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December 1988

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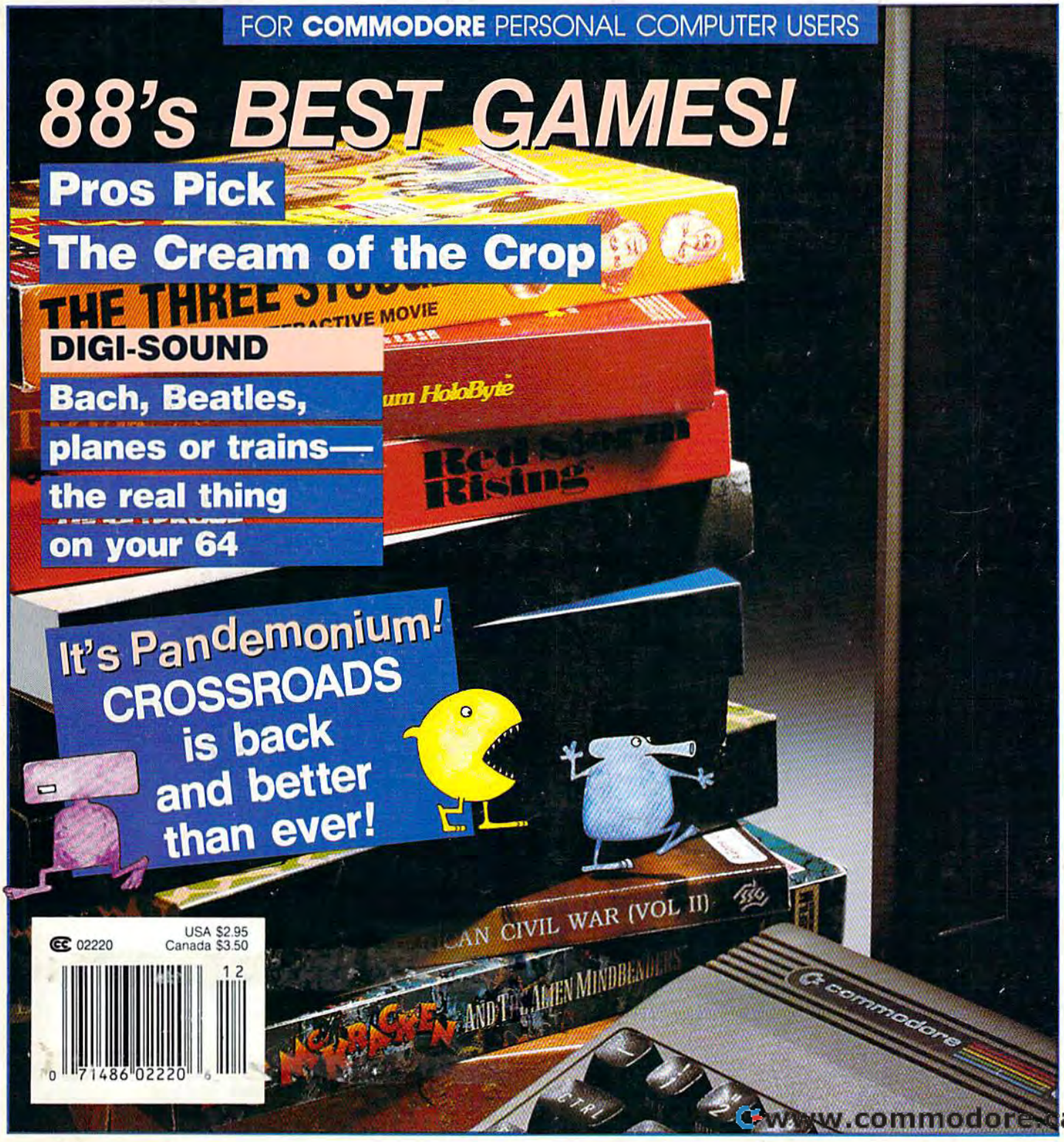

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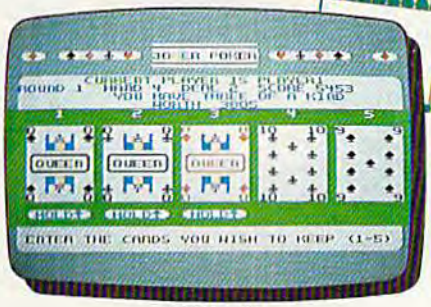

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4. Limit five entries per family or household. Five free entry forms and full contest rules are included with "Aussie Joker Poker" or may be obtained by sending a stamped self-addressed envelope larger than 5½" × 7½" with a hand written request to: Aussie Joker Poker Contest Entry Forms, P.O. Box 22381, Gilroy, CA 95021-2381. Mail-in requests limited to one per name, household or family and must be received no later than 3/31/89. WA & VT residents need not include return postage. Full rules also available from participating Mindscape retailers.
5. Monthly entries must be received no later than the last day of the month in which a drawing will take place in order to participate in the month's drawing. Drawings will be held from December, 1988 through April 1989, inclusive. Final entries must be received by 4/30/89.
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*=General, **64**=Commodore 64, **+4**=Plus/4, **16**=Commodore 16, **128**=Commodore 128

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editor's notes

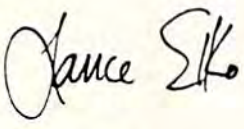
In our final issue of the year, there are a number of items worth noting. First, if you like games—are there any 64 owners who don't?—check out our cover feature, "88's Best Games," on page 10. We solicited individual secret ballots from *GAZETTE* staff members and our regular out-of-house reviewers for the best Commodore 64 games of the year. The resulting compilation listed dozens of games. We selected the titles with the most mentions and came up with our collective vote for the best games of 1988.

Speaking of games, we have "Crossroads II: Pandemonium" in this issue (page 38). Steve Harter has written an excellent sequel that improves on what is already a very popular game ("Crossroads," December 1987) with readers as well as our staff. As a further enhancement to the latest version, contributing editor Randy Thompson developed a clever maze editor. We're sure you'll like the whole package.

Also in this issue is the list of winners from the GEOS Programming Contest sponsored by Berkeley Softworks and *GAZETTE*. Some of the programs we reviewed were outstanding, and Berkeley has plans to publish the best of these on a shareware disk and through Q-Link. For details, see page 58.

Last December, we published the "*GAZETTE* Readership Survey," and we were surprised at the tremendous response. Your feedback helped us to shape the magazine into a product that serves you better. On page 24, we have the 1988 version of that questionnaire, and we'd greatly appreciate a few minutes of your time. Let us know what you like about this magazine and what you don't. This is not a marketing survey or something we share with advertisers. It's an editorial survey designed solely to let you tell us what we're doing—right and wrong—for you, the reader. The results will again help us make a better product for you in the coming year.

At this writing, we're well under way on our January issue, and I can say that we'll be bringing you a solid 1989 debut. Until then, have a safe and happy holiday.



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letters to the editor

Send questions or comments to Letters to the Editor, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, NC 27403. We reserve the right to edit letters for clarity and length.*

Excel No More

The staff of Surfside sincerely thanks you for running the Excel 2001 disk drive review in the October issue. Scott Thomas should be congratulated for a job well done.

We're sorry we have to report on some unfortunate circumstances. Between the time the drive was submitted for review and the time the review was published, the manufacturer discontinued production of the Excel 2001. Our manufacturer was sued by Commodore and forced to discontinue production of the drives.

We don't know of any other 1571-compatible disk drives in production. As an alternative, Surfside will continue to sell and support the FSD-2 Excelerator Plus as the only 100-percent 1541-compatible drive available. The manufacturer of the FSD-2 has taken the necessary steps to keep Commodore from making any weighty moves.

We would like to extend the offer of our upgrade chip from Creative Micro Designs for all current owners of the Excel 2001. This upgrade chip increases the speed of the drive by 20 percent and is available for $19.95. Also, we will support the one-year warranty on all the Excel 2001s.

Eric Kloor
Surfside Components International
Soquel, CA

To the Rescue

You've done it again! I had printed out a file of documentation for a terminal program and thought, "I wish I could have printed that in condensed type and with three columns instead of a full page. It would have looked a lot better."

The following morning in the mail was a copy of the October issue with Rob Bixby's "Speed Columns" program. I usually wait for the disk to arrive, but once in a while I can't wait to try a new program and sit right down and type it in as I did this one. It works perfectly!

Keep up the good work! I still think *GAZETTE* is the best magazine supporting the 64, and I'll continue to support you in the best charter-subscriber tradition.

Paul L. Baker
Browns Valley, CA

Timing means a lot. Thanks for the kind remarks.

64s for a Worthy Cause

We have successfully applied VIC-20s to the training of Braille transcribers and currently have 12 donated machines being used in this manner.

Our certified transcribers (those who have passed a rigorous test designed by the Library of Congress) are now looking for help in obtaining Commodore 64 computers to use in preparing Braille. Just as a word processor helps a secretary, the Braille editing programs available enable a doubling of Braille output by these wonderful volunteers. The cost of the computers is still more than some transcribers can afford, however. If any readers have a spare 64 they wish to donate to a worthy cause and gain a deductible amount in the process, please have them contact us. We can also use disk drives, power supplies, and monitors. We'll put these to good use.

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A Topsy-Turvy World

Has *GAZETTE* turned your life upside down? The picture on page 55 of the October issue gives evidence that this is true!

Adam Kropelin
Jeffersonville, VT

Yes, Adam, we experimented with a new camera technique in which our photographer and assistant editor, Rhett Anderson, stands on his head and aims the lens at the screen. It didn't turn out badly for a first try, though, did it? Actually, you're right—the picture is upside down, and you were the first (including our staff) to notice.

CP/M Blues

I recently bought a 128. I've been told that there are vast amounts of CP/M software available. Why have I not seen your advertisers promoting CP/M software? If they have, I am having difficulty identifying what is for CP/M as opposed to 128/64 software.

Steve Aslan
Philippines

CP/M, a disk-based operating system that's older than the Commodore 64, is supported by a huge base of public domain software that has accumulated over the years. You don't see many ads for CP/M software in this magazine or other Commodore-specific publications for a couple of reasons. First, CP/M is an operating system that works on many machines—128 CP/M users are a very small portion of the CP/M market. (Also, the market perception is that only a small minority of 128 owners are active CP/M users.) Second, there is no great demand for CP/M software since so much of it is in the public domain.

We've published nearly a dozen articles on CP/M since 1986. Most recently, we ran a two-part series in the March and April 1988 issues: "Super CP/M Software for the 128," by Clifton Karnes. This series discusses in detail a variety of programs recommended by the author. Also, the July 1986 issue contains an article, "CP/M Public Domain Software," that provides names and addresses of contact groups and organizations. If you have back issues of GAZETTE *spanning the past two years, we suggest looking through them (including the "Feedback" column) for more information.*

128 Software Dearth

If you were a 128 owner, you'd wonder why you were taking *GAZETTE*. October's issue has just one program, and it's useless to me.

John Locke
Central Point, OR

We addressed this topic in the July issue of this column ("Call to 128 Programmers"), and we are still receiving far more quality submissions for the 64 than we do for the 128. So here's another summons to those of you who program the 128. We'd love to hear from you.

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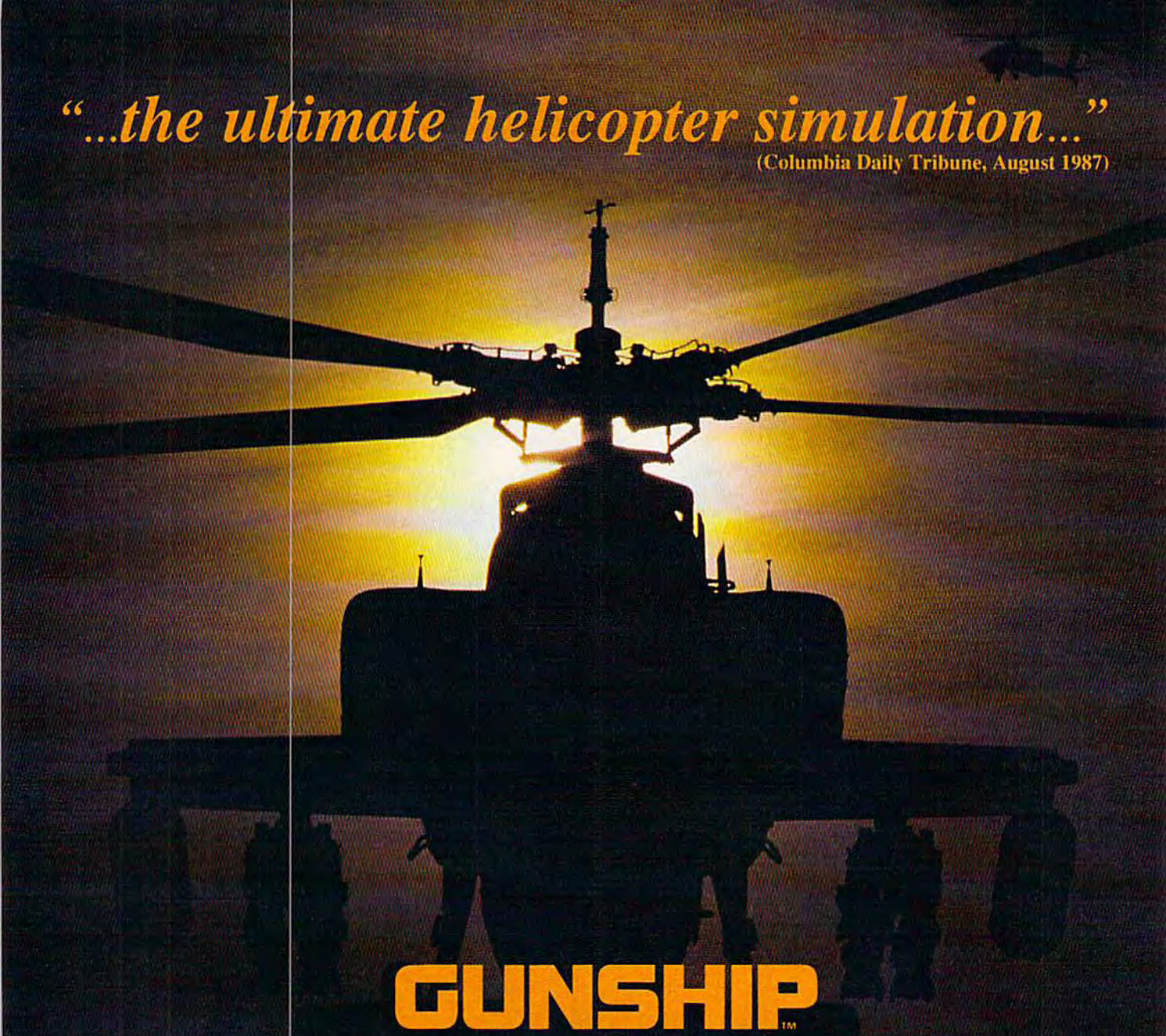
"...the ultimate helicopter simulation..."

(Columbia Daily Tribune, August 1987)



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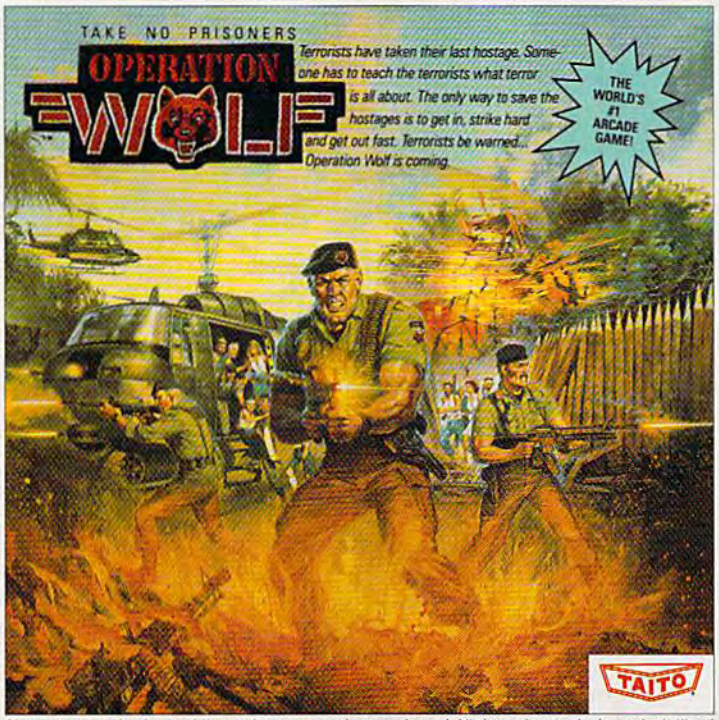

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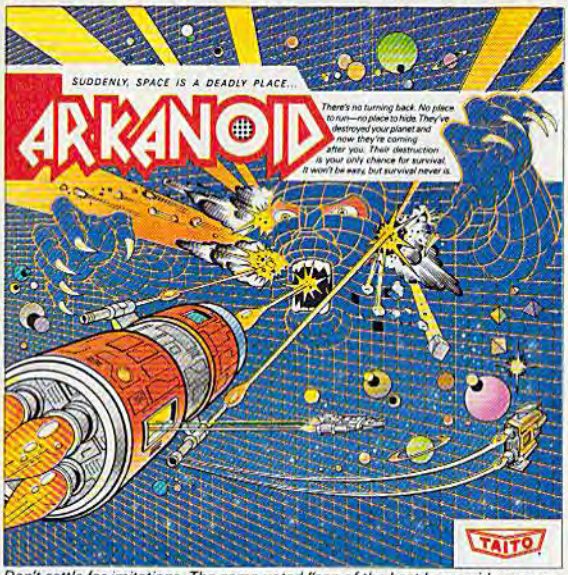

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88's BEST games

With all the great Commodore 64 games released in 1988, choosing the best was not easy. After due consideration, here are our picks for the best games of the year. If you've missed any of these, be sure to check them out—you'll be glad you did.

The Train

In a world filled with flight and sea simulations, it's nice to have one that runs on rails. Based on a film starring Burt Lancaster, *The Train* is one of 1988's richest entertainment packages. Arcade action, strategy, animation, and plenty of sound effects all go into making this a value-packed simulation that's not easy to master.

Tetris

Tetris is the first entertainment software from the Soviet Union to be marketed in the West, and it's been a tremendous success story in all machine formats. In *Tetris*, the player attempts to manipulate objects of various shapes and sizes as they fall so that they land in a solid pattern. Sound easy? It's not. Sound like fun? It is—and it's thoroughly addictive.

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Zak McKracken and the Alien Mindbenders

In the role of an ace reporter for *The National Inquisitor,* you're out to crack the story of a stupidity epidemic from outer space. *Zak* leans heavily on problem solving to propel characters through scenes. As you might expect in a product from Lucasfilm, the game includes many cinematic touches. Cut scenes break the action and show you what's happening elsewhere. Sight gags, one-liners, pratfalls, and a hilarious yet cunning story round out the package.

Red Storm Rising

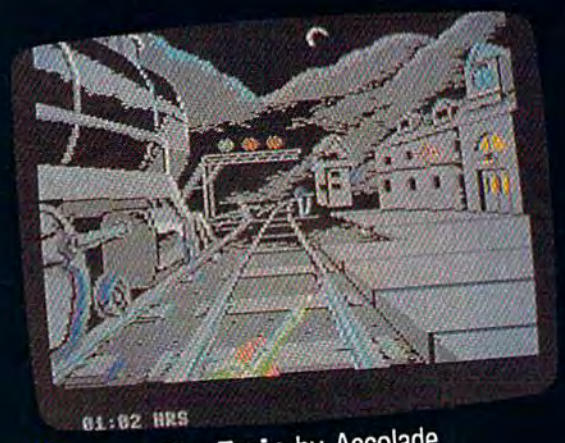
Based on Tom Clancy's best-selling novel, *Red Storm* raises submarine simulation to new heights. Players must monitor five types of radar and sonar, five classes of missiles, and three programmable torpedoes. The ocean itself becomes a character in this simulation as you use its characteristics to hide from the enemy and accomplish your mission.

L.A. Crackdown

A new direction for Epyx, this detective drama pits the player against ruthless, international drug dealers in a high-stakes sting operation. As a senior detective with the L.A.P.D., you must gather enough evidence to put away the drug kingpin for life. *Crackdown* is joystick-controlled for ease of operation and includes options for the advanced game player.

Decisive Battles of the American Civil War: Volume II—Gaines Mill to Chattanooga

This simulation presents five battles from the middle years of the Civil War. Adding to the realism are the sorts of problems generals on both sides faced on the battlefield. *Decisive Battles* recreates the conflict between North and South in remarkable detail, using an interface that simplifies and makes more realistic the command criteria. *Decisive Battles* reminds us that innovation remains possible in even the most familiar of formats.



The Train by Accolade

Tetris by Spectrum HoloByte

Zak McCracken by LucasFilm Games

Red Storm Rising by MicroProse

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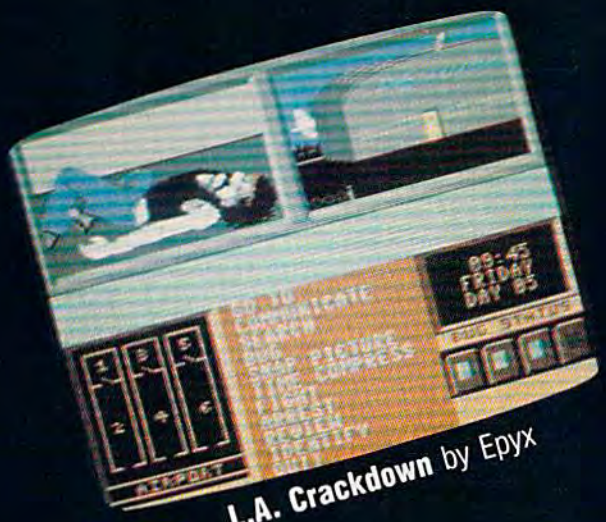

L.A. Crackdown by Epyx

Decisive Battles by SSG

The Three Stooges by Cinemaware

The Three Stooges

Not many attempts to transfer characters from cinema to software have succeeded. This one does. Cinemaware has taken the time and effort to make this game look, sound, and feel like a Three Stooges film. Digitized music, sound effects, and voices from actual movies the trio made for Columbia help add to the slapstick realism.

Publishers' Names and Addresses

Decisive Battles of the American Civil War: Volume II
Strategic Studies Group
Distributed by Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404

L.A. Crackdown
Epyx
600 Galveston Dr.
Redwood City, CA 94063

Red Storm Rising
MicroProse
180 Lakefront Dr.
Hunt Valley, MD 21030

Tetris
Spectrum HoloByte
2061 Challenger Dr.
Alameda, CA 94501

The Three Stooges
Cinemaware
4165 Thousand Oaks Blvd.
Westlake Village, CA 91362

The Train
Accolade
550 S. Winchester Blvd.
San Jose, CA 95128

Zak McKracken and the Alien Mindbenders
Lucasfilm Games
Distributed by Mediagenic
3885 Bohannon Dr.
Menlo Park, CA 94025

Contributors: Robert Bixby; Ervin Bobo; Lance Elko; Keith Ferrell; Steve Hedrick; David Hensley, Jr.; David and Robin Minnick; Tom Netsel; Neil Randall; and Troy Tucker.

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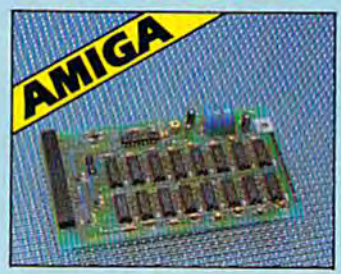

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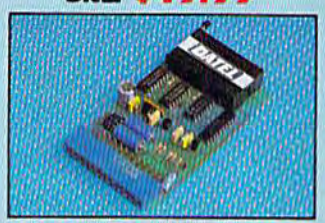

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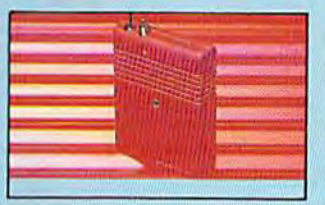

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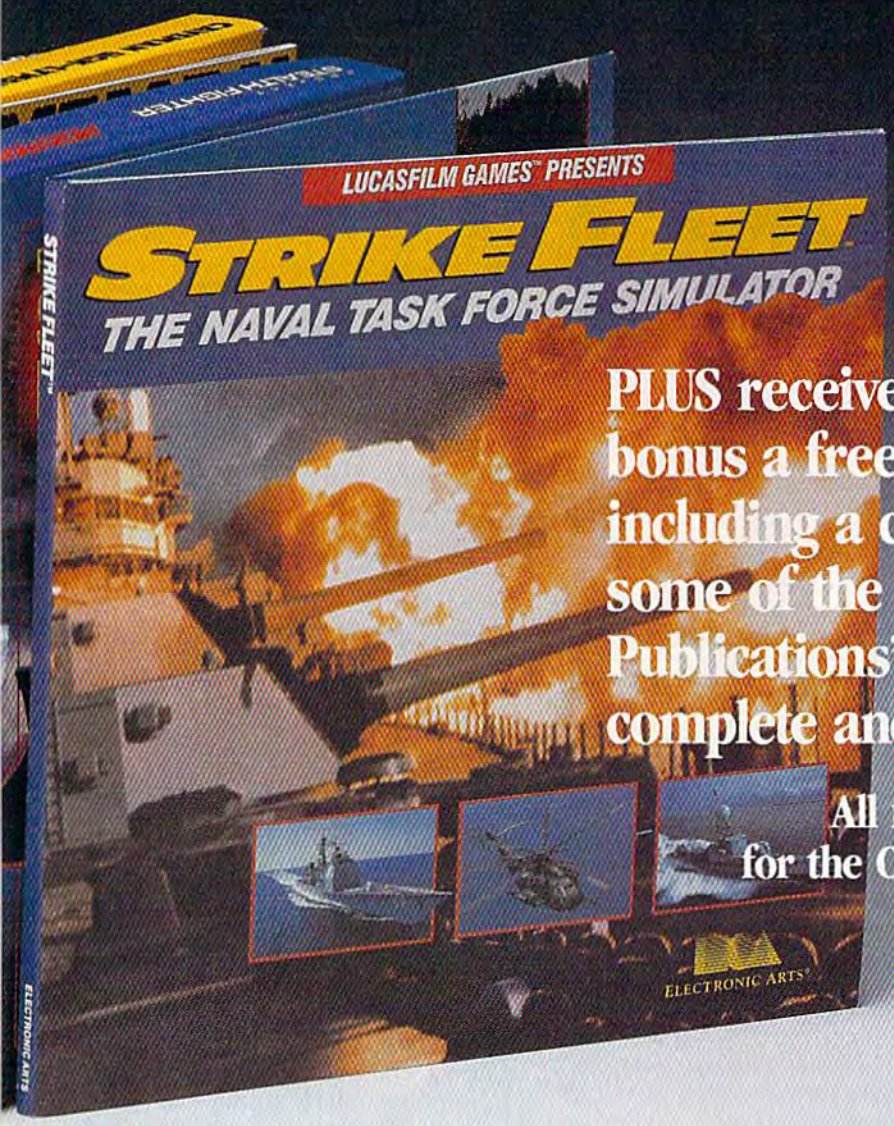

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Extravagance!

That's professional wrestling in a word and a punctuation mark. There's nothing subtle about the sport or its superstars. Half circus, half Circus Maximus, pro wrestling misses no opportunity to milk a drama from its trappings, and neither does the software it has inspired. We're talking tightened turnbuckles here, canvas stretched drum taut, perfect profiles and massive muscles oiled for best effect.

With one foot in show biz and one in athletics, wrestling was made for TV, and made, not incidentally, for the disk drive.

The matchup of software and suplexes—not to mention elbow drops, clotheslines, pile drivers, and body blocks—is currently fostering competition among several promoters. Mastertronic, Data East, Epyx, Mindscape, Gamestar, and MicroLeague Sports have all tossed their hats into the ring. Just as the WWF (World Wrestling Federation, or does your TV stay off on weekends?) and the NWA (National Wrestling Alliance) each has its own sense of style, the designers and publishers of wrestling software bring distinct approaches to this gaudiest of sports.

Tighten the ropes around your 64—wrestling has arrived on disk. It's not a sport for the faint of heart, as our intrepid sports reporter discovered during the legwork for this piece. Live, more or less, from ringside, a look at the world of professional wrestling, software style. . . .

The programs do have a few things in common. All use some sort of endurance meter to let players know how much strength

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they've got left. With one exception, wrestling software is joystick-intensive, with moves that demand split-second timing and solid eye-hand coordination.

Other than that, and a certain flair for the, shall we say, melodramatic, the games are distinctive. Here are the current top arenas for software wrestling.

Cage Match

Not every bout is for title stakes, nor is every arena Trump Plaza. Most wrestlers start their careers in backwaters; more than a few end there. One such lower-key coliseum can be found in Mastertronic's *Cage Match*. The milieu here is galactic—half a dozen of the cosmos's toughest wrestlers have been gathered for a test of their skills.

Their skills, as it turns out, are a bit limited. Colorful creatures of various species—including one human—slug it out in semislow motion, although one could attribute this to local gravitational conditions.

As a *Cage Match* wrestler, your goal is not to pin the opponent, but to stun him long enough for you to climb out of the cage. The winner moves on to the next bout; the loser is vaporized when the mat goes radioactive.

The game is accompanied by several other nonwrestling games, some of them quite good, on Mastertronic's *Megaplay* Volume 1.

Tag Team Wrestling

One-on-one wrestling may show the sport at its purest, but tag-team bouts boast their own attraction. In a four-man matchup, you can be dragged to the edge of your bleacher as your hero gets his stuffing knocked out; then rise, cheering as his partner surges to the rescue at the last minute. (More likely is the scenario where your hero is wrestling fair and square, and the opponent's partner blindsides him.)

Both aspects are nicely captured in Data East's *Tag Team Wrestling*. It's Ricky's Fighters vs. Strong & Bad—no alternate teams here.

Fortunately, both teams bring a lot of flair to the mat, with Ricky and his partner Ultramachine representing good, and Worly and Mascross being more masterful at the sport's darker aspects. The object is the classic one: Pin the other guy for a threecount.

Getting there, as they say, is half the fun. Wrestlers can dive out of the ring in search of weapons such as two-by-fours, chairs, and lead pipes. There are secret moves, as well as the more traditional drop kicks, neck hangings, back breakers, and body slams.

The game offers the chance to advance to World, and then to Super, Champion. But take it from me, it won't be easy.

Bop 'n Wrestle/Bop 'n Rumble

Wrestling is theater as much as it is sport. And where there is theater, there are prima donnas—the gorgeous wrestlers, the ones who spend as much time in front of the mirror as on the mat. Mindscape's *Bop 'n Wrestle* stars one of these. Gorgeous Greg is a blond hunk of vanity and destruction, coiffured and oiled for the cameras, not to mention his opponents.

