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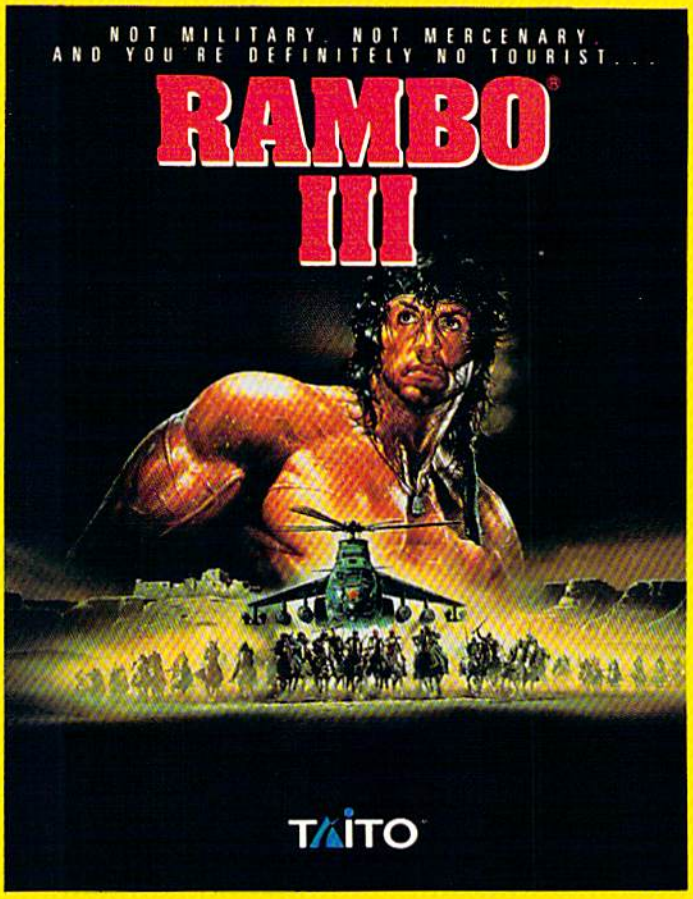

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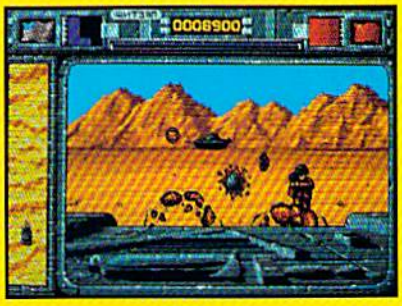

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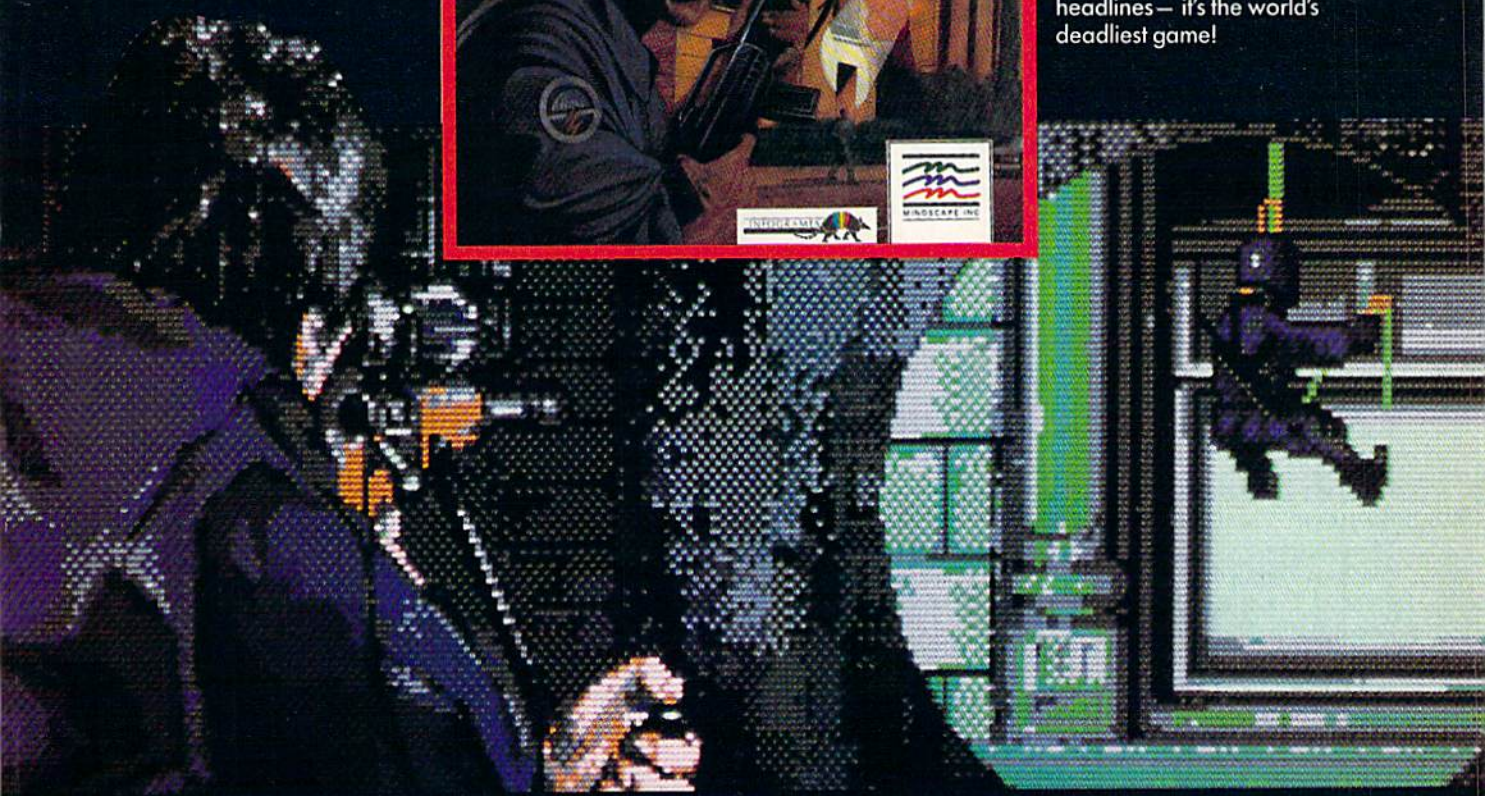

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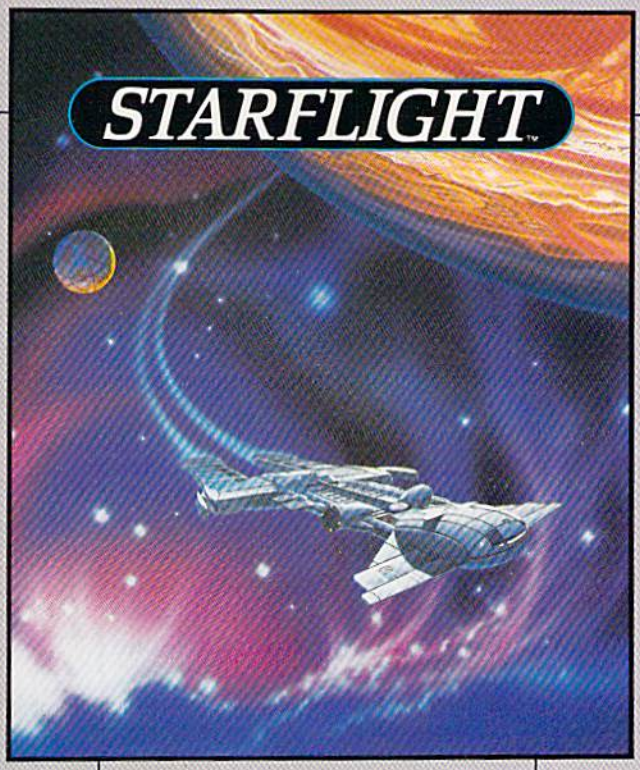

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EDITOR'S notes

It's official: the Commodore 128 and 128D are dead. Oddly, though, we didn't hear this from Commodore. Nicholas Alexander, a reader from Houston, Texas, wrote us and included a photocopy of a letter on Commodore letterhead which reads, in part: "We have stopped production on the 128 and 128D. Although we will continue to support both lines." The letter is signed by a Commodore customer service representative and dated July 14.

After seeing some recent user group newsletters, it's obvious that many of you, like Nicholas Alexander, knew this (officially) before we did. What's strange, though, is this: Commodore's various PR agencies have for many months been regularly sending us press releases on corporate staffing changes and quarterly financial reports. (If you read this column, you've been following a variety of Commodore happenings regularly.) We did not hear anything—and still haven't—from Commodore on the demise of these machines.

One staff member suggested that I write a touching eulogy on the death of a great machine. But, no. The 128's certified extinction is news, but there's no element of surprise. Our 128 readers know that we will continue to support the machine for a long time to come.

A press release we *did* receive recently tells us that Commodore lost $10.1 million for the fourth quarter (ending June 30) of 1989. CEO Irving Gould noted that the loss was due primarily to the impact of the stronger U.S. dollar on sales and by lower sales of consumer products in certain major markets. Gould added that Commodore's loss was also affected by increases in operating expenses, a result of the company's expansion of its sales and marketing program and staff. According to Gould, Commodore should return to profitability in the next fiscal quarter, and planned increases in marketing programs and new products will favorably impact future sales.

What we're hearing now is that Commodore will be bringing the Amiga 500 into mass-market outlets (namely, Sears and Service Merchandise) and that the company has committed to some serious ad campaigns to tout the Amiga.

All 64 and 128 loyalists should wish Commodore luck with the Amiga push—after all, the stronger the company, the better chance of support for its entire line of machines.

One final note: In last month's "Horizons" column, Rhett Anderson noted that we would begin a special series on neural networks in this issue. We'll start that series—a three-parter—next month.

Lance Elko
Associate Publisher/Editorial

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COMMODORE 64/128

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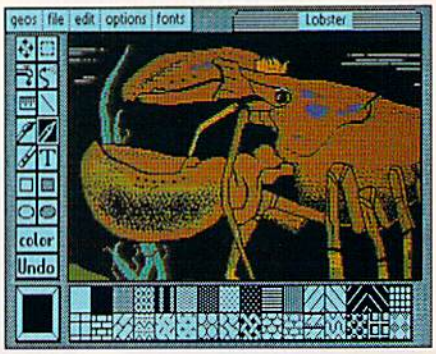

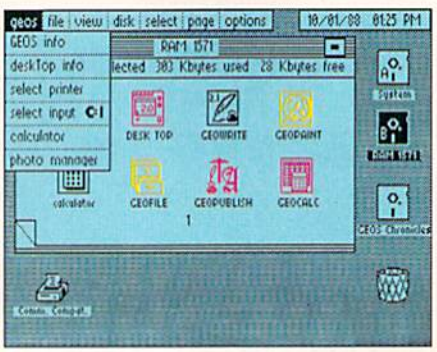

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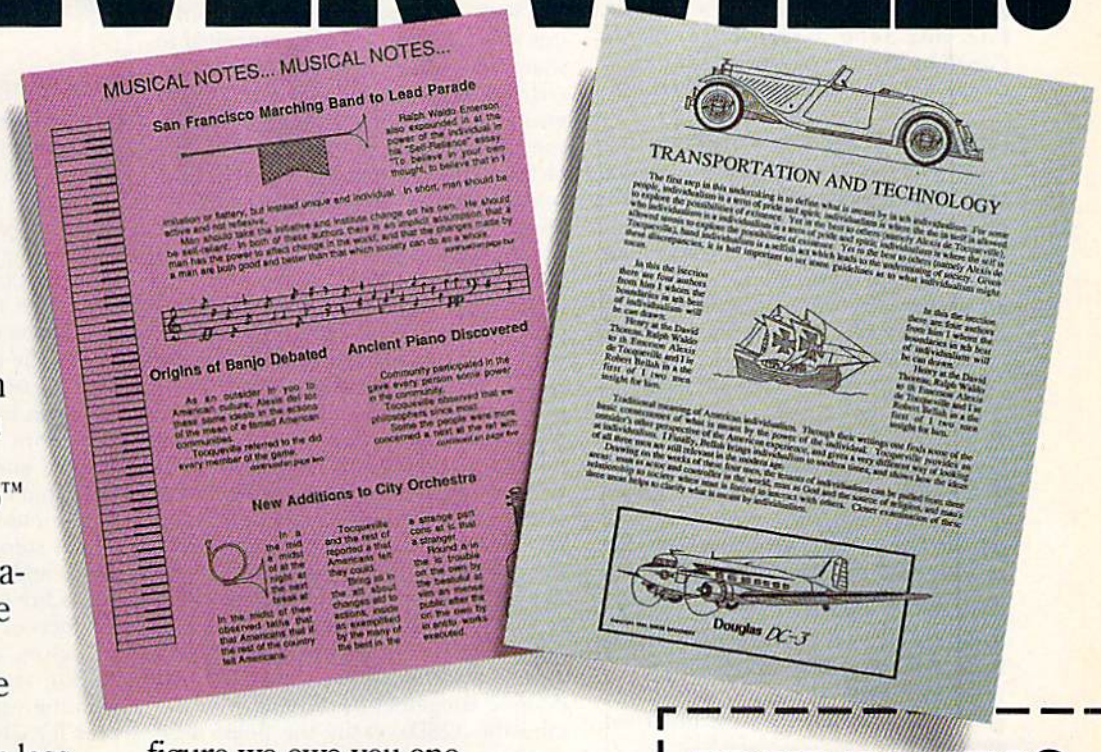

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Call for Plus/4 and VIC-20 Software

I still own and use a Plus/4 and several VIC-20s. I very much need a source for programs for both of these computers. I give them to youngsters to help them get started in computing. Surely there are public domain programs available on tape or disk. Perhaps some of your readers can help.

Arthur Farrington
Lawton, OK

Readers have helped with every challenge we've offered in these pages. So, readers, here's one more. If you have some solid information for Mr. Farrington, write and tell us—we'll publish appropriate replies.

Comparative Graphics

It seems like whenever I look at the back side of a software package, the graphics for the 64 screen don't look as good as the graphics for the other versions. Why?

John Bershaw
Lake Oswego, OR

You probably saw packages which displayed screens for 64, Amiga, PC, and possibly Apple IIGS versions. Amiga, PC (with EGA or VGA displays), and IIGS computers all feature more colors and greater screen resolutions than the 64 does. If a graphics designer exploits the capabilities of these machines, the resulting screens are bound to look better than those from the 64. The 64's screens do rather nicely, however, when compared to those of the 8-bit Atari and Apple II computers.

geoVision

Is there any way I could buy a disk collection of your programs from "The GEOS Column"? I love your programs, but my fingers get tired and my typing isn't any better.

Charlie Hoft
Gretna, LA

Nice timing, Charlie. Your letter arrived during the week we were planning such a disk. It's advertised in this issue on page 35.

Yin and Yang

It is with profound sadness that I write this letter, a sadness I feel compelled to share with all you good people at *Gazette* and with my millions of fellow users in the Commodore community. The specific symptom (not the cause) is the fact that this communication will be essentially my last on Commodore equipment. I've made the move to another operating system that is more well known and respected in the world of computing. The reason I've been compelled to make the switch is not because of the equipment I use. This worthy 128D can do just about anything I might need—more, in fact, than the other large, gray bulk sitting on my desk can at this moment. With the addition of several thousand dollars, my other machine might be able to catch up to my Commodore. No, the hardware is not the cause. It is Commodore itself. I've been a supporter of CBM hardware for many years, owning a 64, 128, and 128D. The parent company has in part always abandoned me, and now has done so altogether by dropping the 128 (and the 128D), easily the finest 8-bit machine ever built. To talk about "lack of support" is to make a bizarre joke and understatement all in one breath. In short, good-bye and thank you, *Gazette* folks—good-bye to my productive "fun" machine of many years, and hello MS-DOS.

Gigi Cascio
Forest Hills, NY

It's true that Commodore service leaves much to be desired, but my system has been very reliable. I started using a 64 when I was about 7 or 8 years old (I'm now 13). The 64 worked for about three years before it broke down. I replaced it with a 128, which I have used since. In that time, I've had only one problem with it, and that was entirely my fault. Shortly after I got my 64, I also got a 1541 drive. That's still in use with only one trip to the repair shop, and that was almost five years after I bought it. On the other hand, my father has recently purchased an IBM AT compatible for my sister. That has broken down twice already. Fortunately, it was under warranty. I just hope the dealer has all the bugs out before school starts.

Jerry Hsu
Fort Washington, PA

CP/M Update

In your March 1989 issue, you printed a letter from John Black in which he mentioned the CP/M Software Vendors List that is produced by our computer club. I've received many inquiries from your readers, and I thought you might wish to inform them of the current situation with the listing.

The vendors list is an ongoing project by the members of the CP/M SIG, with the second edition having been released in July. This 16-page document lists more than 105 companies, user groups, and other sources that either sell commercial CP/M software or distribute public domain (and shareware) CP/M software. We list the name, address, and phone number of the vendor, a brief description of the vendor's products or services with suggested retail prices, and a date when the information was last verified (by contact with the vendor). It is a valuable reference for CP/ M users.

The list has been placed on many CP/M-oriented BBSs around the country (it can be found in the CPMSVL-D.LBR file). This library contains the listing in both *WordStar 4* document form and as a ready-to-print file. A paper version can be purchased with a check or money order for $2.50 (U.S.), payable to Samuel Vincent. Write to: CP/M SIG of PACC, P.O. Box 82, Hyde Park, Pennsylvania 15641.

Samuel Vincent
User Group Coordinator, CP/M SIG
Pittsburgh Area Computer Club
Hyde Park, PA

The Word on HomeWord

Several years ago, Sierra marketed a word processor titled *HomeWord.* Do you know if it's still available?

Arthur Farrington
Lawton, OK

We learned that you can buy the 64 version of HomeWord *directly from Sierra (P.O. Box 485, Coarsegold, California 93614) for $49.95. Sierra also noted that the Electronic Boutique software retail chain carries the product.* G

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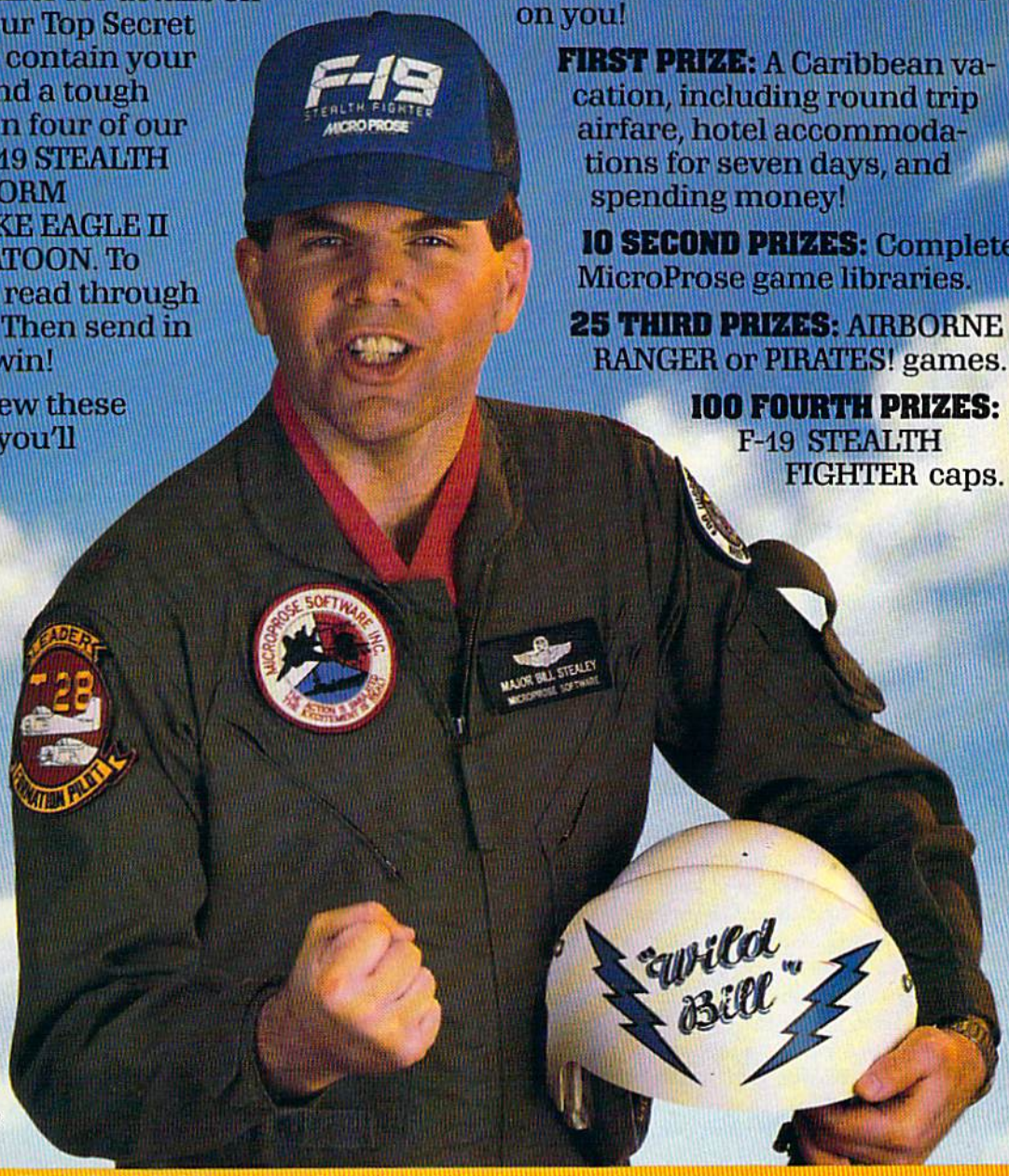

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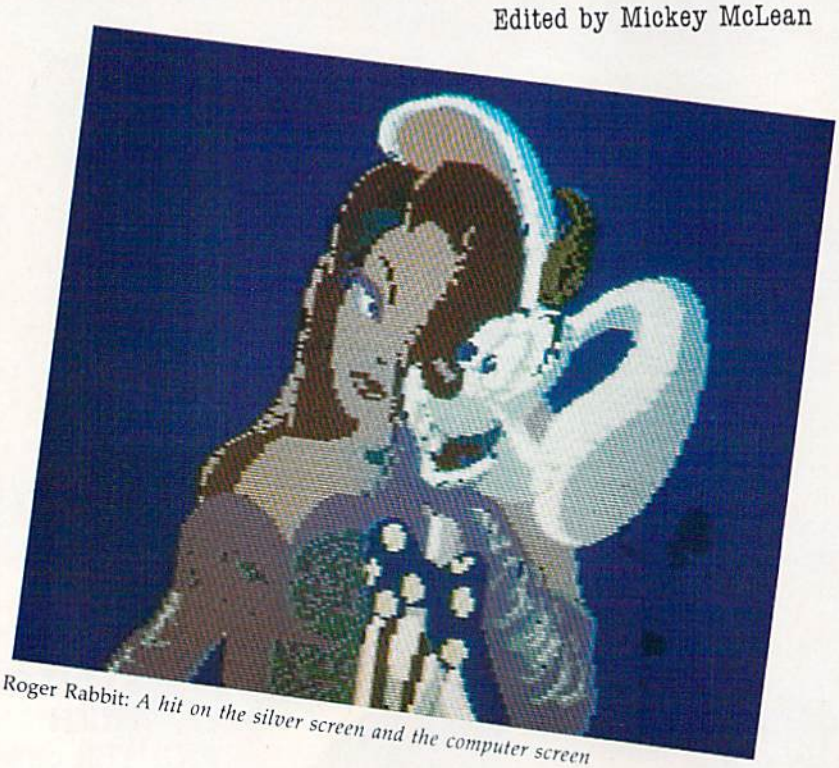
COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

Edited by Mickey McLean



Roger Rabbit: *A hit on the silver screen and the computer screen*

Toon Turns Gold

Who Framed Roger Rabbit has not only met success at the box office, but has also prospered as a computer game. This title from Buena Vista Software (2600 West Olive Avenue, 10th Floor, Burbank, California 91505) has been certified gold (more than 100,000 units sold) by the Software Publishers Association.

Buena Vista has announced its plans to release several more titles based on the popular movie rabbit.

Big Dealer, Big Talker

Free Spirit Software (P.O. Box 128, 58 Noble Street, Kutztown, Pennsylvania 19530) has produced two new programs for the Commodore 128. You can become the Donald Trump of your neighborhood with *Wheel & Deal* ($29.95) or add digitized speech to 128 programs with *Digitalker 128* ($29.95).

In *Wheel & Deal*, a game that utilizes the 128's 80-column screen, you must accumulate property and amass wealth by making big deals and taking big chances. You win the game by accumulating over $100,000 or by forcing the other players into bankruptcy. The game can be played by two or four people. *Wheel & Deal* requires a mouse or joystick, an 80-column color monitor, and a 1571 disk drive. The game is not copy-protected and can be transferred to a 1581 disk drive.

Digitalker 128, a programming utility for *Basic-8* and BASIC 7.0 programs on the 128, adds speech to 80-column programs. The program features a set of machine language routines that can play digitized sound samples from within a program. The sounds can be found on the ClipSound Disk, which has over 500,000 bytes of sound. Several speech demos and talking 80-column games are included with the program. *Digitalker* supports but does not require a 1700 or 1750 RAM expansion unit. The program and sound disks are not copy-protected and can be copied to a 1581-formatted disk.

CP/M Classic

The Public Domain Software Copying Company (33 Gold Street, Suite L-3, New York, New York 10038), dedicated to providing classic software packages for CP/M users, has repackaged *Fortran-80* ($39.95; $99.50 starting in November) for the Commodore 128.

This 128 CP/M disk edition comes packaged with three manuals. The Fortran-80 User's Manual provides a summary of user commands and syntax, describes the *Fortran-80* compiler commands and error messages, and details the use of the Link-80 linking loader. Program-development, compile, link, and run examples are also provided in the manual. With the Fortran-80 Reference Manual, you get a description of *Fortran-80* statements, functions, and syntax. The Fortran-80 Utility Manual describes the use of the *Macro-80* assembler and *Lib-80* library manager with the *Fortran-80* compiler.

PDSC is also offering the *Forth* programming language for an additional $29 included with *Fortran-80* orders.

Realms Revisited

Travel again through TSR's world of Forgotten Realms with *Curse of the Azure Bonds* ($39.95) from SSI (675 Almanor Avenue, Sunnyvale, California 94086-2901).

This sequel to the Advanced Dungeons & Dragons fantasy role-playing game, *Pool of Radiance*, places your party of adventurers in the city of Tilverton, where they discover azure-blue symbols imprinted under the skin of each their sword arms. The characters are rendered powerless and must do as the bonds command. To control their own destiny, they must search the Forgotten Realms for the members of the alliance who created the bonds.

You can create your own characters at the beginning of the game or use characters from *Pool of Radiance* or *Hillsfar*. Game features include over 24 new high-level spells and

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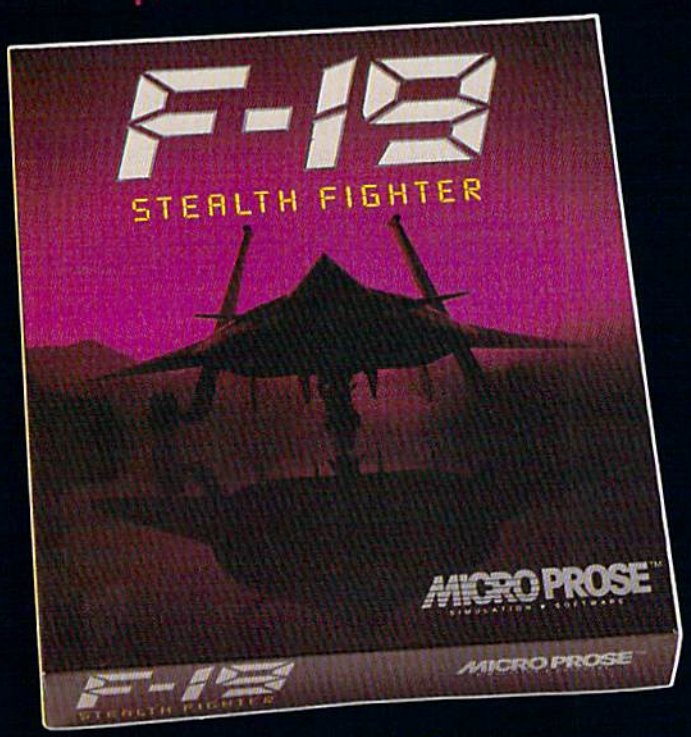

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"Calling F-19 a computer game is like calling the Pacific Ocean a puddle."

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NEWS, NOTES, AND NEW PRODUCTS

characters including High Priests, Lords, Paladins, Ranger Lords, Wizards, and Master Thieves. New monsters you'll encounter include Beholders, Salamanders, Manticores, Rakshasa, and Margoyles.

For those who find the going difficult, SSI plans to release a clue book later this year.

Curse of the Azure Bonds, *SSI's sequel to* Pool of Radiance

Delay Tactics

Commodore 64 and 128 users who have a Passport, Sequential, Dr. T, or compatible interface can now use the MIDI Delay processor ($50) from Triangle Audio (P.O. Box 1108, Sterling, Virginia 22170) to process MIDI data.

You can set delay time in one-millisecond increments up to eight seconds on the internal timer, or the delay can be driven by an external MIDI clock source. All types of MIDI data, including continuous controllers, can be delayed up to 15 times with optional data filtering. Each repeat can be sent out on the same or consecutive channels with or without a programmable transposition. Dynamic control allows you to specify changes to the attack and release velocities. Because the control of the number of repeats and repeat dynamics is separate, it is possible to have increasing velocities without endless repeats. Incoming velocities can also be inverted. All delay controls are live while processing.

The MIDI Delay also features realtime MIDI control options. The delay time can be changed via any MIDI controller with programmable sensitivity. A coordinated response mode can change the number of repeats and repeat dynamics at the same time from any MIDI controller. Presets are provided to let you program and call up your favorite delay settings. Banks of presets can be saved to and loaded from disk. A pop-up disk directory allows point-and-click loading of preset files. Presets can be selected from the keyboard or with MIDI program-change commands. Some presets are included to demonstrate the processor's capabilities.

Origin's Four for Fall

Origin (136 Harvey Road, Building B, Londonderry, New Hampshire 03053) has announced a new diverse lineup of games soon to be released, including a space-flight simulator, a cybertank designer, a martial-arts battle, and a medieval fantasy.

Space Rogue ($49.95), a 3-D space flight simulation with role-playing adventures, incorporates the principles of Newtonian physics as you struggle for galactic control. As you play, you'll encounter the history, culture, and economics of deep space.

You can design the future's ultimate military cybertank in *Omega* ($49.95). This strategic design simulation places you in the role of cybernetic engineer for the Organization of Strategic Intelligence. You must integrate chassis components and create artificial intelligence in order to build the world's supreme cybertank. Your creations can be matched in a free-for-all or in team combat against sophisticated OSI tanks. You can also put your designs up against tanks created by other engineers using any popular computer type. Designs can be transferred by modem or uploaded and downloaded from private bulletin boards.

Origin's *Windwalker* ($39.95) combines role-playing adventure with martial-arts action. You'll find yourself surrounded by the culture, personalities, and events of the ancient Orient in this fictional game that employs authentic historical and cultural facts.

In *Knights of Legend* ($49.95), you can explore the land of Ashtalarea. Game features include the ability to create up to six characters and customize your own weapons, spells, and armor. During combat, fatigue can be as dangerous as a sword blow and a wound can render a limb useless. Origin reported that *Knights of Legend* took more than eight years to develop.

West Chester Happenings

Commodore continues to announce new strategy under the leadership of Harold Copperman. The company's president announced that Commodore's applications and technical-support group for third-party hardware and software developers will now report directly to him. The division was formerly part of the research and development department.

The move is designed to integrate third-party developers into the company's new sales and marketing strategies, which include expansion into the education, government, and business markets. Copperman also announced plans for a software development program designed to increase the ways the Commodore 64, 128, Amiga, and MS-DOS compatibles are used and to take advantage of worldwide market opportunities.

Other plans include the formation of a developer's advisory board, establishment of a worldwide communications link, marketing and technical support, and coordination of user interfaces and documentation standards.

In a related move, Copperman announced the appointment of Robert Larson to vice president of consumer sales. The former senior vice president of Casio, an electronic musical instrument manufacturer, will be responsible for pursuing new sales and merchandising strategies for the company's three computer lines. G

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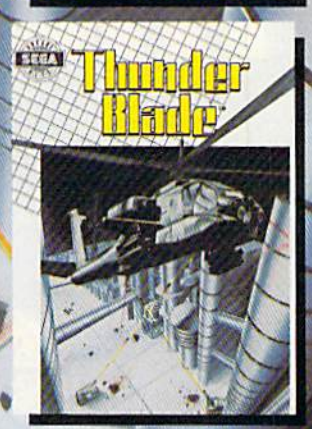

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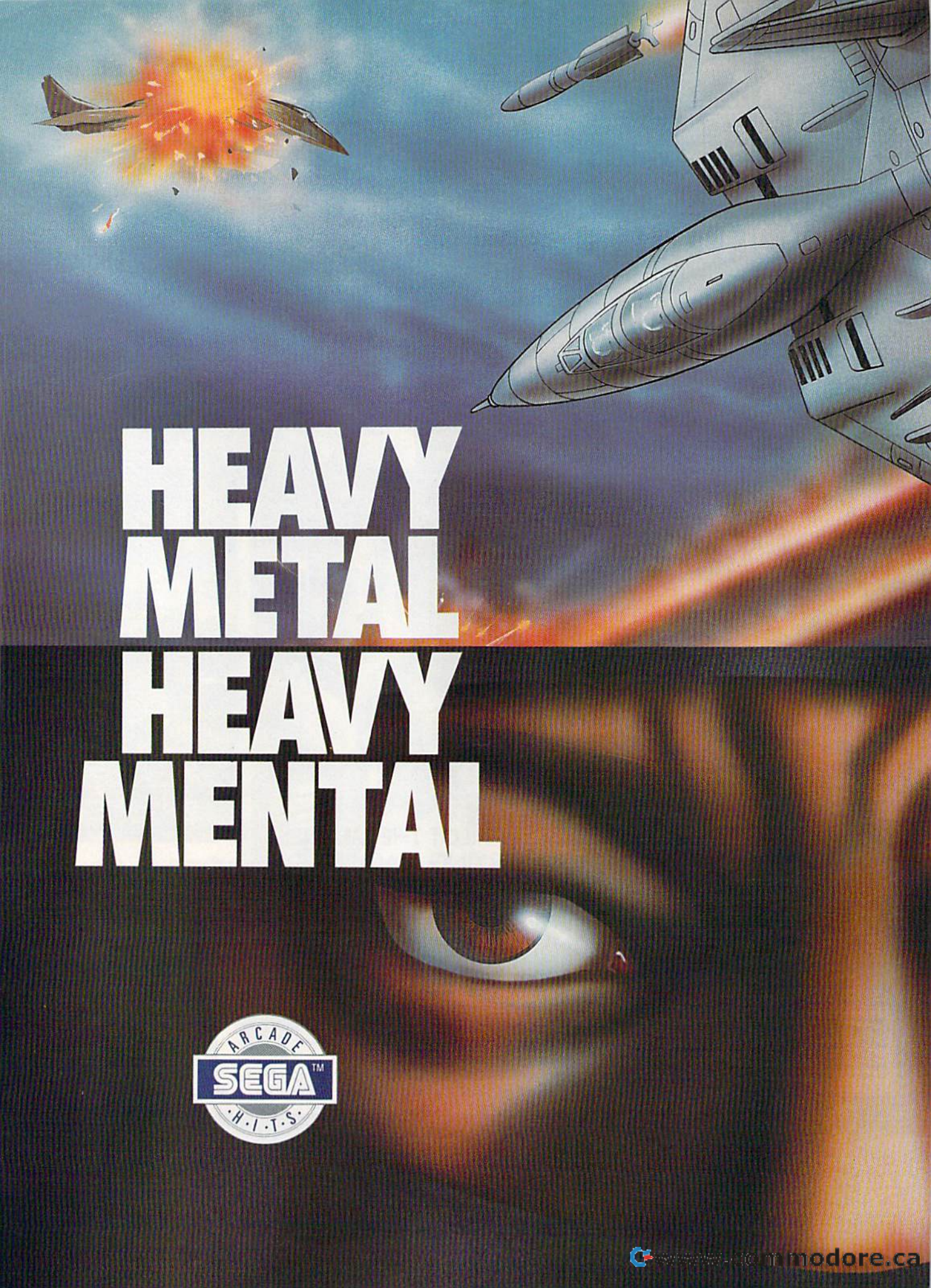

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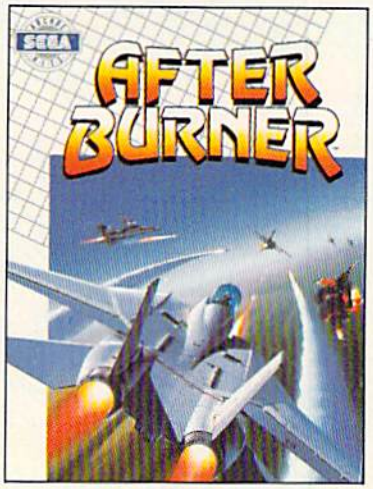

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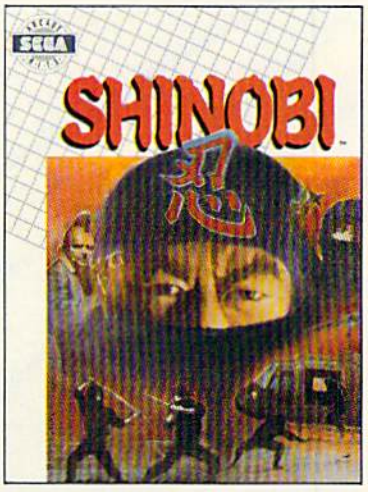

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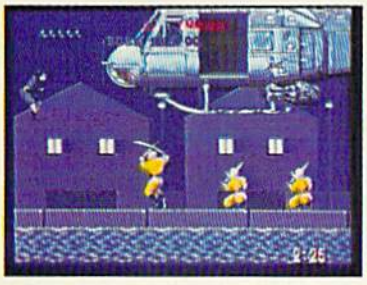

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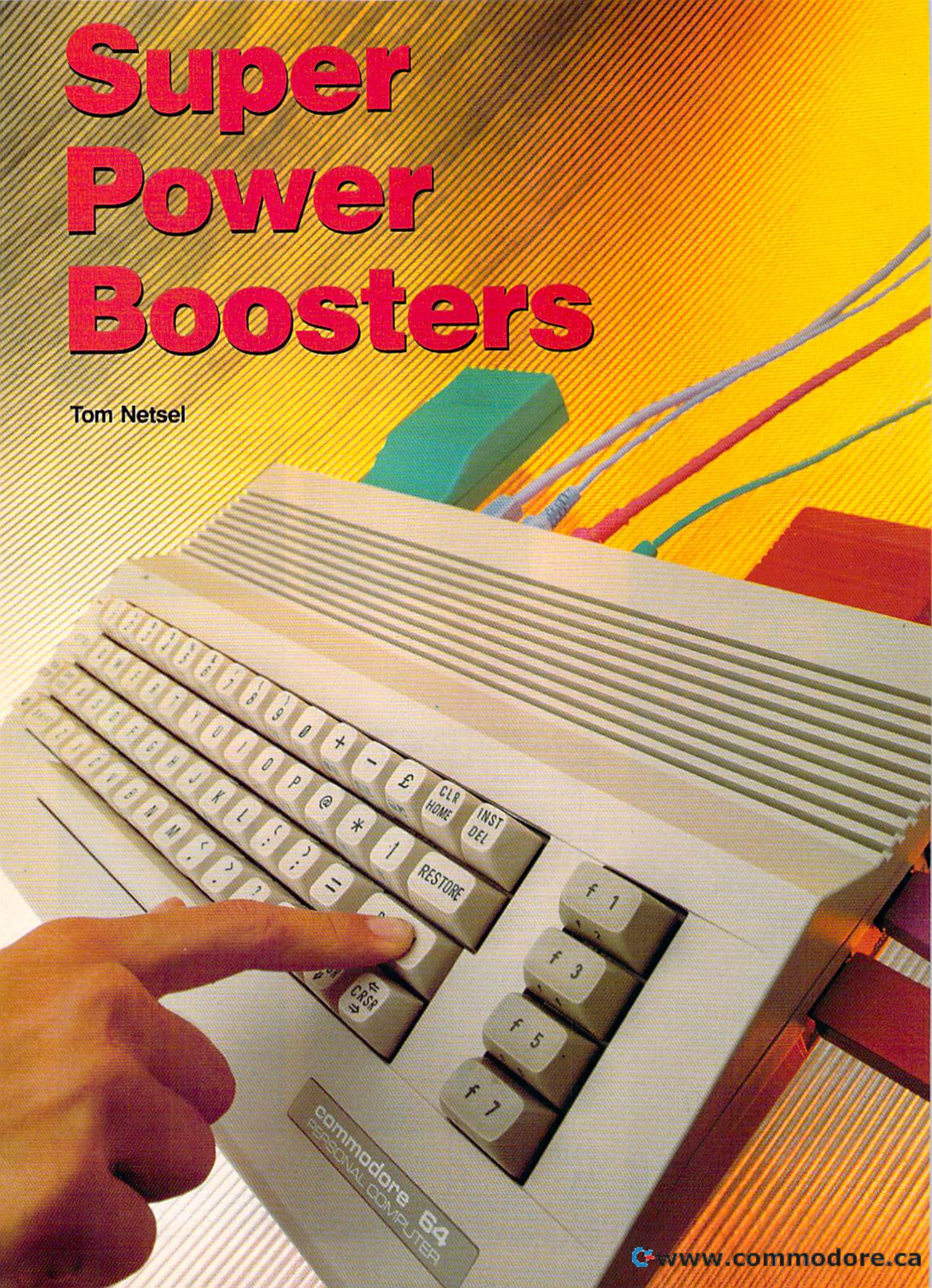
Super Power Boosters

Tom Netsel



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Take your 64 or 128 to the limit with these powerhouse accessories.

