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JULY 1993

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(SEE PAGE 56)**

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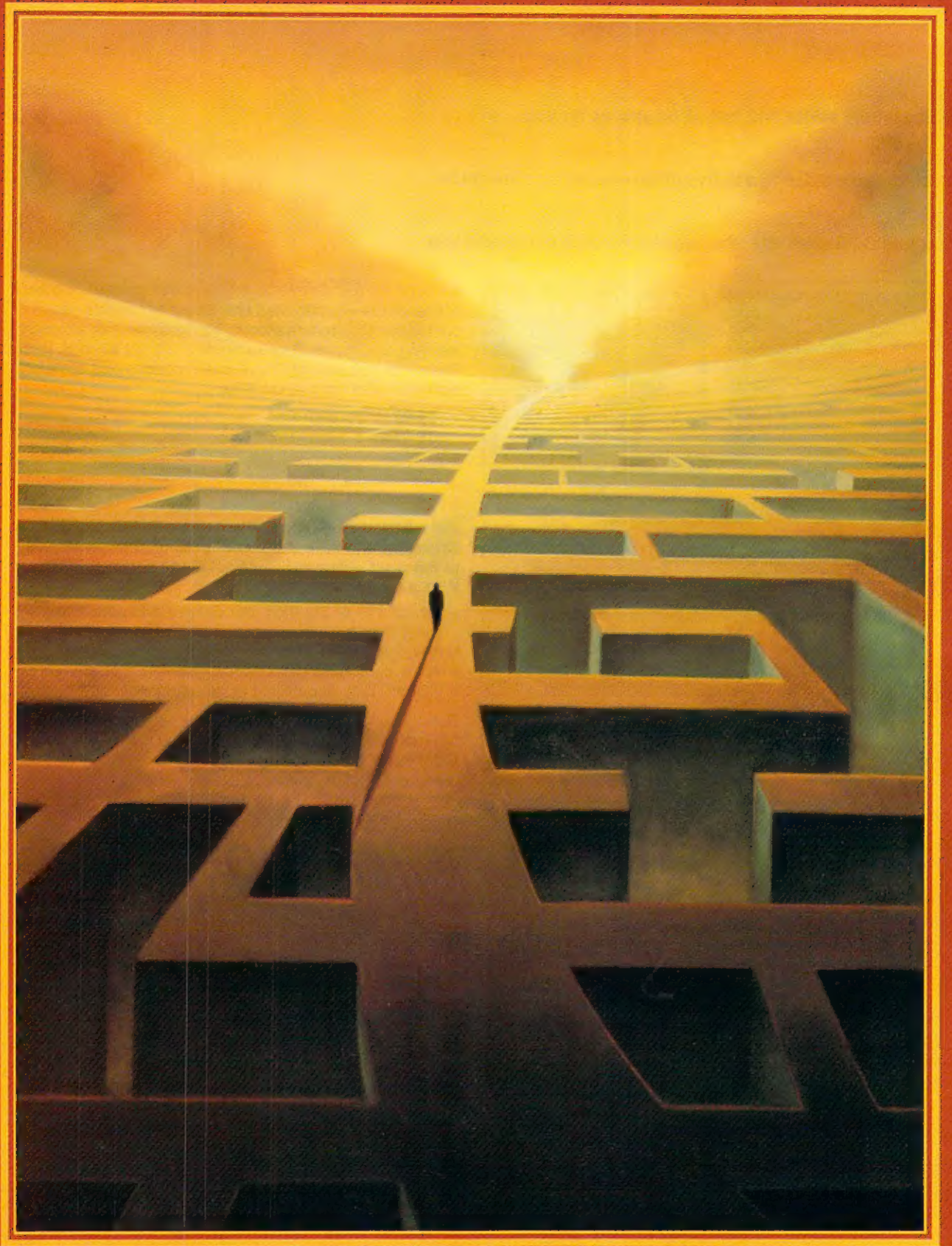
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64/128 VIEW

Gazette celebrates its tenth birthday with this issue—and launches a new column to help celebrate.

Tom Netsel

What were you doing ten years ago this month? If you happened to visit a newsstand, you may have picked up a new magazine called COMPUTE!'s Gazette.

I was working at the University of Central Florida in Orlando, and I had just bought a 64. I was wondering what to do with it when I spotted a Gazette at my local grocery store. I'll have to confess that I missed the first issue. I didn't see Gazette until the second issue hit the newsstand, but I've been hooked ever since.

Gazette was billed originally as being "for owners and users of Commodore VIC-20 and 64 personal computers." As time passed and Commodore introduced the Plus/4, the 16, and the 128, Gazette's coverage expanded to those machines. But when the smoke finally settled over the personal computer battlefield, the 64 and 128 emerged as the survivors, and Gazette narrowed its editorial focus to those Commodore veterans.

Speaking of veterans, as I browse through the masthead of that first issue, I see the names of four people who are still associated with the magazine. Regular readers will recognize columnists Jim Butterfield and Fred D'Ignazio, but two other veterans may not be as familiar. Terry Cash is now copy production manager, and De Potter is production manager. Without their valued assistance, there wouldn't be any magazine.

Editorial's staff has changed frequently, but Gazette's goal of providing its readers with the best of Com-

modore-related information and entertainment has not changed. In large measure, each Gazette editor has relied on 64 and 128 owners who are willing to share their knowledge with our readers. From that first issue through the one you read today, we've encouraged you to submit articles and programs for publication. That need is just as strong today as it was a decade ago. Some things don't change.

Change is inevitable, however, and you'll see it in this issue with the addition of a new column. Over the years we've published original programs and reviewed commercial software, but we've seldom covered public domain programs and shareware—until now. GEOS columnist Steve Vander Ark examines this vast source of programs in his new column, "PD Picks."

The programs Steve will review and recommend can be found on bulletin boards, commercial online services, user group libraries, and elsewhere. If you can't locate a convenient source for these programs, look for them on our monthly Gazette Disks. These programs—unlike the Gazette type-ins—are not copyrighted, and you may distribute them freely. All we ask is that you honor the fee requests of shareware authors if you use their programs.

In closing, I'd like to thank all of you devoted Commodore users for your support over the past ten years. Without your help, Gazette would have folded years ago. But with it, look for Gazette each month for years to come. □

GAZETTE

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11

YEARS IN 8-BIT HEAVEN

BY LARRY COTTON

THE YEAR WAS 1982.



The Vietnam War Memorial was dedicated in Washington, D.C.

England and Argentina fought over the Falkland Islands.

The Equal Rights Amendment lapsed without ratification.

The St. Louis Cardinals won the World Series.

Barney Clark became the first person to receive an artificial heart,
the Jarvik-7.

And in the autumn of that year, the Commodore 64 personal
computer was born.

Commodore International, a darling of Wall Street investors at that time, was known primarily for its calculators; the PET series of computers; and a successful, albeit memory-deficient older sibling of the 64, the VIC-20. The company was run by the inimitable Jack Tramiel and sons, a team famous for squeezing the most bang from a buck.

The personal computer market was in a frenzy at the time, and Tramiel brazenly introduced a new computer called the Commodore 64. This new machine was priced at \$595, a ridiculously low price for that time. A disk drive or a monitor were extra.

The Field

The 64's major competitors were the Apple II+ (\$1,530), Atari 800 (\$899), IBM PC (\$1,565), and TRS-80 Model III (\$999). The 64 was exactly the machine the world had been holding its breath for, with a third more built-in memory than the Apple II+—four times more than the Atari 800—yet priced at two to three times less than the Apple and a third less than the Atari.

The 64 featured (as it does today) a breathtaking 16 colors; 40 characters per screen row; eight Movable Object Blocks (sprites); and, best of all, an unbelievable 64K of random access memory, 39K of which was available for BASIC programs. Even without a drive and color monitor, the 64 was still far and away the feature leader with outstanding color, graphics, and an integral three-voice music synthesizer. Its musical talents alone rivaled those of many dedicated keyboard synthesizers at the time.

I must confess that I was not one of the original personal computer enthusiasts. I hadn't assembled an Altair in my basement back in the 1970s. My computer-related background consisted of occasionally perusing Byte magazine and assembling a few Circuit Cellar projects. Later, my interest expanded into creating some original, but primitive, rats-nest circuits around various Radio Shack chips. One such device featured four toggle switches to input data to a tone-generating chip. It could play tunes stored in its minuscule 1K of memory! I began to see the need for a real computer.

Full List Price

After extensive comparative research, I decided to invest in a 64. I bought the shiny little machine (serial number 10917, with no colored bars in the logo) from a nearby dealer for full list price. I sold my prized 1959 Mer-

TUNNELS

Larry Cotton is the author of Gazette's popular and long-running "Beginner BASIC" column. The following program is the first one that he wrote for the 64 and was among the first that he sold to Gazette.

```

10 PRINT POKE 53280,0: POKE
   53281,0: PRINTCHR$(147)
20 A=1: B=-1: C=40: D=-40: N=1:
   P=54272: V=1984
30 FORZ=1TO12: GOSUB 110
40 V=V-39: N=N+1
50 NEXT
60 V=V+42: N=N-1
70 FORZ=1TO12: GOSUB 110
80 V=V+42: N=N-1
90 NEXT
100 END
110 Q=INT(15*RND(1))+1
120 FORX=1TON:POKEV+A,67:
   POKE V+A+P,Q: V=V+A: NEXT
130 POKEV,75: POKEV+P,Q
140 FORX=1TON: POKEV+D,66:
   POKEV+D+P,Q: V=V+D: NEXT
150 POKEV,73: POKEV+P,Q
160 FORX=1TON: POKEV+B,67:
   POKEV+B+P,Q: V=V+B: NEXT
170 POKEV,85: POKEV+P,Q
180 FORX=1TON: POKEV+C,66:
   POKEV+C+P,Q: V=V+C: NEXT
190 POKEV,74: POKEV+P,Q
200 RETURN

```

cedes to raise the cash to finance it. In addition to the computer, I proudly took home a disk drive (instead of the more common Datassette tape drive), a printer, and a 13-inch color television to use as a monitor. My sons, David and Michael (then 13 and 10), and I cleared some working space and unpacked each component with loving care. With great anticipation and excitement, we connected the parts with cables, plugged them into the wall, and gingerly threw the power switches. Everything worked beautifully! We were thrilled!

As we tentatively put our new toy through its paces, we marveled at its wondrous capabilities. The only demonstration program our Commodore dealer supplied with the 64 (in anticipation of a wildly successful Christmas selling season) showed Santa Claus sailing around a chimney and surrounded by flurrying snow, all the while accompanied by background music playing "Jingle Bells."

Software Shortage

Our giddiness soon diminished with the slow dawning that, however wonderful the computer itself was,

Commodore had introduced the 64 with virtually no available software. The company's first ads had vaguely promised a word processor; a database; a spreadsheet; and several games, including Gorf, Visible Solar System, Radar Rat Race, Mole Attack, Avenger, Ace of Aces, and Jupiter Lander.

With a dearth of software, we dutifully turned to the user's guide and began teaching ourselves to program in BASIC. My first program (beyond the sophisticated 10 PRINT "HELLO") was one I called Tunnels. This gem printed multicolored rectangles to the screen that overlapped in increasing and decreasing sizes. It was eventually published in a series of demos called "Baker's Dozen" that were published in the January and February 1985 issues of COMPUTE!'s Gazette. (That was back when COMPUTE had an exclamation point.)

Magazine Scene

After tiring of driving 45 miles every month to my dealer, I started a subscription to COMPUTE! in February 1983 and voraciously read every word written about the 64. That was when COMPUTE carried articles and type-in programs for all of the popular PCs of the day. Charles Brannon, Jim Butterfield, and Richard Mansfield became my gurus of the 64, educating me on every aspect and minutiae of video, inputs, outputs, machine language, and math. I snipped hundreds of articles from that magazine and from Gazette after it premiered in July 1983.

Articles in that first Gazette included a review of the strange Exatron Stringy Floppy, a mass storage device that's sort of halfway between a cassette recorder and a disk drive. There was a column by Fred D'Ignazio called "Computing for Kids," and tutorials on sound, reading paddles in BASIC, accelerated IF statements, and joysticks. I still have my volume 1, number 1 safely stashed away with other prized memorabilia.

Many other Commodore-specific magazines have appeared—and disappeared—during the past 11 years, among them Ahoy!, Commander, Transactor, Midnight Gazette, Commodore Magazine, Power Play, and RUN. Today, only the Gazette section of COMPUTE remains.

Software at Last

Commercial software soon started to catch up with 64 sales, and I could finally put my 64 to work. Among the first programs I bought for the 64 were



Since the Commodore 64's debut in 1982, worldwide sales of it and the 64C, shown here, have topped 10 million.

the Commodore Macro Assembler Development System, Editor Pak, Word Machine, Name Machine and, Totl Time Manager 2.6. Although it has long been excelled by other assemblers, I still use MADS for my feeble attempts at machine language programming. The first BASIC program I ever typed in was a sprite editor by Donald A. Pitts. It appeared in an article called "A Shape Generator for the Commodore 64" that was published in COMPUTE (November 1982).

SpeedScript

Perhaps the most famous type-in program ever published in any computer magazine is SpeedScript, the program that I'm using to write this article. It was written by Charles Brannon and first appeared for the VIC-20 and 64 in the January 1984 Gazette. Updated several times over the years, its latest version, SpeedScript 3.2, was published in May 1987. The program has been enhanced many times, allowing users to customize the program to their liking. Among these programs are SpeedScript-80, an 80-column version; SpeedCheck, a spelling checker; SpeedSearch, a fast utility for finding any phrase within a SpeedScript file on disk; SpeedCount, a word-counting enhancement; ScriptRead, a fast SpeedScript file reader; and Instant 80, a true WYSIWYG preview for SpeedScript. Some of these enhancements were published in Gazette and others appeared in COMPUTE when it still published type-in programs. (All of these programs are still available on the SpeedScript disk.) When I considered myself proficient in BASIC (I wasn't), I wrote a 92-block program called Muzic! which I attempted to package and sell. I think I sold a grand total of

four disks—and these probably went to my 64-owning friends.

Meanwhile, back on the hardware front, finding the television hookup inadequate, I bought my one and only upgrade for the 64—a 1702 monitor. I'm staring at it still. What a wonderful improvement! No more zigzag lines and blurry characters.

Rabbits and Snails

Although it represented a quantum leap in data transfer speeds over the interminably slow tape cassette, the 1541 disk drive soon earned a reputation of its own for snail-like loading and saving (90 blocks—23K—in about a minute) and an easy-to-misalign read-write head.

To alleviate the first problem, I bought an Epyx Fastload cartridge. If there ever was a 64 accessory that's deserved to become a classic, it's this cartridge. Soon thereafter, I read an article on how to add an on-off switch to avoid plugging and unplugging the cartridge to accommodate programs which did or didn't use it. My Fastload's been sticking out of its port ever since.

The head alignment problem was much more frustrating. I read many articles, sent the 1541 to several repair shops, and drilled holes in the bottom housing to access the stepper motor's adjustment screws. Finally, someone managed to fix it, and it's been fine ever since.

Price Wars

As the years flew by, the 64's price plummeted. By June 1983, the 64's mail-order price was \$395; a year later, it had slipped to \$199; in May 1987, \$169.95. Today you can buy one for about \$150.

Part of the reason for its decreas-

ing price was the onslaught of other low-priced competitive machines which vied for the computerphile's attention: APF Imagination Machine, the Apple-compatible Franklin Ace 1000 and 1200, Timex/Sinclair 1000 and 2000, Apple IIc, more Tandy machines, Texas Instruments 99/4A, Coleco Adam, Atari 520ST, and IBM PCjr (born November 1983 and died March 1985). When used 64s began to hit the want ads at rock-bottom prices, I bought a spare.

Meanwhile, Commodore wasn't resting on its laurels. While simultaneously boosting production and cutting the price of the 64, Commodore was trotting out the portable SX-64; the anomalous Plus/4 and 16; the 128 and 128D; the breakthrough Amiga family; and the IBM compatibles, variants of which became especially popular in Europe. None of those computers approached the sales of the 64, which is still being built and sold internationally today as the cosmetically enhanced 64C.

Software Bonanza

Within 18 months after its splashy introduction, more and more software companies had climbed aboard the lucrative 64 bandwagon. Ads for programs like EasyCalc, Sprite-Magic, Mail Mate, Choplifter, Sargon II, General Ledger, Busiwriter 64, Monopoly, Centropod, Software Automatic Mouth (an amazing voice-synthesis program known as SAM), Script 64, Typing Tutor, SuperTerm, and WordPro Plus/64 proliferated in Commodore-specific magazines.

Programmers who knew the 64 were in demand. Even Brøderbund Software was advertising for software authors in December 1983.

A New Operating System

In March 1986, Berkeley Softworks—now GeoWorks—introduced GEOS, the Graphic Environment Operating System. Although I'm not a GEOS fan (without an REU and extra drives, molasses is fast in comparison), I seem to be in the minority. Commodore quickly adopted GEOS as its "official operating system" for the 64, and many apparently excellent software products have greatly helped the 64 stay alive and kicking. Gazette's GEOS column first appeared in September 1987.

Applications

By November 1988, 64's were being pressed into service for almost everything but cleaning the kitchen sink. A radio station in Phoenix used one to

report activities on a call-in talk show. Many people, such as one avid user in Niceville, Florida, used their 64's to track stock market investments. One commercial application used 128s to monitor and control furnace settings in a large apartment complex.

Teachers calculated students' grades with them in Richmond, Virginia. A fireman in Tulare County, California, used his for eliminating some of the paperwork involved in running a fire department. A preacher in Asheville, North Carolina, tracked the recreational activities of his church with his 64. A Union, Iowa, farmer used a spreadsheet running on a 64 to keep an eye on his farm's financial condition. At Bosch Power Tools, where I work, we used a 64 for years to calculate and generate graphs of motor-performance curves.

Hardware

While millions of owners were putting their 64s to creative uses, hardware manufacturers were busy as well. Here's a short list of peripherals that have made life easier and more interesting.

- Card? printer interface (Cardco)
- VIC-1520 plotter/printer (Commodore)
- Fastload cartridge (Epyx)
- Command Control Trackball (Wico)
- The Voice Box voice synthesizer (The Alien Group)
- Hearsay 1000 voice synthesizer/recognizer (Hearsay)
- Minimodem-C (Aprotek)
- Super Graphix printer interface (Xetec)
- SWL shortwave listener cartridge (Microlog)
- Flexidraw 170-C light pen (Inkwell Systems)
- Stringy Floppy storage device (Exatron)
- Ultimate Interface (Schnedler System)
- Lt. Kernal hard drive (Xetec)
- ComputerEyes video digitizer (Digital Vision)
- MW-302 printer interface (Micro World Electronix)
- Home Control Interface (X-10)
- Interpod interface between computer and various peripherals (Limbic Systems)
- VIC 1650 modem (300 bps, originally \$150) (Commodore)
- 1750 RAM expander (Commodore)
- Sonus MIDI interface (SOFTpacific)
- Video Byte II video digitizer (The Soft Group)
- 1351 mouse (Commodore)
- Ten Key Pad (Quality Computer)
- Super Expander 64 cartridge

- (Commodore)
- 1581 3 $\frac{1}{2}$ -inch drive (Commodore)
- Bodylink fitness system (Bodylog)

Perhaps the most bizarre peripheral of all was the heavily advertised Spartan adapter for interfacing the 64 to Apple II/II+ peripherals (Mimic Systems). I'm not sure it ever attained volume production.

Software

Here are some of my favorite programs and applications for the 64. Chances are you probably have some of these, too.

- SpeedScript 3.2 word processor (COMPUTE Publications)
- Instant 80 80-column preview (COMPUTE Publications)
- Print Shop card/sign maker (Brøderbund)
- Doodle drawing program (City Software)
- Flexidraw (Inkwell Systems)
- Generic Librarian MIDI software (The Music Software Exchange)
- Simon's BASIC cartridge (Commodore)
- PractiCalc spreadsheet (Computer Software Associates)
- CADPAK-64 drawing program (Abacus)
- Screen Graphics-64 graphics enhancement to BASIC (Abacus)
- Tax Master (Master Software)
- Datafile (RUN magazine)

How about a few games?

- Space Taxi (Muse)
- Summer Games II (Epyx)
- Impossible Mission ("Stay awhile; stay forever!") (Epyx)
- Raid on Bungeling Bay (Brøderbund)
- Tetris (Spectrum HoloByte)
- Advanced Dungeons & Dragons (Strategic Simulations)
- Bard's Tale (Electronic Arts)
- Pinball Construction Set (Electronic Arts)
- Zork series (Infocom)
- Dragonworld (Trillium)
- Flight Simulator II (subLOGIC)
- Choplifter (Brøderbund)^a Where in the World Is Carmen Sandiego? (Brøderbund)

In a Babbage's one day, I ran across Light and Temperature Labs, scientific experiments from Hayden Software. They were on sale for \$10 each. In case you missed these sadly underpromoted products, each one is a series of scientific experiments on disk, supported by great documenta-

tion, along with an interface box which connects to a joystick port. The box accepts either a photocell or an accurate temperature probe—also furnished! What a find!

Gadgets

Over the last decade-plus, I've whiled away quite a few hours building and writing supporting software for my own collection of miscellaneous gadgets that connect to the user, cartridge, or joystick ports. Some of these include the following.

- A numeric keypad
- A plotter (although plodder would be a better name), which could draw with four felt pens whatever appeared on the monitor screen
- A MIDI interface (I still use it almost daily with my spare 64)
- A relay interface which controls small electrical devices
- A room measurer which uses an old Wico trackball mechanism to roll around the periphery of a room, taking the room's measurements
- A model "drummer boy" which uses relay-switched solenoids to control drumsticks
- A device to synchronize taped music and kaleidoscopic images (works with a four-track tape deck)
- A talker, based on a Radio Shack voice synthesis chip

In Retrospect

I've spent literally thousands of pleasant hours with my 64 over the past 11 years. The computer is still perfect for the vast majority of my purposes. Back in May 1988, Rich McIntyre, then Commodore's senior vice president of sales and marketing said, "Eight-bit? Who cares? You're buying a machine for a specific reason. If it satisfies that need, it's never obsolete. Only your requirements become obsolete. . . . If the need continues to exist until the year 2000, that machine is still satisfactory."

Maybe Jim Hilty said it best in last December's issue of Gazette. "The 64 has always been kind of a barnstorming computer . . . just plug it in and fly by the seat of your pants. It's a fun computer, a truly personal computer, a computer that an individual can enjoy programming, a welcome friend."

Thank you, Commodore. Thanks also to everyone who builds the hardware, writes the software, and publishes information about this marvelous machine that is the Commodore 64. Here's to 11 more happy, productive, profitable, educational, and entertaining years in 8-bit heaven. □

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- * **Worldwide Distributor Of Major Products.**
Ever hear of Maverick, Super Snapshot, Super 1750 Clone, and the 1581 Toolkit? We've been actively involved in the ground up production and world-wide distribution of these and many other fine Commodore products.
- * **Purchase From Us With Confidence.**
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MATHBOOSTER

I don't think there's a kid left in the universe who doesn't respond to falling images on a computer screen with a desire to stop them, to be the good guy, the hero. Witness the fact that even kids who own videogames and whose parents won't give them quarters can't resist checking out the games in malls and stores.

What does this have to do with an arithmetic drill-and-practice program for the 64? Boosting falling satellites back into space is the premise behind Mathbooster, a program imported from Australia.

To prevent these satellites from tumbling down and crashing into the earth, students must quickly and correctly solve math equations. This program provides a drill with positive reinforcement that's fun.

Mathbooster is not a teaching program. It's designed to reinforce through practice the math skills that the students have learned in class.

When the game starts, satellites are strung across the sky, and a booster rocket waits atop its launch pad. Below each satellite is an equation. This first wave of satellites begins to fall. Using the appropriate keys, you place the launch pad beneath a satellite and type in an answer to the equation. Pressing Return or the space bar launches the booster rocket—only if the answer is correct. If so, the booster rocket then pushes the satellite back into space. If the answer is incorrect, the satellite continues its fall toward earth. Once you've successfully propelled the first wave back into orbit, a second wave begins to fall—at a faster rate than the first!