There are fully eight of those opponents in this game, ranging from Bad Barney Trouble to Redneck McCoy to Angry Abdul. Each wrestler appears in character costume, with just enough exaggeration to capture the sort of hyperbole that has made real-world wrestling so popular.

Bop 'n Wrestle also packs a full array of high-energy moves—Airplane Spins, a Flying Body Press, the classic Atomic Drop, and the rarely seen but always agonizing Reverse Suplex. No pain, no gain.

The theatrical side of wrestling

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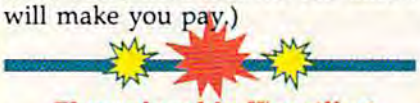
is nicely captured in *Bop 'n Wrestle*, as in most of these programs, but the social concerns voiced by the wrestlers rarely get their due. One place they do is in *Bop 'n Rumble*. Gorgeous Greg is on the streets this time, out to right wrongs, break a few bad guys' arms, and save some little old ladies from distress. The action is furious and hilarious, and Mindscape is serious when it advises you *not* to pick on the old ladies. (You will, though; everybody does. And, trust me, the old ladies will make you pay.)



Championship Wrestling

Nicely capturing many of the more deadly and deranged aspects of professional wrestling, Epyx's entry also offers the most challenging joystick commands. *Championship Wrestling* offers players their choice of eight separate wrestlers or offers 2–8 players the chance to put together their own cards.

Those cards can be pretty exciting, with wrestlers having not only the traditional arsenal of moves but also a custom move apiece. There's Purple Hays, master of the Ghetto Blaster, or Zeke Weasel, whose Stomp looks like it sounds, or Prince Vicious, known for the Vicious Circle which combines an airplane spin with an atomic drop for awesome destructive effect.

Animation is superb, and the joystick routines are sensible if complex. Some moves, in fact, require putting together a combination of joystick and fire-button moves, letting you build momentum for the big moment when you slam your opponent to the mat. Successfully executed moves earn points, with the computer keeping score. Because of the complexity, Epyx has wisely included a practice mode. Try it—you'll need it.

Don't let the sophisticated joystick routines scare you off. You can do quite well by just grabbing the stick, putting your thumb on the button, and wading in.

(For those preferring a touch of the exotic in the wrestling, don't miss the Sumo match in Epyx's *World Games*.)

Take Down

Look out, WWF, the GWF (Gamestar Wrestling Federation) is out to steal the spotlight.

And it just might succeed. Previewed in a beta version, Gamestar's *Take Down* proves that there's plenty of life left in Commodore animation, and every bit of that life has been put into the ring. Some of the moves in this game are so smoothly executed that you'd swear you were watching a cartoon.

You're not. This is down-and-dirty wrestling at its best. No scorekeeping, no points for good form. The object is to pin the opponent to the mat. The game's eight wrestlers include Mr. Cool, Sgt. Slam, Sea Dawg, and Ninja, each well characterized, each with his own set of four custom moves as well as the basics. Some of the custom moves include the Wrench Suplex, yet another variation on one of wrestling's grandest body breakers.

Take Down not only provides ample opportunity to hurt the other guy, you can also hurt yourself. The "big splash" leap from the ropes is a great way to flatten your opponent—unless you miss, in which case it's *your* energy meter that dwindles.

The meter will dwindle plenty without your help. The newest of the animated wrestling programs, this is also one of the fastest paced. Don't enter the ring until you're ready. And even then, be prepared for some of the fiercest competition currently available.

MicroLeague Wrestling

Wrestling is also a strategic event, an approach taken to good effect on MicroLeague Sports' distinctive disk. This product bears the official endorsement of the WWF and comes complete with the digitized images and moves of some of the Federation's greatest stars. Hulk Hogan himself is here, along with Paul "Mr. Wonderful" Orndorff, and Randy "Macho Man" Savage, accompanied, of course, by his manager, the beautiful Miss Elizabeth. Coloring the action is commentary from Vince McMahon, Jesse Ventura, and Bruno Sammartino.

MicroLeague gives you its wrestling straight (or at least as straight as pro wrestling itself) with details ranging from the stars' processional into the arena to recreations of the actual moves they pit against each other. Bouts are timed, letting you decide on their length. Will it be a 10- or 20-minute strength spree, or an hour-long grudge match, with each maneuver carefully planned?

This is one game that doesn't rely on eye-hand-joystick skills, meaning it's the one where I'm most evenly matched with my ten-year-old wrestling-fanatic son. Players must select moves from their wrestler's menu bar. Once both players—or one player and the computer—have made their choice, the results are announced. Can Randy Savage's Snap Mare succeed against the Hulkster's Head Smash? What's the likelihood of Hulk pulling off a clothesline in the face of Orndorff's Eye Rake? The computer plots the results, announces the winner, and then presents a series of digitized images and sound effects that show the move's several stages. There are moments when you'll be convinced you're at ringside.

And the drama will soon be enhanced. MicroLeague's original disk will soon be joined by an add-on disk bringing new wrestlers to the Commodore arena. Hacksaw Jim Duggan on disk—what more could any wrestling fan ask?

Stay tuned. Something tells me that wrestling—on disks and on the tube—is here to stay.

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"It wins my vote for *Adventure Game of the Year.*"
-William "Biff" Kritzen, *Computer Gaming World*

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Nothing could be worse than this god-forsaken, radioactive desert.

More Sniperdroids! All tracking me with them death glares. And them Uzis. They're weird trigger-twitchin' folks. I suspect it's them poisoning the water.

Or maybe it's those Leather Thugs. Heck, I don't know anymore. I heard they have a bunch of civilians cut off east of Ranger Center, which is where I'm headed. Hope not. They want me dead. Like every other mutant this side of Vegas.

The worst part is, I'm getting to be as bad as they are. You wouldn't believe some of the ways I've learned to kill. I hang out in sewers, and my best friend is a MAC 17 submachine gun.

Gramps talked about life before the nuclear war. All I know is I don't want others living this way. Gotta rebuild this desert right. Gotta make it so you can sleep with your eyes closed.

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Red Storm Rising

How realistic can a simulation be? That's a question software publishers have been asking for years, with MicroProse pursuing it perhaps more intensely than anyone else. The company's latest release comes close to providing an answer. With *Red Storm Rising*, it's produced not only a superb simulation against which similar products will be measured for some time to come, but also interactive entertainment that's very close to being a novel.

Modern submarine warfare is high-tech chess played for the very largest of stakes. Long gone are the days when the sub's skipper—a John Wayne or Cary Grant type—reversed his cap, pasted his eye to the 'scope, and barked firing orders.

Now, a submarine is a set of systems—defensive and offensive, all of them interrelated, many of them interdependent. Duels between submarines, or between subs and surface vessels, can take hours or days as each attempts to locate the other and gain the tactical advantage. Concentration is key—blips and instrument readings can locate and identify the enemy. Tracking and killing can take hours or days.

Red Storm Rising captures those tensions, fashioning them into the centerpiece of an interactive novel. Based on the best seller by Tom Clancy, the game uses the book's wide sweep as backdrop; focus is trained upon your submarine and its mission. Your mission, though, may determine the outcome of World War III.

It will take a while to learn enough to save the world. Aware of the complexity of the simulation, MicroProse has built in several training missions, as well as four difficulty levels ranging from Introductory to Ultimate. While the temptation is, doubtless, to begin with the full-campaign game, the results will quickly send you to one of the training missions, where your sub is invulnerable. There are two training missions—one pitting you against a Soviet sub, the other against an antisubmarine destroyer.

Training and battle simulations provide a good opportunity to sample *Red Storm*'s richness. You're offered a choice of playing in 1984, '88, '92, or '96, with technological advances altering the nature of play in each time period. Weapons, already "smart," become even smarter with passing years. The Soviet Northern Fleet—Red Banner—grows in size and capability.

During training you can also discover just how systems-oriented submarine warfare has become. Sonar is the heart of submarine sensors, and *Red Storm* reveals many of the varieties of sonar available today. Modern systems can identify the sound signature of other vessels—a far cry from the simple "pings" of submarine war movies—and provide vital information as battle looms. Additionally, there is radar and, of course, a periscope. (This is the modern world, though; the 'scope is laser-equipped.) While you listen for the noise of other craft, be sure you do everything you can to muffle your own sounds; the bad guys are listening, too.

Red Storm Rising *is a master achievement, perhaps the finest entertainment software of 1988.*

Once combat begins, you have the best modern weapons at your disposal. Depending upon how you've configured your boat, you can select from several types of torpedoes and missiles. Today's weapons are programmable, and some torpedoes run on wires which allow them to be steered. When you're facing an enemy sub, these abilities can spell the difference between success and disaster. For those who miss the old "fire and watch" days, MicroProse includes a feature called Action Track, which provides a beautifully animated view of your missiles homing in on enemy surface ships and aircraft.

With training runs mastered, the next step is a full battle simulation. These include one-on-one duels with other subs, with carrier task forces, or with groups of surface ships. Each engagement has its own characteristics,

demands its own strategy, and requires the right weapons.

Unfortunately, your opponents are quite intelligent as well. *Red Storm*'s manual makes the point that today's sub captains and crews are highly educated and superbly trained. The same goes for their counterparts on the other side. It's frightening—but salutary in the larger sense—to watch an enemy outmaneuver, outstrategize, and outthink you. This is especially true at the Ultimate level, where the enemy captains are simply uncanny. More than any solitaire simulation I know, *Red Storm* delivers the sensation of playing against another person.

The ocean itself is a character in the game. Its characteristics must be closely monitored: There are offensive and defensive advantages to be gained from various sea conditions and depths. Thermoclines, shadow zones, ducts, and convergence are only a few of the fascinating aquatic characteristics that affect your sonar readings. The ocean is your element, and you will be repaid for learning its nature.

You can and should train, but no matter how prepared you consider yourself, the full *Red Storm* scenario is likely to take you by surprise. For one thing, Soviet tactics differ from game to game; it is unlikely that you will encounter the same situations twice. For another, surprise was a key element in the novel, and it figures here as well.

The campaign game begins with a concise summary of Clancy's opening sequence. Soviet fuel supplies are destroyed by revolutionaries. In hopes of staving off economic collapse, the Soviets plan to seize Middle Eastern oil fields. First, though, NATO must be neutralized. Through subterfuge, the

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Soviets heighten tensions until hostilities break out, all the while making it appear that the West is at fault. This narrative information is delivered via self-contained, noninteractive scenes that dramatize Clancy's story.

While the training missions and battle simulations begin at sea, the campaign scenario requires that you navigate your sub from your home port of Holy Loch, Scotland, to your destination in northern waters. The Norwegian Sea is the crucial passage through which Soviet forces—both submarines and surface vessels—must pass in hopes of interdicting Allied convoys. It will be your battleground, the testing place for your skills.

Using accelerated time and satellite and reconnaissance information, you drive northward, constantly monitoring the latest data, but constantly aware that the data is already old. Judgment, analysis, and guesswork must come together as you take up your position. And positioning, in modern submarine combat, can be everything. Once you're in position, game time slows until it's only slightly accelerated; I've been engaged in cat-and-mouse duels that lasted the better part of an hour. (They'd have lasted longer were I a better submarine captain.)

As the campaign proceeds, you receive periodic updates on the progress of the war. A map reveals the degree to which Soviet efforts to penetrate NATO territory have been successful or the degree to which the Allies have held back the invaders—with the crucial assistance loaned by you and your sub. Total failure earns a grimly animated sequence showing the hammer and sickle being raised over Washington; success results in a change of leadership in Moscow. You can win medals and commendations if your performance warrants them.

A game this sophisticated can't be learned in an evening. In fact, you might wish to spend an evening or two reading *Red Storm*'s manual. MicroProse has long been known for the excellence of its documentation; this time, the company has surpassed itself. Thorough and literate, the manual is a clearly written and illustrated guide to modern submarine strategy and tactics, as well as a compendium of contemporary and projected ships, sensors, and weapons systems. There's also a fair amount of political observation and commentary scattered through the pages; nothing obtrusive—just a definite point of view. It's refreshing to encounter that sort of perspective, whether or not you agree with it. For all of its thoroughness, the manual could use a bibliography; a game such as this demands a commitment that additional reading could reinforce and enhance.

I returned to Tom Clancy's *Red Storm Rising* more than once as I played the game. (His *Hunt for Red October* is another good source for submarine tactics worth trying.) As I read, I was struck by how faithfully MicroProse captured the feel of Clancy's vision of World War II while also duplicating the sorts of situations his submarine warriors faced.

Red Storm Rising is, to my mind, the finest entertainment software of 1988, a high-water mark (as it were) in interactive development that will not be surpassed for some time to come.

—*Keith Ferrell*

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JORDAN VS BIRD ONE ON ONE

Sky Travel

I don't usually gush over software, but *Sky Travel* has caught my attention. It's a wonderful program, and I'm not even an astronomy buff.

With *Sky Travel* on your 64, you can view the heavens as seen from anywhere in the world on any date between 9999 B.C. and 9999 A.D. It's such a user-friendly program, you can operate it without the manual. Once you do open the 61-page manual, you'll find an excellent beginner's tour of *Sky Travel* and an introduction to astronomy as well.

Sky Travel has four basic modes of operation: Sky, Map, Set, and Chart. In Sky mode, you'll find yourself looking at the sky with a 72-degree field of view. This is just about what you'd see outside, looking at the night sky.

First set your latitude, longitude, and the time of evening. Then look to the north and see the North Star, Big Dipper, Little Dipper, and other stars and planets—assuming you live in the Northern Hemisphere. Now walk outside, and if it's a clear night, you'll see the same stars in the night sky!

It was cloudy the first few nights I looked, but on the fourth evening I could see a single star through the haze, straight overhead. Returning to my computer, I moved the crosshairs in an upward direction until *Sky Travel* reported I was "Looking Straight Overhead."

Sure enough, there was one extremely bright star in the center of the screen. I aligned the crosshairs and pressed the f7 (Inform) key. The disk drive whirred, and this message scrolled across the bottom of the screen: *Vega "falling bird," (alpha) Lyrae HD#172167 0 magnitude, spectral class A0 (var); double star, separation (seconds) = 63; 25 light years distance. Surrounded by infra-red emitting disk of dust and solid material. It may have a planetary system in the process of formation. Vega is the second brightest star in the sky and is approaching Earth at 20 miles per second.*

Sky mode displays additional information on the right of the screen. You'll find the date, time, and time zone, plus elevation, azimuth, right ascension, and declination. The manual describes all these terms in language that's easy to understand.

Several options can be toggled on or off in Sky mode. *Lines* toggles a set of lines connecting the constellation's stars, *names* toggles the constellations's abbreviated names, and *symbols* toggles the planetary symbols. With *deep-sky* switched on, the screen displays more distant objects in the universe, such as nebulae and galaxies.

After identifying Vega with the Sky mode, I turned on Track mode. This tracks the sun, moon, or any of the planets, keeping them in the center of the screen. I set the time for about 4:00 a.m. and found the moon below the horizon. *Sky Travel* allows you to stop the clock, run the clock in realtime, or move the clock forward or backward at up to 64 times normal speed.

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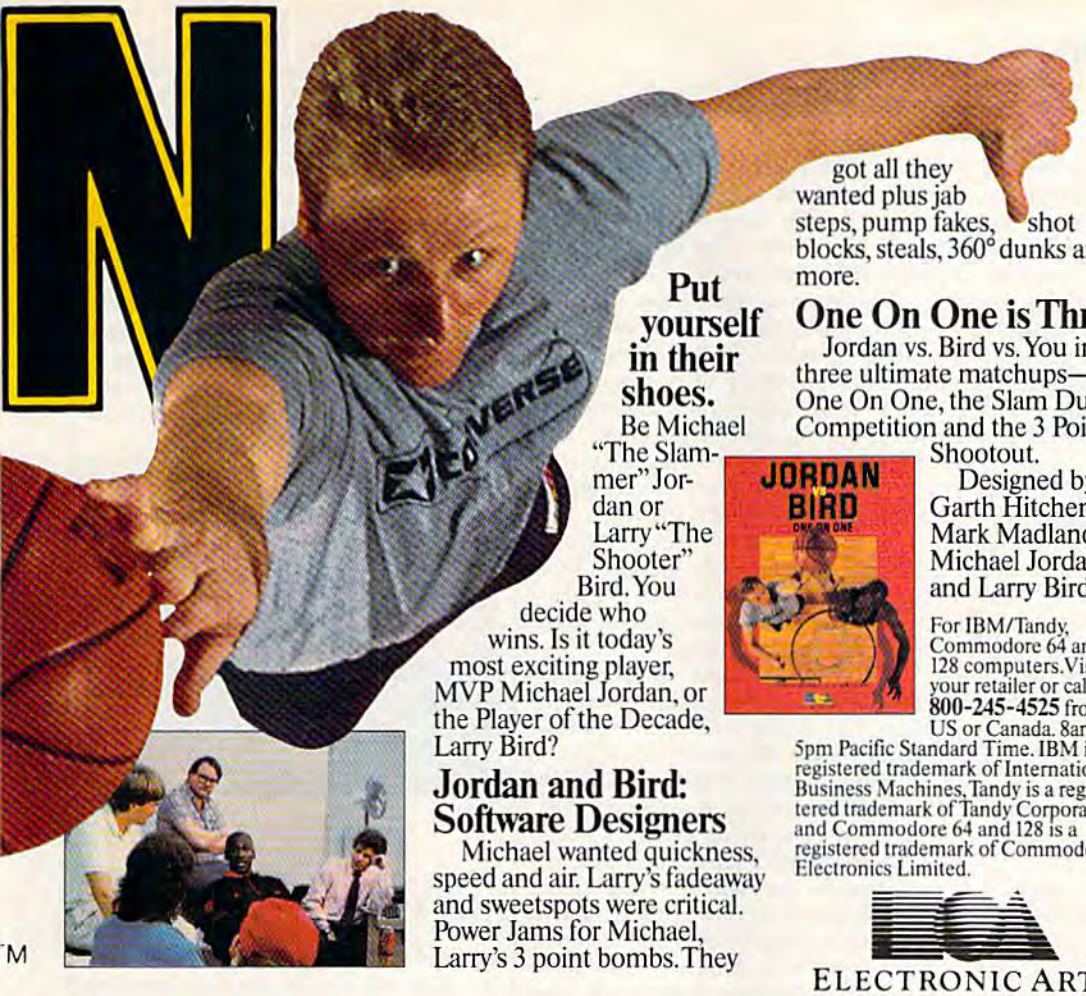

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to just one minute. Watching the moon rise, I was startled to see the background switch from black to light gray at 4:20 a.m., then purple at 4:43 a.m., blue at 5:05 a.m., and light blue at 5:32 a.m. This realistic touch came as a pleasant surprise, as I had hardly touched the manual at this point.

Using Set mode, you can adjust the month and year, making it possible to observe past or future events. The manual includes many examples, including solar and lunar eclipses and transits by Mercury and Venus.

You can view the heavens from anywhere on any date between 9999 b.c. and 9999 a.d.

You can also observe planetary occultations. The manual gives a detailed example of the occultation of Mars by the moon that was observed by Aristotle on May 4, 357 B.C.

Set mode also allows moving forward and backward in time over thousands of years. The Earth precesses, or wobbles slowly on its axis, over a period of about 23,000 years. Because of this precession, Polaris, the star we see at the end of the Little Dipper's handle, will not be the North Star in a few thousand years. *Sky Travel* calculates this precession and allows accurate viewing of the skies throughout many thousands of years. Take a look at Polaris's location in 7530 A.D.

Map mode shows a Mercator map of the Earth. By positioning the crosshairs, you can set *Sky Travel* to your approximate location, or you can use the Latitude and Longitude display on the right side of the screen for a more exact setting. To see the Southern Cross, set your location to anywhere in the Southern Hemisphere. You can even view the night sky as seen by a friend living in a distant location.

Chart mode sends a portion of the sky to your printer. I set the date ahead to the middle of my beach vacation and printed one chart looking straight overhead and another looking north, setting the time for midnight. *Sky Travel* printed the star maps sideways, using a full 8½ × 11 inch sheet. The printout included all the information shown on the right side of the screen. In addition to the stars and planets, *Sky Travel* also printed the date, time, elevation, and other relevant data. Chart mode uses the popular 1525/801 printer format—with my interface set accordingly, it printed successfully on my first attempt.

The manual suggests a Boy Scout merit badge counselor might be interested in one of the program's examples. I think the manual is too modest. After showing *Sky Travel* to my boss, an ex-pilot, he commented that the program would be a good training tool for celestial navigation. As the program's subtitle states, *Sky Travel* is an all-encompassing astronomy program. Whether you're just curious about the heavens or you'd like to navigate by the stars, you'll find *Sky Travel* a rewarding experience.

—*Russ Fisher*

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Zak McKracken and the Alien Mindbenders

I know people are laughing at me. It's these stupid nose glasses I'm wearing. You know, those fake glasses with a big nose, bushy eyebrows, and a mustache. On top of that, my mother's mad because I haven't called, but I'm not taking any chances—I'm not going to touch a telephone, and I'm going to keep wearing these stupid nose glasses until I solve the riddle behind *Zak McKracken and the Alien Mindbenders*. A fellow can't be too careful.

But I'm getting ahead of the story. Let me start at the beginning.

As a hotshot reporter for *The National Inquisitor*, the sleaziest tabloid to grace a supermarket checkout line, Zak McKracken is assigned to investigate a rampaging two-headed squirrel that's terrifying campers near Seattle. Zak is tired of dreaming up yarns about vegetarian vampires and carnivorous cantaloupes, but he agrees to do this one last story before he writes his novel.

Since Zak's going to be in the area anyway, his boss wants him to check out the 50th anniversary of the 1947 UFO sightings near Mount Rainier.

Zak reluctantly agrees, picks up an airline ticket to Seattle, and returns to his apartment. Later that night he has a strange dream about a giant face on the surface of Mars, a map of the Earth, a sinister-looking alien, an attractive brunette, and a pair of ominous nose glasses.

Zak's dream is also a convenient place to run the credits for this zany adventure by Lucasfilm Games. That's the same group who dreamed up *Maniac Mansion*. Make sure you keep one eye on the dream while reading the credits or you'll miss several important clues to the game.

Speaking of clues, check out the complimentary copy of *The National Inquisitor* that's included with the software. It's packed with great stories such as the one about the fellow who used a dime to free himself from his wrecked Toyota. Good taste prevents me from revealing what part a wet rat played in his survival, but there are plenty of other tantalizing tidbits. Read about a mechanic who turned a VW bus into a space shuttle. Dissolving parachutes, singing dolphins, Egyptian practical jokers, and a wondrous zip-open tummy diet are just a few of the journalistic jewels found in Zak's tabloid.

The top story, however, is the stupidity epidemic that's plaguing the world. It's been linked to a group of aliens who are running the telephone company, according to the *Inquisitor*. These noseless fiends have connected a stupidity machine to the phone system, and its 60-cycle hum is turning everyone's brains to mashed potatoes. It won't take you long to discover that saving the world from this nefarious plot is Zak's true mission.

You have to guide Zak and his friends, Annie, Melissa, and Leslie, to a number of exotic locales where they must solve a variety of puzzles. They have to piece together fragments of an ancient puzzle, unmask the aliens, and turn off the insidious stupidity machine. Zak needs the help of his friends, but he has to find them first.

If using a team of characters to solve the game's puzzle sounds a little like *Maniac Mansion*, it's no accident. This animated adventure uses the same format and user interface.

When characters speak, their words appear at the top of the screen. Below that is the animation window. This is where the action takes place, and it fills up most of the screen. Below that is a sentence line and a list of verbs. Instead of your trying to guess which words the game's parser understands, your choices are listed on the screen. Click on the verb you want; then move the joystick to an object on the screen or to the items in a character's inventory and click the fire button again. The program automatically builds a sentence. Click once more and the character carries out the directions.

I'm going to keep wearing these nose glasses until I solve this puzzle.

These directions often require the program to access the disk. Since the game's designers know the 1541's less-than-speedy reputation, a snail icon appears on the screen until the game continues. This type of humor pervades the story. Another example is on the plane to Seattle, where you'll probably have Zak visit the rest room—if you can get past the cranky stewardess. Click on the verb *Use* and then click on *Toilet*. The resulting action won't offend anyone—even your grandmother—but it is funny. The game is packed with humor.

Zak and his friends have to solve dozens of puzzles, and there are a number of possible solutions. Just use your imagination and try several objects in your inventory. Be sure to read the tabloid for clues. There are even a couple of clues in the game's instructions.

Since the game's two disks are not copy-protected, the manual suggests you make backup copies and put the originals in a safe place. It also explains how to install the game on a hard disk. If your character leaves the country, you'll have to enter an exit visa code for the game to continue, so don't lose the code sheets.

Naturally, you won't complete the game in one sitting, but you can save your progress on a separate disk. After you've seen the opening sequences a couple of times, you can easily skip them when restarting a saved game so you can get right to the story.

As in *Maniac Mansion*, the action occasionally is interrupted with a *cut scene*. These are short animated sequences that provide clues and information about the aliens and the mischief they have in mind.

The animation is amusing, the plot is entertaining and funny, and the puzzles are mindbending without being discouraging. In short, Zak's a winner.

Wait a minute! Did I say *mindbending*? OK, that does it. I don't care what other people say. I'm going to keep wearing these nose glasses until I solve this puzzle. But it's so much fun, I hope it takes weeks and weeks. Sorry, mother.

—*Tom Netsel*

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Monopoly

I didn't even want to open the box. How could *Monopoly*, the computer game, have the same appeal as the famous board game?

For me, the real fun of the board game is being able to gleefully count, and then gloat over, my stack of money; coaxing my sister into showing mercy; triumphantly moving my marker with bounces that shake houses off the streets; vainly trying to keep my mother from being ruthless; hearing groans as I buy still more houses and hotels; plotting with my brother-in-law to bankrupt the women of the family, only for us to fight it out between ourselves; and, finally, ending a game at 2 a.m., exhausted, bleary-eyed, and happy.

I didn't want to open the box, because I was certain that no computer game could ever recreate the joy of the real thing. But this one comes awfully close.

Licensed from Parker Brothers, the computer edition of Monopoly is extremely faithful to the board game. Gameplay is the same—with one exception. Perhaps it was only our house rule, but when the pot filled with money from fines, taxes, and such, the first person to land on Free Parking got it all. That's just not possible here.

The playing screen shows the entire board from a tilted perspective. Because the names of the properties are too small to read, the deed cards appear four at a time in a lower portion of the screen, showing the properties next to your token. The screen also displays each player's cash holdings. This prevents you from sticking money in your pockets in an effort to look poor. It also prevents you from gleefully counting your stack of bills, though you can still gloat.

To roll the dice, shown in the screen's lower left corner, press the joystick fire button or designated key. Following the roll of the dice, your token automatically moves the appropriate number of spaces. The active player's name is displayed in the screen's upper left corner. An action bar runs across the top of the screen.

Monopoly can be played by one to eight players, with each player choosing a token for his or her name. One player can play by competing against the computer, an opponent even more ruthless than my mother. Before starting, you elect to play either a regular or a short game. In the short game, you set a time limit in hours and minutes. When the time is up, the game ends—the one with the most money and property wins.

The dice are rolled to determine who will be first to play. When your name appears as the active player, use the joystick or keyboard to make a choice from the action bar. You can quit or save a game, mortgage property, buy houses, see owners, trade properties, collect rent, or auction property. You can also select Fastmove, which allows less time for moves.

Since property cards are not physically laid out, the Owner option lets you see the properties' owners. You'll need to collect rent from players who landed on your properties prior to your turn. Selecting Cash toggles on or off each player's net worth in cash and property. Mortgage shows the cards of your own properties, and you can select the properties you want to borrow against by moving the cursor and pressing RETURN.

As the game progresses, you try to own blocks of similar properties, while leaving yourself enough capital to buy houses and hotels. You'll still cringe, just as you did with the board game, when forced to choose a card from Chance or Community Chest—especially if the card says *Go to Jail*. . . .

In a regular game, play ends when all players but one have gone bankrupt or admit defeat. You can delay either outcome by saving the game to a separate disk. This option makes it possible to end at a reasonable hour, rather than at 3 a.m. I must admit, I don't miss the late hours.

> *I didn't want to open the box—I was certain that no computer game could ever recreate the joy of the real thing.*

Another thing I don't miss is being forced to be the banker—and the bickering and nagging that usually goes along with the position. The computer handles all the chores of banking, dealing properties, and collecting fines and taxes, leaving you free to concentrate on the game.

In the end, I found that *Monopoly* is the same game I played years ago, with several new conveniences built in. Even the packaging looks like the traditional box seen in stores for half a century. The rules seem somehow easier to understand, perhaps because I now have more understanding. It was always a good game and a good excuse for getting together with family and friends. It still is.

But you can never really go back to those times. Now I play the game with a new generation of would-be tycoons—my own children. When fortunes suddenly change, Mike frets and fumes, Kelly chortles and wails, Mike triumphantly buys a hotel for Baltic Avenue, and Kelly gives him a raspberry as she takes Boardwalk and Park Place. And I sit there, realizing that some things never really change.

Perhaps 25 years from now, my kids will sit down to write a review of the new holographic Monopoly and will begin by reminiscing about the games they played as children. It'll simply prove once again the enduring quality of this classic game.

—*Ervin Bobo*

Electronic Arts
1820 Gateway Dr.
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$29.95

L.A. Crackdown

When I was a lad, my friends and I used to play a game called *Cops and Robbers*. I have fond memories of those adventurous days, righting wrongs and conquering evil throughout the neighborhood. Unfortunately, when I reached my midthirties, I had to discontinue this practice because my children started to disclaim me. My friends became involved in mundane things, such as dentistry and architecture, and seemed to lose interest in our game. No matter. Thanks to Epyx, my computer and I can still chase the bad guys with an action-packed cops-and-crooks game called *L.A. Crackdown*.

Epyx breaks new ground with this police adventure, the third in the company's Masters Collection Series. *L.A. Crackdown* is a welcome departure from the sports-skate-surf software cycle the company has been dealing in recently. I've been an Epyx fan since 1982, when I bought my first 64, and I have yet to use a piece of its software that I consider a disappointment. I'm happy to say that *L.A. Crackdown* is no exception.

In this scenario, you are a veteran police detective returning from vacation and finding you've been assigned to a very important undercover operation. A major drug ring, headed by

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what appears to be a legitimate businessman, is about to flood the city with a synthetic narcotic from the Far East. The case has top priority. You are supplied with a comprehensive file on the suspects, a high-tech surveillance van, and the services of an undercover rookie policeman to assist with the legwork. Your mission is to collect enough evidence to put the mastermind and his gang of thugs in the slammer and to prevent the drugs from reaching the streets.

You're a veteran police detective who's been assigned to a very important undercover operation.