Your 64 has come a long way, baby. From a modest home computer designed to work with a tape drive, the 64 and, later, the 128 have evolved into powerful machines capable of tasks never dreamed of by their designers.

Here's a look at some of the accessories, peripherals, and hardware that serious computer users can add to their systems to get the most out of their machines. You may not want to add all these items yourself, but even a couple of these products can go a long way toward boosting your computing power.

A Hard Decision

No power user worthy of the name is content to load and save files with a pokey 1541 disk drive. To transfer bytes with the big boys, you need a hard drive. Enter the Lt. Kernal from Xetec.

This 20-megabyte drive isn't cheap (the 64 and 128 weren't designed to work with a hard drive), but it will hold almost as much information as 120 floppy disks. The Lt. Kernal is built into a sturdy metal unit that houses both the drive and its power supply. It has a fairly large footprint of 12 × 14 inches and stands almost 3 inches high, but the case is strong enough to serve as a stand for a monitor.

The drive's interface (or *host adapter*, as Xetec calls it) plugs into the 64 or 128 cartridge port. Installation also requires some internal modifications. Two cables must be connected to a specific chip in the 64; additionally, for the 128, one chip must be removed and reinstalled. Installation is not difficult, but care must be taken when working inside any electronic device.

The Lt. Kernal's storage space can be divided into 11 logical units, which can be further divided into 15 separate subdirectories. Rather than storing programs or files anywhere in the drive, subdirectories make the space more manageable by letting you group similar programs together. One logical unit could be used for word processing, and others could be reserved for databases, games, utilities, or whatever. Without subdirectories, imagine how big a directory listing would be on one 20-meg disk.

While the Lt. Kernal stores plenty of data, you can access any of it very quickly. The drive loads and saves programs more than 65 times faster than a 1541. The speed of transfer to the 64's memory is rated at an average 38,000 bytes per second, and 65,000 bytes per second for the 128. Simply type a filename and the Lt. Kernal finds, loads, and runs it almost instantly.

The Lt. Kernal's disk operating system supports or enhances 42 system commands. No more long commands to memorize for deleting a file—just type DEL and the filename. COPY copies a file from one directory to another within the disk. RENUM renumbers BASIC program lines. Type DIR for the directory of the current logical unit.

If you run an electronic bulletin board, operate a small business, program with compiled languages, or simply have a need for speed and size, a hard disk drive is virtually a necessity. The 64 version of the Lt. Kernal sells for $899.95, and the 128 version is priced at $949.95.

If 20 megabytes still leaves you cramped for space, consider Xetec's 40-megabyte version. This model of the Lt. Kernal doubles the available disk space and sells for $1,395 and $1,445 for the 64 and 128, respectively.

Memory Booster

If power users want a larger, faster disk drive, it's only logical for them to want more memory, or RAM, as well. Extra memory permits your computer to work with larger databases, spreadsheets, and word processor documents—and to do that work much faster.

Added RAM acts like an extra disk drive for programs normally too large to reside in the internal memory of the 64 or 128. When a program needs to access a separate routine or file, instead of calling it from the disk drive, it fetches it from the added RAM. When the added RAM is used as described here, it's called a *ramdisk*.

Commodore's 1764 RAM Expansion Unit (REU) adds 256K of RAM to the 64. Included with the REU and power supply is *RAMDOS*, software that lets you use the 1764 as a high-speed drive or ramdisk. GEOS makes excellent use of this expander by speeding up program applications. The 1700 and 1750 RAM expanders add as much as 512K of storage space for the 128. GEOS 128 supports both of these units. (Note that the REU uses the same expansion port as the hard disk.)

Cartridge Power

Not all commercial programs can be stored on a hard disk. These programs must still be loaded each time from a floppy disk. Power users are impatient and they want their machines to work fast. Since it's impossible to do away entirely with slow floppy drives, most power users employ a fast-loading cartridge to cut loading times.

There are several cartridges on the market, all offering many features in addition to fast loading. Cartridges provide power users with an astonishing number of programs, utilities, and special enhancements. Many of the copy utilities allow for making backup copies of copy-protected software, a feature helpful for installing such products on a hard drive.

The downside to cartridges is that they occupy the Commodore's lone cartridge port. You can't use a fast-load cartridge and a RAM expander (or even a hard drive) at the same time.

EPROM Primer

A ramdisk is fast, but all its memory vanishes as soon as the power shuts off. In order to preserve data or a program, it must be saved to some nonvolatile medium. There are two ways to accomplish this task. One is by saving data on disk or tape, and the other is by storing it in read only memory (ROM). Once a program is stored in ROM, it is virtually permanent and instantly available.

Power users and programmers often create their own ROM cartridges for programs they've written. Relatively simple and inexpensive hardware devices let you program erasable, program-

continued on page 34

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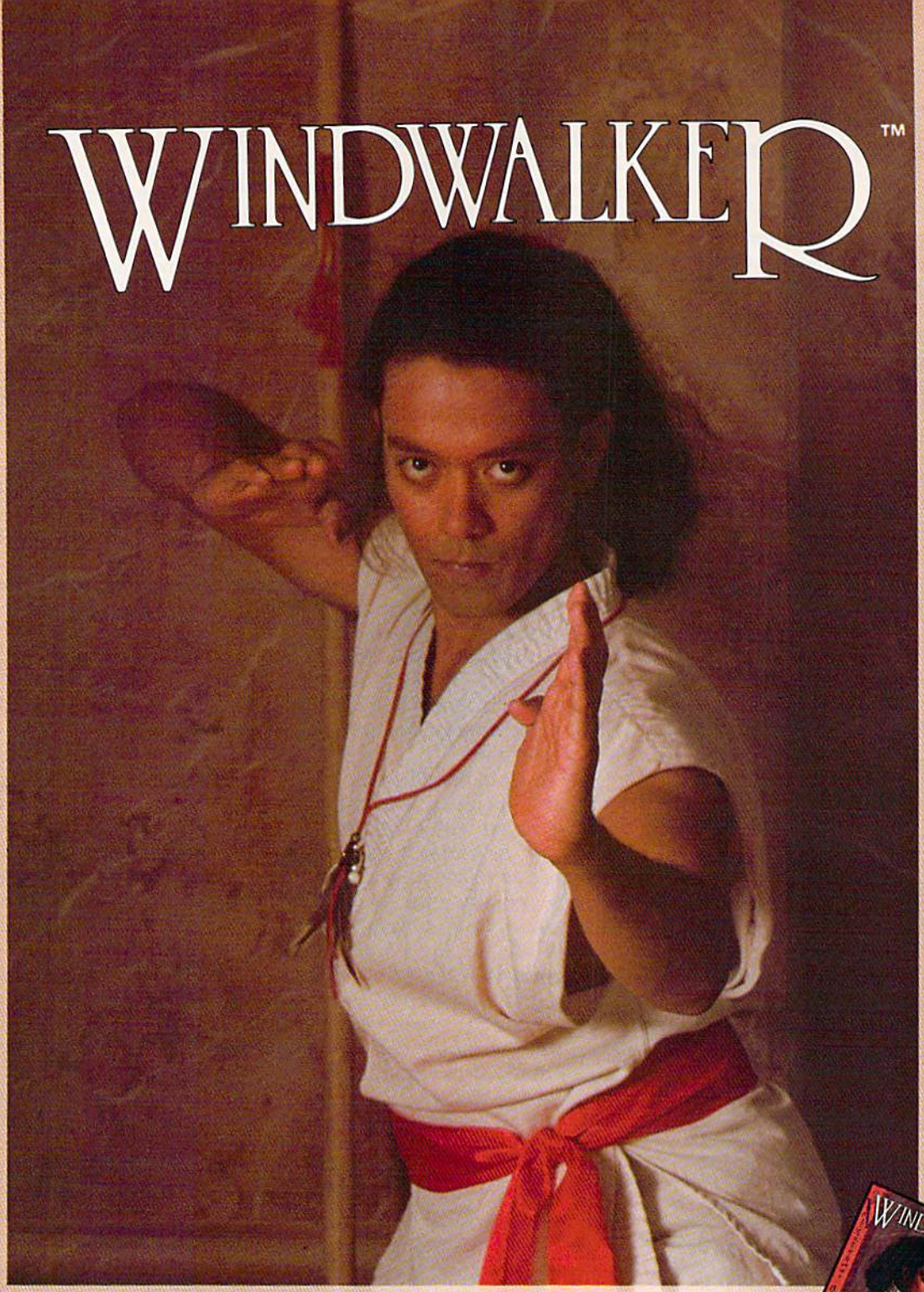
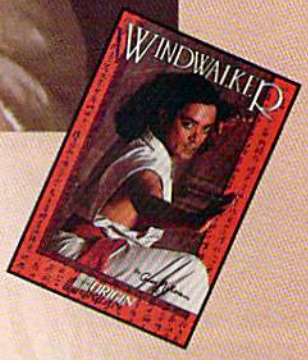
WINDWALKER™





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WHITE WATER

EDITOR'S CHOICE

Tim Hanson

Experience the thrill of river running without getting wet in this exciting, arcade-style game for the Commodore 64. Joystick required.

"There's nothing like it," they said. "Definitely a challenge, but you can handle it." As you drift toward your first set of rapids, you're beginning to have some doubts. After all, there's nothing between you and those boulders ahead but a flimsy rubber raft.

Rafting, especially in a powerful river, is a dangerous adventure. But with "White Water," you can enjoy river running in the safety of your own home. In this game, you must guide your raft down eight rocky rivers. But beware—you're not alone. Crocodiles and Hovercraft share these waterways.

Getting Started

White Water is written in machine language, so you must use "MLX," the machine language entry program, found elsewhere in this issue, to enter it. When MLX prompts you, respond with the values given below.

Starting address: 0801
Ending address: 1E60

When you've finished entering the data for White Water, be sure to save a copy of it to tape or disk.

To start the game, load the program just as if it were written in BASIC. Plug a joystick into port 2 and type RUN. Then press the fire button to begin.

Shoot the wild rapids in "White Water."

Take the Plunge

As the game begins, you're in the multicolored raft on the left of the screen. Your goal is to maneuver this raft through an eight-level course as quickly as you can while avoiding the various obstacles—the rocks, crocodiles, and Hovercraft—that appear before you in the river. Each time you hit an obstacle, you lose a raft. Fortunately, you're given two replacement rafts.

To control the raft, use the joystick. Push the joystick up and down to move the raft across the river. To increase the raft's speed, push the joystick to the right; to decrease the raft's speed, push the joystick to the left.

Your score is updated and shown at the top of the screen. The faster you go downstream, the more points you score. Also, whenever you pass a crocodile or Hovercraft, you're awarded 100 points.

Once you've completed a level, a message will appear informing you that you're about to advance to the next level. If you find this message lingers too long, just press the fire button to continue.

When you've completed all eight levels, the game starts again from the beginning.

Eight Patterns

After you've played White Water for a while, you'll begin to notice repeating rock formations in the river. This is because there are only eight screen patterns, and each level consists of various combinations of these basic formations.

In order to shorten the program, the eight screen patterns have been compacted to half their normal size. This was achieved by using only four bits to store a character. Thus, one byte contains information for two characters. The disadvantage in using this technique is that only sixteen characters can be represented on the screen at once.

See program listing on page 79. **G**

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FLASH CARD

Martin L. Otterson

"Flash Card" is an educational tool that makes learning math fun for children and makes teaching it easy on you. Drills are provided at various skill levels in four basic areas: addition, subtraction, multiplication, and division. Each problem is shown using oversized characters. What results is a display that resembles an actual flash card.

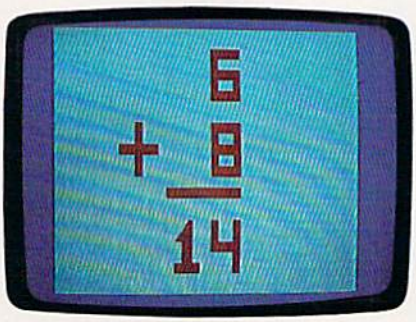
Getting Started

Flash Card is written in BASIC. To ensure accurate entry, use "The Automatic Proofreader," found elsewhere in this issue, to type it in. When you've finished, be sure to save a copy of the program to tape or disk. To begin a math quiz, simply load the program and type RUN. (If you have a joystick, plug it into port 1.)

The title screen displays a menu offering four types of math problems. To select addition, press 1; for subtraction, press 2; for multiplication, press 3; and for division, press 4.

Next, you must choose a skill level based on the operation you selected. If you've chosen addition or subtraction, you'll be prompted for a high and a low value. With addition, the program generates all the problems whose addends are within the indicated range. For example, if you enter 5 and 2, the program will display all the problems in the range from (2 + 2) to (5 + 5).

If you've chosen subtraction, for each problem, the program randomly picks two numbers from the specified range, adds these together, and uses the result as the minuend. One of the two random numbers is then used as the subtrahend. This process continues until all possible problems have been displayed.



"Flash Card," with its clear display, is especially well suited for tots.

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If you've selected multiplication or division, the program offers either problems in a numerical range or problems from a table. For a range, the program builds multiplication problems using a process similar to that used for addition. Division problems, on the other hand, are formulated using a process similar to that used for subtraction. If you specify problems from a table, the program prompts you for a multiplier or divisor, and then generates all the problems which use this value.

After you've answered the program prompts, a math problem is generated and displayed on the screen. Once you've solved the problem, press any key or the fire button to see the answer. To display the next problem, press a key or the fire button.

The program does not accept a response until the entire math problem or answer has been displayed. This prevents the program from advancing to the next problem or showing the answer too soon.

When all problems for a specified skill level have been displayed, the program returns to the main menu.

See program listing on page 82. G

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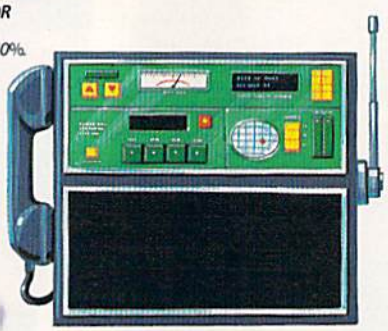

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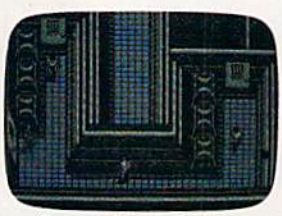

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Cartridge Power!

Art Hunkins

Supercharge your 64 and 128 with the hot, new generation of cartridges.

It's no secret that the 64, BASIC 2.0, and the 1541 disk drive are each deficient in certain ways. Many of these shortcomings have been met with various hardware and software solutions. Chief among the problems are slow disk drive speed, difficult communication between computer and drive (lack of an accessible DOS wedge), no built-in machine language monitor, and a general absence of certain important features, including copy and backup procedures.

Over the past several years, plug-in utility cartridges and ROM replacement chips were developed to address these problems. And they've proved to be successful solutions. In fact, some cartridges are up to fifth versions, each version more powerful than its predecessor. Cartridge competition has been—and still is—a hotly contested area in the Commodore 64/128 market.

Full Utility

The utility cartridge is a descendant of the accelerator cartridge, which was designed, primarily, to accelerate the loading of programs. Utility cartridges still offer fast-load capabilities, but also much more. They speed up most, if not all, disk functions (including saving and formatting), and they include both a DOS wedge and the capability for single-stroke disk-access commands. The crop of currently available cartridges for the 64 are utility cartridges, but not all are. Interex's Blowup, for example, is exclusively a screen-capture-and-manipulation device. Even Timeworks' Partner, with its variety of desktop accessories, does not strictly meet the above conditions.

New ROMs

If you're looking for accessible disk turbo features, a DOS wedge, and programmable function keys only, you should consider ROM replacement products as well.

ROM replacements come in two varieties, parallel and serial. Both involve opening your computer (and with the better products, also the disk drive) and attempting some modest installation work. This means plugging and unplugging chip components

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or small circuit boards, not soldering. These constitute semipermanent modifications to your equipment.

Without question, the parallel ROM replacement offers the best disk turbo speed—but it ties up the parallel port (you can't use a modem) and leaves a cable permanently attached to your disk drive. ROM replacements are, however, compatible with some utility cartridges. For example, I've been word processing for some time now with a cartridge version of *Write Now!* and a superfast Dolphin DOS parallel turbo system (from Micro Accessories of South Australia).

An excellent serial system, available for the 64 or 128 and a wide variety of disk drives, is JiffyDOS, from Creative Micro Designs. Serial systems, while slower, need no additional cables and do not tie up your parallel port. They are also much less expensive.

Supercartridges

Many users prefer a cartridge to a ROM replacement. Cartridges are easily inserted and removed, and they are readily interchangeable among different 64s, 128s, and disk drives. They don't involve modification of the computer or drive. The supercartridges offer a host of extra features, such as BASIC extensions, machine language monitors, and track-and-sector editors. Two additional features found on the supercartridges which are most useful in a crisis are a reset button and an *old* (sometimes called *unnew*) command. These allow you to recover a BASIC program if your 64 decides to visit never-never land. (The reset button is not needed on the 128, but the *old* command is.)

We'll take a closeup look at five powerful cartridges, three of which we'll put in the supercartridge class.

If you're interested in graphics manipulation, sprite or character-set editing, or screen dumping in varied formats, it would be a good idea to carefully study the specific cartridge documentation. For extensive graphics capability and flexible color printing (including recolorization), look into Super Explode! 5 (discussed below).

Competition among cartridge makers has been—and still is—a hotly contested area in the 64/128 market.

We'll start with the latest generation of multifunction supercartridges: Final Cartridge III, Super Snapshot 4, and Action Replay 5. These may seem to have super price tags as well, but actually cost only $10–$20 more than less capable cartridges. All supercartridges, in addition to the features noted above, offer archival-backup capability, freezers, and various devices which—through the freezer—allow modifications to games (such as implementation of unlimited lives or firepower and the elimination of sprites or various types of collisions.)

Final Cartridge III

Final Cartridge III is the only supercartridge with 64K of ROM; the other supercartridges contain 32K of ROM plus 8K of RAM.

FCIII's additional 32K of ROM is dedicated to a unique desktop accessory, something quite apart from the normal range of cartridge utilities. It is inspired by the Amiga and Macintosh, complete with multiple relocatable windows, pull-down menus, and options of keyboard, joystick, or mouse operation. (I recommend the mouse; keyboard control is somewhat cumbersome, and joystick control is nearly impossible.)

Included in the desktop are a complete point-and-click interface for DOS, a freezer interface, a notepad, a calculator, and a clock with an alarm. (A word of caution: To use the notepad with a parallel printer, you must have a recent interface which has internal switches for "transparent" mode. Or you can try to find a simple serial-to-Centronics cable. This is because, like Action Replay 5, FCIII contains its own Centronics interface. This extra interface is more a hindrance than a blessing in the U.S.; the situation is presumably different abroad.)

In two Preferences menus, you can change many default options, such as pointer velocity, default drive number, key repeat, and border color. There are multiple screen-dump choices as well, and numerous character sizes, colors, pin densities, and printer types are supported.

What I like most about Final Cartridge III is its ease of use. The programmed function keys are laid out logically and are easy to remember. The BASIC toolkit is by far the largest collection on any of the cartridges—almost 30 commands (unfortunately *replace/change* is not implemented, contrary to publicity). Its monitor is particularly useful and extensive, allowing data display and alteration in five different formats, for example. (Data is modified simply by overtyping.) The monitor even contains sprite and character editors.

Missing entirely from FCIII are file-copy and disk-backup routines, except from the freezer. As with Action Replay 5, which also comes from Europe, FCIII fully supports a tape drive and offers turbo-tape access. The Commodore–RUN key combination still loads and runs the first program on tape (*dload* is the shortcut for disk).

A final delightful feature is the automatic forward and backward scrolling of BASIC program listings, combined with a simple method for getting the cursor to the bottom left of the screen. FCIII is the only cartridge that implements BASIC list scrolling.

FCIII includes a parameters disk for archiving heavily protected programs that require extra help.

Super Snapshot 4

Super Snapshot contains 32K of ROM and 8K of RAM. SS particularly makes a lot out of the importance of the 8K of RAM, but it seems to be relevent only in archiving and customizing certain games and in slightly speeding up

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some turbo functions. With the 8K of RAM, after making changes in a game (through the ML monitor), you can pick up exactly where you left off.

The latest incarnation of Super Snapshot, version 4, contains several unique and important features. One is an autoboot-from-disk capability. On power-up or reset, after 30 seconds or upon pressing a designated key, any disk in the drive containing an autoboot sector will boot. (This roughly duplicates the 128's autostart.) The utility/parameters disk contains a routine for adding the autoboot sector; you simply specify the name of the program you wish to autoboot. (This program could in turn install several others.)

Also invaluable are programmed function keys that can easily be redefined (again, as on the 128). I've created an SS4 autoboot disk that first redefines the function keys the way I like them, then installs *BASIC Aid* from the utility disk. I could add to this autorun list if I wished.

SS4's 14-command toolkit, unlike the other supercartridges, exists on disk only, though the ability to autoboot from disk diminishes the inconvenience. Unfortunately, both *find* and *change* commands are lacking. A sprite editor is also included on disk. Indeed, a number of SS4 applications, including backups, require the accompanying disk. This can be considered a limitation.

By contrast, Final Cartridge III includes no supplementary utility disk, nor does Action Replay 5. But Action Replay 5 offers an optional *Graphics Support* disk at $19.99. Its contents are less significant and less integrated with the cartridge than are Super Snapshot's. Note, though, that Action Replay 5 already includes sprite-editor, BASIC-toolkit, and backup software. The Action Replay 5 disk is not essential, and, given its price, I do not particularly recommend it. Super Snapshot's *Slideshow Creator* (an optional disk for $14.95) is clearly superior to Action Replay's slide-show utility.

Cartridges are easy to insert and remove, and they're interchangeable among different 64s, 128s, and disk drives.

I found SS4 less easy to use and less straightforward in design than Final Cartridge III and Action Replay 5. Even at the opening screen, the choices seem more complex than necessary. The freeze button doubles as a reset, which introduces more complication. The manual, while quite complete, is not well organized, and information can be difficult to find. On the other hand, none of the three supercartridges has a very well organized or error-free manual, though Action Replay's is clearly the best.

Other particularly attractive features of SS4 include the file-copy and disk-backup routines (the whole-disk duplicators are on the utility disk). SS4 easily makes multiple copies of files, and it includes a number of whole-disk copy options. Disk drive types may be mixed (the 1581 is fully supported). Backup routines directly access the parameters list on disk, which gives instructions as to which backup routine to use. (The whole process seems as painless as can reasonably be expected.) The nibbler is the well-known *Shotgun II*.

Super Snapshot, like Action Replay 5, is easily and inexpensively upgradable ($20 or less). You simply unscrew the cartridge, pry out one ROM chip, and press in another. The only North American product among these supercartridges, SS offers a PAL version for overseas use, costing an extra $4. If you are searching for the ultimate in cartridge turbos, SS4's excellent program load and save times are beaten only by Action Replay 5, and only by a mere second or two.

Action Replay 5

Datel's Action Replay 5, a British product, is in many ways the most straightforward and self-contained of the multifunction cartridges. Software design is well planned, without any bells and whistles. It is remarkable in few respects, solid and comprehensive in all.

As noted above, it possesses the fastest turbo functions of the three cartridges; it even supports a special Warp*25 disk turbo that permits files to be fast-loaded *without* the cartridge. Two turbo-tape procedures are included. The file-copy routine permits multiple copies of batches of files, a very useful feature. Disk backups can be made with the whole disk or BAM copy method; the latter can save considerable time. One limitation is that the backup routines support only the 1541 drive.

In my opinion, AR5's most unusual features are its allowance for users to enter BASIC POKEs in a frozen program (without entering a monitor) and its Poke-finder General routine, a kind of hit-or-miss lives-finder for games. Over a series of life-losing trials, this routine attempts to identify one or more POKE addresses that will give you infinite lives. Datel claims a success rate of more than 80 percent.

The machine language monitor is full-featured and scrolls bi-directionally (as do all the monitors in these cartridges). The integrated track-and-sector editor is quite adequate. The 12-item BASIC toolkit contains several uncommon commands: *linesave*, which saves part of a program, and *boot*, which loads and then runs a machine language program from its starting address. Backup and copy commands are accessible from BASIC, unlike those of the other two supercartridges.

Unfortunately, several crucial commands are lacking: *renumber*, *find*, and *change* (although *merge* includes an option that renumbers a program addition prior to merging it—totally neglecting GOTOs and GOSUBs.)

Game-player options from the freezer are similar to those in Super Snapshot, but Action Replay 5 includes a stand-alone sprite monitor/editor. AR5 also includes a unique text editor for text-based

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screens with which you can customize opening game screens. This editor works in tandem with the machine language monitor.

One pleasant final touch with Action Replay 5: The f1 key loads and runs any program from the disk's onscreen directory. You might think the Commodore–RUN key combination would be changed to do this (as in Super Snapshot). But AR5, like Final Cartridge III, fully supports tape, so that particular keystroke combination is already spoken for. AR5's boot capability for machine language programs is a most attractive feature, both in its f1-key implementation and its added *boot* command.

Warp Speed

Down a notch from the supercartridges is the 16K Warp Speed cartridge, essentially an updated and expanded successor to the original generation of accelerator cartridges. It provides turbo speed to all disk functions (except scratch and validate) and features a native 128 mode (the only cartridge in this survey to have this), a reset button, and an *old* command. Its track-and-sector editor is particularly useful and extensive; it is integrated well into the flexible ML monitor. Fortunately for the user, 64 and 128 modes function identically.

What's missing are a BASIC-toolkit feature and programmed function keys. However, you can still load, save, scratch, and so on, using shorthand commands from the onscreen directory with a minimum of effort.

The single-drive file-copy routines are of limited value because you must swap disks for every file. It's not possible to make more than one copy at a time. On the other hand, both whole-disk copiers are excellent and fast; the 128 version is particularly speedy, usually requiring no more than a single pass. Warp Speed's manual is small though adequate. The programming is not always as clear as it could be: Options on both the Copy and the Track/Sector submenus are confusing.

Note that preprogrammed function keys are a mixed blessing. With Warp Speed, as with early accelerator cartridges, it is not difficult to wedge in your own function-key definitions. This is usually impossible with cartridges that preprogram these keys (Super Snapshot is an exception). Also, you can find *BASIC Aid* packages on disk that will not cause a wedge conflict.

Super Explode! 5

Super Explode! version 5 is primarily a graphics cartridge. It is designed to capture, manipulate, and edit screens and then print them. Its color print capability includes recolorization, and it dumps to all but one available color printer. Its extensive ability to manipulate graphics images makes it the cartridge of choice for graphics buffs. (Note that Super Explode! interfaces with The Soft Group's Video Byte system, a low-cost video digitizer designed to capture full-color images from a VCR or live camera.)

Super Explode! 5's modest utility repertoire includes a complete disk-turbo feature, directory list to screen, single-stroke disk

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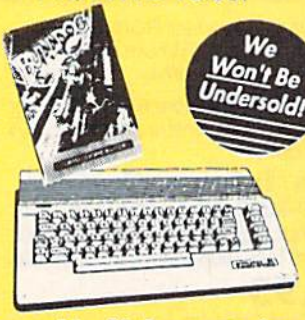

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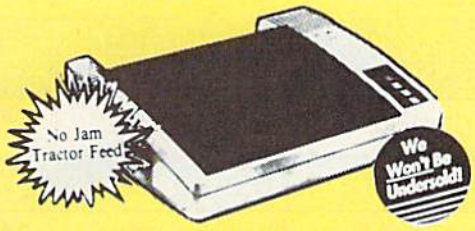

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commands, and easy access to the error channel. These commands are not implemented on function keys, nor are the function keys programmed. There is no BASIC toolkit, monitor, or disk-backup or archiving capability. There *is* a fast multiple-copy file routine, as well as an *unnew* command. The freeze button doubles as a reset.

The manual is on disk (you must print it out) and is rather haphazard. Nonetheless, it contains a wealth of technical information. Topics include split screens, elementary and advanced file conversion (for *Doodle*, Koala, text screens, and custom character sets), sprite manipulation, and sprite overlay. If you require few utility functions but extensive graphics capability, Super Explode! 5 is for you.

A Different Option

When considering a cartridge purchase, you may also want to consider another possibility: using a RAM cartridge to put together a personalized set of utilities. Quick Brown Box offers such an opportunity. The 32K or 64K battery-backed RAM is fairly expensive, but it's attractive because it permits utility customization.

Note that putting together a custom set of utilities is complicated and time-consuming and should be attempted only by the more experienced programmer. The big problem in customizing your box is that utilities gathered from varied sources are often incompatible with each other and with RAM-box software. Since these various routines were not designed to coexist, as they are in a ROM cartridge, there are both memory-location and interrupt, or wedge, conflicts. ROM cartridges typically contain a large number of routines; assembling a compatible, comprehensive collection on your own is difficult. If you write your own routines, the RAM cartridge is a good bet; and Brown Box programmers are ready to help. Support is excellent.

Importantly, Quick Brown Box offers an optional disk that includes compatible utilities for both the 64 and the 128. Utility boxes can be constructed, saved, and reloaded for either machine. With some effort, any box can be made to autostart—that is, to automatically boot a short BASIC program that in turn activates any number of utility routines. Remaining box memory is available to the user as a ramdisk.

QBB's Manager software makes using all this capability quite easy once QBB is constituted. You can even instantly save or recall a current program to or from the ramdisk with a single keystroke and RETURN. The combination of utility cartridge and fast-access ramdisk is a thoroughly fascinating one. Be prepared, though, to spend time and effort, and to experience some frustration.

The 64 box I've constructed autoinstalls the following software upon power-up or reset (QBB has a reset button): Fast Save, Fast

Cartridge Comparisons

	Final Cartridge III	Super Snapshot 4	Action Replay 5	Warp Speed	Super Explode! 5
Disk turbo	yes	yes	yes	yes	yes
DOS wedge	yes	yes	yes	yes	yes
Single-stroke disk-access commands	with function keys	yes	yes	yes	yes
Single-stroke directory list to screen	with function keys	yes	yes	yes	yes
Disk commands work with screen directory	yes	yes	yes	yes	yes
Programmed function keys	yes	yes	yes	no	no
Reprogrammable function keys	no	yes	no	no	no
BASIC toolkit extension (# of commands)	yes (29)	on disk only (14)	yes (12)	no	n.a.
Reset button and *old* command	yes	yes (reset doubles as freeze)	yes	yes	yes
Track/sector editor	yes	yes	yes	yes	n.a.
ML monitor	yes	yes	yes	yes	n.a.
Disk backup	no	yes (on disk)	yes (for 1541 only)	yes	n.a.
File copy	no	yes	yes (multiple copies)	yes (limited)	n.a.
Bidirectional scrolling LIST (BASIC)	yes	no	no	no	n.a.
Disk autoboot	no	yes	no	no	n.a.
Freezer	yes	yes	yes	no	n.a.
Parameters disk included for freezer	yes	yes	no	n.a.	n.a.
Screen dumps	yes	yes	yes	yes (text only, from BASIC)	yes
Screen dumps in color	yes	no	no	n.a.	yes
Extended graphics capability	n.a.	n.a.	n.a.	n.a.	yes
Desktop accessory	yes	no	no	n.a.	n.a.
Native 128 mode	no	no	no	yes	no

Note: In the above chart, n.a. *indicates* not applicable.

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Load, Tiny Aid (extra BASIC commands), Directory Aid, and a function-key routine. All but the last item are included in the optional utilities disk.

Tiny Aid includes the commands I use the most: *change, find, delete, number, renumber,* and *append*—all the crucial ones. Directory Aid lists a noncorrupting disk directory to the screen and permits one-key loading, scratching, or file reading to screen or printer. A help screen is available.

Also in my box, ready for instant access when needed, are an *old* command, Fast Format, Supermon (ML monitor), a kill Box command, and the QBB Manager program itself for changing/editing box contents. All these routines are furnished on the *Supplemental Utilities* disk.

Now if my system crashes, I hit the cartridge reset button while holding down the CTRL key to defeat the autostart sequence; I then call the *old* routine, save my BASIC program to a ramdisk, and press reset again, this time with autoboot (to reinstall the utilities). Last, I reclaim my BASIC program from the ramdisk. Each one of these operations takes three keystrokes or less.

For more information on the products mentioned in this article, contact the following manufacturers:

Action Replay 5
Datel Computers
3430 E. Tropicana #67
Las Vegas, NV 89121
$64.99
Graphics Support disk, $19.99

Final Cartridge III
Home and Personal Computers
99 Washington St. and Park Ave.
East Orange, NJ 07017
$69.95 (includes parameters disk)

Super Explode! 5
The Soft Group
P.O. Box 111
Montgomery, IL 60538
$44.95 ($49.95 with disable switch)

Super Snapshot 4
Software Support International
2700 NE Andresan Rd.
Vancouver, WA 98661
$64.95 (includes parameters/utility disk)
Slideshow Creator disk, $14.95

Quick Brown Box
Brown Boxes
26 Concord Rd.
Bedford, MA 01730
$99.00 (32K); $129.00 (64K)
Supplemental Utilities disk, $6.00

Warp Speed
Cinemaware
4165 Thousand Oaks Blvd.
Westlake Village, CA 91362
$49.95

Something for Everyone

All the products discussed are fine ones, designed to make computing faster and more convenient. While all offer turbo disk access, DOS wedges, and so on, they do differ from each other in many significant respects.

The chart on page 32 compares major features of the cartridges. The features are listed in general order of importance to the author. Though no cartridge will meet your every requirement, one or more will come close. Commodore computer enthusiasts are fortunate to have such a range of excellent utility products available. **G**

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mable, read only memory (EPROM) chips. EPROM is like ROM: Data is fixed until you decide to erase it by exposing the chip to ultraviolet light. There are several EPROM "burners" on the market, and they are relatively simple to operate.

Parallel Path

If a hard disk is out of your budget, you can still give your 1541 a boost. Replace its serial bottleneck with a high-speed parallel data path to your computer. Chip Level Designs offers RapiDOS Professional, a kit that modifies the computer and drive so programs load in less than six seconds. It is necessary to replace several components inside both units, so users may wish to have a technician install the $99 kit.

For a simpler modification that still adds a burst of speed, replace only the Kernal ROM in the drive and computer. Disks format in ten seconds, and programs save six times faster than before. It is fairly simple to install such products as JiffyDOS (from Creative Micro) or RapiDOS (from Chip Level), although some chips in older computers and drives may have to be unsoldered before the new ones can be plugged in. Conversions exist for most 64- and 128-compatible disk drives, with prices ranging from $25 to $50.

Modem Limits

Not long ago, 300-baud modems set the standards in telecommunications, but these Model-T units have been left in the dust of today's faster models. Now, 1200-baud and 2400-baud modems vie for top honors, with the faster units gaining in popularity as prices continue to moderate. It's easy to get spoiled once you try a faster modem.