The third wave consists not of satellites but the space shuttle! It's a very large space shuttle that needs a very large booster rocket to restore it to orbit. Points are accumulated for boosting satellites and the shuttle back into space. If a satellite or the shuttle reach-

current problem type, change it, change the speed settings, load and save the problem type and settings, or return to the game. When you view a problem, the screen lists the type of operation that's being displayed: addition, subtraction, addition and sub-

difficult. The screen instructions and the manual enable you to create the exact drill you want for your student.

Speed Settings govern the actual game, controlling how fast the satellites and shuttle fall, how quickly that speed increases, when the first shuttle appears, how many times per wave it appears, and whether or not the sound effects are turned on. With these you can customize a game to best challenge students without overwhelming them.

The manual is thorough. Aside from a couple of typos, it provides helpful insight and guidance in devising games that will provide the kind of drill that will most benefit your children or students. Included are some appendices describing the ten sample games already on the disk and providing some examples of how to set up game formats. Mathbooster also carries its own copying program to allow you to make backups.

Mathbooster is the second Free Spirit import from Australia that we've reviewed. These two programs by Satchel Software are copyrighted by the Minister of Education and are used by the school systems in South Australia. (Mathbooster's manual even makes reference to the South Australian curriculum modules.) As with the first program, Dr. Spellingstein, we are impressed by the solid programming that provides the actual computer game yet allows you to create and modify within the program to make it fit your needs. It's powerful, flexible, and easy to operate.

Kids love computers and computer games. Most kids also love learning, although they'd deny it if you'd ask



Boost falling satellites back into space with Mathbooster, a program that combines arcade action with math drill.

es the ground, the game ends. As in arcade games, the program keeps track of current high scores.

Mathbooster comes with ten sample games already prepared. However, its power comes in the variations you can create by altering the type of problems. The main menu lists three options: Start the game, Load different problems, and Change problems. The first one is self-explanatory. The second option lets you load other files of problems already created and saved on disk. The third option lets you create these other math files.

The first menu under option 3 allows you to view the

traction, multiplication, division, or multiplication and division.

Next, it tells you what form the equation will take, such as $A + B = C$. Then, for each A, B, C, or other variable, the program sets the parameters. For example, if you're practicing addition where the sum, C, never exceeds 12, then A's parameters would be 1-6, and B's would be 1-6 also.

The next option is to change the problem type. The Operations List lets you do this. For each operation there's a screen that guides you through the steps of choosing the parameters for the variables. This requires care and thought, but it isn't

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REVIEWS

them. Computers and learning games can be an irresistible combination when blended properly. Mathbooster provides the perfect recipe for turning math practice into a real treat.

DAVID and ROBIN MINNICK

Satchel Software
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720 Sycamore St
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Circle Reader Service Number 414

JARA-TAVA

Want to take a trip to an exotic location; hunt for buried treasure; and fight crocodiles, sharks, and hungry snakes? Then Satchel Software's latest text adventure, Jara-Tava, is your ticket to adventure.

Jara-Tava begins, like many good adventures, with the inheritance of an ancient treasure map. A letter from your dear, departed Uncle Bartholomew suggests that Captain Kidd's treasure might be found on the island of Jara-Mau. It also warns of danger should you go to neighboring Jara-Tava, the Isle of Fire.

With no further urging, you're on your way. Of course, you learn early in the game that the treasure isn't on peaceful Jara-Mau but across the shark-invested strait on Jara-Tava.

Satchel Software designed this interactive text adventure with junior high students in mind. It has colorful graphics, easy-to-use text commands, and a challenging plot. Familiar elements from classic literature, skillfully woven into the game, are sure to please teacher, student, and parents alike. In addition to Kidd's treasure, you'll find Robinson Crusoe's tree house and Captain Nemo's submarine, *Nautilus*. Also, straight from an Indiana Jones adventure, there's a golden idol that's protected by a large boulder.

Teachers in Southern Australia have been using this text game in their classrooms since 1988. However, the game has only recently been licensed for distribution in the U.S. by Free Spirit Software. The package comes complete with three disks and a 134-page combination instruction and resource manual.

Teachers who decide to use this game as part of their classroom curriculum will be delighted with the hidden teacher's controls built into the program. Accessed by pressing Shift-T at the beginning of the game, teachers or parents can set options like help com-

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REVIEWS

to use for simple reports as they enter high school. It's also useful for people who have never used word processing programs or have been intimidated by them in the past. Called Tell-a-Tale, the Jara-Tava word processor is a very simple-to-learn program that lets you write and then save your work to a disk. You can also center titles, change cases of words and letters, work with existing files, and print out reports. The program will not do more elaborate functions like footnotes and headers, but it's sufficient for most word processing needs.

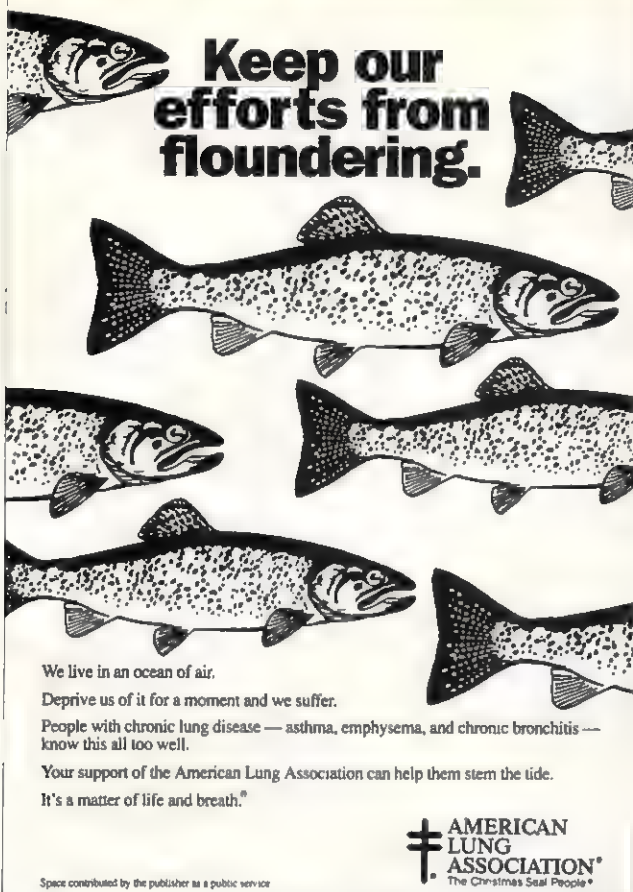
The database is useful for storing word lists and simple groups of information. The word lists can then be imported into the word processor to make spelling lists or to use in essays. Satchel has already begun five databases for the user. The names are Pirates, Islands, Volcanoes, Whales, and Sharks. You can build on this basic base by adding additional files. Each file may be up to 29 characters. Files may be deleted; however, the erase function has been restricted so no more than one file can be erased at a time. This safeguard keeps you from accidentally wiping out your entire database.

The Tree of Knowledge game pits the player against the computer's ability to guess. There are five trees on the disk that you can select: Animals, Pirates, Whales, Sharks, and Snakes. New information can be added to the existing trees to make a more complex guessing game. These can be saved and replayed again and again.

The resource disk takes the Jara-Tava package far beyond mere game software. In my opinion, this one disk is worth the modest price of the package all by itself.

And there's still more. Take a look at the extensive, spiral-bound instruction manual. Tucked in the center of the manual is a 68-page section that is filled with activities related to the themes found in the Jara-Tava game. There are word games, crossword puzzles, word searches, drawing activities, and group games. There are ideas for crafts, too. You can build your own model volcano, make beanbags shaped like whales, or do any of a variety of activities. All the instructions are included. As an added bonus, Satchel has given permission for teachers to copy any or all of the manual for use in their own classrooms.

All in all, Jara-Tava is an outstanding package that does more than merely entertain players. It stimulates and ed-



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FLYER

Flyer is a deceptively simple but maddening little arcade game for the 64. The idea is to guide a paper airplane through the rooms of a house, avoiding furniture and other obstacles.

Helping you in your fight against gravity and wind resistance are a number of air vents that provide lift and a series of rollers that give your glider extra speed and maneuverability. As your glider passes over a vent, push up on a joystick to gain altitude. Maintain a light touch, though. If you climb too high, you'll smack into the ceiling and crash.

As your plane glides from left to right across the screen, aim for the diamond-shaped rollers in the middle of the room. When you fly through one, push your stick hard to the right to

pick up speed. Control is rather limited with this flyer, but you can lose altitude quickly by pulling back on the stick.

As in any house, furniture is a major obstacle for paper airplanes. Beds, lamps, stereos, and bookcases seem to suck the planes into them. When you crash, you start again in the first room which is filled with nothing but air vents and rollers. Since I crash so frequently, I'm glad that author Cameron Kaiser lets me keep the action moving. To restart, simply press the fire button.

The music playing in the background is a great rendition of "The Blue Danube." It puts the 64's SID chip to good use, but that tune just about drives me crazy! The volume control takes care of that, however.

That melodic but cursed background music is Flyer's only sound effect, but it's really not that bad. I just get annoyed when I can't master a game.

It took me quite some time to develop just the right touch with Flyer, guiding the plane through the house. Getting through the first room filled with rollers and vents was a breeze—pardon the pun—but I thought I'd never make it past that bed in the next room. I'd gain a little altitude, pick up some speed, fly over a vent, pull back to

clear the bed, and then swish! Back to the beginning.

Flyer's graphics are pretty simple: Everything's in black, white, and gray. The rooms fill only a narrow portion of the 64's monitor. Each one is only about two inches high. That's why you have to be careful about not flying into the ceiling. I think a little more creativity could have been shown here to expand the playing screen, and the gray rooms could use a bit of color to give the game more visual appeal.

The documentation is clear and concise. It consists of a two-sided sheet of instructions and hints that's well written and easy to understand.

All in all, Flyer is a simple game, and that could be its biggest drawback. If you're the type who gets discouraged easily, you'll probably get bored with Flyer rather quickly. On the other hand, if you're the type who refuses to let a computer beat you, you'll probably get addicted to flying this little electronic paper airplane.

CHRISTIAN FLEMING

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Circle Reader Service Number 415

Where to find chips and whether excessive poking can be hazardous to their health.

Character ROM Chip

Can you possibly tell me where I can get the 9011225-01 chip for my 64? I have been looking since 1991 but haven't been able to locate one in my country.

DAVID SANIEL SUAREZ LOPEZ
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The chip you want is the Character ROM chip, and you can order it from The Grapevine Group, 3 Chestnut Street, Suffern, New York 10901. The latest price is \$9.50 plus \$8.50 shipping costs to Mexico. Ask for part number C1225. You can order the chip by mail or by calling (914) 357-2424. Readers in the U.S. can order by calling (800) 292-7445. Ask for the free catalogue of Commodore and Amiga chips, too.

Poked to Death?

Question: After about a year of sustained use, the SID (Sound Interface Device) chip in my Commodore 64 has stopped functioning. Can this be caused by misusing the chip? For instance, is there such a thing as excessive poking?

DONALD DRAPER
RICHMOND, VA

The SID chip is designed to be poked. Such activity is considered normal use and will not damage it. In general, nothing any program does will ever damage any of a computer's internal hardware. Like all other electronic components, SID chips occasionally fail. The only cure is to replace the chip. Replacing the chip can be either simple or difficult, depending on whether the one in your computer is socketed or soldered. The SID chip, which has the numerical designation 6581, is located near the center of the circuit board in

both the 64 and 128

Math Errors

When using my 64 for math homework, I keep running into some problems. If I raise a variable containing a negative number to a fractional exponent, the computer returns an **ILLEGAL QUANTITY ERROR**. It doesn't happen with constants. For example, if I have the computer print -8 to the power of $.5$, it works fine. But if I make X equal -8 and then try to print X to the power of $.5$, it doesn't. Why is this?

TARO WILLIAMS
LAKE GENEVA, WI

*Computers follow a rule called order of operations or operator precedence, which tells them which functions or operations to perform before others. For example, PRINT $3 + 2 * 7$ will give you a result of 17, not 35, because multiplication has a higher precedence than addition. The result of $2 * 7$ is calculated before the 3 is added in.*

The up-arrow (power) function has a higher precedence than the negation (-) function, as you'll see if you PRINT $-4 \uparrow 2$. The 64 prints -16 as the answer. But squaring -4 should result in a positive 16, not a negative one. What happens is that the result of 4 to the power of 2 is calculated; then the minus sign is appended.

Although PRINT $-8 \uparrow .5$ seems to work, you'll get an error message if you try PRINT $(-8) \uparrow .5$. So it's not a matter of variables versus constants; it's strictly a problem with raising a negative number to a fractional power.

Raising to the $.5$ power is the same as finding the square root of a number. The square root of -8 would have to be a number that multiplied by itself yielded -8 . But whenever you square a real number, the result is positive, so

there's no such thing as a square root of a negative number, at least among the real numbers. Mathematicians use imaginary numbers to handle square roots of negative numbers, but your 64 isn't built to handle imaginary numbers.

A Teacher's Thanks

I would like to thank Gazette for providing me with a source of programs that I have incorporated into an integrated computer-use package for the teachers of my school board. Our educational system, like many, is facing financial cutbacks, with little or no money available for computers or software. Your programs filled that need. We have numerous 64s in our system, and now we are able to make much greater use of them.

I selected programs from Gazette that provided word processing, spreadsheet, database, graphics, and keyboarding skills. Other programs supplied language arts, programming suggestions, science, social studies, and telecommunications resources.

With the current wave of upgrading, many educators felt that the 64 had nothing to offer. In fact, it has much to offer if it is utilized to the fullest possible extent. The computers are already in the system, and the Gazette and well-written public domain programs offer a viable way to provide for integrated programming for our students. Thank you.

CAROL A. NAUSS
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PD PICKS

Steve Vander Ark

A NEW COLUMN, VERSION 2

Yep, version 2. This is the second time I've written this column. If you feel as though you've just walked into the middle of a movie, let me explain. This is a new column that deals with public domain programs and shareware. I wrote the first version a few weeks ago, but when I reread the introduction, I just shook my head. It was boring.

Oh, it was OK. I might use it as part of an article somewhere along the line. It defines shareware and a few other related terms, chatters about how nice it is to be writing this new column, and warns everyone—in no uncertain terms—to pay their shareware fees. It ends with a flourish about how shareware is on the cutting edge of Commodore programming today.

I'm talking bold, new, and exciting programs that push the limits of Commodore's 8-bit wonder! I've got to be spitting a little flame. I don't want you to read this column once and then next time decide to save it until you've read the part again about how to type in the programs. I want you to turn to this column *first!*

I'll be covering programs that I hope will provide some of the old spark that made the 64 so exciting—and made its owners so gung-ho, so (let's face it) nuts about their machines. That spark is what keeps me coming back to this great little machine.

I've been rummaging in some of the stranger corners of QuantumLink's libraries, tracking down programs to throw at you. Feel free to download them. I've provided filenames and uploader names for easy downloading. If you're not on Q-Link and you can't find these files on local

bulletin boards or at your user group, you'll find the programs mentioned here on the Gazette Disk. Now, let's take a look at this month's programs—a couple of fast and furious, arcade-style shoot-'em-ups.

Astra

By Chris Batchelor
QuantumLink filename: AS-TRA3.SDA, uploaded by Chris-EMM.

OK, for you 128 users out there, here's an 80-column program that will cost you hours of sleep. The way I see it, Chris Batchelor, the sadist who created this arcade torture, must lie awake nights himself, chortling like the Wicked Witch of the West as he imagines poor joystick jockeys like me with crippled thumbs and glazed eyes, trying desperately to fight off these endless waves of death. After playing this fast-paced shoot-'em-up, I *know* I need a continuous fire button on my joystick, anything to save my left hand from being twisted into a permanent claw.

Astra starts innocently enough. It seems so easy to pour merciless fire into those little bugs that swoop into those little chutes. But then there are more and more of them. Before long, bugs are hurtling down in droves, piling up like spilled gummy bears. There just aren't enough blasts per second to clear them all out. Before long, they get you. And then you play it again, and again, and again.

You'll love this game, especially if you get a rush out of annihilating all those little bugs like I do. It works its horrors in 80 columns, which means that you won't be able to complain at all about the graphics. As far as speed goes, well, just try to keep up with it. I can't honestly say how great it is a higher levels

(I never survive that long).

This is the third incarnation of this game. The fine-tuning has made it a real corker. So flex that thumb a bit, slam back Mountain Dew's until your eyes bug out, and face the endless hordes in Astra.

Odin

By Frank Lindsey
QuantumLink filename: ODIN, uploaded by Mondain.

OK, all of you 64 users who've been reading this and growling nasty things about those 128 users and their fancy graphics, here's a game that will make a red-eyed, thumb-happy zombie out of you, too.

Odin is one of those games that put you in a spaceship at the bottom of the screen, armed with an endless supply of energy bolts or whatever. As usual, the details are unimportant. What is important is that all those crazed blobs plummeting toward you will turn your spaceship into pixel dust if you don't keep pounding that fire button. There's no continual fire here (the one major flaw in an otherwise outstanding game), so plan on some actual finger or thumb pain as you try to clear a path in the weaving mess.

Odin does Astra one better by hurling a nifty variety of nasties down the screen. They're all animated with blinking lights and flapping wings, making them nice to look at for that split second before you obliterate them or vice versa. Once you get past the first level, they fire back, lobbing little bombs your way.

Once again, I have to admit that I can't vouch for the higher levels. I count myself lucky to live past level 2.

Launch yourself into either of these games. Have fun and let me know how you make out! □

Explore the exciting world of public domain and shareware programming in this new Gazette column.

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MACHINE LANGUAGE

Jim Butterfield

FILE END CHECK

BASIC's INPUT# statement has limitations that can cause a program crash during a file read. The problem surfaces when two conditions are met. First, the program wants to read the whole file, using INPUT# to get the data and test the system variable ST (status) to detect the end of the file. The second condition occurs when the file ends with more than one Return character.

A quick pair of programs will show this effect. First, write a file as follows.

```
100 OPEN 1,8,2,"0:BADFILE,S,W"
110 PRINT#1,"JINGLE"
120 PRINT#1,"JANGLE"
130 PRINT#1
140 CLOSE 1
```

Line 130 creates the problem by writing a blank line at the end of the file. In other words, there will be more than one Return character at the end. Now for the doomed reading program.

```
100 OPEN 1,8,2,"0:BADFILE"
110 INPUT#1,A$
120 PRINT A$
130 IF ST=0 GOTO 110
140 CLOSE 1
```

The program will read "regular" files without trouble. But on our bad file, the program will read *JINGLE* and *JANGLE* and then lock up.

Why does this happen? It's a conflict of two system rules. Rule 1: The INPUT# command always reads to the next Return character. If it finds a blank line, it immediately goes back for another read. Rule 2: If the file handler is asked to deliver data beyond the end of the file, it will supply a Return character. Combine these rules, and you'll see that if the last line of a file is blank, the INPUT# statement will continue to

read blank lines—and it'll do so forever!

Our first project is to write a program that will scan a file quickly and find out what's at the end—a single Return, the normal condition; no Return, unusual but not fatal; or more than one Return, possibly a crash. So our program detects the danger. Another time, we'll add to the program so that it will fix the problem.

The BASIC part of our program will ask for the name of the data file and open it as logical file number 1. Then it calls the following machine language program at address 8704, hexadecimal 2200.

First, connect the input stream to logical file 1.

```
2200 LDX #01
     JSR $FFFC
```

Our plan is to store the last character of the file at address \$2101 and the previous character in \$2100. As a precaution, we'll prepare to store 0 in this last address.

```
LDA #00
```

As we go around our loop, the A register will contain the last character received from the file. Store this, and read another character.

```
2207 STA $2100
```

To read a character from a file, we may use a subroutine call to either \$FFCF (INPUT) or \$FFE4 (GET). The result is the same either way.

```
JSR $FFE4
```

The received character is in A. We may test for end-of-file by looking at our system status variable ST. That variable is located at hex address 90. In Commodore machines prior to the VIC-20, it's located at address \$96.

```
LDY $90
```

If ST has a value of 0, the file read is proceeding normally, and we have not reached the file's end. In this instance, BEQ takes us back around the loop.

```
BEQ $2207
```

If we didn't take the BEQ branch, we may assume that we're at the end of the file. The final character, still in the A register, is stored at \$2101.

```
STA $2101
```

The last instruction in our program jumps to \$FFFC, CLRCHN, which restores the input stream to its default path (screen/keyboard).

```
JMP $FFCC
```

It's a small program, a fast program—and it will leave the last two bytes of the file in addresses \$2100 and \$2101 and 8448 and 8449 respectively. BASIC should now close the file and test these bytes. Here's the program in the format of a BASIC loader.

```
CJ 100 PRINT"FILE END CHECKER
      [SPACE]- JIM BUTTERFIELD"
XR 110 DATA 162,1,32,198,255,1
      69,0,141,0,33,32,228,25
      5
GS 120 DATA 164,144,240,246,14
      1,1,33,76,204,255
PC 160 DATA 72,32,204,255,162,
      2,32,201,255,174,0,33
JF 200 FOR J=8704 TO 8726
EJ 210 READ X:T=T+X
BP 220 POKE J,X
AE 230 NEXT J
XS 240 IF T<>3010 THEN STOP
XF 300 INPUT "NAME OF FILE";FS
JQ 310 OPEN 15,8,15
FJ 320 OPEN 1,8,2,FS
GB 330 INPUT#15,E,ES:IF E<>0 T
      HEN PRINT ES:STOP
QH 340 SYS 8704
SB 350 CLOSE 1
SD 360 CLOSE 15
GC 370 IF PEEK(8449)<>13 THEN
      [SPACE]PRINT"FILE DOES
      [SPACE]NOT END WITH <RE
      TURN>." : END
SE 380 IF PEEK(8448)<>13 THEN
      [SPACE]PRINT"FILE ENDS
      [SPACE]WITH A SINGLE <R
      ETURN>." : END
XS 390 PRINT"FILE ENDS WITH MU
      LTIPLE <RETURN> CHARS."
```

In order to read a file successfully, you have to know what's at its end.

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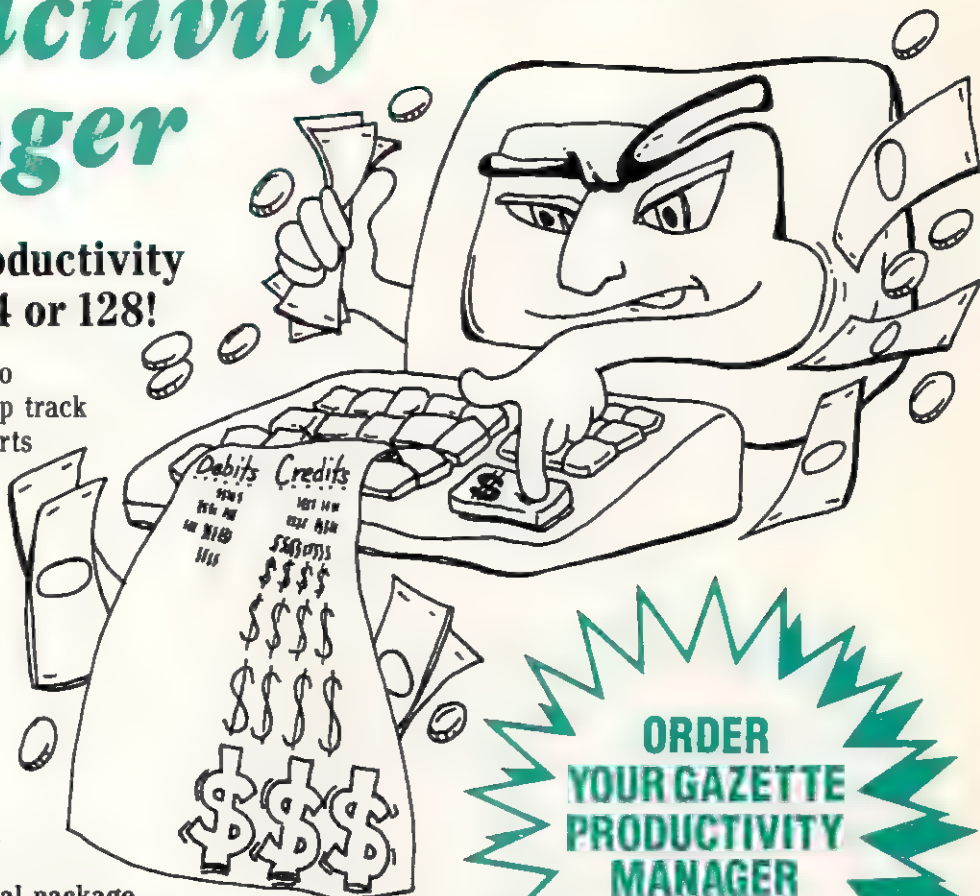
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PROGRAMMER'S PAGE

Randy Thompson

SNOOPERS AND REMOVERS

Readers have come through again with some great tips. Let's get right to them.