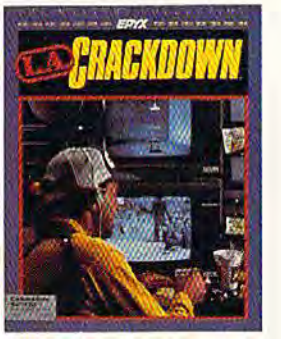
Before starting the investigation, you'll want to read the thorough case file (documentation) and choose a partner. Review a roster of the top four rookie candidates and decide whether you want to work with the martial-arts expert or team up with a six-foot-plus 212-pounder who is packed with muscles. If brains or marksmanship is your preference, choose another candidate.

You communicate with your rookie via a concealed wireless earpiece that he wears. This lets you direct his movements as he prowls through darkened buildings in pursuit of incriminating evidence. You can have him search various locations and plant bugs in telephones. You can even direct him to chat with the cautious suspects in an effort to extract valuable information. Be aware that your sidekick has a mind of his own, so if you ask him to do something stupid or work him too long without sleep, he'll quit. And since you cannot fit inside your computer to replace him, you're advised to be a good boss.

L.A. Crackdown is not a typical adventure/strategy game that requires a vast amount of keyboard input. A major portion of the game is joystick-controlled. Getting around in the environment is as easy as selecting an action from the menu and pressing the fire button.

Your computer screen represents a two-camera view from your surveillance van and is divided into six easy-to-understand sections. At the top left is a television picture of your rookie as he investigates the interior of a building. The top right displays the television picture of the building's exterior. Flanking the menu options in the center of the screen are the appropriate floor plans, clock/calendar, and your handy-dandy Bug Status Indicator.

The animated micrographics in *L.A. Crackdown* are excellent and give the player a terrific feeling of realism. When you move from one room to another or follow a suspect's car, it's a joy to watch the animated action unfold.



Plan to use a fair amount of educated guesswork in attempting to solve this case. Clues are not exactly lying around for you and your partner to trip over. You will have to learn your suspect's patterns and habits without drawing too much attention to yourself. If you keep stumbling across the three henchmen guarding a warehouse and an airport hangar, they'll shoot your unarmed partner, thus ending the game. Using the Save option before entering

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dangerous territory will allow you to resurrect your fallen comrade and continue the game without starting over.

Hide as many as four bugs and listen in on telephone conversations at any of the four stakeout locations. These bugs offer valuable information and can help move your case along quite nicely. A flash on the bug indicator alerts you that an important call has been recorded.

Working undercover is tedious: It requires a lot of waiting for something to happen. Fortunately, there is a Time Compress option available to make time zip by. If a suspect makes a move while you're using the option, the time compression stops and action resumes.

If there is a down side to this very impressive crime adventure, it's the incessant disk drive access required to play the game. The 1541 really gets a workout, as the situation is constantly changing, prompting the program to search for information on the disk. If you own a 1571, the problem is not as noticeable.

Complex games of strategy such as this require a commitment from the player to stick with them. This is easy with *L.A. Crackdown* because the unfolding story holds your interest and keeps you coming back time and again to gather more evidence.

Epyx has a history of developing fine software products that skillfully entertain. *L.A. Crackdown* is a bold step in a new direction that will attract gamers of all ages.

—Steve Hedrick

Epyx
600 Galveston Dr.
Redwood City, CA 94063
$39.95

The Three Stooges

I'd say that to know them is to love them, except for the fact that I know a lot of people who not only don't love the Stooges, but are actually offended by them. Go figure! As for myself, I love 'em, maybe even more today than when I first made their acquaintance as a kid. There's something about Larry, Moe, and Curly that ages well, like fine wine or comfortable tweeds.

Part of their modern-day appeal may simply be nostalgia, but the more likely reasons are the universality of slapstick, of which the boys were the absolute masters, and the basic sweetness that underlies even the most violent of Stooge routines.

Both of these aspects have been captured by Cinemaware, and it's high time, too. Before now, the Three Stooges had made, at best, a shaky transition to the modern world. In the late fifties, their films moved from shorts to full-length features, but the victory was hollow at best. For one thing, Curly, the soul of the outfit, had died. And with the exception of Shemp, subsequent replacements were hardly fit to have their toes stomped by Curly's shoes, much less to fill them. The Stooges' features were hampered by a trio only two-thirds complete.

A cartoon series in the sixties was even worse. Lousy animation, inaccurate characterization, dumb plots, bad writing—the Stooges could hardly have been more abused. Certainly their accomplishment was safe: All of those gorgeous black-and-white shorts would for years be run in the wee hours of the morning. Still, it would have been nice to see the Stooges in the modern world.

Enter Cinemaware, which achieves the translation that the movies and cartoons mangled. *The Three Stooges* is not only a terrific piece of action software, but it's also a genuine addition to the Stooges' canon.

Cinemaware has long identified its products as movies, layering cinema-style credits and narrative over interactive arcade sequences. The approach has worked quite well, generating hits such as *Defender of the Crown*. Lately Cinemaware has worked to stretch its format beyond arcade-level action. Plot and narrative are figuring more and more highly in the company's releases, with interior arcade games becoming increasingly integral, if not subordinate, to storytelling.

But the company hasn't forgotten its roots, either: *Stooges* is a good example. While the game depends on arcade sequences, they are *great* arcade sequences, besides which, if ever there was a subject suited to arcade adaptation, it's *The Three Stooges*. Slapstick was the Stooges' trademark, and slapstick makes a fine foundation for an arcade-style computer game.

There's also a story, albeit a minimal one. (Then again, the Stooges' shorts weren't exactly loaded with plot.) This time, our guys have to raise a substantial chunk of change in order to save an orphanage and, not incidentally, raise themselves in the estimation of three beautiful women. Slapstick violence is tempered by worthy goals—the boys would have loved it.

The money can be raised in a variety of ways, each of them based upon a classic Stooges routine. Stooge fans will instantly recognize the mad gurney race through crowded hospital corridors, Curly's boxing skills being enhanced by Larry Fine's fiddling, a high-society pie fight, and, perhaps the most famous routine of all, the duel between Curly and a bowl of vicious oyster stew.

Each of the contests is well-realized,

with action that moves in the true Stooge manner. Between events, there's a chance to play the famous Stooge slapping game. Everything runs to the accompaniment of classic Stooge music. Digitized sounds and voices also remind players of the original Stooges.

That this package is a labor of love is obvious from the (very funny) title sequence throughout the program. Documentation explains the game mechanics—which are simple enough for a child to operate, yet challenging enough for an adult—while also paying tribute to the Stooges themselves.

A game must rise or fall on the strength of its play, and here Cinemaware rises very high indeed. Each scenario delivers solid action and interplay while also communicating that distinctly Stoogey atmosphere. Joystick control of both individual events and overall interface is smooth and, even at the game's higher levels, reasonable. I never felt that I was robbed of points because the stick didn't respond fast enough.

A purist might insist, I suppose, that the game would be more accurate in grainy black-and-white, but Cinemaware's artists have given the game's coloration enough of an Art Deco ambience so that the screens contribute to the overall 1930s feel of the game. (Fans of black-and-white will find a nice touch upon booting the program.) Animation is excellent throughout—you've never quite seen a pie fly until you've seen one fly here.

What would the Stooges themselves have thought of this project? First, being the fellas that they were, they'd have been happy to help save the orphanage. And, being the boys that they were, they also would have slapped, gouged, and tugged each other for control of the joystick.

In other words, they'd have loved it. And anyone who doesn't is a chowderhead, or at least a wiseguy. Yeah? Yeah!

After far too long an absence, the Three Stooges are back.

—Keith Ferrell

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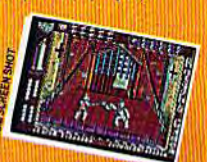

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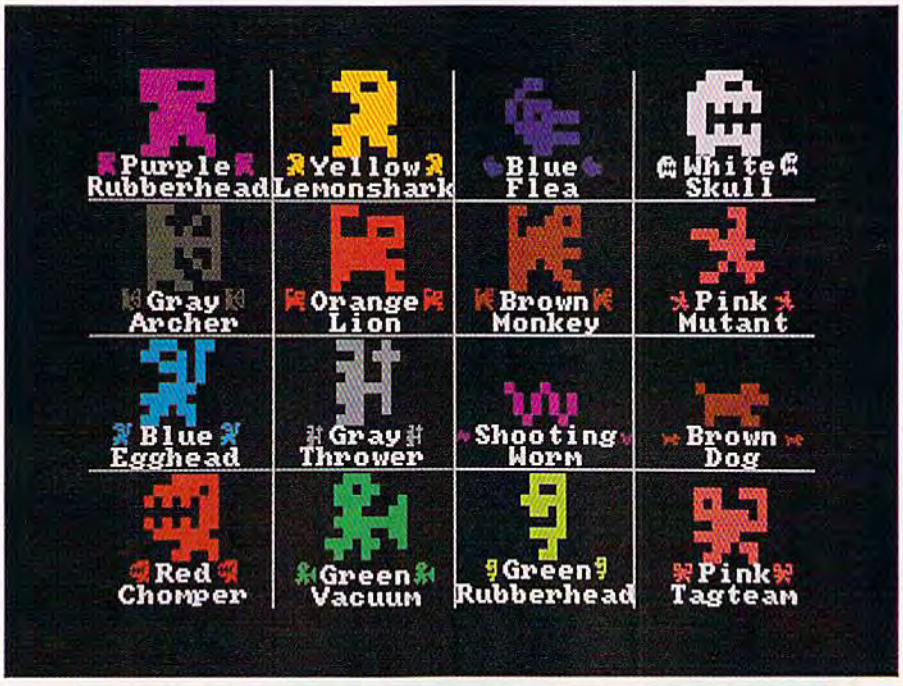
CROSSROADS II

PANDEMONIUM



Steve Harter

It's been a year since you've come to the crossroads, and things haven't gotten much better. In fact, it could be said that things are significantly worse. New gangs of creatures have moved in. They're smarter. They're faster. They're more powerful.

"Crossroads II: Pandemonium" is an arcade-action game that will pull you out of your seat and onto an action-packed screen. Race down the halls. Shoot the bad guys before they shoot you. Outrace the creatures to pick up spars and build up your shields. Crossroads II features more action on your 64's screen than you've ever seen.

Last December we published "Crossroads," a graphically stunning one- or two-player action game for the 64 that introduced our readers to such creatures as the voracious Yellow Lemonshark and the dastardly Purple Rubberhead. The author has improved upon his excellent original, adding new mazes, creatures, and challenges. When you play "Crossroads II," you'll understand the meaning of the word *pandemonium*.

GETTING STARTED

Crossroads II is written in machine language. Type it in using "MLX," the machine language entry program located elsewhere in this issue. When you run MLX, you're asked for the starting and ending addresses of the data you'll be entering. When MLX prompts you for the addresses for Crossroads II, respond with the values given below.

Starting address: 0801
Ending address: 21C0

Be sure to save a copy of the program to tape or disk before exiting MLX.

Crossroads II loads and runs like a BASIC program. When you're

continued on page 40

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Crossroads II Maze Editor

Randy Thompson

You've played "Crossroads II: Pandemonium." Now use the "Crossroads II Maze Editor" to modify the game. When you decide where to put the corridors, you control the tempo, difficulty, and danger of the game.

Crossroads is an exciting one- or two-player game that's played on an unpredictable battlefield of corridors, sharp turns, and dangerously spacious pitlike areas where the phrase *take cover* has little, if any, meaning. With Maze Editor, you can modify or completely redesign the eight different mazes used by this frantic game. The maze editor wedges into Crossroads II, allowing you to create mazes interactively: Just draw your maze using a joystick and press a key to reenter the game and test your maze. If you find something wrong, just press RESTORE to return to the maze editor and change what you don't like. It's that easy.

Maze Editor offers several editing features: reverse, clear, copy, paste, undo, and save. When you save your mazes to disk, a whole new copy of the Crossroads program is saved along with them. This way, all you have to do is load the new version of Crossroads. You can have several versions of the game, all on the same disk.

GETTING STARTED

Use "MLX," the machine language entry program found elsewhere in this issue, to type in Maze Editor. When MLX prompts you, respond with the values given below.

Starting address: C800
Ending address: CDC7

Be sure to save a copy to disk when you've finished entering the program.

To install Maze Editor, enter

```
LOAD "MAZE EDITOR",8,1
NEW
SYS 51200
```

Now, load and run Crossroads II.

MAZE EDITING KEYS

Key	Function
SHIFT-R	Reverse maze
SHIFT-U	Undo editing changes
SHIFT-C	Copy current maze into paste buffer
SHIFT-V	Paste maze
CLR/HOME	Erase maze
F1	Previous maze
F3	Next maze
F5	Save new version of Crossroads with modified mazes
F7	Exit editor and return to Crossroads

Note: Undo restores the maze to the state that it was in when you last moved to that maze using f1 or f3, pasted to that maze using SHIFT-V, or saved the program using f5. Any editing changes made between these times can be undone with SHIFT-U.

CREATE A WORLD

To edit a maze, press RESTORE while Crossroads II is in demo mode (that is, while the words *Crossroads II: Pandemonium* appear at the top of the screen). The current maze number (1–8) appears in the upper right corner of screen. (The editor comes up with the maze that was on the screen when you pressed RESTORE.) Move through the eight mazes with the f1 and f3 keys.

Using a joystick plugged into port 1, move the white blinking cursor. Editing works the same as in the popular *GAZETTE* programs "Ultrafont +" and "Sprite Magic." To draw, press the fire button while on top of a space and move the joystick. Press the fire button while on top of a wall and move the joystick to erase. To move the cursor without drawing or erasing, move the joystick without pressing the fire button. Mazes must be symmetrical, so everything drawn is "mirrored" to the right-hand portion of the screen (you can draw only on the left portion of the screen).

To quit edit mode and return to Crossroads, press f7. To save your new mazes, press f5. Enter a filename. A new copy of the Crossroads program with your mazes is saved to disk. You must choose a filename that is unique, as the maze editor does not offer a save-with-replace option. The save option saves only to disk device 8. You cannot save mazes to tape.

FOLLOW THE RULES

There are certain rules that you must follow when creating mazes. You must never leave a single isolated square on the screen. If an enemy creature beams into that space, the game locks up. You can't place a wall in the square where your player starts the game (and be sure to leave somewhere to go from this square). And finally, you must be sure that there are at least 40 or more blank spaces on the screen for enemy creatures to appear.

If you make a mistake in drawing your maze and Crossroads II locks up, press RUN/STOP-RESTORE. Then type SYS 51200 to reinstall Maze Editor. Type RUN to start Crossroads II.

You can't determine the character or character color used to draw your maze—this is determined randomly by the program. Crossroads II always uses mazes 1–4 for levels 1–4. Mazes for level 5 and above are randomly chosen from the eight mazes available. The program never chooses to use the same maze twice in a row.

Finally, Maze Editor works with Crossroads II only. It does not work with the original "Crossroads."

See program listing on page 95.

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ready to play, plug a joystick into port 1 (or plug in two joysticks for a two-player game), load the program, and type RUN.

THE CAST OF CREATURES

There are 16 different types of creatures in Crossroads II. Five of the creatures from the original Crossroads have moved out; four remain. There are 12 new creatures, and only one is friendly—the small Brown Dog. In fact, he can help you by killing the more dangerous creatures.

The game begins in Demo Mode, which gives you a chance to see how the creatures interact. You'll see 8 of the 16 creatures that live in Crossroads II. Take a close look at each one. Does it shoot bullets or other projectiles? Does it like to cluster in groups with other creatures of the same type? To see a different maze and different creatures, press f7.

Choose a starting level by pressing a key 1–9 (level 1 is the easiest); select the number of players by pushing the joystick forward. (Look at the upper right corner of the screen. You'll see one little man in one-player mode, two little men in two-player mode.) To start play, press the fire button. Creatures begin to appear in the maze. You (and your opponent, in a two-player game) appear near the bottom of the screen.

You can pause Crossroads II at any time during the game. Simply press f5. While the game is paused, you can change the color of your player. Press f1 to change player 1's color; press f3 to change player 2. Keep pressing until you get the color you want.

Use the joystick to move, and press the fire button to shoot. By holding down the trigger, you can fire a deadly stream of bullets—you *never* have to reload.

You acquire shields by picking up the whirling, white spars. Shields protect you from being destroyed by shots. (If a creature picks up a spar, it will also be protected.) You lose a shield each time you are shot. If you're hit without a shield, you lose a life. You move on to the next maze after you've collected five spars. You receive 500 points for each spar you collect.

Crossroads II features two new kinds of spars: Red spars give you extra firing power (you shoot more bullets faster), while blue spars double your speed. This new superspeed may take a while to get used to, but it's a powerful aid once you've mastered it. You lose these special powers the next time you die.

At the beginning of the game, you're given four lives and three shields. The number of shields and the number of lives are indicated under the letters *S* and *L* at the top of the screen.

Whenever a player or a creature dies, its spars are randomly distributed throughout the maze.

You can stop Crossroads II by pressing RUN/STOP–RESTORE. However, BASIC's pointers may be corrupted, so it's best to simply turn off the computer when you've finished playing.

Keep your wits about you—every alley is dangerous in "Crossroads II."

A PLAYER'S NOTEBOOK

Because there are so many dangerous creatures in Crossroads II, you might want to take notes as you encounter them. Here's some inside information to help you get started.

You'll hear and see the creatures appearing at the beginning of each level. They appear five at a time. As you're playing through the level, extra creatures may appear. Watch out for creatures that appear right next to you—back off and shoot them immediately.

Several of the creatures try to kill by running into their enemies. Note that the shields of these creatures are *not* decreased when they attack.

There are two types of rubberheads in Crossroads II: the Light Green Rubberhead and the Purple Rubberhead. Don't shoot a rubberhead in the back—the bullet will bounce right back toward you. To kill a rubberhead, you must shoot it as it charges you.

Some screens have passageways that are unblocked for the entire length of the screen. If you shoot down one of these passageways, your bullet continues wrapping around the maze indefinitely (or until it hits something—watch your back!). A good strategy is to duck into one of these passageways, fire a few rounds, and then get out. Hopefully, a few unsuspecting creatures will blunder into the ambush.

If you're on a level that has a large number of a single type of creature, be sure not to kill off that creature's enemies. Let the enemies do their damage; then kill off any creatures that remain.

On the higher levels, you may encounter the Green Vacuum, a creature that can instantly suck up its enemies, despite shields. If you get sucked up, you lose all your shields and any special powers you have acquired.

A dog is man's best friend. The small Brown Dog cannot harm you. Don't shoot the dog; it will do its best to try to destroy your enemies. Above level 19, the dog gains strength, speed, and courage.

When the white creature eats a spar, its speed increases. Do your best to keep it away from spars.

Every 30 seconds, the speed of the level increases. It's in your best interest to finish levels as quickly as possible.

When the light red human mutant walks into the light red creature, look out! The mutant jumps onto the creature to form a worthy opponent. Above level 16, this combined supercreature can appear already formed.

If no bullets or other creatures are nearby, a creature can turn invisible. For this reason, be sure to shoot as you round corners, or you may never know what hit you.

Crossroads II is quite a challenge. Beginners may want to try the original "Crossroads" first (December 1987). Look elsewhere in this issue for information on ordering back issues of *GAZETTE* magazines and disks.

See program listing on page 91.

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HANK STRAM
Radio voice of NFL Monday Night Football

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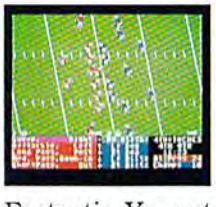

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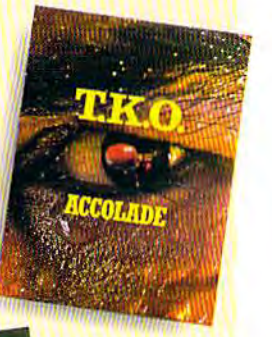

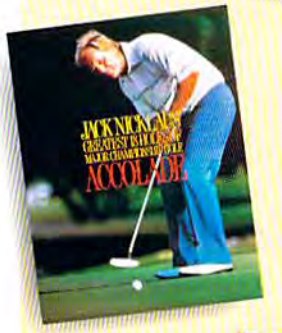

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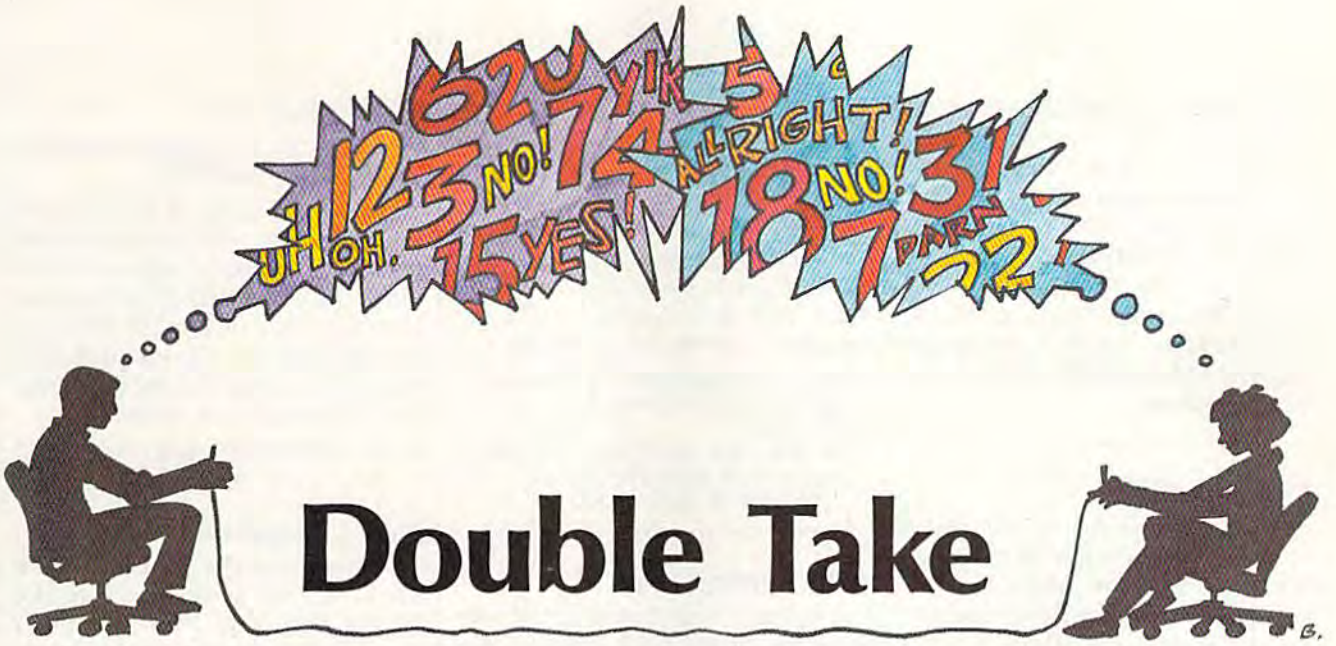


Double Take

Mark Tuttle

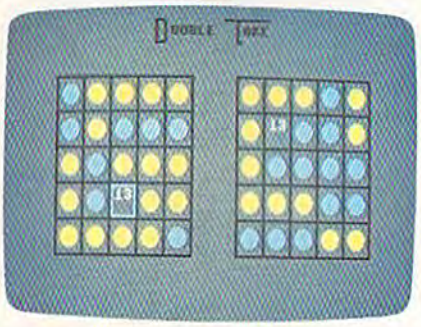
Two players compete in this brain-twisting strategy game for the 64. You play on two boards at once—be sure to watch both. Joystick required.

You go brain to brain against a friend when you play "Double Take," an addictive strategy game that demands your full concentration. Although the rules are complex, you'll master them quickly. After a few games, you'll be preparing traps for your opponent.

The object of the game is to place five pieces of your own color in a row—horizontally, vertically, or diagonally. But consider this: You play on two boards at once. The plays you make on one board affect the other board. And you can change your opponent's pieces to your color by placing one of your pieces between two of your opponent's pieces. These twists make Double Take a genuine challenge.

Getting Started

Double Take is written in BASIC. To avoid typing errors, enter the program using "The Automatic Proofreader," found elsewhere in this issue. When you've finished typing, be sure to save a copy of the program to tape or disk.



Challenge a friend to a game of "Double Take," a brainteaser that's played on two boards.

When you're ready to play Double Take, plug in two joysticks. (If you have only one joystick, plug it into port 2.) Load the program and type RUN. You'll see Double Take's title screen. Press 1 if you have one joystick plugged in or 2 if you have two. If you use one joystick, you'll have to pass the joystick between players after each move.

There are two numbered square boards, with five squares per side. Note that the numbers are scrambled and that they are in different places on the two boards. You use the joystick to move and the fire button to place pieces on the left board. When you put a piece down, a piece also goes down on the right side, in the like-numbered square. For instance, suppose you put down a piece in the upper left corner of the left board on the square numbered 13. A piece would also be placed on the square numbered 13 on the right board, no matter where it was. Your goal is to place five of your pieces in a row on either board.

Once played, the pieces are *not* secure. By placing a piece between two of your opponent's pieces (horizontally or vertically only), you can change those two pieces to your color. Note that the changes occur on both boards. This rule makes the game a real mind-bender.

When one of you finally gets five pieces in a row, the game ends. Press the fire button to play another.

See program listing on page 98.

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Do you have a question or a problem? Have you discovered something that could help other Commodore users? We want to hear from you. Write to Gazette Feedback, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, NC 27403. We regret that, due to the volume of mail received, we cannot respond individually to programming questions.*

Computer Math

Programs exist for determining square or cube roots. In the November 1987 issue of *GAZETTE*, you printed an excellent short program for prime numbers. How about a program for quadratic equations? I never could do them in school.

Gerard W. Meister
Western Springs, IL

A quadratic equation is one of the form $ax^2+bx+c=0$, *where* a, b, *and* c *are constants. If you know the values of these constants, the trick is to find a suitable value for* x*—one which fits the equation.*

There's a formula to find x *in a quadratic equation. It looks like this:*

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Unless you know the mathematical symbols, you'll have a hard time putting this formula into a BASIC program. The formula actually gives two answers. The ± *symbol means* plus or minus. *First you use the formula with a plus sign; then you use it with a minus sign. Here's a program that brings it all together:*

```
10 PRINT "ENTER VALUES FOR A, B,
   AND C."
20 INPUT A,B,C
30 X1=(-B+SQR(B*B-4*A*C))/(2*A)
40 X2=(-B-SQR(B*B-4*A*C))/(2*A)
50 PRINT "VALUES FOR X ARE";X1,X2
```

*There is a problem, though. Certain entries will cause the program to crash. For example, if A is 0, you'll get a division-by-zero error. Also, certain combinations of values for the constants will cause the expression B*B−4*A*C to be negative. Since you can't take a square root of a negative number, you'll get an illegal quantity error. Add the following lines to the program to solve these problems:*

```
21 IF A=0 THEN PRINT "A IS 0, SO
   QUADRATIC FORMULA
FAILS":END
22 IF (B*B-4*A*C)<0 THEN "DETER-
   MINANT IS LESS THAN 0, SO
   QUADRATIC FAILS":END
```

Reformatting Disks

I'm trying to write a disk utility program for the 64 which includes formatting. I've added the following lines. When they execute, the green light on the drive blinks repeatedly, and the disk doesn't format. Is there something wrong with the program, or is it not possible to reformat a disk?

```
100 INPUT"ENTER DISK NAME";C$
110 PRINTCHR$(147)"FOR-
    MATTING..."
120 OPEN15,8,15
130 PRINT#15,"NEW0:";C$;",01"
140 CLOSE15:PRINT"...DONE"
```

J. R. Beard
Wimberley, TX

You can reformat disks. The problem you're having is in line 130. Instead of a semicolon following NEW0, *there should be a colon, so that the line reads*

```
130 PRINT#15,"NEW0:";C$;",01"
```

or, abbreviating the NEW command, as

```
130 PRINT#15,"N0:";C$;",01"
```

We'd like to make two additional suggestions. First, a disk name on a Commodore machine, like a filename, can be no longer than 16 characters. In both cases, if the name exceeds this length, only the first 16 characters are used. To avoid some confusion, you may want to make the user aware of this by adding the following line to the program:

```
105 IFLEN(C$)>16THENPRINT"NAME
    TOO LONG.":GOTO100
```

Second, because of line 130, the disks you format will all have the same two-character disk identifier—01. It's best to assign a unique ID to each disk. Here, you could change line 100 so the user would be able to input a disk ID—say, as D$—along with the disk name. Line 130 would then become

```
130 PRINT#15,"N0:";C$;D$
```

Plus/4 Translations

Your magazine has published more articles and programs for the Plus/4 than any other computer magazine I've found. My question: Is there a systematic way of converting 64 and 128 programs containing POKEs, PEEKs, and SYSs so they work on my Plus/4?

Leroy Carter
Lewisburg, TN

This is a question we're often asked, in one form or another. Unfortunately, the many differences between the 64 (or the 128) and the Plus/4 make such conversions difficult at best.

If you decide to give it a try,

Good News, Bad News

The good news is that we haven't had enough bugs in recent programs to warrant printing our "Bug-Swatter" column. That's two months in a row now! The bad news is that there are a couple of problems with Program 3, "Font Editor," from "SpeedPrint" (October 1988). Line 1350 contains the character {TAB}. This character can be typed by holding down CTRL and pressing I. The other problem is in line 1550. If S=0, the program tries to go to a line number that doesn't exist. Change line 1550 to read

```
1550 IFS=0THEN1620
```


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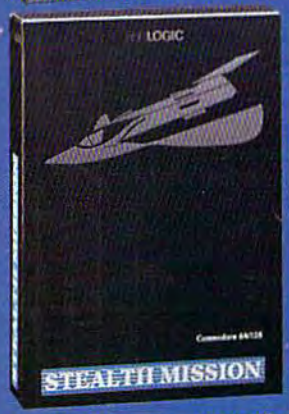

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you'll need to obtain a detailed memory map for each computer. In this regard, Mapping the Commodore 64 *and* Mapping the Commodore 128, *available from COMPUTE! Books, are both outstanding. For the Plus/4, an excellent reference is* The Programmer's Reference Guide for the Commodore Plus/4, *by Cyndie Merten and Sarah Meyer (Scott, Foresman and Company).*

Assuming that you're attempting to convert a BASIC program, isolate all PEEK, POKE, and SYS addresses in the 64 or 128 program, and, using the memory map, determine the function of each. Access to a 64 or 128 is helpful at this point. By running the program on its native machine, you can witness firsthand what each command does. A few STOPs, strategically placed within the program, will also help.

After this, search the Plus/4 memory map for the corresponding register or ROM routine that each command references (assuming one exists), and substitute its address into the program. In this process, you'll find that most Commodore memory maps use the same label for similar or identical routines.