Popular 2400-baud modems include the Avatex 2400 and the Hayes Smartmodem 2400.

Never satisfied with the status quo, power users push technology to the limits. They may want to zip data along telephone lines with a 9600-baud modem—but here they run into a snag. The serial routines in the 64 simply were not designed to handle modem traffic at that speed, and communication becomes unreliable.

Power Printers of Choice

The versatile 9-pin dot-matrix printer is still the workhorse of the 64 and 128 market. It offers high-speed draft copies, near-letter-quality printing for more formal applications, and graphics—all at a bargain price. Limited resolution is its primary shortcoming—at 72 dots per inch (dpi), the dots that make up each letter are obvious and individual letters look porous.

A step up the printer scale are the 24-pin models. These printers offer higher-quality print at a higher price, but even they are not good enough to satisfy some power users. Users who are serious about quality skip dot-matrix technology entirely. For them, there is but one choice: the laser printer.

Laser printers can print 8–12 pages per minute, combining text and graphics with outstanding resolution, 300 dpi or better. Gone is the chugging noise of the dot-matrix printer; lasers hum along almost silently.

Power users in the fields of graphics and desktop publishing require the quality and control that only a laser printer can offer, and they are willing to pay the price for that quality. Star Micronics, a printer company familiar to many Commodore owners, offers its eight-page-per-minute LaserPrinter 8. This printer comes with a standard one megabyte of RAM and four internal fonts. The LaserPrinter 8 supports most computers through its Centronics parallel and RS-232C serial interfaces. Its suggested retail price is $2,699.

Hewlett-Packard has sold more than 1 million LaserJet printers, making the printers of this series the top sellers in the laser-printer field. The LaserJet II prints eight pages per minute, comes with six internal fonts, and sells for a retail price of $2,695.

For the power user who wants to move up to laser quality without paying the laser price, HP offers its DeskJet for less than $1,000. This inkjet printer prints high-resolution text in multiple fonts and full-page graphics at 300 dpi. Printing speed is about two pages per minute.

Face to Interface

Because no laser printer is Commodore-ready, you'll need an interface to connect the printer to the 64 or 128. Depending on the software and other considerations, a serial or parallel interface may be required. But even if you're not ready to park a laser printer next to your 64 or 128, you'll need an interface for any printer if it isn't Commodore-ready.

In addition to acting as a bridge between printer and computer, interfaces include many built-in features to enhance your printing capabilities. One feature that users particularly appreciate is the buffer.

The 64 or 128 can process text and graphics electronically much faster than a mechanical printer can put it on paper. Send a long file to your printer and your computer can be tied up for some time, waiting for the data to transfer. If the interface has a buffer, the computer dumps the text almost immediately to this special storage area, where it is kept until the printer can catch up. This frees the 64 or 128 for other chores. One of the more popular printer interfaces is Xetec's Super Graphix Gold ($119). Its 32K buffer is large enough to hold approximately 20 typewritten pages of double-spaced text.

Super Graphix Gold supports standard serial transfers from the 64 and fast serial transfers from the 128. Other features include four built-in fonts, four downloadable fonts, LED activity and error lights, reset and clear buttons, and 16 DIP switches for flexible operation in a variety of modes.

Power Checkbook

One thing you may notice about power users is their need for a power checkbook. It takes money to get the most in speed, convenience, and flexibility. Because some of the peripherals for the 64 or 128 alone cost more than an entire system, you may want to give serious thought before making certain upgrades. But if you want maximum power and you can afford it, it's all there for the 64 and 128. G

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REVIEWS

Batman

Data East's newest release was well timed to catch the Batmania sweeping the country. I didn't know what to expect from *Batman*, but I was hoping to see some sort of computerized comic book. Data East didn't disappoint me.

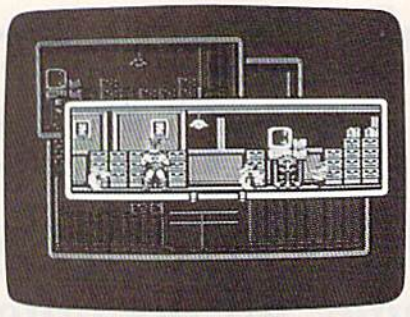
After loading *Batman*, a comic-book-style graphic appears showing the Caped Crusader and the Penguin. In the years since I'd seen the Penguin, I'd forgotten about his white gloves, cigarette holder, and umbrella. Holy Batmemory!

Batman, subtitled *The Caped Crusader*, is really two games in one. You battle the Penguin in "A Bird in Hand" or the Joker in "A Fete Worse than Death." Although I spent the first evening playing the Penguin variant, I couldn't resist the Joker.

The game opens with Batman in the Batcave. Armed with my trusty joystick, I started to explore Batman's world. Each "room" in this game appears as one comic-book panel of varying width and height, just as you would expect to see in the comics. As you move Batman from one panel to the next, each new panel partially overlays the old. The portion of the overlapped panel is seen in shades of gray where it formerly was drawn in color. Unused portions of the screen are black. This treatment is reminiscent of the old Batman comic books that relied on dark colors to portray Batman as a creature of the night. Although Batman has a suit of black armor in this year's movie, he is portrayed here in the traditional comic-book colors of gray and blue.

As the story opens, the Joker has somehow separated the dynamic duo and kidnapped Robin. Fighting against the Joker's plot, you move through the sewers under Gotham City and emerge either at a fair or inside the fun house. The sewers and the fun house are filled with the nefarious Joker's tricks and hired hands.

If you remember the Joker's toys drawn at the bottom of the comic-book scenes, you'll be pleasantly surprised to see them included here: locomotives, tanks, jumping jacks, flying squirrels, toy helicopters, and little clowns. Each of these toys is in motion and most of them are trying to trip up Batman. While some of these toys are shooting, the flying squirrels can delay Batman for a few moments.



The Joker's hired hands also try to slow the Caped Crusader. They are particularly nasty little goons who seem to specialize in kidney punches. You may overcome these guys either by kicking and punching them or by using the Batarang on them, providing you've found it.

The Joker has hidden bombs in the sewers, and you will need to locate wire cutters to disarm them. I recommend you draw a map as you wind your way through the sewers until you learn your way around.

After playing *Batman* for a time, I'm now able to navigate through the various cartoon panels without referring to my map. Nevertheless, there are well over 100 panels in the game, and it takes repeated adventures to find your way.

At certain locations, you may discover locked chests that contain various items. Most of these objects will be required later, but some have no value or may even impede Batman. Some of the objects are edible, such as a can of cola, a carrot, or a chicken. Be sure to find these because Batman needs nourishment from time to time to regain his strength.

The user interface is well designed: Simply pull back on the joystick and click the fire button. A status screen appears, showing your score, each item you have collected, and the amount of energy Batman has remaining. Use the hand icon to click on any item you want to use or discard. You may also restart the game from the status screen. The status screen also shows the percentage of the game completed and the number of the Joker's armed bombs remaining.

Each game may be played in a few minutes, one of my favorite features in most any game. Nevertheless, I do wish the game had a pause feature for when the phone rings at a crucial moment. The game has its humorous moments. When Batman throws the Batarang at the Joker's little green men, they duck and cover their heads. So far I've completed 81 percent of the game. I've found Robin tied up high above the fairground, but I've yet to rescue him. Data East has done an excellent job with this game. If you enjoyed *Batman* comics, you'll enjoy this game.

—Russ Fisher

Batman
Data East
470 Needles Dr.
San Jose, CA 95112
$24.95

RoboCop

This bang-bang, shoot-'em-up game is based on the movie *RoboCop*, but even if you haven't seen the film, this half-human/half-robot cop named Murphy will provide you with plenty of fast-paced, arcade-style action.

RoboCop is so fast that after playing it for ten days, I had to concede that my reflexes may have slowed a bit. I needed help. So off I went to my friendly computer store where I acquired a fancy joystick with a repeating trigger, one with neat little suction cups on the bottom. Back home and armed with my new joystick, I smoothly blasted my way through levels 1 and 2 the first evening.

There are nine levels in this game. In the first level, you must get to the end of a dangerous Detroit street using your part-man/part-robot cop. On the street, you're met by plenty of thugs who want to use you as a shooting gallery. Although the action is very fast, the graphics scroll smoothly. The amount of detail is impressive, with brick storefronts, numerous alleys, open shop doors with iron grills, and neon signs. You can't miss the bad guys—they're all dressed in tank tops.

It's not necessary to obtain a certain score before proceeding to the next

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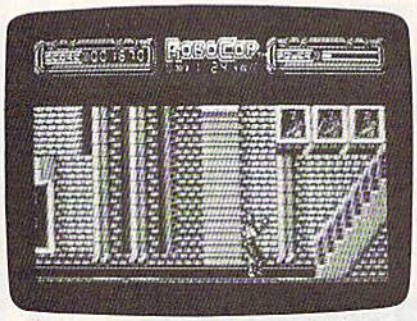
level. If you complete a level rapidly and accurately enough, expect to proceed to the next one regardless of your score. After an extra-fast and accurate performance, the crooks start diving out of windows as *RoboCop* approaches.

Level 2 is easier to master. Here, a villain has taken a woman hostage and holds her as a shield. Try not to hit her in the shootout. This level reminded me of a carnival shooting gallery, as the hoodlum slides left and right on an erratic course. Fast action on your part is still called for, however—you're racing an onscreen timer.



After dispatching that thug, my super-duper joystick took me quickly to level 3, where I found another nasty street that needed cleaning up. This one was populated with creeps on motorcycles, as well as scum encountered earlier. Once more there was nice detail in the storefront scenes and more smooth-scrolling graphics.

During each of these shootouts, the bad guys often drop useful supplies that *RoboCop* can recover and use, including armor-piercing bullets that can travel through and eliminate more than one pursuer. The assassins might also drop three-way bullets or baby food. Baby food? Yep, *RoboCop* requires baby food to replenish his power, although the graphic looks more like an old-fashioned milk bottle than food.

The first night I used my new joystick, I almost made it to level 4, but this game is tough. The next night I rushed home from work, anxious to see the next screen touted by the instructions as Precinct Headquarters. At this level, you try to match up mug shots. The game was getting even more interesting.

I loaded the game into my 128 and turned off the music, which the manual calls *ambience*, and opted for the sound effects, which it calls *atmospherics*. (I never could remember which was ambience and which was atmospherics. Why doesn't Data East call it music and sound effects?) I fought my way through familiar territory and was ready to meet new challenges.

I finally made it to level 4. A mug shot appeared on the left side of the screen. On the right side, various face parts are rapidly displayed, reminiscent of Murphy's latent memory in the movie. You must select the correct face parts to match the mug shot. When the timer expires on this level, the game proceeds to level 5. If you have successfully matched the mug shot, you will begin that level with a higher score.

The level 5 scenario is an abandoned factory (you may recall the movie shootout). This is a five-story building, so you must move up and down the stairways to find all the tough guys. Barriers have to be destroyed to reach the far end of the factory. Failure at this level does not return you to the beginning; once this level is reached, *RoboCop* always restarts from level 4.

In level 6, you attempt to make an arrest at O.C.P. Headquarters, where robots such as yourself are made. But trouble explodes and you end up facing another ED-209 robot in hand-to-hand combat.

You confront two more ED-209s in levels 7 and 8 as you battle up and down the steel works. Try to disarm the thug with the cobra gun, because that's the only weapon that can defeat the other robots.

Finally, in the boardroom, you face the villain who holds the president hostage. But remember your directive: Protect the innocent. Don't harm the president as you exchange fire with his kidnapper. It will take more than one shot to rid Detroit of this evil menace.

The game recycles to the opening screen very quickly after each game ends. *RoboCop* is a fast, action-packed game with a lot of nice features. And it can be played whenever a few minutes are available. I like this cross between a cop and a hardware store—you will, too.

—Russ Fisher

RoboCop
Data East
470 Needles Dr.
San Jose, CA 95112
$34.95

Smart Cart

Smart Cart is a battery-backed 32K RAM cartridge for the 64. Although Datel calls it "pseudo-ROM," its intended, indeed only, general use is as a ramdisk, for which the *RAM Disk* software package is needed.

Since RAM cartridges are fairly expensive, Smart Cart is a good buy at $60; though if you factor in the required $15 *RAM Disk* software, the price is somewhat less spectacular. Smart Cart does not work with the 128 in native mode.

Smart Cart sports a French-made, three-volt lithium battery that is soldered to the circuit board in four places. It is a permanent rather than replaceable variety, intended to last two years. The battery may prove difficult to locate in this country, as well as to install.

With the basic *RAM Disk* software in place, you have a complete, well-implemented 32K disk emulation. The ramdisk leaves 107 blocks of instantly accessible "disk" space available for your programs, and you can work with sequential files just as you would on an actual disk. A command channel wedge, which can be transferred to a real disk drive, facilitates communication between the computer and the ramdisk.

As a dedicated 32K ramdisk for the 64, Smart Cart is well worth its price.

The core software includes several commands: OLD, for retrieving a BASIC program after cartridge reset (there is a reset button); DEV, for changing the ramdisk device number (normally 7); and a DIR ($) directory list-to-screen command, which cannot be transferred to an actual drive.

The support disk contains only three programs. In addition to the ramdisk core program, a second program is a routine that dumps and retrieves total cartridge (or bank) contents as program files. Each of the four banks requires 33 blocks of disk storage. Advanced programmers can turn Smart Cart into a customized "pseudo-ROM" box, with up to four, 8K "cartridges" selectable at power-up. The remaining program on the *RAM Disk* package implements this option.

Documentation is rather sketchy. Instructions are designed for either the self-sufficient machine language programmer or the beginner intent on using Smart Cart as a simple disk substitute. For the moderate to advanced computer user, a wider range of technical and troubleshooting information would be helpful. For any but *RAM Disk* applications, explanation takes a sink-or-swim approach.

Several additions to the core program would increase Smart Cart's usefulness: single-stroke load, load/run and save commands that work through the directory listing, programmed (and preferably programmable) function keys to implement these and other commands, and an autoboot capability that could load or load/run one or more programs at power-up.

Smart Cart would also be enhanced if software were available to help it double as a utility cartridge (ramdisk and utility functions can easily coexist). Actually, the second half of Smart Cart's manual consists of documentation for

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precisely such a set of utilities. This yet-to-be-released utility, called Diskmate, is designed to contain disk turbos, single-stroke commands, programmed function keys, a BASIC toolkit, an ML monitor, copy and backup (both whole disk and BAM) routines. Diskmate will make a welcome and useful addition when it's available. Unfortunately, it is still being debugged in England, where Datel products originate, and a release date has not been announced.

It is important for hardware companies to offer such utilities because routines from various sources may not work with each other or with the basic cartridge software. I tried several toolkit packages, as well as a self-designed function-key program, with Smart Cart. All of the routines contained their own wedges, and none of them were compatible with Smart Cart.

It is worth noting that Diskmate and many other features are included with Datel's Action Replay 5.0, an excellent utility cartridge that sells for $65—somewhat less than the combined cost of Smart Cart and *RAM Disk*. (Earlier versions of the Action Replay cartridge were even called Diskmate.) Smart Cart and Action Replay 4.0 and 5.0 come in the same cartridge shell. Action Replay does not, however, function as a ramdisk, nor can it be user-customized as a RAM cartridge might be.

Another limitation of the *RAM Disk* software is the need for an ML monitor to move a machine language program to a ramdisk. Users who wish merely to transfer programs from disk drive to ramdisk need a simpler way to copy programs.

As a dedicated ramdisk, Smart Cart is well worth its price. Until a range of compatible utility software is available, however, it will be pretty much limited to this single application. If and when something like Diskmate becomes available, Smart Cart will be an appealing combination of utility cartridge and instant-access ramdisk.

Particularly attractive would be a modular design in which the user, through customized autoboot, could select the routines he or she wished to activate from compatible options and variants. Only the desired modules would be loaded into the cartridge, leaving all remaining space available as a ramdisk. (This would be a marked improvement over the monolithic requirements of ROM.) Such a flexible combination of features would prove nearly irresistible to a wide range of users.

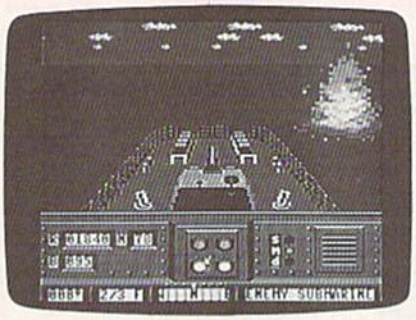
—Art Hunkins

Smart Cart
Datel Computers
3430 E. Tropicana #67
Las Vegas, NV 89121
32K RAM cartridge—$59.99
RAM Disk *software—$14.99*

Destroyer Escort

MicroPlay Software has developed a North Atlantic sea-battle game so true to life and so authentic that it may have you spilling coffee down the front of your shirt.

As the name implies, *Destroyer Escort* is a game fashioned after the triumphs and travails of World War II escort destroyers assigned to safeguard and protect supply ships on Atlantic crossings. The lifeblood of the Allied war effort in Europe, the convoys were also the main target objective of German naval and air forces. Your mission is to destroy all threats to a convoy of five cargo ships by fighting off the bold and tenacious fighter aircraft, warships, and dreaded U-boats of the Axis forces.



Destroyer Escort is particularly authentic in its portrayal of the period's technology. If you're expecting tight, fast turns from your vessel or lightning-fast battery fire from the gunnery, you're in for a suprise. Your destroyer is of a vintage which must glide through nautical miles of waves before it can complete a turn. Similarly, your firepower is somewhat limited by a mandatory wait for reloading before reuse. This may frustrate some joystick jockeys used to rapid-fire lasers and hyperspace capabilities, but the objective of this game is to emulate, as closely as possible, the wartime technology of this period in history.

The dangers a player must face as captain and protector of the convoy are also historically correct. Ever-dangerous submarines will try to slip past your defenses and wreak havoc with the convoy. Enemy battleships and waves of enemy aircraft will also test your mettle.

The opening-screen teletype machine pecks out orders from naval operations that give the destroyer captain a choice of six sea lanes and three levels of expected resistance. Ultimately, you'll be evaluated according to the number of convoy ships that reach port and by how many enemy planes, ships, and subs you left in your wake. The Navy Cross or perhaps even the Navy Medal of Honor await successful sea captains who can complete these difficult missions. Either failure to protect the convoy or the capture of your vessel by enemy forces will bring a reduction in rank to ensign.

A good captain knows his ship like the back of his hand, and to be effective against the Germans, you must do the same. From the bridge, you can direct your attention to eight separate stations (screens) of the destroyer.

The Map Station displays the operation theater for your selected mission, complete with land masses, including your location, your destination, and hot spots of enemy activity. It is from here that you begin to direct the convoy across the Atlantic until an adversary is detected and the battle-station gongs sound. Once this happens, all forward progress ends and you must move to the appropriate station to counter the threat.

The Navigation Station is normally the first station to visit during an attack. The enemy must be located, and your course and speed must be corrected accordingly. Fortunately, excellent reconnaissance gives you ample time to locate and get a fix on the attacker before things get hectic. The enemy's bearing and distance is displayed in this and all other ship-station information windows, once established. The top section of all station screens is reserved for a forward view of your ship's progress to ensure that you aren't sailing blindly around the high seas.

The four Battle Stations consist of a five-inch Gun Mount fore and aft, an Anti-Aircraft Gun Station, a Depth Charge Station, and a Torpedo Launcher on the port and starboard sides.

The Damage Report Station displays any damage the ship incurs both during and after combat and the time needed to make repairs. The Ship's Status Station documents the ship's fuel and munitions and provides a list of vanquished foes.

Positioned on the bridge and with these stations at your disposal, you must assess the tactics needed to shield the fleet from harm, defeat all attackers, and determine the wisest utilization of limited amounts of fuel and ammunition.

If you should squander resources or have extreme difficulty with a foe, resupply at sea is possible. The center ship in the convoy is designated as the supply ship. You must skillfully maneuver your craft within 100 yards of the supply ship and maintain the distance while taking on stores.

This is one war game with exceptionally fine graphics. The images are sharp, clear, and very realistic. Unlike some war games, which reduce the action to tactical blips on a grid, *Destroyer Escort* uses graphic representations of what a U.S. Navy captain might actually have seen from the bridge. The movements of the destroyer, convoy, and attacking subs, planes, and ships are so well executed that you may

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forget you're playing a computer game. Just remember to remain calm—and make sure you're wearing an old shirt if you plan on having a cup of coffee while you're playing.

—Steve Hedrick

Destroyer Escort
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Medalist International
180 Lakefront Dr.
Hunt Valley, MD 21030
$39.95

Navy Seal

I almost turned in my snorkel after a few test dives with *Navy Seal*. This action game from Cosmi didn't win me over immediately. No one said it was going to be easy, but its rigorous training and dangerous missions can overwhelm a recruit. But I got in shape, learned enough to survive a "suicide" mission, and I now appreciate the challenge *Navy Seal* has to offer.

Don't expect to see cute circus performers who balance balls on their noses and eat fish. These seals are a tough breed of combat swimmers who are as deadly on land as they are underwater. With their ability to parachute into any global hot spot at a moment's notice, seals are considered the Navy's Green Berets, and more.

> *These seals are a tough breed of combat swimmers who are as deadly on land as they are underwater.*

SEAL is an acronym for Sea, Air, and Land. "Created by an Executive Order in the sixties, the Special Warfare SEAL Program was intended to produce an elite corps of commandos out of the ranks of Navy Diver and Demolition Teams," according to the game's manual.

Just as a seal must complete 26 weeks of intensive Basic Underwater Demolition Training, *Navy Seal* provides its own basic training. This course is tough to master and consists of four sections: marksmanship, a land obstacle course, an underwater obstacle course, plus climbing and rappelling. This section and the rest of the game are joystick-controlled.

Imagine going for a two-mile swim while instructors in patrol boats propel logs at you from all directions. Try to dodge the logs and complete the swim. I earned a 90-percent rating on my first attempt, and I figured this was going to be a snap. The course got tougher immediately, and then I remembered a sign posted at the seal's training command that reads, "The Only Easy Day Was Yesterday."

On the marksmanship course, the instructions are printed in capital letters and the graphics leave a bit to be desired. This part of the game looks amateurish, yet it seems impossibly difficult. Armed with an automatic weapon, you must turn and fire at targets as they randomly appear. There simply is not enough time to rotate your figure and fire off an accurate burst before a target disappears.

My enthusiasm was dimming when I finally realized I was not expected to shoot every target that popped up. Check the scoring carefully and you'll discover how to get a good rating without blasting everything in sight.

On the ground course, you are expected to complete a 100-meter run in less than two minutes. That isn't too difficult, but there are a couple of catches. Avoid incoming artillery rounds. Hit the deck when you hear a round approaching, but don't hug the earth too long. Make sure you avoid being crushed by the half-track following close behind you. Repeat the course until you get it right.

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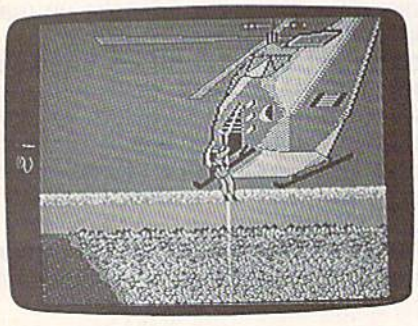
The 3-D effect is good, but again the graphics could be better. A solid wall of ice faces you in the climbing test. Using nothing but the natural cracks in its surface, your figure must climb to the top. There is only one way up, and it helps to adjust your monitor's contrast and brightness to determine the correct route.

I still have trouble with this one. The graphics are fine and the wind effects sound like something blowing off Everest's southern slope. I just haven't made it to the top yet and earned the chance to rappel down. I have discovered that if I move my climber too far to the right, I can't move him back. He can't find a way to the top, and I can't move him back to find another route. The clock keeps ticking, and there's no way to stop the game. That's another gripe I have with *Navy Seal*—there's no way to quit one segment and move to another except by rebooting.

To be fair to the spirit of the seals, however, don't give up just because things get a little tough. The training session is almost a game in itself, and there is plenty yet to come.

Bail out of a C-130 cargo plane and free-fall to an altitude of 1000 feet before popping your chute. You are one mile from shore, and you want to land near your rubber raft, which was kicked out right before you jumped. Maneuver with your joystick. Keep an eye on your altimeter and use the fire button to detach your parachute 30 feet above the water.



This begins Operation Godzilla, a mission that requires you to swim underwater to infiltrate an enemy depot, set explosive charges, then, with luck and skill, return safely to a pickup point for recovery. Expect a few dangers along the way.

The first challenge after hitting the water involves a long underwater swim. Sharks and barracudas abound, and enemy divers, mines, and patrol boats threaten your safety as well. One life is all you get. Stop an enemy spear, detonate a mine, or get mangled by a shark, and the mission is aborted.

The graphics improve in this part of *Navy Seal*, and the shimmering underwater scenery is particularly well done. You must check your compass and swim on a certain heading. You can't just swim in a straight line, however; you must check your compass heading every few minutes and make adjustments. A status line indicates your heading, relative distance to target, and number of shafts remaining for your M75S1 spear gun (you start with 30).

This segment of the game is rather long, and it's frustrating to swim for what seems like hours only to fall victim to an enemy's spear gun. Once you complete a segment, however, you don't have to start from the beginning. After a mission report, *Navy Seal* immediately recycles to a section you failed to complete. Two of *Navy Seal*'s four missions require long swims, but enduring these underwater marathons only to end up as shark bait caused my enthusiasm for the program to wane. Don't fall into this trap though; there's a way to complete the swim in almost complete safety. Play the game a few times and you probably will discover the secret, too. Violence is not always the answer.

Rappel down a rope from a hovering helicopter, place explosives, defend yourself with a silenced 9 mm automatic pistol, an M63A4 machine gun, M266U1 hand grenades, a spear gun, or a knife. Rescue a kidnapped ambassador from a jungle camp, disarm Polaris missiles in a damaged sub, infiltrate an offshore chemical-weapons manufacturing facility. Each of these missions contains insertion, infiltration, target, and exfiltration segments to challenge your skills.

Because missions vary in difficulty, be sure to read the manual first. Learn which weapons to use and how to operate in different situations. Also check out the manual's excellent reference section on seal history and training—it provides valuable background. The seals are a tough bunch, and *Navy Seal* is a tough game. You'll get your money's worth, but it won't come easy.

—Tom Netsel

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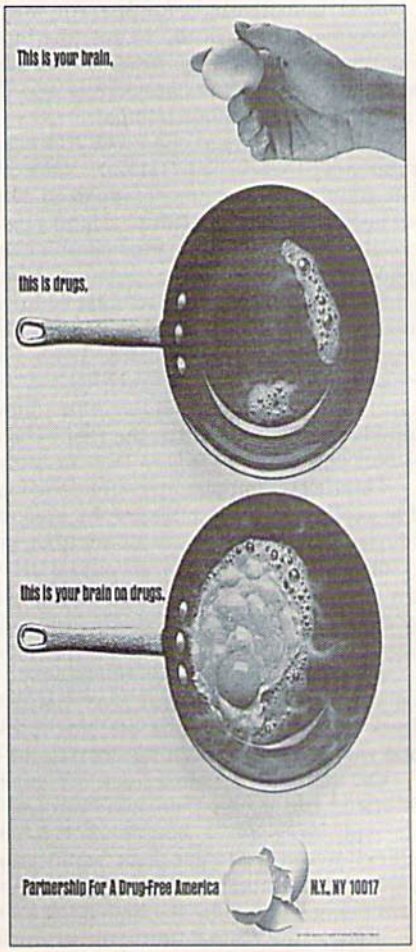

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DP

EDITOR'S CHOICE

Thomas Henry

Writing BASIC programs is a lot easier with this powerful extension to BASIC 2.0. As a bonus, we've included a variety of commands that support the disk drive. For the 64.

BASIC 2.0, the language that's built into every 64, is sorely lacking when compared to some BASICs. There's no provision for formatted output, clearing portions of the screen, or indefinite looping structures. Sound and graphics must be done with cryptic POKE statements. And support for disk drives is generally weak. To send a command to the drive, you must open a channel, issue the command, and then close the channel.

Traditionally, BASIC programmers had two methods of dealing with the inadequacies of BASIC: write machine language support routines or switch to another language. Machine language gives you complete control of the computer, but it can be difficult to program. Languages such as Pascal or C are easier to learn, but the delays for compiling can be intolerable. Wouldn't it be nice if you could add a few new commands to BASIC instead?

Enter "DP BASIC." DP BASIC (Data Processing BASIC) is a 4K extension that adds 33 new commands and functions to BASIC 2.0. These commands are easy to use; the keywords behave exactly like standard BASIC 2.0 keywords. There are no PEEKs, POKEs, SYSs, or USRs to deal with. In short, these 33 new commands look as though they have always belonged with the language.

What type of things can you do with these new commands? You can input data reliably, clear windows, flash portions of the screen, carry out just about any type of disk operation, sort multidimensional arrays, position the cursor easily, print columns of figures attractively with many different formats, and do much more. With DP BASIC installed, writing any kind of database program becomes a snap—from a bowling scorekeeper, to a teacher's grade book, to a collector's inventory log.

Getting Started

DP BASIC is written entirely in machine language. Type it in using "MLX," the machine language entry program found elsewhere in this issue. When MLX prompts you for the starting and ending addresses, respond with the values given below.

Starting address	**C000**
Ending address	**CF0F**

Enter the data for DP BASIC. Be sure to save a copy to disk before you exit MLX.

When you're ready to use DP BASIC, enter the following commands:

```
LOAD"DP BASIC",8,1
NEW
SYS 49152
```

BASIC

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Table 1: DP BASIC Commands and Functions

Commands	Description
BACK	Set background color
BEEP	Generate a beep
BORDER	Set border color
CLEAR	Clear a rectangular region
FLASH	Flash a rectangular region
LINPUT	Line input
OFF	Turn off FLASH command
PRINT @	Position cursor and print
PRINT USING	Formatted numeric print
REPEAT	Beginning of REPEAT-UNTIL loop structure
SORT	Sort two-dimensional array
TEXT	Set text color
UNTIL	End of REPEAT-UNTIL loop structure
Functions	**Description**
COMB	Combinations/binomial coefficient
DIV	Integer division
FACT	Factorial
FRAC	Fractional portion of a real number
GCD	Greatest common divisor
INKEY$	Get a keypress
MAX	Maximum of two numbers
MIN	Minimum of two numbers
MOD	Integer remainder after division
RAND	Integer random-number generator
ROUND	Round real number to specified digits
Disk Commands	**Description**
CAT	Disk catalog
COLLECT	Validate a disk
DLOAD	Load program from disk
DS$	Disk error message
DSAVE	Save program to disk
EXEC	Load and execute program from disk
HEADER	Format a disk
RENAME	Rename a file on disk
SCRATCH	Scratch a file from disk

These commands load and initialize DP BASIC. Since DP BASIC resides in memory locations $C000–$CF0F, it won't interfere with normal BASIC programs. All of DP BASIC's commands and functions are available in both direct and program mode.

DP BASIC Commands

It's convenient to separate DP BASIC's keywords into three categories: commands, functions, and disk commands (see Table 1). The following alphabetical list shows the syntax for all of DP BASIC's commands, along with a brief description of how they're used. Except where noted, all parameters are integers.

BACK *n*

This command sets the background color to color *n*, where *n* ranges from 0 to 15.

BEEP *tone,length*

This command generates a short beep. (This is handy when you don't want to get involved in SID-chip programming.) *Tone* ranges from 0 to 255 and sets the frequency of the beep (the larger the value of *tone*, the higher the frequency). *Length* ranges from 0 to 15 and specifies the duration of the beep. The beep sounds for 24 milliseconds with a *length* of 0, and 24 seconds with a *length* of 15. A *length* of 8 produces a short, pleasant beep. BEEP 0,0 shuts off all sound.

BORDER *n*

The border command changes the border color to color *n*, where *n* ranges from 0 to 15.

CLEAR *x1,y1,x2,y2*

This command clears a rectangular area of the screen. The upper left corner of the rectangle is defined by *x1,y1*; the lower right corner is defined by *x2,y2*. Both *x1* and *x2* range from 0 to 39; *y1* and *y2* range from 0 to 24.

FLASH *x1,y1,x2,y2*

The FLASH command causes a rectangular area of the screen to blink. The upper left corner of the rectangle is defined by *x1,y1*; the lower right corner is defined by *x2,y2*. Both *x1* and *x2* range from 0 to 39; *y1* and *y2* range from 0 to 24. Only one rectangle at a time may be flashed. *Note:* The flashing is independent of the cursor blink. If you move the cursor through the flashing region, it may cause areas of the rectangle to blink out of sequence. The flashing is disabled by the OFF command (see below).

LINPUT *n,"prompt-string";string-variable*

LINPUT (Line INPUT) is a crash-proof input routine. Unlike the 64's INPUT command, LINPUT accepts leading blanks, commas, colons, semicolons, and any printable character from the keyboard. However, all screen-control functions, such as CLR/HOME, cursor down, cursor up, and so on, are disabled. Only cursor right and cursor left, INST, and DEL are operational.

The parameter *n* sets the number of characters that are accepted. If you specify 10, for example, an invisible window ten characters wide is created. You may move the cursor anywhere inside this window, inserting and deleting text. If the *n* parameter is omitted, the width defaults to the last used width value (or 1, if no previous width has been specified).

Prompt-string is a string of characters to be displayed as a prompt to the user. It may be no longer than 39 characters. The string the user types in is placed in the specified *string-variable*.

OFF

Turns off a flashing region.

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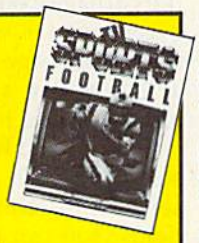

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PRINT @*column,row,data*

This command operates identically to an ordinary print statement, but first it positions the cursor at a given row and column (0–39 and 0–24, respectively). *Data* may be of any type, and all the usual rules for commas and semicolons apply. To position the cursor at a given location without printing anything, leave off the final comma and data, as in PRINT @10,15.

PRINT USING *edit-string;numeric-data*

This command prints what's in *numeric-data* according to the format specified by *edit-string*. *Edit-string* may be either data or a string variable and may consist of a plus sign, a dollar sign, number signs, a decimal point, and commas. If the plus sign is used, the sign of the number is displayed. If a dollar sign is used, the number is shown with a leading dollar sign. Each number sign reserves space for a single digit of the number. Commas may be used where desired, with an optional decimal point. Following are a few examples that illustrate this powerful command.

```
100 PRINT USING"##.#";3.141592
```

This line prints 3.1 (with one leading blank).

```
100 A$="+##.###"
110 PRINT USING A$;12.3456
```

This line prints +12.346. Note that the plus sign is printed instead of a leading space. (Had the number been negative, a negative sign would have been printed.)

```
100 B$="$#,###.##"
110 X=12.34:Y=567.8912
120 PRINT USING B$;X*Y
```

In this example, $7,008.01 is printed.

```
100 PRINT USING "###.##";12.3
```

This example prints 12.30, with a leading blank and a trailing 0. This illustrates how PRINT USING can be utilized to create neat columns of figures whose decimal points line up correctly.

REPEAT

Used with **UNTIL**. The only structured looping construct available to BASIC 2.0 programmers is the FOR-NEXT loop. Although useful, it's limited to situations where a series of statements repeats a specific number of times. DP BASIC's REPEAT-UNTIL structure, on the other hand, repeats a group of statements until a given condition becomes true. If the condition is never true, the statements execute indefinitely. Note that the test for the condition is performed at the bottom of the loop; therefore, the group of statements executes at least once.

```
100 REPEAT
110 GET A$
120 UNTIL (A$<>"")
```

In this example, line 110 is continually executed until a key is pressed.

SORT *string-array,sort-field,max-size,pointer-array,direction*

This command is used to sort a two-dimensional string array. While this command carries out a simple bubble sort algorithm, it's relatively fast because it's done in machine language. Speed is further increased by sorting an array of *pointers* rather than the data itself.

The first parameter is the two-dimensional array to be sorted, *sort-field* is the dimension number that you want to sort, *max-size* is the size of the first dimension of the array, and *pointer-array* is an array of integers. *Direction* is either 0 or 1 (0 to sort in ascending order, 1 to sort in descending order).

The array of pointers is just an integer array. Each element of the integer array holds an index into the string array. For example, let's assume you're working with A$, a 4 × 2 array of strings, and A%, an array of four integers. Before the sort, the arrays might look like this:

	A$(n,1)	A$(n,2)	A%(n)
n=1	"Chuck"	"Jones"	1
n=2	"Bob"	"Zachary"	2
n=3	"William"	"Smith"	3
n=4	"Hobart"	"Butz"	4

After sorting the array with the statement SORT A$,1,4,A%,0, A% looks like this:

	A%(n)
n=1	2
n=2	1
n=3	4
n=4	3

This means that the first element of A$ is found at A$(A%(1),1), or A$(2,1). The second element of A$ is found at A$(A%(2),1), or A$(1,1), and so forth. In general, A$(n,1) is found at A$(A%(n),1).

By sorting the array of pointers, no string data is actually moved; only the pointers move. This gives the benefit of greater speed and completely eliminates the garbage-collection problem that often occurs with string usage. (String garbage-collection typically arises when strings are moved around or are being updated.)

An added benefit of the bubble sort is that it's a *stable* sort; it preserves the relative order of equal fields. You can use this to your advantage when you need to sort data with two or more fields. Simply sort the least significant field first and the most significant field second.

TEXT *n*

Changes the text color to color *n* (0–15). This command also changes the color of all text on the screen to color *n*.

UNTIL (*Boolean condition*)

This is the matching keyword for the REPEAT command; it closes off the loop. All statements between the REPEAT and UNTIL execute until the condition is true.

DP BASIC Functions

A function is a routine that takes two or more values, performs some type of operation on the values, and then returns a result. DP BASIC includes a variety of functions that make programming easier.

COMB(*n,k*)

This function calculates a combination, sometimes called a *binomial coefficient*. Both *n* and *k* should be nonnegative, with *n* greater than or equal to *k*. In simple terms, this function computes the number of ways that you can choose *k* things from a set of *n* objects. For example, COMB(6,4), which is 15, tells us that there are 15 ways to make a committee of four from a group of six people. This function is particularly useful to programmers interested in statistics.

DIV(*n,k*)

This function calculates the integer result of *n* divided by *k*. For example, DIV(7,3) is 2. Both *n* and *k*

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may be either integers or floating-point numbers.