Memory Snooper

Here's a simple BASIC program that searches an area of memory for text messages.

```
SD 10 S=41118:E=41865
PF 20 FOR I=S TO E
HS 30 C=PEEK(I):IF C>31 AND C<
    123 THEN PRINT CHR$(C);
EX 40 GET K$:IF K$=CHR$(13) TH
    EN PRINT
MP 50 IF K$<>"4" THEN NEXT I
```

As listed, this program scans the area of ROM that contains BASIC keywords and error messages. You might try searching the area of memory that contains BASIC programs: 2049-40959. To do this, in line 10 make S equal to 2049 and E equal to 40959. I find this program useful in searching for and reading E-mail that I have neglected to read completely before logging off QuantumLink.

You can make the text easier to read as it prints to the screen by pressing Return. This forces the program to print a carriage return. To stop the program before it finishes searching memory, press the back arrow key.

BRIAN KISSINGER
EVANSVILLE, IN

Function Keys 128

When programming in BASIC on the 128, the GET statement doesn't return the Commodore 64 character codes for function keys (133-140) unless you execute a POKE 828,183 first, thus disabling the keys' preprogrammed definitions. (POKE 828,173 returns the 128's function keys to normal.)

Rather than disabling the 128's function key definitions, you can use them to simulate a string of keypresses that

your program recognizes. For example, I recently wrote a game that lets me press G at any time to access a game-control menu. From that menu, I can press L to load a game or S to save a game, after which the program displays the prompt *Are you sure (Y/N)?* before continuing. To simplify the selection of the game-save option, I programmed the f1 key to simulate pressing the G, S, and Y keys with this command:

KEY1, "GSY"

Now when I press the f1 key while the game is running, the character codes for the G, S, and Y keys are put into the keyboard buffer and read by the game's GET statement. This calls up the game-control menu, selects the save-game option, and answers Y in response to the *Are you sure (Y/N)?* prompt. This gives me three keypresses in one!

RICHARD R HARVEL
FORT WORTH, TX

REMOVER

The following program removes all REM statements from 64 BASIC programs. To use this handy utility, load and run the program shown below. Then load the BASIC program containing the unwanted REM statements, and type *SYS 49152*.

```
SH 100 REMOVER
AJ 110 FOR I=49152 TO 49392:RE
    AD D:POKE I,D:C=C+D:NEX
    T I
JP 120 IF C<>33534 THEN PRINT
    {SPACE}"ERROR IN DATA S
    TATEMENTS"
CA 130 DATA 24,165,43,105,2,13
    3,253,165,44,105,0,133
JP 140 DATA 254,32,204,192,176
    ,60,24,165,253,195,2
MK 150 DATA 133,253,165,254,10
    5,0,133,254,160,0,140,2
    40,192,177,253
XK 160 DATA 240,8,201,143,240,
    37,200,76,33,192
FX 170 DATA 152,24,105,3,32,21
    9,192,32,204,192,176,18
GS 180 DATA 24,165,253,105,2,1
    33,253,165,254,105,0,13
    3
GD 190 DATA 254,160,0,76,33,19
```

```
2,76,51,165,192,0,240
PP 200 DATA 1,136,152,32,219,1
    92,160,0,177,253,240,4
KK 210 DATA 200,76,92,192,152,
    141,239,192,173,240,192
    ,201
BK 220 DATA 0,208,22,24,173,23
    9,192,105,5,141,239,192
GB 230 DATA 56,165,253,233,5,1
    33,253,165,254,233,0
PX 240 DATA 133,254,24,165,253
    ,72,109,239,192,133,251
    ,165,254
GH 250 DATA 72,105,0,133,252,1
    60,0,177,251,145,253,32
PA 260 DATA 191,192,32,204,192
    ,176,3,76,151,192,104
AH 270 DATA 133,254,104,133,25
    3,56,165,45,237,239,192
    ,133,45,165,46
GR 280 DATA 233,0,133,46,160,0
    ,76,48,192,230
BB 290 DATA 251,208,2,230,252,
    230,253,208,2,230,254,9
    6
MQ 300 DATA 24,165,254,197,46,
    208,7,165,253,197,45
DC 310 DATA 208,1,56,96,141,23
    9,192,24,165,253,109,23
    9,192
GF 320 DATA 133,253,165,254,10
    5,0,133,254,096,0,0,0,0
```

Besides making a program smaller, removing REM statements can make a program run faster because the computer no longer has to skip over those descriptive but nonfunctional lines of code.

At first glance, line 100 may appear to be missing a REM statement before the program's name. Of course, when the program runs, BASIC will interpret the first three letters of the word as REM and pass on to the next line. This means you can test the program on itself.

Be careful not to run this utility on programs that have GOTO or GOSUB commands that jump to lines that begin with a remark. Those lines will also be deleted.

VINCE TAGLE
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BEGINNER BASIC

Larry Cotton

USER PORT CLOCK (PART 2)

The 64 is blessed with four ports to connect with the outside world. Two of them are quite well known: joystick ports 1 and 2, which are located on the right side of the computer next to the power switch. As we learned some time back, those ports can be used for output as well as for normal joystick input.

The other two ports may not be quite as familiar to you. Facing the computer as you nor-

so have a basic knowledge of digital electronics or know someone who does.

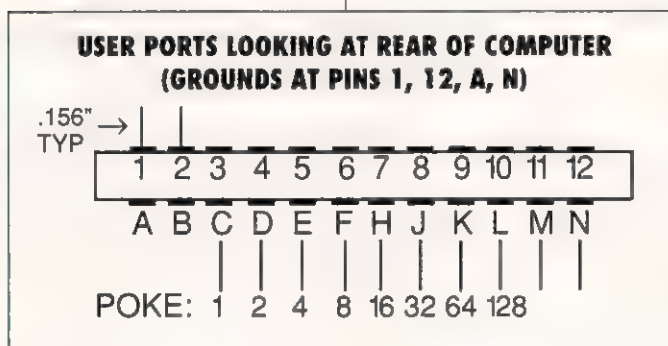
Please remember two things: that all ports are connected to the innards of your computer and that their outputs are rather feeble and sensitive to abuse. Avoid static electric charges like the plague, and always connect ports to low-voltage circuits by means of properly matched opto-isolators, transistors, and/or relays.

The figure below shows the user port as you face the rear of the computer. The pins

When you run this, pressing C, for instance, turns pin C on. (In the jargon of electronics, the voltage on pin C goes high or jumps from 0 to +5 volts DC.) This voltage is enough to power a Light Emitting Diode (LED) or trigger a sensitive transistor or relay, which must be connected between the controlled pin and a ground (pin 1, 12, A, or N).

Now let's finish last month's program. Add lines 10-30 from the above program, change line 420, and add lines 430-470.

Here's how to activate your 64's user port at any time of day.



mally do, the port at the extreme right rear is the cartridge port. It normally accepts game and other types of cartridges, such as the common fastload cartridge. The port on the extreme left rear is the user port, to which I referred last month. When you want to make a connection to the outside world, that's the one to think of first. This port is easy to program in BASIC. I'll show you how to turn on and off each of its pins.

In fact, the programming is easier than wiring the hardware. As I warned you last month, I won't go into a lot of detail about user-port connections. If you decide on a project, you'll need a card-edge connector with .156-inch terminal-to-terminal spacings, available at Radio Shack or Mouser Electronics. You should al-

which we can control easily are those on the bottom row lettered C through L (skipping G and I).

Here's a very simple program that looks at the keyboard to see if C, D, E, or F is pressed.

```
10 P=56577: REM USER PORT
20 POKEP+2,255: REM ALL PINS OUTPUT
30 POKEP,0: REM ALL PINS OFF
40 GETA$: IFA$="" THEN 40
50 IFA$="C" THEN POKEP,1
60 IFA$="D" THEN POKEP,2
70 IFA$="E" THEN POKEP,4
80 IFA$="F" THEN POKEP,8
90 GOTO 40
```

Line 20 sets up the user port so that all subsequent POKEs are interpreted as outputs, line 30 turns all pins off, and line 40 waits for a key to be pressed.

```
420 PRINT"[CLR][DOWN]USER PORT PIN C ON.
430 PRINT"[DOWN]PRESS ANY KEY TO TURN OFF.
440 POKEP,1
450 GETA$: IFA$="" THEN 450
460 POKEP,0
470 PRINT"[DOWN]USER PORT PIN C OFF.
```

Now when you run the program, enter the times as you did last month. When the "alarm" goes off, pin C in the user port is turned on. Poking other values to P in line 440 activates other pins as follows.

Poking	Turns On
1	C
2	D
4	E
8	F
16	H
32	J
64	K
128	L

Combinations of pins can be activated by adding the values in the left column corresponding to the pins you want to turn on. For instance, to turn on pins C and H, poke 17 (1 + 16) to P (56577). To turn on pins J, K, and L, poke 224.

I've just about run out of space for this month, but I'll mention some of the program's highlights.

The subroutine in lines 290-410 gathers user input in hours, minutes, and seconds to set the clock and the alarm. Line 90 pokes values based on this user-supplied information to three clock registers 56329-56331. Line 130 forms a variable B which is calculated from these values. B is the number of seconds from midnight to when the clock's alarm is set—when the user port is to be activated. For example, B would have a value of 25,200 for 7:00 a.m. Line 160 starts the clock by poking a 0 to the tenths-of-seconds register 56328.

The clock is updated and printed to the screen in a loop in lines 170-280. The same registers we poked are continually peeked in line 170, from which printable values are derived in lines 180-220. A in line 230 is the actual time of day in seconds from midnight. Line 240 continually compares A to B. When they're equal, the alarm goes off; control zips to line 420 which turns on pin C in the user port. Here's the entire listing in case you missed last month's column. Remember, always set the user port to activate within 24 hours of starting the clock.

```

BM 10 P=56577:REM USER P
    ORT
BF 20 POKEP+2,255:REM AL
    L PINS OUTPUT
CC 30 POKEP,0:REM ALL PI
    NS LOW
DS 40 PRINTCHR$(147):POK
    E53281,14:POKE646,
    6
KR 50 PRINT"SET CLOCK AT
    :{DOWN}"
PK 60 R=8:GOSUB290:K=432
    00:REM 43200 SECON
    DS IN 12 HOURS
GX 70 IFIS="PM"THENX=K
ER 80 FORI=1TO3:H=INT(T(I
    )/10):L=T(I)-10*H
    :T(I)=16*H+L:NEXT
MC 90 C=56331:POKEC,T(1)
    :POKEC-1,T(2):POKE
    C-2,T(3)
FA 100 PRINT"{DOWN}ACTIV

```

```

    ATE USER PORT AT:
    {DOWN}"
FD 110 R=18:GOSUB290
HS 120 IFIS="PM"THENY=K
JB 130 B=Y+T(1)*3600+T(2
    )*60+T(3)
SK 140 PRINT"{DOWN}PRESS
    ANY KEY TO START
    CLOCK.{DOWN}"
RE 150 GETA$:IFAS="THEN
    150
SB 160 POKEC-3,0
PH 170 H=PEEK(C):M=PEEK(
    C-1):S=PEEK(C-2):
    T=PEEK(C-3)
XG 180 C1$=CHR$((16ANDH)
    /16+48)+CHR$((15A
    NDH)+48)
XM 190 H=VAL(C1$)*3600
GJ 200 IFC1$="00"THENC1$
    ="12"
HD 210 C2$=CHR$((240ANDM
    )/16+48)+CHR$((15
    ANDM)+48):M=VAL(C
    2$)*60
FD 220 C3$=CHR$((240ANDS
    )/16+48)+CHR$((15
    ANDS)+48):S=VAL(C
    3$)
HA 230 A=X+H+M+S:IFA=2*K
    THENPOKEC,0:POKEC
    -3,0:X=0
SG 240 IFA=BTHEN420
BJ 250 IFA<THENJS="AM":
    GOTO270
XX 260 JS="PM"
MD 270 PRINT"{WHT}TIME I
    S "C1$+":":C2$+":
    "+C3$+":":T;JS+"
    {UP}"
HG 280 GOTO170
DE 290 H$="":INPUT"HOURS
    ";H$:IFH$<"0"ORH$
    >"9"THENPRINT"
    {2 UP}":GOTO290
KE 300 T(1)=VAL(H$):IFT(
    1)<0ORT(1)>12THEN
    PRINT"{2 UP}":GOT
    O290
RA 310 IFT(1)=12THENT(1)
    =0
HP 320 M$="":INPUT"
    {DOWN}MINUTES";M$
    :IFM$<"0"ORM$>"9"
    THENPRINT"{3 UP}":
    GOTO320
PG 330 T(2)=VAL(M$):IFT(
    2)<0ORT(2)>59THEN
    PRINT"{3 UP}":GOT
    O320
CE 340 S$="":INPUT"
    {DOWN}SECONDS";S$
    :IFS$<"0"ORS$>"9"
    THENPRINT"{3 UP}":
    GOTO340
GG 350 T(3)=VAL(S$):IFT(
    3)<0ORT(3)>59THEN
    PRINT"{3 UP}":GOT
    O340
DC 360 PRINT"{DOWN}AM OR
    PM (PRESS A OR P

```

```

    )"
HD 370 GETIS:IFIS<>"A"TH
    ENIFI$<>"P"THEN37
    0
EE 380 IFIS="A"THENIS="A
    M":GOTO400
FH 390 IS="PM"
JD 400 POKE214,R:PRINT:P
    OKE211,24:PRINTIS
EX 410 RETURN
AQ 420 PRINT"{CLR}{DOWN}
    USER PORT PIN C O
    N."
XK 430 PRINT"{DOWN}PRESS
    ANY KEY TO TURN
    {SPACE}OFF.
GS 440 POKEP,1:REM TURNS
    ON PIN C
MD 450 GETA$:IFAS="THEN
    450
HF 460 POKEP,0
HB 470 PRINT"{DOWN}USER
    {SPACE}PORT PIN C
    OFF."

```

ATTENTION WRITERS, PROGRAMMERS

Gazette is looking for utilities, applications, games, educational programs, and tutorial articles. If you've created a program that you think other readers might enjoy or find useful, send it and the documentation on disk to

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D'IVERSIONS

Fred D'Ignazio

TODDLER'S CHOICE

For a recent Public Broadcasting Service show, "Learning Matters," we videotaped my segment, Technology Corner, in my family's study. We reviewed the newest multimedia CD-ROM titles for toddlers, including Just Grandma and Me (Brøderbund); Mother Goose (Sierra On-Line); Silly, Noisy House (Voyager); and Millie's Math House (Edmark). Our reviewers were my three-year-old daughter Laura and her one-year-old buddy Alex.

At the end of the segment, the show's producer, John Merrow, noted that the equipment and software we used was "expensive and possibly out of reach" for many families. He wanted to know if there was another toddler we could interview who had a more down-to-earth computer setup.

I thought of Tommy Kurek, Laura's next-door neighbor, and we called Tommy's parents and scheduled a visit.

Tommy's computer, it turned out, was a perfect toddler configuration: a second-hand Commodore 64. Most of the software titles and extra equipment were purchased at yard sales or flea markets. The price of Tommy's entire setup was well under \$400—the price of a single CD-ROM drive.

The computer station was on a small table in the corner of the family living room surrounded by books, Tommy's toys, and two or three lounging cats. When the family did their computing, Tommy sat in his chair, and his mom and dad sat on each side of him on the floor. This made them all about the same size.

To begin the interview, we asked Tommy's daddy, Keith, if Tommy had suffered from not having the latest multimedia computer equipment.

"I don't think so," said

Keith. "Tommy just turned three. While he was still two, using the Commodore 64, he learned how to write his own name, his friend Laura's name, my name, his mommy's name (Leanne), and the names of all four family cats.

"Also, while he was two, Tommy used the computer to learn how to count to 39, count objects on the computer screen and press the correct number on the keyboard, and recognize and find every number from 0 to 9 and every letter in the alphabet."

"Do you have any advice for fellow parents who have toddlers?" we asked Keith.

"Tell them to find or buy a Commodore 64," said Keith. "If the parents buy an expensive computer, they'll be so worried about its safety they'll never be relaxed around it with their two-year-old, and they'll be afraid to turn their child loose on the computer. The great thing about this computer is it's 100 percent Tommy's computer. He can do anything he wants, and the Commodore can take it.

"The other good thing about the 64," Keith continued, "is that lots of Tommy's educational programs come on cartridges. When we go visit Grandma on weekends, we just throw the computer into the car along with a couple of Tommy's favorite cartridges. At Grandma's we plug into her television set, and Tommy is busy for hours working on his number, shape, and letter games. When it comes time to go home, it takes about ten seconds to unplug the computer and toss it back into the car."

We asked Tommy to pick out his favorite 64 programs to recommend to other toddlers who are just starting to compute. Here's his list:

• KinderComp (Spinnaker Software). A set of shape-, num-

ber-, and letter-recognition programs perfectly suited for your toddler computer whiz.

• Astro Grover (CTW-Sesame Street). Same as above, featuring the lovable Sesame Street muppet Grover.

• Ernie's Magic Shapes (CTW-Sesame Street). Shape-recognition program featuring Ernie.

• Big Bird's Special Delivery (CTW-Sesame Street). More early learning programs featuring Big Bird. All three programs (Grover, Ernie, and Big Bird) can be found in a single package entitled The Sesame Street Learning Library.

• Kids on Keys (Spinnaker Software). Helps with keyboard recognition.

• Alphabet Zoo (Spinnaker Software). Letter recognition.

• Learning with Leeper (Sierra On-Line). Fun, educational games hosted by cute little onscreen characters such as Leeper.

• Design-a-Saurus (Britannica Software). Dinosaur recognition and naming program. (Tommy is a dinosaur nut. He carries a Tyrannosaurus Rex doll to bed with him instead of a blanket.)

• Dinosaurs Are Forever (Polarware). More reptiles for young dinosaur enthusiasts.

• Kermit's Electronic Story Maker (Simon & Schuster). You and your children can cook up your own online picture books.

The cost of these programs? "At worst, under a hundred dollars," Keith says. "The important thing is to watch for yard sales where you can pick up children's software for just a couple of dollars. Also, sign onto local bulletin boards where you can pick up lots of freeware educational programs. Join a 64 user group, and you're sure to run into other young parents who are eager to share with you and your kids." □

A 64 can be an ideal first computer for toddlers—as well as a great teaching tool.

PROGRAMS

ULTIMATE ML MONITOR

By Ted Green and Ed Balchick

Examining and debugging troublesome machine language (ML) routines or trying to see how well machine code actually works is usually a struggle. ML programs run so quickly that it's difficult to determine exactly what happens and when it happens without altering the program. A standard monitor's breakpoint returns are not much help because the display is corrupted and the program halts.

Now, with the Ultimate ML Monitor, you can execute any piece of ML code in slow motion or single step through it one command at a time! A special user interface lets you interact directly with the ML program. You can view and control the actual operation of the program in text or hires mode as it runs; examine and modify the program, data, or register values; and allow the Kernal serial bus to access routines while in the single-step mode. These and many other features, such as full implementation of 6502 quasi-operations, make the Ultimate ML Monitor a powerful programming utility that you'll wonder how you did without.

Getting Started

Ultimate ML Monitor consists of three programs: two small programs that make up the loader system and the main program. These three files must all be saved to the same disk, but the program that you wish to monitor can be on any disk, even another drive.

The setup portion of the loader system is written in BASIC. To avoid typing errors, use The Automatic Proofreader to enter the program. See "Typing Aids" elsewhere in this section. When you finish typing this portion in, save it to disk with the filename ULTIMON.B.

Next, the smart portion of the loader system is written in machine language, and you will need MLX, our machine language entry program. Again, see "Typing Aids." When MLX prompts, respond with the following values.

Starting address: CC13

Ending address: CFFE

After you type in the loader program, be sure to save a copy to disk with the filename ULTIMON.L.

The monitor portion of the program

is written entirely in machine language for speed and compactness. You must enter this program with MLX. When MLX prompts you, respond with the following values.

Starting address: 8000

Ending address: 8EBF

Be sure to save a copy to disk with the filename ULTIMON.O.

Loading the Program

Ultimate is very easy to use. Load and run Ultimon.B as you would any BASIC program. Before you run it, however, you should have the program available that contains the ML code that you wish to examine. This program should be copied onto the same disk as the Ultimate system if you are using a single drive. If you are using Ultimate with a two-drive system, have each disk in a drive before running Ultimate.

As for what kind of program to look at, the possibilities are almost limitless. You aren't limited to looking at a pure ML program, the kind you load with the ,8,1 extension and start with a SYS command that you often forget. Ultimate will examine an ML program that loads like BASIC or even a BASIC program that reads the ML from data statements and pokes them to memory and then calls them with a SYS command.

In the latter two cases, Ultimate can catch the ML portion just as BASIC tries to execute it (if you start in single step). This means that for BASIC programs in general, all of the BASIC is actually run by the interpreter. However, once you are in the ML routine, you cannot go back to the BASIC program.

When you have selected the program that you wish to examine, load the drive(s) and run Ultimon.B. The screen will clear and display the following prompt.

ADDRESS TO LOAD MONITOR:

The address must be entered as a decimal value. The Ultimate program can be put at any unused area from 2048 (\$0800) up to and including 36864 (\$9000). It can also be put at 49152 (\$C000). If you try to place it above 49152, you will get an error message. Placing the monitor in the RAM under

ROM (BASIC or Kernal) is possible, but not recommended, except for advanced users. The most important factor in choosing the load address is determining where there will be 4K of memory that won't be used by the program to be monitored.

Don't forget about BASIC variables. If they are a problem, protect 4K for Ultimate first. Ultimate will protect itself from any memory access commands while in any mode except full speed. This protective feature will cause the monitored program not to execute those commands, possibly causing an infinite loop in the monitored program. If this happens, it's best to start over and choose a new load address.

You'll then be prompted for a program to monitor and a drive number from which to load. If you enter the same drive as the current drive, you must copy your program to the disk with the Ultimate system on it because there is no time to switch disks.

You'll then be asked whether you want to run the program in single-step mode or at full speed. Enter S for single step or F for full speed. You'll usually want to start in single-step mode for most small programs or anytime you want complete control over the whole monitored program. Full-speed mode is a good choice when you want to monitor a large program, and the piece of code that you're interested in is executed sometime after the program begins.

If you select full speed, hitting the Restore key at anytime will break into the program in the single-step mode (unless the program changes the NMI vector at \$0318 while in full speed). When the single-step mode is activated, the status line will be displayed at the bottom of the screen.

Using the Program

Once you enter the single-step mode of Ultimate, the main program interface is the interactive status line. Note that all numbers on the status line are shown in hex. The main features of the status line are the following: PC (which shows the contents of the emulated program counter of the program you are examining) and A, X, Y, and SR (which are the current contents of the emulated accumulator and the X,

Y, and status [flag] registers).

To the left of PC is the space for the full-speed Kernal routine indicator, an asterisk (*). More about that later.

The most important feature of the status line is the command display field. This contains the opcode mnemonic of the current instruction and the operand field. The operand field can be toggled between two different types of displays for some commands. The secondary mode is like a standard disassembler listing of the command.