Should the program contain a custom machine language routine, identify what it does and decide whether the Plus/4 has the hardware to perform the same task. If it does, transfer the ML code with a monitor to a block of unused RAM on the Plus/4. If you place the code in the BASIC workspace, be sure to adjust the necessary BASIC pointers so that the routine won't be overwritten. Then, just as you did for the BASIC portion of the program, substitute the corresponding Plus/4 addresses in the code wherever necessary. For this step, you need extensive knowledge of machine language and a great deal of patience.

Because of hardware differences between the 64 (or 128) and the Plus/4, certain types of programs just won't convert without losing their essence—for instance, arcade-style game programs that use sprites. Others can be converted if you replace portions of the code with routines that emulate those found in the 64 or 128 version. Since the Plus/4 contains a more powerful BASIC than the 64 does, in some cases you can substitute a couple of BASIC commands for an entire machine language routine or for a series of POKES. For example, many 64 game programs rely heavily on the SID chip. On the Plus/4, you use the built-in sound commands instead.

When converting 128 programs to the Plus/4, note that the 128 shares a number of disk and graphics commands with the Plus/4. In fact, many BASIC programs written for the 128 will run as is on the Plus/4.

Outputting to the Printer

I wrote a short BASIC program on my 64 which contains only a few PRINTs and GOSUBs. Is there a way to send only what's in quotation marks to the printer?

Andrew DuBry
Medford, OR

The CMD (Change Main Device) statement sends output to the printer rather than to the screen. To use it, place the following line at the beginning of your program:

```
10 OPEN4,4,0:CMD4
```

At the end of your program, add this line:

```
1000 PRINT#4:CLOSE4
```

The OPEN command in line 10 opens a file or channel (number 4) to

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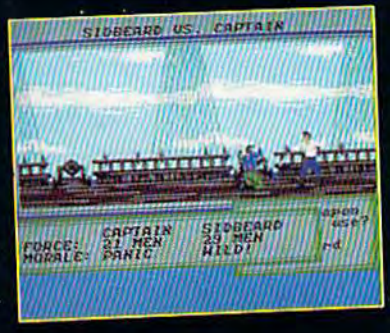

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the printer (device 4), and CMD diverts output from the screen to the printer. To print in upper/lowercase, specify a secondary address of 7 when opening the printer channel (for example, OPEN4,4,7).

Should your program contain a GET statement, you could encounter problems. After the GET executed, any output intended for the printer would, from that point on, be sent to the screen instead. To prevent this, change line 10 to

```
10 OPEN4,4,0
```

and all PRINTs to PRINT#4, (the comma must be present). If you decide later you want to send the output to the screen (device 3), change line 10 to

```
10 OPEN4,3
```

Relocating ML Programs

I've acquired quite a few programs for my Commodore 64. My problem is that many of them are machine language programs that reside in the same place in memory—often beginning at 49152. Is there a way to alter programs so that they occupy different areas of memory? That way, I could use them at the same time.

David Crow
McAlester, OK

Generally, unless a machine language program was designed to be relocated, this is no easy task. The following analogy will show you why.

A machine language program occupies sequential memory addresses, like adjacent houses on a street. It contains instructions to jump to different addresses in the program. Some of these instructions contain relative addresses, which is like telling someone Go to the party three houses up the street. *Others are absolute, which is like saying* Go to the party at 1115 Glenwood.

Now, suppose the city changed all the house numbers on Glenwood by adding 1000 to each address. For example, 1115 Glenwood would become 2115 Glenwood, 115 Glenwood would become 1115 Glenwood, and so on. After this, you'd still find the party if you went three houses up the street, but you wouldn't if you went to 1115 Glenwood; since the city had changed the addresses, the party would subsequently be at 2115 Glenwood.

Moving a machine language program is like changing house numbers. While the program can still make relative jumps, absolute jumps fail since the code is no longer at its old address.

When a programmer assembles a program, he or she instructs the assembler to begin at a certain address. The assembler calculates all subsequent addresses (including jump addresses) by adding to the starting address. To change the location of a program with an assembler, you specify a different starting address before actually assembling the program. The proper absolute jump addresses are then calculated by the assembler and placed in the code.

Indeed, the easiest way to relocate machine language code is using an assembler. But this requires you to have a copy of the original source code for the program and a copy of the assembler used to assemble it. Getting hold of both is usually difficult.

Another approach is to use a machine language monitor. First transfer the machine language code to the desired location and then physically change each absolute jump address. This technique is challenging and should only be undertaken by those familiar with machine language.

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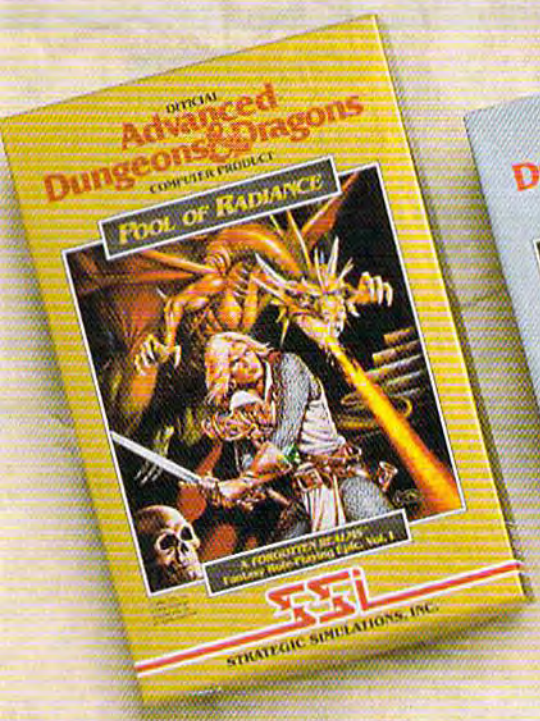

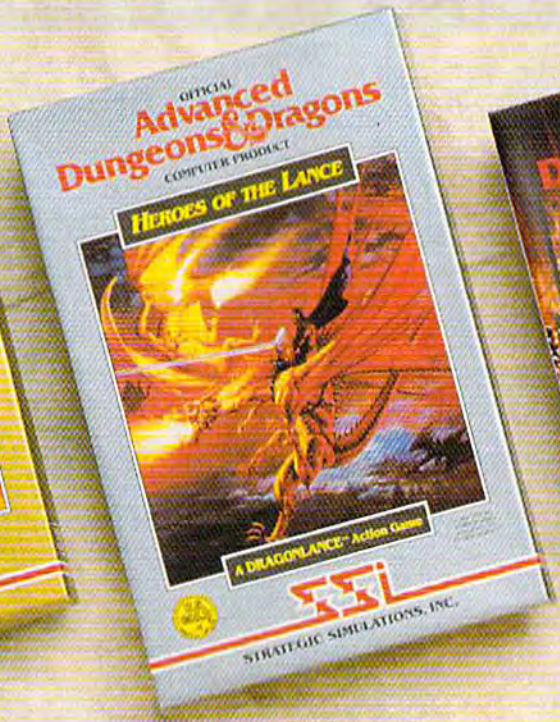

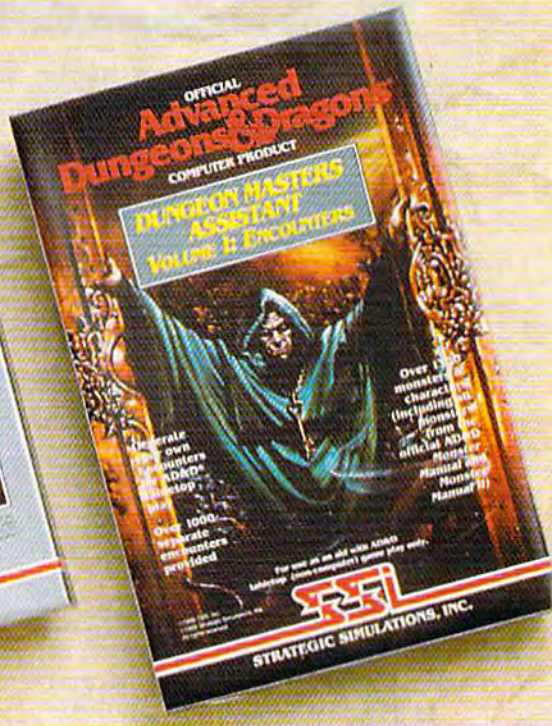

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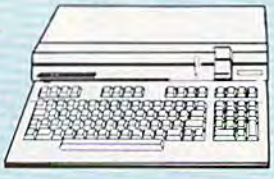

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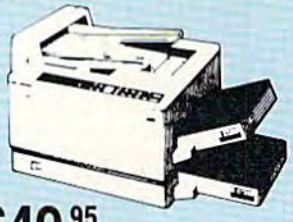

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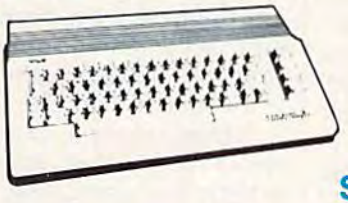

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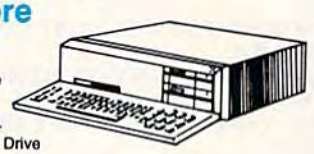

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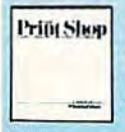

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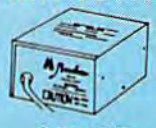

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BASIC for beginners

Wish List

Larry Cotton

Happy Holidays. This month we'll write a short seasonal program that will give us the opportunity to learn several new BASIC statements. The program creates a Christmas wish list which can be added to, deleted from, printed onto the screen, printed on a printer, and saved to or loaded from disk. In the process, we'll introduce some BASIC statements that are necessary to communicate with a disk drive and printer.

Since our wish list will be primarily a list of words, it can be stored in the computer, saved to disk, and printed on the printer in the form of a string array. Let's just call it I$(C)—*I* for *Item* and *C* for *Counter*.

Unless you are particularly greedy, 100 items should suffice. The first step is to dimension the array:

```
100 DIM I$(100)
```

Now let's set up the screen. Leave the background color blue, but change the border and characters to white. We'll do this on the Commodore 64 with POKE statements:

```
110 POKE 53280,1: POKE 646,1
```

Next, a menu with numbered options would be appropriate. (Another common way to offer choices is to ask for the first letter of the choices to be typed, but, as you will see, the numbered-option method is quite easy and efficient.)

```
120 PRINT"{CLR}{3 DOWN} 1. ADD
    ITEM(S) TO LIST
130 PRINT"{DOWN} 2. SAVE LIST TO
    DISK
140 PRINT"{DOWN} 3. LOAD LIST
    FROM DISK
150 PRINT"{DOWN} 4. DELETE ITEM
    FROM LIST
160 PRINT"{DOWN} 5. SHOW LIST ON
    SCREEN
170 PRINT"{DOWN} 6. PRINT LIST
180 PRINT"{DOWN} 7. QUIT
```

We must get the computer to wait for the user to type something:

```
190 GETA$:IFA$=""THEN190
```

Now we want the computer to take action if any of the keys 1–7 is pressed. We could use several IF-THEN statements, but we'll use ON-GOSUB here because it's more efficient:

```
200 ONVAL(A$)GOSUB220,270,330,380,
    450,500,530
```

We will make each of the menu options access one of seven subroutines corresponding to the number pressed. Since I've already written and renumbered this program, I know what each subroutine's target line is. When you write your own programs, give yourself some room. Start numbering subroutines with higher round numbers, such as 500, 1000, and 2000; then, if you want, you can renumber the program.

What if the user types an entry other than one from the range 1–7? Since ON will respond only to numbers that correspond to the position of the line numbers after GOSUB, there's an easy way to make sure the program doesn't accept any other keypresses—send control back to print the menu:

```
210 GOTO120
```

What Do You Want?

Our main information-gathering loop is in lines 220–260. As each item is input, the program loops until RETURN is pressed with no entry:

```
220 PRINT"{CLR}"
230 C=C+1:PRINT"{3 DOWN} ITEM
    NO.";C"{LEFT}";
240 INPUTI$(C)
250 IFI$(C)=""THENC=C-
    1:GOSUB450:RETURN
260 GOTO220
```

Line 220 clears the screen. Line 230 introduces our item counter C, which will be the index to the array I$(C). The counter begins as 0, but now needs to be incremented before we get the user's input. We print our question and, by carefully positioning the cursor, cause the question mark in line 240's INPUT statement to be printed right after the words. You may want to remember this technique; it's very common and very useful.

We must provide a way for the user to escape from the INPUT loop. When the RETURN key is pressed with no entry, I$(C) is set to a null string. Line 250 decrements the counter (it was incremented in line 230), sends control to another subroutine at line 450, which will list the items on the screen, and then returns control to print the menu again.

If an entry has been made, we want to continue looping; line 260 sends control back to the beginning of the loop at line 220.

This completes the main portion of the program. All that's left is to write the subroutines for saving and loading our wish list, deleting items, and printing the list onscreen and to the printer.

Saving Subroutine

Here's the save-to-disk subroutine:

```
270 IFC=0THENRETURN
280 L="":INPUT"{DOWN} NAME OF
    LIST TO SAVE";L$:IFL$=
    ""THENRETURN
290 OPEN1,8,1,L$
300 PRINT#1,C
310 FORT=1TOC:PRINT#1,I$(T):NEXT
320 CLOSE1:RETURN
```

We want to save to the disk the items that are stored in the I$(C) array. Lines 270 and 280 should look familiar. First we check the counter to see if any entries have been made. If the counter is 0, the subroutine ends with a RETURN to line 210—the line immediately following the GOSUBs.

If entries have been made (the variable C isn't 0), line 280 first sets L$ to an empty string and then asks the user to input the list's name. If he or she just presses the RETURN key, the subroutine ends without a filename being entered. Again, the program returns to line 210.

Let's say the user types WISH

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LIST 1 and presses RETURN at line 280's INPUT. L$ becomes the string "WISH LIST 1"

Now it's time to send the file named WISH LIST 1 to the disk drive. When you communicate with peripheral equipment, such as disk drives and printers, you need to open and close channels. And, like the computer itself, the peripherals expect the communications to be in a syntax they recognize.

The OPEN command opens the channel for communication. The first 1 in the command is a file number. (Think of opening a Manila file folder with a particular number on it.) Once that file is opened, data can be sent to it by referring to its number. You can assign the file any number from 1 to 127.

The number 8 makes sure the information is sent to the disk drive. (If you have a second drive, refer to it as device 9.)

The next parameter, 1 in this program, tells the disk drive to save the information. L$ is the name of the file.

So far, we haven't actually sent any data; we've only told the disk drive to get ready to receive it. Next we use another BASIC statement, PRINT#, which sends information to the disk drive. PRINT#'s effect is similar to PRINT's, except that instead of information being printed to the screen, it's being printed to the disk.

The first piece of information we need to send to the disk is the number of items in the wish list—the value of the counter C. Line 300 does this. Then line 310 uses a FOR-NEXT loop to send the array I$(C) to the disk.

All the necessary information has been sent to the disk. We must now close our file (CLOSE1) and end the subroutine (RETURN) in line 320.

Other Subroutines

We're running out of space for this month, so I'll show you the rest of the program and explain it in detail next month. That way you'll be able to present a nice, neat list to Santa. Here's the loading subroutine:

```
330 L$="":INPUT"{DOWN} NAME OF
    LIST TO LOAD";L$:IFL$=
    ""THENRETURN
340 OPEN1,8,0,L$
350 INPUT#1,C:IFC=0THENPRINT
    "{DOWN} NO LIST
    FOUND.":GOTO370
360 FORT=1TOC:INPUT#1,I$(T):NEXT
370 CLOSE1:GOSUB450:RETURN
```

Here's the item-deleting subroutine, which uses a new function—CHR$( ):

```
380 IFC=0THENRETURN
390 FORT=1TOC:PRINT"{CLR}{2
    DOWN}":PRINTT;I$(T)
400 PRINT"{DOWN} PRESS RETURN
    TO CONTINUE OR
410 PRINT"{DOWN} SPACE BAR TO
    DELETE ITEM
420 GETA$:IFA$<>CHR$(13)THENIFA$
    <>" "THEN420
430 IFA$=CHR$(13)THENNEXT:
    RETURN
440 FORZ=TTOC:I$(Z)=I$
    (Z+1):NEXT:C=C-1
```

The subroutine for printing your wish list on the screen is as follows:

```
450 IFC=0THENRETURN
460 PRINT"{CLR}":FORT=1TOC:
    PRINTT;I$(T):NEXT
470 PRINT"{DOWN} PRESS ANY KEY
    FOR MENU.
480 GETA$:IFA$=""THEN480
490 RETURN
```

Here's another subroutine which communicates with a peripheral, your printer:

```
500 IFC=0THENRETURN
510 PRINT"{DOWN} PRINTING . . .
520 OPEN4,4:FORT=1TOC:PRINT#4,I$
    (T):NEXT:PRINT#4:CLOSE4:
    RETURN
```

If you don't have a printer, use these lines:

```
500 PRINT"{DOWN} NO PRINTER
    HERE":PRINT"{DOWN} PRESS
    ANY KEY TO CONTINUE . . .
510 GETA$:IFA$=""THEN520
520 RETURN
```

The last lines contain the subroutine to quit the program:

```
530 PRINT"{DOWN} ARE YOU SURE?
540 GETA$:IFA$=""THEN540
550 IFA$="Y"THENEND
560 RETURN
```

Next month we'll have more on communicating with peripherals.

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Randy Thompson

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"Program Merge" adds a feature that every BASIC programmer can use—the ability to merge BASIC programs. It's small, fast, and completely relocatable, so it won't interfere with other programming utilities.

Getting Started

Program Merge is written in machine language, but it's listed here as a BASIC loader. Using "The Automatic Proofreader," found elsewhere in this issue, type in the program and save a copy to disk.

By default, the machine language routine is stored in memory at 49152 ($C000). If you like, you can change the starting address to another location simply by changing the value of the variable SA in line 30.

Run the program. Program Merge prints the message PROGRAM MERGE INSTALLED AT *xxxxx*, where *xxxxx* is the starting address for the program. If you've made an error in your typing, you'll see the message ERROR IN DATA STATEMENTS.

Program Merge merges a program in memory with one on disk. Use the following syntax to merge a program on disk with one in memory:

SYS 49152,"*filename*",*drive#*

where *filename* is the name of the program to be merged and *drive#* is the device number of the drive in which the program is located. If you change the program's starting address, be sure to change the SYS address as well. If both programs contain identically numbered lines, the line on disk takes precedence—it is the one which will be placed in the resulting program.

How It Works

When a program is entered from the keyboard, typed characters are stored into an input buffer. When the RETURN key is pressed, the BASIC interpreter abbreviates the line into BASIC tokens, searches through program memory for the new line's proper location, and inserts it into the program. Program Merge does essentially the same thing. Each program line is read from disk into the input buffer. But since the line is already tokenized, Program Merge simply has to find the right place in memory and insert the line.

The key to making this routine work lies in changing two of the 64's vectors. One of these is the IMAIN vector, located at 770–771 ($302–$303). Every time a program line is entered, the computer jumps through this vector to enter immediate mode. Because merging program files requires inserting more than one line at a time, Program Merge redirects this vector to point to our merge routine.

The second vector that has to be changed is the ICLALL vector located at 812–813 ($32C–$32D). Whenever a line is inserted into a program, a CLR command is executed—closing all open files via the ICLALL vector. Program Merge needs to keep the program file being merged open, so the merge program changes this vector to keep the file open. Both of these vectors are restored to their original values when the merge is finished.

See program listing on page 89.

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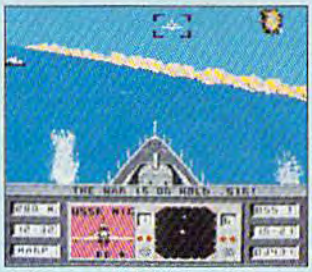

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The *GAZETTE* staff chose the winners of the contest. We've handed the entries over to Berkeley, who will put the cream of the crop onto a special shareware disk. We'll keep you posted.

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1st	GeoWar *Lysle Shields*	GeoSliders *Lester Gock*
2nd	Cluster Wars *Francis Kostella*	(No Entry)
3rd	Ultimate Stage *Roger Pingleton*	(No Entry)

EDUCATION

	Application	Desk Accessory
1st	Music Box *Obbie Zendik*	StatesNCaps *David Hall*
2nd	Bingo *Robert Rosenbaum*	(No Entry)
3rd	(No Entry)	(No Entry)

PRODUCTIVITY

	Application	Desk Accessory
1st	Dialog Box Editor *Stephen Van Egmond*	Text Print *Terry Van Camp*
2nd	GeoGraph *Ernest Hunter*	Get Directory *Nicholas Vrtis*
3rd	(No Entry)	(No Entry)

OPEN PROGRAMMING

	Application	Desk Accessory
1st	LaserMatrix *William Prendergast*	Fill Pattern Editor *Jason Clark*
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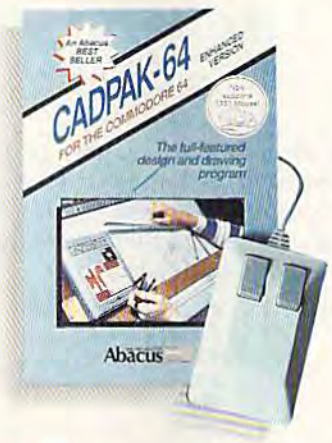

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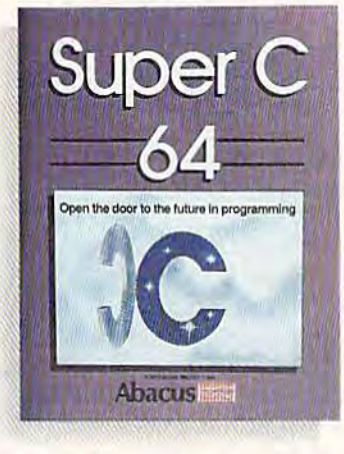

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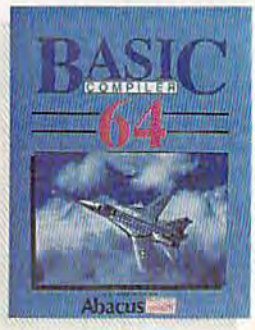

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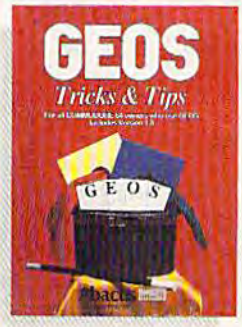

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machine language programming

Dressing Up GETIN

Jim Butterfield
Contributing Editor

Machine language programmers often prefer to use GETIN ($FFE4) for keyboard input, rather than the more sophisticated INPUT ($FFCF). With GETIN, they retain control of the system. Their programs can reject unwanted characters, check to see how long the user takes to type a character, or take action without the need for RETURN to be pressed.

But there are problems with using GETIN. Characters typed on the keyboard do not show on the screen (unless the program writes them there directly). The cursor doesn't blink, so it's not clear that the program requires input. If editing features are desired, the program has to do the work.

This month, we'll write a simple program which uses GETIN. It displays a prompt character and honors the delete key.

The program as given here allows only characters of the alphabet to be typed. No spaces, no numbers, no punctuation are allowed. It also limits the total number of characters that can be typed (the value is assumed to be stored at $20FF before the program begins).

The location of this program, $2000 (or decimal 8192), is not ideal for general programming. I chose it so that it can be used on all Commodore 8-bit machines. Let's look at the code.

Register X and address $2100 log the number of characters received on the input line. We start at 0, of course.

```
2000  LDX  #$00
```

Here's where we print the prompt. I've picked ASCII character 164, the underline character. We print a backspace character immediately following the underline, so that the cursor will be in the right place. I've decided not to print the prompt if the maximum number of characters have already been entered. So we compare X with the fixed limit value stored at $20FF and skip ahead if we don't want a prompt.

```
2002  STX  $2100
      CPX  $20FF
      BEQ  $2014
      LDA  #$A4     (the prompt)
      JSR  $FFD2
      LDA  #$9D     (cursor left)
      JSR  $FFD2
```

Now we get a character from the keyboard. We must restore the value of X, which might have been lost during the GETIN call.

```
2014  JSR  $FFE4
      LDX  $2100
```

If we haven't received any characters (that is, the register X equals 0), we won't honor the delete or return keys; instead we'll skip ahead to the character test.

The loop terminates if the return key is pressed.

```
      BEQ  $202A
      CMP  #$0D     (RETURN?)
      BEQ  $2040
      CMP  #$14     (INST/DEL)
      BNE  $202A
```

If we detect the delete key, we back up the counter and then call PRINT ($FFD2). PRINT will do the work.

```
      DEX
      JSR  $FFD2    (print delete)
      BNE  $2002
```

Here's where we check for a character of the alphabet. But we won't do this check if the line is full. So again, we check X against the contents of $20FF, the line limit.

```
202A  CPX  $20FF
      BEQ  $2002
```

If the character in the A register is less than *A* or greater than Z, we won't echo it and won't store it. This test also catches the "no character" case, which leaves a value of 0 in the A register.

```
      CMP  #$41     ("A")
      BCC  $2014
      CMP  #$5B     ("Z" plus 1)
      BCS  $2014
```

Our character is legitimate. We echo it to the screen and store it away. The X counter is bumped to the next value, of course. Then, we go back to do it all again.

```
      JSR  $FFD2    (Print)
      STA  $2101,X  (Store)
      INX
      BNE  $2002    (Always go back)
```

If we've detected a return character, we come to the following code. We'll store the character. Then we'll print a space to erase any remaining prompt character from the screen. Next, we'll print the return character to get to a new screen line.

```
2040  STA  $2101,X
      LDA  #$20     (space)
      JSR  $FFD2
      LDA  #$0D     (RETURN)
      JSR  $FFD2
```

Let's prove that we received the input correctly by printing it back out. Here comes the loop:

```
      LDX  #$00
204F  LDA  $2101,X
      INX
      JSR  $FFD2    (print)
      CMP  #$0D     (RETURN?)
      BNE  $204F
      RTS
```

Before running this program, remember to put a value into $20FF indicating how many characters you want as a limit.

If you'd rather enter this program in BASIC, type in the program found on page 98. Since it requires accurate typing, use "The Automatic Proofreader," found elsewhere in this issue, when you're entering the program. Be sure to save a copy to disk when you've finished typing.

Next Month:

Jim Butterfield Shows How to Pass Strings Between BASIC and Machine Language

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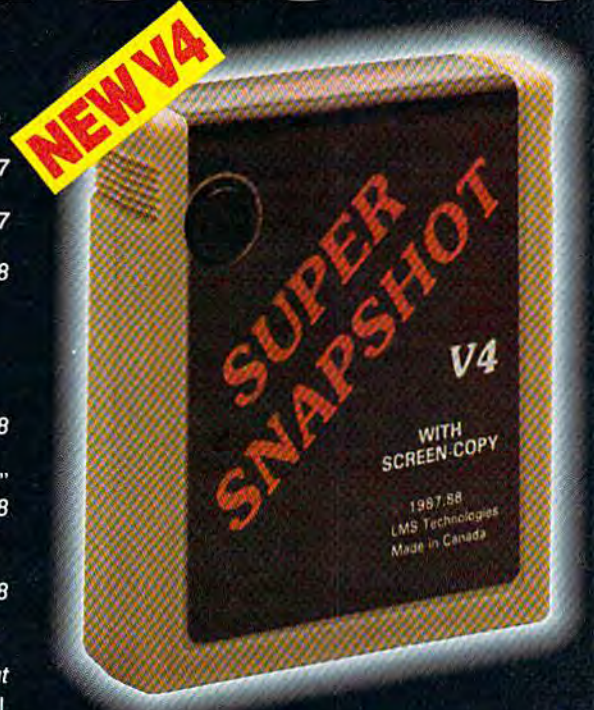

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the programmer's page

Randy Thompson
Contributing Editor

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

What's the first BASIC command that you learned to use? If you're like most people, it was the PRINT statement. PRINT, as explained in textbooks and programming manuals, sends output to the computer screen. But is that *all* it can do?

On the 64, PRINT has some hidden talents. With just three POKEs, you can make PRINT vocal as well as literate.

Printing in C Major

Type in and run the following one-liner. Be careful when entering the characters contained in quotation marks. Many of these are special graphics characters that are produced by pressing the SHIFT or COMMODORE key in conjunction with another key. There are also a few reverse-on and reverse-off characters. If you're unfamiliar with the way *GAZETTE* lists these characters, see "How to Type In *COMPUTE!'s Gazette* Programs," found elsewhere in this issue.

```
HK 10 POKE209,0:POKE210,212:PO
      KE211,0:PRINT"{K}H*IA@
      {RVS}{A}O{OFF}J{RVS}*
      {OFF}LA@{RVS}PO{OFF}L@
      {C}A@{RVS}{A}{OFF}@{RVS}
      X{OFF}G{*}";
```

By its appearance, you might expect this code to spew strange characters onto the screen. Instead, it plays a simple yet pleasing three-note chord in the key of C major.

To silence the sound, enter POKE 54296,0. This resets the SID chip's volume register, making the chord inaudible. You can enter this POKE from immediate mode or place it in a program line that follows the noisy PRINT statement. You can also turn the sound off by pressing RUN/STOP–RESTORE.

Sound Effects

Using the same technique, it's possible to generate a variety of sound effects for your BASIC programs. Here are just a few:

Ominous Error Noise

```
JK 10 POKE209,0:POKE210,212:PO
      KE211,0:PRINT"ØD HU{V}
      {RVS}{U}{OFF}@@@@@@@@<U@*
       @@@@@O";
```

Ringing Telephone

```
EA 10 POKE209,0:POKE210,212:PO
      KE211,0:PRINT"95*{RVS}@
      {OFF}S@{RVS}{A}{OFF}LA@@
      @@@QA F*@{RVS}{A}{OFF}@@
      @{RVS}<";
```

Plane Engine

```
FR 10 POKE209,0:POKE210,212:PO
      KE211,0:PRINT"{RVS}C
      {OFF}A{RVS} P{OFF}U@
      {RVS}{A}{OFF}LA@@@@@{+}A
       PA@{A}@@@{RVS}<";
```

Spaceship

```
BH 10 POKE209,0:POKE210,212:PO
      KE211,0:PRINT"{RVS}£
      {OFF}G {RVS}8{OFF}W@
      {RVS}{A}{*}{OFF}'@ØU@
      {RVS}{A}{OFF}{A}D@PA@@@T
      {RVS}{E}{OFF}?";
```

As with the chord example, you must execute a POKE 54296,0 to turn off these sounds.

How It Works

In many respects, PRINT is just a complicated POKE statement. POKE takes a number and stores it at a given address, while PRINT takes a character and stores it at a given screen location. In a sense, PRINT is just POKEing characters into screen memory. The sound programs listed above take advantage of this. Instead of POKEing characters to the screen, I use PRINT to POKE characters to the SID chip registers, thus producing sound. Not only is this method shorter than using 25 POKE statements, but it's much faster.

