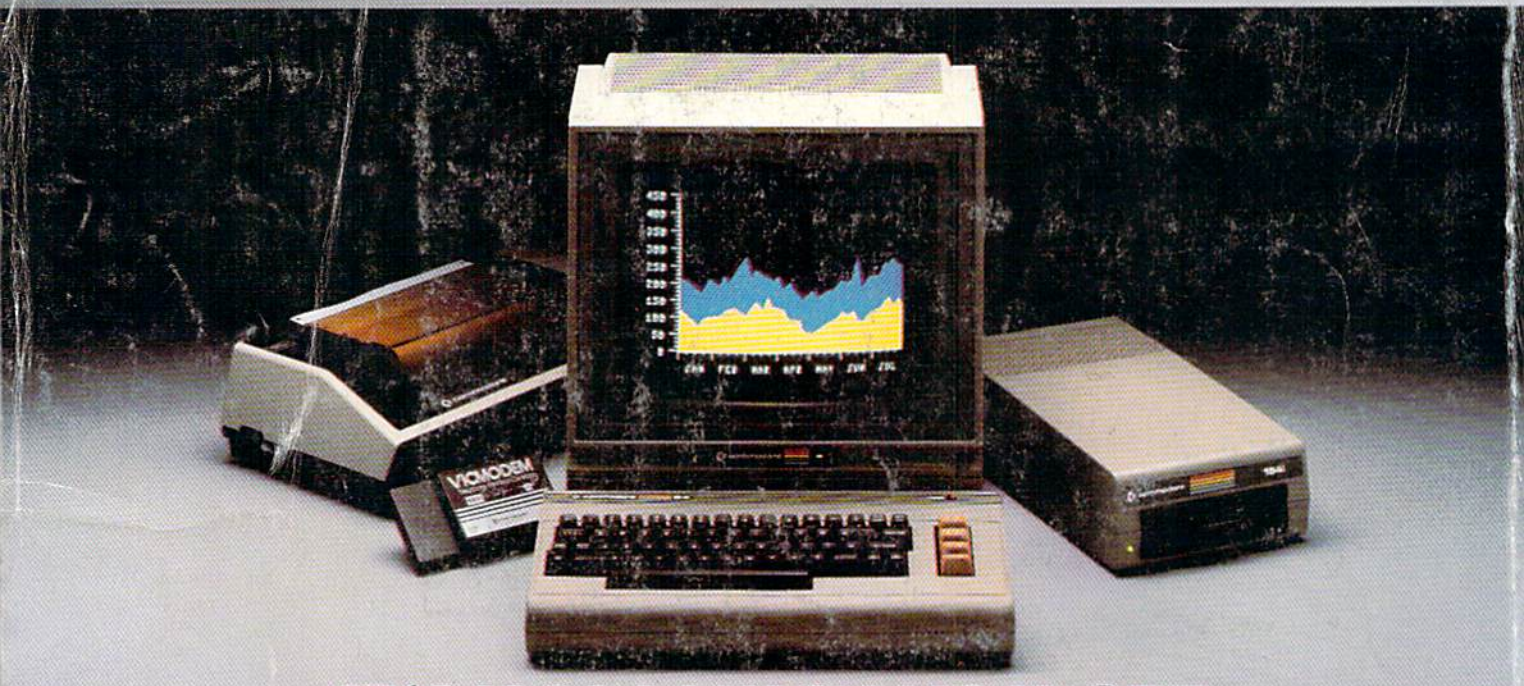

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