The main display mode is what gives Ultimate its powerful debugging features. It has the ability to convert the addressing mode into the actual memory location used by the CPU and to display it on the status line. For example, if locations 0E = 75, 0F = 10, and Y = AF, then the command above would display as LDA \$1124. You can toggle between these two modes at anytime with the asterisk key, even view the two modes of the same command without stepping. There are some commands that will show an address (branches, RTS, JSR, and so on) that look identical. The command field also indicates the address of the destination if a branch is taken. An RTS will display the actual address of the command after the JSR, not the address 1 that it pulls off the stack. There are some other features used in the status display, but these will be discussed in the appropriate key description below.

Key Functions

A single keystroke activates many of Ultimate's key features.

F7

Pressing f7 executes the next program instruction and displays the results on the status line.

S

Press S to enter slow motion program emulation from single-step mode. The approximate execution speed of this mode varies greatly, but generally takes about 150 times longer than real execution speed. If there are a lot of Kernal routines, the Kernal mode can speed up the program considerably.

←

The back arrow exits the monitor and

runs the monitored program in full speed (real execution). Ultimate may be corrupted if set at a bad address. This key is good for running through a large piece of code to get to a particular point. It also sets up the Restore key to go to single-step mode.

Restore

Restore triggers Ultimate from full-speed mode, breaks into the program, and enters single-step mode at the current command.

*

The asterisk toggles the operand field display between disassembly mode and address-calculation mode.

f1

This function key toggles the status line on and off without running the program. It's used to view the current video display area under the status line. Single step (f7) and slow motion (S) are the only valid keys while the status line is off.

H

Hunt allows you to enter an address that is the actual computed address operand of a command. The program runs in slow motion until it finds a command that uses that address. This is useful for seeing when a particular memory location is accessed in a program. If the hunt is successful and the status line displays the command line and PC, you can toggle the display mode (*) or look at the source code listing. Hunt can also be exited at anytime with the @ (At) key.

R

The R key will let the program run until an address is reached. Enter the PC of any command in the code and then the program will run in slow motion until the command is ready to be executed. This means that when the single-step mode display comes on, the command before the one you selected will be on the display line. That is because when a command is shown, it has already been executed and the new PC has been calculated. This is useful to get the program to the beginning of a specific subroutine or section of code that you are interested in without hav-

ing to try to stop it by hand at the right spot. This mode can be canceled at anytime by pressing the @ (At) key.

J

Use the J key to run through a subroutine in slow motion until the corresponding RTS is encountered. This means that all nested subroutines will be executed and normally the program will display the RTS command when it returns to single-step mode. Since this command triggers off the emulated stack level, the program could also drop back into single-step mode if two values are pulled from the stack or the stack pointer is incremented by 2 before an RTS is encountered. This is useful in allowing you to see if the routine pulls its return address off the stack so it can jump somewhere else. It's safe to enter J-mode anytime after a JSR. If it's used outside of a subroutine, it may never drop back into single-step mode on its own, but you can exit at anytime with the @ (At) key.

P

P sets the emulated PC to a new address; the beginning of a program; or the end of a loop, subroutine, or whatever. The new address is entered in the PC space on the status line. After the address has been entered, the value will reverse to show that you have to make a decision. You must either press Return or f3. Return resets the emulated stack pointer to the top of the stack, \$FF. This is useful when restarting the monitored program so that stack doesn't wrap around. Pressing f3 will not change the current stack pointer. This is useful for going to the beginning of a loop or jumping over some code where you may need the values that are on the program's stack. Nothing changes but the location of where the monitor reads the next command.

D

Dump has the same usage as Hunt except that all occurrences of the desired address usage (PC) are sent to the printer. This will not stop until the @ (At) key is pressed to cancel the mode.

K

This key toggles Kernal mode, the desired execution mode of calls to Kernal

subroutines listed in the Kernal jump table (\$FF81-\$FFF3). The default mode is step-by-step emulation (in single-step or slow mode). The special mode is full-speed execution, which is designated by an asterisk to the left of PC on the status line.

This mode is useful for speeding up programs with heavy Kernal usage where you are only concerned with the routine's net effect on the program. It also allows serial bus I/O routines such as disk access even in single-step mode. Most Kernal routines that use the serial bus cannot be successfully single stepped. Note that if the Kernal LOAD is used, the monitor program could be corrupted because the self-protection feature is temporarily disabled.

If the Kernal mode is off, single-step mode will still let you choose how to execute each Kernal call. When you get to a Kernal call, the address of the routine will reverse. Return will execute the routine in full speed, and f3 will take it out of reverse mode and allow you to continue to single step through the routine.

If you press Return, the routine will execute, and the next command shown will be the RTS of the routine. Also, the PC will show the address of the routine itself and will be reversed to show that you just executed that Kernal routine. The RTS shows where the program is returning to. If Kernal mode is on, then all Kernal routines will be executed in full speed with results as mentioned above.

F

Fill lets you change the contents of any memory location. Note that the monitor will not protect itself, so use caution when altering any monitor parameters given in the article.

M

Memory will let you examine the contents of a memory location. For areas that have layers of memory such as \$D000 (character ROM and I/O device RAM), the memory configuration used by the monitored program determines where the value comes from. To view a different area, alter the offset value, START + \$0055, with the Fill command. START is equal to the address

you loaded the monitor to at the beginning of the session. If you do this, you must change it back before you continue, or the monitored program may crash.

A, X, or Y

Enter a new value into a CPU register. After a value is entered, it will reverse to show that you have to make a decision. Return will modify the emulated status register like an LDA command, while f3 will leave the flags unchanged. These features may be useful for altering loop indexes or putting a keycode into A to be checked when letting the program go to the routine that handles the key.

W

W redisplay the status line in the current screen configuration. This is useful in single-step mode when stepping through code that alters VIC parameters and the screen changes so you can't see the status line anymore. Pressing W will recover it without stepping.

C

C cycles the color of the status line text for text mode and hi-res mode status line displays independently. All 16 colors are available. A separate color can be locked in for each mode and will stay the same even if you toggle between monitor and full-speed modes. You won't have to change it after switching modes.

In hi-res mode, the foreground and background colors are changed. Since the background color changes only after all 16 foreground colors have changed, it may take a while to get the desired color combination. If you know the color codes that you want for the foreground and background, you can put the proper value into START + \$052D. (See F key above.) The value should be in the following format: High nybble equals background; low nybble equals foreground. See any 64 reference book for more details. To actually implement the color after changing the memory value, hit f1 twice.

V

V toggles multicolor mode. This key will have effects in both text and hi-res

modes. You may find it useful to turn off multicolor mode to read the status line clearly and then turn it back on.

G

G toggles hi-res display between text mode and hi-res mode. This is for seeing the status line should the display mode change while single stepping (like W key). Note that the proper mode will be selected automatically when changing between single-step, slow, and full-speed modes.

Del

The Delete key has two functions. It reprints the current status line with the command after using M or F keys, and cancels data-entry modes of any keys requiring hex input, such as H or P.

@

The @ (At) key cancels any slow-motion mode (from S, J, R, H, or D) back to single-step mode.

Operational Notes

Not only are the regular 56 commands of the 6502 interpreted, but also the 14 quasi-opcodes as defined by Raeto Collin West in "Programming the 64" by COMPUTE books. Most of these opcodes have reproducible results, although many don't seem to lend themselves to most programming tasks.

The new mnemonics that you may encounter while experimenting are ASO, RLA, LSE, RRA, AXS, LAX, DCM, INS, ALR, ARR, OAL, SAX, SKB, and SKW. While there isn't enough space to discuss quasi-ops at length, most of them essentially decode in a way that is similar to the LDA-type commands. SKB branches over (skips) one byte, and SKW skips two.

These codes are included here when most other monitors ignore them because some software may use them to hide codes.

Another debugging feature is that Ultimate stops automatically at a BRK or any invalid commands. BRK commands can be continued normally, but invalid opcodes will display three back arrows (←←←) and the hex value of the invalid opcode that has been encountered. At this point, reset the PC to a new piece of code to continue.

Ultimate executes quasi-ops like it ex-

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ecutes all other commands. They are executed by the 6502 after any addresses are decoded.

The program works by emulating major features of the 6502 and 64. The real stack and CPU registers are copied to a protected area of memory within the monitor, and all memory activity is monitored in protected mode so that the monitored program behaves as if it were running in real mode. Also, window space is maintained and protected for the text screen line, color memory line, and one hi-res line so that the status line may be displayed while any program access to the real memory area is sent to the window. All of this windowing is generally transparent to the user and the monitored program.

For example, an access to the first location of the status line LDA \$07C0, in default area, is shown as such, although the real load comes from the screen window maintained by the monitor. If a command tries to access the monitor's protected memory, the command will not be executed. In single-step mode the operand field will be reversed to alert you of this condition.

Advanced Uses

The Ultimon.O program is a stand-alone program. It contains the routine that actually performs the absolute address conversions necessary to relocate the program to the new address. This makes it very useful to load and run after another program has already been loaded.

During the first call, Ultimon.O modifies itself so that later calls to the start address enter the monitor mode. This feature may be useful when a program that you wish to monitor is so large that it would overwrite Ultimate. Usually programs using some hi-res graphics are like this. The solution would be to load the monitor over a 4K section of a bitmap that may not be needed while you are trying to figure out some portion of the program. The loading could be performed by replacing a small piece of code with a JSR to the following routine (WEDGE). Then, the wedge routine would have to be piggy-backed onto another piece of the monitored program.

SETLFS = \$FFBA

SETNAM = \$FFBD
LOAD = \$FFD5
DEVICE = \$BA

WEDGE LDA #1
LDX #<NAME+1 ;lo byte
LDY #>NAME+1 ;hi byte JSR SET-
NAM

NAME LDA #69 ;decimal
LDX DEVICE
LDY #0 ;relocate
JSR SETLFS

LDA #0 ;load
TAX
LDY #>BEGIN JSR LOAD
JMP BEGIN

This loader will load, relocate, and kick start into single-step mode any ML program as long as Ultimon.O is saved as filename E, BEGIN = safe area (bitmap). Just find free memory for WEDGE and insert JSR WEDGE into code. Another technique is to load Ultimate ML Monitor with a standard monitor that can perform a relocatable load to any address. Then run Ultimate so that it initializes itself to the new address. The initialization routine ends with an RTS. Now Ultimate is ready to use or can be resaved from the new address with a length of 4K. To call it, just use JSR or SYS to go to the new address.

ULTIMON.B

HG 5 REM COPYRIGHT 1993 - COMP
UTE PUBLICATIONS - ALL RI
GHTS RESERVED
MP 10 IFATHENSYSS2243
KD 20 D=PEEK(186):A=-1:LOAD"UL
TIMON.L",D,1

ULTIMON.L

CC13:A9 93 20 D2 FF A9 00 8D CB
CC1B:21 D0 8D 3E CD A9 06 8D BD
CC23:20 D0 A9 0D 8D 86 02 A2 34
CC2B:02 38 A9 13 ED 3E CD A8 E6
CC33:18 20 F0 FF 38 A9 26 ED A1
CC3B:3E CD CD 3E CD 90 22 A8 A2
CC43:A2 00 BD FA CC 20 D2 FF 22
CC4B:E8 EC 3E CD 90 F4 B9 FA FF
CC53:CC 20 D2 FF C8 C0 26 90 DB
CC5B:F5 20 EF CC EE 3E CD D0 9F
CC63:C6 A2 04 A0 13 18 20 F0 BD
CC6B:FF A2 01 BD 00 CD 20 D2 F4
CC73:FF CA 10 F7 A9 00 8D 3E E7
CC7B:CD A9 01 8D 86 02 A2 06 E6
CC83:38 A9 14 ED 3E CD A8 18 97
CC8B:20 F0 FF 38 A9 0E ED 3E 94

CC93:CD CD 3E CD B0 0A A2 09 28
CC9B:A0 00 20 F0 FF 4C F0 CD 79
CCA3:A8 84 02 A2 00 BD 22 CD 26
CCAB:20 D2 FF E8 EC 3E CD 90 25
CCB3:F4 B9 22 CD 20 D2 FF C8 6C
CCBB:C0 0E 90 F5 A2 08 38 A9 F9
CCC3:14 ED 3E CD A8 18 20 F0 5E
CCCB:FF A4 02 A2 00 BD 30 CD 1E
CCD3:20 D2 FF E8 EC 3E CD 90 4D
CCDB:F4 B9 30 CD 20 D2 FF C8 56
CCF3:C8 D0 FD E8 D0 F8 60 20 BF
CCFB:54 48 45 20 55 4C 54 49 4A
CD03:4D 41 54 45 20 4D 41 43 70
CD0B:48 49 4E 45 20 4C 41 4E 3E
CD13:47 55 41 47 45 20 4D 4F D8
CD1B:4E 49 54 4F 52 59 42 45 71
CD23:2E 20 4A 2E 20 42 41 4C E2
CD2B:43 48 49 43 4B 20 20 54 47
CD33:2E 20 4A 2E 20 47 52 45 22
CD3B:45 4E 20 00 20 60 A5 A9 88
CD43:00 85 7A A9 02 85 7B 20 67
CD4B:79 00 20 F3 BC 4C 9B BC F1
CD53:A9 0D 4C D2 FF 55 4C 54 FF
CD5B:49 4D 4F 4E 2E 4F 9F 41 EC
CD63:44 44 52 45 53 53 20 46 3F
CD6B:4F 52 20 4D 4F 4E 49 54 B6
CD73:4F 52 20 00 9F 4E 41 4D 55
CD7B:45 20 4F 46 20 50 52 4F 46
CD83:47 52 41 4D 20 54 4F 20 65
CD8B:42 45 20 4D 4F 4E 49 54 0D
CD93:4F 52 45 44 00 00 9F 4E 4E
CD9B:55 4D 42 45 52 20 4F 46 C9
CDA3:20 44 52 49 56 45 20 00 47
CDAB:9F 53 49 4E 47 4C 45 00 10
CDB3:53 54 45 50 20 4F 52 20 BE
CDBB:46 55 4C 4C 20 53 50 45 52
CDC3:45 44 00 05 45 52 52 4B
CDCB:4F 52 20 21 21 20 45 4D 1B
CDD3:55 4C 41 54 4F 52 20 57 F5
CDEB:49 4C 4C 20 4F 56 45 52 6B
CDE3:57 52 49 54 45 20 4C 4F C0
CDEB:41 44 45 52 00 A9 C0 20 4F
CDF3:90 FF A5 BA 8D 33 CF 20 31
CDFB:CC FF 20 53 CD 20 53 CD 9A
CE03:A9 61 A0 CD 20 1E AB 20 AF
CE0B:3F CD A4 64 C0 C0 90 0E CE
CE13:A6 65 F0 0A A9 C7 A0 CD 97
CE1B:20 1E AB 4C F0 CD A2 00 8E
CE23:8E 18 03 8C 19 03 20 53 9F
CE2B:CD A9 77 A0 CD 20 1E AB E9
CE33:A9 00 85 C6 20 60 A5 A0 31
CE3B:00 89 00 02 F0 06 99 0E 45
CE43:01 C8 00 F5 8C 34 CF 20 02
CE4B:53 CD A9 99 A0 CD 20 1E 6F
CE53:AB 20 3F CD A5 65 8D 32 A3
CE5B:CF 20 53 CD A9 0F AE 32 49
CE63:CF A0 0F 20 BA FF A9 00 1E
CE6B:20 BD FF 20 C0 FF 20 1E EE
CE73:CF 20 C0 FF A9 00 85 02 73
CE7B:A2 0F 20 C6 FF 20 CF FF BE
CE83:C9 2C F0 07 05 02 85 02 DC
CE8B:4C 80 CE A0 FF C8 20 CF 86
CE93:FF 99 00 02 C9 2C D0 F5 4E
CE9B:A9 00 99 00 02 A9 01 8D 87
CEA3:86 02 A9 C0 A0 02 20 1E A5
CEA9:AB A5 92 C9 30 D0 0F A2 EA
CEB3:45 20 C6 FF 20 CF FF 85 9A
CEBB:FB 20 CF FF 85 FC A9 45 12

CEC3:20 C3 FF A9 0F 20 C3 FF 7D
 CECB:20 CC FF A5 02 C9 30 F0 8F
 CED3:03 4C 29 CE 20 53 CD A9 AB
 CEDB:AB A0 CD 20 1E AB 20 E4 F7
 CEE3:FF AA F0 FA C9 53 F0 04 7B
 CEEB:C9 46 D0 F2 85 02 A0 CA 89
 CEF3:B9 34 CF 99 33 03 88 D0 96
 CEFB:F7 A9 09 A2 58 A0 CD 20 4C
 CF03:BD FF A9 45 AE 33 CF A0 8D
 CF0B:00 20 BA FF A2 00 AC 19 91
 CF13:03 8A 20 D5 FF 20 44 FE 40
 CF1B:4C 34 03 A9 45 AE 32 CF 02
 CF23:A0 45 20 BA FF AD 34 CF 03
 CF2B:A2 0B A0 01 4C BD FF 00 5C
 CF33:00 00 38 A5 FB E9 FE A5 5F
 CF3B:FC E9 03 B0 0D A9 88 8D EC
 CF43:08 03 A9 CF 8D 09 03 4C BC
 CF4B:57 CF A9 87 8D 08 03 A9 74
 CF53:03 8D 09 03 20 1E CF A9 EB
 CF5B:00 20 D5 FF 86 2D 84 2E DD
 CF63:A5 FB F0 04 C9 01 F0 09 70
 CF6B:A5 FC C9 08 D0 7B A0 03 8F
 CF73:2C A0 02 B1 FB 85 14 C8 93
 CF7B:B1 FB 85 15 20 60 A6 20 E4
 CF83:A3 A8 4C AE A7 20 73 00 38
 CF8B:C9 9E F0 42 C9 97 D0 38 80
 CF93:A5 7B 48 A5 7A 48 E6 7A 85
 CF9B:D0 02 E6 7B 20 EB B7 38 11
 CFA3:A5 14 E9 A5 15 E9 03 29
 CFB:90 18 38 A5 14 E9 FE A5 E6
 CFB3:15 E9 03 B0 0D A9 88 8D 71
 CFB:08 03 A9 CF 8D 09 03 4C 35
 CFC3:C5 CF 68 85 7A 68 85 7B 9B
 CFCB:20 79 00 4C E7 A7 A9 E4 B4
 CFD3:8D 08 03 A9 A7 8D 09 03 BF
 CFDB:20 73 00 20 8A AD 20 9B 51
 CFE3:BC A5 64 85 FC A5 65 85 FE
 CFEB:FB 46 02 B0 03 6C FB 00 28
 CFF3:A5 FC 48 A5 FB 48 A9 20 7D
 CFFB:48 6C 18 03 00 00 00 0E

ULTIMON.O

8000:EA EA EA A5 03 48 20 B9 1C
 8008:E3 BA CA 9A 68 85 03 18 24
 8010:69 0D 48 A9 43 48 60 20 C8
 8018:2F 83 29 EF 8D 49 8D BA 1D
 8020:8E B2 82 20 3E 83 A9 C0 7B
 8028:8D 18 03 A9 82 8D 19 03 70
 8030:A9 81 8D 71 8E A2 00 BD AB
 8038:00 01 9D 4A 8D E8 D0 F7 7B
 8040:8E 73 86 CA 9A A9 7B 8D E2
 8048:E0 83 20 34 8A 20 13 83 60
 8050:20 C1 82 78 A9 00 85 01 03
 8058:A0 00 8C 61 84 8C 03 86 34
 8060:8C 96 83 8C BB 83 8C D9 65
 8068:82 8C 49 84 20 D0 82 A8 31
 8070:BE ED 8A 8E E0 83 BC EF 05
 8078:8B B9 C8 8C 8D 86 80 B9 D0
 8080:C9 8C 8D 87 00 20 FF BF 38
 8088:20 3E 83 A9 00 F0 33 58 B6
 8090:10 08 AD B2 82 CD DC 82 04
 8098:B0 25 A9 DF 8D 00 DC AD 42
 80A0:01 DC C9 BF F0 11 A9 00 AD
 80A8:F0 05 CE A7 80 F0 05 20 A9
 80B0:55 83 F0 0B 4C 53 80 A9 66
 80B8:0D 20 A8 FF 20 AE FF 20 39
 80C0:C1 82 20 CE 83 20 85 85 61
 80C8:2D 36 87 F0 F5 C9 03 F0 35
 80D0:3D C9 04 D0 13 AD 86 85 52
 80D8:49 01 8D 86 85 F0 E0 20 AA

80E0:92 86 30 E4 54 47 45 42 AD
 80E8:C9 0D D0 04 A9 40 D0 13 6F
 80F0:AE 86 85 D0 D3 C9 22 D0 83
 80F8:18 AC B2 82 C8 C8 8C DC 0F
 8100:82 A9 80 8D 8C 80 AD 86 DF
 8108:85 D0 03 20 92 86 4C 53 FE
 8110:80 C9 11 D0 0B 8A 48 20 28
 8118:D9 86 68 AA A9 01 D0 E3 38
 8120:C9 29 D0 2B A2 04 20 90 15
 8128:84 A2 04 20 DE 86 AD DC E1
 8130:82 8D D1 82 AD DD 82 8D B1
 8138:D2 82 A2 04 20 A3 83 20 90
 8140:48 83 D0 05 A9 FF 8D B2 CD
 8148:82 20 06 83 4C 53 80 C9 08
 8150:1F D0 0B AD 16 D0 49 10 E9
 8158:8D 16 D0 4C C8 80 C9 31 93
 8160:D0 0B AD 01 84 49 01 8D 2D
 8168:01 84 4C C2 80 C9 09 D0 D0
 8170:09 20 92 86 20 E9 84 4C B8
 8178:C5 80 C9 1D D0 0B 20 D9 56
 8180:86 A9 40 8D 67 83 4C EC E0
 8188:80 C9 15 D0 16 20 D9 86 59
 8190:A9 8D 8D DB 82 A9 3D 20 90
 8198:21 87 20 EB 86 20 DB 82 BF
 81A0:4C C8 80 C9 24 D0 1D 20 67
 81A8:D9 86 A9 AD 8D DB 82 A9 D4
 81B0:3D 20 21 87 AD 55 80 85 40
 81B8:01 20 DB 82 20 BE 84 20 0D
 81C0:43 83 D0 B3 C9 0A D0 24 D7
 81C8:A2 16 20 EB 86 8D 46 8D E9
 81D0:48 CA CA 20 A6 83 20 48 D1
 81D8:83 D0 0D AD 49 8D 48 28 87
 81E0:68 08 68 8D 49 8D 00 01 23
 81E8:68 4C C2 80 C9 17 D0 0B EA
 81F0:A2 1B 20 EB 86 8D 47 8D 55
 81F8:4C D0 81 C9 19 D0 0B A2 E7
 8200:20 20 EB 86 8D 48 8D 4C F7
 8208:D0 81 C9 1A D0 0B AD 11 CF
 8210:D0 49 20 8D 11 D0 4C 71 82
 8218:81 C9 14 D0 1D AD E8 8C DD
 8220:D0 09 EE 2E 8D 85 AD 2D 85 43
 8228:4C 31 8E 2E EF 84 AD EF BB
 8230:84 8D 62 85 20 63 85 4C 65
 8238:C8 80 C9 25 D0 16 AD EE 76
 8240:89 49 01 8D EE 89 4A 90 18
 8248:03 A9 2A 2C AE 20 8D 9F C9
 8250:8A 4C C2 80 C9 12 D0 32 78
 8258:20 D9 86 A9 80 8D 67 83 DB
 8260:A9 04 20 B1 FF 20 BE ED 46
 8268:A0 00 20 84 82 AD DD 82 13
 8270:20 BE 84 AD 8C 82 20 BE 90
 8278:84 C8 20 84 82 4C EC 80 DD
 8280:20 A8 FF C8 B9 C7 8A 10 5E
 8288:F7 60 C9 39 D0 A9 20 92 6E
 8290:86 AD 55 80 85 01 A2 00 6C
 8298:BD 4A 8D 9D 00 01 E8 D0 41
 82A0:F7 A9 17 8D 18 03 8D 16 C5
 82A8:03 A9 80 8D 19 03 8D 17 89
 82B0:03 A2 00 9A AD D2 82 48 8F
 82B8:AD D1 82 48 20 20 83 08 6E
 82C0:40 20 E9 84 A9 00 8D 8C 68
 82C8:80 8D 86 85 8D 67 83 60 0C
 82D0:B9 FF FF 99 D7 82 60 EA C0
 82D8:EA EA 60 EA EA EA 60 A9 36
 82E0:48 8D 61 84 20 C1 82 F0 D6
 82E8:08 A9 03 2C A9 02 2C A9 D8
 82F0:01 8D F9 82 18 20 13 83 2C
 82F8:69 00 8D D1 82 AD D2 82 74
 8300:69 00 8D D2 82 60 AD D2 5E
 8308:82 8D D9 82 AD D1 82 8D 5E