Three memory locations must be changed in order to direct the PRINT statement's output to the SID chip. The first two memory locations, 209 and 210, point to the address of the current screen line. The third location, 211, specifies the column number (0–79) at which the next character will be placed (the 64 has a logical line length of 80 characters). The address found at these locations determines where in memory—usually screen memory—the PRINT statement will store its characters. To calculate exactly where in memory the next character will be stored, enter PRINT PEEK (209)+PEEK(210)*256 +PEEK (211). To alter these locations, use the code POKE 209,*lb*:POKE 210,*hb* :POKE 211,0, where *lb* and *hb* are the low byte and high byte of the desired memory address.

To send printed characters to the SID chip registers at 54272 ($D400), I use the commands POKE 209,0:POKE 210,212:POKE 211,0. Now, the first character in each string is stored at location 54272, the next character is stored at 54273, the third character is stored at 54274, and so on. (Reverse-on and reverse-off codes don't count as characters because they only change the appearance of other characters; they do not produce any output by themselves.)

Determining which characters to PRINT is the hardest part of getting these sound routines to work. As you know, the computer stores characters in memory as ASCII numbers—the letter *A* is stored as an ASCII 65. But when sent to the screen, these characters are stored as *screen codes,* not in ASCII. To PRINT a 65 to memory, you must send a spade character (SHIFT-A), not an *A*. The screen-code value for an *A* is 1. For a complete list of characters and their corresponding screen-code values, refer to Appendix E in the Commodore 64's *User's Guide.*

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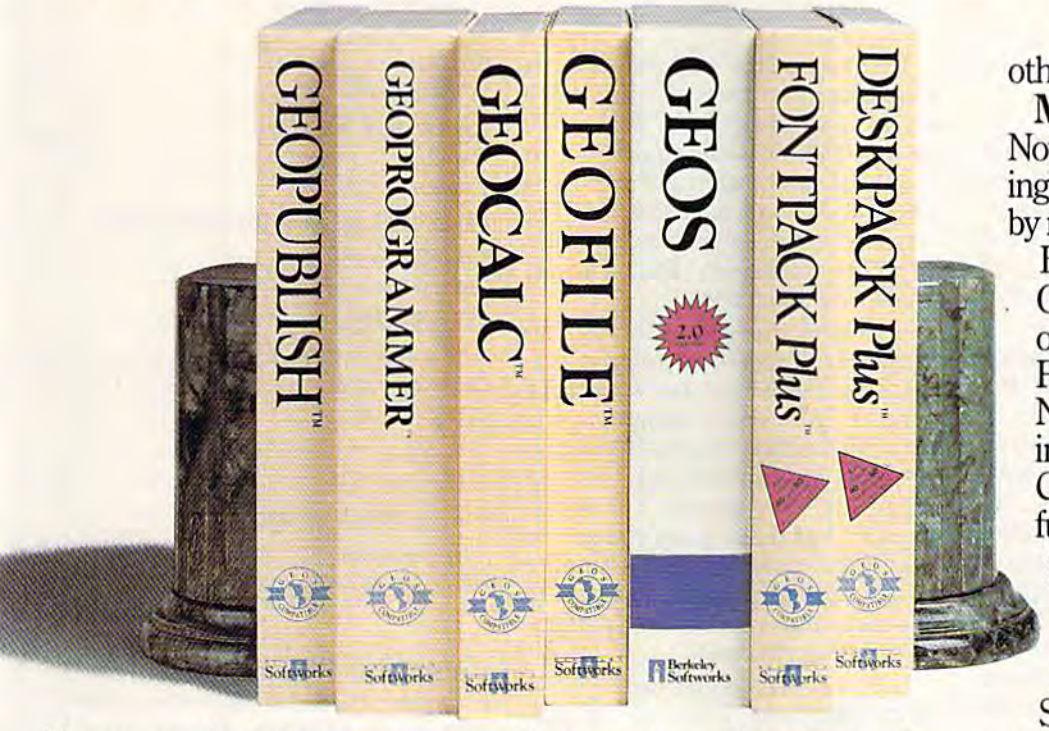

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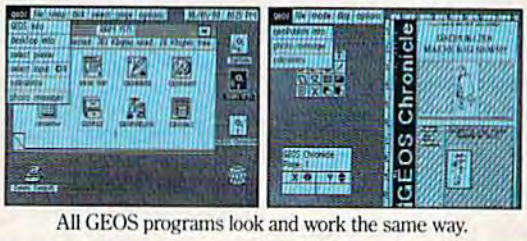

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Abusing Software

Rhett Anderson
Assistant Editor

Computers are the ultimate quick-change artists. Just pop a disk into the drive, boot up, and your computer has put on a disguise. It's no longer a computer; it's a word processor. Now it's a number-crunching spreadsheet. Now it's a game.

No matter how hard programmers try to fool you, though, there still is a computer underneath.

I started to think about this the last time I went to my parent's house in Ohio. My brother, Matthew, had fed a random text file into a spelling checker on my father's computer. He occupied himself by laughing at the suggestions the spelling checker made. When he found that for a lot of small nonsense words, the program suggested *Jew* as the correction, Matt stumbled across something that I've been thinking about ever since.

What is the meaning of this? Does it say something profound about the English language? That may be part of it, but my bet is that it says more about the algorithm used to select sound-alikes for English words.

Remember, while you or I would have a lot of trouble making heads or tails of a random sequence of characters, the computer isn't surprised at all—to a computer, all text is created equal, be it Shakespeare, a high school term paper, or random gibberish. Its algorithm tells it to take things one word at a time. Inside the word, it takes one sound at a time.

For an example, look at the sentence *The ghoti made for a good meal.* The spelling checker's dictionary recognizes every word but one: *ghoti.*

A person might translate the sentence like this: *The goatee made for a good meal.* A goatee is a tuft-like beard. Something's wrong here.

A computer program might also suggest *goatee.* What else might it suggest? Let's take it one sound at a time. *GH*—how about an *F* sound, as in *enough? O*—how about an *I* sound, as in *women?* TI—how about a *sh* sound, as in *translation?* The word? *Fish.* Thus, *The fish made for a good meal.*

Indeed, that's just the way that programs designed to suggest correct spellings work—one sound at a time. If you abuse programs the way my brother did, that's the kind of thing you can find out. And the word *Jew?* My guess is that the sounds that make it up happen to match the sounds in a good number of short nonsense words (at least to the algorithm used in that particular spelling checker).

Some people are employed to abuse programs. These are the program testers. At large software companies, you could probably find a roomful of people playing the next hot computer game or laboring over a new spreadsheet's documentation. Smaller companies hire outside beta testers to catalog the bugs in their programs.

The next time you sit down in front of a program, don't use it—abuse it.

Our Readers' Faces

"Horizons" thanks the many readers who sent in their favorite telecommunications faces. If you missed the September column, these are the faces that people make when they communicate with each other over an online service like CompuServe or Q-Link. (Tilt your head to the left to see the faces.)

:D a big smile
Doug Grabowski Jr.
Clinton, CT

(Doug found this one in a reproduction of a newsletter printed on page 15 of the September *GAZETTE.*)

(8-) someone wearing glasses
Jim Turk
Virginia Beach, VA

:-& tongue-tied
Wes Biggs
Sebastopol, CA

?B) a cool dude with wavy hair
Scott Silverman
Los Angeles, CA

o) a cyclops
B. "Cyclops" Mitchell
Long Beach, NY

!-(a pirate
L. Borshard
Parsippany, NJ

>:I an angry programmer
Joseph Mancuso
Staten Island, NY

Complaint Department

For heaven's sake! What is the matter with Rhett Anderson, claiming that the word horizons *"comes indirectly from the Greek word* kyklos, *meaning* a bounding circle . . .*"?*

Any standard American Heritage dictionary would have told Rhett—had he taken the two minutes it takes to look it up—that horizon *comes directly from the Greek* horizon, *from the present participle of* horizein (to divide, separate), *from* horos (boundary, limit).

In working with words, one of the first obligations of a writer or editor is to remain true to their lexical meanings, if used in a serious context (which I presume the column was meant to be). If this quality is lacking, the credibility of the whole piece can be called into question by purists or not-so-purist readers such as me.
F. Paul Kosbab
Tulsa, OK

Here is the derivation from the Random House dictionary I used: [<L <Gk *horizōn (kyklos)* bounding (circle)]. It looks as though *horizon* meant *bounding* and *kyklos* meant *circle.* Thanks, Paul, for clearing up the "Horizons" identity crisis.

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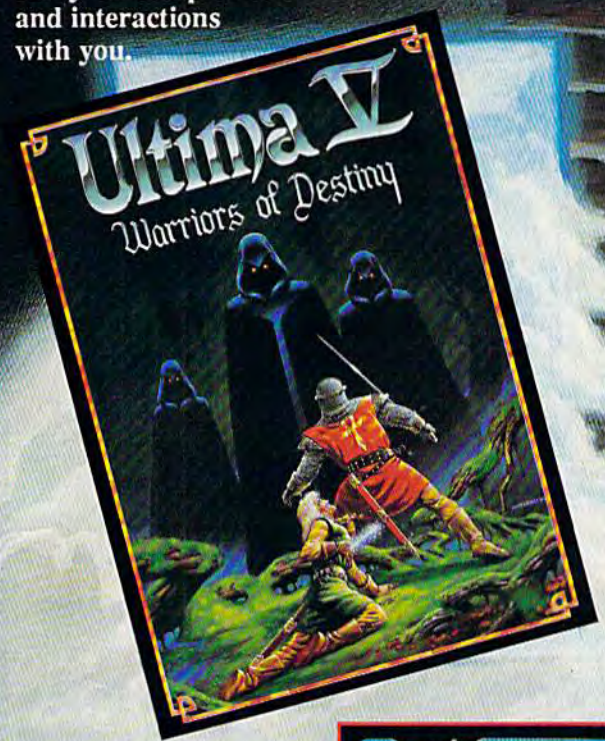

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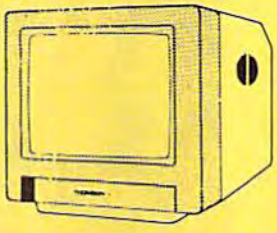

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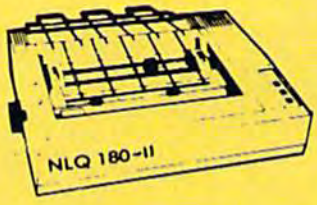

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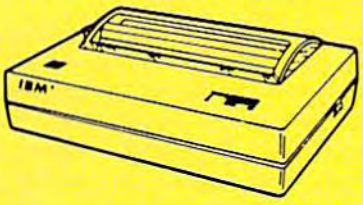

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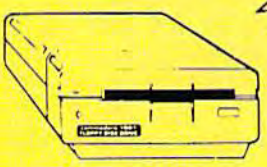

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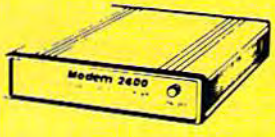

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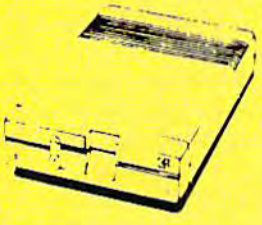

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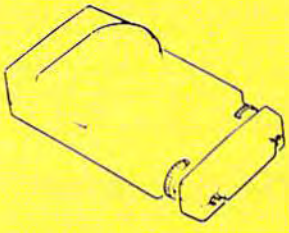

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d'iversions

An Electronic Field Trip

Fred D'Ignazio
Contributing Editor

In a recent nine-nation Gallup survey conducted for the National Geographic Society, half of the adults did not know that Nicaragua was the country where the Contras and Sandinistas are fighting. Almost a third couldn't identify a single member of NATO.

This survey also found that adult Americans' map-reading skills were abysmal. When asked to identify states in the U.S., adults could correctly identify fewer than six of every ten states. More than half of the adults couldn't find Japan on a world map; one out of seven could not find the U.S. And a third of all adults could not use a road map correctly.

The U.S. also has the distinction of being the only country surveyed where its students score worse than its adults. In a recent geography test taken by young adults, ages 18–24, the Americans came in last, behind their peers in Sweden, West Germany, Canada, Mexico, Italy, Great Britain, and Japan.

Just What Is Geography?

Try putting the above question to a geography teacher—if you can find one. Only two states require students to take geography before graduation—and then only as a filler subject between social studies and history. And fewer than 10 percent of our country's geography teachers majored in the subject in college. According to the *Washington Post*, the real problem is that nobody seems to have thought out exactly what geography is.

The National Geographic Society is the big exception. After a hundred years of thinking, it says geography "deals with the physical and cultural realities of the world. It helps us understand the varied and complex environments of the Earth. It gives meaning to location and establishes a context for understanding the connections among places."

The Society tries to teach geography with a variety of excellent magazines, videotapes, and books. But to really learn geography, you have to travel. In the context of school, travel means field trips. Students must leave the classroom and take field trips all over the world. They must consult maps and plan their journeys. They must research their journeys before they leave and try to match their research with careful observation while traveling.

A New Kind of Field Trip

Unfortunately, field trips are not the answer to most students' awful ignorance of geography—at least not real field trips to real places. As any teacher knows, field trips are expensive, time-consuming, and laborious. It's not easy to pack 30 kids into a school bus and then drive them around the countryside.

The only alternative to real field trips—and to futile textbook memorization—is the *electronic* field trip. For example, a teacher can take an entire class on an electronic field trip by showing them a videotape depicting faraway places. The students' imaginations and senses are uplifted, but their bodies remain in the classroom.

Videotapes are wonderful, but they are a passive medium, not interactive. Students are swept along on magic carpet rides, but there isn't a steering wheel.

The new interactive videodisc technologies, including CD-I and DVI, offer the greatest hope for electronic *interactive* field trips. In my September column, "Murder at Palenque," I described a wonderful computer-videodisc field trip at Bank Street College. Using a joystick, students can "walk" around the ruins of the ancient Mayan city of Palenque, deep in a Central American jungle. By clicking on an onscreen icon, children can call up expert tour guides who tell them vital facts about Palenque's history, economy, and culture. The feeling of being in Palenque is awesome. And, with the joystick, students have full control over the journey. They can amble about like careful archaeologists or blast up the temple stairs on electronic dirt bikes.

Why Am I Here?

If children are going to learn geography on their electronic field trips, the trips must combine several elements. They must appeal to children's senses and imagination so that they feel as though they're vicariously experiencing a real journey and going to a real place. They must give children control over the journey—children "pilots" and "navigators" must be able to turn left, turn right, and explore wherever their fascination and curiosity lead them. The experiential journey children are making through space must be linked with a conceptual journey through "knowledge space"—children's sensory impressions must be embedded in geography concepts and in real knowledge about a locale's history, people, and the life-and-death issues they face. Last, trips must give children a motive for traveling—visits to faraway places are interesting if the sights are spectacular or the journey is wild, fast-paced, or dangerous; but not all places are like this. For an electronic field trip to capture children and concentrate their attention and imagination, it must give the children a mission—a task to accomplish, a problem to solve, a challenge that cannot be refused.

Next month, I'll look at software that takes children on electronic field trips.

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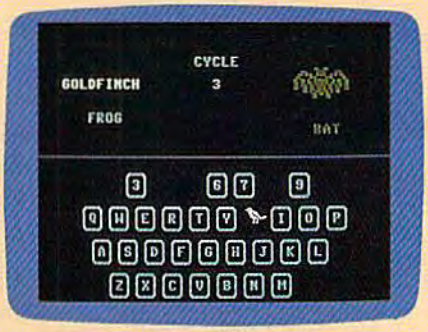

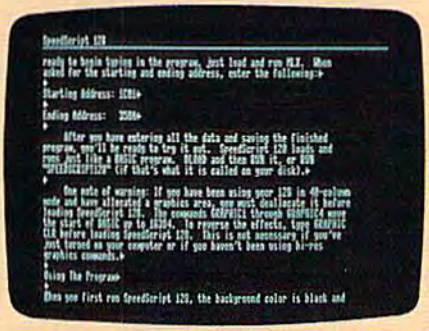

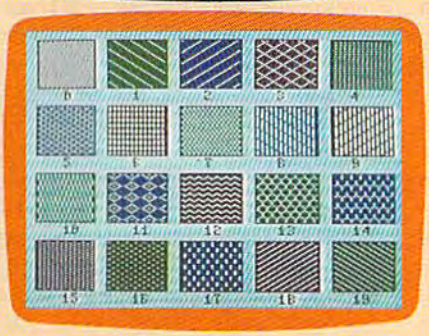

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DIGI-SOUND

Roger Freeman

"Digi-Sound" is your 64's passport to the world of digitized sound. You can record the music of Bach or the Beatles, or the sounds of trains, ducks, sirens—anything, in fact—and then use them in your own programs.

Digi-Sound works by using your computer to analyze and store the sound information that is transmitted by a standard Commodore Datassette, which is normally used for program and data storage.

Getting Started

There are two versions of Digi-Sound. Program 1 is the 64 version. Program 2 is for the 128. Both versions are written in BASIC with machine language routines in DATA statements. Type in the version for your computer. To ensure accuracy, you should use "The Automatic Proofreader," found elsewhere in this issue. Be sure to save a copy to disk after you've finished typing. *(Note: Do not make any changes to the 128 version of the program; if the program is lengthened, it may overwrite a critical portion of memory.)*

Ready to be amazed? This program brings sound and music from the real world directly into your Commodore 64 or 128. A Datassette and a disk drive are required.

When you're ready to use Digi-Sound, load and run the appropriate version. You'll see a menu with several options (six if you're using a 64, seven if you're using a 128). Choose option 1 to digitize sound from a tape in the Datassette. Press PLAY on the Datassette. The screen blanks and, depending on the type of sound, the computer digitizes anywhere from 10 to 20 seconds' worth of sound (30 seconds to two minutes on the 128).

To play the sound back, choose option 2. To save the sound in memory to a disk file for later use, choose option 3. Option 4 is used to load a sound from disk into memory. Keep in mind that the disk files saved by Digi-Sound are 178 blocks long (430 blocks on the 128). Option 5 lets you preview the way that your sounds will digitize. The sound is *not* being saved to memory when you use this option. In the 128 version of the program, you can view the disk directory with option 6. To quit the program, choose option 6 on the 64 or option 7 on the 128.

In the 128 version of the program, the filenames for loads and saves must be no longer than 14 characters because the sound information is saved as two files. The second file uses the same filename with a ".2" appended to the end.

The files saved by both versions of Digi-Sound can be used independently of Digi-Sound. This lets you easily trade sounds with friends or upload them to electronic bulletin board systems. To load a digitized sound file on the 64, simply type LOAD"filename",8,1. Type SYS 49152 to hear the sound. On the 128 you must load two files.

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First type BLOAD"filename",b0,p9728. When the first file has finished loading, load the second by typing BLOAD"filename.2",b1,p9728. After the second file has loaded, type BANK 0, then FAST. If you are in 40-column mode, your screen goes blank. Now type SYS 64000 to play back the sound. After the sound has stopped, type SLOW if you are in 40-column mode to return to the normal screen.

How It Works

Digitizing is the process of storing video or audio information as numbers. Digitized audio information can be played back by a computer to form an approximation of the original sound. Digitized sounds are known as *samples*.

The sounds that you digitize with Digi-Sound will not have the quality of the original sounds on tape. The primary reason for this is that the Datassette was never intended to do what it's being used for in this program. The only information the Datassette transmits is whether there is sound or not. It doesn't transmit the volume of the sound.

Digi-Sound works by toggling one of the SID chip's volume registers between 0 and 15. This click, when produced very frequently, creates the sounds that you hear. The sound information in the 64 version is stored in BASIC's RAM from 4096 to 40959—a total of 36,863 bytes of storage.

In the 128 version of Digi-Sound, the sound data occupies BASIC's RAM from 9984 to 63999 in bank 0, and the same area in bank 1. The 128 version uses 108,030 bytes of memory in this area. The 128 is slowed down because it must switch banks quite often. To compensate, the program takes advantage of the 128's fast mode during digitization and playback.

When you're in continuous-play mode, the only way to exit is to press RUN/STOP-RESTORE.

Sound Tips

The following information should help you to produce long-playing, high-quality samples. First of all, the fewer the number of sounds playing at one time, the better the quality of the sample. Classical music seems to work very well, while rock music with many different instruments produces a more cluttered-sounding sample. If you digitize a person talking, you'll have a fairly clear recording if the spoken words are enunciated clearly. The Datassette doesn't transmit a signal if the sound is too quiet, so make sure that the sound, music, or voice has been recorded at a fairly high volume.

On the Commodore 64, voices last around 20 seconds or more, classical music lasts about 17 to 18 seconds, and rock music lasts about 10 seconds. On the Commodore 128, voices last around two minutes, classical music lasts around one minute, and rock songs last around 30 seconds. If you own a Commodore 128, be sure that you use the 128 version, because the quality and length of its digitization are significantly better than the 64 version's.

See program listings on page 89.

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MATERIALIZER

Peter M. L. Lottrup

Create sensational pixel-by-pixel fade-ins and fade-outs of any Commodore 64 text screen with this amazing graphics utility for BASIC programmers. Disk drive required.

Looking for a way to spice up your programs or make them unique? "Materializer" is a short machine language utility that adds text-screen fade-ins and fade-outs to your BASIC programs. The utility is fully compatible with custom character sets. It does not use any BASIC memory.

Typing It In

Program 1, Materializer, is written entirely in machine language. To enter it, you must use "MLX," the machine language entry utility. When you run MLX, you are asked for the starting and ending addresses of the data you'll be entering. The MLX prompts, and the values you should type in, are as follows:

Starting address: CC00
Ending address: CD62

Be sure to save a copy to disk with the filename ML-MAT before exiting MLX.

Program 2 is a demo program that shows you how to use Materializer's features. The demo checks to see if the ML routine is in memory. If it isn't, the demo attempts to load it as ML-MAT.

Special Effects

To load Materializer, type LOAD "ML-MAT",8,1. To activate Materializer from within your program, use the command SYS 52224. The screen clears. Everything you print after this will be invisible until you choose to materialize it.

When you've created the screen that you want to materialize, start the effect with the statement SYS 52227. The speed of the fade-in depends on the value at address 680. A value of 0 results in the fastest speed. A value of 255 is the slowest. (For example, POKE 680,255 for a slow fade.)

Use SYS 52230 to dematerialize the screen. Like the fade-in speed, the fade-out speed depends on the value at address 680.

SYS 52233 deactivates Materializer. If you press RUN/STOP while the character set is invisible, you'll have to type SYS 52233 to restore the computer to normal. Pressing RUN/STOP–RESTORE resets the video chip to BANK 0 RAM but leaves the text-screen pointer at the wrong address. Type POKE 648,4 to restore the computer to normal.

Program Notes

The routine works by switching the character set from ROM to RAM. It copies the character set to $A000–$A7FF (under BASIC ROM). The materialization is then created by turning on selected bits as the character patterns are copied to $C000. The fade-out effect is created by resetting individual bits of the character patterns in the same way.

While the routine is active, any POKEs or PEEKs to the text-screen or sprite-pattern pointers should be directed to the alternate memory at $C800–$CBFF. Custom characters should be copied to memory, at $A000, before the materializing call (SYS 52227) is used. The demo program provides an example of this.

While the routine is active, Materializer uses memory at $A000–$A7FF, $C000–$CD62, and some zero-page locations.

See program listings on page 91.

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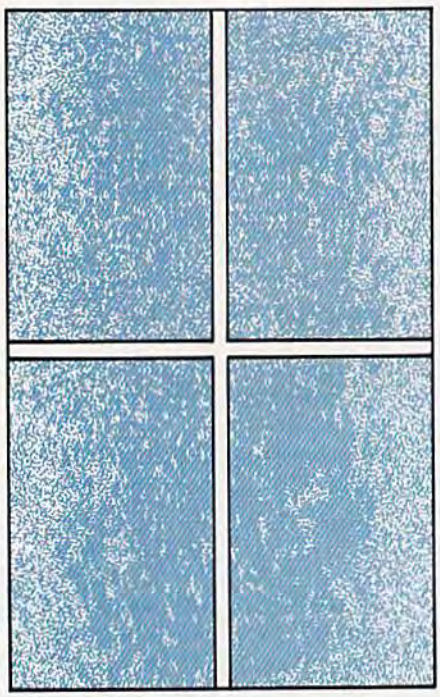
Dynamic Windows

Michael Broussard



You might think that the snazzy pop-up windows found in commercial software would be difficult to create and use in your own programs, but with "Dynamic Windows," they're a snap. For the 64 with disk drive.

Many programs display information in pop-up windows on the screen. These windows appear and disappear at the touch of a button or key, and when they go away, the screen is restored as if the window had never been there. If you want to give your BASIC programs a professional look, try "Dynamic Windows," a powerful utility that can control up to 20 independent windows.

Dynamic Windows is packed with features. You have full control over color, borders, and text formatting. The windows can even overlap.

Getting Started

Program 1, Dynamic Windows, is written entirely in machine language. Type it in with "MLX," the machine language entry program found elsewhere in this issue. When MLX prompts you, respond with the values given below.

Starting address: C000
Ending address: C2AF

Carefully enter the data for Program 1. When you've finished typing, save the program to disk with the name WINDOW.OBJ. The demo program expects to find a file of this name when it is run.

Program 2 is a BASIC demo that shows how the pop-up windows work. To ensure accuracy, enter it using "The Automatic Proofreader," found elsewhere in this issue. Be sure to save a copy to disk before you run it.

The demo program first clears the screen and fills it with boxes. It then opens and closes windows at random locations on the screen based on your selections from a menu (which is also displayed in a window). If you study the listing carefully, you'll see that the first thing the demo program does is load the file WINDOW.OBJ (line 20). You'll need to do this in any program you write that uses Dynamic Windows.

Windowing Commands

Dynamic Windows offers two commands to BASIC programmers. The first command opens a window. The syntax for this command is

SYS 49152,*row*,*col*,*height*,*width*,*color*,*text*

The parameter *row* is the row at which the window is to begin on the screen. Rows are numbered 1–24. The next parameter, *col*, is the column where the window is to start on the screen. Columns are numbered 1–40. Use *height* and *width* to set the size of the window in characters. Both *height* and *width* must be at least 3. The parameter *color* is the background color to be used for the window, according to the values shown in the accompanying table. ▷

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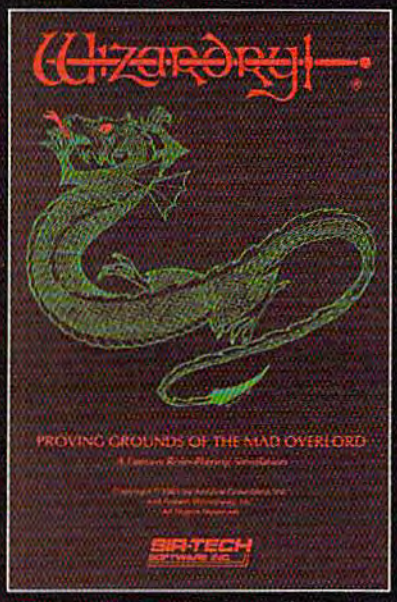

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Colors

Number	Color	Number	Color
0	Black	8	Orange
1	White	9	Brown
2	Red	10	Light red
3	Cyan	11	Dark gray
4	Purple	12	Medium gray
5	Green	13	Light green
6	Blue	14	Light blue
7	Yellow	15	Light gray

The final parameter, *text*, is a string to be displayed in the window. This parameter is optional—if you omit it, the window will be left blank. (If you leave out the string, also omit the comma preceding it.)

A single-character border surrounds the window, so the minimum window size is 3 × 3. If you specify a window that small, you end up with mostly border, as there will only be one character left in the center to contain any data.

If you specify a string to be displayed in the window, the first character of the string is displayed in the upper left corner. Subsequent characters of the string fill in the rest of the first row. The string continues on the next line if it is too long for one line. If the string is longer than the area of the interior of the window, the extra characters are ignored, and if the string is shorter, the rest of the window is padded with spaces.

Formatting Text

The left-arrow character (←), when embedded in a string, tells Dynamic Windows to continue the string on the next line and pads the rest of the current line with spaces. The up-arrow character (↑) is replaced by five spaces in the window—you can think of it as a tab character.

As an example, suppose you want to open a red, 3 × 6 window centered at the top of the screen. Since the window will have a border, its real size is 5 × 8. In order for the window to be centered, it should start in column 16. Also suppose you want to center the word *TEST* on the second line of the window. To accomplish this, set some string variable—say, S$—to "← TEST". The ← character causes the first line of the window to be left blank. The second line will contain a space and the word *TEST*. The rest of the window will be blank.

In order to display a lot of text in a window, you may need to build a string longer than 80 characters. This is done using several program lines:

```
10 S$="THIS IS A PRETTY LONG
   STRING"
20 S$=S$ + " AND NOW IT IS EVEN
   LONGER"
30 S$=S$ + " AND LONGER."
```

With this technique, the maximum length of a string is 255 characters, or enough to fill a 16 × 16 window. If you want more text than this in your window, position the cursor in the window and display the text with the PRINT statement.

To close an open window, use the statement

```
SYS 49155
```

This closes the last window opened and restores the screen. You can close more than one window with the same SYS if you like—just specify the number of windows to close. For example,

```
SYS 49155,3
```

closes the last three windows opened.

Any of the parameters to the open or close subroutines can be expressions. For example,

```
SYS 49152,X+3,SQR(64)+2,6,N+14,C,"
  LINE 1"+"← LINE 2"
```

works fine, with the size, placement, and color of the window dependent on the values of X, N, and C.

Technical Notes

The default window-border character is a space (screen code 32), but you can change this to any character you wish by POKEing the appropriate screen code into location 49838. The demonstration program selects border characters at random, choosing from among screen codes 32, 102, 214, 127, and 215 (a complete list of screen codes can be found in the *Commodore 64 Programmer's Reference Guide*). Also, the windows are displayed in reverse video, so that the color you specify becomes the window background color and the characters within the window are the same color as the screen background. If you prefer, you can have a solid-colored border around your window, with the characters displayed in the window color and the window background color the same as the screen color. This is accomplished with the commands

```
POKE 49838,160:POKE 49839,0
```

(The default values for those locations are 32 and 128, respectively.)

If you try to open more than 20 windows at once, you'll get an ?OUT OF MEMORY error. If you try to close more windows than are currently open, you'll get an ?ILLEGAL QUANTITY ERROR. Attempting to define a window that is too small or that will not fit on the screen generates an ?ILLEGAL QUANTITY ERROR. You will also get this error if you try to specify a window color identical to the default background color.

When a window is opened, the original text hidden behind the window is copied into a buffer so that it can be restored when the window is closed. This buffer can hold about 8192 bytes, or 4096 characters of windows and associated colors. If you open too many large windows simultaneously and the buffer gets full, you get an ?OUT OF MEMORY error even if you haven't opened all 20 windows. The demonstration program guards against overflowing the buffer by limiting the number of windows you can open.