FACT(*n*)

This is the factorial function, which is equal to $1 \times 2 \times 3 \ldots \times n$; n must be a nonnegative value. By definition, FACT(0) is defined to be 1.

FRAC(*n*)

This function returns the fractional part of a real number n. For example, FRAC(12.34) is 0.34.

GCD(*n,k*)

This is a greatest common divisor function, useful for manipulating fractions and the like. It calculates the largest integer divisor that divides into both n and k.

INKEY$

This function requires no argument. It performs the same function as GET, but it waits for a keypress. Consider the following examples:

```
10 A$ = INKEY$
10 GET A$:IF A$="" THEN 10
```

These two code fragments perform identical tasks: They wait for a keypress and place the ASCII value of the key in A$.

MAX(*x,y*)

The MAX( ) function returns the greater of x and y. Both x and y may be either integers or real numbers.

MIN(*x,y*)

This is the reverse of MAX; it returns the lesser of x and y.

MOD(*n,k*)

This function returns the integer remainder after n is divided by k. Both n and k may be integers or real numbers.

RAND(*n*)

RAND returns a random integer between 1 and n, inclusive. For example, RAND(255) returns a random number between 1 and 255.

ROUND(*x,n*)

This is a rounding function. It rounds the real number x to n significant decimal places. For example, ROUND(61.41,1) returns 61.4.

Disk Commands

The 64 provides full support for disk drives, but does it in a rather primitive manner. For example, the command to load a directory from disk is LOAD"$",8. And, as if this weren't bad enough, loading the directory in this manner destroys the program in memory. DP BASIC adds a number of commands that take the drudgery out of working with a disk drive.

CAT

This command performs a nondestructive disk directory to the screen. Press the space bar to freeze the display; press it again to resume. Press RUN/STOP to abort the directory listing.

COLLECT

The COLLECT command performs a validate operation on the disk. Garbage collection is performed, and any poisoned files (files that were opened but not closed properly) are deleted.

DLOAD *"filename"*

This command loads a program directly from disk (you don't need to append ",8" to the command). DLOAD may be used in either immediate or program mode.

DS$

This is actually a string function that requires no argument. It reads the error channel of the disk drive and stores the error message in the reserved variable DS$. DS$ is typically used in conjunction with the PRINT statement to view the disk error channel (PRINT DS$).

DSAVE *"filename"*

This command saves the BASIC program currently in memory to the disk drive. You don't need to append ",8" to this command.

EXEC *"filename"*

This command loads and executes a BASIC program stored on disk. EXEC may be used in either immediate or program mode.

HEADER *"diskname,id"*

This command formats a disk. It's equivalent to OPEN 15,8,15,"N0 :*diskname,id*":CLOSE 15.

RENAME *"oldname"* TO *"newname"*

Use this command to rename a file on disk. It is equivalent to the commands OPEN 15,8,15,"R0:*newname=oldname*":CLOSE 15.

SCRATCH *"filename"*

The last disk command, SCRATCH, deletes a file on disk. It is equivalent to the commands OPEN 15,8,15,"S0:*filename*" :CLOSE 15.

Additional Notes

Like any extension to BASIC, you must load DP BASIC before loading a program written in DP BASIC or the program itself won't work. Indeed, if you try to list a DP BASIC program in BASIC 2.0, the program will look different and you may get a ?SYNTAX ERROR message.

See program listing on page 86. **G**

Table 2: DP BASIC Error Messages

ARRAY DIMENSION ERROR: This message occurs when you try to sort an array that is not two-dimensional.

ARRAY NOT FOUND: The array to be sorted or the associated pointer array does not exist.

BAD EDIT STRING: The edit string in a PRINT USING statement contains an illegal character.

NON-INTEGER ARGUMENT: You have attempted to use a real number where an integer was required. (For example, FACT is defined for integers only.)

PROMPT TOO LONG: The prompt string in the LINPUT command exceeded 39 characters.

TOO MANY DIGITS: This error occurs when a number in a PRINT USING statement is larger than the size of the specified edit string.

UNTIL WITHOUT REPEAT: An UNTIL command was found without a matching REPEAT. (These two commands must come in pairs, as they define the start and end of a loop.)

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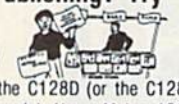

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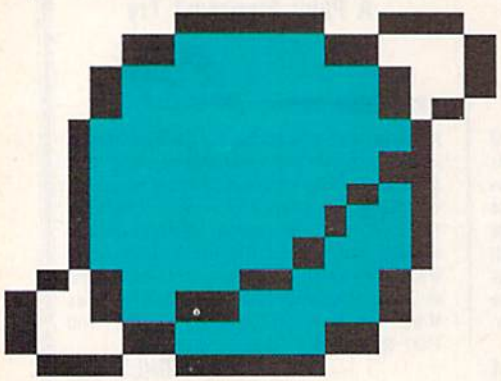

UNIVERSAL INPUT

Peter M. L. Lottrup

Control user input with this versatile machine language entry routine for the 64. Two demos are included.

INPUT is one of the most useful statements in BASIC. Unfortunately, it's also one of the most problematic. Any number of keyboard entries can cause your program to crash.

"Universal Input" is a custom entry routine that eliminates many of the problems that occur with INPUT. It accomplishes this by positioning an input window of a given size at a location you specify and accepting only certain characters. Keys that are normally used for editing, such as INST, DEL, CLR, and HOME, affect only the contents of the input window—the rest of the screen remains intact.

Getting Started

Universal Input consists of a machine language routine and two short BASIC demos. Program 1 is the input routine in machine language form. Type it in using "MLX," the machine language entry program located elsewhere in this issue. The MLX prompts, and the values you should type in, are as follows:

Starting address: C000
Ending address: C4BF

When you've finished typing, be sure to save a copy of the program to disk with the name INPUT.ML.

Programs 2 and 3 are written in BASIC. Type them in using "The Automatic Proofreader," also located elsewhere in this issue. To see Universal Input in action, load and run either program.

Program 2 illustrates three typical input situations: a standard prompt for a name in a one-line window, a one-character yes/no prompt with a default setting, and a special multiple-line test in a vertical window. Program 3 demonstrates the setup for a large input window. In this program, the dynamic keyboard is used to assign data from the window to four separate string variables. Each variable takes on the contents of five screen lines.

Using the Routine

To use Universal Input in your own programs, place the line below at the beginning of the program.

```
10 IF PEEK(49152)< >32 THEN
   LOAD"INPUT.ML",8,1
```

Then, wherever the normal INPUT statement appears, substitute a command with the following syntax:

SYS 49152,*row,column,height,width,clear flag,string variable*

The first four parameters can each be a constant, a variable, or a valid numeric expression. *Row* (0–24) and *column* (0–39) are the coordinates of the upper left corner of the input window. *Height* and *width* are the dimensions of the window. The row plus the height must be a number less than 25, while the column plus the width must be less than 40. If you exceed these limits, Universal Input returns an ILLEGAL QUANTITY error.

The fifth parameter, *clear flag*, determines whether the input window is cleared when you call the routine; 1 clears the window, and 0 leaves it intact.

The last parameter is the BASIC string variable to which the input string is assigned. Any legal variable name can be used here. To handle numeric input, simply take the VAL of the string that's entered. For example, if the data is entered as A$, convert it to the variable A with the statement A=VAL(A$).

Like the BASIC's INPUT statement, Universal Input accepts characters until the RETURN key is pressed. However, whereas BASIC has an 80-character limit, Universal Input accepts strings up to 255 characters in length. BASIC's INPUT statement allows you to type editing and cursor-control characters that affect the whole screen. With Universal Input, these characters can be entered, but they affect only the input window. Universal Input also allows you to enter leading and trailing spaces and characters whose ASCII values are in the ranges 32–127 and 160–255. It doesn't accept color codes and inverse characters. Quote mode, often a source of input problems, is disabled by the routine. *Note:* Because commas can be part of the input string, you can't enter two separate variables using a single command (for example, INPUT A$,B$).

With minor changes to the routine, you can prevent entry of two characters that are sometimes troublesome. If you don't want Universal Input to accept a SHIFT-SPACE, POKE 161 into location 49430 before you execute the command. To prevent SHIFT-CLR/HOME from being entered, POKE 0 into location 49398.

See program listings on page 85. **G**

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SPEEDSCRIPT EASY CURSOR

Larry D. Smith

SpeedScript's cursor takes on a new identity with this modification for versions 3.0 and higher. For the Commodore 64.

Have you ever had trouble moving the cursor to a particular position on your *SpeedScript* screen? Sometimes it seems that you just can't place the cursor where you want it. While it makes perfect sense to move the cursor by words, sentences, and paragraphs, most of us think in terms of up, down, left, and right. With "SpeedScript Easy Cursor," you'll never again watch helplessly as your cursor dances around the screen.

In addition to remapping the up- and down-cursor keys, SpeedScript Easy Cursor also fixes the infamous save-with-replace bug. Henceforth, when you use the save-with-replace command to save a file, *SpeedScript* will first scratch the file. No longer will you have to worry about losing valuable files or destroying your disks.

Typing It In

SpeedScript Easy Cursor is implemented as a short patch to *SpeedScript*. This patch is written in machine language, so you'll need "MLX," the machine language entry program found elsewhere in this issue, to enter it. When MLX prompts you, respond with the values given below.

Starting address: 2801
Ending address: 2948

After you've entered the data, save the program to a disk containing *SpeedScript*.

When you're ready to upgrade, enter the following lines:

```
LOAD "SPEEDSCRIPT 3.2",8
LOAD "filename",8,1
```

where *filename* is the program name you used when saving the patch. Then enter

```
SYS 10431:SAVE "SPEEDSCRIPT EC",8
```

The new program, saved as SPEEDSCRIPT EC, loads and runs just like the original *SpeedScript*, plus it includes the modifications mentioned below.

If you use "Instant 80," the 80-column preview enhancement for *SpeedScript* (December 1987), you'll find that it's compatible with SpeedScript Easy Cursor. To upgrade *SpeedScript*/Instant 80, follow the instructions above and substitute for SPEEDSCRIPT 3.2 the filename you used when you saved *SpeedScript*/Instant 80. (For example, if you saved *SpeedScript*/Instant 80 as SPEEDSCRIPT/80, you'd replace LOAD "SPEEDSCRIPT 3.2",8 with LOAD "SPEEDSCRIPT/80",8.)

Easy Editing

In *SpeedScript*, the up- and down-cursor keys move the cursor to the previous or next sentence, respectively. SpeedScript Easy Cursor remaps these keys so that they move the cursor up and down one screen line, similar to the way they operate when using the BASIC screen editor. The patch doesn't affect any other *SpeedScript* functions; the f1 and f2 keys still move the cursor by words; the f3 and f4 keys, by sentences; and the f5 and f6 keys, by paragraphs. The Erase and Delete functions also still remove text by word, sentence, or paragraph.

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Because of the manner in which *SpeedScript* wraps words at the end of lines, each text line is a different length. This makes it very difficult to move the cursor up or down exactly one line. To avoid this problem, SpeedScript Easy Cursor actually moves the cursor up or down by the average length of a screen line. This usually causes the cursor to move left or right a few spaces as it moves from line to line. Even so, when combined with the left- and right-cursor keys, it makes moving the cursor to a particular spot much easier.

Note that some lines will cause problems for SpeedScript Easy Cursor. When you press the up-cursor key, the program may skip certain short lines that end with a carriage return. In this case, the program moves the cursor to the end of the previous line. Pressing the down-cursor key while on a short line moves the cursor to the beginning of the next line.

Save-with-Replace

SpeedScript normally requires that you use a unique filename whenever you save a file. If a file with the same filename already exists on the disk, *SpeedScript* returns an error message. If you want to save a file with the same name, you have to use *SpeedScript*'s disk-command option (CNTL-↑) to scratch the old file before saving. Although safe and effective, this method is time-consuming.

Another approach is to use the save-with-replace disk command (to use save-with-replace, you append @0: to the beginning of your filenames). The problem with this strategy is the save-with-replace bug. This bug doesn't show up every time you use save-with-replace, but when it does, it generally spells disaster.

SpeedScript Easy Cursor avoids the bug by trapping the save-with-replace command. It recognizes when the save-with-replace command is issued and performs a scratch command followed by a normal save. With SpeedScript Easy Cursor installed, you can use save-with-replace with complete confidence.

See program listing on page 85. **G**

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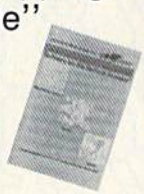

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COPY 81

John Narusis

COPY FILES FROM ONE 3½-INCH DISK TO ANOTHER WITH THIS MACHINE LANGUAGE UTILITY FOR THE 64 AND A 1581 DISK DRIVE.

There are few, if any, 1581 file copiers that work with the 64. "Copy 81" is such a program. It allows you to copy any BASIC or machine language file from the root or a partition of one disk to the root or a partition of another disk. It also lets you copy files from the root or partition of one disk to another partition on the same disk. Copy 81 even copies relative files. Its only limitation is that it reads only 255 files and 20 partitions per directory.

Typing It In

Copy 81 is written in machine language, so you'll need to type it in using "MLX," the machine language entry program, found elsewhere in this issue. The MLX prompts, and the values you should enter, are as follows:

Starting address: 0801
Ending address: 1328

Be sure to save a copy of the program to disk before leaving MLX.

Although Copy 81 is written in machine language, it loads and runs like a BASIC program. When you're ready to use it, load the program and type RUN. The first thing you'll see is the prompt *insert FROM disk, press RETURN.* When you press RETURN, Copy 81 reads the directory information from the disk in the drive.

The program reads the disk in the last disk drive accessed by the computer. For example, if you turn on your computer, load Copy 81 from drive 9 and type RUN. The program reads the directory information from the disk in drive 9. To change the default drive, simply access the new disk drive before running Copy 81. A good way to change the default drive is to initialize the drive you want to use. For instance, to initialize drive 8, you'd type

```
OPEN1,8,15,"I0:":CLOSE1
```

After Copy 81 reads the directory information, you'll see its main menu. From this menu, you can view the files on the current disk, enter a partition, or read the directory information from another disk.

Partitions

Copy 81 can copy files from or to any disk partition. If you aren't sure what a partition is and how it can be used, refer to page 77 of your *1581 Disk Drive User's Guide*. The program, PARTITION AID, on the 1581 Test/Demo disk may also help you understand partitions.

When the 1581 moves into a partition, it treats the partition as if it were a new disk. A partition has its own Block Availability Map (BAM), its own directory track, and its own unique two-character ID. As far as the disk drive is concerned, it's a totally different disk. Copy 81 also treats partitions as if they were new disks.

If the files you want to copy are in a partition, you can select the partition option by pressing P at the main menu. Copy 81 displays all

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the partitions on the disk or the message *NO PARTITIONS, press RETURN* if there aren't any. Use the cursor keys to move the cursor in front of the partition you want to enter and press RETURN. The program moves into that partition, reads the directory information within it, and then returns you to the main menu. If the new partition contains more partitions, you can continue moving deeper. If you're in a partition and decide that you want to return to the root of the disk, select read new disk option by pressing R at the main menu.

Copying Files

Selecting the files option from the main menu displays the files on the disk or in the current partition. To select the files to be copied, you must highlight them. To highlight a file, use the cursor control keys to move the cursor in front of the filename and press RETURN. You can unhighlight a file by moving the cursor in front of the filename and pressing RETURN again.

You can change the status of all the files on the screen by pressing SHIFT–RETURN. All highlighted files are unhighlighted and all unhighlighted files are highlighted. This command can be very handy if you need to copy most or all of the files on a disk.

If there are more than 20 files in the directory, only the first 20 are displayed on the screen. You can view the next 20 files by pressing N or the previous 20 by pressing P.

Once you've selected the files to copy, press C to begin copying. Copy 81 asks whether you want to begin copying. If you press Y, the program begins reading files from the source disk. If you press N, it returns you to the main menu.

After the program reads the source files into memory, it prompts you to place the destination disk into the drive and press RETURN. Next, it displays the prompt *select TO partition, or c for current.* If you wish to copy the files to a partition, use the cursor control keys to move the cursor to the name of the partition and press RETURN. Press C to copy the file to the root directory of the disk. If there aren't any partitions within the current partition or the root directory of the disk, the program displays the prompt *NO PARTITION, press RETURN.*

If you select a partition which contains another, the program displays the select-partition message again. Copy 81 continues to display the select-partition prompt as long as there are partitions nested within the current partition. Press C to copy the files to the current partition or use the cursor control keys to select another partition.

Once you've selected the destination for the files, the program begins writing the files to the disk. If you've selected more files to copy than can be held in memory, Copy 81 requests the source disk again. It continues to prompt you for the source and destination disks until all the files are copied.

To abort the copy procedure at any time, press RUN/STOP. Pressing RUN/STOP before the program has read a file returns you to the main menu. Pressing RUN/STOP after Copy 81 has read a file into memory causes it to display the prompt *Quit? (Y/N).* If you press Y, the program exits to BASIC. If you press N, it continues copying files.

See program listing on page 78. **G**

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feedback

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DATA Statements

When I try to read in text (words) rather than numbers from DATA statements on my 64, I sometimes get an error. Can you tell me why?

Onsby Rose
Abingdon, VA

You didn't specify which error you were getting, so we'll try to cover them all. Data that's read in from DATA statements must agree in type and in number with the variables used in the READ statement. Otherwise, you'll get a SYNTAX ERROR error (on the 128, you get a TYPE MISMATCH error). For example, when you read in string data, it must be assigned to a string variable. The same is true of numeric data.

A second type of error—the OUT OF DATA error—can occur when the program has read in all the data and then encounters an extra READ statement. One way to avoid this is to include a count value at the beginning of your DATA statements that tells the program how many items to read. The lines below illustrates this.

```
10 READ N:DIM A$(N):FOR I=1
   TO N:READ A$(I):NEXT
100 DATA 3,FORK,KNIFE,SPOON
```

Another type of problem can occur when the DATA statements contain string data that include commas, colons, leading spaces, and other special characters. To prevent BASIC from misinterpreting the data, place quotation marks around each item.

Keyboard Solutions

My Commodore 64 is now six years old. I've noticed that the keyboard sensitivity has diminished on the space bar and certain other selected keys. It now requires more than a light touch for a key to register. Can I fix the problem with each key or should I replace the entire keyboard assembly?

Gene Carrell
San Jose, CA

We couldn't answer this any better than Ron Houtrouw of Richland, Washington, did in "Cleaning Your Commodore 64 Keyboard (Old Style)," from the TC-Cubed newsletter. Here are some of the points he makes.

First, the standard disclaimer. Any attempted repairs may void your warranty. There are no guarantees, expressed or implied.

You'll need a #1 and a #2 Phillips screwdriver (a big one and a little one), a high-pressure air supply (or vacuum cleaner), a butter knife, a felt-tip pen, a pencil eraser, some cotton swabs, and some rubbing alcohol. A soldering iron is optional. The keyboard contacts are easier to reach if you desolder two connections, but you can still get at them without doing so. A clean table with a dark-colored cloth covering is a good surface to work on. That way, any screws or components you drop will show up.

Next, a warning. DO NOT use any solvents on your computer. Some of them may melt the plastic. Use cotton swabs dipped in rubbing alcohol for most of the cleaning, but not on the keys themselves because this will erase the painted symbols.

Be sure all cables are disconnected. Start by turning the machine upside down and removing the three Phillips screws in the front that hold the housings together. Turn the computer back over, keyboard facing you, and insert a butter knife where the housings meet. Pry gently and the housings will separate in front. Lift up the front section. Notice that you cannot pry the back side of the casing because it is hinged. On the right is a three-pin connector for the power-supply LED. Mark the side nearest you with a felt-tip pen to aid you in reassembly and detach the connector. On the left is a 19-pin connector that only fits one way; unplug it.

Continue to lift the assembly until it parts in the rear and separates. Remove the eight Phillips screws holding the keyboard to the housing, and then remove the keyboard. If you have a soldering iron, desolder the two electronic leads protruding through the fiberglass on the back of the keyboard. Remove the 23 very small Phillips screws and lift the circuit board. If there is clear tape over the screws, remove it. If you desolder the connections, you can turn the keyboard over to clean the contacts and components. Otherwise, you'll have to reach under it very carefully to clean them.

On the printed circuit board, clean the contact area with alcohol and cotton swabs. Be very gentle if you haven't desoldered the connection. Use a pencil eraser to rub each contact briskly followed by another alcohol swab. Some home-maintenance people feel that the use of pencil erasers could wear the contacts needlessly, so use your own judgment.

While everything is disassembled, use the clean, high-pressure air supply to give the whole works a good dusting. If this is not available, you may use a vacuum cleaner with a nozzle attachment as an alternative (be careful not to take in any screws!). Because high-pressure air can cause injury, use safety glasses or a face shield when working with it.

Reassemble the components, and, if necessary, resolder the two wire connections. Be very careful when replacing the screws. They can easily strip the plastic threads with too much pressure. **G**

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horizons

The Computer's New Clothes

Rhett Anderson

To a programmer like myself, the beauty of a computer is 100-percent internal. When a new computer comes out, I rarely notice what it looks like on the outside (the exception is Steve Jobs' beautiful NeXT). It's the specs I'm looking for. Is it a sixer or an eighter? (That's techie for a computer with a Motorola or an Intel processor, respectively.) What is the video resolution? How is sound handled? How fast is it?

I rarely even notice if a computer has a numeric keypad or not, although I do check to see the layout of cursor keys (abysmal, in the case of the 64) and whether a computer has a mouse (I feel lost without one).

On occasion, I'm forced to notice the outside of a computer—usually when I'm plugging in a peripheral. At these times I must think of the computer as a machine, not as an extension of my mind.

For example, the other day I noticed that most Commodore 64s are a terrible brownish color, something I hadn't noticed since the machine first started shipping. Later models are a pleasing, if conformist, beige.

What am I getting to? A contest. (You did see this coming, of course.)

The Psychedelic 64

Get out your paint guns, glue guns, brushes, stencils, spangles—every little piece of junk that you can find. It's time to make the 64s of the world into new and different beasts.

If you want to get classy, maybe you'll find some matte black paint and make the NeXT-iest 64 in town. Or perhaps you'll take a trip back to the sixties with some Day-Glo paisleies. Or rhinestones for that cheap-Western look. Or leather straps for that expensive-Western look.

When you've finished your new and improved 64, send me a photo of your machine (color slide or print, 35 mm looks best) and your name and address. Tell me how you did the dirty work. My three favorite designs will be featured in a future column. The winners will receive their choice of any three of *Gazette*'s special disk products. Be sure to get your entry in by January 31, 1990.

Be careful when you do the bodywork on your computer. Don't drip paint down into the case. You might want to disassemble your computer before you start. Neither *Gazette* nor I can take any responsibility for any damage you might do in this project. If you want to play it safe, buy a broken 64 and paint it, or paint a disused VIC.

A Different World

There's no fighting it. The 64 no longer drives the entertainment market. The IBM PC and its compatibles do. How can this be? It's a tricky business that has to do with the design philosophies behind the 64 and the PC.

When the 64 and the PC were young, the 64 was the ideal choice for games. On the graphics side, the 64 featured a graphics mode with 16 colors and eight movable objects called *sprites*. The PC was limited to two colors (monochrome) or four colors (CGA). Sprites on the PC? Nope. None.

The sound of the PC was simply awful, limited to beeps, hisses, and raspberries. The 64 was the musical virtuoso of its time with three voices and changeable waveforms and envelopes.

For game input, nothing beats a joystick. The 64 lets you plug in two. The PC? None.

How could the 64 not have won? Well, it won the battle, but lost the war.

The critical difference between the machines is that the 64 has a closed architecture and the PC has an open one. The PC is designed as a lowest-common-denominator machine that doesn't really even begin to blossom until various options are added. The 64, on the other hand, does most of its tricks with its standard equipment.

You can now add an EGA or a VGA video-display card to the PC. No comparable cards are available for the 64. You can add inexpensive sound boards to the PC. Not so with the 64. And as for the PC's most serious gaming limitation, you can now add joysticks.

It's an expensive process, but an expanded, enhanced PC does turn out to be a better game machine than the 64. It's painful to say that, but it's true.

Of course the software producers don't go ga-ga just because the topnotch PC looks and sounds better than the 64. After all, the Amiga outperforms the PC for any game. It's the number of installed units that dictates the enthusiasm of the game companies.

The Big Bummer

Years ago, the prevailing thought was that despite the PC's incredible sales, the machine was doomed because it was old technology. At the time, most people believed that a machine's standard equipment dictated how good its software could be. You could sell games for CGA, but not for EGA. You could sell games for keyboards, but not for joysticks. The PC's phenomenal success has changed all that. If you can sell a hot product to even 1 percent of PC owners, you'll be a millionaire many times over.

Personally, I prefer the approach Commodore took with the 64. When technology gets old, I just want to junk my computer and get the latest machine with the best standard equipment. But America doesn't seem to agree. **G**

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THE geos column

Turbo Format

Kent Farris

Format disks in 9.5 seconds with this disk drive utility for GEOS and GEOS 128, versions 1.3 and higher. Requires a 1541 disk drive.

Formatting disks with the 1541 disk drive is time-consuming. A normal format takes about one minute and 20 seconds. And while GEOS 2.0 greatly speeds up and simplifies many programming tasks, formatting disks isn't one of them.

With "Turbo Format," you can stop waiting on the disk drive and can get back to computing. It completely formats a single-sided disk in only 9.5 seconds. If you don't mind wasting a few more seconds, you can also have it verify the format as it goes.

Typing It In

Program 1, Turbo Format, is written entirely in machine language. To enter it, you'll need to use "MLX," the machine language entry program, found elsewhere in this issue. The MLX prompts, and the values you should type in, are as follows:

Starting address: C000
Ending address: C757

When you've entered all the data for Turbo Format, save two copies to a GEOS work disk, one with the filename TURBO FORMAT and one with the name TURBO.BKUP. One copy will be converted by Program 2 into a GEOS application. The other is a backup copy, in case you have a problem during the conversion.

Now type in Program 2, "Turbo Convert." Be sure to use "The Automatic Proofreader," also found in this issue, to prevent typing mistakes when you enter the program. Save a copy to the work disk containing Program 1. Be very careful when typing in Turbo Convert. Since it writes directly to your disk, it's possible that a typing error could scramble the disk. Until you're sure that Turbo Convert works correctly, use it only on scratch disks.

To prepare Turbo Format, load Program 2 and type RUN. Turbo Convert searches the disk for the file TURBO FORMAT and, when it finds it, converts it into a GEOS application. If something goes wrong during the conversion, check your typing in Program 2 and then try again using TURBO.BKUP.

Formatting

When you first run Turbo Format, it displays a dialog box containing three gadgets: NO, Format, no verify; YES, Format and verify; and Cancel, Exit format. Selecting the YES or NO gadgets causes a requester box to appear. Enter the name and unique two-digit ID for the disk to be formatted. Be sure that the disk to be formatted is in drive A before you press RETURN.

If you select the NO gadget, Turbo Format will format your disk in about 9.5 seconds. If you select the YES gadget, it takes approximately 17 seconds. Format-and-verify takes longer, but the drive attempts to read each sector after it's written and thus verifies that the format was successful. Selecting the Cancel gadget returns you to the deskTop.

Turbo Format checks for two types of errors. Since it works only with the 1541, the program checks the disk drive. If it isn't a 1541, it displays an error message to that effect. It also checks for errors during the format-and-verify operation. If the disk is write-protected or there is a verify error during the format, Turbo Format displays the standard DOS error message. To recover from any error, simply click on the OK gadget. Turbo Format returns you to the main dialog box.

See program listings on page 83. **G**

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d'iversions

The Death of Nintendo

Fred D'Ignazio

The title of this month's column comes from one of the letters I received this month as part of the ongoing 64/Nintendo debate. Much of the letter is reprinted below.

People's interest in this debate is still running high. I used to get mostly junk mail and bills in my mailbox. Now most of the letters are from inflamed readers who are jumping into the great debate.

This month I'm featuring letters with novelty value—for example, a letter from a girl (finally!), a letter from Africa, the Death of Nintendo letter, and so on.

When I rip open the envelopes of many of my readers' letters, a little scrap of paper drops out. Readers have seen that I use only a small quote from each person, so they have reduced their letter to a title, a brief comment, and their name and address. Ingenious!

How Many Games?

Nintendo has some games, but look at all the games the Commodore has. I think that Commodore should put its new games on television. So many kids watch television, and if they heard how many games the Commodore has, they would want to get a Commodore more than a Nintendo.

—Josh Kocher, Cherry Valley, CA

Commodores vs. Oranges

I am 12 years old and own a Commodore 64. I am thoroughly pleased with it. If people feel they want an arcade machine, they should get a Sega or Nintendo. The 64 is a computer and it's not comparable to a Nintendo.

—Jody Renouf, Livermore, CA

Mapping the Nintendo

I eagerly await the debut of *COMPUTE!'s Nintendo Magazine*. And I'm holding out for *COMPUTE!'s Mapping the Nintendo* book.

—Robert Knop, Berkeley, CA

Don't Trash the Best!

Here's an idea I think would make the 64 and 128 more popular. You should try asking Sierra to make some videogames for the Commodore, such as the King's Quest series. Though Sierra probably favors IBM, I'm sure that including Commodore versions would increase their financial prosperity. The 64 and 128 computers are some of the best, so let's try not to trash them.

—Jason Camp and Daniel Rogers, Nairobi, Kenya, East Africa

Who Is Queen of the Sprites?

The Nintendo can't do spreadsheets, checkbook balancing, and so on. But can the 64 hold more than four colors in an 8 × 4 pixel area? Can it effectively produce hires graphics with more than two colors in each 8 × 8 pixel area? Can it easily and readily control more than seven sprites at once?

—Greg Sullivan, Hudson, NY

Video Gunslinger for Hire

With a Commodore or *any* kind of computer, if you become good at it, you can make a living. What can you do with a Nintendo—become a professional game player?

—Michael Whitlock, address withheld by request

Shootout or Wipeout

Commodore vs. Nintendo reminds me of the old cowboy movies. The good guys wore white hats and always won the shootout. Commodore is wearing a faded white hat and may lose the next shootout. . . . Here in California it would be like surfing. Nintendo is hot-dogging the curl and some day soon will wipe out.

—Ivan Musovich, Riverside, CA

The Death of Nintendo

In response to your August column, I am prepared to make a dangerous statement: Nintendo is dying. My prediction is that the NES will stop selling in about four years. Here's the evidence upon which such a prediction is based:

1. The Atari Syndrome. The Atari VCS, in its heyday, was an excellent system, but scores of companies sprouted up overnight to get a slice of Atari's profits. Nintendo systems are now in just about every household that wants them, and several companies have won lawsuits giving them the right to produce games without Nintendo's approval. Nintendo has all its eggs in the basket of the NES, and the basket is starting to come apart.

2. *Pac-Man*-itis. We all remember the cute little yellow guy that ate all day and didn't gain an ounce. Almost everything in the early 1980s was Pac-Man—songs, T-shirts, stickers, TV shows, news articles, books. People had had it up to here with *Pac-Man*. Nintendo has just gone into the cereal business (Zelda-berries? Good grief!), and the idea of Mario and Luigi on Saturday isn't that farfetched.

3. *Hier in da raus* (German for "in one ear and out the other"). Michael Jackson, breakdancing, rap, and surfing all had their heydays, and only the best (or just plain stubborn) held on. Sound familiar? I may be only 15, but I can write through reams—no, bales—of paper regarding the demise of the NES. In closing, I'd like to thank you for the best articles you've written (with the exception of "Is There Life After Nintendo?" of course). Congratulations to Dennis Joslin and Bill Ward, Jr., for their stands. But I will *not* put my feelings about one Ann Tancredi in writing. Keep up the good work, Mr. D'Ignazio.

—Trevor White, Bel Air, MD **G**

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BASIC for beginners

Keys to BASIC Programming

Larry Cotton

This month we'll do the first part of a very interesting (and fun), two-part project for the Commodore 64. In the process, we'll tie together several bits of BASIC that we've discussed over the last several months.

It's always interesting to try to figure out what a program does before you run it, just by looking at its listing. With that in mind, let's construct a program. I won't tell you what it does until later in the column. As you type in the program, apply what you've learned and see if you can determine what it's going to do before you run it. Let's begin.

```
10 PRINT CHR$(147):POKE
   53280,3:POKE 53281,3:POKE
   214,5:PRINT
```

This line clears the screen, colors it and the border cyan, and then moves the cursor down five lines (more on POKEing location 214 later). Now, we'll fill a six-element array A$( ):

```
20 FOR T=1 TO 6:READ
   A$(T):NEXT
30 DATA 167,18,32,144,5,125
```

The DATA statement contains CHR$ codes (see the March 1989 column), which cause the computer to do several things:

```
167   prints a vertical line
 18   turns on reverse
 32   prints a space (often reversed)
144   prints black characters
  5   prints white characters
125   prints another vertical line
```

You can see what each code does by entering PRINT CHR$(X), where X is one of the six numbers above (except 18 and 32, where the effect is not obvious). Try some. The program we're entering uses all six of these CHR$ codes in fairly long sequences to create a picture on the screen.

Forming Long Strings

Next, we'll define three strings which will be used repeatedly:

```
40 C$="3435":D$="6363":E$="36"
```

Don't worry about these for now; we'll look at them a little more in a moment. We've moved the cursor down five lines; now, we'll move it five spaces to the right:

```
50 PRINT TAB(5);
```

The short strings above can be added together (concatenated) to form long ones. We also include some literal strings. Again, don't worry about what we're doing; just type away.

```
60 B$="512"+C$+C$+E$+C$
   +C$+C$+E$+C$+C$+E$
   +C$+C$+C$+"3"
```

Now, run the program. Type PRINT B$ and press RETURN. If you haven't made a typing error, you should see

```
5123435343536343534353435343536343
  53435363435343534353
```

So far, so good. Now enter the next line:

```
70 FOR Z=1 TO 2:GOSUB
   1000:PRINT:PRINT TAB(5);
   :NEXT:PRINT TAB(5);
```

Then enter the subroutine called in line 70.

```
1000 FOR T=1 TO LEN(B$)
1010 M$=MID$(B$,T,1)
1020 U=VAL(M$)
1030 V=VAL(A$(U))
1040 PRINTCHR$(V);
1050 NEXT
1060 RETURN
```

This is probably the most difficult subroutine we've ever written, so I'll take the time to explain it thoroughly. However, it doesn't use any technique we haven't encountered over the last several months.

Remember, we want to print a lot of characters in sequence to draw a picture. We can print any one character like this:

```
PRINT CHR$(167)
```

Or we can define it once:

```
A$(1)=CHR$(167)
```

and print it any number of times like this:

```
PRINT A$(1)
```

Thus, if we want to print a lot of control codes and other characters, we can avoid having to decipher the obscure symbols by using CHR$ codes. Then, all we have to do is refer to the appropriate subscript in the A$ array (the number in the parentheses) to do our printing.

String Scanning

The variable B$ contains 50 characters (they're not numbers yet): ten C$'s (4 characters each), three E$'s (2 characters each), "512," and "3."

What we want to do is scan B$, one character at a time, convert the characters to real numbers, and then print the CHR$ code that corresponds to each particular array subscript number. This will create our picture. Refer to lines 1000–1060, and let's analyze them individually.

In line 1000, we use LEN (covered in the December 1987 column) to determine the length of B$ (50); the T-variable FOR-NEXT loop will execute 50 times. Line 1010 contains the first operation inside the FOR-NEXT loop, MID$ (see the November 1987 column), which scans B$ one character at a time from left to right as T increases from 1 to 50. The first time through the loop, T is 1 and M$ is "5."

At this point, M$ is a literal string—not a number. Line 1020 uses VAL (see the December 1987 column) to change it to a number. The variable U represents that number, which ranges from 1 to 6; it becomes the subscript to the six-element A$ array.

We use VAL again in line 1030

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to extract the desired CHR$ code from A$(U). Line 1040 prints it. The semicolon after PRINT CHR$(V) ensures that the characters are printed sequentially on the screen.

The T-variable FOR-NEXT loop ends at line 1050; control returns to line 1000 until T is 50. Line 1060 RETURNs the subroutine to line 70.

Count Those Parentheses

Here's another approach which may clarify things further. Enter the following line and press RETURN.

```
A$(1)="167"
```

Then enter

```
PRINT A$(1)
```

You should see 167. Now enter

```
PRINT CHR$(A$(1))
```

Notice that there is always the same number of opening parentheses as closing ones. This time you'll get a TYPE MISMATCH ERROR because A$(1) isn't really a number; it's a literal string. For all the computer knows, A$(1) could be "Q" or "UMBRELLA." We must first convert A$(1) to a real number:

```
PRINT VAL(A$(1))
```

Now you'll get the number 167. Enter

```
PRINT CHR$(VAL(A$(1)))
```

Finally, we get the desired result—a vertical line. Lines 1000–1060 could be crunched to

```
1000 FOR T=1 TO LEN(B$):PRINT
     CHR$(VAL(A$(VAL(MID$
     (B$,T,1))))):NEXT:RETURN
```

Look again at B$:

```
5123435343536343534353463534353
  435363435343534353
```

As B$ is scanned character by character in subroutine 1000–1060, each corresponding CHR$ code is printed to the screen on the same line (the semicolon in line 1040 ensures this), thus creating a picture. The following chart shows what the first five characters do.

A$ Index #	CHR$ Code	What It Does
5	5	prints white
1	167	prints vertical line
2	18	reverse printing
3	32	prints space
4	144	prints black

And so forth. You still may not recognize the picture we're drawing until two more program lines are added.

```
80 B$="12"+E$+"3"+D$+D$+
   D$+D$+D$+D$+D$
90 FOR Z=1 TO 2:GOSUB 1000
   :PRINT:PRINT TAB(5);:NEXT
```

These lines are similar to 60 and 70; they form another B$ by concatenating one E$, six D$'s, and other characters. (D$ and E$ were defined in line 40.)

Lines 70 and 90 contain a Z-variable FOR-NEXT loop that ensures each sequence is printed twice. These lines also position the cursor so that the second set of characters falls directly under the first.

It's a Keyboard!