8310:D8 82 60 AD D2 82 8D 44 0B
 8318:8D AD D1 82 8D 45 8D 60 B0
 8320:AD 49 8D 48 AC 48 8D AE D6
 8328:47 8D AD 46 8D 28 60 08 26
 8330:8D 46 8D 8E 47 8D 8C 48 FB
 8338:8D 68 8D 49 8D 60 A5 01 A0
 8340:8D 55 80 A9 36 85 01 60 38
 8348:20 36 87 C9 01 F0 04 C9 18
 8350:05 D0 F5 4A 60 A2 00 AD AC
 8358:8C 80 4A 00 0E A0 07 AD C8
 8360:61 84 C9 80 D0 2A A2 00 EE
 8368:F0 26 24 A8 AD DC 82 D9 40
 8370:D1 82 D0 1D AD DD 82 D9 B0
 8378:D2 82 D0 15 E8 10 13 AD 50
 8380:44 8D 20 BE 84 AD 45 8D EF
 8388:20 BE 84 A9 20 20 A8 FF 4D
 8390:E8 60 A9 00 60 A0 00 A2 81
 8398:04 20 9C 83 20 9F 83 98 94
 83A0:4C BC 83 20 A6 83 20 A9 9C
 83A8:83 BD 9F 8A 49 80 4C 21 83
 83B0:87 20 B7 83 20 B7 83 20 B9
 83B8:BA 83 A9 00 1D 9F 8A 4C FB
 83C0:21 87 B9 D8 8A 20 21 87 9D
 83C8:C8 E0 13 D0 F5 60 A0 05 53
 83D0:B9 44 8D BE 3E 8D 20 BE 8A
 83D8:84 88 10 F4 20 95 B3 A2 96
 83E0:00 BD ED 8B 8D DC 82 BD 70
 83E8:EE 8B 8D DD 82 A2 FD A9 1E
 83F0:EE 0E DD 82 2E DC 82 2A 77
 83F8:90 F7 9D AB 89 E8 D0 EF 36
 8400:A9 00 D0 08 20 5C 84 A2 96
 8408:0E 4C B4 83 AC 0E 83 BE A8
 8410:EF 8B 0E 03 B0 32 AC 95 7D
 8418:87 D0 04 E0 02 F0 E5 C0 08
 8420:02 F0 E1 A2 20 20 99 84 65
 8428:B9 36 8D A8 20 C2 83 38 23
 8430:A9 10 ED F9 82 AA 4A 90 53
 8438:05 A9 00 20 BE 84 A9 00 8B
 8440:20 BE 84 A2 0D 4C B1 83 44
 8448:A9 00 C9 6C D0 B6 A2 0C D8
 8450:20 99 84 A0 00 20 C2 83 F3
 8458:A2 0E D0 DD A2 0C A0 24 D8
 8460:A9 00 30 4B F0 27 4A 80 62
 8468:0B 4A B0 32 20 81 84 AD 80
 8470:D7 82 D0 07 8E 20 81 84 DC
 8478:AD 3F 84 20 BE 84 4C 93 EE
 8480:84 A9 20 20 21 87 D0 13 18
 8488:A2 09 20 90 84 20 93 84 82
 8490:20 99 84 20 99 84 20 99 5B
 8498:84 A9 20 4C 21 87 20 81 FF
 84A0:84 AD D2 82 20 BE 84 AD 8C
 84A8:01 82 20 BE 84 D0 EA 20 88
 84B0:81 84 AD D9 82 20 BE 84 85
 84B8:AD D8 82 4C AA 84 48 4A 26
 84C0:4A 4A 4A 20 C9 84 68 29 27
 84C8:F7 78 F8 18 69 90 2C 67 65
 84D0:83 30 05 90 03 69 00 2C 3B
 84D8:69 40 D8 58 2C 67 83 10 5D
 84E0:03 4C A8 FF 9D 9F 8A E8 FC
 84E8:60 A9 DB 8D 67 85 A9 01 86
 84F0:8D 62 85 A9 FF 8D E8 8C 39
 84F8:8D E9 8C AD 11 D0 29 20 ED
 8500:F0 3C 20 6C 85 8D 67 85 14
 8508:29 C0 8D E9 8C AD 18 D0 44
 8510:29 08 0A 0A 0E E9 8C 09 C5
 8518:1E 8D E9 8C 8D D1 86 AA 07
 8520:E8 8E EB 8C A9 00 8D E8 DA
 8528:8C 8D 00 86 A9 10 8D 62 6A
 8530:85 A9 9A 8D D3 86 A9 8E 2F
 8538:8D D4 86 20 C2 86 20 6C EE

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8540:85 8D E1 8C 8D E3 8C 8D 19
8548:95 85 8D 54 85 8D B7 86 CE
8550:A0 27 B9 C0 07 99 4A 8E 7A
8558:B9 C0 DB 99 72 8E 88 10 74
8560:F1 A9 00 A0 27 99 C0 DB D5
8568:88 10 FA 60 AD 18 D0 29 B9
8570:F0 4A 4A 09 03 8D 83 85 3B
8578:AD 00 DD 6A 6A 6A 29 C0 CC
8580:49 C0 09 00 60 A9 00 D0 FB
8588:10 AD E8 8C F0 0C A0 27 0D
8590:B9 9F 8A 99 C0 07 88 10 8E
8598:F7 60 8A 48 AD E8 8C 8D 45
85A0:D9 85 AD E9 8C 8D DA 85 24
85A8:78 AD 1B D0 4A 29 01 09 6D
85B0:1A 8D BD 85 A5 01 29 FB BB
85B8:85 01 A0 00 A9 00 8D D7 1B
85C0:85 B9 9F 8A 0A 2E D7 85 D7
85C8:0A 2E D7 85 0A 8D D6 85 71
85D0:2E D7 85 A2 07 BD FF FF F2
85D8:9D FF FF CA 10 F7 AD D9 F4
85E0:85 69 08 8D D9 85 90 03 EB
85E8:EE DA 85 C8 C0 28 D0 CC 74
85F0:A5 01 09 04 85 01 58 68 B9
85F8:AA 60 A0 FF 8C 03 86 EE F1
8600:03 86 A9 00 0A A8 20 4F
8608:84 86 B0 0A AD 03 86 C9 FF
8610:06 90 EC 4C EF 87 C8 8C 9E
8618:20 84 86 B0 EF AD 03 86 F4
8620:C9 04 F0 3A B0 40 0A A8 18
8628:0A AA 38 AD D8 82 48 FD 26
8630:EA 8C 8D D8 82 AD D9 82 11
8638:48 FD E1 8C 8D D9 82 18 DE
8640:AD D8 82 79 00 8D 8D 8C 6C
8648:82 AD D9 82 79 01 8D 8D DD
8650:09 82 20 EF 87 68 8D C0
8658:82 68 8D D8 82 60 A9 80 69
8660:8D BB 83 4C F4 82 20 26 70
8668:86 AD 49 8D 29 04 D0 13 34
8670:A9 00 A0 00 8D 0D DC 8C 4D
8678:1A D0 AD 19 D0 8D 19 D0 CD
8680:AD 0D DC 60 38 AD D8 82 F5
8688:F9 E0 8C AD D9 82 F9 E1 E5
8690:8C 60 AD E8 8C D0 19 A9 C3
8698:9A 8D D0 86 A9 8E 8D D1 4D
86A0:86 AD E8 8C 8D D3 86 AD B8
86A8:E9 8C 8D D4 86 20 C2 86 8D
86B0:A0 27 B9 4A 8E 99 C0 07 17
86B8:B9 72 8E 99 C0 DB 88 10 41
86C0:F1 60 A0 00 20 CF 86 EE 2F
86C8:D1 86 EE D4 86 A0 3F B9 7A
86D0:FF FF 99 FF FF 88 D0 F7 CC
86D8:60 20 88 84 A2 09 20 F7 E8
86E0:86 8D DD 82 20 F7 86 8D F3
86E8:DC 82 60 20 EF 86 60 8E FB
86F0:F6 86 20 96 84 A2 00 20 57
86F8:07 87 0A 0A 0A 0A 8D 05 E5
8700:87 20 07 87 09 00 60 A9 E6
8708:2A 20 21 87 CA 20 36 87 9B
8710:F0 1B A0 0F D9 0E 8D F0 76
8718:05 88 10 F8 30 EF B9 1E 30
8720:8D 9D 9F 8A 98 48 20 85 A5
8728:85 68 A8 E8 60 68 68 68 95
8730:68 68 68 4C C2 80 78 8A F2
8738:48 A5 C6 4C A0 0A A2 FF A4
8740:CA D0 FD 88 D0 F8 A9 FF EE
8748:8D 02 DC A9 00 8D 03 DC ED
8750:20 9F FF A5 C5 C9 40 D0 58
8758:05 8D 6C 87 F0 DE CD 6C 5E
8760:87 F0 D9 8D 6C 87 68 85 5B
8768:C6 68 AA A9 40 58 60 AD B6
8770:D7 82 48 8D 55 88 4A 4A 99
8778:29 07 8D 95 87 A8 B9 2E 69
8780:8D 8D F9 82 68 29 E3 09 D9
8788:0C 8D D7 82 A0 01 20 D0 3E
8790:82 8D 3F 84 A9 00 60 AD 30
8798:95 87 C9 03 F0 14 4A B0 DA
87A0:06 20 B3 87 4C AA 87 20 E5
87A8:BA 87 AD D9 82 69 00 8D 91
87B0:D9 82 60 AD 48 8D A0 07 F4
87B8:D0 05 AD 47 8D A0 0F 18 C0
87C0:6D D8 82 8D D8 82 8C 3B 0B
87C8:8D 60 C8 8C D1 87 A0 01 87
87D0:B5 00 99 D8 82 CA 88 10 DB
87D8:F7 60 20 6F 87 C9 02 D0 2F
87E0:1C A0 01 8C 61 84 88 20 5D
87E8:D0 82 A9 EA 8D D9 82 08 C5
87F0:20 20 83 20 D7 82 20 2F C2
87F8:83 28 4C F4 82 6A 6A 90 CF
8800:1D A0 02 20 D0 82 8D 3A EF
8808:84 20 97 87 A9 80 8D 61 9A
8810:84 AD 8C 80 D0 03 4C FA 8E
8818:85 A0 02 4C FC 85 2A 90 FB
8820:0A 4A 4A 00 E7 20 BA 87 D7
8828:4C 0C 88 AC D8 82 4A 4A ED
8830:90 0B A2 00 20 CA 87 20 FB
8838:A1 87 4C 0C 88 AE 47 8D 61
8840:20 CA 87 30 C7 20 6F 87 2D
8848:F0 97 C9 02 D0 0B CE F9 5B
8850:82 08 20 20 83 EA 4C F6 02
8858:87 4A 4A 90 15 4A 90 A1 A6
8860:AD D7 82 C9 AE F0 04 C9 36
8868:AF D0 96 A9 06 8D 95 87 0C
8870:D0 8F 4A 90 97 AD D7 82 C5
8878:29 DE C9 8E D0 A7 20 B3 11
8880:87 4C 0C 88 AD D7 82 8D D1
8888:55 88 C9 78 D0 07 A9 7F 9C
8890:A0 00 20 74 86 C9 58 D0 1A
8898:03 20 70 86 A9 01 8D F9 10
88A0:82 D0 AE AD D7 82 8D F7 B3
88A8:88 A0 01 20 D0 82 30 15 4E
88B0:18 20 13 83 60 D8 82 8D D1
88B8:D8 82 AD D2 82 69 00 8D 01
88C0:D9 82 4C DF 88 49 FF 18 68
88C8:69 01 8D D8 82 38 20 13 56
88D0:83 ED D8 82 8D D8 82 AD 24
88D8:D2 82 E9 00 8D D9 82 18 22
88E0:AD D8 82 69 02 8D D8 82 60
88E8:90 03 EE D9 82 A9 81 8D C9
88F0:61 84 AD 49 8D 48 28 F0 EC
88F8:03 4C EC 82 AD D8 82 8D C7
8900:D1 82 AD D9 82 8D D2 82 62
8908:60 20 EF 82 AC B2 82 AD 5C
8910:49 8D AE 80 83 E0 6F B0 3E
8918:0E 80 6C F0 03 AD 46 8D 6F
8920:99 4A 8D CE B2 82 60 D0 62
8928:0E C8 48 28 B9 4A 8D 00 1A
8930:8D 46 8D 68 4C 3B 89 C8 FE
8938:B9 4A 8D 8D 49 8D 8C B2 91
8940:82 60 AD E0 83 C9 9C F0 DD
8948:09 AD 47 8D 8D B2 82 4C 95
8950:EF 82 AD 49 8D 48 28 AE D2
8958:BF 82 08 8E 47 8D 68 8D 1E
8960:49 8D 4C EF 82 AD E0 83 14
8968:C9 54 D0 1B AC B2 82 88 FE
8970:18 AD D1 82 69 02 99 4A 2E
8978:8D C8 AD D2 82 69 00 99 BA
8980:4A 8D 88 88 C8 B2 82 20 0A
8988:13 83 A0 01 20 D0 82 A1 1E
8990:C8 20 D0 82 8E D1 82 8E A1
8998:3F 84 8D D2 82 8D 3A 84 8E
89A0:AC D7 82 C0 6C D0 1D 8C C9
89A8:49 84 A0 4C 8C D7 82 E8 0C
89B0:8E B9 89 8D BA 89 A0 01 C1
89B8:AD FF FF 99 D1 82 CE B9 2C
89C0:89 88 10 F4 20 06 83 A9 D5
89C8:80 8D 61 84 A0 1C 20 84 2E
89D0:86 90 11 C8 C8 20 84 86 50
89D8:B0 0A 20 55 83 D0 06 20 AB
89E0:C1 82 F0 09 60 2C 67 83 2A
89E8:10 03 EE A7 80 A9 00 D0 98
89F0:1A AD 8C 80 0D 86 85 D0 74
89F8:EB A9 80 8D BB 83 20 CE 50
8A00:83 A9 00 8D BB 83 20 48 8E
8A08:83 D0 D9 AD 8C 80 0D 86 30
8A10:85 D0 03 20 92 86 20 20 8D
8A18:83 20 D7 82 20 2F 83 AD 8C
8A20:8C 80 0D 86 85 D0 03 20 3B
8A28:E9 84 A9 7E 8D E0 83 A9 11
8A30:80 8D 96 83 20 13 83 AC F4
8A38:B2 82 AE E0 83 E0 7E F0 B8
8A40:07 C8 B9 4A 8D 8D 49 8D A9
8A48:C0 B9 4A 8D 8D 81 82 C8 D3
8A50:B9 4A 8D 8D D2 82 8C B2 CB
8A58:82 E0 7E D0 08 EE D1 82 E5
8A60:D0 03 EE D2 82 20 06 83 CD
8A68:A9 02 8D 61 84 60 AC B2 4C
8A70:82 20 13 83 20 EC 82 99 BC
8A78:4A 8D 88 AD D1 82 99 4A 18
8A80:6D 88 AD 49 8D 09 14 99 1B
8A88:4A 8D 88 8C B2 82 AD FE F9
8A90:FF 8D D1 82 AD FF FF 8D 66
8A98:D2 82 20 C1 82 F0 C6 20 50
8AA0:10 03 3D 20 20 20 20 0A
8AA8:20 20 20 20 20 20 20 20 BC
8AB0:20 20 01 3D 20 20 20 20 BC
8AB8:18 3D 20 20 20 19 3D 20 2F
8AC0:20 20 13 12 3D 20 20 48 64
8AC8:55 4E 54 49 4E 47 20 46 51
8AD0:4F 52 20 24 FF 3A 0D FF 6B
8AD8:28 20 20 2C 18 29 28 20 A6
8AE0:20 29 2C 19 20 20 20 20 49
8AE8:20 20 2C 18 20 1E 66 AB 0F
8AF0:B1 AE 66 06 B1 6C 66 06 C9
8AF8:B1 AE 66 06 B1 1B 66 AB B0
8B00:B1 AE 66 06 B1 27 66 63 23
8B08:B1 AE 66 06 B1 54 03 AB DF
8B10:B4 12 03 75 B4 72 03 75 8A
8B18:B4 12 03 75 B4 15 03 AB 71
8B20:B4 AE 03 75 B4 84 03 63 16
8B28:B4 AE 03 75 B4 7B 45 AB 45
8B30:B7 AE 45 60 B7 69 45 60 CB
8B38:C9 51 45 60 B7 21 45 AB AF
8B40:B7 AE 45 60 B7 2D 45 63 ED
8B48:87 A8 45 60 B7 7E 00 AB 77
8B50:BA AE 00 78 BA 6F 00 78 04
8B58:CC 51 00 78 BA 24 00 AB C3
8B60:BA AE 00 78 BA 8A 00 63 6B
8B68:BA AE 00 78 BA AE 8D AE E8
8B70:BD 93 8D 90 BD 42 AB 9F F3
8B78:AB 93 8D 90 BD 09 8D AB DD
8B80:AB 93 8D 90 D8 A5 8D A2 28
8B88:AB AB 8D AB AB 5D 57 5A A8
8B90:C0 5D 57 5A C0 99 57 96 A1
8B98:CF 5D 57 5A C0 0C 57 AB 10
8BA0:C0 5D 57 5A C0 30 57 9C 12
8BA8:AB 5D 57 5A D5 39 33 AE 26
8BB0:C3 39 33 3C C3 4E 33 3F 1F
8BB8:D2 39 33 3C C3 18 33 AB 42
8BC0:C3 AE 33 3C C3 2A 33 63 20
8BC8:C3 A8 33 3C C3 36 81 AE BE

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8BD0:C6 36 81 48 C6 4B 81 63 57
8BD8:AB 36 81 48 C6 0F 81 AB 29
8BE0:C6 AE 81 48 C6 87 81 63 76
8BE8:C6 A8 81 48 C6 09 06 00 A8
8BF0:0B 88 00 0C D8 02 10 C6 26
8BF8:06 10 E6 06 11 62 06 12 84
8C00:68 00 13 52 06 13 8A 06 6C
8C08:14 18 06 14 96 10 15 86 D8
8C10:06 15 A6 06 1B 06 08 1B C2
8C18:08 08 1B 12 08 1B 2C 08 C8
8C20:1B 60 00 1C 30 02 1C 32 94
8C28:02 21 46 02 21 70 08 21 6F
8C30:72 08 2B E4 00 4B 86 02 74
8C38:4B B0 08 4B B2 08 53 60 95
8C40:04 54 E4 04 61 02 00 61 C1
8C48:30 02 61 32 02 64 E4 02 B6
8C50:73 E0 08 7C 82 00 82 02 3F
8C58:0A 82 20 0A 83 02 0A 83 77
8C60:20 0A 93 D8 02 93 E4 02 36
8C68:95 12 0E 95 26 0E 98 86 0D
8C70:00 99 46 08 99 48 08 99 D0
8C78:52 00 9D 02 00 9D 30 02 69
8C80:9D 32 02 A0 70 00 A0 72 96
8C88:08 A4 F0 0C A6 02 08 A6 A1
8C90:26 0C A6 42 08 9A EF 12 55
8C98:FF FE 14 9A C5 16 0C DF 1C
8CA0:00 93 03 00 64 CB 00 94 E5
8CA8:83 00 0E 27 00 60 71 00 1C
8CB0:20 DB 00 4B A7 00 0B 25 FD
8CB8:00 0C A5 00 78 59 00 98 4B
8CC0:71 00 00 71 02 0E 27 02 4E
8CC8:DA 87 45 00 65 89 A3 88 83
8CD0:84 00 09 89 42 89 34 8A 33
8CD8:6E 8A E9 82 DF 82 EC 82 96
8CE0:C0 07 E8 07 C0 DB E8 DB CC
8CE8:00 00 40 00 00 01 00 02 10
8CF0:00 80 DA 8F 0D DC 0E DC 53
8CF8:1A D0 1B D0 81 FF FA FF C5
8D00:4A 8E 72 8E 9A 8E 4A 8D 4C
8D08:00 00 71 86 73 86 23 38 ED
8D10:3B 00 0B 10 13 18 1B 20 7C
8D18:0A 1C 14 12 0E 15 30 31 39
8D20:32 33 34 35 36 37 38 39 33
8D28:01 02 03 04 05 06 02 02 2B
8D30:02 03 02 02 03 03 00 0C 9D
8D38:0C 0C 06 0F 06 0E 04 06 84
8D40:16 1B 20 26 A5 FE 48 A5 F2
8D48:FD 48 A5 FC 48 A5 FB 48 12
8D50:A5 23 48 A5 22 48 A5 25 0D
8D58:48 A5 24 48 A5 27 48 A5 0A
8D60:26 48 A5 02 48 A5 04 48 9E
8D68:A5 28 48 A9 00 85 FD A6 BC
8D70:03 86 FE A9 9E 85 FB A9 D5
8D78:17 8D 18 03 8D 16 03 18 98
8D80:8A 8D 19 03 8D 16 03 69 CB
8D88:0A 85 FC A9 ED 85 22 18 26
8D90:8A 69 0A 85 23 A9 EF 85 0A
8D98:24 18 8A 69 0B 85 25 A9 16
8DA0:2E 85 26 18 8A 69 0D 85 14
8DA8:27 38 A5 FB E5 FD A5 FC 49
8DB0:E5 FE 90 5F A0 00 B1 FD EC
8DB8:85 28 A8 B1 22 A8 B1 24 0C
8DC0:C9 04 90 14 C9 05 B0 04 DC
8DC8:A9 03 D0 20 C9 07 90 03 24
8DD0:A9 01 2C A9 02 AA 00 14 91
8DD8:AA A5 28 29 1C 4A 4A 85 6E
8DE0:28 A8 B1 26 C0 02 D0 04 86
8DE8:00 02 F0 E4 85 04 C9 03 34
8DF0:D0 14 A0 02 B1 FD C9 80 47
8DF8:90 0C C9 90 B0 00 38 E9 A1

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8E00:80 18 65 03 91 FD 18 A5 9A
8E08:FD 65 04 85 FD 90 9A E6 A4
8E10:FE B0 96 A9 8B 85 FD 18 CC
8E18:A5 03 69 0E 85 FE A2 19 5D
8E20:8A 0A A8 B1 FD 85 FB C8 FB
8E28:B1 FD 18 65 03 85 FC A0 BF
8E30:00 B1 FB 38 E9 80 18 65 A3
8E38:03 91 FB CA 10 E2 A0 16 CA
8E40:B9 74 8E 99 00 80 88 10 E5
8E48:F7 68 85 28 68 85 04 68 78
8E50:85 02 68 85 26 68 85 27 1B
8E58:68 85 24 68 85 25 68 85 2D
8E60:22 68 85 23 68 85 FB 68 45
8E68:85 FC 68 85 FD 68 85 FE 88
8E70:68 85 03 60 EA EA EA 0E 6A
8E78:48 8A 48 0A FE 04 01 D0 EB
8E80:03 FE 05 01 68 AA 68 EA 39
8E88:EA EA EA 2C 00 AA 02 37 DB
8E90:05 9D 06 F1 0C F3 0C 01 C0
8E98:0D 03 0D 05 0D 07 0D 0B 98
8EA0:0D 0D 0D C9 0C CB 0C CD 3B
8EA8:0C CF 0C D1 0C D3 0C D5 FB
8EB0:0C D7 0C D9 0C DB 0C DD AE
8EB8:0C DF 0C 42 0E 45 0E 00 1B

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Ed Balchick is an electrical engineer from Pittsburgh, Pennsylvania, who enjoys programming in machine language and in C. Ted Green is an unemployed painter from Cleveland, Ohio, who also enjoys programming. They both enjoy modifying other people's games so they (Ed and Ted) can win them.