Be sure to close a window using the appropriate SYS call when you've finished with it. Clearing the screen erases the display, but any windows are still logically open. You can find out how many windows are open at any given instant by PEEKing the value at location 2. You can close all open windows at once with the following statement:

```
SYS 49155,PEEK(2)
```

Or, if you want to get rid of all open windows without restoring the underlying text on the screen, you can clear the screen and then POKE 2,0.

When developing a BASIC program that uses windows, be sure to save your work often. If your program aborts for any reason, be sure to poke a 0 into location 2 before restarting it. Windows does a lot of checking, but if you restart an aborted program without closing all open windows, you may lock up the system.

See program listings on page 95.

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1986

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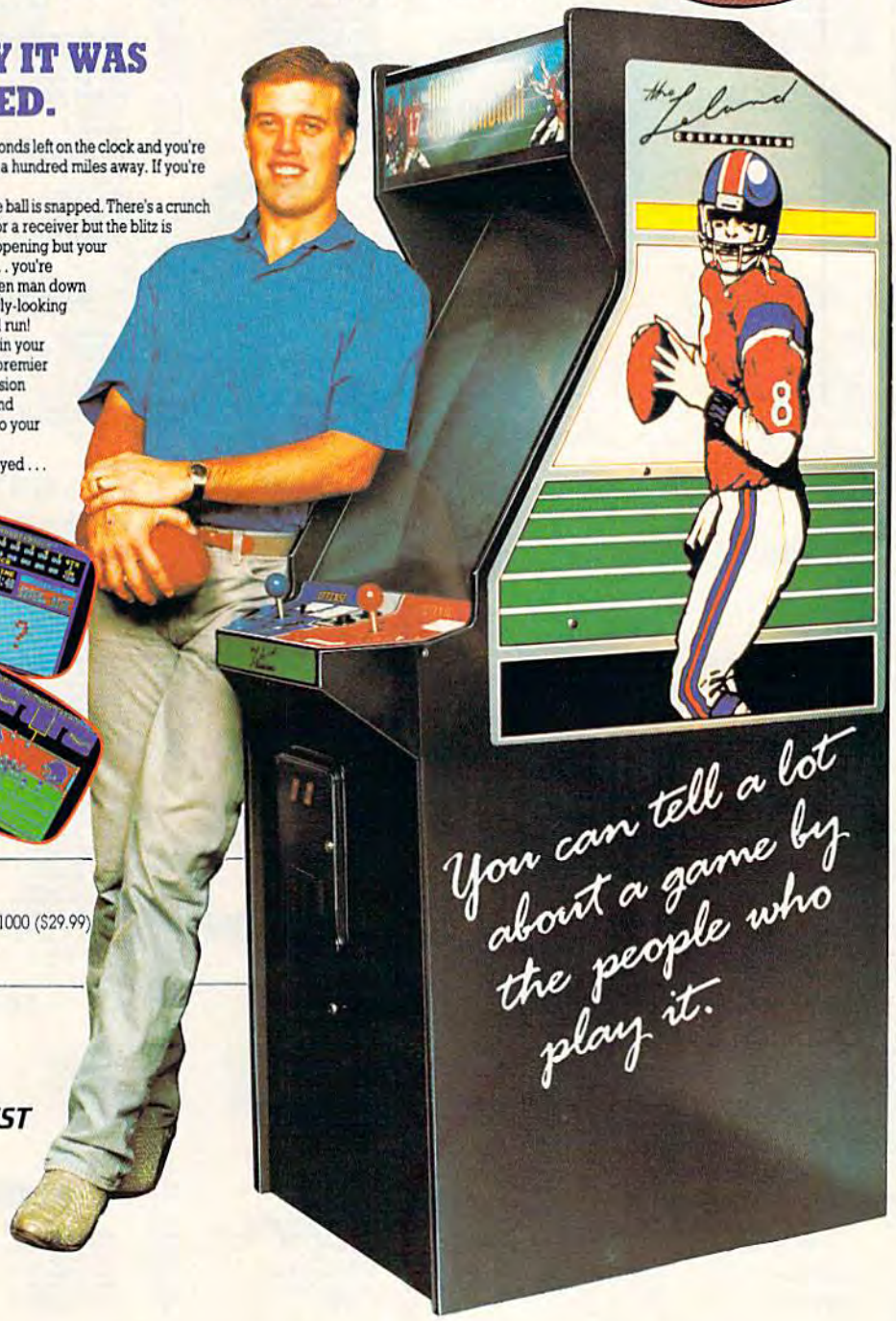

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- Subscription service is a great innovation. *B.C., CA*
- Excellent! It's all I'll use! Keep up the good work. *J.D., NH*
- Finally, the last copier I'll need to buy!!!!!! *P.G., NC*
- Thanks for (your) user support! *A.S., TX*
- C64 owners have needed this for quite some time. *R.C., NY*

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- Relocatable Fast Loader: Now you can fast load all your 1581 files with this super quick fast loader.
- Partition Creator: Open partitions easily with this simple to operate utility. Even a novice can use it.

And as if this weren't enough, included with each toolkit is our 1581 DOS Reference Manual. Over 100 pages of valuable inside information on your 1581 disk drive. Written by David Martin (INFO magazine's Copy Corner reviewer), this manual represents about a year of investigation and research results. Also included with your 1581 TOOLKIT is a variety of handy utilities, including an M/L monitor with Drive Mon, written especially for the 1581 DOS Reference Guide. We could go on and on, but the sooner you order the 1581 TOOLKIT, the sooner you'll experience the finest!

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QUICK!

Turn your 1541 disk drive into a real speed demon with this outstanding utility for the Commodore 64.

Adib Zaky

Although it's much faster than a tape drive, most people would agree that the 1541 disk drive is still slow. Several turbo loaders have been introduced to alleviate the problem. Unfortunately, some of them interfere with other devices attached to the serial bus, while others can't load certain programs because of timing problems. "Quick!" avoids such problems and speeds up both LOAD and VERIFY operations.

TYPING IT IN

Program 1, Quick!, is written in machine language, so it must be entered with MLX. When MLX prompts you, respond with the values given below.

Starting address: 9B00
Ending address: 9EFF

When you've finished typing, be sure to save a copy of the program with the name QUICK155. (The number 155 refers to the memory block at which Quick! starts.)

Program 2, "New Quick," is a BASIC program used to relocate Quick!. Type it in using "The Automatic Proofreader," included elsewhere in this issue. Save a copy of the program to disk with the name NEW QUICK.

GETTING STARTED

Quick! is easy to use. To load and activate it, you need three commands:

```
LOAD"0:QUICK155",8,1
NEW
SYS155*256
```

Once Quick! is activated, it changes the LOAD/VERIFY vector to point to itself. It remains active until it is disabled or until you press RUN/STOP–RESTORE. Reenable Quick! with the command SYS155*256.

Don't press RUN/STOP–RESTORE while Quick! is loading or verifying a file. Doing so will lock up your disk drive and could corrupt your disk. If you need to interrupt a load or verify operation, press RUN/STOP. To disable Quick!, type SYS155*256+3.

Quick! is transparent to the user. Use the LOAD and VERIFY commands as always. The only difference you'll notice is a blank screen and a shorter load time. Most programs work fine with Quick!.

HOW IT WORKS

Quick! first determines whether the requested operation is a disk-directory or tape operation; in either case, it passes control back to the ROM routines. Otherwise, Quick! inserts the filename into the disk drive program and writes both into the drive memory. When the program has loaded into the drive, Quick! displays a SEARCHING FOR *FILENAME* message. When the file is found, the screen blanks and the load or verify begins. In the case of a verify error, Quick! returns an error message and specifies the exact memory byte (not line number) at which the error occurs.

The following loading times were obtained in a rough test:

Length of file (blocks)	Quick! (sec.)	Normal LOAD (sec.)
5	3.5	5
20	6.0	15
30	7.0	21
60	10.5	40.5
126	18.8	83

Verify times show a similar improvement. The longer the program, the greater the advantage of Quick!. With a 126-block program, Quick! is more than four times as fast as the normal load routine.

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DTR Signal Support?	Yes	No	Yes	No
High Speed Detect Line?	Yes	No	No	No
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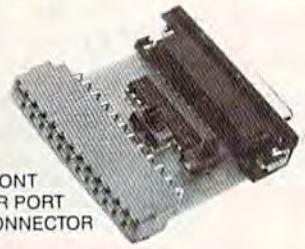

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MOVING QUICK

Quick! resides in blocks 155–158 ($9B00–$9E00) and uses block 159 ($9F00) for storage. If your program uses these blocks, you can change Quick!. The problem is that 6502 machine language is generally not relocatable. The solution is the BASIC program New Quick. New Quick creates a new version of Quick! (from an existing one) in any five-block area of memory.

To use New Quick, load Quick! and type NEW; then run New Quick. You are prompted for the source and destination blocks. At the prompt for the source block, enter the load address of Quick! divided by 256. At the prompt for the destination block, enter the new address divided by 256.

For example, if you wanted to create a version of Quick! that loads at block 202 from one that already exists at block 155, you'd answer the prompts as shown below:

```
SOURCE BLOCK(DEC)? 155
DESTINATION BLOCK? 202
```

You would need to enter both values as decimal numbers. (As you've probably noticed, Quick! must be located on an even 256-byte boundary.)

After New Quick has created the new Quick!, it asks whether you wish to save the new program. If you want to save the new version, press Y and type the filename. New Quick will save the new version of Quick!. (It's a good idea to name the files according to where they are located. For example, the original Quick! is stored with the filename QUICK155.)

When New Quick has finished, the new Quick! has been created at the desired location in memory and can be activated by the proper SYS command. If the new Quick! starts at block 192 ($C000), for example, it may be activated by typing SYS 192*256, or disabled by typing SYS 192*256+3.

INSIDE THE PROGRAM

Although Quick! is tolerant of errors, it isn't as tolerant as the Kernal ROM load and verify routines. A dirty or misaligned read/write head may cause Quick! to malfunction. If a program simply will not load with Quick! enabled, you can always disable Quick! and use the standard load routine.

Quick! actually consists of two programs—one in the computer and one in the disk drive. At the beginning of each load or verify operation, Quick! writes the disk drive subroutine, together with the filename, into blocks 5 and 6 of the drive's memory. This is followed by a "UC" command that causes the drive CPU to JMP to the beginning of the subroutine. The subroutine locates the desired file, reads its data from the disk, and transfers the data to the program in computer memory using a two-bit parallel technique.

Quick! is stable. It works perfectly well with a printer or other serial device connected to the serial bus. The reason is that it does not use the ATN line once the disk drive responds to the computer. The transfer of data is controlled by careful timing and proper manipulation of registers in the disk drive and computer. Because of its need for careful timing, Quick! can have trouble if sprites are turned on while it's loading. This is because sprite direct memory access (DMA) steals clock cycles from the microprocessor. To avoid this problem, turn off sprites during load and verify operations.

Quick! speeds up the load and verify operations, but it doesn't get involved in any other operations on files such as OPEN, PRINT#, GET#, INPUT#, or SAVE. Quick! also doesn't interfere with tape drives.

QUICK! AND *SPEEDSCRIPT*

Even though *SpeedScript* uses nearly every available byte of RAM, adapting it to use Quick! is easy. First, you need to use New Quick to create a copy of Quick! that starts at block 202. This is the highest block of RAM in which Quick! can execute. Next, you need to load *SpeedScript* (version 3.0 or higher) and type in the following line in direct mode:

```
POKE 2481,202:SAVE"0:filename",8
```

where *filename* is the name of the new *SpeedScript* file.

To use *SpeedScript* and Quick! together, simply load Quick! and activate it with the commands

```
LOAD"QUICK202",8,1
NEW
SYS202*256
```

Then, load and run *SpeedScript*.

See program listings on page 97.

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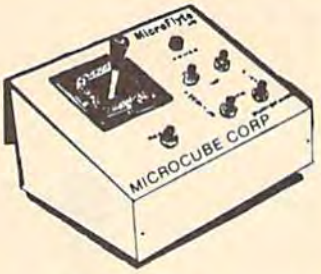

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3 TECHNICAL PROGRAMS

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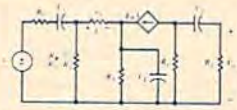

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1526 PRINTSCREEN

James Host

Would you like a hardcopy of your computer art? Looking for a way to make permanent records of your high scores? Try "1526 PrintScreen," a memory-resident screen dump that is activated by a simple key combination. It prints just about any screen the Commodore 64 can display. It works well with hi-res screens, text, custom characters, sprites (expanded or normal), and even extended-color background screens.

The 1526 version of PrintScreen works only with Commodore 1526 or MPS-802 printers. If you have a 1525 or an Epson-compatible printer, use "PrintScreen" from the December 1987 issue of *COMPUTE!'s Gazette*.

This amazing machine language screen dump sends absolutely everything on your 64's screen to the printer—including hi-res graphics, sprites, and redefined character graphics. For Commodore 1526 or MPS-802 printers only.

Typing It In

PrintScreen is written entirely in machine language. To enter it, you must use "MLX," the machine language entry utility. When MLX prompts you, respond with the values given below.

Starting address: 0801
Ending address: 0EE8

Follow the MLX instructions carefully, and be sure to save a copy of the 1526 PrintScreen data before exiting MLX. Although it is written in machine language, 1526 PrintScreen can be used just like a BASIC program.

To use the program, just load it and type RUN. Next, load and run the program that creates the screen you would like to print. When you want to print the screen, hold down the Commodore key and tap RESTORE. The screen freezes. When you release the Commodore key, your screen will begin to print. (Note that the sprites will disappear from the screen during the screen dump, but they will be printed.) After the screen dump has finished, your program will continue running.

PrintScreen works with most BASIC and many machine language programs, but it does not work with programs that require the same areas of memory it uses: $CF00–$CFFF, the RAM beneath the I/O block and Kernal, and certain Page 3 vectors. PrintScreen interrupts whatever program is currently running, so it shouldn't be activated if the computer is accessing a disk drive or modem, or if it's already printing something.

Note that multicolor bitmapped screens and multicolor sprites appear as stripes in the printed dump. This is due to the way these images are stored in memory. Also, 1526 PrintScreen won't accurately reproduce screens which use raster interrupts to change graphic modes in midscreen.

Programming Notes

The 1526 printer does not support normal bitmapped graphics. PrintScreen prints graphics by defining a custom printer character and sending the eight bytes of character definition to a printer channel with the secondary address 5. Each byte sent defines an eight-dot column in the

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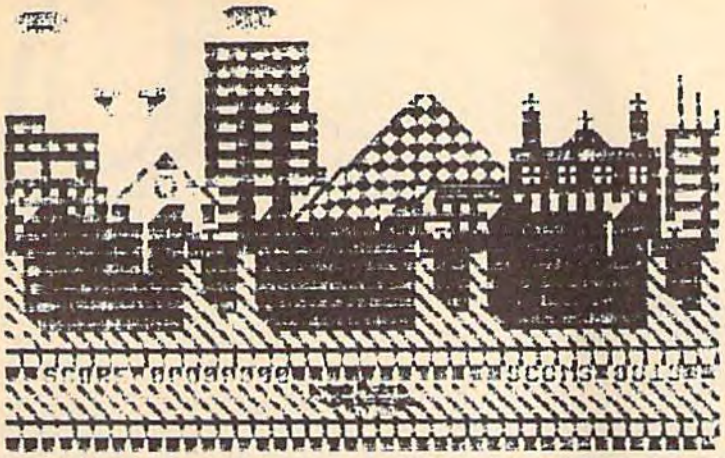

This versatile utility can dump hi-res graphics, sprites, redefined characters, and text to a 1526 or MPS-802 printer.

custom character, with the high bit defining the action of the top pin of the printhead. (This dot-column scheme is opposite the 1525's, which uses the low bit to define the action of the top pin.) After the custom character has been defined, it is printed by sending CHR$(254) to a printer channel with a secondary address of 0 or 7.

The printer accepts only one custom character definition per printed line. To print a full line of graphics, PrintScreen tricks the printer into thinking that it has gone onto another line. This is done by printing CHR$(141) to printer channel 7. Following that, you can send another eight bytes of character definition to channel 5. Before printing the custom character CHR$(254) again, you have to move the printhead back to its previous position by printing an appropriate number of spaces.

This cycle—printing the custom character followed by the carriage return and spaces—causes the head to shuttle back and forth and explains why the 1526 screen dump is considerably slower than screen dumps for other printers.

Here's a short sample program that sends all the 256 printhead pin combinations to the printer:

```
KM 10 OPEN10,4,10:PRINT#10:CLO
      SE10
JE 20 OPEN6,4,6:PRINT#6,CHR$(2
      0);:CLOSE6
AH 30 OPEN5,4,5:OPEN7,4,7
BQ 40 FOR J=0 TO 31
SJ 50 PRINT#7,CHR$(141);
XR 60 FOR K=0 TO 7
CS 70 PRINT#5,CHR$(K+8*J);
PM 80 NEXT K
MF 90 FOR M=0 TO J+1
RP 100 PRINT#7," ";
QS 110 NEXT M
JD 120 PRINT#7,CHR$(254);
QS 130 NEXT J
RG 140 CLOSE5
BD 150 PRINT#7:CLOSE7
```

See program listing on page 96.

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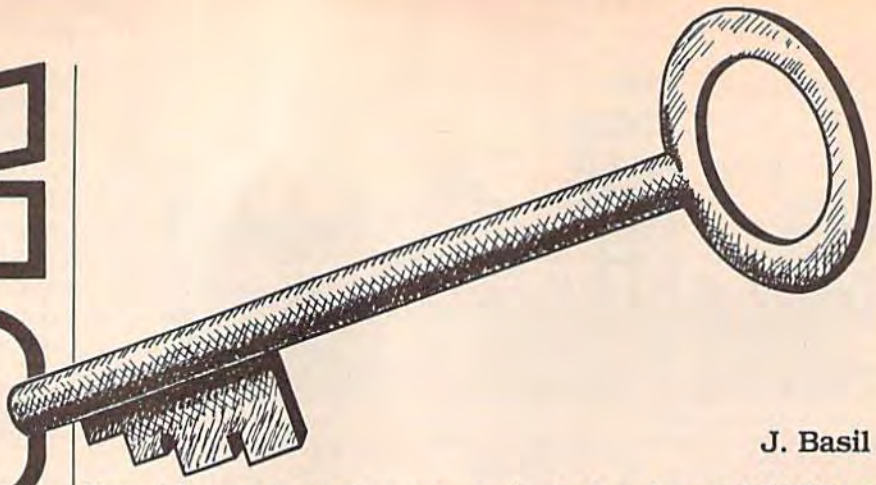
KEY LOCK



J. Basil Cox

Protect your work from prying eyes and mischievous fingers. "Key Lock" adds simple but powerful password security to 64 or 128 programs. As a bonus, this utility also offers an instant-freeze feature.

If you take your computing seriously, "Key Lock" can be an important ally. It lets you put a software lock on your computer; no one can alter your work without the secret password.

Key Lock has another handy feature. It can be used to freeze just about any program. Use it to pause fast-action games or to stop BASIC program listings from scrolling off the screen. This utility stays in the background until you activate it.

Getting Started

There are two separate versions of Key Lock: Program 1 for the 64 and Program 2 for the 128. Type in the version for your machine. Both versions are written in machine language, so you must use the appropriate version of "MLX" for your computer. (The 64 version of MLX is found elsewhere in this issue; the 128 version, published frequently in this magazine, can be found in last month's issue.) The MLX prompts for the 64 version, and the values you should type in, are as follows:

Starting address: CE00
Ending address: CFCF

For Key Lock 128, respond to the 128 MLX prompts with these values:

Starting address: 00C00
Ending address: 00DE7

To use the 64 version, type LOAD "filename",8,1. After the program has loaded, type NEW and SYS 52736. To run the 128 version, type BLOAD"filename", then SYS 3072, and finally NEW.

To use Key Lock, press Commodore–RESTORE to activate the password feature. Type in your password (maximum of nine characters) and press RETURN. In the 64 version, you can use the DEL key and cursor keys to edit your input. These keys clear the input in the 128 version. Key Lock then asks you to confirm the password. If it isn't what you wanted, press *n* to reenter it.

The screen border turns dark blue—your computer is locked. There are only two ways of unlocking the computer: by typing in the password or by turning off the computer. If you enter an incorrect password, the border turns red. After the correct password is entered, the computer returns to its former task.

Press SHIFT–RESTORE to pause the computer. To get it going again, press the space bar.

Technical Considerations

The 64 version of the program is compatible with programs that do not use memory locations $CE00–$CFFF. Screen and color memory are temporarily stored under BASIC ROM ($A000–$A7FF). This means Key Lock will work with most BASIC programs and many ML programs. Key Lock 128 uses the RS-232 buffer and 2K of memory at 4864 ($1300). The 128 version does not work with high-resolution graphics modes or the 80-column display.

Key Lock works by changing the NMI (NonMaskable Interrupt) vector. Pressing the RESTORE key generates an NMI. To disable Key Lock, press RUN/STOP–RESTORE (this does not work when the password or pause is activated). To reenable it, use SYS 52736 on the 64 and SYS 3072 on the 128.

See program listings on page 90.

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Power BASIC:
Program Merge

Article on page 57.

```
HE 10 REM COPYRIGHT 1988 COMPU
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RH 20 PRINT"{CLR}{3 SPACES}COP
      YRIGHT 1988 COMPUTE! PUB
      ., INC."
SH 30 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED":SA=4915
      2
QH 40 V1=SA+96:H1=INT(V1/256):
      L1=V1-H1*256:V2=SA+197:H
      2=INT(V2/256):L2=V2-H2*2
      56
JX 50 FORI=SATOSA+234:READD:CK
      =CK+D:POKEI,D:NEXT
FM 60 IFCK<>29233THENPRINT"***
       ERROR IN DATA STATEMENT
      S ***":END
DQ 70 POKESA+28,L1:POKESA+33,H
      1:POKESA+38,L2:POKESA+43
      ,H2
QS 80 PRINTCHR$(147);"PROGRAM
      {SPACE}MERGE INSTALLED A
      T";SA:END
KG 90 REM MACHINE LANGUAGE DAT
      A
CR 100 DATA 32,231,255,173,2,3
       ,141,235
KA 110 DATA 192,173,3,3,141,23
       6,192,173
SA 120 DATA 44,3,141,237,192,1
       73,45,3
AK 130 DATA 141,238,192,169,96
       ,141,2,3
BE 140 DATA 169,192,141,3,3,16
       9,197,141
JJ 150 DATA 44,3,169,192,141,4
       5,3,32
HS 160 DATA 212,225,165,186,20
       1,8,144,91
DS 170 DATA 169,1,166,186,160,
       3,32,186
CJ 180 DATA 255,32,192,255,32,
       175,245,162
MS 190 DATA 1,32,198,255,32,22
       8,255,32
AS 200 DATA 228,255,32,183,255
       ,201,0,208
QP 210 DATA 58,169,202,160,192
       ,32,30,171
QS 220 DATA 162,1,32,198,255,3
       2,228,255
DQ 230 DATA 32,228,255,32,183,
       255,201,0
SR 240 DATA 208,40,32,228,255,
       133,20,32
SF 250 DATA 228,255,133,21,169
       ,5,141,239
KK 260 DATA 192,32,228,255,172
       ,239,192,153
GD 270 DATA 251,1,201,0,240,47
       ,238,239
BJ 280 DATA 192,208,238,169,21
       1,160,192,32
PA 290 DATA 30,171,173,235,192
       ,141,2,3
EH 300 DATA 173,236,192,141,3,
       3,173,237
EJ 310 DATA 192,141,44,3,173,2
       38,192,141
AF 320 DATA 45,3,169,1,32,195,
       255,32
HK 330 DATA 204,255,76,116,164
       ,132,11,32
HX 340 DATA 19,166,76,167,164,
       169,1,76
FX 350 DATA 49,243,13,77,69,82
       ,71,73
KK 360 DATA 78,71,0,13,63,70,7
       3,76
HG 370 DATA 69,32,78,79,84,32,
       70,79
AK 380 DATA 85,78,68,32,32,69,
       82,82
PQ 390 DATA 79,82,0
```

Digi-Sound

Article on page 70.

Program 1: Digi-Sound—64 Version

```
HE 10 REM COPYRIGHT 1988 COMPU
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       ALL RIGHTS RESERVED
EF 20 PRINTCHR$(14)CHR$(8)CHR$
      (147):POKE53280,0:POKE53
      281,0
RA 30 PRINTTAB(12)"{BLU}COPYRI
      GHT 1988":PRINTTAB(7)"CO
      MPUTE! PUBLICATIONS, INC
      ."
MH 40 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED":FORI=1T
      O1000:NEXT
KF 50 FORI=49152TO49333:READA:
      POKEI,A:X=X+A:NEXT
XQ 60 IFX<>27127THENPRINT"
      {DOWN}ERROR IN DATA STAT
      EMENTS.":STOP
KD 70 PRINT"{CLR}{YEL}{3 DOWN}
      ";TAB(12);"DIGI-SOUND 64
       {2 DOWN}"
BB 80 PRINT"{4 RIGHT}{YEL}
      {RVS} 1 {OFF}{BLU} RECOR
      D{DOWN}":PRINT"{4 RIGHT}
      {YEL}{RVS} 2 {OFF}{BLU}
      {SPACE}PLAYBACK{DOWN}"
QE 90 PRINT"{4 RIGHT}{YEL}
      {RVS} 3 {OFF}{BLU} SAVE
      {SPACE}SAMPLE TO DISK
      {DOWN}"
GJ 100 PRINT"{4 RIGHT}{YEL}
       {RVS} 4 {OFF}{BLU} LOAD
       SAMPLE FROM DISK{DOWN}
       "
KM 110 PRINT"{4 RIGHT}{YEL}
       {RVS} 5 {OFF}{BLU} SAMP
       LE CONTINUOUSLY FROM TA
       PE{DOWN}":PRINT"
       {4 RIGHT}{YEL}{RVS} 6
       {OFF}{BLU} QUIT"
QD 120 PRINTTAB(13)"{2 DOWN}EN
       TER (1-6)"
GX 130 GETA$:IFA$=""THEN130
BJ 140 A=VAL(A$):ONAGOSUB150,1
       80,190,230,260,320:GOTO
       70
QK 150 PRINT"{2 DOWN}{YEL}
       {5 SPACES}PRESS PLAY ON
       YOUR DATASETTE."
AM 160 IFPEEK(1)=55THEN160
SS 170 SYS49223:RETURN
JX 180 SYS49152:RETURN
GR 190 GOSUB330
CF 200 POKE187,PEEK(71):POKE18
       8,PEEK(72):P=PEEK(187)+
       256*PEEK(188):POKE183,P
       EEK(P)
FB 210 POKE187,PEEK(P+1):POKE1
       88,PEEK(P+2):POKE251,0:
       POKE252,16:POKE185,1
JQ 220 POKE186,D:POKE780,251:P
       OKE781,69:POKE782,192:S
       YS65496:RETURN
DX 230 GOSUB330
JQ 240 LOADF$,D,1
SG 250 RETURN
PH 260 PRINT"{DOWN}{YEL}{RVS}N
       OTE:{OFF} YOU MUST RE-R
       UN THE PROGRAM WHEN "
KP 270 PRINT"FINISHED. PRESS P
       LAY ON DATASETTE WHEN"
GJ 280 PRINT "READY OR PRESS A
       NY KEY TO CANCEL."
BK 290 GETA$:IFA$<>""THEN70
FB 300 IFPEEK(1)=119THEN290
JQ 310 SYS49296
CS 320 PRINTCHR$(9):POKE53280,
       14:POKE53281,6:PRINT"
       {73}{CLR}":END
RX 330 INPUT"{YEL}{2 DOWN}ENTE
       R DEVICE NUMBER: ";D
KM 340 INPUT"{YEL}ENTER FILENA
       ME: ";F$:F$=LEFT$(F$,14
       ):RETURN
SJ 350 DATA 169,11,141,17,208,
       234,234,234,120,160,0,1
       69,16,132,63,133,64,234
       ,177
CC 360 DATA 63,170,202,234,234
       ,234,224,0,208,248,201,
       0,240,15,169,15,141,24,
       212
CF 370 DATA 234,234,234,234,23
       4,169,0,141,24,212,200,
       208,223,230,64,165,64,2
       01
KE 380 DATA 160,144,215,88,169
       ,27,141,17,208,234,234,
       234,96,234,234,169,11,1
       41,17
HD 390 DATA 208,234,234,234,12
       0,160,0,169,16,132,63,1
       33,64,234,173,13,220,20
       1,16
DM 400 DATA 208,19,138,145,63,
       162,0,200,208,241,230,6
       4,165,64,201,160,144,23
       3,76
PJ 410 DATA 132,192,232,208,22
       7,138,145,63,200,208,22
       1,230,64,165,64,201,160
       ,144
FA 420 DATA 213,88,169,27,141,
       17,208,234,234,234,96,2
       34,234,169,11,141,17,20
       8,234
HX 430 DATA 234,234,120,173,13
       ,220,197,236,240,249,20
       1,16,208,10,169,15,141
EM 440 DATA 24,212,133,236,76,
       153,192,169,0,141,24,21
       2,76,169,192,200
```

Program 2: Digi-Sound—128 Version

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
CE 20 BANK15:COLOR0,1:COLOR4,1
      :PRINTCHR$(14)"{CLR}
      {3 SPACES}{BLU}COPYRIGHT
       1988 COMPUTE! PUB., INC
      ."
CS 30 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED"
HJ 40 FORI=1TO397:READA:X=X+A:
      NEXT:IFX<>56992THENPRINT
      "{DOWN}ERROR IN DATA STA
      TEMENTS.":STOP
GF 50 FORY=0TO1:RESTORE:BANKY:
      FORX=9728TO9826:READA:PO
      KEX,A:NEXT:FORX=9952TO99
      83:READA:POKEX,A:NEXT:FO
      RX=64000TO64265:READA:PO
      KEX,A:NEXT:NEXT
XH 60 PRINT"{CLR}{DOWN}{YEL}"T
```


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```
      AB(11)"DIGI-SOUND 128"
AE 70 PRINT"{2 DOWN}{4 RIGHT}
      {YEL}{RVS} 1 {OFF}{BLU}
      {SPACE}RECORD{DOWN}":PRI
      NT"{4 RIGHT}{YEL}{RVS} 2
       {OFF}{BLU} PLAYBACK
      {DOWN}":PRINT"{4 RIGHT}
      {YEL}{RVS} 3 {OFF}{BLU}
      {SPACE}SAVE SAMPLE TO DI
      SK{DOWN}":PRINT"
      {4 RIGHT}{YEL}{RVS} 4
      {OFF}{BLU} LOAD SAMPLE F
      ROM DISK{DOWN}"
DS 80 PRINT"{4 RIGHT}{YEL}
      {RVS} 5 {OFF}{BLU} SAMPL
      E TAPE CONTINUOUSLY
      {DOWN}":PRINT"{4 RIGHT}
      {YEL}{RVS} 6 {OFF}{BLU}
      {SPACE}DISK DIRECTORY
      {DOWN}":PRINT"{4 RIGHT}
      {YEL}{RVS} 7 {OFF}{BLU}
      {SPACE}END{2 DOWN}":PRIN
      TTAB(11)"{YEL}ENTER (1-7
      )"
SA 90 GETKEYA$:A=VAL(A$):ONAGO
      SUB100,130,140,160,180,2
      10,220:GOTO60
PR 100 PRINTTAB(8)"{DOWN}{YEL}
      PRESS PLAY TO BEGIN"
ER 110 IFPEEK(1)=115THEN110
CJ 120 BANK0:FAST:SYS64141:SLO
      W:RETURN
FB 130 BANK0:FAST:SYS64000:SLO
      W:RETURN
GG 140 INPUT"{YEL}{2 DOWN}FILE
      NAME ";F$:F$=LEFT$(F$,1
      4)
AG 150 BSAVE(F$),B0,P9728TOP64
      139:BSAVE(F$+".2"),B1,P
      9728TOP64139:RETURN
SH 160 INPUT"{YEL}{2 DOWN}FILE
      NAME ";F$:F$=LEFT$(F$,1
      4)
QG 170 BLOAD(F$),B0,P9728:BLOA
      D(F$+".2"),B1,9728:RETU
      RN
PP 180 PRINTTAB(8)"{DOWN}{YEL}
      PRESS PLAY TO BEGIN"
FS 190 IFPEEK(1)=115THEN190
BD 200 BANK15:FAST:SYS9792
SH 210 PRINT"{CLR}{YEL}":DIREC
      TORY:SLEEP4:RETURN
AJ 220 PRINT"{CLR}{6}":COLOR0,
      12:COLOR4,14:PRINTCHR$(
      9):END
HD 230 DATA 72,169,0,141,0,255
      ,104,141,24,212,169,63,
      141,0,255,96,72,169,0,1
      41,0,255,104,141,24,212
      ,169,127,141,0,255,96,1
      69,0,141,0,255,173,13,2
      20,72,169,63,141
QA 240 DATA 0,255,104,96,169,0
      ,141,0,255,173,13,220,7
      2,169,127,141,0,255,104
      ,96,169,11,141,17,208,1
      20,173,13,220,197,236,2
      40,249,201,16,208,10,16
      9,15,141,24,212
CP 250 DATA 133,236,76,70,38,1
      69,0,141,24,212,76,86,3
      8,169,0,141,0,255,169,1
      1,141,17,208,169,63,141
      ,0,255,96,169,0,141,0,2
      55,169,27,141,17,208,16
      9,63,141,0,255
SP 260 DATA 96,32,224,38,120,1
      60,0,169,39,132,160,133
      ,161,234,177,160,170,20
      2,234,234,234,234,234,2
      34,234,234,234,234,234,
      234,234,234,234,234,234
      ,234,224,0,208
PF 270 DATA 233,201,0,240,10,1
      69,15,32,0,38,169,0,32,
      0,38,200,208,213,230,16
      1,165,161,201,250,144,2
      05,169,127,141,0,255,16
      0,0,169,39,132,160,133,
      161,234,177
EX 280 DATA 160,170,202,234,23
      4,234,234,234,234,234,2
      34,234,234,234,234,234,
      234,234,234,234,234,224
      ,0,208,233,201,0,240,10
      ,169,15,32,16,38,169,0,
      32,16,38,200,208
HJ 290 DATA 213,230,161,165,16
      1,201,250,144,205,169,6
      3,141,0,255,88,32,240,3
      8,96,234,234,32,224,38,
      120,160,0,169,39,132,16
      0,133,161,32,32,38,201,
      16,208
XC 300 DATA 19,138,145,160,162
      ,0,200,208,241,230,161,
      165,161,201,250,144,233
      ,76,196,250,232,208,227
      ,138,145,160,200,208,22
      1,230,161,165,161,201,2
      50,144
XQ 310 DATA 213,169,127,141,0,
      255,160,0,169,39,132,16
      0,133,161,32,48,38,201,
      16,208,19,138,145,160,1
      62,0,200,208,241,230,16
      1,165,161,201,250,144,2
      33
AK 320 DATA 76,0,251,232,208,2
      27,138,145,160,200,208,
      221,230,161,165,161,201
      ,250,144,213,201,250,14
      4,209,169,63,141,0,255,
      88,32,240,38,96
```

Key Lock

See instructions in article on page 88 before typing in.