If you run the program at this point, you should be able to tell what we're creating—a piano keyboard! The next several lines print a squiggly line that will connect the two parts of the keyboard.

```
100 POKE 214,8:PRINT:PRINT
    TAB(34)CHR$(192)CHR$
    (201):PRINT TAB(35)CHR$(194)
110 PRINT TAB(6)CHR$(213);:FOR
    T=1 TO 28:PRINT CHR$(192);
    :NEXT:PRINT CHR$(203)
120 FOR Z=1 TO 5:PRINT TAB(6)
    CHR$(194):NEXT
130 PRINT TAB(6)CHR$(202)CHR$
    (192) CHR$(145)CHR$(145)
    CHR$(145)TAB(8);
```

POKE 214,*x* followed by PRINT moves the cursor down from the top of the screen *x* lines (also see line 10). The TABs move the cursor to the right. The CHR$ codes print the symbols which form the squiggly line. We draw the bottom half of the keyboard with the next four lines, which are similar to lines 60–90.

```
140 B$="12"+E$+C$+C$+E$+C$
    +C$+C$+E$+C$+C$+"3"
150 FOR Z=1 TO 2:GOSUB
    1000:PRINT:PRINT TAB(8);
    :NEXT
160 B$="123"+D$+D$+D$+D$
    +D$
170 FOR Z=1 TO 2:GOSUB 1000
    :PRINT:PRINT TAB(8);:NEXT
```

Superimposed Symbols

This completes the keyboard itself. We now add letters and symbols that show which computer keys correspond to the piano keys.

```
180 POKE 214,5:PRINT:PRINT
    TAB(31)CHR$(18)CHR$(144)
    "C":PRINT CHR$(18);
190 J=10:GOSUB 2000
200 DATA 7,2,9,3,13,5,15,6,17,7,21,9,
    23,0,27,−,29,£,31,H
```

And, a subroutine:

```
2000 FOR Z=1 TO J:READ M,N$
     :PRINT TAB(M)N$;:NEXT
     :RETURN
```

Line 180 strategically positions the cursor, prints a cyan C in a black background, moves the cursor down a line, and turns on reversed characters. Lines 190, 200, and 2000 print reversed letters and symbols (cyan letters, white background) superimposed on the piano keys. The variable J in line 190 tells line 2000 how many pairs of data to read.

READing Numeric and String DATA

Note that we're reading both numeric (M) and string (N$) variables. The variable M is used as a TAB value to position the cursor; N$ is the actual number, letter, or symbol that is printed on the keyboard.

The next three sets of three lines use the same principles as those in lines 180–200.

```
210 POKE 214,14:PRINT:PRINT
    CHR$(18);
220 J=7:GOSUB 2000
230 DATA 12,D,14,F,18,H,20,J,22, K,
    26,":",28,";"
240 POKE 214,8:PRINT:PRINT
    CHR$(18)CHR$(5);
250 J=14:GOSUB 2000
260 DATA 6,Q,8,W,10,E,12,R,14,T,16,
    Y,18,U,20,I,22,O,24,P,26,@,28,*,
    30,↑,32,Z
270 POKE 214,16:PRINT:PRINT
    CHR$(18);
280 J=11:GOSUB 2000
290 DATA 9,Z,11,X,13,C,15,V,17,B,
    19,N,21,M,23,"<",25,.,27,/,29,=
```

Be careful when typing the DATA statements; make sure there's a comma between each item. The quotation marks around the colon, semicolon, and comma avoid encountering syntax errors, since they are normally used as BASIC punctuation. If you want to run the program as is, add this line:

```
300 END
```

Next month: Playing it! **G**

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THE programmer's page

Blast from the Past

Randy Thompson

"The Programmer's Page" is interested in your programming tips and tricks. Send all submissions to The Programmer's Page, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We'll pay $25–$50 for each tip we publish.*

In a recent fit of nostalgia, I pored over a stack of old *Gazette*s in search of hints and tips from years gone by. *Gazette* has 75 issues behind it—a phenomenal amount for a magazine that focuses exclusively on one brand of computer—and there have been quite a few programming gems published in these back issues. Here's just a sampling of what I found.

IF-THEN Logic

Have you ever wondered how your computer evaluates an IF-THEN statement? For example,

```
100 IF A=7 THEN B=C+5
```

It may seem a simple task, figuring out if A equals 7, but BASIC has to be ready for almost anything. An IF expression may contain floating-point, integer, or string variables. It can contain logical operators (NOT, AND, OR). There might be parentheses to signal the order of evaluation. And any extra spaces have to be ignored, unless they are inside quotation marks.

Once the expression has been evaluated, a number is returned to the IF-THEN part of BASIC. If the expression is false, the number returned is 0. If it's true, the result is −1. When a false expression is found, your computer drops into REM mode, ignoring anything after the THEN, and looks for the next line of real BASIC.

To see how this logic works, enter the following line:

```
Q=9:PRINT "Q=9":PRINT Q=9
```

Your computer should respond by printing the string (Q=9), followed by −1 (which means the expression is true, because you assigned the value of 9 to the variable Q). If you enter PRINT Q=15, you should see 0, because the expression is false.

The three equal signs in the example above do three completely different things. The first one is an assignment equal. It assigns the value of 9 to the variable Q. After the PRINT, the equal sign is inside quotation marks and is simply a character equal. The final time it is a comparison equal, used to compare the numbers or variables on either side.

The difference between assignment and comparison is illustrated in this unusual-looking line:

```
R=5:S=R=5:PRINT S
```

First, we assign 5 to variable R. Next, the computer wants to assign a value to S. It decides that R=5 is an expression and does an evaluation (using a comparison equal). The expression is true, which gives a value of −1. That value is assigned to S, and −1 is printed on the screen.

It's not hard to understand that 0 means false. But why −1 for true? Why not 10, or ½, or 16 million?

Actually, you can use any nonzero value to signal a true expression. It is fairly common to use a statement like this in a program:

```
IF A<>0 THEN PRINT
  "MESSAGE"
```

Knowing that 0 always turns out to be false, and nonzero numbers are evaluated as true, you can make a modification to the above line.

```
10 IF A THEN PRINT "MESSAGE"
```

Leaving off the <>0 saves some memory and can be a valuable programming technique. You just have to remember that 0 means false and anything else counts as true.

In the example above, the variable A is evaluated for truth or falsity as if it were an expression. To turn it the other way around, you can use an expression as if it were a variable. If false, the expression is equivalent to 0. If true, it's equivalent to −1.

Let's say your bank charges a fee of 15 cents per check when your balance falls below $400. Otherwise, checks are free. In your checkbook-balancing program, you might have these two lines:

```
130 BAL=BAL−CHK
140 IF BAL<400 THEN BAL=BAL
    −.15
```

You input the check's amount, and the program subtracts it from the balance, determines whether the new balance is below $400, and subtracts the fee if necessary. Now look at this variation:

```
130 BAL=BAL−CHK+((BAL−
    CHK) <400)*.15
```

First the check is subtracted from the old balance. Next, the expression (BAL−CHK)<400 is evaluated. If the new balance is $400 or more, the expression is false, giving you a 0. Zero times 15 cents is 0, and the new balance remains as is. But if the balance is below $400, the expression is true and 15 cents is subtracted (or more accurately, −.15 is added).

We still haven't seen why a true statement is worth −1. For one thing, it makes certain situations work out nicely. Like subtracting 15 cents when your balance goes below $400. Specifically, however, in twos-complement arithmetic, −1 is the logical opposite of 0. At the bit level, you flip the bits and add 1. In BASIC, this is the equivalent of adding 1 and changing the sign. Ask your computer to PRINT NOT 8. You should see −9 on the screen.

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An interesting corollary to this is that, if you are using a logical AND as a mask, 0 masks everything and −1 masks nothing. In other words, for any number X, X AND 0 always results in 0, while X AND −1 always returns X. It's similar to multiplication, where 0 times any number yields 0, and 1 times any number gives back the number.

Knowing how to use variables as expressions (IF A THEN *action*) and how to use expressions as variables (A=(B<15)*2) offers a lot of flexibility in BASIC programming.

Flags, for example, can be useful in almost any type of program. When you first type RUN, all variables are set to 0. So, if you have a variable called FLAG, you know it starts out being false. The flag is down. By assigning a nonzero value to FLAG, it is set, and you can test it with a simple IF FLAG THEN *action*, rather than the bulkier IF FLAG< >0 THEN *action*.

John Michael Lane
"Hints & Tips," September 1984

Scrolling on the 64

When you're writing a program on the 64, you can enter up to 80 characters per line. These program lines are called *logical lines*. Logical lines can take up one or more screen lines when you list a program.

There's a table in memory that keeps track of which screen lines are connected. This line-wrap table starts at location 217 (217 corresponds to the top line, 218 is the second, and so on). If the high bit of one of these locations is on (creating a value of 128 or greater), the screen line is the beginning of a logical line. If the bit is off, the line is continued from the previous line.

Remember that screen lines are always single lines, but that logical lines might contain one or more screen lines.

You can call the computer's built-in scrolling routine with **SYS 59626**. This SYS will scroll one or two screen lines, depending on the size of the logical line at the top of the screen. If it's made up of two logical lines, that's how many lines the screen will scroll. If you want to limit the scroll to a single screen line, type **POKE (218),PEEK(218) OR 128** before the SYS.

There is a quirk associated with the scroll routine. Clear the screen and enter this line: **PRINT"BEFORE":SYS 59626: PRINT "AFTER"**. After you press RETURN, the word BEFORE is printed where the cursor would normally be, but AFTER shows up at the bottom of the screen. And the READY prompt is in the middle of the screen. To avoid this situation, save the position of the cursor before scrolling.

The normal movement of the screen is up, but it's possible to make the screen move in the other direction.

```
10 PRINT "{CLR}";
20 PRINT "{HOME}{2 DOWN}";TAB(
   RND(1)*40);"Q"
30 POKE 218,PEEK(218) OR 128
40 PRINT "{HOME}{DOWN}{LEFT}";
   CHR$(148)
50 IF RND(1)>0.2 THEN 30
60 GOTO 20
```

Line 10 clears the screen. Line 20 moves the cursor to the home position and then down two lines. A solid circle character is then printed in a random position.

Lines 30 and 40 make the screen scroll down. First, the second screen line is marked as the beginning of a logical line (218 is the memory location for the second screen line). Then we print {HOME}, {DOWN}, and {LEFT}, which puts the cursor at the end of the first screen line. CHR$(148) is the insert character. By inserting at the end of the first logical (and screen) line, the computer has to make space for the second line. It moves everything on the screen down a notch. The program then loops back to the beginning.

Jay Bromley
"Hints & Tips," June 1985

WAITing for a Keypress

When you want users to choose something from a menu, you wait for them to press a key and then continue. On the 64, the most common way is to GET a character:

```
100 GET A$:IF A$="" THEN 100
110 IF A$="Y" THEN 500
```

An easier way is to use the WAIT statement. Location 198 keeps track of how many characters are in the keyboard buffer. So, replace the two lines above with one:

```
100 WAIT 198,1:GET A$:IF A$="Y
   " THEN 500
```

If you just want your program to wait for a keypress—any keypress—use the commands **WAIT 198,1:POKE 198,0**. The POKE command clears the keyboard buffer so that the keypress isn't picked up by another WAIT or GET statement.

Paul Barnes
"Hints & Tips," April 1985

Customized Cursor

It's easy to think of the cursor as a flashing object that can be moved around the screen, but there isn't really a separate cursor character. The 64 uses two memory locations (211 and 214) to keep track of the cursor position. Whichever character is at that location seems to blink because the 64 is alternately displaying the regular and reverse shapes of that character. So to change the cursor to an underline, you have to redefine all of the reverse characters to look like underlined characters. When the cursor blinks by alternating between normal and reverse characters, it will look like a blinking underline because the shapes of reversed characters have been altered. Here's a program to do that:

```
10 POKE 55,0:POKE 56,56:CLR:PO
   KE 56334,0:POKE 1,51
20 FOR A=0 TO 1023:POKE A+1433
   6,PEEK(A+53248):POKE A+1536
   0,PEEK(A+53248):NEXT
30 FOR A=15367 TO A+1023 STEP
   {SPACE}8:POKE A,255:NEXT
40 POKE 1,55:POKE 56334,1:POKE
    53272,30
```

Gazette staff
"Feedback," November 1985

Two-Line 64 Directory Lister

By executing the following two lines of code, you can display a disk's directory from within a program. To use this directory lister, simply set the variable D equal to the drive's device number and GOTO 1000. To list the directory of the disk in drive 8, for example, use **D=8:GOTO 1000**.

Enter the following lines exactly as listed. You may change the line numbers, but never the commands themselves.

```
1000 SYS57812"$",D:POKE43,1:PO
   KE44,192:POKE768,174:POKE76
   9,167:SYS47003,1
1010 POKE782,192:SYS65493:SYS4
   2291:LIST:POKE44,8:POKE768,
   139:POKE769,227
```

I believe this to be the shortest program-executable directory lister possible in 64 BASIC.

Randy Thompson
"Four for the 64," April 1988 **G**

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power BASIC

Vertical Scroller

David Scheiderman

Here's a short machine language routine for the 64 that lets you add vertical fine-scrolling to your BASIC programs.

Have you ever wished you could make the information presented in your programs more eye-catching and interesting? It's often difficult to be creative with menus and instruction screens, but "Vertical Scroller" can bring these to life with smooth, vertical scrolling. And, since this routine is less than 100 bytes long, you can easily incorporate it into your BASIC programs.

Getting Started

Vertical Scroller is a machine language (ML) program in the form of a BASIC loader. To avoid typing errors, enter the program using the "The Automatic Proofreader," found elsewhere in this issue. When you've finished typing, be sure to save a copy of the program to tape or disk.

To install Vertical Scroller, load and run the program. Once the ML data has been POKEd into memory, follow the instructions on the screen to observe the scrolling effect. If you wish to use the scrolling routine in your own programs, simply add lines 1000–1240 to your program and execute a GOSUB 1000 before using Vertical Scroller's commands.

Vertical Scroller has two commands: SYS 49152 scrolls the screen display up, and SYS 49201 scrolls it down. To scroll text screens, execute a POKE 252,24 before the SYS command; for high-resolution screens, use POKE 252,56 prior to the SYS. (Note that the routine does have one quirk; the bottom three screen lines flash on and off during scrolling. This is hidden by sprites in the demo.)

```
C000  78        SEI         Turn off other interrupts.
C001  A9 00     LDA  #0
C003  85 FB     STA  $FB    Set line counter to 0.
C005  A6 FB     LDX  $FB
C007  AD 12 D0  LDA  $D012  Wait for top of screen.
C00A  D0 FB     BNE  $C007
C00C  AD 12 D0  LDA  $D012  Make sure we don't repeat a
C00F  CD 12 D0  CMP  $D012  scan line by looping until
C012  F0 FB     BEQ  $C00F  $D012 changes.
C014  29 07     AND  #$07   Scroll down one line.
C016  05 FC     ORA  $FC
C018  8D 11 D0  STA  $D011  Set current graphic mode.
C01B  E8        INX         Increment line counter
C01C  D0 EE     BNE  $C00C  and scroll again.
C01E  E6 FB     INC  $FB    Increment counter's location.
C020  E6 FB     INC  $FB
C022  A5 FB     LDA  $FB    Check to see if we're still on
C024  C9 CF     CMP  #$CF   the screen.
C026  90 DD     BCC  $C005  If we are, go to the beginning.
C028  A5 FC     LDA  $FC
C02A  09 1B     ORA  #$1B   Reset the screen and exit.
C02C  8D 11 D0  STA  $D011
C02F  58        CLI         Reenable interrupts.
C030  60        RTS
```

Program Notes

Scrolling is achieved in Vertical Scroller with raster interrupts. For those interested in ML, below is the commented source code for the program's scroll-up routine.

To cause the scroll-up routine to scroll down, several minor changes are necessary: The counter at $C001 must be set to the bottom of the screen (LDA #$CF); the INCrement instructions at $C01E and $C020 must be replaced with DECrements; and, a check for the bottom of the screen must be substituted for the top-of-the-screen check at $C024 (CMP #0).

See program listing on page 83. **G**

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machine language programming

Random Thought

Jim Butterfield

This month, we continue our discussion of random numbers in machine language. In particular, we'll look at a method for scaling a random number to a given range of values.

Scaling

Machine language random-number generators usually produce a random byte—that is, a random value from 0 to 255. But this is seldom exactly what's needed; most of the time, you want a bigger or smaller range of numbers. How do you get this?

Larger random numbers are easy. Take two random bytes and combine them into a two-byte random value; the resulting range is 0–65535. A smaller random range is trickier.

Some texts suggest that, to obtain a smaller random-number range, you should divide the big random number by the range; the remainder is the random number you want. Thus, if you wanted a number in the range 0–99, you would divide the random byte by 100; the remainder would certainly be in the range 0–99. This sounds good at first, even though division is a relatively slow operation. However, upon closer inspection, you'll find that you've introduced a bias into the random-number generation.

Let's follow the above example of obtaining a random number from 0 to 99. (If you needed a random number between 1 and 100, you would add 1 to the result.) Starting with a random number in the range 0–255, dividing by 100, and taking the remainder does a poor job. You would have three chances of getting 0 as your remainder: when the original random byte is 0, 100, or 200. But you'd have only two chances of getting 99 as your remainder: from original byte values of 99 or 199. As you can see, the probabilities are skewed.

Here's a better way. First, use the logical AND operation to trim the number to the number of bits needed. For a target range of 0–99, seven bits would be needed, so you'd AND with $7F (decimal 127), producing numbers in the range 0–127. Next, you'd check to see if the resulting value is within the range you wanted. If it's not, you'd fetch another value and do it all again. For our example, you would accept values from 0 to 99. If you were to get a number from 100 to 127, you'd go back and try again.

Suppose you were rolling dice. The values you want would be 1–6. This means that you would try for a random range of 0–5 and then add 1 to the result. If your random generator came up with consecutive values of 17, 254, and 3, you'd calculate as follows. First roll: 17 AND 7, giving a value of 1. That's within your target range of 0–5, so you'd take it; adding 1 gives a roll of 2. Next roll: 254 AND 7 gives a value of 6; it's outside your target range, so you'd do it again and get 3 AND 7, which is 3. Your second roll, adding 1, is 4.

This technique is used in the program "Craps," which accompanies this column. If you disassemble this program, you'll see the code at location $2015 (decimal 8213) calling the random-number generator at $2000 (8192) and performing the above test.

Software Random Numbers

We've already looked at the hardware random-number generator contained in the SID chip of the Commodore 64 and 128. You might have a computer without a SID chip, or the chip might be in use for sound effects or music. In such cases, you'll have to generate random numbers with a program.

Numbers generated this way are not truly random, of course. Each value is a scrambled version of the previous value. Start with the same random "seed" number, and you'll always produce the same random-number sequence. For this reason, such values are often called *pseudorandom* numbers.

Volumes have been written about the generation and testing of random numbers. Many popular methods (such as *linear congruential*) use multiplication or bit shifting; these consume time and memory. For speed and compactness, I suggest an additive method that yields excellent results.

Take 17 bytes of random values. Add the first and the sixth values, ignoring any overflow that results. Move all the values down one place, and pop the new value (the sum) at the end of the list. The result will be a stream of random values.

The original 17 values can be anything, providing that at least one value is an odd number. Even values alone would continue to generate even numbers no matter how many additions you performed.

In Craps, the 17 random values are held at locations $2500–$2510, inclusive (decimal 9472–9488). You might be surprised to learn that RAM often powers up with the same memory contents every time. So, you'll need to scramble some of these values to ensure unpredictable random numbers. In Craps, we do this in BASIC with two POKE statements, but we could do the same in machine language by copying over the contents of the jiffy clock or an interface chip timer. Don't forget that at least one number needs to be odd; BASIC takes care of this in line 300. A machine language program could do the job with an ORA #$01 instruction.

An Example Program

Craps is a simple program that will run on any 8-bit Commodore com-

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puter. It shows how random numbers may be cut down to a range, in this case, 1–6. The machine language code is POKEd into memory by BASIC; two bytes of the random seed are randomized; and then the program calls upon the ML portion to roll the dice.

The ML program starts at location $203D (decimal 8253). It begins by calling the random-number generator 16 times to ensure a good byte scramble. Then the program calls a subroutine at location $202E (decimal 8238) to roll a pair of dice. The resulting total comes back in the accumulator, from which it is analyzed for special values such as 7 or 11.

The subroutine at $202E rolls two dice and puts the total of the two into the accumulator. It makes the roll by jumping to the subroutine at $2015 (8213) twice, once for each die.

At $2015, the program makes the actual roll and screens the result. If the number is in the range 1–6, it's printed.

Craps

```
PH 100 DATA 24,173,0,37,109,5,
       37,168,162,16
CC 110 DATA 152,188,0,37,157,0
       ,37,202,16,246,96
FH 120 DATA 32,0,32,173,0,37,4
       1,7,201,6,176,244,105,1
       ,170
XF 130 DATA 9,48,32,210,255,16
       9,32,76,210,255,32,21,3
       2,142,255
QK 140 DATA 31,32,21,32,138,24
       ,109,255,31,96,162,16,1
       42,255,31
EF 150 DATA 32,0,32,206,255,31
       ,208,248,32,46,32,201,7
       ,240,4
EB 160 DATA 201,11,208,8,169,8
       7,32,210,255,170,208,14
       ,201,4
DA 170 DATA 144,4,201,12,208,5
       ,169,76,32,210,255,170,
       169,13
PG 180 DATA 32,210,255,224,13,
       144,1,96,142,254,31
GJ 190 DATA 32,46,32,205,254,3
       1,240,213,201,7,240,225
       ,169,13
BX 200 DATA 32,210,255,208,237
XA 210 FORJ=8192TO8330:READX
HB 220 T=T+X:POKEJ,X:NEXT
AG 230 IF T<>15512 THEN STOP
PQ 300 POKE 9472,2*INT(RND(1)*
       128)+1
KS 310 POKE 9473,RND(1)*256
BD 320 PRINT "PRESS <RETURN> T
       O STOP"
MP 330 PRINT "PRESS ANY OTHER
       {SPACE}KEY TO PLAY"
FC 340 GET X$:IF X$=""GOTO 340
XP 350 IF X$=CHR$(13) THEN END
PJ 360 SYS 8253
CK 370 GOTO 310                G
```

User Group Update

Edited by Mickey McLean

The following list includes updated entries to our annual "Guide to Commodore User Groups," which last appeared in the May and June 1989 issues.

Send typed additions, corrections, and deletions for this list to

Commodore 64/128 User Group Update
COMPUTE!'s Gazette
P.O. Box 5406
Greensboro, NC 27403

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User Group Notes

The correct bulletin board service telephone number for the **Brooklyn Commodore User's Group** (735 East 13th Street, Apartment 7N, Brooklyn, New York 11229-1952) is (718) 645-1979.

The **Arcano 17-Commodore User's Club** (Fausto Pena Nunez, Calle Plata 3307, Villa San Alejandro, C.P. 72090, Puebla, Pue. Mexico) has added a bulletin board service. The telephone number is 91-22-480-722 and operates on Wednesdays from 10:00 a.m. to 2:00 p.m.

New Listings

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Tampa Commodore User's Group, P.O. Box 260973, Tampa, FL 33685-0973

ILLINOIS

McHenry County Commodore Computer Club, 227 E. Terra Cotta Ave., Crystal Lake, IL 60014

Lincoln Area Commodore Users Group, P.O. Box 131, Lincoln, IL 62656

KENTUCKY

Commodore User's Club of Jenkins, c/o Jenkins High School, Patricia Johnson, Box 552, Jenkins, KY 41537

LOUISIANA

PAGE U.G., P.O. Box 7703, Alexandria, LA 71306-7703

MISSOURI

Commodore North Users Group, P.O. Box 34534, N. Kansas City, MO 64116 (BBS# 816-455-0122)

NEBRASKA

Kearney Area Commodore Computer Klub, P.O. Box 1611, Kearney, NE 68848-1611

PENNSYLVANIA

C.U.G.LEB.CO, P.O. Box 511, Richland, PA 17087

VIRGINIA

The Heathsville Commodore Club (HCC), Box 276-F Bay Quarter Dr., Heathsville, VA 22473

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bug-swatter

• "GeoConverter," the GEOS file-conversion program, doesn't work with the 1581 disk drive. The following line changes and additions allow you to use GeoConverter with any 1541-, 1571-, or 1581-compatible disk drive numbered 8–11.

```
EJ 30  PRINT"{CLR}{GRN}"CHR$(14
       2):VE=PEEK(772)+256*PEEK
       (773)
MR 31  IFVE=42364THENPOKE53280,
       0:POKE53281,0:GOTO40
FK 32  LIST0,1:LIST4,1:LIST6,1
BK 80  PRINT"{DOWN}{RVS}{8}GEOC
       ONVERTER 1.2{OFF}{DOWN}
       {GRN}"
QA 81  N=8:PRINT"DRIVE NUMBER "
       N"{4 LEFT}";:INPUTN
AC 82  IFN<8ORN>11THEN81
SA 83  PRINT"IS DRIVE"N"A 1581?
       ";:T$=CHR$(18):S$=CHR$(
       1)
PJ 84  GETK$:IFK$<>"Y"ANDK$<>"N
       "THEN84
MR 85  PRINTK$:IFK$="Y"THENT$=C
       HR$(40):S$=CHR$(3)
BE 130 NL$="":OPEN 15,N,15,"I0
       :":OPEN 2,N,2,"#"
XC 280 DT$=T$:SS$=S$:T$=HT$:S$
       =HS$:GOSUB370
XB 310 GET#2,CT$,GT$:GOSUB370:
       PRINT#2,HD$;:GOSUB380:T
       $=DT$:S$=SS$:GOSUB370
```

• The program under the heading "Another BASIC Editor" ("Feedback," June 1989) was accidentally switched with another listing. The program given converts BASIC programs into *SpeedScript* files instead of converting *SpeedScript* files into BASIC programs. The correct listing is below.

```
KQ 63900 PRINT"CONVERT FILE FR
         OM SPEEDSCRIPT":INPUT
         "TO BASIC, ENTER FILE
         NAME";F$
EE 63905 OPEN2,8,2,F$+",P,R":G
         ET#2,A$:GET#2,B$
DP 63910 CR$=CHR$(31):POKE152,
         1:FLAG=0:L$="":PRINT"
         {CLR}{2 DOWN}":T=1104
AD 63915 IF ST AND 64 THEN6395
         5
DM 63920 GET#2,CH$
KR 63925 IF CH$=CR$ AND FLAG=0
          THEN63915
DA 63930 IF CH$<>CR$ THEN POKE
         T,ASC(CH$):T=T+1:FLAG
         =1:L$=L$+CH$:GOTO6391
         5
JB 63935 POKE220,PEEK(220)OR12
         8:IFT>39THENPOKE220,P
         EEK(220)AND127
AB 63940 PRINT"{HOME}{4 DOWN}G
         OTO63910:{2 DOWN}":PO
         KE198,0
QD 63945 IF VAL(L$)=0 THEN6391
         0
XM 63950 GOTO63975
DH 63955 CLOSE2:LN=63900
AG 63960 PRINT"{CLR}{2 DOWN}":
         FORN=LN TO LN+35 STEP
          5:PRINT N:NEXTN
AC 63965 PRINT"LN=";N;:IF N<63
         965 THEN PRINT":GOTO6
         3960":GOTO63975
MR 63970 PRINT"{4 DOWN}":GOTO6
         3975
CG 63975 FOR I=631 TO 640:POKE
          I,13:NEXT I:POKE 198
         ,10:PRINT"{HOME}";:EN
         D
```

If you're interested in converting BASIC programs into *SpeedScript* files, see the October 1989 "Feedback" discussion under the heading "BASIC to *SpeedScript*."

• One of the programs from "The Programmer's Page" (September 1989) is incorrect. A character is missing from line 20 of the hi-res screen dump program listed under the heading "Hi-Res Page Printer." The correct line is

```
XG 20  FORJ=0TOC:LOCATEH(J),V:B
       =B+A(J)*RDOT(2):NEXT:B$=
       CHR$(B):PRINTB$B$;:NEXT:
       PRINT:H=H-7:C=6+4*(H=2):
       LOOP:PRINTCHR$(15):PRINT
       #1:CLOSE1:END
```

• "Verbatim" (May 1989) breaks with an OUT OF MEMORY ERROR if you take too long to guess the words. The problem comes from jumping out of a subroutine and a FOR-NEXT loop in line 820. Add or change the following six lines to correct the problem:

```
QJ 430 PRINT"{HOME}{10 DOWN}"S
       PC(32);:FORI=1TOWL:GOSU
       B720:IFOUT=1THENI=WL
MK 435 NEXT:IFOUT=1THEN610
DG 436 PRINT"{RVS}{5} ":TM=16
XD 610 OUT=0:PRINT"{HOME}";:FO
       RI=1TODO(TU):PRINT"
       {DOWN}";:NEXT:PRINTSPC(
       AC(WL))"{RVS}{5} "
QG 820 PRINT"{HOME}{9 DOWN}"SP
       C(28)"{RVS}{11 SPACES}"
       :PRINT"{DOWN}"SPC(30)"
       {RVS}{7 SPACES}"
SC 825 OUT=1:RETURN
```

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MLX Machine Language Entry Program For Commodore 64

Ottis R. Cowper

"MLX" is a labor-saving utility that allows almost fail-safe entry of Commodore 64 machine language programs.

Type in and save some copies of MLX—you'll want to use it to enter future ML programs from COMPUTE!'s GAZETTE. When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

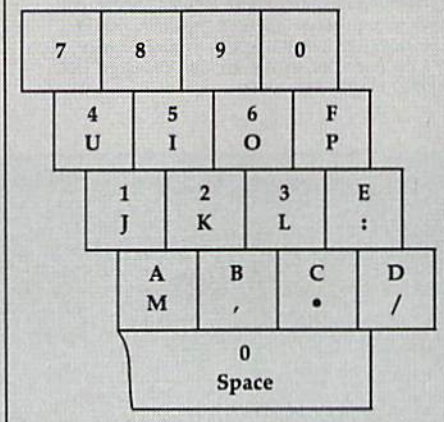
Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing.

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, the numeric keypad modification from the March 1986 "Bug-Swatter" column is now incorporated in the listing. The keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figure below shows the keypad configuration:



MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redis-

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played. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save. Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750), so this should *not* be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk or LOAD *"filename"* for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk or LOAD *"filename"*,1,1 for tape, and then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, and then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to insure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
      I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
      4=254:Z5=255:Z6=256:Z7=
      127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
      :BS=PEEK(55)+Z6*PEEK(56
      ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
      :S$=" ":D$=CHR$(20):Z$=
      CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
      +23:POKE I,0:NEXT:POKE
      {SPACE}SD+24,15:POKE 78
      8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
      R$(8):POKE 53280,15:POK
      E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
      {2 SPACES}{8 @}
      {2 SPACES}"SPC(28)"
      {2 SPACES}{OFF}{BLU} ML
      X II {RED}{RVS}
      {2 SPACES}"SPC(28)"
      {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
      {3 SPACES}COMPUTE!'S MA
      CHINE LANGUAGE EDITOR
      {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
      RESS{4}";:GOSUB300:SA=A
      D:GOSUB1040:IF F THEN18
      0
GF 190 PRINT"{BLK}{2 SPACES}EN
      DING ADDRESS{4}";:GOSUB
      300:EA=AD:GOSUB1030:IF
      {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
      R WORKSPACE [Y/N]{4}";A
      $:IF LEFT$(A$,1)<>"Y"TH
      EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
      ING...";:FORI=BS TO BS+
      EA-SA+7:POKE I,0:NEXT:P
      RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
      {BLK}{RVS} MLX COMMAND
      {SPACE}MENU {DOWN}{4}":
      PRINT T$"{RVS}E{OFF}NTE
      R DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISP
      LAY DATA":PRINT T$"
      {RVS}L{OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE
       FILE":PRINT T$"{RVS}Q
      {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
      MID$("EDLSQ",I,1)THEN A
      =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
      90,700,280:GOSUB1060:GO
      TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
      T"{DOWN}{4}ARE YOU SURE
       [Y/N]";A$:IF LEFT$(A$,
      1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
      LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
      =MID$(IN$,3):GOSUB320:A
      D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
      $(B$,J,1):B=ASC(A$)-C4+
      (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
      0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
      H$,B+1,1);:B=A-B*C6:PRI
      NT MID$(H$,B+1,1);:RETU
      RN
RR 360 A=INT(AD/Z6):GOSUB350:A
      =AD-A*Z6:GOSUB350:PRINT
      ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
      CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
```

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```
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
       [4]";:GOSUB300:IF IN$<>
       N$ THEN GOSUB1030:IF F
       {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
       {SPACE}":GOSUB400:IF IN
       $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
        THEN PRINT IN$:PRINT"
       {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$
       =S$:FOR J=1 TO 2:IF F T
       HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<
       24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A
       $>"@"ANDA$<"G")THEN540
GS 485 A=-(A$="M")-2*(A$=",")-
       3*(A$=".")-4*(A$="/")-5
       *(A$="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$=":
       ")-9*(A$="U")-10*(A$="I
       ")-11*(A$="O")-12*(A$="
       P")
CM 487 A=A-13*(A$=S$):IF A THE
       N A$=MID$("ABCD123E456F
       0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J
       =1)OR F)THEN PRINT B$;:
       J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF TH
       ENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
       ((I=0)AND(J=1))THEN GOS
       UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;
       :J=2-J:IF J THEN PRINT
       {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
       {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:INPUT#3,IN$
       :IF IN$=N$ THEN CLOSE3:
       GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
       MID$(IN$,I):GOSUB320:IF
        I<25 THEN GOSUB380:A(I
       /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
       B1060:PRINT"{BLK}{RVS}
       {SPACE}ERROR: REENTER L
       INE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
       R I=0 TO 7:POKE B+I,A(I
       ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
       LOSE3:PRINT"{DOWN}{BLU}
       ** END OF ENTRY **{BLK}
       {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
       {SPACE}DISPLAY DATA ":G
       OSUB400:IF IN$=N$ THEN2
       20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
        {RVS}SPACE{OFF} TO PAU
       SE, {RVS}RETURN{OFF} TO
        BREAK[4]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
       I=BTO B+7:A=PEEK(I):GOS
       UB350:GOSUB380:PRINT S$
       ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
       :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
       ENPRINT"{DOWN}{BLU}** E
       ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
       SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
       UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
       {SPACE}DATA ":OP=1:GOTO
       710
PC 700 PRINT"{DOWN}{RVS} SAVE
       {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
       NAME[4]";IN$:IF IN$=N$
       {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
       {RVS}T{OFF}APE OR {RVS}
       D{OFF}ISK: [4]";
FP 730 GET A$:IF A$="T"THEN PR
       INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
       ,15,"I0:":B=EA-SA:IN$="
       0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
       OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
       H*256):PRINT#1,CHR$(AL)
       ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
       R$(PEEK(BS+I));:IF ST T
       HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
       O940
GS 800 GOSUB1060:PRINT"{DOWN}
       {BLK}ERROR DURING SAVE:
       [4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
       OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
       $)+256*ASC(B$+Z$):IF AD
       <>SA THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:P
       OKE BS+I,ASC(A$+Z$):IF(
       I<>B)AND ST THEN F=2:AD
       =I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
       >0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN
        CLOSE1:CLOSE15:GOSUB10
       60:PRINT"{RVS}ERROR: "A
       $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
       187,PEEK(FA+3):POKE188,
       PEEK(FA+4):IFOP=0THEN92
       0
HJ 890 SYS 63466:IF(PEEK(783)A
       ND1)THEN GOSUB1060:PRIN
       T"{DOWN}{RVS} FILE NOT
       {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
       30):IF AD<>SA THEN F=1:
       GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
       2)-1:F=F-2*(A<EA)-3*(A>
       EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
       OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
       UB1010:ON OP GOTO950:SY
       S 63591
AE 940 GOSUB1080:PRINT"{BLU}**
        SAVE COMPLETED **":GOT
       O220
XP 950 POKE147,0:SYS 63562:IF
       {SPACE}ST>0 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
        LOAD COMPLETED **":GOT
       O220
DP 970 GOSUB1060:PRINT"{BLK}
       {RVS}ERROR DURING LOAD:
       {DOWN}[4]":ON F GOSUB98
       0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
       G ADDRESS (";:GOSUB360:
       PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
       AD=SA+AD:GOSUB360:PRINT
        D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
       ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
       *256):POKE193,AL:POKE1
       94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
       *256):POKE174,AL:POKE1
       75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
       1050
HA 1040 IF(AD>511 AND AD<40960
       )OR(AD>49151 AND AD<53
       248)THEN GOSUB1080:F=0
       :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
       {SPACE}INVALID ADDRESS
        {DOWN}{BLK}":F=1:RETU
       RN
AR 1060 POKE SD+5,31:POKE SD+6
       ,208:POKE SD,240:POKE
       {SPACE}SD+1,4:POKE SD+
       4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
       TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
       240:POKE SD,0:POKE SD+
       1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
       KE SD+4,0:POKE SD,0:PO
       KE SD+1,0:RETURN
```


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The Automatic Proofreader

Philip I. Nelson

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, and 16 and prevents nearly every kind of typing mistake.

Type in the Proofreader *exactly* as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, **10 PRINT"THIS IS BASIC"** will generate a different checksum than **10 PRINT"THIS ISBA SIC"**.