RASCALS

By Bob Broderick

Just before dozing off during another boring haul of galactic space animals in your freighter, you notice a red light on the control panel. Uh-oh! That warning light means there's been a power failure in the cargo hold, and all of the animals have escaped from their electric holding cells. They are a wild and dangerous bunch, but you've got to get them corralled. Without a moment's hesitation, you suit up and set out to recapture those intergalactic rascals!

Rascals combines arcade action with strategy in a fast-paced game for the 64 that is written entirely in machine language. To enter it, you'll have to use MLX, our machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts for starting and ending addresses, respond with the following.

Starting address: 0801
Ending address: 1088

Be sure to save a copy of the program before you exit MLX. Although Rascals is written in machine language, it loads and runs like a BASIC program.

Playing the Game

As the brave freighter captain, you control the figure in the lower right-hand corner of the screen. Use keys I, J, L, and K to move it up, left, right, and down, respectively. The object is to trap all the moving creatures on the screen. To do this, you must push crates that are scattered around the screen to form a corral, surrounding a rascal. The rascal mustn't be able to move in any direction, including diagonally, or it will escape. You can move as many crates at one time as you like.

Warning! This is a serious game. You have one life and can lose it by coming in contact with a rascal. If all the rascals have been boxed in, you've won the game. After each game, type Y to play again or N to end.

A Few Questions

However, before you can begin play, you must answer the questions on the opening screen. The first question will ask you how many rascals you want loose in the hold. Enter a number from 1 to 7. Remember, the fewer rascals there are, the faster they'll go!

The next question regards the number of crates available to you. A higher number will give you more boxes, making the game easier. A setting of 1 will give you the least amount of crates.

The third question regulates the speed at which the rascals move. A setting of 1 is the fastest, while 9 is the slowest. Finally, you will need to confirm your answers to begin play.

A timer at the top of the screen counts the number of moves the rascals have made, so you can compete against your best efforts. Enjoy—and get those rascals!

RASCALS

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0801:0C 08 0A 00 9E 20 32 30 64
0809:36 34 00 00 00 00 FF A2 E3
0811:00 BD 49 08 9D EB 1F E8 FD
0819:D0 F7 EE 14 08 EE 17 0B E0
0821:AD 17 08 C9 29 D0 E8 A9 73
0829:38 A2 31 A0 39 8D 07 08 44
0831:8E 08 08 8C 09 08 E8 8E 1D
0839:0A 08 4C 00 20 00 00 00 DA

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PROGRAMS

0841:00 00 00 00 00 00 00 6F C0	0A71:FE A9 20 A0 28 91 FE A5 A8	0CA1:B1 FE 30 28 A9 87 91 FE 68
0849:A9 07 8D 86 02 8D 21 D0 63	0A79:FE 8D B8 21 A5 FF 8D B9 9B	0CA9:A9 20 88 91 FE A5 FE 8D E2
0851:A9 93 20 D2 FF A9 00 8D 80	0A81:21 18 69 D4 85 FF A0 00 14	0CB1:B8 21 A5 FF 8D B9 21 EE A7
0859:21 D0 60 00 FF A9 00 8D 6E	0A89:A9 04 91 FE 4C CB 21 C9 33	0CB9:B8 21 D0 03 EE B9 21 18 79
0861:21 D0 A9 0E 8D 20 D0 78 53	0A91:89 D0 03 4C CB 21 C9 88 C2	0CC1:69 D4 85 FF CB A9 04 91 FA
0869:A5 01 29 FB 85 01 A2 00 E6	0A99:F0 06 4C 72 23 4C B8 21 5B	0CC9:FE 4C CB 21 4C 32 22 20 8F
0871:BD 00 D8 9D 00 38 BD 00 B1	0AA1:AD BA 23 10 03 4C C9 22 9F	0CD1:61 25 20 DF 24 20 2A 25 01
0879:D9 9D 00 39 BD 00 DA 9D B2	0AA9:A2 01 A5 FE 18 6D BA 23 03	0CD9:20 8D 24 A2 00 BD 41 27 B4
0881:00 3A BD 00 DB 9D 00 3B 68	0AB1:85 FE A5 FF 69 00 85 FF 53	0CE1:F0 07 9D 00 04 E8 4C 80 C4
0889:BD E1 27 9D 00 3C BD 00 1C	0AB9:A0 00 B1 FE C9 20 F0 0C 01	0CE9:24 60 AC D7 25 A2 80 8E 82
0891:DD 9D 00 3D BD 00 DE 9D 15	0AC1:C9 89 F0 CB C9 88 D0 D5 DF	0CF1:ED 04 8E ED D8 88 F0 39 B6
0899:00 3E CA D0 D3 A5 01 09 DF	0AC9:E8 4C 4D 22 A5 FE 85 39 9E	0CF9:E8 8E 0D 05 8E 0D D9 88 01
08A1:04 85 01 58 A2 00 BD AA F5	0AD1:A5 FF 18 69 D4 85 3A A9 2D	0D01:F0 2F E8 8E 2A 05 8E 2A 12
08A9:21 9D 54 28 E8 D0 F7 20 59	0AD9:0F A0 00 91 39 A5 FE 38 4D	0D09:D9 88 F0 25 E8 8E 6B 05 FF
08B1:72 24 20 5E 20 20 CB 21 28	0AE1:ED BA 23 85 FE A5 FF E9 D0	0D11:8E 6B D9 88 F0 1B E8 8E 65
08B9:4C 52 20 78 A9 01 8D 1A 96	0AE9:00 85 FF A0 00 B1 FE AC DA	0D19:D3 05 8E D3 D9 88 F0 11 51
08C1:D0 8D 12 D0 A9 7F 8D 0D 60	0AF1:BA 23 91 FE CA D0 E6 A9 5F	0D21:E8 8E 11 06 8E 11 DA 88 CC
08C9:DC A9 1B 8D 11 D0 A9 83 91	0AF9:20 A0 00 91 FE AD B8 21 A0	0D29:F0 07 E8 8E A1 06 8E A1 67
08D1:A2 20 8D 14 03 8E 15 03 AD	0B01:18 6D BA 23 8D B8 21 AD 47	0D31:DA A2 87 8E BE 07 A9 14 B4
08D9:AD D9 25 8D A9 21 58 60 97	0B09:B9 21 69 00 8D B9 21 A5 AC	0D39:8D BE DB 60 A9 FF 8D 0F C2
08E1:EE 19 D0 CE A9 21 D0 09 33	0B11:FF 18 69 D4 85 FF A9 04 2B	0D41:D4 A9 0F 8D 86 02 8D 21 63
08E9:AD D9 25 8D A9 21 20 9A 71	0B19:AC BA 23 91 FE 4C CB 21 93	0D49:D0 A9 93 20 D2 FF A9 0C A0
08F1:20 AD 0D DC 4C 31 EA AE 98	0B21:4C 32 22 4C CB 21 38 E9 30	0D51:8D 21 D0 A9 81 8D 12 D4 6A
08F9:9E 21 BD AA 21 38 E9 29 EA	0B29:80 8D BA 23 A2 02 A5 FE D3	0D59:A9 00 A2 04 85 FC 86 FD 08
0901:85 FC BD A2 21 E9 00 85 BD	0B31:38 ED BA 23 85 FE A5 FF DB	0D61:A2 09 AD 1B D4 CD D8 25 2B
0909:FD A0 00 AB 00 20 6F 21 EC	0B39:E9 00 85 FF A0 00 B1 FE 5C	0D69:90 13 E6 FC D0 02 E6 FD 97
0911:A0 28 20 6F 21 A0 50 20 C4	0B41:C9 20 F0 0C C9 89 F0 D8 52	0D71:A5 FC C9 E7 D0 EA A5 FD D0
0919:6F 21 E0 00 D0 06 6E 6A 2E	0B49:C9 88 D0 D7 E8 4C D1 22 3C	0D79:C9 07 D0 E4 60 A9 88 A0 FD
0921:21 4C 15 21 8E 6C 21 AD A1	0B51:A5 FE 85 39 A5 FF 18 69 05	0D81:00 91 FC 4C 0D 25 00 A2 04
0929:1B D4 CD 6C 21 B0 F8 AA E6	0B59:D4 85 3A A9 0F 91 39 AC FA	0D89:28 A9 89 9D 9F 04 9D BF 35
0931:BD A0 21 AA A0 29 B1 FC 23	0B61:BA 23 B1 FE A0 00 91 FE EA	0D91:07 CA D0 F7 A2 27 A0 04 72
0939:48 A9 20 91 FC 8A A8 B1 0C	0B69:CA F0 11 A5 FE 18 6D BA 8B	0D99:86 FC 84 FD A2 17 A9 89 F4
0941:FC 8D 6B 21 68 91 FC 48 80	0B71:23 85 FE A5 FF 69 00 85 DF	0DA1:8D BF 07 A0 00 91 FC C8 66
0949:AE 9E 21 8C 6C 21 A5 FC 77	0B79:FF 4C 02 23 A9 20 AC BA F6	0DA9:91 FC CA F0 10 A5 FC 18 5D
0951:18 6D 6C 21 9D AA 21 A5 E9	0B81:23 91 FE AD B8 21 38 ED F0	0DB1:69 28 85 FC A5 FD 69 00 03
0959:FD 69 00 9D AB 21 A5 FD C9	0B89:BA 23 8D B8 21 AD B9 21 57	0DB9:85 FD 4C A1 25 60 A9 93 45
0961:18 69 D4 85 FD 68 91 FC 7E	0B91:E9 00 8D B9 21 A5 FF 18 A1	0DC1:20 EB 1F A9 1E 8D 18 D0 8D
0969:AD 6B 21 C9 87 D0 03 EE 62	0B99:69 D4 85 FF A9 04 A0 00 E8	0DC9:A2 00 BD DA 25 9D 00 04 3E
0971:BA 21 EE 9E 21 EE 9E 21 14	0BA1:91 FE 4C CB 21 20 5E 23 EF	0DD1:BD 41 26 9D 67 04 E8 D0 A7
0979:EE 6E 21 AD 6E 21 CD D7 09	0BA9:A2 08 BD 4B 28 9D D0 04 DC	0DD9:F1 A9 38 8D D3 25 20 C3 6E
0981:25 F0 01 60 AD 6A 21 CD AF	0BB1:A9 01 9D DA D8 CA D0 F2 C4	0DE1:25 8D B7 04 38 E9 30 8D 80
0989:D7 25 D0 03 EE 6D 21 A9 34	0BB9:4C 75 23 A2 00 BD 31 28 63	0DE9:D7 25 A9 B6 8D DF 04 A9 77
0991:00 8D 9E 21 8D 6E 21 8D E2	0BC1:F0 0C 9D D0 04 A9 01 9D 7A	0DF1:3A 8D D3 25 20 C3 25 8D 41
0999:6A 21 8D 9F 21 A2 30 EE B7	0BC9:D0 D8 E8 4C 60 23 60 20 D0	0DF9:DF 04 38 E9 0B 8D D8 25 10
09A1:97 04 AD 97 04 C9 3A D0 3C	0BD1:5E 23 78 A9 31 A2 EA 8D 01	0E01:A9 B5 8D 07 05 20 C3 25 D6
09A9:1D 8E 97 04 EE 96 04 AD A8	0BD9:14 03 8E 15 03 A9 78 8D 1B	0E09:8D 07 05 18 E9 2F 8D D9 D0
09B1:96 04 C9 3A D0 10 8E 96 67	0BE1:19 D0 A9 F0 8D 1A D0 A9 1D	0E11:25 A9 A0 8D 2F 05 20 E4 C9
09B9:04 EE 95 04 AD 95 04 C9 12	0BE9:FF 8D 0D DC A2 00 BD 54 B7	0E19:FF F0 FB C9 4E F0 9F 60 63
09C1:3A D0 03 8E 95 04 60 00 EB	0BF1:28 9D AA 21 CA D0 F7 58 CC	0E21:20 E4 FF CA D0 FA 20 E4 CA
09C9:00 00 00 00 20 90 21 B0 12	0BF9:A2 00 20 E4 FF CA D0 FA 7B	0E29:FF F0 FB C9 31 90 F7 C9 23
09D1:03 20 8A 21 C8 20 90 21 D9	0C01:20 E4 FF F0 FB C9 4E F0 06	0E31:38 B0 F3 60 00 02 00 88 AA
09D9:00 03 20 8A 21 C8 20 90 AE	0C09:0B C9 59 D0 F3 EA A9 00 EF	0E39:88 88 88 88 88 88 88 55
09E1:21 B0 03 20 8A 21 60 98 45	0C11:8D 21 D0 60 4C E2 FC 00 40	0E41:88 88 88 88 88 88 88 5D
09E9:9D A0 21 E8 60 B1 FC C9 33	0C19:4C 32 22 AD B8 21 85 FE 57	0E49:88 88 88 88 88 88 88 65
09F1:87 F0 04 C9 20 D0 02 18 81	0C21:AD B9 21 85 FF A0 28 8C 5A	0E51:88 88 88 88 88 88 88 6D
09F9:60 38 60 00 00 00 00 56	0C29:BA 23 B1 FE 30 EA A9 87 95	0E59:88 88 88 88 88 88 88 75
0A01:00 00 00 00 00 00 ED 03	0C31:91 FE A9 20 A0 00 91 FE 30	0E61:20 80 20 20 20 20 20 52 C7
0A09:04 0D 05 2A 05 6B 05 D3 59	0C39:A5 FE 18 69 28 B8 21 87	0E69:20 20 20 41 20 20 20 53 CA
0A11:05 11 06 A1 06 BE 07 00 FF	0C41:A5 FF 69 00 8D B9 21 A5 94	0E71:20 20 20 43 20 20 20 41 E0
0A19:A9 00 8D BA 21 4C 72 23 A1	0C49:FF 18 69 D4 85 FF A0 28 77	0E79:20 20 20 4C 20 20 20 53 8B
0A21:A9 00 8D 6D 21 4C 48 23 80	0C51:A9 04 91 FE 4C CB 21 AD E2	0E81:20 20 20 80 20 80 88 88 D9
0A29:AD BA 21 D0 EB AD 6D 21 06	0C59:B8 21 38 E9 01 85 FE AD 85	0E89:20 20 20 20 20 20 20 20 A5
0A31:D0 EE 20 E4 FF F0 F1 C9 2D	0C61:B9 21 E9 00 85 FF A0 00 49	0E91:20 20 20 42 19 20 42 0F CA
0A39:49 D0 03 4C P6 21 C9 4A 65	0C69:A9 81 8D BA 23 B1 FE 30 22	0E99:02 20 42 12 0F 04 05 12 CC
0A41:D0 03 4C FA 23 C9 4B D0 5F	0C71:5B A9 87 91 FE A9 20 C8 53	0EA1:09 03 0B 20 20 20 20 20 48
0A49:03 4C BE 23 C9 4C D0 D8 F5	0C79:91 FE A5 FE 8D B8 21 A5 F5	0EA9:20 20 20 20 20 88 88 FE
0A51:4C 34 24 AD B8 21 38 E9 9C	0C81:FF 8D B9 21 18 69 D4 85 DB	0EB1:88 88 88 88 88 88 88 CD
0A59:28 85 FE AD B9 21 E9 00 C3	0C89:FF 88 A9 04 91 FE 4C CB 2C	0EB9:88 88 88 88 88 88 88 DD
0A61:85 FF A9 A8 8D BA 23 A0 36	0C91:21 AD B8 21 85 FE AD B9 06	0EC1:88 88 88 88 88 88 88 D5
0A69:00 B1 FE 30 22 A9 87 91 25	0C99:21 85 FF A0 01 8C BA 23 80	0EC9:88 88 88 88 88 88 88 E5

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0ED1:88 88 88 88 88 88 88 88 20 85
0ED9:20 20 20 20 20 20 20 20 F5
0EE1:23 20 0F 06 20 52 01 13 39
0EE9:03 01 0C 13 3F 20 87 20 84
0EF1:20 28 31 2D 37 29 20 20 DF
0EF9:20 20 20 20 20 20 20 20 16
0F01:20 20 20 20 20 20 20 43 42
0F09:12 01 14 05 20 44 05 0E 6D
0F11:13 09 14 19 3F 20 36 20 16
0F19:20 28 31 2D 39 29 20 20 19
0F21:20 20 20 20 20 20 20 3F
0F29:20 20 20 20 20 20 52 79
0F31:01 13 03 01 0C 13 20 53 45
0F39:10 05 05 04 3F 20 35 20 86
0F41:20 28 31 2D 39 29 20 20 41
0F49:20 20 20 20 20 20 20 20 67
0F51:20 20 20 20 20 20 20 41 90
0F59:02 0F 16 05 20 43 0F 12 8D
0F61:12 05 03 14 3F 20 20 20 46
0F69:20 28 59 2F 4E 29 20 20 37
0F71:20 20 20 20 20 20 20 8F
0F79:4B 05 19 13 3A 20 49 2D E4
0F81:55 10 20 20 20 4A 2D 52 2B
0F89:09 07 08 14 20 20 4B 3D
0F91:2D 44 0F 17 0E 20 20 20 FB
0F99:4C 2D 4C 05 06 14 89 89 20
0FA1:89 89 89 89 89 89 89 89 BF
0FA9:89 89 89 89 89 89 89 89 C7
0FB1:89 89 89 89 89 89 89 89 CF
0FB9:89 89 89 89 89 89 89 89 D7
0FC1:89 89 89 89 89 89 89 20 76
0FC9:70 40 6E 70 40 6E 70 40 E1
0FD1:40 72 40 6E 70 40 6E 6E 6B
0FD9:20 70 40 40 40 40 40 40 F3
0FE1:40 40 40 40 40 40 40 40 FF
0FE9:40 40 40 40 40 40 89 89 20 9F
0FF1:6B 72 7D 6B 40 73 6D 40 B3
0FF9:6E 5D 20 20 6B 40 73 5D 4D
1001:20 6D 40 6E 20 02 19 00 D6
1009:42 0F 02 20 42 12 0F 04 CC
1011:05 12 09 03 0B 89 89 20 3B
1019:7D 6D 40 7D 20 6D 40 40 AA
1021:7D 6D 40 71 7D 20 6D 71 33
1029:40 40 40 7D 20 54 09 0D CA
1031:05 3A 20 30 30 30 20 20 0C
1039:20 20 20 20 20 00 18 3C E4
1041:5A 66 3C 66 3C 18 18 3C C4
1049:7E 5A 7E 56 6A 7E 66 7E 0D
1051:5A 7E 66 7E 3C 18 18 3C A1
1059:76 D5 F7 66 3C 18 18 3C 3E
1061:24 3C 18 0C 18 0C 0E 4A BD
1069:4E 7E 7C 7C 24 24 3E 3A 10
1071:3E 18 18 3C 64 46 3C 24 56
1079:3C 3C 5A 3C 66 66 1F 23 04
1081:7D 7D 7D 7E 7C 00 1F 23 9C
1089:7D 7D 7D 7E 7C 00 D9 CF C6
1091:D5 A0 C4 C9 C5 C4 AE A0 39
1099:D0 CC C1 D9 A0 C1 C7 C1 88
10A1:C9 CE BF A0 D9 AF CE 00 87
10A9:D9 CF D5 A0 D7 CF CE A1 AC
10B1:A1 00 00 00 00 00 00 00 A2

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Bob Broderick is a student at California High School and has been programming for about five years. He wrote Rascals because he wanted a small arcade-style game that he could play with relative ease and few rules. He lives in San Ramon, California.

SCUD

By William F. Snow

There has been a lot of discussion over the past few years about how little people know about world geography. For example, do you know the names of all of the countries in the Americas? Can you at least venture a guess as to how many there are in North, Central, and South America? Give up? There are 35! Despite its military-sounding name, Scud will help you learn the names and capitals of these 35 countries.

Entering the Program

Scud is an entertaining and fun way to learn something about the countries of the Americas. It's written entirely in BASIC. To help avoid typing errors, enter it with The Automatic Proofreader. See "Typing Aids" elsewhere in this section. Be sure to save a copy of the program before you try to run it.

Playing Scud isn't difficult. Plug a joystick into port 2 and then load and run Scud. The opening screen will give brief instructions for playing the game. After a short pause, you will be presented with the name of a country and asked to choose the capital from a list of three. If you choose incorrectly, you are given the correct answer in a special bulletin.

Defend the City

If you choose correctly, the city will be displayed, sirens will wail, and missiles will be launched at the city. It will then be your responsibility to use your Scud missiles to try to shoot down any enemy rockets before they reach the city. Use the joystick to aim your Scud. A total of three missiles will be launched from different positions during each attack. If you shoot down all three, you will have saved the city.

Modifications

Scud was written to help teach the names and capitals of the countries of the Americas. Since Scud is written entirely in BASIC, it should be very easy to modify the game so that the capitals of any other group of countries or states could be taught. The names of the countries, followed by their capitals, are in data statements in lines 1200-1300.

In order to modify the game, change this data to whatever group you wish to work with. Then, the following code should be changed to reflect the number of countries or states you have entered into the data statements: the dimension statements in line 40; the FOR in line 80; the number of countries in lines 150, 160, 170 (the scramble routine); and the end-of-game routine in line 200.

Scud is fun to play and will quickly teach the names and capitals of the countries of the Americas to anyone who wants to learn them.