Program 1: Key Lock—64 Version

```
CE00:AD 18 03 8D 7C CF AD 19 4B
CE08:03 8D 7D CF A9 17 8D 18 14
CE10:03 A9 CE 8D 19 03 60 48 2A
CE18:AD 8D 02 8D E3 CF C9 02 FC
CE20:F0 08 C9 01 F0 04 68 6C 56
CE28:7C CF 8A 48 98 48 78 A9 4E
CE30:7E 8D 18 03 A9 CF 8D 19 64
CE38:03 38 20 F0 FF 8C CB CF 12
CE40:8E CC CF AD 20 D0 8D CD 5A
CE48:CF 20 34 CF AE E3 CF E0 DE
CE50:02 F0 10 20 F9 CE 20 9F 1A
CE58:FF 20 E4 FF C9 20 D0 F6 02
CE60:4C D5 CE 20 F2 CE A0 00 89
CE68:20 CF FF C9 0D F0 0B C0 A9
CE70:0A F0 07 99 CE CF C8 4C 5D
CE78:68 CE A9 00 99 CE CF A9 84
CE80:B0 A0 CF 20 1E AB A9 CE 5C
CE88:A0 CF 20 1E AB 20 9F FF 6D
CE90:20 E4 FF C9 59 F0 07 C9 7A
CE98:4E D0 F2 4C 63 CE A9 06 64
CEA0:8D 20 D0 20 F2 CE A0 00 3D
CEA8:20 CF FF C9 0D F0 0B C0 E9
CEB0:0A F0 07 99 D9 CF C8 4C F5
CEB8:A8 CE A2 00 BD CE CF F0 6C
CEC0:14 DD D9 CF D0 04 E8 4C CC
CEC8:BC CE A9 02 8D 20 D0 20 7C
CED0:F2 CE 4C A6 CE AD CD CF 28
CED8:8D 20 D0 20 F9 CE 18 AC 49
CEE0:CB CF AE CC CF 20 F0 FF DB
CEE8:20 0C CE 68 A8 68 AA 68 9E
CEF0:58 40 A9 7F A0 CF 4C 1E F2
CEF8:AB 20 73 CF B9 00 A0 99 88
CF00:00 04 B9 FA A0 99 FA 04 EC
CF08:B9 F4 A1 99 F4 05 B9 EE AD
CF10:A2 99 EE 06 B9 00 A4 99 56
CF18:00 D8 B9 FA A4 99 FA D8 2F
CF20:B9 F4 A5 99 F4 D9 B9 EE 99
CF28:A6 99 EE DA C8 C0 FA D0 1D
CF30:CB 4C 6C CF 20 73 CF B9 7B
CF38:00 04 99 00 A0 B9 FA 04 F1
CF40:99 FA A0 B9 F4 05 99 F4 FE
CF48:A1 B9 EE 06 99 EE A2 B9 EC
CF50:00 D8 99 00 A4 B9 FA D8 34
CF58:99 FA A4 B9 F4 D9 99 F4 EA
CF60:A5 B9 EE DA 99 EE A6 C8 6B
CF68:C0 FA D0 CB A5 01 09 01 42
CF70:85 01 60 A5 01 29 FE 85 A9
CF78:01 A0 00 60 00 00 40 93 DA
CF80:20 20 20 20 20 20 20 20 20
CF88:20 4B 45 59 20 4C 4F 43 5D
CF90:4B 20 41 43 54 49 56 41 EF
CF98:54 45 44 0D 0D 0D 0D 45 09
CFA0:4E 54 45 52 20 59 4F 55 A4
CFA8:52 20 4B 45 59 20 3E 00 FE
CFB0:93 11 20 43 4F 4E 46 49 20
CFB8:52 4D 20 50 41 53 53 57 33
CFC0:4F 52 44 20 28 59 2F 4E 7A
CFC8:29 3F 00 00 00 00 00 00 CC
```

Program 2: Key Lock—128 Version

See instructions in article on page 88 before typing in.

```
0C00:AD 18 03 8D BE 0D AD 19 CC
0C08:03 8D BF 0D A9 17 8D 18 AA
0C10:03 A9 0C 8D 19 03 60 A5 A9
0C18:D3 C9 02 F0 07 C9 01 F0 2E
0C20:03 6C BE 0D 78 8D F6 0D 72
0C28:AD 27 0A 48 A9 3D 8D 18 1C
0C30:03 8D 27 0A A9 0D 8D 19 68
0C38:03 A9 00 8D 00 FF 38 20 A5
0C40:F0 FF 8C DE 0D 8E DF 0D BF
0C48:AD 20 D0 8D E0 0D 20 86 34
0C50:0D AD F6 0D C9 01 D0 0D 0B
0C58:20 9F FF 20 E4 FF C9 20 45
0C60:D0 F6 4C 22 0D 20 40 0D C0
0C68:A2 00 8E F6 0D 20 0F 0D 27
0C70:F0 FB C9 0D F0 19 C9 14 9D
0C78:F0 EB C9 9D F0 E7 20 D2 51
0C80:FF AE F6 0D 9D E1 0D E8 6B
0C88:8E F6 0D E0 0A 90 DE 20 C5
0C90:0F 0D C9 59 F0 F9 C9 4E 93
0C98:F0 F5 AE F6 0D A9 00 9D 98
0CA0:E1 0D 8E F7 0D A0 0E 20 65
0CA8:42 0D A0 00 B9 E1 0D 20 C8
0CB0:D2 FF C8 CC F6 0D 90 F4 1A
0CB8:20 0F 0D C9 59 F0 07 C9 49
0CC0:4E D0 F5 4C 65 0C A9 06 6C
0CC8:8D 20 D0 20 40 0D A0 00 43
0CD0:A2 00 8E F6 0D 20 0F 0D 8F
0CD8:F0 FB C9 0D F0 19 C9 14 06
0CE0:F0 E9 C9 9D F0 E5 20 D2 31
0CE8:FF AE F6 0D 9D EC 0D E8 FF
0CF0:8E F6 0D E0 0A 90 DE A2 B0
0CF8:00 BD E1 0D F0 24 DD EC 4E
0D00:0D D0 04 E8 4C F9 0C A9 EF
0D08:02 8D 20 D0 4C CB 0C A0 E1
0D10:6F 8C F8 0D C8 D0 FD CE 49
0D18:F8 0D D0 F8 20 9F FF 4C 67
0D20:E4 FF AD E0 0D 8D 20 D0 20
0D28:20 4E 0D 18 AC DE 0D AE B2
0D30:DF 0D 20 F0 FF 20 0C 0C 35
0D38:68 8D 27 0A 58 4C 33 FF C9
0D40:A0 00 B9 C0 0D F0 06 20 46
0D48:D2 FF C8 D0 F5 60 A0 00 64
0D50:B9 D8 12 99 00 04 B9 D2 AF
0D58:13 99 FA 04 B9 CC 14 99 C4
0D60:F4 05 B9 C6 15 99 EE 06 CC
0D68:B9 D8 16 99 00 D8 B9 D2 9B
0D70:17 99 FA D8 B9 CC 18 99 34
0D78:F4 D9 B9 C6 19 99 EE DA 0F
0D80:C8 C0 FA D0 CB 60 A0 00 BC
0D88:B9 00 04 99 D8 12 B9 FA 17
0D90:04 99 D2 13 B9 F4 05 99 E3
0D98:CC 14 B9 EE 06 99 C6 15 7D
```


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```
ØDA0:B9 Ø0 D8 99 D8 16 B9 FA D9
ØDA8:D8 99 D2 17 B9 F4 D9 99 5Ø
ØDB0:CC 18 B9 EE DA 99 C6 19 41
ØDB8:C8 CØ FA DØ CB 6Ø Ø0 Ø0 B3
ØDC0:93 11 45 4E 54 45 52 2Ø F2
ØDC8:4B 45 59 2Ø 3E Ø0 93 43 63
ØDD0:4F 4E 46 49 52 4D 2Ø 28 B3
ØDD8:59 2F 4E 29 3F Ø0 Ø0 Ø0 C1
```

Materializer

See instructions in article on page 72 before typing in.

Program 1: Materializer

```
CC00:4C 0C CC 4C 74 CC 4C 3D CD
CC08:CD 4C 45 CD A9 08 20 D2 A1
CC10:FF A9 C0 85 FC A9 00 85 98
CC18:FB A8 A2 08 91 FB C8 D0 8D
CC20:FB E6 FC CA D0 F6 AD 18 93
CC28:D0 C9 15 F0 07 C9 21 F0 E0
CC30:03 A0 01 2C A0 00 B9 39 08
CC38:CD 8C AA 02 85 FC 20 21 D2
CC40:CD A9 00 A8 85 FD 85 FB E0
CC48:A9 A0 85 FE A2 08 B1 FB 14
CC50:91 FD C8 D0 F9 E6 FC E6 A4
CC58:FE CA D0 F2 20 19 CD A9 18
CC60:C8 8D 88 02 A9 93 20 D2 A1
CC68:FF A9 00 8D 00 DD A9 20 30
CC70:8D 18 D0 60 A2 00 8E A9 D2
CC78:02 A2 00 8E A7 02 A9 00 3D
CC80:85 FB 85 FD A9 C0 85 FC C4
CC88:A9 A0 85 FE A0 00 20 21 26
CC90:CD AE A7 02 AD A9 02 F0 DA
CC98:11 B1 FB 3D 29 CD F0 17 F3
CCA0:B1 FB 3D 31 CD 91 FB 18 91
CCA8:90 0D B1 FD 3D 29 CD 85 93
CCB0:02 B1 FB 05 02 91 FB A5 7B
CCB8:FB 18 69 08 85 FB 90 02 43
CCC0:E6 FC A5 FD 18 69 08 85 9D
CCC8:FD 90 02 E6 FE A5 FE C9 8A
CCD0:A8 D0 C1 A9 00 85 FB 85 59
CCD8:FD A9 C0 85 FC A9 A0 85 A1
CCE0:FE E8 E0 08 90 02 A2 00 A2
CCE8:AD A8 02 F0 0B 98 48 8A A8
CCF0:48 20 0A CD 68 AA 68 A8 3C
CCF8:C8 C0 08 90 97 EE A7 02 FA
CD00:AE A7 02 E0 08 F0 0F 4C 99
CD08:7E CC AC A8 02 A2 FF CA 9B
CD10:D0 FD 88 D0 F8 60 4C 19 AC
CD18:CD A5 01 09 07 85 01 58 5D
CD20:60 78 A5 01 29 FA 85 01 10
CD28:60 40 08 80 01 10 02 20 79
CD30:04 BF F7 7F FE EF FD DF 48
CD38:FB D0 D8 15 17 A9 01 8D 61
CD40:A9 02 4C 79 CC A9 04 8D F4
CD48:88 02 A9 93 20 D2 FF A9 0D
CD50:97 8D 00 DD AC AA 02 B9 C6
CD58:3B CD 8D 18 D0 A9 09 20 97
CD60:D2 FF 60 00 00 00 00 00 71
```

Program 2: Materializer Demo

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
DG 40 IFPEEK(52225)<>12THENLOA
      D"ML-MAT",8,1
MQ 50 POKE53280,0:POKE53281,0:
      POKE680,3
QG 60 DIMVT$(24):VT$(0)="
      {HOME}":FORI=1TO24:VT$(I
      )=VT$(I-1)+"{DOWN}":NEXT
AE 70 PRINT"{BLK}{CLR}"CHR$(14
      ):SYS52224
FJ 75 PRINTVT$(7)TAB(5)"{CYN}
      {A}**********************
      ********{S}"
AQ 80 PRINTTAB(5)"-{28 SPACES}
      -"
BD 90 PRINTTAB(5)"- {RED}
      {6 SPACES}MATERIALIZER
      {9 SPACES}{CYN}-"
MG 100 PRINTTAB(5)"-{YEL}
       {6 SPACES}COPYRIGHT 198
       8{8 SPACES}{CYN}-"
BX 110 PRINTTAB(5)"-{YEL} COMP
       UTE! PUBLICATIONS,INC.
       {SPACE}{CYN}-"
RH 120 PRINTTAB(5)"-{YEL}
       {4 SPACES}ALL RIGHTS RE
       SERVED{5 SPACES}{CYN}-"
AG 130 PRINTTAB(5)"-
       {28 SPACES}-"
DA 140 PRINTTAB(5)"{Z}********
       **********{X}
       "
GH 160 SYS52227:GOSUB520
FQ 170 SYS52230:FORDY=1TO700:N
       EXT:PRINT"{CLR}{BLU}":P
       OKE53280,12:POKE53281,1
       2
AH 180 A$="{RVS}":FORI=1TO39:A
       $=A$+" ":NEXT
RM 190 PRINTVT$(0)A$VT$(23)A$
SM 200 FORI=1TO22:PRINTVT$(I)"
       {RVS} "TAB(38)" ":NEXT
SC 210 PRINTVT$(9)TAB(10)"
       {BLK} COMPLETE SCREEN"
MG 220 PRINTVT$(11)TAB(11)"MAT
       ERIALIZATIONS"
PQ 230 PRINTVT$(13)TAB(12)"
       {2 SPACES}ARE EASY":SYS
       52227:GOSUB520
PX 250 SYS52230
BF 260 PRINT"{5}{CLR}"CHR$(9)C
       HR$(142):SYS52224
JA 270 PRINT"{CLR}"VT$(7)"
       {BLK}{3 RIGHT}ALL CHARA
       CTERS ARE HERE,"
BB 280 PRINTVT$(9)"{3 RIGHT}AL
       SO {RVS}{BLU} REVERSE
       {OFF} {BLK}AND"
FQ 290 PRINTVT$(11)"{3 RIGHT}
       {BLU}QASZX{+}{B}{V}
       {BLK}- CHARACTER GRAPHI
       CS!{BLK}"
AK 300 SYS52227:GOSUB520:SYS52
       230
BG 310 PRINT"{CLR}"VT$(12)"AND
        PROGRAMMABLE CHARACTER
       S ARE A SNAP!"
EM 320 FORI=0TO7:READA:POKE409
       60+I,A:NEXT
KF 330 DATA 60,60,24,255,24,60
       ,36,102
BC 340 PRINTVT$(14)TAB(16)"
       {BLU}@ @ @{BLK}":SYS522
       27
CX 350 GOSUB520:SYS52230
EB 360 PRINT"{5}{CLR}"CHR$(9)C
       HR$(14):SYS52224
CS 370 PRINTVT$(9)TAB(7)"{BLK}
       THE SPEED OF THE FADE I
       N"
CX 380 PRINTVT$(11)TAB(7)"AND
       {SPACE}FADE OUT MAY ALS
       O BE"
SC 390 PRINTVT$(13)TAB(7)"CONT
       ROLLED..."
KQ 400 PRINTVT$(15)TAB(16)"
       {RVS}{BLU} FAST "
GQ 410 POKE680,0:SYS52227:GOSU
       B550:SYS52230:GOSUB550
MK 420 PRINTVT$(15)TAB(14)"
       {RVS} REGULAR "
RS 430 POKE680,25:SYS52227:GOS
       UB550:SYS52230:GOSUB550
SM 440 PRINTVT$(15)TAB(14)"
       {OFF}{2 SPACES}{RVS} SL
       OW "
QH 450 POKE680,50:SYS52227:GOS
       UB550:SYS52230:GOSUB550
       :POKE680,0
HX 460 PRINT"{CLR}"VT$(9)TAB(1
       2)"{BLK}({BLU}R{BLK})ES
       TART DEMO"
KA 470 PRINTVT$(11)TAB(12)"(
       {BLU}E{BLK})XIT TO BASI
       C"
ED 480 SYS52227
HE 490 GETA$:IFA$="R"THENSYS52
       230:RUN
CF 500 IFA$="E"THENSYS52230:SY
       S52233:END
BG 510 GOTO490
EX 520 PRINTVT$(18)"{5 RIGHT}P
       RESS A KEY TO DE-MATERI
       ALIZE"
AX 530 GETA$:IFA$=""THEN530
QJ 540 RETURN
AK 550 FORDY=1TO1000:NEXT:RETU
       RN
```

Crossroads II: Pandemonium

See instructions in article on page 38 before typing in.

```
0801:0B 08 0A 00 9E 32 34 34 34
0809:35 00 00 00 CE 53 5C 50 80
0811:3C 1F 36 23 38 6C 79 33 99
0819:7F 3B ED 48 B0 A7 7D 37 50
0821:FC 3B 6C 46 00 C7 85 BF 5A
0829:FC 1F 6C 46 00 30 20 37 A9
0831:7C 30 E8 46 7E CF F8 F0 23
0839:F8 7F E6 87 3C 72 FF D5 7C
0841:C0 D5 7F 63 F8 BE D5 C0 7C
0849:D5 7E F0 98 C7 8D BF FC 7C
0851:FF EC C6 C3 FF 8F FF 3C 2C
0859:7E 7E EE 87 0E 48 EE 4C 5A
0861:7F 4E 5E 53 E3 C5 E9 FF CF
0869:E9 E5 C3 E0 00 00 00 80 EE
0871:46 7F 7C 46 3C 26 3C 20 8B
0879:20 3C 5E 46 40 40 80 B8 95
0881:AF 78 3F 36 E0 8F 89 FF 2B
0889:FC FF C2 83 38 38 30 7F 2B
0891:BE 68 CE EC 00 00 00 3C FF
0899:3C 00 00 00 00 00 44 AA FA
08A1:AA 11 00 00 00 00 02 FF 4F
08A9:02 00 00 00 4E 53 9F 58 12
08B1:3F 1E 08 0C 38 6C 7D 33 4C
08B9:FF 33 21 30 30 A7 75 37 FF
08C1:7C B0 10 18 00 07 C5 BF 27
08C9:FC 3B 10 18 00 30 20 3E E9
08D1:78 30 20 30 7E CF FF F0 55
08D9:FF 7F 30 38 3C 72 FE FF FC
08E1:D5 FF 7F 1C F8 BE FF D5 27
08E9:FF 7E 60 70 27 6D 9F FF DA
08F1:3F 3C 30 38 FF F1 FF 3C 3E
08F9:7E 7E 38 3C 4E E8 4E 4C B2
0901:7E 4E 4C 0E E3 C5 E9 FF 5A
0909:E9 E5 F3 98 00 00 00 80 12
0911:86 FF 7C 38 3C 24 3E 2C 94
0919:20 3C 10 18 00 30 40 B8 C7
0921:AF 78 3F 18 20 EF 89 FF 66
0929:F8 FF 4C 68 38 38 30 7F 4A
0931:76 30 30 38 00 00 00 3C 50
0939:3C 00 00 00 00 00 11 AA 36
0941:AA 44 00 00 00 00 02 FF BD
0949:02 00 00 00 DB C3 3C BD 80
0951:BD 3C C3 DB DB E7 7E BD C0
0959:BD 7E E7 DB 7E 81 81 81 23
0961:81 81 81 7E 66 A5 C3 18 16
0969:18 C3 A5 66 7E 81 99 A5 66
0971:A5 99 81 7E E7 A5 DB 24 86
0979:24 DB A5 E7 DB 99 3C FF 85
0981:FF 3C 99 DB 7E C3 BD BD CF
0989:BD BD C3 7E A9 FF 8D 0E C0
0991:D4 8D 0F D4 A9 80 8D 12 1D
0999:D4 A9 01 85 02 A9 C0 8D BE
09A1:72 0E A9 2F 8D 73 0E A9 98
09A9:03 85 06 A2 31 20 85 0E AC
09B1:18 69 0A 9D 00 04 20 85 1B
09B9:0E 69 08 9D 80 04 20 85 E1
09C1:0E C9 03 F0 F9 C9 02 D0 88
09C9:02 A9 FF 9D 00 05 20 85 FA
09D1:0E D0 07 A8 BD 00 05 F0 73
```