A common typing error is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you *run* any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP– RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, and 65526 for the Plus/4 and 16). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable *both* programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA+
   29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,136
   ,137
```

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BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Copy 81

See instructions in article on page 56 before typing in.

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:31 00 00 00 A5 BA 8D 4C 31
0811:17 20 E7 FF A9 00 8D 50 6A
0819:17 A9 0E 20 D2 FF A9 08 D4
0821:20 D2 FF 20 AC 11 20 5A 3C
0829:11 B0 2C 20 AC 11 20 BE 1E
0831:11 20 61 08 B0 F0 A9 00 1B
0839:8D 4D 17 20 E5 08 B0 E6 DF
0841:A9 00 8D 46 17 8D 51 17 E4
0849:A8 99 46 15 C8 D0 FA 20 CD
0851:F3 08 B0 D2 4C FF 09 A9 BE
0859:37 85 01 A9 0F 4C C3 FF 52
0861:A9 0F 20 C3 FF A9 02 A2 97
0869:00 A0 12 20 BD FF A9 0F 36
0871:4C 7D 08 A2 63 A0 17 20 1E
0879:BD FF A9 03 A8 AE 4C 17 7D
0881:20 BA FF 20 C0 FF A5 90 34
0889:D0 35 A2 0F 20 C6 FF B0 61
0891:2E A0 00 20 A5 FF 99 77 BA
0899:17 C8 F0 23 C9 0D D0 F3 CF
08A1:99 77 17 C8 A9 00 99 77 C3
08A9:17 20 CC FF A0 00 B9 77 D6
08B1:17 C9 32 90 09 20 D5 08 8B
08B9:F0 04 20 4C 11 38 60 20 56
08C1:CC FF A9 0F 20 C3 FF 20 8E
08C9:9B 11 38 60 20 CC FF A9 D6
08D1:03 4C C3 FF A0 00 B9 77 DE
08D9:17 C9 35 D0 06 C8 B9 77 D9
08E1:17 C9 30 60 A9 01 A2 03 95
08E9:A0 12 20 BD FF A9 03 4C A7
08F1:7D 08 A2 03 20 C6 FF B0 14
08F9:27 A9 00 8D 47 17 20 A5 5D
0901:FF C9 44 D0 1B 20 A5 FF BF
0909:A2 53 A9 17 86 41 85 42 6E
0911:20 CC 09 A4 90 D0 09 A0 4C
0919:EC 20 63 09 A4 90 F0 08 F7
0921:20 CD 08 20 98 11 38 60 93
0929:A9 08 8D 4F 17 20 4A 09 8F
0931:A4 90 D0 0F CE 4F 17 F0 97
0939:EF 20 A5 FF 20 A5 FF A4 3C
0941:90 F0 EA 20 CD 08 4C 8B E9
0949:08 20 A5 FF 48 20 A5 FF 2A
0951:20 A5 FF 68 10 0A 29 07 65
0959:F0 06 C9 05 F0 0B 90 2C EF
0961:A0 1B 20 A5 FF 88 D0 FA A7
0969:60 AE 47 17 E0 14 B0 F0 5B
0971:AD F6 11 20 C9 09 A0 09 F8
0979:20 63 09 20 A5 FF A8 20 36
0981:A5 FF D0 04 C0 78 90 03 CC
0989:EE 47 17 60 AE 50 17 D0 83
0991:CF AE 46 17 E0 FF F0 C8 23
0999:9D 46 15 AD F5 11 20 C9 87
09A1:09 A0 03 20 63 09 AE 46 A5
09A9:17 9D 46 16 A0 07 20 63 9D
09B1:09 48 20 A5 FF AE 46 17 17
09B9:9D 46 14 68 9D 46 13 1D 7E
09C1:46 14 F0 03 EE 46 17 60 69
09C9:20 EB 09 A0 00 20 A5 FF DD
09D1:91 41 C8 C0 10 D0 F6 60 34
09D9:8E 48 17 8E 49 17 20 EB E3
09E1:09 A2 00 8E 4F 17 60 AD 4F
09E9:F5 11 85 42 8A 0A 0A 0A AA
09F1:0A 85 41 8A 4A 4A 4A 4A 95
09F9:18 65 42 85 42 60 20 AC 92
0A01:11 20 A3 11 20 E4 FF F0 B0
0A09:FB C9 03 D0 08 20 81 11 CF
0A11:D0 EC 4C 58 08 C9 50 D0 B0
0A19:03 4C 2B 0A C9 46 D0 03 D3
0A21:4C 49 0B C9 52 D0 DD 4C 89
0A29:24 08 AD 47 17 D0 09 20 A9
0A31:55 0A 20 63 11 4C FF 09 6F
0A39:A2 00 20 4A 0A 20 D2 FF BD
0A41:20 D2 FF 20 73 0A 4C D2 4B
0A49:0A 8E 48 17 8E 49 17 A9 F1
0A51:00 8D 4F 17 A9 93 20 D2 D2
0A59:FF A9 0C 85 D3 A0 00 B9 8C
0A61:53 17 20 AA 0A C8 C0 10 98
0A69:D0 F5 A9 0D 20 D2 FF 4C 02
0A71:D2 FF AE 49 17 AD F6 11 C7
0A79:20 EB 09 20 8D 0A EE 49 77
0A81:17 AE 49 17 EC 47 17 90 AA
0A89:EC 4C 80 0C 20 95 0A A9 0D
0A91:0D 4C D2 FF 20 B7 0A A9 37
0A99:04 85 D3 A0 00 B9 63 17 5A
0AA1:20 AA 0A C8 C0 10 D0 F5 1C
0AA9:60 AA 29 7F C9 20 B0 02 E7
0AB1:A2 3F 8A 4C D2 FF 20 CC A0
0AB9:0A A0 00 B1 41 99 63 17 64
0AC1:C8 C0 10 D0 F6 A9 36 85 C9
0AC9:01 58 60 78 A9 34 85 01 32
0AD1:60 20 6B 0C F0 FB C9 03 5A
0AD9:D0 03 4C FF 09 C9 0D D0 FA
0AE1:F0 AD 4D 17 C9 08 B0 E9 AE
0AE9:20 00 0B 90 03 4C 27 08 18
0AF1:AE 4D 17 AD F7 11 20 39 EB
0AF9:0B EE 4D 17 4C 3C 08 20 ED
0B01:AC 11 20 BE 11 AD F6 11 DF
0B09:AE 4F 17 20 EB 09 20 8D 80
0B11:0A A2 0F 20 C9 FF A9 2F 89
0B19:20 A8 FF A9 30 20 A8 FF 57
0B21:A9 3A 20 A8 FF A0 00 B9 65
0B29:63 17 20 A8 FF C8 C0 10 F9
0B31:D0 F5 20 CC FF 4C 8B 08 4E
0B39:20 EB 09 A0 00 B9 63 17 4A
0B41:91 41 C8 C0 10 D0 F6 60 A7
0B49:AD 46 17 D0 09 20 55 0A 35
0B51:20 66 11 4C FF 09 A2 00 61
0B59:20 5F 0B 4C E7 0B 20 4A 73
0B61:0A 20 C7 11 AE 49 17 20 77
0B69:E8 09 BD 46 15 20 A3 0B CD
0B71:AE 49 17 BD 46 15 29 07 CF
0B79:A8 B9 FA 11 20 D2 FF 20 2F
0B81:B2 0B 20 B7 0B A9 0D 20 6C
0B89:D2 FF EE 4F 17 EE 49 17 F9
0B91:AE 49 17 EC 46 17 B0 07 F9
0B99:AD 4F 17 C9 14 90 C8 4C 9A
0BA1:80 0C 10 05 A9 12 20 D2 F5
0BA9:FF 20 95 0A A9 92 20 D2 C5
0BB1:FF A9 20 4C D2 FF BD 46 53
0BB9:13 48 BD 46 14 20 C2 0B 39
0BC1:68 8D 51 17 A2 08 A9 00 93
0BC9:F8 8D 52 17 0E 51 17 6D CC
0BD1:52 17 CA D0 F4 D8 48 4A 23
0BD9:4A 4A 4A 20 E2 0B 68 29 30
0BE1:0F 09 30 4C D2 FF 20 6B CE
0BE9:0C F0 FB C9 03 D0 03 4C 0C
0BF1:FF 09 C9 50 D0 0F AD 48 EE
0BF9:17 F0 EB 38 E9 14 AA 20 ED
0C01:5F 0B 4C E7 0B C9 4E D0 80
0C09:0B AD 49 17 CD 46 17 90 F2
0C11:ED 4C E7 0B C9 43 D0 03 E0
0C19:4C D5 0C C9 0D D0 09 AE 57
0C21:4F 17 20 5D 0C 4C E7 0B EC
0C29:C9 8D D0 2D 20 F0 FF 8E C9
0C31:52 17 18 A2 04 20 F0 FF E7
0C39:AE 48 17 8E 51 17 20 5D 0B
0C41:0C A9 11 20 D2 FF AE 51 33
0C49:17 E8 EC 49 17 D0 EC AE DD
0C51:52 17 18 20 F0 FF 4C E7 65
0C59:0B 4C E7 0B 20 E8 09 BD 2C
0C61:46 15 49 80 9D 46 15 4C 8F
0C69:A3 0B 20 E4 FF F0 FB C9 ED
0C71:91 F0 34 C9 11 F0 46 C9 54
0C79:13 F0 01 60 20 9C 0C AD B6
0C81:48 17 8D 4F 17 A9 13 20 CF
0C89:D2 FF A9 0D 20 D2 FF 20 7D
0C91:D2 FF 20 D2 FF 20 D2 FF 6A
0C99:A9 58 2C A9 20 A0 02 84 C8
0CA1:D3 20 D2 FF A9 00 60 20 34
0CA9:9C 0C AD 4F 17 CD 48 17 55
0CB1:F0 08 CE 4F 17 A9 91 20 B5
0CB9:D2 FF 4C 99 0C 20 9C 0C 84
0CC1:AE 4F 17 E8 EC 49 17 B0 E1
0CC9:08 EE 4F 17 A9 11 20 D2 A1
0CD1:FF 4C 99 0C 20 7B 11 F0 F2
0CD9:03 4C FF 09 20 AC 11 A2 8F
0CE1:00 8E 48 17 8E 4A 17 8E 72
0CE9:4B 17 8E 49 17 AD 50 17 FA
0CF1:F0 32 20 5A 11 90 08 20 B3
0CF9:81 11 D0 F6 4C 58 08 20 94
0D01:BE 11 20 61 08 B0 EB AD 61
0D09:4D 17 F0 18 A9 00 8D 4F E6
0D11:17 AD F7 11 20 09 0B B0 1E
0D19:D9 EE 4F 17 AD 4F 17 CD DD
0D21:4D 17 90 ED A9 00 8D 51 52
0D29:17 20 8C 0D AD 51 17 F0 0B
0D31:54 20 5D 11 90 08 20 81 A0
0D39:11 D0 F6 4C 58 08 AD 50 42
0D41:17 D0 21 A9 01 8D 50 17 CF
0D49:AD 48 17 48 AD 49 17 48 BC
0D51:20 30 0F 68 8D 49 17 68 18
0D59:8D 48 17 90 0C A9 00 8D CC
0D61:50 17 F0 CD 20 0D 0F B0 68
0D69:C8 20 96 0F AE 48 17 BD 36
0D71:46 15 10 03 4C EB 0C EE 3F
0D79:48 17 EC 46 17 90 ED 20 76
0D81:D0 11 4C 58 08 20 66 11 F5
0D89:4C 58 08 20 C1 11 A9 00 88
0D91:85 3F A9 18 85 40 20 BA 1D
0D99:0D F0 3F AE 49 17 BD 46 B1
0DA1:15 10 03 20 E0 0D EE 49 0F
0DA9:17 A5 40 CD F9 11 B0 08 1B
0DB1:AE 49 17 EC 46 17 90 DE B5
0DB9:60 20 E4 FF C9 03 D0 03 A7
0DC1:20 81 11 60 AE 49 17 BD FA
0DC9:46 15 29 0F 9D 46 15 20 B2
0DD1:CD 08 20 84 11 D0 01 60 4F
0DD9:68 68 68 68 4C 58 08 20 C9
0DE1:E8 09 20 8D 0A A9 10 20 C6
0DE9:74 08 B0 D8 A9 00 AE 49 D7
0DF1:17 9D 46 13 9D 46 14 BD E4
0DF9:46 15 29 0F C9 04 D0 03 95
0E01:4C 97 0E A2 03 20 C6 FF 3B
0E09:AE 49 17 BD 46 15 29 40 A6
0E11:F0 0E 20 6A 0E 20 73 0E B9
0E19:F0 06 20 BB 11 4C C5 0D 41
0E21:A0 00 20 A5 FF 91 3F A5 56
0E29:90 D0 1D C8 D0 F4 20 F2 7F
0E31:0E E6 40 A5 40 CD F9 11 AE
0E39:90 E8 AE 49 17 A9 40 1D 3F
0E41:46 15 9D 46 15 4C 54 0E 6E
0E49:C8 98 AE 49 17 9D 46 16 2C
0E51:20 73 10 A9 01 8D 51 17 EE
0E59:20 CD 08 20 8B 08 90 08 A1
0E61:20 84 11 F0 03 4C D9 0D E9
0E69:60 5D 46 15 09 20 9D 46 71
0E71:15 60 A0 00 20 A5 FF C8 A4
0E79:D0 FA A5 90 D0 08 20 F2 54
0E81:0E 20 88 0E D0 EE 60 AD 4F
0E89:4A 17 DD 46 13 D0 06 AD 46
0E91:4B 17 DD 46 14 60 A9 01 AF
0E99:9D 46 13 BD 46 15 29 40 6D
0EA1:F0 0F 20 6A 0E AD 4A 17 77
0EA9:9D 46 13 AD 4B 17 9D 46 9B
0EB1:14 20 3D 11 AE 49 17 20 81
0EB9:29 11 20 8B 08 B0 18 A2 41
0EC1:03 20 C6 FF 20 DE 0E 20 F8
0EC9:CC FF A5 40 CD F9 11 90 0E
0ED1:E0 20 FE 0E 4C 3B 0E 20 B2
0ED9:FE 0E 4C 54 0E A0 01 20 DC
0EE1:A5 FF 91 3F C8 A5 90 F0 E5
0EE9:F6 98 A0 00 91 3F 20 73 F8
0EF1:10 AE 49 17 FE 46 13 D0 64
0EF9:03 FE 46 14 60 AE 49 17 C8
0F01:BD 46 13 D0 03 DE 46 14 33
0F09:DE 46 13 60 20 BE 11 18 C6
0F11:AD 4E 17 F0 19 A9 00 8D 88
0F19:4F 17 AD F8 11 20 09 0B 10
0F21:B0 0C EE 4F 17 AD 4F 17 92
0F29:CD 4E 17 90 ED 18 60 20 5E
0F31:BE 11 20 E7 FF 20 61 08 C0
0F39:B0 F4 A9 00 8D 4E 17 20 16
0F41:E5 08 B0 EA 20 F3 08 B0 AA
0F49:E5 AD 47 17 D0 03 4C 63 AE
0F51:11 A2 00 20 4A 0A 20 CA 28
0F59:11 AE 48 17 20 73 0A 20 29
0F61:6B 0C F0 FB C9 03 D0 05 17
0F69:20 AC 11 38 60 C9 43 D0 E9
0F71:05 20 AC 11 18 60 C9 0D A3
0F79:D0 E5 AD 4E 17 C9 08 B0 B4
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0F81:DE 20 00 0B B0 EF AE 4E B8
0F89:17 AD F8 11 20 39 0B EE B9
0F91:4E 17 4C 40 0F A9 18 85 FE
0F99:40 A9 00 85 3F 20 C4 11 AF
0FA1:20 BA 0D D0 03 4C DB 0D 3B
0FA9:AE 48 17 BD 46 15 10 0D A3
0FB1:20 D2 0F AE 48 17 BD 46 C1
0FB9:15 29 40 D0 13 A9 00 8D 8E
0FC1:4A 17 8D 4B 17 EE 48 17 4D
0FC9:AE 48 17 EC 49 17 90 D0 9B
0FD1:60 20 E8 09 20 8D 0A AE CF
0FD9:48 17 BD 46 15 29 0F C9 33
0FE1:04 D0 03 4C 86 10 AA A0 C5
0FE9:10 A9 2C 99 63 17 C8 BD 60
0FF1:FA 11 99 63 17 C8 A9 2C 96
0FF9:99 63 17 C8 AE 48 17 BD AF
1001:46 15 29 20 D0 03 A9 57 ED
1009:2C A9 41 99 63 17 C8 98 0D
1011:20 74 08 90 19 20 88 0E D0
1019:F0 08 E6 40 20 7D 10 4C F7
1021:16 10 BD 46 16 20 73 10 94
1029:AE 48 17 4C C8 0D A2 03 1D
1031:20 C9 FF AE 48 17 20 88 26
1039:0E F0 12 A0 00 B1 3F 20 4E
1041:A8 FF C8 D0 F8 E6 40 20 DF
1049:7D 10 4C 34 10 BD 46 15 12
1051:29 40 D0 06 BD 46 16 20 E3
1059:64 10 20 CD 08 20 8B 08 70
1061:B0 C6 60 8D 4F 17 B1 3F E9
1069:20 A8 FF C8 CC 4F 17 D0 F2
1071:F5 98 18 65 3F 85 3F 90 2B
1079:02 E6 40 60 EE 4A 17 D0 02
1081:03 EE 4B 17 60 A0 10 AE 0E
1089:48 17 BD 46 15 29 20 D0 0E
1091:1E A9 2C 99 63 17 C8 A9 FC
1099:4C 99 63 17 C8 A9 2C 99 03
10A1:63 17 C8 BD 46 16 99 63 4F
10A9:17 C8 A9 01 8D 4A 17 98 29
10B1:20 74 08 90 15 A0 00 B1 E5
10B9:3F 20 73 10 20 7D 10 AE B6
10C1:48 17 20 88 0E D0 F0 4C 3A
10C9:29 10 20 23 11 A2 03 20 F1
10D1:C9 FF A9 FF 20 A8 FF 20 CF
10D9:CC FF 20 8B 08 90 05 20 C9
10E1:D5 08 D0 D1 20 23 11 20 F5
10E9:8B 08 B0 C9 20 11 11 A2 8E
10F1:03 20 C9 FF A0 00 B1 3F 7C
10F9:C8 20 64 10 20 CC FF 20 68
1101:11 11 20 7D 10 AE 48 17 AE
1109:20 88 0E D0 DF 4C 5B 10 23
1111:20 3D 11 AD 4A 17 20 A8 27
1119:FF AD 4B 17 20 A8 FF 4C 71
1121:35 11 20 3D 11 AE 48 17 E4
1129:BD 46 13 20 A8 FF BD 46 27
1131:14 20 A8 FF A9 01 20 A8 B4
1139:FF 4C CC FF A2 0F 20 C9 63
1141:FF A9 50 20 A8 FF A9 63 D5
1149:4C A8 FF A9 20 20 D2 FF 7D
1151:A0 00 A9 17 A2 77 4C E6 DC
1159:11 A0 19 2C A0 09 20 D5 51
1161:11 2C A0 35 2C A0 2B 20 D8
1169:DD 11 20 B8 11 20 E4 FF 21
1171:C9 03 F0 05 C9 0D D0 F5 C1
1179:18 60 20 AC 11 A0 61 2C 88
1181:A0 5B 2C A0 51 20 DD 11 32
1189:20 CD 11 20 E4 FF F0 FB 58
1191:C9 03 F0 F7 C9 59 60 A0 0C
1199:6D 2C A0 77 20 DD 11 4C EF
11A1:BB 11 A0 00 A9 12 A2 FC D1
11A9:4C E6 11 A9 93 20 D2 FF 2B
11B1:A9 0C 85 D3 A0 00 2C A0 97
11B9:44 2C A0 7E 2C A0 84 2C 1E
11C1:A0 8F 2C A0 9A 2C A0 CB 3A
11C9:2C A0 A5 2C A0 67 2C A0 3D
11D1:F2 20 DD 11 A9 0D 20 D2 D6
11D9:FF 4C D2 FF A9 20 20 D2 4A
11E1:FF A9 12 A2 04 85 42 86 1C
11E9:41 B1 41 F0 06 20 D2 FF A6
11F1:C8 D0 F6 60 E0 F0 F6 F8 43
11F9:CE 3F 53 50 55 52 43 49 86
1201:30 00 24 12 C3 CF D0 D9 BB
1209:38 31 92 00 49 4E 53 45 57
1211:52 54 20 D4 CF 20 44 49 95
1219:53 4B 2C 00 49 4E 53 45 AE
1221:52 54 20 C6 D2 CF CD 20 85
1229:44 49 53 4B 2C 00 CE CF AF
1231:20 C6 C9 CC C5 D3 2C 00 F2
1239:CE CF 20 D0 C1 D2 D4 C9 96
1241:D4 C9 CF CE D3 2C 00 50 C8
1249:52 45 53 53 20 D2 C5 D4 34
1251:D5 D2 CE 00 C3 4F 4E 54 3B
1259:49 4E 55 45 3F 00 D1 55 A7
1261:49 54 3F 00 C3 4F 50 59 7C
1269:3F 00 28 59 2F 4E 29 00 CC
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1289:50 45 4E 49 4E 47 2E 2E 9F
1291:2E 00 52 45 41 44 49 4E 67
1299:47 2E 2E 2E 00 57 52 49 E0
12A1:54 49 4E 47 2E 2E 2E 00 07
12A9:53 45 4C 45 43 54 20 D4 27
12B1:CF 20 50 41 52 54 49 54 AE
12B9:49 4F 4E 2C 20 4F 52 20 E5
12C1:43 20 46 4F 52 20 43 55 3C
12C9:52 52 45 4E 54 00 4E 2D A5
12D1:4E 45 58 54 20 50 41 47 CA
12D9:45 20 20 50 2D 50 52 45 46
12E1:56 20 50 41 47 45 20 20 07
12E9:43 2D 53 54 41 52 54 20 C6
12F1:43 4F 50 59 00 44 4F 4E 29
12F9:45 21 00 20 46 2D 46 49 C7
1301:4C 45 53 20 20 50 2D 50 F7
1309:41 52 54 49 54 49 4F 4E 38
1311:53 20 20 52 2D 52 45 41 90
1319:44 20 4E 45 57 20 44 49 94
1321:53 4B 0D 0D 00 00 00 00 36
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BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

White Water

See instructions in article on page 20 before typing in.

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0801:0B 08 0A 00 9E 32 30 36 2E
0809:31 00 00 00 A9 00 8D 3C 56
0811:03 8D 3D 03 8D 3E 03 A9 F2
0819:2F 85 00 A9 D0 85 58 A9 B3
0821:30 85 5A A0 00 84 57 84 45
0829:59 8C 0E DC A9 33 85 01 BE
0831:B1 57 91 59 C8 D0 F9 E6 1C
0839:58 E6 5A A5 58 C9 D8 90 01
0841:EF A9 37 85 01 A9 01 8D 31
0849:0E DC A9 30 85 58 A9 34 E4
0851:85 5A A0 00 84 57 84 59 B2
0859:98 29 04 F0 09 B1 57 0A 57
0861:91 57 49 FF 91 59 C8 D0 8D
0869:EF E6 58 E6 5A A5 58 C9 88
0871:32 90 E5 A0 7F B9 FB 10 70
0879:99 00 32 88 10 F7 A0 77 3E
0881:B9 7B 11 99 00 38 B9 F3 51
0889:11 99 78 38 B9 6B 12 99 54
0891:F0 38 B9 E3 12 99 68 39 9E
0899:88 10 E5 A0 2E B9 B9 EC 71
08A1:99 00 D0 88 10 F7 A9 1D F1
08A9:8D 18 D0 A9 00 8D 20 D0 82
08B1:8D 21 D0 20 AF 0E A9 D3 C9
08B9:A0 0E 20 E9 0D A9 47 A0 7E
08C1:0F 20 E9 0D A9 A3 A0 0F 9B
08C9:20 E9 0D AD 1C D8 48 AD 63
08D1:44 D8 48 AD 6C D8 48 A0 16
08D9:12 B9 09 D8 99 0A D8 B9 70
08E1:31 D8 99 32 D8 B9 59 D8 50
08E9:99 5A D8 88 10 EB 68 8D 8F
08F1:5B D8 68 8D 33 D8 68 8D 27
08F9:0B D8 A0 00 A2 10 AD 00 8A
0901:DC 29 10 F0 09 CA D0 F6 E8
0909:88 D0 F1 4C CC 08 A9 00 70
0911:8D 3F 03 8D 40 03 8D 41 5D
0919:03 A9 03 8D 42 03 A9 01 C2
0921:8D 43 03 A9 07 85 02 78 90
0929:A9 00 8D 0E DC A9 01 8D BF
0931:1A D0 A9 1B 8D 11 D0 A9 67
0939:11 8D 14 03 A9 0E 8D 15 9F
0941:03 58 A9 FB 85 57 A9 12 CE
0949:85 58 A0 00 84 59 B1 57 8C
0951:85 5A C8 B1 57 85 5B A9 22
0959:25 85 5C A9 05 85 5D A9 28
0961:0E 8D 44 03 8D 45 03 A9 C7
0969:00 8D 46 03 A9 24 8D 48 19
0971:03 A9 04 8D 49 03 A9 0E 80
0979:8D 86 02 20 AF 0E A9 40 7F
0981:A0 10 20 E9 0D A9 01 8D 29
0989:86 02 20 4B 0E A0 27 A9 03
0991:A0 99 F0 04 A9 00 99 F0 2A
0999:D8 A9 4A 99 18 05 A9 4B D8
09A1:99 C0 07 88 10 E9 A9 E1 77
09A9:8D F8 07 A9 64 8D 00 D0 66
09B1:A9 A4 8D 01 D0 A9 00 8D 3E
09B9:02 D0 8D 03 D0 8D 10 D0 90
09C1:A9 03 8D 15 D0 A9 01 8D 29
09C9:1C D0 AD 1E D0 D0 FB AD 25
09D1:1F D0 D0 FB A9 08 8D 22 2C
09D9:D0 A9 0D 8D 23 D0 A9 06 EE
09E1:8D 25 D0 A9 07 8D 26 D0 44
09E9:A9 0C 8D 27 D0 A9 08 8D C2
09F1:04 D4 8D 0B D4 8D 12 D4 73
09F9:A9 00 A0 17 99 00 D4 88 65
0A01:10 FA A9 0F 8D 18 D4 AD 26
0A09:44 03 0A 0A 0A 49 FF 8D E4
0A11:00 D4 A9 02 8D 01 D4 A9 73
0A19:CD 8D 02 D4 A9 0C 8D 03 A0
0A21:D4 A9 60 8D 06 D4 A9 43 09
0A29:8D 04 D4 A9 2D 8D 0E D4 CA
0A31:A9 01 8D 0F D4 A9 50 8D 78
0A39:14 D4 A9 81 8D 12 D4 CE 07
0A41:48 03 10 76 A9 24 8D 48 E4
0A49:03 AD 00 DC 8D 4A 03 29 DC
0A51:01 D0 0B CE 01 D0 A9 E2 E9
0A59:8D F8 07 4C 76 0A AD 4A 99
0A61:03 29 02 D0 0B EE 01 D0 75
0A69:A9 E0 8D F8 07 4C 76 0A 2C
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0A79:10 40 A9 04 8D 49 03 AD 60
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1921:07 00 10 E4 55 55 55 55 27
1929:55 08 00 20 55 55 55 55 0A
1931:55 55 08 00 20 55 55 55 BA
1939:55 55 55 08 00 20 55 55 17
1941:55 55 55 6D 09 00 30 F6 94
1949:55 55 55 55 08 00 00 00 BB
1951:20 55 55 55 6D 09 00 00 78
1959:00 30 F6 55 55 08 00 10 A6
1961:44 07 00 20 55 55 08 00 89
1969:20 55 08 00 20 55 55 08 0B
1971:00 20 55 08 00 20 55 55 57
1979:08 00 30 66 09 00 20 55 F9
1981:55 4C 07 00 00 00 10 E4 57
1989:55 55 55 08 00 00 00 20 07
1991:55 55 55 55 4C 07 00 10 52
1999:E4 55 55 55 55 55 08 00 A3
19A1:20 55 55 55 55 55 55 08 EB
19A9:00 20 55 55 55 55 55 55 E3
19B1:08 00 20 55 55 55 55 55 41
19B9:6D 09 00 30 F6 55 55 55 F4
19C1:55 08 00 00 00 20 55 55 21
19C9:55 6D 09 00 00 00 30 F6 7A
19D1:55 55 08 00 10 44 07 00 A4
19D9:20 55 55 08 00 20 55 08 CF
19E1:00 20 55 6D 09 00 20 55 7B
19E9:08 00 30 F6 0A 00 00 30 16
19F1:66 09 00 00 B0 0A 00 71 B8
19F9:00 00 00 71 00 B0 0A 00 1A
1A01:82 00 00 00 82 00 B0 0A F5
1A09:00 93 00 00 00 93 00 B0 21
1A11:0A 00 00 00 00 00 00 00 4A
1A19:B0 0A 00 00 00 00 00 00 28
1A21:00 B0 0A 10 74 00 71 00 4A
1A29:41 07 B0 0A 20 85 00 82 10
1A31:00 52 08 B0 0A 30 96 00 44
1A39:93 00 63 09 B0 0A 00 00 E1
1A41:00 00 00 00 00 B0 0A 00 4C
1A49:00 00 00 00 00 00 B0 0A E8
1A51:00 00 00 00 00 00 00 B0 36
1A59:0A 71 00 71 00 71 00 71 3D
1A61:B0 0A 82 00 82 00 82 00 D9
1A69:82 B0 0A 93 00 93 00 93 67
1A71:00 93 B0 0A 00 00 00 00 41
1A79:00 00 00 B0 0A 00 00 00 09
1A81:00 00 00 00 B0 0A 00 00 63
1A89:00 00 00 00 00 B0 7C 10 89
1A91:74 00 71 00 41 07 E1 85 9D
1A99:20 85 00 82 00 52 08 52 13
1AA1:9D 30 96 00 93 00 63 09 EF
1AA9:F3 0A 00 00 00 00 00 00 5A
1AB1:00 B0 0A 00 00 00 00 00 53
1AB9:00 00 B0 0A 00 00 00 00 A4
1AC1:00 00 00 B0 0A 41 74 00 3F
1AC9:71 00 41 74 B0 0A 52 85 FD
1AD1:00 93 00 52 85 B0 0A 52 65
1AD9:85 00 00 00 52 85 B0 0A E4
1AE1:63 96 00 00 00 63 96 B0 D8
1AE9:0A 00 00 00 00 00 00 00 23
1AF1:B0 0A 71 00 10 07 00 00 CB
1AF9:71 B0 0A 93 00 30 09 00 60
1B01:00 93 B0 0A 00 00 00 00 D2
1B09:00 00 00 B0 0A 00 00 00 9A
1B11:00 41 07 00 B0 1A 07 00 74
1B19:71 00 52 08 10 B7 3A 09 AF
1B21:00 93 00 63 09 30 B9 0A F8
1B29:00 10 07 71 00 00 00 B0 0C
1B31:0A 00 30 09 93 00 00 00 9F
1B39:B0 0A 00 00 00 00 00 00 4A
1B41:71 B0 0A 10 07 00 00 00 D6
1B49:00 93 B0 0A 30 09 00 00 C0
1B51:00 71 00 B0 0A 00 00 71 B0
1B59:00 71 93 10 B7 0A 00 00 45
1B61:93 00 93 00 30 B9 0A 00 50
1B69:00 00 00 00 00 00 B0 0A 0B
1B71:00 00 00 00 00 00 00 B0 58
1B79:99 99 99 99 99 99 99 99 AF
1B81:99 99 99 99 99 99 99 99 B7
1B89:99 99 99 99 99 99 99 99 BF
1B91:99 99 99 99 99 99 99 99 C7
1B99:99 99 99 99 99 99 99 99 CF
1BA1:99 99 99 99 99 99 99 99 D7
1BA9:99 99 99 99 99 99 99 99 DF
1BB1:99 99 99 99 0A 00 41 74 2F
1BB9:00 41 74 00 B0 7C 00 52 98
```


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```
1BC1:85 00 52 85 00 E1 9D 00 20
1BC9:52 85 00 52 85 00 F3 0A CD
1BD1:00 63 96 00 63 96 00 B0 D9
1BD9:0A 00 00 00 00 00 00 00 15
1BE1:B0 0A 00 00 00 00 00 00 F2
1BE9:00 B0 0A 00 71 00 00 00 19
1BF1:71 00 B0 7C 00 93 00 00 0D
1BF9:00 93 00 E1 9D 00 00 00 20
1C01:00 00 00 00 F3 0A 00 00 01
1C09:00 71 00 00 00 B0 0A 00 74
1C11:10 07 93 10 07 00 B0 0A 2A
1C19:71 30 09 00 30 09 71 B0 70
1C21:0A 93 00 00 71 00 00 93 62
1C29:B0 0A 00 00 00 82 00 00 46
1C31:00 B0 0A 71 00 00 93 00 15
1C39:00 71 B0 0A 82 00 00 00 98
1C41:00 00 82 B0 0A 93 00 00 73
1C49:71 00 00 93 B0 0A 00 00 21
1C51:00 C2 07 00 00 B0 0A 10 02
1C59:07 00 D2 09 10 07 B0 0A 08
1C61:30 09 10 8E 00 30 09 B0 62
1C69:0A 00 00 30 8F 00 00 00 26
1C71:B0 0A 00 00 00 93 00 00 D2
1C79:00 B0 0A 00 00 00 00 00 1F
1C81:00 00 B0 0A 71 00 00 71 6D
1C89:00 00 71 B0 0A 93 00 00 99
1C91:82 00 00 93 B0 0A 00 10 02
1C99:07 93 10 07 00 B0 0A 00 83
1CA1:30 09 00 30 09 00 B0 0A EA
1CA9:00 00 00 71 00 00 00 B0 A9
1CB1:0A 00 00 00 93 00 00 00 8B
1CB9:B0 0A 00 00 00 00 00 00 CC
1CC1:00 B0 4C 74 00 00 00 00 F6
1CC9:00 41 E4 55 85 00 00 00 70
1CD1:00 00 52 55 55 C5 44 74 68
1CD9:00 41 44 5E 55 55 55 55 D0
1CE1:85 00 52 55 55 55 55 55 7C
1CE9:55 85 00 52 55 55 55 6D 6B
1CF1:66 66 96 00 63 66 66 F6 42
1CF9:0A 00 00 00 00 00 00 00 37
1D01:B0 0A 00 00 00 00 00 00 16
1D09:00 B0 0A 71 10 07 71 10 57
1D11:07 71 B0 0A 82 20 08 82 09
1D19:20 08 82 B0 0A 82 20 08 63
1D21:82 20 08 82 B0 0A 82 20 A0
1D29:08 82 20 08 82 B0 0A 82 F9
1D31:20 08 82 20 08 82 B0 0A 85
1D39:82 20 08 82 20 08 82 B0 BC
1D41:0A 82 20 08 82 20 08 82 CC
1D49:B0 0A 82 20 08 82 20 08 43
1D51:82 B0 0A 82 20 08 82 20 A8
1D59:08 82 B0 0A 82 20 08 93 27
1D61:20 08 82 B0 0A 82 20 08 AB
1D69:00 20 08 82 B0 0A 82 30 B7
1D71:09 00 30 09 82 B0 0A 82 34
1D79:00 00 00 00 10 8E B0 0A D9
1D81:82 00 00 00 00 20 85 B0 39
1D89:0A 82 00 00 00 00 30 8F 59
1D91:B0 0A 82 00 10 44 07 00 96
1D99:82 B0 0A 82 71 20 55 08 69
1DA1:71 82 B0 0A 93 93 20 55 6C
1DA9:08 93 93 B0 0A 00 00 30 CA
1DB1:66 09 00 00 B0 0A 00 00 0F
1DB9:00 00 00 00 00 B0 0A 00 CA
1DC1:00 00 00 00 00 00 B0 4C A9
1DC9:44 07 00 00 00 10 74 B0 C1
1DD1:55 55 08 00 00 00 20 85 D2
1DD9:B0 6D DF 09 00 00 00 30 84
1DE1:8F B0 0A 82 00 71 00 71 B0
1DE9:00 82 B0 0A 82 00 82 00 94
1DF1:82 00 82 B0 0A 82 00 82 A5
1DF9:00 82 00 82 B0 0A 82 00 AF
1E01:82 00 82 00 82 B0 0A 82 3C
1E09:00 82 00 82 00 82 B0 0A 83
1E11:82 00 82 00 82 00 82 B0 A8
1E19:0A 82 00 93 00 93 00 82 05
1E21:B0 0A 82 00 00 00 00 00 88
1E29:82 B0 0A 82 41 07 00 00 62
1E31:00 82 B0 0A 82 63 09 00 78
1E39:00 71 82 E1 0A 82 00 00 9A
1E41:71 71 93 82 52 0A 93 00 0F
1E49:00 93 93 00 93 F3 0A 00 5D
1E51:00 00 00 00 00 00 B0 0A F8
1E59:00 00 00 00 00 00 00 B0 46
```

Flash Card

Article on page 22.