SCUD

```

BH 10 REM COPYRIGHT 1993 - COM
      PUTE PUBLICATIONS - ALL
      {SPACE}RIGHTS RESERVED
QD 20 REM BY WM. F. SNOW
GG 30 GOSUB1020
XJ 40 CLR:DIM QS(35),AS(35),CO
      S(35),CAS(35),Y(35):V=53
      248:SN=54272:POKESN+24,1
      5
GS 50 POKE53280,7:POKE53281,7:
      POKEV+31,0
QD 60 POKESN+4,0:PRINT"[CLR]
      {8 DOWN}"SPC(14)"{BLU}PL
      EASE WAIT":PRINT"
      {3 DOWN}{3 SPACES}OUR SP
      IES ARE";
CD 70 PRINT" CHECKING ON THE E
      NEMY"
DE 80 FOR QA=1TO35:READQS(QA),
      AS(QA):NEXT
BE 90 FOR S=12288 TO 12351:REA
      DSP:POKES,SP:NEXT
AB 100 FORS=12352TO 12415:READ
      SP:POKES,SP:NEXT
QD 110 FORS=12416 TO 12479:REA
      D SP:POKES,SP:NEXT
BM 120 FORS=12480TO12543:READS
      P:POKES,SP:NEXT
AK 130 FORS=12544 TO 12607:REA
      D SP:POKES,SP:NEXT
JE 140 FORS=12608 TO 12671:REA
      DSP:POKES,SP:NEXT
FM 150 FOR I=1 TO 35
KC 160 X=INT(RND(.)*35)+1
FC 170 FOR CK=1 TO35:IF X=Y(CK)
      THEN160
SM 180 NEXTCK:Y(I)=X
BD 190 COS(X)=QS(I):CAS(X)=AS(I):
      NEXTI
GS 200 SC=0:FORI=1TO4:POKEV+I,
      0:NEXT:POKEV+21,0:P=P+1
      :IF P>35THENP=35:GOTO11
      40
AS 210 POKE53280,13:POKE53281,
      1
MD 220 JR=INT(RND(.)*10)+2
RC 230 PRINT"[CLR]{10 DOWN}
      {4 SPACES}SCUDS HAVE BE

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PROGRAMS

```

EN LAUNCHED AT THE
PB 240 PRINTSPC(9)"CAPITAL OF
{SPACE}{BLK}"COS(P)
SF 250 PRINT:PRINTSPC(12)"
{BLU}SHOULD YOU GO TO"
BK 260 Q=INT(RND(.)*10)+1:IF Q
=P THEN260
GJ 270 R=INT(RND(.)*10)+1:IF R
=P OR R=Q THEN270
RF 280 POKE2040,192:POKEV+29,1
:POKEV+40,1
MP 290 S=INT(RND(.)*3)+1:ON S
{SPACE}GOTO300,340,380
JD 300 PRINT:PRINTSPC(9)"{BLK}
A){BLU}"CAS(P):PRINT:PR
INTSPC(9)"{BLK}B){BLU}"
CAS(Q)
HD 310 PRINT:PRINTSPC(9)"{BLK}
C){BLU}"CAS(R):PRINTSPC
(9)"{3 DOWN}{CYN}HIT Q
{SPACE}TO END GAME"
MX 320 GOSUB600:IF BS="A"THEN4
20
SB 330 GOSUB820:GOTO200
GC 340 PRINT:PRINTSPC(9)"{BLK}
A){BLU}"CAS(Q):PRINT:PR
INTSPC(9)"{BLK}B){BLU}"
CAS(P)
HG 350 PRINT:PRINTSPC(9)"{BLK}
C){BLU}"CAS(R):PRINTSPC
(9)"{3 DOWN}{CYN}HIT Q
{SPACE}TO END GAME"
XP 360 GOSUB600:IF BS="B"THEN4
20
SG 370 GOSUB820:GOTO200
FG 380 PRINT:PRINTSPC(9)"{BLK}
A){BLU}"CAS(R):PRINT:PR
INTSPC(9)"{BLK}B){BLU}"
CAS(Q)
KG 390 PRINT:PRINTSPC(9)"{BLK}
C){BLU}"CAS(P):PRINTSPC
(9)"{3 DOWN}{CYN}HIT Q
{SPACE}TO END GAME"
QE 400 GOSUB600:IF BS="C"THEN4
20
PE 410 GOSUB820:GOTO200
AK 420 PRINT"{CLR}":POKE53280,
13:POKE53281,13
JG 430 PRINT"{HOME}{18 DOWN}"S
PC(8)"{BLK}B":PRINTSPC(
7)"{PUR}NP{2 SPACES}
{RVS}{OFF}"
ME 440 PRINT"{3 SPACES}{BLK}
{H}{A}IOP*OP":PRINT"
{4 SPACES}{PUR}OP{T}
{RVS}{OFF}{N}BP{0}NP"
CR 450 PRINT"{3 SPACES}{BLK}O
{SPACE}{N}{RVS}{OFF}
{N}B{PUR}M M{N}":GOSUB1
120
HX 460 POKEV+21,3:XA=75:YA=200
:POKE2041,194:POKEV+39,
11:POKEV+40,6
AB 470 SC=SC+1:IFSC>3 THEN GOS
UB970:GOTO200
HC 480 PS=INT(RND(.)*3)+1:ON P
S GOTO490,720,770
SQ 490 POKE2040,192:POKEV+39,1
1:X=60:XX=255:FORA=1TO2
5:XX=XX-3:POKEV,XX
XX 500 POKEV+1,X:GOSUB570
QA 510 POKEV+2,XA:POKEV+3,YA:N
EXT
EH 520 POKEV+30,0
SX 530 POKE2040,193:FORA=1TO50
:XX=XX-3:X=X+3:POKEV,XX
:POKEV+1,X:GOSUB570
KE 540 IFFB=0ANDPEEK(V+30)AND2
=2THEN GOSUB630:GOTO470
BF 550 POKEV+2,XA:POKEV+3,YA:I
F(PEEK(V+31)AND1)=1THEN
910
RR 560 NEXT:GOTO200
MP 570 JY=PEEK(56320)AND15:FB=
PEEK(56320)AND16:REM RE
AD STICK AND BUTTON
FA 580 IFJY=7THENXA=XA+JR:IF X
A>255THEN XA=255
BB 590 IFJY=11THENXA=XA-JR:IF X
A<1 THEN XA=1
JD 600 IFJY=13THENYA=YA+JR:IF
{SPACE}YA>250 THEN YA=2
50
SS 610 IFJY=14THENYA=YA-JR:IF
{SPACE}YA<1 THEN YA=1
XR 620 RETURN
MQ 630 POKE2040,195:POKEV+39,2
:GOSUB1100:POKEV+23,1:P
OKEV+29,1
DM 640 FORDE=1TO8:POKEV+39,EC:
FORDE=1TO70:NEXT:NEXT:P
OKEV,0:POKEV+1,0
MS 650 POKEV+31,0:POKEV+23,0:R
ETURN
GS 660 GET BS:IF BS="" THEN660
QB 670 RETURN
MM 680 GET BS:IFBS=""THEN680
KB 690 IF BS="A"ORBS="C"ORBS="
B"THENRETURN
SA 700 IF BS="Q"THEN1140
XC 710 GOTO680
XF 720 POKE2040,196:POKEV+39,1
1:POKEV,60:FORVS=0TO200
STEP5:GOSUB570
EG 730 POKEV+1,VS:POKEV+30,0:P
OKEV+2,XA
EG 740 POKEV+3,YA:IFFB=0ANDPEE
K(V+30)AND2=2THENGOSUB6
30:GOTO470
JR 750 IF(PEEK(V+31)AND1)=1 T
HEN910
GS 760 NEXT:GOTO200
DG 770 POKE2040,197:POKEV+39,1
1:POKEV,255:POKEV+1,220
DC 780 FORX=255TO0STEP-3:GOSUB
570:POKEV,X:POKEV+30,0
HJ 790 POKEV+2,XA:POKEV+3,YA:I
FFB=0ANDPEEK(V+30)AND2=
2THENGOSUB630:GOTO470
BM 800 IF(PEEK(V+31)AND1)=1 T
HEN910
BR 810 NEXT:GOTO200
AP 820 PRINT"{CLR}{4 DOWN}
{6 RIGHT}{RED}OM {H}
{N}{2 SPACES}{H}
{2 SPACES}{H}{2 SPACES}
O{Y}{Y}P{2 Y} B {N}M
{2 SPACES}{H}"
DB 830 PRINT"{6 RIGHT}LN {H}
{N}{2 SPACES}{H}
{2 SPACES}{H}{2 SPACES}
L{P}{2 SPACES}{N}
{3 SPACES}B {N} M {H}"
KR 840 PRINT"{6 RIGHT}{H}M {H}
{N}{2 SPACES}{H}
{2 SPACES}{H}{2 SPACES}
{H}{3 SPACES}{N}
{3 SPACES}B {N}
{2 SPACES}M{H}"
FB 850 PRINT"{6 RIGHT}LN M{P}N
{2 SPACES}L{P} L{P} L
{P}{2 SPACES}{N}
{3 SPACES}B {N}
{3 SPACES}{H}"
MA 860 PRINT "{3 DOWN}{BLK}"SP
C(4)CAS(P):PRINT"{BLU}
{SPACE}THE CAPITAL OF
{BLK}":PRINTSPC(4)COS(P)
CQ 870 PRINT"{BLU}{2 SPACES}HA
S BEEN DESTROYED ";
RP 880 PRINT"BY SCUD MISSLES.
{3 SPACES}THE PERSON WH
O COULD HAVE SAVED THE
{SPACE}CITYDID";
BA 890 PRINT" NOT HAVE ENOUGH
{SPACE}INFORMATION TO G
ET{2 SPACES}TO THE RIGH
T CITY IN TIME."
XS 900 PRINT"{3 DOWN}{8 RIGHT}
{6}HIT ANY KEY TO CONTI
NUE{BLU}":GOSUB660:RETU
RN
MP 910 POKEV+21,0:PRINT"{HOME}
{20 DOWN}"SPC(4)"{RED}M
{F}{5 SPACES}N N":GOSU
B1100
AR 920 PRINTSPC(4)"N M
{4 SPACES}N NNM N"
QP 930 PRINTSPC(3)"TM M{Q}IBBN
{+}P{2 E}Q":POKESN+4,0
MC 940 FORDE=1 TO500:NEXT:FORC
L=1704TO1903:POKECL,32:
NEXT
FJ 950 PRINTSPC(3)"{UP}{BLK}
{D}{0}{K}{E}{2 I}R{R}
L{E}{+}{7}":FORDE=1T
O1000:NEXT
QF 960 POKEV,0:POKEV+1,0:POKEV
+31,0:GOTO200
PC 970 POKEV+21,0
RH 980 PRINT"{CLR}{5 DOWN}
{4 RIGHT}{BLK}THANK YOU
11":PRINT:PRINT"{BLU}YO
UR KNOWLEDGE AND MARKSM
ANSHIP";
AM 990 PRINT" HAVE{4 SPACES}SA
VED{BLK}":PRINT:PRINTCA
S(P):PRINT:PRINT"{BLU}T
HE CAPITAL OF{BLK}"
HR 1000 PRINT:PRINT COS(P):PRI

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DB 1010	NT" {BLU}" PRINT" {5 DOWN} {WHT} HIT ANY KEY TO CONTINUE {BLU}":GOSUB660:SS=SS+ 1:RETURN	EK 1210	ST. JOHNS,BAHAMAS,NASS AU,BELIZE,BELMOPAN DATACANADA,OTTAWA,COST A RICA,SAN JOSE,CUBA,H AVANA,DOMINICA,ROSEAU	RF 1380	DATA000,000,144,000,00 0,224,000,000,000,000, 000,000,000,000,000,00 0,000
JA 1020	POKE53280,10:POKE53281 ,10	PB 1220	DATADOMINICAN REPUBLIC ,SANTO DOMINGO,EL SALV ADOR,SAN SALVADOR,GREN ADA	KK 1390	DATA000,000,000,000,00 0,000,000,000,000,000, 000,000,000,000,000,00 0,000
PG 1030	PRINT" {CLR} {3 DOWN} {BLK}"SPC(12)"N{2 T} {2 SPACES}N{2 T} {2 SPACES}{G} {M} {2 SPACES}OM":PRINTSPC (12)"M{0}{3 SPACES}{G} {4 SPACES}{G} {M} {2 SPACES}{G}{M}"	FS 1230	DATAT. GEORGE'S,GUATE MALA,GUATEMALA,HAITI,P ORT-AU-PRINCE,HONDURAS	GK 1400	DATA000,000,000,000,00 0,000,255,128,000,000, 000,000,000,000,000,00 8,000
QA 1040	PRINTSPC(14)"M {2 SPACES}{G} {4 SPACES}{G} {M} {2 SPACES}{G}{M}":PRIN TSPC(12)"{2 @}N {2 SPACES}M{2 @} {2 SPACES}M{0}N {2 SPACES}LN"	XC 1240	DATATEGUCIGALPA,JAMAIC A,KINGSTON,MEXICO,MEXI CO CITY,NICARAGUA,MANA GUA	AC 1410	DATA000,000,000,000,00 0,000,000,000,000,000, 000,000,000,000,000,00 0,000
JD 1050	PRINT" {3 DOWN} {BLU} {3 SPACES}THE ENEMY IS LAUNCHING SCUD MISSIL ES AT NATIONAL CAPITAL S";	KG 1250	DATAPANAMA,PANAMA CITY ,SAINT LUCIA,CASTRIES, SAINT VINCENT & THE GR ENADINES	MA 1420	DATA000,000,000,000,00 0,000,032,000,000,032, 032,004,032,000,000,03 2,000
KM 1060	PRINT" IN THE AMERICAS . {3 SPACES}YOUR JOB IS TO GET TO THE CAPITAL UNDER ATTACK";	HJ 1260	DATAKINGSTOWN,TRINIDAD & TOBAGO,PORT OF SPAI N,UNITED STATES,WASHIN GTON D.C.	KF 1430	DATA001,002,000,000,13 2,000,000,072,000,128, 048,000,064,120,002,09 2,252
KG 1070	PRINT" AND DESTROY THE MISSILES. USE A {2 SPACES}JOYSTICK IN {SPACE}PORT TWO,";	BP 1270	DATARGENTINA,BUENOS A IRES,BOLIVIA,LA PAZ,BR AZIL,BRASILIA,CHILE,SA NTIAGO	FH 1440	DATA248,128,120,002,00 0,048,000,000,072,000, 000,132,000,001,002,00 0,000
RP 1080	PRINT" BUT BE CAREFUL, {3 SPACES}EQUIPMENT IN DIFFERENT CITIES DOES NOT ";	MX 1280	DATACOLOMBIA,BOGOTA,EC UADOR,QUITO,GUYANA,GEO RGETOWN,PARAGUAY,ASUNC ION	CS 1450	DATA016,000,000,016,00 0,000,016,032,016,016, 032,000,000,000,000,00 0,000
DF 1090	PRINT" ALWAYS RESPOND {SPACE}WITH THE SAME S PEED.":GOSUB900:RETURN	KE 1290	DATAPERU,LIMA,SURINAME ,PARAMARIBO,URUGUAY,MO NTIVIDEO,VENEZUELA,CAR ACAS	BK 1460	DATA000,003,255,128,00 1,215,000,000,214,000, 000,124,000,000,056,00 0,000
KG 1100	POKESN+4,129:POKESN+5, 92:POKESN+1,1:POKESN,1 00:FORF=1TO999:NEXT:PO KESN+4,0	FS 1300	DATABARBADOS,BRIDGETOW N,ST. KITTS & NEVIS,BA SSETERRE	RR 1470	DATA040,000,000,040,00 0,000,040,000,000,040, 000,000,040,000,000,04 0,000
CE 1110	RETURN	FE 1310	DATA000,000,000,000,00 0,000,000,000,000,000, 000,000,000,000,000,00 0,000	EC 1480	DATA000,040,000,000,04 0,000,000,040,000,000, 056,000,000,016,000,00 0,016
PD 1120	POKESN+14,5:POKESN+13, 16:POKESN+3,1:POKESN+6 ,240:POKESN+4,65	GG 1320	DATA001,000,000,003,00 0,000,007,000,024,015, 000,104,127,000,143,25 5,000	QP 1490	DATA000,000,016,000,00 0,000,000,000,000,000, 000,000,000,000,000,00 0,000
CJ 1130	POKESN,240:POKESN+1,20 :POKEV+30,0:RETURN	EB 1330	DATAL143,255,000,104,12 7,000,024,015,000,000, 007,000,000,003,000,00 0,001	BA 1500	DATA000,000,000,000,00 0,000,000,000,000,000, 000,000,000,000,000,00 0,000
QD 1140	PRINT" {CLR} {5 DOWN} {7 RIGHT}YOU SAVED "SS " OUT OF THE "P	SG 1340	DATA000,000,000,000,00 0,000,000,000,000,000, 000,000,000,000,000,00 0,000	FK 1510	DATA003,000,000,007,00 0,000,025,015,255,241, 000,000,025,000,000,00 7,000
SG 1150	PRINT:PRINT" {8 RIGHT}C ITIES THAT WERE ATTACK ED"	CJ 1350	DATA000,000,000,000,00 0,000,000,000,000,000, 000,000,000,000,004,00 0,000	JE 1520	DATA000,003,000,000,00 0,000,000,000,000,000, 000,000,000,000,000,00 0,000
AA 1160	PRINT" {5 DOWN} {5 RIGHT}WOULD YOU LIK E TO TRY AGAIN (Y/N)": GOSUB660	FR 1360	DATA006,000,000,007,00 0,000,007,128,000,007, 192,000,007,224,000,00 7,240	PD 1530	DATA000,000,000,000,00 0,000,000,000,000,000
FA 1170	IF B\$="N"THEN END	PX 1370	DATA000,007,248,000,00 7,252,000,015,254,000, 028,000,000,120,000,00 0,144		
AX 1180	IFB\$="Y"THEN RUN 40				
CR 1190	GOTOL140				
SJ 1200	DATAANTIGUA & BARBUDA,				

William Snow, a teacher for more than 27 years, is vice president of the McHenry County Commodore Computer Club in McHenry, Illinois.

CRYPTARITHM SOLVER

By David Pankhurst

When I first bought my Commodore, I used it often to solve math problems. I liked the brute-force approach the computer allowed. I'd just have a series of FOR-NEXT loops go through the possible answers until a solution would appear.

That was fine most of the time, but eventually I came across a type of math problem the computer couldn't help me with, the cryptarithm. You've no doubt seen this type of problem before.

HELP
+ THE

YOUNG

Each letter represents a different digit, 0-9. In this example, there are ten different letters, so all ten digits are used. The words *HELP* and *THE* each make numbers that, when added together, match the result in *YOUNG*. There are no restrictions, except that 0 can't be the first digit in any number.

Clearly, this isn't a simple loop problem. Let's say the *H* above was assigned 1; the *E*, 2; the *L*, 3; and so on throughout the puzzle. A sample addition could then be tried, and the result checked.

So how many times does this need to be done? To completely check the puzzle, *H* has to be tried out for each of the 9 digits (leaving out 0), *E* by each of the remaining 9, the *L* by the remaining 8, and so on. This gives approximately $9 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ choices, or 3,265,920 different combinations. That's a lot of loops in BASIC! If the 64 managed one calculation per second, it would take more than 35 days to complete.

To the Rescue

Enter machine language. Cryptarithm Solver brings ML brute force to these puzzles. In a matter of hours, it can solve most cryptarithms. A puzzle is first broken up into combinations, and the computer tries different substitutions for each letter.

If the result is correct (totals on both sides of the equal sign match) the puzzle is solved. The program then goes on to see if there are other solutions.

Typing It In

Cryptarithm Solver is written in BASIC, but it pokes machine language routines into memory to speed calculations. To help avoid typing errors, enter the program with The Automatic Proofreader; see "Typing Aids" elsewhere in this section. Be sure to save a copy of the program before you try to run it.

Solving Equations

When you run Cryptarithm Solver, the program will prompt you for a puzzle. To solve the above problem, enter it in the following format. (You may use lowercase letters.)

HELP+THE=YOUNG

After you press Return, the program displays a constantly changing sum in the bottom of the screen. This is a window into the processing of the program. The display is the test result produced by each combination. Usually, the result is wrong, and the next combination is then tried. However, when the result is true, the solution is displayed, along with the time it took to find. Processing then continues with the next combination.

No Key Words

You need to watch out for one thing when you're preparing input for Cryptarithm Solver. If you typed *SEND + MORE = MONEY*, the program would display an error message informing you that the words contained an embedded BASIC function or command. This is because the BASIC commands END, OR, and ON are embedded in the formula, and the computer tries to encode these as commands. To avoid this problem, insert spaces between the letters. *SEND + MORE = MONEY* would work fine.

Cryptarithm Solver works well with all sorts of mathematical operations, not just addition. One example is the following multiplication.

ABCDE*9=FGHIJ

Entering it this way fixes the 9; only letters are changed in the puzzle. By the way, there are two solutions to this puzzle. As with other computer math opera-

tions, be sure to enter an asterisk for multiplication.

Cryptarithm Solver works at ML speeds, but even that isn't fast enough for instantaneous results. Depending on the formula, the program can perform as many as 60 tests a second, so it would still take half a day to solve some puzzles.

Even Faster

One way to shorten the time is to put the result first on the line. As an example, look at *MONEY=SEND+MORE*. Cryptarithm Solver starts by assigning 1 to *M*; usually, that is the correct digit for the first place in the sum. So, you can save testing for the other eight digits, and this can mean solving most puzzles in less than an hour. The examples here ranged from 40 seconds to three hours, using these tips.

Other Languages

Cryptarithm Solver is not restricted to English. It also works in French.

ELEVE+LECON=DEVOIR

This translates loosely to become *STUDENT+LESSONS=HOMEWORK*. If we entered the words into Cryptarithm Solver as *ELEVE+LECON=DEVOIR*, the *D* (which logically is 1), would be assigned 7, and it would have to go through the whole cycle to solve. By reversing the order, *D* is assigned 1 immediately, and the solution is that much quicker. It took me 64 minutes. (I'll give you this one. The answer is $69656 + 96078 = 165734$.)

When the program finds a solution, leave it running to search for other answers. When all reasonable solutions have been tried, however, you'll want to stop it. To quit, hold down the Q key. You'll be asked if you wish to continue. Press Y to continue or N to stop. To slow the action, hold down the Ctrl key. But be warned; the solutions take much longer.

I hope you enjoy Cryptarithm Solver, yet one more way the brute-force methods of computing can yield practical results and eliminate all that difficult thinking for us humans. To end, here are two more puzzles:

PETER+PETER+PETER+PETER=REPEAT

MARS+VENUS+SATURN+URANUS=NEPTUNE

CRYPTARITHM SOLVER

```
PH 100 REM COPYRIGHT 1993 - CO
MPUTE PUBLICATIONS INTL
LTD - ALL RIGHTS RESER
VED
RH 105 POKE 53280,0:POKE 53281
,0:PRINT"{CLR}{YEL}{H}
{N}"
XK 110 PRINT"{8 SPACES}CRYPTAR
ITHMS{2 SPACES}SOLVER
AQ 120 PRINT"{11 SPACES}BY D.P
ANKHURST
BX 130 PRINT
RE 140 INPUT "CODE STRING";X$
XB 150 DIM L(20):L=0:GOSUB350:
PP=P:Y$="1023456789"
EM 160 FOR I=1 TO LEN(Y$):POKE
C-1+I,ASC(MID$(Y$,I,1)
):NEXT:POKE CM,LEN(Y$)-
1
AR 170 FOR I=1 TO LEN(X$):POKE
511+I,ASC(MID$(X$,I,1)
):NEXT:POKE I,0:SYS 491
55
SD 174 FOR J=1 TO I-1:IF PEEK(
511+J)THEN 178
AM 176 PRINT"{RVS} EMBEDDED BA
SIC FUNCTION OR COMMAND
{OFF}":END
GE 178 NEXT:Y=1
JX 180 IF PEEK(511+Y)<>0 THEN
{SPACE}Y=Y+1:GOTO 180
QQ 190 FOR K=1 TO Y-1:C=PEEK(5
11+K):C$=CHR$(C):IF C$<
"A" OR C$>"Z" THEN250
PX 200 IF L=0 THEN230
CR 210 Y=-1:FOR I=0 TO L-1:IF
{SPACE}L(I)=C THEN Y=I
CG 220 NEXT:IF Y<>-1 THEN240
PA 230 L(L)=C:Y=L:L=L+1
SA 240 POKE PP,K:POKE PP+1,Y:P
P=PP+2
HC 250 NEXT:POKE PC,PP-P:FOR I
=0 TO L-1:POKE X+I,I:NE
XT:POKE MX,L-1
DC 260 PRINT"{CLR}";:F=0
CS 270 PRINT"{HOME}{24 DOWN} "
X$;:SYS 49152
MS 280 POKE 198,0:Y=PEEK(781)
EB 290 IF Y=255 AND F=0 THEN P
RINT:PRINT"{UP}{RVS} SO
RRY-NO MATCH {OFF}":GOT
O340
SC 300 IF Y=255 THEN PRINT:PRI
NT"{UP}{RVS} END OF LIS
TS {OFF}":GOTO340
PP 310 IF Y<>1 THEN330
DK 320 F=F+1:PRINT"{2 SPACES}"
INT(TI/6)/10"SECONDS";:
PRINT:PRINT " X$;:SYS 4
9158:GOTO280
QH 330 IF Y=0 THEN PRINT"
{2 SPACES}CONTINUE?";:W
AIT 198,255:GET Y$:IF Y
```

```
$="Y"THEN270
EF 340 PRINT:PRINT" FINISHED A
T"INT(TI/6)/10 "SECONDS
":END
DD 350 TI$="000000":DS=1984:IF
PEEK(44)<>18 THEN GOSU
B 400
RC 360 DX=50432:NX=DX+1:MX=NX+
1:X=MX+1:T=X+80:CM=T+80
:C=CM+1:PC=C+80:P=PC+1:
R=P+80
DR 370 RETURN
RS 400 RESTORE:FOR I=0 TO-1 ST
EP-1:READ Y$:I=VAL(Y$)=
-1:NEXT:X= 49152:DATA -
1
HQ 410 READ Y:IF Y<>-2 THEN PO
KE X,Y:X=X+1:GOTO 410
KA 420 RETURN
HP 430 DATA{2 SPACES}24,144, 3
0, 76,{2 SPACES}9,192,
{SPACE}56
AQ 440 DATA 176, 24,165,122, 7
2,165,123
FC 450 DATA{2 SPACES}72,169,
{2 SPACES}2,133,123,169
,{2 SPACES}0
SH 460 DATA 133,122, 32,124,16
5,104,133
SE 470 DATA 123,104,133,122, 9
6,173,{2 SPACES}2
FK 480 DATA 197,141,{2 SPACES}
0,197,165,122, 72
XH 490 DATA 165,123, 72,176,
{2 SPACES}6, 32, 63
KR 500 DATA 192, 76, 56,192, 3
2,137,192
ER 510 DATA 104,133,123,104,13
3,122, 96
FB 520 DATA 174,244,197,142, 6
9,198,206
JD 530 DATA{2 SPACES}69,198,17
4, 69,198,188,245
KM 540 DATA 197,190,{2 SPACES}
3,197,189,164,197
JE 550 DATA 206, 69,198,174, 6
9,198, 48
PA 560 DATA{2 SPACES}15,188,24
5,197,153,192,
{2 SPACES}7
HF 570 DATA 153,255,{2 SPACES}
1,174, 69,198, 76
SC 580 DATA{2 SPACES}69,192,16
9,255,162,{2 SPACES}1,1
33
HB 590 DATA 122,134,123, 32,11
5,{2 SPACES}0, 32
RS 600 DATA 158,173,165, 97,24
0,{2 SPACES}3,162
HQ 610 DATA{3 SPACES}1, 96,165
,197,201, 62,208
JJ 620 DATA{3 SPACES}3,162,
{2 SPACES}0, 96,173,141
,{2 SPACES}2
HD 630 DATA 201,{2 SPACES}4,20
8, 17,169,{2 SPACES}5,1
60
```

```
DS 640 DATA 255,162,255,202,20
8,253,136
KC 650 DATA 208,248,170,202,13
8,208,241
XM 660 DATA 174,{2 SPACES}0,19
7,188,{2 SPACES}3,197,2
00
HQ 670 DATA 140,{2 SPACES}1,19
7,174,163,197,169
AD 680 DATA{3 SPACES}0,157, 83
,197,202, 16,250
JS 690 DATA 174,{2 SPACES}0,19
7,169,255,202, 48
AX 700 DATA{3 SPACES}9,188,
{2 SPACES}3,197,153, 83
,197
JM 710 DATA 202, 16,247,173,
{2 SPACES}1,197,205
HB 720 DATA 163,197,240,
{2 SPACES}2,176, 48,172
KQ 730 DATA{3 SPACES}1,197,185
, 83,197,208, 12
RP 740 DATA 174,{2 SPACES}0,19
7,173,{2 SPACES}1,197,1
57
QQ 750 DATA{3 SPACES}3,197, 76
,235,192,238,{2 SPACES}
1
RX 760 DATA 197, 76,199,192,17
3,{2 SPACES}0,197
QF 770 DATA 205,{2 SPACES}2,19
7,208,{2 SPACES}3, 76,
{SPACE}63
RF 780 DATA 192,238,{2 SPACES}
0,197,169,{2 SPACES}0,1
41
HM 790 DATA{3 SPACES}1,197, 76
,171,192,206,{2 SPACES}
0
EM 800 DATA 197, 16,155,162,25
5, 96
XK 810 DATA -2
```

David Pankhurst, the author of the Calc II spreadsheet, lives in Montreal, Quebec, Canada.

FLASHER 64

By Henry Sopko

Focus attention to where you want it on-screen with Flasher 64. You can make words or graphic characters flash, scroll the screen while they flash, and have as many characters flashing as you want.

Flasher 64 is a short machine language program. To enter it, use MLX, our machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts, respond with the following addresses.

Starting address: CC00
Ending address: CDF7

PROGRAMS

Be sure to save a copy of the program before you exit MLX.

With just two commands, you can make a word or a graphic character flash anywhere on the screen. As with the 128 in 80 columns, you can use the command CHR\$(15) to turn on the flashing and use CHR\$(143) to turn it off. All characters can be made to flash with the exception of characters 254 and 255. These two characters are used in a special way in the program. However, they can be used in the non-flashing mode.

You can also use your own custom characters as long as the screen memory stays at \$0400 (default). Flasher 64 commands can be entered in both direct and program modes. Since Flasher runs in the background using the IRQ routine, your BASIC or machine language programs will continue to execute as normal without slowing down.

How It Works

A second screen was necessary to accomplish this flashing technique. The second screen, located at \$C800, is filled with the byte value of \$FF. Then, when the command CHR\$(15) is used, the character(s) are redirected to the second screen. The command CHR\$(143) or a carriage return will cancel the printing of the character(s) to the second screen and resume printing them to the main screen. While this is happening, the IRQ routine is scanning for characters on the second screen. Any character other than 255 will be printed to the main screen located at \$0400 (1024).

Two phases are required to make characters flash. The first phase puts the characters on the screen, while the second fills them with blank spaces giving the effect of flashing characters.

Also, it was necessary to copy the BASIC ROM and the Kernal ROM to the underlying RAM to support the scrolling of the flashing characters. A few changes were made to the Kernal so that the two screens would be in sync with each other when the screen is scrolled.

To use Flasher 64 in your program, you must first execute the program with SYS 52224. Do this only at the beginning of your program. After you have issued this SYS command, use

the commands CHR\$(15) and CHR\$(143) to turn on and off the flashing sequence.

For example, after you've entered the SYS command, enter the following line in immediate mode.

```
PRINTCHR$(15)"FLASH ON"CHR$(143)
"FLASH OFF"
```

It's also possible to turn off all or just part of a flashing word. Simply send the character 255 to the second screen in the area that you wish to have the flashing stopped. In order to send the character 255, you must first use the PRINTCHR\$(15) and then in quotes press the Ctrl-Rvs keys simultaneously. While you're still in quote mode, hold down the Commodore logo key along with the B key. This produces a character value of 255.

A Demonstration

For a demonstration of how these commands are used, enter the demo program and study its commands. The demo is written in BASIC. To help you avoid typing errors, enter it with The Automatic Proofreader. Again, see "Typing Aids." Since the demo loads and runs Flasher 64, make sure both programs are on the same disk. After you've studied the demo, you should easily be able to use Flasher 64 in your own programs.

Some cartridges may interfere with Flasher 64. To use the program with Super SnapShot v5, use the cartridge's >Q command to quit the wedge since Flasher 64 changes the IBSOUT vectors to point to its own routine. This problem occurs only in the direct mode.

FLASHER 64

```
CC00:20 B6 CD A2 75 86 01 20 23
CC08:96 CC A9 20 78 A2 C6 A0 D3
CC10:CC 8E 14 03 8C 15 03 58 7D
CC18:A2 00 86 92 A2 26 A0 CC B8
CC20:8E 26 03 8C 27 03 8E 94 AA
CC28:CC AE 95 CC F0 06 20 7B AE
CC30:CC 20 60 CC C9 93 F0 22 B1
CC38:C9 0F D0 03 20 60 CC C9 AA
CC40:8F D0 03 20 7B CC C9 0D E7
CC48:D0 0A AE 88 02 E0 08 90 5F
CC50:03 20 7B CC AE 94 CC 4C 5D
CC58:CA F1 20 96 CC 4C 38 CC 16
CC60:8D 91 CC A5 D2 8D 92 CC D7
CC68:18 69 C4 85 D2 A9 C8 8D B5
CC70:88 02 A9 01 8D 95 CC AD 1E
CC78:91 CC 60 8D 91 CC AD 92 A0
```

```
CC80:CC 85 D2 A9 04 8D 88 02 40
CC88:A9 00 8D 95 CC AD 91 CC 0F
CC90:60 00 00 00 00 00 8E 91 09
CC98:CC 8C 92 CC A2 00 A9 FF 43
CCA0:A2 00 A0 C8 86 FB 84 FC 56
CCA8:A0 00 91 FB C8 C0 00 D0 9E
CCB0:F9 E8 E0 04 F0 05 E6 FC 44
CCB8:4C AA CC A9 FE 8D E8 CB 23
CCC0:A9 93 AE 91 CC 60 08 48 43
CCC8:8A 48 98 48 E6 02 A6 02 DF
CCD0:E0 14 F0 03 4C 21 CD A2 53
CCD8:00 86 02 A2 00 A0 C8 86 19
CCE0:FB 84 FC A2 00 A0 04 86 74
CCF0:FD 84 FE A0 00 B1 FB C9 15
CCF8:FE F0 28 C9 FF D0 08 C8 04
CD00:C0 00 F0 18 4C ED CC A6 EC
CD08:92 E0 01 F0 0A 91 FD C8 A7
CD08:C0 00 F0 08 4C ED CC A9 FF
CD10:20 4C 05 CD E6 FC E6 FE 44
CD18:4C ED CC A5 92 49 01 85 8A
CD20:92 68 A8 68 AA 68 28 4C 4E
CD28:31 EA A9 C8 A0 28 8D 46 DF
CD30:CD 8C 45 CD A9 C8 A0 00 0D
CD38:8D 4D CD 8C 4C CD A2 00 4F
CD40:A0 00 84 FE B9 00 00 C9 44
CD48:FE F0 28 99 00 00 C8 C0 90
CD50:28 D0 F1 18 AD 45 CD 69 7B
CD58:28 B0 25 8D 45 CD 18 AD F0
CD60:4C CD 69 28 B0 27 8D 4C CE
CD68:CD A0 00 A6 FE E6 FE E0 EF
CD70:1A D0 D1 A0 00 A9 FF 99 D1
CD78:C0 CB C8 C0 28 D0 F8 60 63
CD80:8D 45 CD EE 46 CD E6 FE 13
CD88:A0 00 4C 5E CD 8D 4C CD EE
CD90:EE 4D CD E6 FE A0 00 4C E5
CD98:44 CD 78 8E 91 CC A2 04 CA
CDA0:8E 88 02 AE 91 CC 4C C8 F1
CDA8:E9 8E 91 CC 20 2A CD AE CF
CDB0:91 CC 58 4C FF E9 A0 00 01
CDB8:84 02 A2 A0 84 FB 86 FC 93
CDC0:A2 00 B1 FB 91 FB C8 D0 82
CDC8:F9 E8 E0 20 F0 05 E6 FC 20
CDD0:4C C2 CD E6 02 A5 02 C9 DF
CDD8:02 F0 07 A2 E0 86 FC 4C 24
CDE0:C0 CD A2 9A A0 CD 8E 0F B6
CDE8:E9 8C 10 E9 A2 A9 A0 CD 08
CDF0:8E 14 E9 8C 15 E9 60 00 EF
```

FLASHER DEMO

```
HG 5 REM COPYRIGHT 1993 - COMP
UTE PUBLICATIONS - ALL RI
GHTS RESERVED
DR 10 REM FLASHER 64 DEMO
KG 20 POKE53280,0:POKE53281,0
KQ 30 IFL=0THENL=1:LOAD"FLASHE
R 64.ML",8,1
DE 40 SYS52224:REM TURN ON FLA
SHER 64
EH 50 :
CD 60 PRINTCHR$(147);:REM CLEA
RS SCREENS
AH 70 PRINT"{11 SPACES}{RVS}
{YEL}DEMO OF FLASHER 64"
FM 80 PRINT
KC 90 PRINT"{WHT}USE THE COMMA
ND: {RED}PRINTCHR$(15)
{2 SPACES}TO TURN ON FLA
SHING"
KR 100 PRINT"{RVS}{CYN}EG:
```

```

{OFF}{2 SPACES}PRINTCHR
$(15)"CHR$(34)"FLASHER
{SPACE}NOW ON"CHR$(34)
PR 110 PRINTCHR$(15)"FLASHER N
OW ON":REM COMMAND TO T
URN ON FLASHING
KE 120 FORD=1TO6000:NEXT
QA 130 PRINT:PRINT"{WHT}USE TH
E COMMAND: {RED}PRINTC
HR$(143){2 SPACES}TO TUR
N OFF FLASHING."
DH 140 PRINT"{RVS}{CYN}EG:
{OFF}{2 SPACES}PRINTCHR
$(15)"CHR$(34)"FLASH ON
"CHR$(34)"CHR$(143)"CHR
$(34);
BS 150 PRINT" FLASH OFF"CHR$(3
4)"
EF 160 PRINTCHR$(15)"FLASH ON"
CHR$(143)" FLASH OFF"
KS 170 FORD=1TO6000:NEXT:REM D
ELAY LOOP
KB 180 PRINT:PRINT"{WHT}USE TH
E COMMAND: {RED}PRINTC
HR$(15)"CHR$(34)"{RVS}
{7 B}"CHR$(34);
AP 190 PRINT"TO TURN OFF A FLA
SHING WORD."
CP 200 PRINT:PRINT"{RVS}{CYN}E
G:{OFF}{2 SPACES}PRINTC
HR$(15)"CHR$(34)"FLASH
{SPACE}ON"CHR$(34):PRIN
T
RB 210 PRINTCHR$(15)"FLASH ON"
CS 220 FORD=1TO3000:NEXT:REM D
ELAY LOOP
CM 230 PRINT:PRINT"{CYN}{RVS}E
G:{OFF}{2 SPACES}PRINTC
HR$(15)"CHR$(34)"{RVS}
{7 B}"CHR$(34);
KJ 240 PRINT"TO TURN OFF A FLA
SHING WORD."
CE 250 REM IFPEEK(146)<>1THEN1
40:PEEK THIS LOCATION F
OR ON OR OFF CYCLE
EK 260 REM IF PEEK(146)=1 THEN
CHARACTERS ARE ON SCRE
EN
EK 270 REM IF PEEK(146)=0 THEN
CHARACTERS ARE OFF SCR
EEN
BD 280 :
CG 290 IFPEEK(146)<>1THEN250:R
EM ↑
BE 300 PRINT"{4 UP}";:REM MOVE
UP TO WORD
MH 310 PRINTCHR$(15)"{RVS}
{8 B}"
MK 320 FORD=1TO6000:NEXT:REM D
ELAY LOOP
QX 330 PRINT:PRINT:PRINT
CG 340 PRINT"SCROLL FLASHING C
HARACTERS OFF SCREEN"
HK 350 FORX=1TO24:FORD=1TO25:N
EXTD:PRINT:NEXTX
GF 360 PRINT"{WHT}*****
CHR$(15)" {PUR}{RVS}THA

```

```

TS ALL FOLKS!{OFF} "CHR
$(143)"{WHT}*****
{CYN}"

```

Henry Sopko lives in Hamilton, Ontario, Canada.

TYPE-SIM

By Donald G. Klich

This program was designed to let you use your 64 or 128 as a typewriter for filling in the blanks on preprinted forms, addressing envelopes, typing labels, and other such tasks. Preprinted forms are usually designed with vertical spacing of six lines to the inch, the same as most printers. Therefore Type-Sim allows you to set your printer on the first entry line and move down the form as necessary. With Type-Sim you can set a left or right margin to orient your entries.

Typing It In

The program is written in BASIC 2.0 and will run on either the 64 or 128. Use The Automatic Proofreader to avoid typing errors. See "Typing Aids" elsewhere in this section. Be sure to save your program before using it. To take advantage of Type-Sim's upper- and lowercase printing, be sure your printer is in the ASCII conversion mode or an equivalent mode.

Operation Menu

When you run Type-Sim, you'll see a menu that offers four data-entry operations (options) and an exit option. Option 1 allows you to set up a form in the printer so that your text will print in the desired location. You must first supply a column position, perhaps along the edge of the form, where you can test-print an X. When the X prints, the computer sends a backspace and a reverse linefeed. You should adjust the form to make sure the printing is in the desired location. You can repeat the option by pressing the space bar. When the form is correctly positioned, press Return to go back to the menu.

Option 2 allows you to select whether the following entries will be left (L) or right (R) justified. For instance, a business address would be left oriented while entries on an income tax form would be right oriented. See the next option for setting margin settings.

Option 3 is where you enter your text. Before you start, however, you must indicate the left or right margin setting from which your entries will print. The program will pack data to the right of a left margin or immediately to the left of a right margin.

After you've entered the margin setting for this particular entry and pressed Return, you'll be prompted to enter the phrase or line of text to be printed. Press Return to print. If you need linefeeds to move the print head, you'll have that option after you print each entry. To return to the menu, press the up-arrow (↑) key.

Option 4 permits you to select any additional linefeeds you may require to move down the form.

Option 5 exits the program.

TYPE-SIM

```

HH 10 REM COPYRIGHT 1993 COMPU
TE PUBLICATIONS INTL LTD
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GS 20 REM TYPEWRITER SIMULATOR
GB 30 POKE53281,0:POKE53280,0:
OPEN1,4:PRINT"{CLR}"SPC(
8)"{2 DOWN}{BLU}UCCCCC
CCCCCCCCCCCCCI"
XH 40 PRINT"{BLU}{8 SPACES}B
{1}TYPEWRITER SIMULATOR
{BLU}B":PRINTSPC(8)"JCCC
CCCCCCCCCCCCCCCCCK"
AK 50 PRINT"{DOWN}{CYN}
{10 SPACES}MENU OF OPERA
TIONS:"
AF 60 PRINT"{DOWN}{7 SPACES}
{RVS}{YEL}1{OFF}{WHT} SE
T UP FORM IN PRINTER"
RB 70 PRINT"{7 SPACES}{RVS}
{YEL}2{OFF}{WHT} SET UP
{SPACE}L-R POINTER"
DA 80 PRINT"{7 SPACES}{RVS}
{YEL}3{OFF}{WHT} INPUT T
YPING ROUTINE"
RR 90 PRINT"{7 SPACES}{RVS}
{YEL}4{OFF}{WHT} EXTRA L
INE FEEDS"
JH 100 PRINT"{7 SPACES}{RVS}
{YEL}5{OFF}{WHT} QUIT P
ROGRAM"
FP 110 GOSUB440:ONVAL(A$)GOTO1
20,190,250,410,430:GOTO
110
SA 120 PRINT"{3 DOWN}{GRN}TO A
LIGN THE FORM, ENTER TH
E HORIZONTAL"
BX 130 PRINT"COLUMN WHERE A RE
PEATED {1}X{GRN} CAN BE
PRINTED"
SC 140 PRINT"{DOWN}USE SPACE T
O REPEAT THE {1}X{GRN}
{SPACE}AND RETURN TO EX

```

PROGRAMS

```

IT";
FD 150 PRINT"{2 SPACES}ENTER
{SPACE}COLUMN NUMBER:";
:INPUTN
PR 160 PRINT#1,SPC(N)"X":PRINT
#1,CHR$(27);CHR$(106);C
HR$(0):PRINT#1,CHR$(27)
;"@";
EH 170 GOSUB440:IFAS=CHR$(32)T
HEN160
CX 180 IFAS=CHR$(13)THEN50
FG 190 PRINT"{2 DOWN}{GRN}ENTE
R AN {YEL}L{GRN} IF YOU
ARE PLANNING TO"
QK 200 PRINT"ORIENT YOUR ENTRI
ES TO THE LEFT":PRINT
HK 210 PRINT"ENTER AN {YEL}R
{GRN} IF YOU ARE PLANNI
NG TO"
FG 220 PRINT"ORIENT YPUR ENTRI
ES TO THE RIGHT":PRINT"
L/R?{2 SPACES}";:GOSUB4
40:MS=AS
CQ 230 PRINTMS:IFMS<>"L"ANDMS<
>"R"THEN190
GD 240 GOTO50
PA 250 PRINTCHR$(14)
GP 260 IFMS<>"L"ANDMS<>"R"THEN
PRINT"{2 DOWN}{1}
{4 SPACES}L OR R LOCATO
R ?":PRINTCHR$(142):GOT
O190
FR 270 PRINT"{CLR}{GRN}
{2 DOWN}{5 SPACES}ENTER
AN UP ARROW {{YEL}↑
{GRN}) TO QUIT"
EK 280 LOS="LEFT":IFMS="R"THEN
LOS="RIGHT"
SA 290 AS="":PRINT"{GRN} ENTER
THE PRINT POSITION FOR
YOUR ";LOS;:INPUT" MAR
GIN";AS
DS 300 IFAS=CHR$(94)THENPRINT"
{CLR}CHR$(142):GOTO50
QG 310 IFVAL(AS)>80ORA$=""THEN
250
PM 320 P=VAL(AS):AS="":PRINT"
{5 SPACES}ENTER PHRASE
{SPACE}TO BE PRINTED
{WHT}":INPUTAS
HQ 330 IFAS=CHR$(94)THENPRINT"
{CLR}CHR$(142):GOTO50
XK 340 IFMS="L"THENN=P:IFN+LEN
(AS)>80THENPRINT"NO
{SHIFT-SPACE}ROOM
{SHIFT-SPACE}TO
{SHIFT-SPACE}PRINT":GOT
O290
DM 350 IFMS="R"THENN=P-LEN(AS)
+1:IFN<0THENPRINT"NO
{SHIFT-SPACE}ROOM
{SHIFT-SPACE}TO
{SHIFT-SPACE}PRINT":GOT
O290
PR 360 PRINT#1,SPC(N);AS:PRINT
#1,CHR$(27);CHR$(106);C
HR$(0):PRINT#1,CHR$(27)

```

```

;"@";
HX 370 PRINT"{GRN}{5 SPACES}LI
NE FEED? Y/N{3 SPACES}"
;:GOSUB440:PRINTAS
DJ 380 IFAS=CHR$(94)THENPRINT"
{CLR}CHR$(142):GOTO50
DF 390 IFAS="Y"THENPRINT#1,"":
GOTO250
HQ 400 GOTO250
PD 410 PRINT"{GRN}{2 DOWN}
{5 SPACES}ENTER NUMBER
{SPACE}OF LINE FEEDS";:
INPUTAS:IFVAL(AS)=0THEN
50
FC 420 FORI=1TOVAL(AS):PRINT#1
:NEXT:GOTO50
SM 430 CLOSE1:END
RJ 440 AS="":GETAS:IFAS=""THEN
440
FC 450 RETURN

```

Donald Klich is a frequent contributor. His most recent program, *CrossRef 128*, appeared in the May 1993 issue. He lives in Mount Prospect, Illinois. □

TYPING AIDS

MLX, our machine language entry program for the 64 and 128, and The Automatic Proofreader are utilities that help you type in Gazette programs without making mistakes. To make room for more programs, we no longer include these labor-saving utilities in every issue, but they can be found on each Gazette Disk and are printed in all issues of *Gazette* through June 1990.

If you don't have access to a back issue or to one of our disks, write to us, and we'll send you free printed copies of both of these handy programs for you to type in. We'll also include instructions on how to type in Gazette programs. Please enclose a self-addressed, stamped envelope. Send a self-addressed disk mailer with appropriate postage to receive these programs on disk.

Write to Typing Aids, COMPUTE's Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

ONLY ON DISK

In addition to the type-in programs found in each issue of the magazine, Gazette Disk offers bonus programs. Here's a special program that you'll find only on this month's disk.

Mergee

By Robert Quinn
Koorngall, Waga Waga
NSW, Australia

This month's bonus program is a tough, thinking-person's game for the 64 that can be played from the keyboard or joystick. The game begins with a playing field that's filled with single-digit numbers, random boxes, squares, and open spaces. The object of Mergee is to move the numbers around so that they merge with other numbers and disappear from play. Only like digits can merge, however, and when all of the numbers are gone, the game is over. The rules are simple, but there are a few surprises waiting for you that'll make Mergee almost as frustrating to play as it is entertaining.

Public Domain Programs

Don't forget that Gazette Disk now contains the best of public domain programs and shareware. For a complete rundown of the programs on this disk, see Steve Vander Ark's "Share This" column, which makes its debut in this issue of *Gazette*.

You can have these programs and all of the type-in programs found in this issue—ready to load and run—by ordering the July Gazette Disk. The price is \$9.95 plus \$2.00 shipping and handling. Send your order to Gazette Disk, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. You can order by credit card by calling (919) 275-9809, extension 283.