```
CK 10 POKE53280,6:POKE53281,15
QC 20 PRINT"{CLR}{BLU}":PRINTT
      AB(12)"COPYRIGHT 1989"
MR 30 PRINTTAB(6)"{DOWN}COMPUT
      E! PUBLICATIONS, INC."
PJ 40 PRINTTAB(10)"{DOWN}ALL R
      IGHTS RESERVED"
PE 50 FOR X=1TO2000:NEXT
QX 60 GOSUB1080:GOTO1260
XB 70 PRINTCHR$(147)
SD 80 A$="FLASH":Z=VA+81:GOSUB
      1110
JC 90 A$="CARD":Z=VA+321:GOSUB
      1110
MQ 100 FORI=1TO13:PRINT:NEXTI
DA 110 PRINTTAB(13)"1. "P$(1)
JD 120 PRINTTAB(13)"2. "P$(2)
RS 130 PRINTTAB(13)"3. "P$(3)
CM 140 PRINTTAB(13)"4. "P$(4)
PJ 150 PRINTTAB(13)"5. "P$(5):
      PRINT
SD 160 GETJ$:IFJ$<>""THEN160
AJ 170 I=0:PRINTTAB(13)P$(6);:
      INPUTI
AM 180 IFI<1ORI>5THEN170
CR 190 ONIGOTO200,210,220,230,
      240
XG 200 IT=43:P=1:GOTO700
HP 210 IT=45:P=2:GOTO700
AR 220 IT=42:P=3:GOTO570
BB 230 IT=47:P=4:GOTO570
ME 240 END
FA 250 HN=HA-LA+1
MJ 260 TN=INT(RND(0)*(HA-LA+1)
      )+LA
GR 270 BN=INT(RND(0)*(HA-LA+1)
      )+LA
AJ 280 IFAZ(TN,BN)=1THEN260
RB 290 AZ(TN,BN)=1:AY=AY+1
DH 300 IFIT=43THENAN=TN+BN
EF 310 IFIT=45THENNA=TN+BN:AN=
      TN:TN=NA
FH 320 IFIT=42THENAN=TN*BN
PM 330 IFIT=47THENNA=TN*BN:AN=
      TN:TN=NA
FP 340 IFAN>INT(AN)THEN370
FR 350 IFAN>9ORTN>9ORBN>9THENL
      I=1
EK 360 GOSUB810
MA 370 IFAY=(HN)*(HN)THENGOTO1
      200
CB 380 LI=0:GOTO260
SF 390 S=0
FB 400 IFS=1THEN440
ME 410 TN=INT(RND(0)*(NH-NL+1)
      )+NL
CQ 420 BN=HA
RF 430 IFS=0THEN460
DC 440 TN=HA
CG 450 BN=INT(RND(0)*(NH-NL+1)
      )+NL
GD 460 IFAZ(TN,BN)=1THEN530
PS 470 AZ(TN,BN)=1:AY=AY+1
JK 480 IFIT=42THENAN=TN*BN
JB 490 IFIT=47THENNA=TN*BN:AN=
      TN:TN=NA
FK 500 LI=1:GOSUB810
GH 510 IFIT=42ANDAY=19THEN10
KK 520 IFIT=47ANDAY=10THEN10
PG 530 S=S+1
FA 540 IFIT=47THEN390
EX 550 IFS>1THEN390
GF 560 GOTO400
GJ 570 GOSUB1240
AC 580 PRINTTAB(10)"1. SELECT
      {SPACE}RANGE"
SJ 590 PRINT:PRINTTAB(10)"2. P
      RACTICE TABLES":PRINT
FE 600 GETJ$:IFJ$<>""THEN600
GA 610 I=0:PRINTTAB(10)P$(6);:
      INPUTI
AF 620 IFI<1ORI>2THEN570
EP 630 IFI=1THEN700
HQ 640 GOSUB1240
JF 650 PRINT:PRINTTAB(05)"FOR
      {SPACE}TABLES "P$(6):PR
      INT
HK 660 GETJ$:IFJ$<>""THEN660
HR 670 HA=0:PRINTTAB(05)"FROM"
      ;NL;"TO";NH;:INPUTHA
BG 680 IFHA<NLORHA>NHTHEN570
PD 690 GOTO390
RB 700 GOSUB1240
PA 710 PRINTTAB(5)"FLASH CARD
      {SPACE}WILL RANDOMLY DI
      SPLAY"
HF 720 PRINT:PRINTTAB(5)"ALL C
      OMBINATIONS IN A RANGE"
AX 730 PRINT:PRINTTAB(5)"OF DI
      FFICULTY FROM";NL;"TO";
      NH
RF 740 GETJ$:IFJ$<>""THEN740
FB 750 PRINT:PRINTTAB(5)"HIGHE
      ST NUMBER";:INPUTHA
FD 760 IFHA<NLORHA>NHTHEN740
DM 770 PRINT:PRINTTAB(5)"LOWES
      T NUMBER ";:INPUTLA
DE 780 IFLA<NLORLA>NHTHEN770
FM 790 IFLA>HATHEN700
RE 800 GOTO250
HR 810 PRINTCHR$(147)
HA 820 IFTN<10THEN880
PR 830 IFTN<100THEN860
SS 840 A=INT(TN/100)+48:X=VA+0
      90
EQ 850 TN=TN-((A-48)*100):GOSU
      B1150
QQ 860 A=INT(TN/10)+48:X=VA+09
      5
JA 870 TN=TN-((A-48)*10):GOSUB
      1150
JP 880 A=TN+48:X=VA+100:GOSUB1
      150
RS 890 IFBN<10THEN920
QE 900 A=INT(BN/10)+48:X=VA+37
      5
AR 910 BN=BN-((A-48)*10):GOSUB
      1150
MF 920 A=BN+48:X=VA+380:GOSUB1
      150
QQ 930 A=IT:X=VA+368:GOSUB1150
QP 940 IFLI<1THEN960
KM 950 A=28:X=VA+614:GOSUB1150
CA 960 A=28:X=VA+619:GOSUB1150
KD 970 GETJ$:IFJ$<>""THEN970
MD 980 GETA$:IFA$=""THENGOTO98
      0
RG 990 IFAN<10THEN1050
EJ 1000 IFAN<100THEN1030
GF 1010 A=INT(AN/100)+48:X=VA+
      730
RX 1020 AN=AN-((A-48)*100):GOS
      UB1150
PJ 1030 A=INT(AN/10)+48:X=VA+7
      35
HH 1040 AN=AN-((A-48)*10):GOSU
      B1150
BP 1050 A=AN+48:X=VA+740:GOSUB
      1150
FS 1060 GETJ$:IFJ$<>""THEN1060
FK 1070 GETA$:IFA$=""THENGOTO1
      070
EJ 1080 GOSUB1240
GF 1090 PRINTTAB(13)"PLEASE WA
      IT ..."
HH 1100 FORI=1TO500:NEXTI:RETU
      RN
AQ 1110 FORI=1TOLEN(A$)
AG 1120 A=ASC(MID$(A$,I,1))-64
DB 1130 X=Z+(I*6):GOSUB1150
```


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```
CK 1140 NEXTI:RETURN
CQ 1150 CM=GM+(A*64):W=PEEK(CM
        ):K=1
BB 1160 FORM=XTOX+W-1
DE 1170 FORN=MTOM+40*(H-1)STEP
        40
QA 1180 POKEN+CC,C:POKEN,PEEK(
        CM+K):K=K+1
FG 1190 NEXTN:NEXTM:RETURN
KQ 1200 FORTN=NLTONH:FORBN=NLT
        ONH
DM 1210 AZ(TN,BN)=0:NEXTBN:NEX
        TTN
QA 1220 AY=0:GOTO70
XB 1230 AY=0:GOTO70
KH 1240 PRINTCHR$(147):PRINTTA
        B(15)P$(P)
PM 1250 FORI=1TO5:PRINT:NEXTI:
        RETURN
HC 1260 POKE 650,128:POKE 56,1
        28:CLR
KE 1270 VA=1024:CC=55296-VA:GM
        =36864
QG 1280 C=2:H=5:DIMAZ(50,50):D
        IML$(64)
AJ 1290 G(0)=32:G(1)=160:G(2)=
        98:G(3)=226
KQ 1300 G(4)=223:G(5)=105:G(6)
        =95:G(7)=233
SB 1310 G(8)=97:G(9)=225:G(10)
        =100
DJ 1320 P$(1)="ADDITION":P$(2)
        ="SUBTRACTION"
BJ 1330 P$(3)="MULTIPLICATION"
        :P$(4)="DIVISION"
SC 1340 P$(5)="EXIT":P$(6)="SE
        LECT A NUMBER"
KX 1350 NL=1:NH=10
GG 1360 L$(1)="371110101004111
        0"
SH 1370 L$(3)="3711601001010010
        "
FR 1380 L$(4)="311110100104115
        0"
AC 1390 L$(6)="311110123001230
        0"
BG 1400 L$(8)="311110023001111
        0"
AP 1410 L$(12)="31111000010000
        10"
CF 1420 L$(18)="311110101604154
        40"
PM 1430 L$(19)="37131012310121
        50"
HA 1440 L$(28)="5100001000010000
        01000010000"
JX 1450 L$(42)="44675004500076
        0075460"
HK 1460 L$(43)="50010000100111
        110010000100"
BC 1470 L$(45)="50010000100001
        000010000100"
SK 1480 L$(47)="50230002300123
        100230002300"
KE 1490 L$(48)="41111110001100
        0111111"
SS 1500 L$(49)="40700171111888
        8100008"
MR 1510 L$(50)="47507110751175
        0145001"
MG 1520 L$(51)="4101011010110 1
        0111111"
AM 1530 L$(52)="41110000100001
        0011111"
KE 1540 L$(53)="4111011010110 1
        0110111"
GB 1550 L$(54)="4111111010110 1
        0110111"
HJ 1560 L$(55)="4100001000010 0
        0011111"
JR 1570 L$(56)="4111111010110 1
        0111111"
HQ 1580 L$(57)="4111011010110 1
        0111111"
CK 1590 L$(61)="4010100101001 0
        1001010"
FB 1600 Y=-1
JB 1610 FORI=0TO4032STEP64
JH 1620 Y=Y+1:IFVAL(L$(Y))=0TH
        EN1690
JR 1630 XY=VAL(MID$(L$(Y),1,1)
        )
SC 1640 POKEGM+I,XY
HH 1650 FORZ=2TOLEN(L$(Y))
MD 1660 XY=VAL(MID$(L$(Y),Z,1)
        )
EB 1670 POKEGM+I+Z-1,G(XY)
JX 1680 NEXTZ
JB 1690 NEXTI:GOTO70
```

Vertical Scroller

Article on page 67.

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
FE 20 GOSUB1000
HP 30 POKE53280,0:POKE53281,0:
      PRINT"{CLR}{3 SPACES}COP
      YRIGHT 1989 COMPUTE! PUB
      ., INC."
FB 40 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED"
SA 50 PRINT"{DOWN}{YEL}
      {11 SPACES}VERTICAL SCRO
      LLER"
KQ 60 PRINT"{DOWN}{CYN}
      {5 SPACES}SYS 49201 MOVE
      S SCREEN DOWN"
XS 70 PRINT"{DOWN}{CYN}
      {5 SPACES}SYS 49152 MOVE
      S SCREEN BACK UP"
EP 80 PRINT"{3 DOWN}{7}
      {3 SPACES}PRESS ANY KEY
      {SPACE}FOR A DEMONSTRATI
      ON"
QK 90 POKE 252,24:REM SET SCRE
      EN MODE
QF 100 GETA$:IFA$=""THEN100
CH 110 SYS49201
CP 120 SYS49152
EJ 130 GOTO100
FD 1000 FORAD=49152TO49247:REA
        DBY
MQ 1010 POKEAD,BY:X=X+BY:NEXTA
        D
CG 1020 IFX<>15241THENPRINT"ER
        ROR IN DATA STATEMENTS
        .":END
EH 1030 V=53248:POKEV+21,255:P
        OKEV+29,255
HR 1040 FORI=832TO896:POKEI,25
        5:NEXTI
AJ 1050 FORI=2040TO2047:POKEI,
        13:NEXTI
EB 1060 FORI=V+1TOV+16STEP2:PO
        KEI,247:NEXTI
EH 1070 FORI=0TO8STEP2:POKEV+I
        ,24+I*24:NEXTI
PD 1080 FORI=0TO4STEP2:POKEV+I
        +10,I*24:NEXTI
GG 1090 POKEV+16,224:FORI=39TO
        46:POKEV+I,0:NEXT
RF 1100 RETURN
SR 1110 DATA120,169,0,133,251,
        166,251
DS 1120 DATA173,18,208,208,251
        ,173,18
MC 1130 DATA208,205,18,208,240
        ,251,41
PE 1140 DATA7,5,252,141,17,208
        ,232
GM 1150 DATA208,238,230,251,23
        0,251,165
CJ 1160 DATA251,201,207,144,22
        1,165,252
AQ 1170 DATA9,27,141,17,208,88
        ,96
GE 1180 DATA120,169,207,133,25
        1,166,251
JK 1190 DATA173,18,208,208,251
        ,173,18
FS 1200 DATA208,205,18,208,240
        ,251,41
MA 1210 DATA7,5,252,141,17,208
        ,232
BD 1220 DATA208,238,198,251,19
        8,251,165
DA 1230 DATA251,201,2,176,221,
        169,11
PC 1240 DATA141,17,208,88,96
```

The GEOS Column

See instructions in article on page 61 before typing in.

Program 1: Turbo Format

```
C000:BF FF FF FF 83 FB FF EF 5D
C008:FB FC EA 88 84 EA BA B7 A9
C010:EA BA B7 E8 B8 87 FF FF 1F
C018:FF FF C7 FF FF 83 FF FF A0
C020:83 3F FF 83 3F FF C7 FF F4
C028:FF FF FF FF FF FF FF EF 99
C030:FF FF EF FF FF EF FF FF 6F
C038:EF FF FF EF FF FF FF FF B0
C040:83 05 00 00 04 56 0A 00 52
C048:04 47 65 6F 73 54 75 72 8B
C050:62 6F 46 6F 72 6D 61 74 1F
C058:20 00 00 00 00 52 2E 20 AF
C060:4B 65 6E 74 20 46 61 72 45
C068:72 69 73 00 00 00 00 00 EB
C070:00 00 00 00 00 00 00 00 F1
C078:00 00 00 00 00 00 00 00 F9
C080:00 00 00 00 00 00 00 00 02
C088:00 00 00 00 00 00 00 00 0A
C090:00 00 00 00 00 00 00 00 12
C098:00 00 00 00 54 68 69 73 A4
C0A0:20 69 73 20 6D 79 20 74 03
C0A8:75 72 62 6F 20 66 6F 72 B0
C0B0:6D 61 74 20 61 70 70 6C EB
C0B8:69 63 61 74 69 6F 6E 00 21
C0C0:00 00 00 00 00 00 00 00 42
C0C8:00 00 00 00 00 00 00 00 4A
C0D0:00 00 00 00 00 00 00 00 52
C0D8:00 00 00 00 00 00 00 00 5A
C0E0:00 00 00 00 00 00 00 00 62
C0E8:00 00 00 00 00 00 00 00 6A
C0F0:00 00 00 00 00 00 00 00 72
C0F8:00 00 00 00 A9 C0 85 2F 05
C100:A9 04 85 03 A9 37 85 02 71
C108:20 56 C2 A5 02 C9 04 F0 14
C110:0C C9 03 F0 03 4C 2C C2 DF
C118:A9 26 8D 36 07 A9 04 85 7B
C120:03 A9 9E 85 02 A9 04 85 FF
C128:0D A9 B4 85 0C 20 56 C2 DB
C130:4C 11 05 81 0B 10 10 56 E5
C138:04 04 02 18 0B 47 22 6E A8
C140:04 03 02 30 0B 47 3A 80 34
C148:04 02 02 48 0B 47 52 92 BF
C150:04 00 18 54 55 52 42 4F E5
C158:20 46 4F 52 4D 41 54 20 C4
C160:46 4F 52 20 47 45 4F 53 68
C168:1B 00 46 6F 72 6D 61 74 B9
C170:2C 20 6E 6F 20 76 65 72 EE
C178:69 66 79 00 46 6F 72 6D BB
C180:61 74 20 61 6E 64 20 76 A7
C188:65 72 69 66 79 00 45 78 BD
C190:69 74 20 66 6F 72 6D 61 D1
C198:74 00 81 0B 10 10 F4 04 E5
C1A0:0B 10 20 C7 04 0B 10 28 C2
C1A8:E0 04 0D 10 38 0C 13 00 58
C1B0:64 69 73 6B 6E 61 6D 65 1F
```

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```
C1B8:2C 69 64 00 00 00 00 00 39
C1C0:00 00 00 54 48 45 4E 20 9D
C1C8:45 4E 54 45 52 20 44 49 46
C1D0:53 4B 20 4E 41 4D 45 20 A3
C1D8:27 2C 27 00 54 48 45 4E 7C
C1E0:20 45 4E 54 45 52 20 44 CC
C1E8:49 53 4B 20 49 44 1B 00 E2
C1F0:18 0E 57 41 52 4E 49 4E AF
C1F8:47 2D 2D 43 48 41 4E 47 70
C200:45 20 44 49 53 4B 53 20 DB
C208:4E 4F 57 0F 00 A5 BA 20 90
C210:B0 C2 20 35 C2 20 5C C2 08
C218:A4 BA B9 86 84 C9 01 F0 7C
C220:35 20 5F C2 A9 05 85 03 CF
C228:A9 36 85 02 20 56 C2 4C 0D
C230:00 04 81 0B 10 10 40 05 DD
C238:01 02 20 00 18 45 52 52 8F
C240:4F 52 2D 2D 4E 4F 54 20 F2
C248:41 20 31 35 34 31 20 44 DA
C250:52 49 56 45 1B 00 A9 16 B2
C258:85 FF A9 8F 85 FB A9 07 45
C260:85 FC A9 00 85 FD A9 05 99
C268:85 FE 20 51 06 A0 00 B9 F5
C270:B4 04 C9 2C F0 07 99 1F 43
C278:07 C8 4C 73 05 C8 B9 B4 E7
C280:04 8D 31 07 C8 B9 B4 04 9C
C288:8D 32 07 20 3D 06 20 44 CA
C290:0A A0 02 B9 53 0A 20 A8 CA
C298:FF 88 10 F7 A9 00 20 A8 F7
C2A0:FF A9 05 20 A8 FF 20 AE 67
C2A8:FF A5 BA 20 B4 FF A9 6F 59
C2B0:85 B9 20 96 FF A0 00 20 77
C2B8:A5 FF 99 15 06 C8 C9 0D 89
C2C0:D0 F5 A9 00 99 14 06 20 AA
C2C8:AB FF 20 44 0A A9 49 20 16
C2D0:A8 FF A9 30 20 A8 FF A9 30
C2D8:3A 20 A8 FF 20 AE FF 20 74
C2E0:E7 FF A0 00 A9 A0 99 1F 90
C2E8:07 C8 C0 10 D0 F8 A9 96 91
C2F0:8D 36 07 20 5F C2 20 EA DE
C2F8:C1 A9 06 85 03 A9 0B 85 3D
C300:02 20 56 C2 4C 00 04 81 73
C308:0B 10 10 15 06 01 02 20 C4
C310:00 18 44 75 6D 6D 79 20 B1
C318:73 70 61 63 65 20 74 6F DB
C320:20 62 65 20 66 69 6C 6C 1D
C328:65 64 20 62 79 20 65 72 2F
C330:72 6F 72 20 6D 73 67 1B 40
C338:00 A9 08 85 FF A9 8F 85 CE
C340:FB A9 06 85 FC A9 00 85 5D
C348:FD A9 04 85 FE 20 35 0A FE
C350:A5 FD 20 A8 FF A5 FE 20 6D
C358:A8 FF A9 20 20 A8 FF A0 AF
C360:00 B1 FB 20 A8 FF C8 C0 6D
C368:20 90 F6 A5 FB 69 1F 85 A6
C370:FB A5 FC 69 00 85 FC A5 4B
C378:FD 69 20 85 FD A5 FE 69 A3
C380:00 85 FE 20 AE FF C6 FF 4E
C388:D0 C3 60 12 01 41 00 15 B8
C390:FF FF 1F 15 FF FF 1F 15 A0
C398:FF FF 1F 15 FF FF 1F 15 A8
C3A0:FF FF 1F 15 FF FF 1F 15 B0
C3A8:FF FF 1F 15 FF FF 1F 15 B8
C3B0:FF FF 1F 15 FF FF 1F 15 C0
C3B8:FF FF 1F 15 FF FF 1F 15 C8
C3C0:FF FF 1F 15 FF FF 1F 15 D0
C3C8:FF FF 1F 15 FF FF 1F 15 D8
C3D0:FF FF 1F 11 FC FF 07 13 56
C3D8:FF FF 07 13 FF FF 07 13 93
C3E0:FF FF 07 13 FF FF 07 13 9B
C3E8:FF FF 07 13 FF FF 07 12 A2
C3F0:FF FF 03 12 FF FF 03 12 12
C3F8:FF FF 03 12 FF FF 03 12 1A
C400:FF FF 03 12 FF FF 03 11 22
C408:FF FF 01 11 FF FF 01 11 D5
C410:FF FF 01 11 FF FF 01 11 DD
C418:FF FF 01 A0 A0 A0 A0 A0 35
C420:A0 A0 A0 A0 A0 A0 A0 A0 A9
C428:A0 A0 A0 A0 A0 30 30 A0 0F
C430:32 41 96 A0 A0 A0 00 00 87
C438:00 00 00 00 00 00 00 00 C1
C440:00 00 00 00 00 00 00 00 C9
C448:00 00 00 00 00 00 00 00 D1
C450:00 00 00 00 00 00 00 00 D9
C458:00 00 00 00 00 00 00 00 E1
C460:00 00 00 00 00 00 00 00 E9
C468:00 00 00 00 00 00 00 00 F1
C470:00 00 00 00 00 00 00 00 F9
C478:00 00 00 00 00 00 00 00 02
C480:00 00 00 00 00 00 00 00 0A
C488:00 00 00 78 AD A2 04 85 1F
C490:12 AD A3 04 85 13 AD A7 BE
C498:04 8D FD 05 A9 A0 8D A7 2A
C4A0:04 AD 00 1C 09 0C 8D 00 EC
C4A8:1C 29 10 D0 05 A9 A6 4C 02
C4B0:0F 06 38 A5 22 69 01 85 E2
C4B8:4A 20 32 06 C6 4A D0 F9 11
C4C0:A2 00 86 4B 20 39 06 A9 BC
C4C8:01 85 22 20 4B F2 85 43 EE
C4D0:8A 0A 0A 0A 0A 0A 85 44 CB
C4D8:AD 00 1C 29 9F 05 44 8D 76
C4E0:00 1C 20 53 06 A9 55 8D B9
C4E8:01 1C A0 00 84 4D A5 39 EB
C4F0:99 00 03 C8 C8 A5 4D 99 45
C4F8:00 03 C8 A5 22 99 00 03 31
C500:C8 A5 13 99 00 03 C8 A5 98
C508:12 99 00 03 C8 A9 0F 99 D7
C510:00 03 C8 99 00 03 C8 B9 66
C518:FA 02 59 FB 02 59 FC 02 FD
C520:59 FD 02 99 F9 02 E6 4D A4
C528:A5 4D C5 43 90 C0 98 48 C7
C530:A9 00 85 30 A9 03 85 31 D9
C538:20 30 FE 68 A8 88 20 E5 D3
C540:FD 20 F5 FD A9 00 85 32 FB
C548:20 61 06 C6 4D D0 F9 50 5B
C550:FE B8 20 00 FE A9 00 85 B1
C558:32 A5 22 C9 12 D0 28 A9 15
C560:04 85 31 20 E9 F5 85 3A E3
C568:20 8F F7 20 FE 06 D0 2A C4
C570:A2 09 50 FE B8 CA D0 FA 17
C578:20 53 06 20 BB 06 20 C9 AB
C580:06 50 FE B8 20 00 FE 20 AD
C588:26 07 D0 0E E6 22 20 28 0C
C590:06 A5 22 C9 24 F0 05 4C A4
C598:40 05 85 4B AD 00 1C 29 B9
C5A0:F3 8D 00 1C A9 EC 8D 0C 73
C5A8:1C A5 4B F0 05 29 7F 4C 3C
C5B0:C8 C1 60 20 2B 06 AE 00 ED
C5B8:1C E8 4C 39 06 20 35 06 CA
C5C0:AE 00 1C CA 8A 29 03 85 58
C5C8:44 AD 00 1C 29 FC 05 44 2F
C5D0:8D 00 1C A0 06 A2 00 CA 36
C5D8:D0 FD 88 D0 FA 60 A9 CE E5
C5E0:8D 0C 1C A9 FF 8D 01 1C A8
C5E8:8D 03 1C 60 20 BB 06 A2 24
C5F0:0A A4 32 50 FE B8 B9 00 44
C5F8:03 8D 01 1C C8 CA D0 F3 52
C600:A2 09 50 FE B8 A9 55 8D BF
C608:01 1C CA D0 F5 20 BB 06 31
C610:A0 04 50 FE B8 B9 9C 07 D5
C618:8D 01 1C 88 10 F4 A2 40 92
C620:A0 04 50 FE B8 B9 A1 07 EF
C628:8D 01 1C 88 10 F4 CA D0 83
C630:EF A9 55 A2 08 50 FE B8 2D
C638:8D 01 1C CA D0 F7 A5 32 E0
C640:18 69 0A 85 32 60 A2 05 2B
C648:A9 FF 50 FE B8 8D 01 1C BE
C650:CA D0 F7 60 A0 BB 50 FE 10
C658:B8 B9 00 01 8D 01 1C C8 32
C660:D0 F4 50 FE B8 B9 00 04 3E
C668:8D 01 1C C8 D0 F4 60 A9 D1
C670:D0 8D 05 18 2C 05 18 10 A1
C678:0D 2C 00 1C 30 F6 AD 01 13
C680:1C B8 A0 00 98 60 A9 A1 99
C688:60 A9 5A 85 4B 20 E4 06 FE
C690:D0 17 A4 32 A2 0A 50 FE E0
C698:B8 AD 01 1C D9 00 03 D0 75
C6A0:09 C8 CA D0 F1 A9 00 85 07
C6A8:4B 60 C6 4B D0 DF A9 A0 7B
C6B0:60 A5 43 85 4D A5 22 C9 A7
C6B8:12 D0 30 20 FE 06 D0 63 A0
C6C0:20 B3 06 20 E4 06 D0 5B 4A
C6C8:A0 BB 50 FE B8 AD 01 1C 2A
C6D0:D9 00 01 D0 4F C8 D0 F2 AA
C6D8:A2 FC 50 FE B8 AD 01 1C 8B
C6E0:D9 00 04 D0 3F C8 CA D0 6C
C6E8:F1 F0 32 20 FE 06 D0 33 D8
C6F0:20 B3 06 20 E4 06 D0 2B 4A
C6F8:A0 04 50 FE B8 AD 01 1C 6C
C700:D9 9C 07 D0 1F 88 10 F2 BF
C708:A2 40 A0 04 50 FE B8 AD EA
C710:01 1C D9 A1 07 D0 0D 88 9A
C718:10 F2 CA D0 ED C6 4D D0 C8
C720:CA A9 00 60 A9 A5 60 4A 74
C728:29 A5 D4 55 4A 29 A5 94 7C
C730:52 20 44 0A A0 02 B9 50 EA
C738:0A 20 A8 FF 88 10 F7 60 BE
C740:A5 BA 20 B1 FF A9 6F 85 7B
C748:B9 4C 93 FF 57 2D 4D 45 89
C750:2D 4D 00 00 00 00 00 00 C9
```

Program 2: Turbo Convert

```
BH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
      - ALL RIGHTS RESERVED
SH 20 PRINT"{CLR}{N}{4 DOWN}BU
      ILDING TURBO FORMAT...PL
      EASE WAIT"
MC 30 PRINT"{14 DOWN}"TAB(13)"
      COPYRIGHT 1989"
BG 40 PRINTTAB(7)"COMPUTE! PUB
      LICATIONS, INC.":PRINTTA
      B(10)"ALL RIGHTS RESERVE
      D."
HQ 50 OPEN15,8,15:OPEN2,8,2,"0
      :TURBO FORMAT,P,R"
DM 60 INPUT#15,A$,B$,C$,D$:IFV
      AL(A$)>0THENPRINTA$,B$,C
      $,D$:CLOSE2,15:END
KF 70 PRINT#15,"M-R"CHR$(24)CH
      R$(0)CHR$(2)
DC 80 GET#15,T$:T=ASC(T$+CHR$(
      0))
CA 90 GET#15,S$:S=ASC(S$+CHR$(
      0))
JQ 100 PRINT#15,"M-R"CHR$(97)C
       HR$(2)
KB 110 GET#15,D$:D=ASC(D$+CHR$
       (0))
CG 120 PRINT#15,"M-R"CHR$(103)
       CHR$(2)
HB 130 GET#15,I$:I=ASC(I$+CHR$
       (0))
JD 140 OPEN3,8,3,"#"
CX 150 PRINT#15,"U1";3;0;T;S
FQ 160 GET#3,TP$:TP=ASC(TP$+CH
       R$(0))
ES 170 GET#3,SP$:SP=ASC(SP$+CH
       R$(0))
PF 180 PRINT#15,"B-P";3;0
HP 190 PRINT#3,CHR$(0);CHR$(25
       5);
PC 200 PRINT#15,"U2";3;0;T;S:C
       LOSE2:CLOSE3
FF 210 OPEN2,8,2,"#"
JE 220 PRINT#15,"U1";2;0;18;D
JP 230 PRINT#15,"B-P";2;I
HA 240 PRINT#2,CHR$(131);CHR$(
       TP);CHR$(SP);CHR$(71);C
       HR$(101);CHR$(111);CHR$
       (115);
EX 250 PRINT#2,CHR$(84);CHR$(1
       17);CHR$(114);CHR$(98);
       CHR$(111);CHR$(70);CHR$
       (111);
CC 260 PRINT#2,CHR$(114);CHR$(
       109);CHR$(97);CHR$(116)
       ;
XG 270 PRINT#15,"B-P";2;I+19
EK 280 PRINT#2,CHR$(T);CHR$(S)
       ;CHR$(0);CHR$(6);
PC 290 PRINT#15,"U2";2;0;18;D
GK 300 CLOSE2:CLOSE3:CLOSE15
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

www.commodore.ca

SpeedScript Easy Cursor

See instructions in article on page 54 before typing in.

```
2801:EA A2 24 A0 00 20 18 28 D6
2809:20 18 28 C9 1F F0 03 CA 9E
2811:D0 F6 A2 01 4C B1 0B AD D8
2819:39 00 D0 02 C6 3A C6 39 26
2821:B1 39 60 EA 8A 48 A2 26 34
2829:A0 00 B1 39 C9 1F D0 02 02
2831:A2 01 E6 39 D0 02 E6 3A 1A
2839:CA D0 EF 68 AA 4C B1 0B 9C
2841:48 8A 48 98 48 A0 00 AD 5D
2849:45 20 C9 40 D0 67 C8 B9 F0
2851:45 20 C9 3A D0 F8 C8 98 BD
2859:AA E6 BB C6 B7 CA D0 F9 21
2861:A5 9A 48 A5 B7 48 A5 BB 74
2869:48 A5 BC 48 98 48 A9 00 9C
2871:20 BD FF A9 0F A2 08 A0 8F
2879:0F 20 BA FF 20 C0 FF A2 57
2881:0F 20 C9 FF A9 53 20 D2 48
2889:FF A9 3A 20 D2 FF 68 A8 9D
2891:B9 45 20 F0 06 20 D2 FF 79
2899:C8 D0 F5 A9 0D 20 D2 FF 6A
28A1:20 CC FF A9 0F 20 C3 FF 50
28A9:68 85 BC 68 85 BB 68 85 1F
28B1:B7 68 20 C9 FF 68 A8 68 F3
28B9:AA 68 20 D8 FF 60 AD 0F F6
28C1:08 C9 25 F0 52 A9 25 8D 4D
28C9:A9 09 A9 01 85 2D A9 26 D0
28D1:85 2E A9 01 8D 8B 0B A9 10
28D9:25 8D 8C 0B A9 24 8D 8D E8
28E1:0B A9 25 8D 8E 0B A9 41 D4
28E9:8D D8 12 A9 25 8D D9 12 39
28F1:A9 01 85 FC 85 FE A9 28 7B
28F9:85 FD A9 25 85 FF A0 00 81
2901:B1 FC 91 FE E6 FC E6 FE 85
2909:A9 BF C5 FC D0 F2 A9 25 73
2911:8D 08 25 8D 0B 25 60 A9 01
2919:28 8D 07 25 A9 01 85 2D 9F
2921:A9 29 85 2E A9 01 8D 8B 1E
2929:0B A9 28 8D 8C 0B A9 24 51
2931:8D 8D 0B A9 28 8D 8E 0B 49
2939:A9 41 8D D8 12 A9 28 8D 05
2941:D9 12 60 0D 00 00 00 00 E1
```

Universal Input

See instructions in article on page 52 before typing in.

Program 1: INPUT.ML

```
C000:20 73 00 20 8A AD 20 F7 B3
C008:B7 C0 19 90 03 4C 9E C4 0D
C010:8C A7 02 20 FD AE 20 8A 79
C018:AD 20 F7 B7 C0 28 90 03 BD
C020:4C 9E C4 8C A8 02 AE A7 23
C028:02 18 20 F0 FF 20 FD AE EE
C030:20 8A AD 20 F7 B7 98 18 04
C038:6D A7 02 D0 03 4C 9E C4 F2
C040:C9 1A 90 03 4C 9E C4 8C 62
C048:AA 02 20 FD AE 20 8A AD 3C
C050:20 F7 B7 98 18 6D A8 02 2A
C058:D0 03 4C 9E C4 C9 29 90 A6
C060:03 4C 9E C4 8C A9 02 20 C5
C068:FD AE 20 8A AD 20 F7 B7 D6
C070:C0 02 90 03 4C 9E C4 C0 3C
C078:01 D0 03 20 40 C4 20 FD 64
C080:AE 20 8B B0 A5 47 85 FD 31
C088:A5 48 85 FE A9 00 85 CC B4
C090:8D AB 02 A0 00 84 02 20 44
C098:A3 C4 A5 FB 8D AC 02 A5 5A
C0A0:FC 8D AD 02 AE AA 02 A5 A3
C0A8:FB 8D AE 02 A5 FC 8D AF 6D
C0B0:02 AD AE 02 18 69 28 8D D8
C0B8:AE 02 90 03 EE AF 02 CA 59
C0C0:D0 EF AD AF 02 8D B4 02 09
C0C8:AD AE 02 38 E9 28 8D B3 4F
C0D0:02 B0 03 CE B4 02 20 E4 9F
C0D8:FF F0 FB C9 0D D0 03 4C B0
C0E0:87 C3 C9 1D F0 5B C9 9D 48
C0E8:F0 45 C9 11 F0 61 C9 91 B0
C0F0:D0 03 4C 76 C1 C9 93 D0 B9
C0F8:03 4C 9C C1 C9 13 D0 03 FD
C100:4C AC C1 C9 14 D0 03 4C DF
C108:C6 C1 C9 94 D0 03 4C 5A 67
C110:C2 C9 20 90 C1 C9 A0 B0 9B
C118:04 C9 80 B0 B9 A4 02 20 AF
C120:F0 C2 91 FB 20 05 C3 A9 05
C128:1D 20 D2 FF 4C D6 C0 20 FB
C130:35 C1 4C D6 C0 20 B3 C4 68
C138:20 40 C3 A9 9D 20 D2 FF 02
C140:60 20 B3 C4 20 05 C3 A9 05
C148:1D 20 D2 FF 4C D6 C0 20 1C
C150:B3 C4 EE AB 02 AD AB 02 97
C158:CD AA 02 90 06 CE AB 02 7B
C160:4C D6 C0 A9 11 20 D2 FF 21
C168:A5 FB 18 69 28 85 FB 90 37
C170:02 E6 FC 4C D6 C0 20 B3 C0
C178:C4 CE AB 02 AD AB 02 C9 91
C180:FF D0 06 EE AB 02 4C D6 BC
C188:C0 A9 91 20 D2 FF A5 FB E8
C190:38 E9 28 85 FB B0 02 C6 75
C198:FC 4C D6 C0 20 40 C4 20 40
C1A0:A3 C4 A0 00 84 02 8C AB 2C
C1A8:02 4C D6 C0 20 B3 C4 AE 2F
C1B0:A7 02 AC A8 02 18 20 F0 4A
C1B8:FF 20 A3 C4 A9 00 85 02 5F
C1C0:8D AB 02 4C D6 C0 A5 FB FB
C1C8:CD AC 02 D0 0E A5 FC CD 7A
C1D0:AD 02 D0 07 A5 02 D0 03 10
C1D8:4C D6 C0 A5 FB 85 45 A5 D0
C1E0:FC 85 46 A5 02 8D B0 02 11
C1E8:20 35 C1 A5 FB 85 47 A5 86
C1F0:FC 85 48 A5 02 8D B1 02 63
C1F8:AD AE 02 C5 45 D0 0A AD CA
C200:AF 02 C5 46 D0 03 4C 28 4E
C208:C2 AC B0 02 B1 45 8D B2 C0
C210:02 20 32 C2 8C B0 02 AC E8
C218:B1 02 AD B2 02 91 47 20 DC
C220:46 C2 8C B1 02 4C F8 C1 1B
C228:A9 20 AC B1 02 91 47 4C 6C
C230:D6 C0 C8 CC A9 02 90 0D BA
C238:A0 00 A5 45 18 69 28 85 53
C240:45 90 02 E6 46 60 C8 CC 4D
C248:A9 02 90 0D A0 00 A5 47 9D
C250:18 69 28 85 47 90 02 E6 01
C258:48 60 AD B3 02 85 45 85 41
C260:47 AD B4 02 85 46 85 48 44
C268:AC A9 02 88 B1 45 8C B0 E3
C270:02 88 8C B1 02 C9 20 D0 0E
C278:42 AC B1 02 B1 47 20 E8 74
C280:C2 8C B1 02 AC B0 02 91 9E
C288:45 A5 47 C5 FB D0 0D A5 42
C290:48 C5 FC D0 07 AC B1 02 A8
C298:C4 02 F0 15 AC B1 02 20 C0
C2A0:BE C2 8C B1 02 AC B0 02 09
C2A8:20 D3 C2 8C B0 02 4C 79 F3
C2B0:C2 A9 20 20 D2 FF A9 9D 8F
C2B8:20 D2 FF 4C D6 C0 88 C0 53
C2C0:FF D0 0F AC A9 02 88 A5 33
C2C8:47 38 E9 28 85 47 B0 02 6C
C2D0:C6 48 60 88 C0 FF D0 0F 17
C2D8:AC A9 02 88 A5 45 38 E9 84
C2E0:28 85 45 B0 02 C6 46 60 A7
C2E8:C9 80 90 03 38 E9 80 60 80
C2F0:48 29 80 8D B5 02 68 29 7D
C2F8:3F 48 AD B5 02 F0 04 68 85
C300:09 40 60 68 60 E6 02 A4 F5
C308:02 CC A9 02 90 31 EE AB EB
C310:02 AD AB 02 CD AA 02 90 47
C318:0B C6 02 CE AB 02 A9 9D 5A
C320:20 D2 FF 60 AC A8 02 AD 2C
C328:AB 02 18 6D A7 02 AA 18 92
C330:20 F0 FF 20 A3 C4 A0 00 77
C338:84 02 A9 9D 20 D2 FF 60 3E
C340:C6 02 A4 02 C0 FF D0 3E 46
C348:CE AB 02 AD AB 02 C9 FF 36
C350:D0 0B E6 02 EE AB 02 A9 D3
C358:1D 20 D2 FF 60 AD AB 02 E3
C360:18 6D A7 02 AA AD A8 02 C3
C368:18 6D A9 02 A8 18 20 F0 83
C370:FF 20 A3 C4 A5 FB 38 ED 3C
C378:A9 02 85 FB B0 02 C6 FC DD
C380:AC A9 02 88 84 02 60 E6 65
C388:CC 20 B3 C4 AD AA 02 85 E2
C390:02 A9 02 8D BB 02 A9 00 D5
C398:18 6D A9 02 B0 08 C6 02 12
C3A0:A6 02 D0 F4 F0 02 A9 FF 48
C3A8:A0 00 8D B6 02 91 FD 20 10
C3B0:3A C4 A2 00 A5 34 8D AF A3
C3B8:02 A5 33 38 ED B6 02 8D 70
C3C0:AE 02 B0 03 CE AF 02 AD 4D
C3C8:AF 02 C5 32 90 0B F0 02 19
C3D0:D0 17 AD AE 02 C5 31 B0 61
C3D8:10 CE BB 02 F0 06 20 26 B9
C3E0:B5 4C B2 C3 A2 10 6C 00 17
C3E8:03 A5 33 38 ED B6 02 85 19
C3F0:33 B0 02 C6 34 A5 33 91 1B
C3F8:FD 20 3A C4 A5 34 91 FD 3A
C400:A5 33 85 FD A5 34 85 FE C1
C408:AE A7 02 AC A8 02 18 20 7B
C410:F0 FF 20 A3 C4 A0 00 8C 85
C418:B7 02 A9 00 8D AB 02 A4 F6
C420:02 B1 FB 20 81 C4 AC B7 C8
C428:02 91 FD 20 3A C4 8C B7 8E
C430:02 20 05 C3 CE B6 02 D0 C5
C438:E6 60 C8 D0 02 E6 FE 60 7D
C440:AE A7 02 AC A8 02 18 20 B3
C448:F0 FF AD A7 02 8D B8 02 34
C450:AD AA 02 8D B9 02 A9 20 BD
C458:AE A9 02 20 D2 FF CA D0 E2
C460:FA EE B8 02 CE B9 02 F0 AC
C468:0D AE B8 02 AC A8 02 18 7F
C470:20 F0 FF 4C 56 C4 AE A7 D5
C478:02 AC A8 02 18 20 F0 FF 86
C480:60 48 29 40 8D BA 02 68 39
C488:29 3F C9 20 B0 02 09 40 91
C490:48 AD BA 02 C9 40 D0 04 16
C498:68 09 80 60 68 60 A2 0E C6
C4A0:6C 00 03 A5 D2 85 FC A5 67
C4A8:D1 18 65 D3 85 FB 90 02 4A
C4B0:E6 FC 60 A4 02 B1 FB 20 32
C4B8:E8 C2 91 FB 60 00 00 00 5C
```

Program 2: Demo 1

```
FF 5 REM COPYRIGHT 1989 COMPUT
     E! PUBLICATIONS, INC. - A
     LL RIGHTS RESERVED
FM 10 IFPEEK(49152)<>32 THEN L
     OAD"INPUT.ML",8,1
BC 20 POKE53280,0:POKE53281,0:
     PRINT"{CLR}HELLO!"
MJ 30 PRINT"{DOWN}WHAT IS YOUR
      NAME ?{DOWN} **********
      **********"
KS 40 SYS49152,2,20,1,20,1,NM$
HE 50 PRINT:PRINT"{2 DOWN}HELL
     O, "NM$
PB 60 PRINT"{3 DOWN}DO YOU LIK
     E THIS INPUT (Y/N) Y"
SH 70 SYS49152,10,29,1,1,0,A$
MX 80 IFA$<>"Y"ANDA$<>"N"THEN7
     0
PR 100 PRINT"{CLR}MULTIPLE CHO
     ICE EXAMPLE:":PRINT
KJ 110 FORI=1TO9:PRINT"QUESTIO
     N #"STR$(I)". ANSWER (Y
     /N):":NEXT
BE 120 SYS49152,2,28,9,1,0,RP$
BP 130 FL=0:FORI=1TOLEN(RP$):I
     FMID$(RP$,I,1)<>"Y"ANDM
     ID$(RP$,I,1)<>"N"THENFL
     =1
RB 140 NEXTI:IFFLTHEN120
CE 150 PRINT:PRINT:PRINT"ANSWE
     R STRING:"RP$
```

Program 3: Demo 2

```
XE 0 REM COPYRIGHT 1989 COMPUT
     E! PUBLICATIONS, INC. - A
     LL RIGHTS RESERVED
XK 1 REM --- THIS DEMO STORES
     {SPACE}MOST OF ---
DX 2 REM --- THE SCREEN TO VAR
     IABLES ---
AM 3 REM --- A$,B$,C$ & D$ ---
FM 10 IFPEEK(49152)<>32THENLOA
     D"INPUT.ML",8,1
PG 20 DIMVT$(25):VT$(0)="
```


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```
      {HOME}":FORI=1TO25:VT$(I
      )=VT$(I-1)+"{DOWN}":NEXT
JJ 30 PRINT"{CLR}"VT$(21)"PLEA
      SE ENTER ANY DATA ON THI
      S SCREEN"
DA 40 PRINT"AND PRESS <RETURN>
       WHEN DONE."
DS 50 SYS49152,0,0,20,40,1,A$
AP 60 REM --- SAVE TO A$,B$,C$
      & D$ ---
PE 70 POKE631,13:POKE198,1:SYS
      49152,0,0,5,40,0,A$
EP 80 POKE631,13:POKE198,1:SYS
      49152,5,0,5,40,0,B$
XF 90 POKE631,13:POKE198,1:SYS
      49152,10,0,5,40,0,C$
KB 100 POKE631,13:POKE198,1:SY
      S49152,15,0,5,40,0,D$
MD 110 PRINT"{CLR}PRESS ANY KE
      Y TO SEE THE SCREEN..."
FC 120 GETK$:IFK$=""THEN120
EB 130 PRINT"{CLR}"A$;B$;C$;D$
QA 140 PRINT
```

DP BASIC

See instructions in article on page 44 before typing in.

```
C000:A0 0B B9 46 CE 99 00 03 10
C008:88 10 F7 20 44 A6 A9 EA CD
C010:A0 CE 20 1E AB 6C 02 A0 2F
C018:A6 7A A0 04 84 0F BD 00 BB
C020:02 10 07 C9 FF F0 3E E8 4D
C028:D0 F4 C9 20 F0 37 85 08 02
C030:C9 22 F0 58 24 0F 70 2D 2E
C038:C9 3F D0 04 A9 99 D0 25 43
C040:C9 30 90 04 C9 3C 90 1D 82
C048:84 71 A0 00 84 0B 88 86 64
C050:7A CA C8 E8 BD 00 02 38 93
C058:F9 9E A0 F0 F5 C9 80 D0 4A
C060:32 05 0B A4 71 20 DE C0 72
C068:E8 C8 99 FB 01 C9 00 F0 A3
C070:38 38 E9 3A F0 04 C9 49 71
C078:D0 02 85 0F 38 E9 55 D0 69
C080:9D 85 08 BD 00 02 F0 DD D6
C088:C5 08 F0 D9 C8 99 FB 01 50
C090:E8 D0 F0 A6 7A E6 0B C8 91
C098:B9 9D A0 10 FA B9 9E A0 10
C0A0:D0 B2 F0 0F BD 00 02 10 48
C0A8:BA 99 FD 01 C6 7B A9 FF 35
C0B0:85 7A 60 A9 CC 85 0B A0 6D
C0B8:00 B9 69 CD D0 02 C8 E8 BB
C0C0:BD 00 02 38 F9 69 CD F0 E6
C0C8:F5 C9 80 F0 94 A6 7A E6 F1
C0D0:0B C8 B9 68 CD 10 FA B9 26
C0D8:69 CD D0 E4 F0 C6 C9 8B AC
C0E0:D0 04 A9 CC D0 06 C9 99 99
C0E8:D0 02 A9 CF 60 10 0F 24 0B
C0F0:0F 30 0B C9 FF F0 07 C9 9F
C0F8:CC B0 06 4C 24 A7 4C F3 DE
C100:A6 38 E9 CB AA 84 49 A0 79
C108:FF CA F0 08 C8 B9 69 CD AA
C110:10 FA 30 F5 C8 B9 69 CD 8D
C118:30 05 20 47 AB D0 F5 4C 46
C120:EF A6 20 73 00 20 2B C1 19
C128:4C AE A7 C9 CC 90 04 C9 89
C130:E2 90 06 20 79 00 4C ED 5E
C138:A7 38 E9 CC 0A AA BD 03 21
C140:CE 48 BD 02 CE 48 4C 73 B8
C148:00 A9 00 85 0D 20 73 00 5E
C150:08 C9 E2 90 26 C9 EE B0 96
C158:22 28 48 C9 E5 B0 06 20 BA
C160:73 00 20 F1 AE 68 38 E9 32
C168:E2 0A A8 B9 2E CE 85 55 9D
C170:B9 2F CE 85 56 20 54 00 AA
C178:4C 8D AD 28 4C 8D AE 8A 3E
C180:30 19 E0 1F B0 03 4C 3A D4
C188:A4 38 E9 1F 0A AA BD 52 64
C190:CE 85 22 BD 53 CE 85 23 01
C198:4C 47 A4 4C 74 A4 20 9E 82
C1A0:AD 20 79 00 C9 89 F0 05 8D
C1A8:A9 A7 20 FF AE A5 61 D0 8E
C1B0:08 20 09 A9 D0 03 4C FB 23
C1B8:A8 20 79 00 B0 03 4C A0 92
C1C0:A8 4C 2B C1 68 68 A9 03 68
C1C8:20 FB A3 20 06 A9 18 98 71
C1D0:65 7A 48 A5 7B 69 00 48 D2
C1D8:A5 39 48 A5 3A 48 A9 52 79
C1E0:48 4C AE A7 68 68 BA BD 04
C1E8:01 01 C9 52 D0 30 20 79 8C
C1F0:00 F0 28 20 9E AD BA A5 7E
C1F8:61 D0 17 BD 02 01 85 3A 79
C200:BD 03 01 85 39 BD 04 01 67
C208:85 7B BD 05 01 85 7A 4C 96
C210:AE A7 8A 18 69 05 AA 9A F8
C218:4C AE A7 4C 08 AF A2 1F 8C
C220:6C 00 03 C9 D8 F0 2B C9 83
C228:40 D0 23 20 73 00 20 9E E2
C230:B7 86 14 E0 28 B0 08 20 F7
C238:FD AE 20 9E B7 E0 19 B0 7A
C240:6B A4 14 20 F0 FF 20 79 6A
C248:00 F0 06 20 FD AE 4C 9D AD
C250:AA 60 20 A6 AD 20 A3 B6 9D
C258:A0 00 B1 64 F0 49 C9 10 FA
C260:B0 45 8D 00 02 C8 B1 64 3C
C268:85 57 C8 B1 64 85 58 AC 51
C270:00 02 88 B1 57 C9 2E F0 D1
C278:2E C8 A9 00 85 59 85 5A 73
C280:AA 2C A9 30 99 01 02 88 FB
C288:30 5B B1 57 C9 24 D0 0F 38
C290:20 C3 C3 A9 40 2C A9 80 B0
C298:05 5A 85 5A 4C 82 C2 C9 49
C2A0:2B D0 0C 24 5A 10 EF A2 49
C2A8:21 6C 00 03 4C 48 B2 C9 BC
C2B0:2C D0 0D 20 C3 C3 A9 40 E4
C2B8:05 59 85 59 A9 2C D0 C4 C1
C2C0:C9 2E D0 13 24 59 30 DF C8
C2C8:70 DD 20 C3 C3 A9 80 05 09
C2D0:59 85 59 A9 2E D0 AD C9 04
C2D8:23 D0 CC 20 C3 C3 24 59 8E
C2E0:30 A0 E8 D0 9D A5 5A 48 51
C2E8:8A 48 A9 3B 20 FF AE 20 2D
C2F0:8A AD 20 CA BB 20 DD BD AF
C2F8:A0 FF A9 00 85 5C AA C8 BF
C300:B9 00 01 F0 13 C9 45 F0 CE
C308:A3 C9 2E D0 03 E8 D0 EF F3
C310:E0 00 F0 EB E6 5C D0 E7 17
C318:68 C5 5C B0 0D A8 20 A2 C9
C320:B3 20 C7 BB 20 EF C3 20 A6
C328:DD BD 68 85 5A A2 FF E8 B9
C330:BD 01 02 F0 04 C9 2E D0 9A
C338:F6 A0 FF C8 B9 00 01 F0 B0
C340:18 C9 2E D0 F6 86 57 84 1E
C348:58 E8 C8 B9 00 01 F0 05 D5
C350:9D 01 02 D0 F4 A6 57 A4 C9
C358:58 88 CA 10 12 24 5A 30 8E
C360:09 70 07 B9 00 01 C9 20 BC
C368:F0 4F A2 22 6C 00 03 BD D9
C370:01 02 C9 2C F0 E4 B9 00 83
C378:01 C9 2D F0 0F C9 20 F0 78
C380:05 9D 01 02 D0 D3 24 5A AA
C388:10 02 A9 2B 48 BD 02 02 BF
C390:C9 2C D0 01 E8 24 5A 50 0F
C398:06 A9 24 9D 01 02 CA 68 F9
C3A0:C9 20 D0 0E E0 FF F0 11 0A
C3A8:9D 01 02 CA 30 0B A9 20 4D
C3B0:D0 F6 E0 FF D0 F2 4C 6A CF
C3B8:C3 A9 01 A0 02 20 1E AB 2F
C3C0:4C 9D AA 24 5A 30 03 70 77
C3C8:01 60 4C A7 C2 20 CA BB D4
C3D0:20 CC BC 20 79 C5 4C 50 01
C3D8:B8 20 CA BB A9 00 85 61 93
C3E0:20 97 E0 20 6E C5 20 CC 14
C3E8:BC 4C 0A C5 20 1B C5 24 9C
C3F0:66 30 09 A9 F9 A0 BA 20 5B
C3F8:5B BC 30 03 4C 48 B2 20 9C
C400:36 C5 20 11 C5 A9 03 20 26
C408:FB A3 A2 05 B5 61 48 CA AB
C410:10 FA A9 F9 A0 BA 20 8C F1
C418:BA A9 5C A0 00 20 78 BF 30
C420:20 C7 BB A2 00 68 95 61 7B
C428:E8 E0 06 D0 F8 20 71 C5 1D
C430:20 49 B8 20 CC BC 20 0C DA
C438:BC 20 14 C5 4C 4F C5 20 52
C440:5E C5 10 03 4C 11 C5 60 2F
C448:20 5E C5 30 FA 4C 11 C5 26
C450:20 1B C5 20 33 C5 20 36 92
C458:C5 20 14 C5 A5 61 F0 18 58
C460:20 67 C5 20 CC BC 20 87 AF
C468:C4 A2 04 B5 5C 95 57 CA 8B
C470:10 F9 20 C7 BB 4C 5C C4 8D
C478:4C 11 C5 20 1B C5 20 67 BE
C480:C5 4C CC BC 20 7B C4 20 FD
C488:71 C5 4C D3 C3 20 CA BB F2
C490:20 33 C5 20 A1 B7 A9 00 F0
C498:85 5D E0 00 F0 1E E0 01 1B
C4A0:F0 1A 86 5C 8A 20 3C BC C9
C4A8:20 CA BB C6 5C A5 5C C5 D0
C4B0:5D F0 10 20 3C BC 20 6E AC
C4B8:C5 4C A8 C4 A9 BC A0 B9 D4
C4C0:20 A2 BB 60 20 1B C5 20 99
C4C8:33 C5 20 36 C5 20 14 C5 61
C4D0:20 A1 B7 86 5D 20 11 C5 85
C4D8:20 A1 B7 8A 38 E5 5D F0 7F
C4E0:DB B0 03 4C 48 B2 48 20 67
C4E8:9A C4 A9 02 20 FB A3 68 E6
C4F0:AA A0 05 B9 61 00 48 88 58
C4F8:10 F9 20 96 C4 A2 00 68 8F
C500:95 69 E8 E0 06 D0 F8 4C 8D
C508:4F C5 A9 BC A0 B9 4C 67 99
C510:B8 A9 57 2C A9 5C A0 00 10
C518:4C A2 BB 20 73 00 20 FA C2
C520:AE 20 8A AD 20 CA BB 20 FA
C528:FD AE 20 8A AD 20 C7 BB 44
C530:4C F7 AE A9 57 2C A9 5C 6B
C538:A0 00 48 20 A2 BB 20 CC 30
C540:BC 68 A0 00 20 5B BC D0 11
C548:01 60 A2 20 6C 00 03 20 4C
C550:55 C5 4C 12 BB A5 66 45 29
C558:6E 85 6F A5 61 60 20 1B AC
C560:C5 20 79 C5 4C 5B BC A9 55
C568:57 A0 00 4C 0F BB A9 57 9E
C570:2C A9 5C A0 00 20 28 BA 9D
C578:60 A9 57 A0 00 60 20 A6 FB
C580:B3 20 79 00 C9 2C F0 12 10
C588:20 9E B7 E0 50 B0 04 E0 FE
C590:01 B0 03 4C 48 B2 CA 8E 1F
C598:B1 02 20 FD AE C9 22 D0 13
C5A0:17 20 BD AE A9 3B 20 FF DC
C5A8:AE 20 A6 B6 C9 27 90 05 E4
C5B0:A2 23 6C 00 03 20 21 AB 6A
C5B8:20 45 AB 20 42 AB 18 A5 B3
C5C0:D1 65 D3 85 03 85 05 A5 3F
C5C8:D2 69 00 85 04 85 06 E6 99
C5D0:05 D0 02 E6 06 18 A5 03 A0
C5D8:6D B1 02 85 22 A5 04 69 39
C5E0:00 85 23 18 AD 88 02 69 B0
C5E8:03 48 A9 E7 C5 22 68 E5 29
C5F0:23 B0 0D 20 EA E8 CA A4 13
C5F8:D3 18 20 F0 FF 4C BE C5 FB
C600:38 20 F0 FF 8E B2 02 8C 9F
C608:B3 02 A5 7A 48 A5 7B 48 64
C610:20 8B B0 20 8F AD 68 85 32
C618:7B 68 85 7A A9 00 8D B0 EE
C620:02 85 D4 A9 00 85 CC 20 15
C628:E4 FF F0 FB C9 22 F0 F7 B6
C630:C9 0D F0 27 C9 14 D0 03 B9
C638:4C BE C6 C9 94 D0 03 4C 4B
C640:E0 C6 C9 1D D0 03 4C 05 2B
C648:C7 C9 9D D0 03 4C 15 C7 28
C650:48 29 7F C9 20 68 90 CF 6C
C658:4C 2A C7 20 3F C7 A9 2C 2A
C660:8D FF 01 A9 22 8D 00 02 B8
C668:AC B1 02 B1 03 29 7F C9 99
C670:20 B0 04 09 40 D0 06 C9 66
C678:40 90 02 09 80 99 01 02 89
C680:88 10 E8 AC B1 02 C8 88 ED
C688:B9 01 02 C9 20 F0 F8 C8 8F
C690:A9 00 99 01 02 AE B2 02 68
C698:AC B3 02 18 20 F0 FF AE 9E
C6A0:B1 02 F0 08 A9 1D 20 D2 FA
C6A8:FF CA D0 F8 20 D7 AA AD F5
C6B0:01 02 F0 07 A2 FF A0 01 25
C6B8:4C 0D AC 4C F3 AB AC B0 62
C6C0:02 F0 1A 88 20 3F C7 B1 96
C6C8:05 91 03 C8 CC B1 02 D0 2C
C6D0:F6 A9 20 91 03 CE B0 02 18
C6D8:C6 D3 4C 23 C6 4C 27 C6 F6
C6E0:AC B1 02 CC B0 02 F0 F5 A3
C6E8:B1 03 C9 20 D0 EF 88 20 C2
C6F0:3F C7 B1 03 91 05 88 CC F4
C6F8:B0 02 10 F6 AC B0 02 A9 A6
C700:20 91 03 D0 D5 AC B0 02 36
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C708:CC B1 02 F0 D0 C8 8C B0 2D
C710:02 A0 1D D0 0B AC B0 02 E7
C718:F0 C3 88 8C B0 02 A0 9D 57
C720:20 3F C7 98 20 D2 FF 4C AA
C728:DA C6 48 20 3F C7 68 20 EB
C730:D2 FF AC B0 02 CC B1 02 72
C738:F0 E4 EE B0 02 D0 E8 98 20
C740:48 A9 01 85 CC A5 CF F0 64
C748:0C A5 CE AE 87 02 A0 00 91
C750:84 CF 20 13 EA 68 A8 60 F5
C758:20 73 00 20 E4 FF F0 FB DB
C760:85 FB A9 01 20 7D B4 A0 F7
C768:00 A5 FB 91 62 20 CA B4 D7
C770:68 68 4C 8F AD 20 9E B7 B3
C778:8E A7 02 20 FD AE 20 9E 05
C780:B7 8E A8 02 20 FD AE 20 3B
C788:9E B7 8E A9 02 20 FD AE FC
C790:20 9E B7 8E AA 02 AE A9 1C
C798:02 B5 D9 29 0F 85 FC BD AA
C7A0:F0 EC 85 FB AE A9 02 AC 21
C7A8:AA 02 A9 20 91 FB 88 CC 9F
C7B0:A8 02 10 F8 CA EC A7 02 02
C7B8:30 0E A5 FB E9 28 85 FB 4F
C7C0:A5 FC E9 00 85 FC D0 DF 41
C7C8:60 20 9E B7 8E AB 02 20 27
C7D0:FD AE 20 9E B7 8E AC 02 4C
C7D8:20 FD AE 20 9E B7 8E AD 6E
C7E0:02 20 FD AE 20 9E B7 8E 9D
C7E8:AE 02 A9 01 8D AF 02 78 3D
C7F0:A9 F7 A0 C7 4C 7F C8 CE A4
C7F8:AF 02 D0 39 A9 0F 8D AF E2
C800:02 AE AD 02 B5 D9 29 0F 8A
C808:85 FC BD F0 EC 85 FB AE 86
C810:AD 02 AC AE 02 B1 FB 49 91
C818:80 91 FB 88 CC AC 02 10 83
C820:F4 CA EC AB 02 30 0E A5 C9
C828:FB E9 28 85 FB A5 FC E9 E9
C830:00 85 FC D0 DD 4C 31 EA 3D
C838:AD 14 03 C9 31 D0 07 AD 2B
C840:15 03 C9 EA F0 40 78 AE 2D
C848:AD 02 B5 D9 29 0F 85 FC 13
C850:BD F0 EC 85 FB AE AD 02 EA
C858:AC AE 02 B1 FB 29 7F 91 5C
C860:FB 88 CC AC 02 10 F4 CA 7B
C868:EC AB 02 30 0E A5 FB E9 87
C870:28 85 FB A5 FC E9 00 85 66
C878:FC D0 DD A9 31 A0 EA 8D 82
C880:14 03 8C 15 03 58 60 20 1A
C888:9E B7 8A 29 0F 8D 20 D0 FA
C890:60 20 9E B7 8A 29 0F 8D 4E
C898:21 D0 60 20 9E B7 8A 29 0F
C8A0:0F 8D 86 02 A0 00 84 FB 18
C8A8:A0 D8 84 FC A0 00 91 FB 45
C8B0:E6 FB D0 02 E6 FC A6 FB 63
C8B8:E0 E8 D0 F2 A6 FC E0 DB 05
C8C0:D0 EC 60 A9 00 A8 99 00 72
C8C8:D4 C8 C0 1D D0 F8 20 9E 2A
C8D0:B7 8A 4A 6E 00 D4 4A 6E 67
C8D8:00 D4 8D 01 D4 20 FD AE 33
C8E0:20 9E B7 8A 09 F0 8D 06 F6
C8E8:D4 F0 02 A9 0F 8D 18 D4 AF
C8F0:A9 11 8D 04 D4 EA A9 10 43
C8F8:8D 04 D4 60 20 13 B1 90 34
C900:0E 48 20 73 00 90 10 C9 14
C908:24 D0 07 A2 80 30 17 4C 2C
C910:08 AF 20 13 B1 90 0A 09 B5
C918:80 AA 20 38 CB C9 24 F0 DC
C920:05 A2 16 6C 00 03 20 73 28
C928:00 20 FD AE 68 20 A6 CA 4A
C930:85 FB 86 FC A0 04 B1 FB 9A
C938:C9 02 F0 05 A2 25 6C 00 22
C940:03 A0 07 B1 FB 85 FE C8 36
C948:B1 FB 85 FD A5 FD 0A 85 03
C950:63 A5 FE 2A 85 62 18 A5 0D
C958:FD 65 63 85 63 A5 FE 65 1E
C960:62 85 62 A2 90 38 20 49 EB
C968:BC 20 CA BB 18 A9 09 65 56
C970:FB 85 FB 90 02 E6 FC 20 B1
C978:8A AD A9 57 A0 00 20 28 D4
C980:BA 20 9B BC 18 A5 65 65 40
C988:FB 8D B4 02 A5 64 65 FC BA
C990:8D B5 02 20 FD AE 20 8A 10
C998:AD 20 9B BC A5 65 8D B8 E0
C9A0:02 A5 64 8D B9 02 20 FD 18
C9A8:AE 20 13 B1 90 10 09 80 70
C9B0:48 20 73 00 90 15 C9 25 70
C9B8:D0 0C A2 80 30 17 4C 08 92
C9C0:AF A2 16 6C 00 03 20 13 BD
C9C8:B1 90 F6 09 80 AA 20 38 EF
C9D0:CB C9 25 D0 EC 20 73 00 3D
C9D8:20 FD AE 68 20 A6 CA 18 A1
C9E0:69 07 8D B6 02 90 01 E8 45
C9E8:8E B7 02 20 9E B7 E0 00 89
C9F0:F0 06 A9 58 A2 5B D0 04 61
C9F8:A9 5B A2 58 8D 72 CA 8E 6C
CA00:74 CA AD B8 02 D0 03 CE EB
CA08:B9 02 CE B8 02 D0 06 AD 6D
CA10:B9 02 D0 01 60 85 5F A2 A7
CA18:00 8E BA 02 8E BB 02 EE 1F
CA20:BA 02 D0 03 EE BB 02 AD F5
CA28:BA 02 AE BB 02 20 F0 CA 6A
CA30:A5 FD 85 5D A5 FE 85 5E 31
CA38:A0 02 B1 FB 99 57 00 88 47
CA40:10 F8 AC BA 02 AE BB 02 A1
CA48:C8 D0 01 E8 98 20 F0 CA 17
CA50:A0 02 B1 FB 99 5A 00 88 6B
CA58:10 F8 AA 38 E5 57 90 02 BC
CA60:A6 57 A0 FF E8 C8 CA D0 04
CA68:08 A5 5A C5 57 90 0A B0 D4
CA70:1B B1 5B D1 58 F0 EE 10 FC
CA78:13 A0 01 B1 5D 48 B1 FD 68
CA80:91 5D 68 91 FD 88 10 F3 82
CA88:A9 00 85 5F AD B8 02 CD BB
CA90:BA 02 D0 0F AD B9 02 CD 35
CA98:BB 02 D0 07 A5 5F D0 3B 9E
CAA0:4C 02 CA 4C 1F CA 85 45 6F
CAA8:86 46 A5 2F 85 FB A5 30 52
CAB0:85 FC 38 A5 31 E5 FB 85 48
CAB8:FD A5 32 E5 FC 05 FD F0 44
CAC0:02 B0 05 A2 24 6C 00 03 24
CAC8:A0 00 A5 45 D1 FB D0 0C E3
CAD0:C8 A5 46 D1 FB D0 05 A5 EC
CAD8:FB A6 FC 60 18 A0 02 B1 B4
CAE0:FB 65 FB 48 C8 B1 FB 65 3C
CAE8:FC 85 FC 68 85 FB 90 C2 84
CAF0:0A 85 FB 8A 2A 85 FC 18 8E
CAF8:A5 FB 6D B6 02 85 FB 85 1D
CB00:FD A5 FC 6D B7 02 85 FC 44
CB08:85 FE A0 01 B1 FB 48 88 DC
CB10:B1 FB 85 FC 68 85 FB 0A 5B
CB18:A8 A5 FC 2A AA 18 98 65 FB
CB20:FB 85 FB 8A 65 FC 85 FC 66
CB28:18 A5 FB 6D B4 02 85 FB 40
CB30:A5 FC 6D B5 02 85 FC 60 63
CB38:20 73 00 90 FB 20 13 B1 FD
CB40:B0 F6 60 20 1F CD 20 3A A6
CB48:CD 20 79 00 F0 27 20 73 D5
CB50:00 F0 22 C9 2C D0 57 9D F5
CB58:B4 02 E8 20 73 00 A9 49 22
CB60:20 FF AE F0 49 9D B4 02 19
CB68:E8 20 73 00 F0 40 9D B4 63
CB70:02 E8 20 73 00 A9 00 9D C2
CB78:B4 02 A2 00 BD D5 CE F0 13
CB80:06 20 16 E7 E8 D0 F5 20 FA
CB88:CF FF C9 59 08 20 D7 AA F1
CB90:28 D0 1A A9 08 20 B1 FF 72
CB98:A9 6F 20 93 FF A0 00 B9 5A
CBA0:B4 02 F0 06 20 A8 FF C8 FD
CBA8:90 F5 20 AE FF 60 4C 08 17
CBB0:AF 20 1C CD CA A9 00 9D 23
CBB8:B4 02 4C 93 CB 20 22 CD DE
CBC0:20 79 00 F0 46 C9 22 D0 44
CBC8:E5 A5 7A 48 A5 7B 48 20 5C
CBD0:73 00 F0 DA C9 22 D0 F7 5E
CBD8:20 73 00 A9 A4 20 FF AE 4C
CBE0:20 3A CD A9 3D 9D B4 02 37
CBE8:E8 A4 7A 84 49 A4 7B 68 F1
CBF0:85 7B 68 85 7A A5 49 48 D4
CBF8:98 48 20 3A CD A9 00 9D 49
CC00:B4 02 68 85 7B 68 85 7A DC
CC08:4C 93 CB A2 08 6C 00 03 45
CC10:20 D9 CC 4C 6F E1 20 D9 AB
CC18:CC 4C 59 E1 20 D9 CC A9 20
CC20:00 A6 2B A4 2C 20 D5 FF A0
CC28:90 03 4C F9 E0 A5 90 29 DB
CC30:BF F0 03 4C 9C E1 86 2D B1
CC38:84 2E 20 59 A6 20 33 A5 FA
CC40:4C AE A7 20 25 CD 20 3A 7D
CC48:CD 4C 75 CB A9 08 85 BA 7A
CC50:A9 60 85 B9 A9 02 A2 D3 91
CC58:A0 CE 20 BD FF 20 D5 F3 F5
CC60:A5 BA 20 B4 FF A5 B9 20 F4
CC68:96 FF A9 00 85 90 20 A5 D6
CC70:FF 20 A5 FF 20 A5 FF 20 7E
CC78:A5 FF A6 90 D0 03 AA D0 7B
CC80:06 20 42 F6 4C D7 AA 20 14
CC88:D7 AA 20 A5 FF 85 49 20 DF
CC90:A5 FF A6 49 20 CD BD 20 3A
CC98:3F AB 20 A5 FF A6 90 D0 A7
CCA0:E0 20 D2 FF C9 00 D0 F2 EF
CCA8:20 E1 FF F0 D4 20 E4 FF CA
CCB0:F0 C2 20 E1 FF F0 CA 20 0F
CCB8:E4 FF F0 F6 D0 B6 20 73 67
CCC0:00 20 E5 CC 98 20 7D B4 E0
CCC8:A8 B9 B4 02 91 62 88 10 13
CCD0:F8 20 CA B4 68 68 4C 8F A0
CCD8:AD A9 00 85 0A 20 57 E2 6E
CCE0:A2 08 4C EC E1 A9 08 A0 8C
CCE8:6F A2 00 86 B7 86 90 84 C8
CCF0:B9 85 BA 20 B1 FF 20 AE 9E
CCF8:FF A5 90 F0 05 A2 05 6C 46
CD00:00 03 A5 BA 20 B4 FF A5 36
CD08:B9 20 96 FF A0 FF C8 20 12
CD10:A5 FF 99 B4 02 C9 0D D0 1F
CD18:F5 4C 42 F6 A9 56 2C A9 22
CD20:4E 2C A9 52 2C A9 53 A2 99
CD28:00 9D B4 02 E8 A9 30 9D CD
CD30:B4 02 E8 A9 3A 9D B4 02 12
CD38:E8 60 86 B7 20 79 00 D0 64
CD40:03 4C 0B CC C9 22 F0 03 5A
CD48:4C 08 AF E6 7A D0 02 E6 72
CD50:7B A0 00 B1 7A F0 0D C9 68
CD58:22 F0 06 9D B4 02 E8 D0 2C
CD60:EA 20 73 00 E4 B7 F0 D9 A9
CD68:60 49 C6 52 45 50 45 41 BB
CD70:D4 55 4E 54 49 CC 50 52 4B
CD78:49 4E D4 45 58 45 C3 43 DD
CD80:4F 4C 4C 45 43 D4 48 45 F7
CD88:41 44 45 D2 52 45 4E 41 31
CD90:4D C5 44 4C 4F 41 C4 44 DE
CD98:53 41 56 C5 53 43 52 41 E2
CDA0:54 43 C8 43 41 D4 55 53 DF
CDA8:49 4E C7 46 4C 41 53 C8 B0
CDB0:43 4C 45 41 D2 4F 46 C6 E4
CDB8:4C 49 4E 50 55 D4 53 4F 8F
CDC0:52 D4 42 4F 52 44 45 D2 F8
CDC8:42 41 43 CB 54 45 58 D4 38
CDD0:42 45 45 D0 46 52 41 C3 56
CDD8:46 41 43 D4 52 41 4E C4 96
CDE0:52 4F 55 4E C4 44 49 D6 A9
CDE8:4D 4F C4 43 4F 4D C2 47 48
CDF0:43 C4 4D 41 D8 4D 49 CE 7A
CDF8:44 53 A4 49 4E 4B 45 59 38
CE00:A4 00 9D C1 C3 C1 E3 C1 6E
CE08:22 C2 1B CC B0 CB 42 CB 9C
CE10:BC CB 0F CC 15 CC 42 CC DA
CE18:4B CC 07 AF C8 C7 74 C7 80
CE20:37 C8 7D C5 FB C8 86 C8 70
CE28:90 C8 9A C8 C2 C8 CD C3 B8
CE30:8D C4 D9 C3 EC C3 7B C4 6F
CE38:84 C4 C4 C4 50 C4 3F C4 07
CE40:48 C4 BE CC 58 C7 7F C1 7A
CE48:83 A4 18 C0 ED C0 22 C1 58
CE50:49 C1 60 CE 74 CE 88 CE BA
CE58:97 CE A6 CE B5 CE C4 CE 78
CE60:55 4E 54 49 4C 20 57 49 36
CE68:54 48 4F 55 54 20 52 45 8E
CE70:50 45 41 D4 4E 4F 4E 2D 76
CE78:49 4E 54 45 47 45 52 20 41
CE80:41 52 47 55 4D 45 4E D4 82
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CE90:20 53 54 52 49 4E C7 54 2A
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CEA0:44 49 47 49 54 D3 50 52 15
CEA8:4F 4D 50 54 20 54 4F 4F D0
CEB0:20 4C 4F 4E C7 41 52 52 7A
CEB8:41 59 20 4E 4F 54 20 46 88
CEC0:4F 55 4E C4 41 52 52 41 AA
CEC8:59 20 44 49 4D 45 4E 53 A7
CED0:49 4F CE 24 30 41 52 45 73
CED8:20 59 4F 55 20 53 55 52 67
CEE0:45 3F 20 28 59 2F 4E 29 C4
CEE8:20 00 93 44 50 2D 42 41 4A
CEF0:53 49 43 20 36 34 20 45 FC
CEF8:4E 47 41 47 45 44 20 41 E8
CF00:54 20 24 43 30 30 30 0D 3A
CF08:0D 00 48 45 4E 52 59 00 F9
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How To Type In *COMPUTE!'s Gazette* Programs

Each month, COMPUTE!'s Gazette publishes programs for the Commodore 128, 64, Plus/4, and 16. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then on, erasing what was in memory. So be sure to *save a program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the *Gazette*, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT}, and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it. **G**

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT + ↑	

For Commodore 64 Only

[1]	COMMODORE 1	
[2]	COMMODORE 2	
[3]	COMMODORE 3	
[4]	COMMODORE 4	
[5]	COMMODORE 5	
[6]	COMMODORE 6	
[7]	COMMODORE 7	
[8]	COMMODORE 8	

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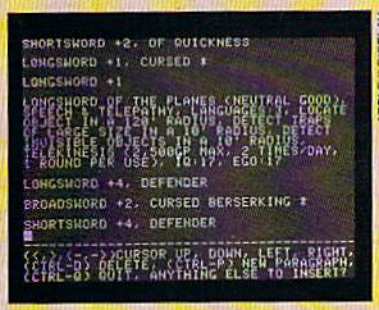

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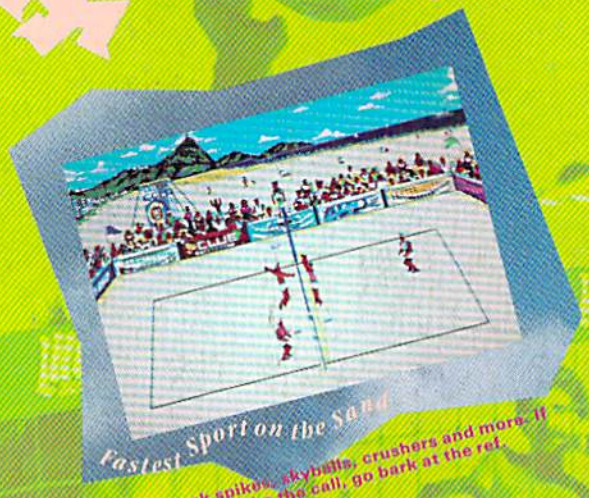

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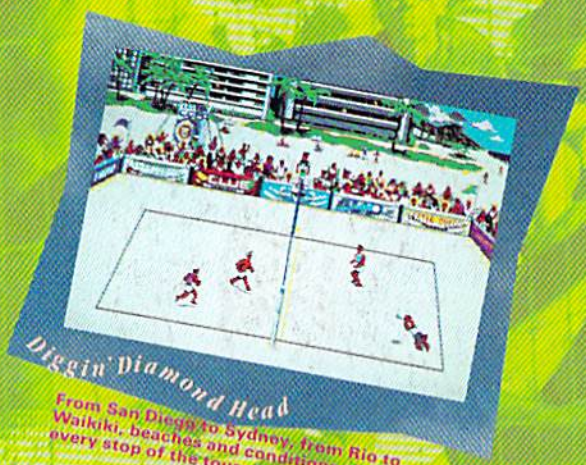
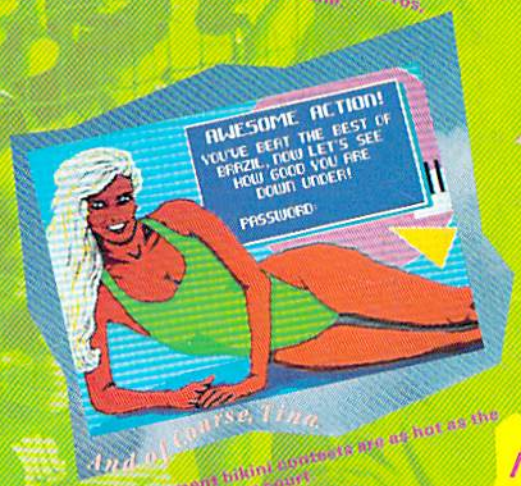


Diggin' Diamond Head

From San Diego to Sydney, from Rio to Waikiki, beaches and conditions change on every stop of the tour.



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