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```
09D9:E5 98 C9 03 F0 F0 C9 02 4F
09E1:D0 02 A9 FF 9D 80 05 AD B8
09E9:1B D4 29 0F 69 05 9D 00 6F
09F1:06 9D 80 06 CA 10 B6 A9 8C
09F9:1A 85 FB 20 8B 0E A2 31 07
0A01:DE 80 06 10 1A BD 00 06 34
0A09:9D 80 06 BD 00 04 18 7D 66
0A11:00 05 9D 00 04 BD 80 04 36
0A19:18 7D 80 05 9D 80 04 A5 95
0A21:06 D0 31 BD 00 04 30 2C 0B
0A29:48 29 07 A8 68 4A 4A 4A 62
0A31:85 FC B9 F6 1E 85 FD BD AE
0A39:80 04 30 18 0A 18 7D 80 42
0A41:04 65 FC A8 20 75 0E 05 D2
0A49:FD 48 86 03 98 AA 68 20 CF
0A51:71 0E A6 03 CA 10 A9 C6 57
0A59:06 10 A3 A9 03 85 06 C6 84
0A61:FB 30 03 4C FC 09 C6 02 40
0A69:30 03 4C AC 09 A9 00 8D 27
0A71:0E DC 85 6D A9 73 85 01 72
0A79:A2 EC BD FF CF 9D FF 27 ED
0A81:BD EB D0 9D EB 28 CA D0 C9
0A89:F1 A2 3F BD 4D 09 9D 30 FC
0A91:29 CA 10 F7 A9 77 85 01 A5
0A99:A9 01 8D 0E DC A9 1A 8D A4
0AA1:18 D0 AD 24 D0 C9 F6 D0 5A
0AA9:02 E6 6D AD BE 21 D0 02 1F
0AB1:E6 6D A9 01 85 FC 20 8B C5
0AB9:0E A4 FC A9 0F 20 58 0D EE
0AC1:A0 00 A9 10 20 58 0D A0 79
0AC9:00 A9 11 20 58 0D E6 FC 2E
0AD1:A5 FC C9 0A 90 E0 A9 CC F9
0AD9:8D 16 D0 A9 FF 8D 15 D0 20
0AE1:A9 00 8D 21 D0 8D 20 D0 5C
0AE9:8D 1B D0 8D 1D D0 8D 17 DC
0AF1:D0 8D CD D0 A2 07 A9 00 1D
0AF9:9D 28 40 9D 50 60 CA 10 72
0B01:F5 85 66 85 67 A2 04 A8 0F
0B09:8D 60 40 86 52 99 00 60 C7
0B11:48 8A 99 19 60 C8 C0 19 73
0B19:F0 09 68 18 69 28 90 ED 73
0B21:E8 B0 EA 78 A9 15 8D 14 8D
0B29:03 A9 10 8D 15 03 58 20 8B
0B31:04 10 A2 07 86 0D 86 48 CF
0B39:86 52 8D 60 40 9D 40 60 38
0B41:9D 48 60 CA 10 F7 AA 9D 44
0B49:00 46 9D 00 50 E8 D0 F7 64
0B51:85 AE 85 AF 85 B0 CA 86 8C
0B59:D7 A9 0A 85 4B 85 B1 A9 DC
0B61:E6 A0 1D 20 1E AB 20 A7 40
0B69:0E A2 0F BD 86 1E 9D 14 E8
0B71:06 A9 0A 9D 14 DA CA 10 C1
0B79:F2 20 4C 11 A2 00 86 53 21
0B81:A9 96 A0 1E 20 1E AB A9 82
0B89:00 A6 53 E0 60 90 0A 8A A5
0B91:38 E9 60 A8 A9 00 F9 20 36
0B99:1F 18 7D 13 1E C9 F0 90 B0
0BA1:06 85 3A E6 53 D0 E0 8D FE
0BA9:4E 04 A5 3A 8D 4E D8 A5 3D
0BB1:53 29 01 F0 3C A6 CB E0 DF
0BB9:03 D0 03 4C 30 0B BD 81 55
0BC1:EB C9 31 90 07 C9 3A B0 F3
0BC9:03 8D 23 06 AD 00 DC C9 7A
0BD1:7F F0 07 29 10 F0 53 20 62
0BD9:1B 0C AD 01 DC C9 FF F0 45
0BE1:10 29 10 D0 09 AD 26 04 A8
0BE9:C9 20 F0 05 D0 3C 20 1B 2E
0BF1:0C A9 08 85 61 A9 00 85 09
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19A9:4B 4A 85 3F 86 05 B5 11 7D
19B1:F0 5A A9 10 20 47 14 B5 25
19B9:14 9D 00 46 A9 01 95 49 87
19C1:95 4E BD 18 1F 09 20 9D 86
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19C9:00 44 BD 07 1F 85 07 A9 FB
19D1:17 85 08 20 CE 1A BD 13 61
19D9:1F 9D 00 51 A9 00 20 FB A1
19E1:12 A6 05 20 D2 1D A6 05 C6
19E9:C9 20 F0 1B C9 3F D0 05 CA
19F1:FE 00 50 D0 12 20 05 1B F0
19F9:A6 0A 20 A4 14 A6 0A A9 49
1A01:00 9D 00 46 20 EF 1C A4 9E
1A09:05 20 2A 12 4C 76 0F 86 0F
1A11:05 BD 00 48 85 FD 85 02 EC
1A19:A0 03 84 FC A9 A0 99 6D 2F
1A21:40 A9 00 99 65 40 99 69 42
1A29:40 99 7F 40 88 10 ED 85 BD
1A31:42 A6 05 BC 00 41 B9 83 98
1A39:40 10 02 E6 42 A6 05 BD B4
1A41:00 4E 85 03 BD 00 4F 85 FB
1A49:FB A4 FC A5 03 18 79 E3 ED
1A51:1E 20 7A 19 AA 85 03 A5 94
1A59:FB 18 79 E7 1E 20 85 19 D4
1A61:A8 85 FB 20 AE 0F A6 FC C8
1A69:9D 61 40 FE 65 40 BD 61 C5
1A71:40 C9 20 D0 06 C6 FD D0 61
1A79:D0 F0 10 C9 40 90 0C A6 F3
1A81:03 20 ED 0F E6 42 A6 FC 78
1A89:9D AE 40 C6 FC 30 07 A5 09
1A91:02 85 FD 4C 3E 1A A6 05 59
1A99:A5 42 F0 04 A9 20 85 42 AA
1AA1:BD 00 44 29 DF 05 42 9D 05
1AA9:00 44 60 A2 08 BD F5 1F 67
1AB1:F0 08 9D 17 06 A5 A2 9D 2F
1AB9:17 DA CA 10 F0 20 99 1D E2
1AC1:F0 03 4C 1B 0D A9 93 20 C0
1AC9:D2 FF 4C 30 0B A5 07 9D 8E
1AD1:00 4E A5 08 9D 00 4F 60 BA
1AD9:A2 02 A9 00 85 46 BD 00 D5
1AE1:46 F0 10 BD 00 45 10 06 8E
1AE9:20 68 1D 4C F2 1A 20 94 85
1AF1:15 A6 13 E8 E0 0C D0 E6 0B
1AF9:60 86 09 20 5E 19 A6 07 CE
1B01:A4 08 D0 09 86 09 BC 00 08
1B09:4F BD 00 4E AA 20 ED 0F FB
1B11:A8 A6 09 84 0A 60 A5 4D 19
1B19:29 10 D0 F9 A4 3A B9 4E 71
1B21:00 F0 01 60 A9 05 20 39 94
1B29:12 A4 3A B9 BE 00 99 4E EB
1B31:00 B9 00 51 85 FE 84 05 21
1B39:A2 02 BD 00 46 F0 19 E8 0A
1B41:E0 0C D0 F6 A6 4C 86 FD E5
1B49:20 A4 14 A6 4C E8 E0 0C 79
1B51:D0 02 A2 02 86 4C A6 FD 95
1B59:A5 FE A4 05 86 8D 9D 00 AC
1B61:51 B9 00 4B 48 B9 00 43 CF
1B69:86 05 84 FD 20 47 14 68 43
1B71:9D 00 47 A9 01 9D 00 4D C5
1B79:A4 FD BD 00 41 C9 12 D0 5F
1B81:06 B9 00 41 9D 00 4A BD 7C
1B89:00 44 29 F0 19 00 44 9D F3
1B91:00 44 B9 00 45 29 40 F0 50
1B99:05 A9 20 9D 00 46 BC 00 2D
1BA1:51 A6 FD 20 61 19 A6 05 AD
1BA9:20 CE 1A A6 FD BD 00 45 7D
1BB1:10 08 A6 05 20 5E 19 20 E3
1BB9:CE 1A A5 FD C9 02 B0 05 2F
1BC1:A6 05 9D 00 43 20 D2 1D 9D
1BC9:A6 05 C9 20 F0 1C C9 40 9B
1BD1:B0 06 A9 00 9D 00 46 60 F0
1BD9:86 09 20 FF 1A 20 FB 1B FD
1BE1:A6 0A BD 00 46 30 02 D0 6D
1BE9:0E 60 BD 00 43 30 08 E6 C8
1BF1:41 D0 04 A9 FF 85 41 4C FC
1BF9:69 12 A4 0A B9 00 43 C9 BC
1C01:12 D0 2F A6 09 BD 00 45 4B
1C09:29 20 F0 26 BD 00 46 C9 A2
1C11:14 B0 1F B9 00 51 A8 BD 53
1C19:00 51 D9 0F 1F F0 13 BC 71
1C21:00 51 B9 0F 1F 9D 00 51 96
1C29:A9 01 A6 09 BC 00 43 4C 94
1C31:39 12 A6 0A DE 00 46 A9 2D
1C39:01 20 FB 12 A0 03 A6 09 02
1C41:BD 00 45 29 20 F0 04 DE 3F
1C49:00 46 2C A0 07 84 0B BD C0
1C51:00 41 C9 01 F0 10 BD 00 66
1C59:43 30 20 C9 02 B0 1C BD A8
1C61:00 46 C9 02 90 15 A6 0A B4
1C69:A9 00 9D 00 46 F0 0C BD F5
1C71:00 45 29 20 F0 05 A9 01 12
1C79:20 FB 12 A6 0A BD 00 46 FA
1C81:D0 12 A5 0B C9 07 F0 04 5C
1C89:A9 02 85 0B 20 A4 14 A6 DA
1C91:0A 20 EF 1C A6 09 BD 00 6B
1C99:46 D0 08 20 A4 14 A6 09 F7
1CA1:20 EF 1C A6 09 E0 02 B0 54
1CA9:0D 20 93 0F BD 00 46 30 7E
1CB1:02 D0 03 4C A3 19 BD 00 41
1CB9:43 C9 02 B0 0B A4 0A BE 0F
1CC1:00 46 D0 04 AA 20 B8 14 41
1CC9:A0 02 A6 09 E0 0C B0 01 D1
1CD1:88 A6 0A E0 0C B0 01 88 F4
1CD9:A5 0B 20 39 12 A6 0A E0 5F
1CE1:02 B0 0A 20 93 0F BD 00 DE
1CE9:46 F0 C8 30 C6 60 BD 00 D0
1CF1:50 85 FE A9 00 9D 00 50 F4
1CF9:C6 FE 30 F1 20 D2 12 A9 94
1D01:3F 20 A5 0F 20 B0 1D D0 57
1D09:EF 20 04 10 A2 01 BC 15 6C
1D11:1F B5 11 F0 25 BD 00 50 E9
1D19:0A 0A 18 7D 00 50 79 45 2F
1D21:60 99 45 60 A9 00 9D 00 29
1D29:50 A5 47 C5 4B D0 0B 0A F7
1D31:0A 79 44 60 38 E9 04 99 68
1D39:44 60 20 CB 14 CA 10 CE 29
1D41:A6 B1 E8 E0 0A 90 04 A2 A3
1D49:00 E6 B0 86 B1 20 99 1D 1A
1D51:D0 FB 20 58 0F 20 A7 0E D2
1D59:AD 00 46 85 14 AD 01 46 2B
1D61:85 15 E6 4B 4C 6C 0C 86 E7
1D69:13 20 A4 14 A6 13 20 5E 2B
1D71:19 20 CE 1A 20 92 19 4C 85
1D79:69 12 86 13 BD 00 45 29 90
1D81:FB 9D 00 45 20 92 19 20 13
1D89:69 12 A6 13 4C 6E 12 BD 01
1D91:00 45 49 04 9D 00 45 60 5E
1D99:A2 07 BD FE 1F F0 08 9D F8
1DA1:C7 05 A9 0A 9D C7 D9 CA 61
1DA9:10 F0 A5 CB C9 03 60 AD 62
1DB1:1B D4 29 03 D0 13 A9 02 2C
1DB9:C5 4B B0 0D AD 1B D4 29 3D
1DC1:01 F0 03 A9 02 2C A9 06 CD
1DC9:2C A9 01 4C C5 0F 20 5E 72
1DD1:19 A6 07 A4 08 4C AE 0F 4B
1DD9:A9 03 95 14 A9 02 95 AA C8
1DE1:A9 06 95 BE 60 93 1C 20 BA
1DE9:20 20 20 43 52 4F 53 53 3E
1DF1:52 4F 41 44 53 20 49 49 8C
1DF9:20 3A 20 9C 50 41 4E 44 09
1E01:45 4D 4F 4E 49 55 4D 20 5C
1E09:20 20 20 20 20 1C C0 1E 74
1E11:20 00 F6 2E 2E 2E 03 0F 5E
1E19:10 19 12 09 07 08 14 20 17
1E21:31 39 38 38 20 03 0F 0D 07
1E29:10 15 14 05 21 20 10 15 44
1E31:02 0C 09 03 01 14 09 0F 3C
1E39:0E 13 F2 2E 2E 2E 17 05 DF
1E41:0C 03 0F 0D 05 20 14 0F D6
1E49:20 10 01 0E 04 05 0D 0F F7
1E51:0D 09 15 0D F7 2E 2E 2E CC
1E59:10 12 05 13 13 20 06 09 22
1E61:12 05 20 02 15 14 14 0F 3C
1E69:0E 20 14 0F 20 13 14 01 9E
1E71:12 14 F5 5E 40 4C 7A 61 E9
1E79:2C 13 14 1D 1E 7F 7E 18 E8
1E81:19 12 14 11 76 13 14 01 8B
1E89:12 14 20 01 14 20 0C 05 26
1E91:16 05 0C 20 31 13 11 1D B2
1E99:14 00 04 07 13 1C 50 4C C6
1EA1:41 59 45 52 20 31 20 96 3F
1EA9:53 20 9E 4C 1F 20 20 20 0A
1EB1:48 49 47 48 20 20 1E 4C DB
1EB9:45 56 45 4C 20 1C 50 4C F9
1EC1:41 59 45 52 20 32 20 96 63
1EC9:53 20 9E 4C 00 00 00 37 87
1ED1:6E A5 02 04 05 06 08 09 88
1ED9:0B 0E 00 00 04 FC 04 FC 38
1EE1:00 00 00 00 01 FF 01 FF 28
1EE9:00 00 00 01 02 80 00 01 49
1EF1:03 80 00 01 80 80 40 20 86
1EF9:10 08 04 02 01 02 04 08 01
1F01:10 20 40 80 04 05 01 25 BA
1F09:C0 DB 08 0C 00 04 01 00 72
1F11:03 02 02 03 00 08 10 02 04
1F19:05 19 03 02 1A FF 01 00 73
1F21:30 12 1E 78 48 0C 00 00 B9
1F29:18 08 7A 5E 10 18 00 00 8B
1F31:0C 64 58 1A 26 30 00 00 2D
1F39:07 21 81 11 11 03 00 10 29
1F41:40 07 1F 0F 07 8F 00 01 AD
1F49:07 11 08 02 04 05 03 05 AF
1F51:06 04 08 01 09 01 01 00 F2
1F59:01 13 02 32 07 00 05 1F A1
1F61:80 3B 2A 09 40 05 08 10 BA
1F69:00 20 00 32 83 94 32 22 C7
1F71:44 75 55 52 73 64 85 11 48
1F79:64 11 33 04 01 21 01 88 EB
1F81:9B 5D 77 96 69 5A 58 6F 12
1F89:FF 9C 8F A7 6D C6 88 21 14
1F91:21 4A 21 06 FF 04 04 03 92
1F99:0E 00 0E FF 12 FF FF 10 41
1FA1:12 07 FF FF FF 7F 7F 11 B8
1FA9:7F 11 7F 7F 7F 11 12 13 4B
1FB1:13 7F 12 7F 7F 11 FF 11 E4
1FB9:FF 7E 75 7A AA BA 77 71 8E
1FC1:72 A9 34 BC 7B A9 7D B6 2A
1FC9:68 22 22 60 20 58 40 52 44
1FD1:48 79 40 50 58 5A 53 7A EC
1FD9:5A 68 62 78 58 62 20 21 E0
1FE1:20 05 12 1E 06 09 0C 11 13
1FE9:0E 10 1A 18 18 CF 1C 08 38
1FF1:0B 00 00 32 07 01 0D 05 34
1FF9:00 0F 16 05 12 10 12 05 09
2001:13 13 00 06 37 FF BF E0 0A
2009:20 00 FA AA A8 20 00 AA D3
2011:FF EA 80 08 AB FE 8A 80 8B
2019:08 AB BF 88 82 00 BB A0 F4
2021:00 00 00 FB A0 08 0A 00 5A
2029:AA BF 8A 88 08 AE BE 8A 8B
2031:00 28 8E BA EA 08 00 BE 2F
2039:AA E8 02 00 FF BE D0 00 E5
2041:24 80 01 38 00 09 C0 00 FC
2049:42 00 05 90 00 4D FB F7 79
2051:00 00 0D DB FB 10 20 1F 70
2059:6A FD 00 00 0A BB FD 22 AB
2061:20 0F AA 00 00 00 0E AA 91
2069:00 08 A0 0A BA 00 AB AF 3D
2071:F8 00 01 FF FB E8 80 20 F2
2079:23 FE FA 80 00 AF FB FA 24
2081:80 A0 A8 0A 08 80 A0 D8 3C
2089:0E 00 00 00 D8 0E 08 80 60
2091:A0 A8 0A 0A 80 A0 AF FB 10
2099:FA 00 00 AB FB F0 00 00 B5
20A1:AF 7A EA 14 22 BD 5F A8 66
20A9:00 02 FF BF F0 00 01 80 70
20B1:00 00 00 01 80 00 00 00 06
20B9:01 80 00 00 00 01 80 00 9F
20C1:00 00 01 80 00 00 00 01 2B
20C9:80 00 00 00 01 FF BF F0 C2
20D1:00 00 EF AF E2 02 00 BF E9
20D9:BE DA 00 21 AE BB D0 08 50
20E1:01 FF FE 00 00 20 BB FA 75
20E9:08 80 00 23 DE 0B A0 00 E4
20F1:82 00 0F A0 00 00 00 00 5F
20F9:00 00 00 00 00 00 00 00 3A
2101:00 0E E0 00 82 00 0A A0 AB
2109:00 AB BE 08 00 20 BA BA 3F
2111:08 28 00 BA EA 08 00 20 A4
2119:F7 EF F0 00 00 BB EB 80 B8
2121:00 08 EA EA 82 A8 A8 8A 04
2129:EE 82 22 A8 EE EA 80 20 96
2131:08 E8 AF E0 A2 02 FB E0 AB
2139:20 00 02 BF A1 E0 02 10 6C
2141:BD A1 08 02 10 BD A1 00 A6
2149:5A 1F B5 A0 08 02 00 F7 81
2151:5F F0 44 00 BD 40 08 14 1B
2159:00 B5 40 0B 55 FF 84 00 75
2161:0B D5 FD A0 44 1A DD 5C 0B
2169:80 00 1B FD 5C 80 04 1F 3B
2171:AD FF 0A D1 1E E0 44 81 67
2179:D1 1A D0 44 0D D1 1A 04 71
2181:44 B5 51 18 14 44 FF F5 A6
2189:D8 00 41 BE FF D8 28 05 05
2191:3A 80 48 08 05 BE 80 4A 09
2199:0B FD BE 80 58 0B F5 BE 5A
21A1:80 00 2B FD BE 20 08 0A F9
21A9:00 BE A0 08 08 00 FD BF 2C
21B1:D0 00 00 AD 7F D8 10 41 F7
21B9:BD 75 D8 10 41 00 00 00 5E
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Crossroads Maze Editor

See instructions in article on page 39 before typing in.

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C800:A9 12 8D 18 03 A9 C8 8D FB
C808:19 03 A9 DC A0 CB 20 1E 7C
C810:AB 60 48 8A 48 A2 FF E8 F6
C818:BD 74 CD F0 08 DD 04 04 32
C820:F0 F5 4C 4A FE 20 BC F6 BE
C828:20 E1 FF D0 03 4C 69 FE 6A
C830:A2 F6 9A 20 FB CA 20 3F B0
C838:C8 20 5D CB 4C 2F 0B CE A2
C840:D8 CD D0 08 A9 F0 8D D8 51
C848:CD 20 9E C8 CE D9 CD D0 73
C850:0D A9 F8 8D D9 CD AD F8 25
C858:07 49 03 8D F8 07 20 D5 F2
C860:CB C9 93 D0 03 20 88 C9 3D
C868:C9 C3 D0 03 20 A4 C9 C9 0B
C870:D6 D0 03 20 BB C9 C9 D2 6F
C878:D0 03 20 DF C9 C9 D5 D0 27
C880:03 20 D7 C9 C9 85 D0 03 3C
C888:20 0D CA C9 86 D0 03 20 01
C890:34 CA C9 87 D0 03 20 5C CF
C898:CA C9 88 D0 A2 60 AE 00 14
C8A0:D0 AC 01 D0 AD 00 DC 2D 47
C8A8:01 DC 4A B0 0C C0 42 F0 1F
C8B0:08 88 88 88 88 88 88 88 02
C8B8:88 4A B0 0C C0 F2 F0 08 B3
C8C0:C8 C8 C8 C8 C8 C8 C8 C8 52
C8C8:4A B0 0C E0 1C F0 08 CA BA
C8D0:CA CA CA CA CA CA CA 4A E1
C8D8:B0 0C E0 B4 F0 08 E8 E8 8F
C8E0:E8 E8 E8 E8 E8 E8 48 AD F5
C8E8:11 D0 10 FB 8E 00 D0 8C 9B
C8F0:01 D0 68 4A B0 1C AD DA 15
C8F8:CD D0 13 CE DA CD 20 18 5B
C900:C9 C9 20 D0 04 A5 C4 D0 0D
C908:02 A9 20 8D DB CD 20 1E 58
C910:C9 60 A9 00 8D DA CD 60 A9
C918:20 6A C9 B1 FC 60 AD 00 6F
C920:D0 C9 24 D0 07 AD 01 D0 E1
C928:C9 EA F0 3D 20 6A C9 AD 39
C930:DB CD 91 FC 8C DC CD A9 44
C938:13 38 ED DC CD 0A 18 6D 23
C940:DC CD A8 AD DB CD 91 FC DB
C948:A2 26 AD 01 D0 C9 F2 F0 01
C950:0F C9 42 D0 14 BD 50 04 6F
C958:9D C0 07 CA 10 F7 30 09 42
C960:BD C0 07 9D 50 04 CA 10 F5
C968:F7 60 AD 01 D0 38 E9 42 53
C970:4A 4A AA BD 36 CD 85 FC DD
C978:BD 37 CD 85 FD AD 00 D0 42
C980:38 E9 1C 4A 4A 4A A8 60 FF
C988:A2 2C A0 26 BD 36 CD 85 D6
C990:FC BD 37 CD 85 FD A9 20 6D
C998:91 FC 88 10 F9 CA CA 10 E6
C9A0:E9 A9 00 60 EE 20 D0 20 53
C9A8:86 CA A2 36 BD DD CD 9D 88
C9B0:90 CD CA 10 F7 CE 20 D0 66
C9B8:A9 00 60 EE 20 D0 A2 36 DB
C9C0:BD 90 CD 9D DD CD CA 10 B6
C9C8:F7 20 D8 CA A6 C8 20 E2 A3
C9D0:0E CE 20 D0 A9 00 60 A6 E4
C9D8:C8 20 E2 0E A9 00 60 A2 C6
C9E0:2C A0 26 BD 36 CD 85 FC 44
C9E8:BD 37 CD 85 FD B1 FC C9 B5
C9F0:20 D0 04 A5 C4 D0 02 A9 BA
C9F8:20 91 FC 88 10 EF CA CA C9
CA00:10 DF A9 20 8D BD 07 8D CB
CA08:99 07 A9 00 60 AE 26 04 6F
CA10:CA 8A 29 0F F0 1D 20 86 86
CA18:CA 20 D8 CA 8E 26 04 C9 C1
CA20:05 B0 06 A2 00 86 BB F0 D1
CA28:02 E9 04 AA 86 C8 20 E2 DE
CA30:0E A9 00 60 AE 26 04 E8 3C
CA38:8A 29 0F C9 09 F0 F4 20 F1
CA40:86 CA 20 D8 CA 8E 26 04 3E
CA48:C9 05 90 07 38 E9 04 A2 9A
CA50:FF 86 BB AA 86 C8 20 E2 24
CA58:0E A9 00 60 20 69 CB F0 94
CA60:1F 20 86 CA 20 D8 CA A2 A7
CA68:C7 A0 CD 20 BD FF A9 01 08
CA70:A2 08 A0 FF 20 BA FF A2 FB
CA78:BE A0 21 A9 2B 20 D8 FF DF
CA80:20 47 CB A9 00 60 48 8A A8
CA88:48 98 48 A9 50 85 FC A9 48
CA90:04 85 FD A0 00 A2 00 A9 87
CA98:80 8D DC CD A9 00 9D DD B0
CAA0:CD B1 FC C9 20 D0 04 A9 BB
CAA8:00 F0 03 AD DC CD 1D DD EB
CAB0:CD 9D DD CD C8 C0 14 90 2F
CAB8:0F A0 00 A5 FC 18 69 28 9B
CAC0:85 FC A9 00 65 FD 85 FD B9
CAC8:4E DC CD 90 D4 E8 E0 37 C2
CAD0:D0 C5 68 A8 68 AA 68 60 F6
CAD8:48 A8 48 AD 26 04 38 E9 3C
CAE0:31 0A A8 B9 64 CD 85 FC A4
CAE8:B9 65 CD 85 FD A0 36 B9 5F
CAF0:DD CD 91 FC 88 10 F8 68 C9
CAF8:A8 68 60 A2 00 8E 28 40 FD
CB00:8E 15 D0 8E 04 D4 8E 0B C2
CB08:D4 86 C6 8E DA CD A9 40 0F
CB10:8D 8A 02 BD B6 CC 9D 40 91
CB18:03 E8 10 F7 A9 0D 8D F8 82
CB20:07 A9 00 8D 10 D0 A9 01 96
CB28:8D 15 D0 8D 27 D0 A9 1C AA
CB30:8D 00 D0 A9 42 8D 01 D0 5E
CB38:A9 F0 8D D8 CD A9 F8 8D B4
CB40:D9 CD A6 C8 20 E2 0E A9 EB
CB48:4D A0 CC 20 1E AB A9 30 6D
CB50:A6 BB 10 02 A9 34 18 65 FF
CB58:C8 8D 26 04 60 20 86 CA 18
CB60:20 D8 CA A9 FF 8D 15 D0 63
CB68:60 A2 01 20 FF E9 A9 A4 9A
CB70:A0 CC 20 1E AB A9 00 8D 03
CB78:DC CD A2 01 AD DC CD 18 EA
CB80:69 0A A8 20 F0 FF A9 B3 F4
CB88:A0 CC 20 1E AB 20 D5 CB DE
CB90:C9 0D F0 3D C9 14 D0 0E 90
CB98:AE DC CD F0 F0 CE DC CD D1
CBA0:20 D2 FF 18 90 D4 AE DC 90
CBA8:CD E0 10 F0 E0 C9 20 F0 CF
CBB0:14 C9 2E F0 10 C9 30 90 32
CBB8:D4 C9 5B B0 D0 C9 41 B0 84
CBC0:04 C9 3B B0 C8 9D C7 CD 59
CBC8:EE DC CD 20 D2 FF 18 90 22
CBD0:A9 AD DC CD 60 20 9F FF E3
CBD8:20 E4 FF 60 93 0D 20 12 E2
CBE0:20 43 52 4F 53 53 52 4F 74
CBE8:41 44 53 20 49 49 2D 2D 95
CBF0:4D 41 5A 45 20 45 44 49 07
CBF8:54 4F 52 20 49 4E 53 54 59
CC00:41 4C 4C 45 44 20 0D 20 08
CC08:20 20 43 4F 50 59 52 49 EC
CC10:47 48 54 20 31 39 38 38 03
CC18:20 43 4F 4D 50 55 54 45 17
CC20:21 20 50 55 42 2E 2C 20 F4
CC28:49 4E 43 2E 0D 20 20 20 8E
CC30:20 20 20 20 20 20 20 20 C9
CC38:41 4C 4C 20 52 49 47 48 9F
CC40:54 53 20 52 45 53 45 52 56
CC48:56 45 44 0D 00 13 98 43 78
CC50:52 4F 53 53 52 4F 41 44 1D
CC58:53 20 4D 41 5A 45 20 45 CE
CC60:44 49 54 4F 52 2E 20 45 BE
CC68:44 49 54 49 4E 47 20 4D B2
CC70:41 5A 45 3A 20 05 20 9D 80
CC78:0D 97 46 31 2E 2E 50 52 77
CC80:45 56 20 20 46 33 2E 2E E1
CC88:4E 45 58 54 20 20 20 46 F2
CC90:35 2E 2E 53 41 56 45 20 59
CC98:20 46 37 2E 2E 45 58 49 1E
CCA0:54 13 0D 00 13 11 97 46 1D
CCA8:49 4C 45 4E 41 4D 45 3A 8B
CCB0:20 05 00 3F 9D 00 FF 00 7C
CCB8:00 FF 00 00 FF 00 00 FF 52
CCC0:00 00 FF 00 00 FF 00 00 5A
CCC8:FF 00 00 FF 00 00 00 00 62
CCD0:00 00 00 00 00 00 00 00 6A
CCD8:00 00 00 00 00 00 00 00 72
CCE0:00 00 00 00 00 00 00 00 7A
CCE8:00 00 00 00 00 00 00 00 82
CCF0:00 00 00 00 00 00 FF 00 8A
CCF8:00 C3 00 00 C3 00 00 C3 65
CD00:00 00 C3 00 00 C3 00 00 23
CD08:C3 00 00 FF 00 00 00 00 85
CD10:00 00 00 00 00 00 00 00 AB
CD18:00 00 00 00 00 00 00 00 B3
CD20:00 00 00 00 00 00 00 00 BB
CD28:00 00 00 00 00 00 00 00 C3
CD30:00 00 00 00 00 00 50 04 70
CD38:78 04 A0 04 C8 04 F0 04 A1
CD40:18 05 40 05 68 05 90 05 FE
CD48:B8 05 E0 05 08 06 30 06 AC
CD50:58 06 80 06 A8 06 D0 06 0F
CD58:F8 06 20 07 48 07 70 07 AC
CD60:98 07 C0 07 06 20 3D 20 DD
CD68:74 20 AB 20 E2 20 19 21 A8
CD70:50 21 87 21 03 12 0F 13 11
CD78:13 12 0F 01 04 13 20 09 C9
CD80:09 20 3A 20 10 01 0E 04 96
CD88:05 0D 0F 0E 09 15 0D 00 63
CD90:FF FF E0 00 00 BD F7 EA 1A
CD98:44 40 AC 44 0A 84 40 A6 C9
CDA0:44 00 00 40 BD F4 0A 44 7C
CDA8:40 AC 44 0A 84 40 A6 46 71
CDB0:A0 00 00 BD F4 0A 44 40 11
CDB8:AC 44 0A 84 40 A6 44 00 6A
CDC0:00 40 BF FC 08 00 00 45 B9
```

Dynamic Windows

See instructions in article on page 74 before typing in.

Program 1: Dynamic Windows

```
C000:4C 35 C0 A9 00 8D B5 C2 0C
C008:A9 01 A8 8D B2 C2 20 79 E6
C010:00 C9 2C D0 0D 20 73 00 66
C018:20 9E AD 20 AA B1 C9 00 B8
C020:D0 42 8C B2 C2 88 C4 02 1B
C028:B0 3A C6 02 20 EF C0 CE 9A
C030:B2 C2 D0 F6 60 A5 02 C9 AC
C038:15 90 04 A2 10 D0 27 A9 CE
C040:01 8D B5 C2 AD 86 02 8D A1
C048:B4 C2 A9 00 8D B0 C2 8D 4C
C050:B3 C2 8D B8 C2 20 79 00 23
C058:C9 2C F0 0D A2 0B D0 06 A1
C060:A2 16 D0 02 A2 0E 4C 37 10
C068:A4 20 73 00 20 9E AD 20 A9
C070:AA B1 C9 00 D0 EE AE B0 3D
C078:C2 98 C9 28 B0 E6 9D 1E B7
C080:C3 E8 8E B0 C2 E0 05 D0 6F
C088:CC CE 1E C3 CE 1F C3 AD 4C
C090:22 C3 29 0F 8D B6 C2 AD A4
C098:21 D0 29 0F CD B6 C2 F0 B4
C0A0:C3 AD 21 C3 C9 03 90 BC 08
C0A8:18 6D 1F C3 C9 29 B0 B4 BA
C0B0:AD 20 C3 C9 03 90 AD 18 F3
C0B8:6D 1E C3 C9 1A B0 A5 20 8C
C0C0:79 00 C9 2C D0 29 20 73 D9
C0C8:00 20 9E AD A5 0D C9 FF F5
C0D0:D0 8E A5 64 85 FB A5 65 26
C0D8:85 FC A0 00 B1 FB 8D 1D 26
C0E0:C3 C8 B1 FB 85 0D C8 B1 10
C0E8:FB 85 0E A9 19 85 16 A5 D6
C0F0:01 29 FE 85 01 A9 B9 85 1D
C0F8:FB A9 C2 85 FC A9 00 85 A7
C100:FD A9 A0 85 FE A5 02 8D 79
C108:B0 C2 F0 19 A0 02 B1 FB B0
C110:AA C8 B1 FB 0A 20 66 C2 71
C118:CA D0 F7 A9 05 20 5A C2 EE
C120:CE B0 C2 D0 E7 A0 00 AD 0C
C128:B5 C2 F0 05 B9 1E C3 91 05
C130:FB B1 FB 99 1E C3 C8 C0 89
C138:05 D0 EC AE 1E C3 AC 1F 73
C140:C3 20 34 C2 AD 20 C3 8D 63
C148:B1 C2 A0 00 A9 28 8D B0 23
C150:C2 AE 21 C3 AD B5 C2 D0 DB
C158:16 B1 FD 91 FB 20 89 C2 62
C160:A9 01 20 66 C2 B1 FD 91 CD
C168:FB 20 7E C2 4C FC C1 B1 79
C170:FB 91 FD 20 89 C2 A9 01 C3
C178:20 66 C2 B1 FB 91 FD 20 5B
C180:7E C2 AD B1 C2 CD 20 C3 16
C188:F0 04 C9 01 D0 0F AD AE 9B
C190:C2 18 6D AF C2 91 FB 20 98
C198:99 C2 4C FC C1 EC 21 C3 BA
C1A0:F0 EC E0 01 F0 E8 AD 1D A7
```


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```
C1A8:C3 D0 04 A9 20 D0 E2 AD 15
C1B0:B3 C2 D0 F7 AD B8 C2 F0 1F
C1B8:06 CE B8 C2 4C AB C1 AD 78
C1C0:1D C3 F0 E7 B1 0D C9 5F 15
C1C8:D0 0C 8D B3 C2 20 53 C2 A4
C1D0:CE 1D C3 4C AB C1 C9 5E 96
C1D8:D0 08 A9 04 8D B8 C2 4C 5D
C1E0:CD C1 C9 41 90 07 C9 5B 98
C1E8:B0 03 38 E9 40 18 6D AF 18
C1F0:C2 91 FB 20 99 C2 20 53 27
C1F8:C2 CE 1D C3 A9 01 20 5A 5D
C200:C2 A9 01 20 66 C2 CE B0 FF
C208:C2 CA F0 03 4C 54 C1 A9 D0
C210:00 8D B3 C2 AD B0 C2 20 71
C218:5A C2 CE B1 C2 D0 12 20 0E
C220:A7 C2 AD B5 C2 D0 01 60 F6
C228:E6 02 AD B4 C2 8D 86 02 FD
C230:60 4C 4C C1 8E 23 C3 A9 D0
C238:00 85 FB A9 04 85 FC E0 4A
C240:00 F0 08 A9 28 20 5A C2 D6
C248:CA D0 F8 98 20 5A C2 AE AE
C250:23 C3 60 E6 0D D0 02 E6 69
C258:0E 60 18 65 FB 85 FB A9 ED
C260:00 65 FC 85 FC 60 18 65 36
C268:FD 85 FD A9 00 65 FE 85 C1
C270:FE C9 BF 90 08 20 A7 C2 BB
C278:A2 10 4C 37 A4 60 AD B6 09
C280:C2 85 FB AD B7 C2 85 FC F3
C288:60 A5 FB 8D B6 C2 18 A5 96
C290:FC 8D B7 C2 69 D4 85 FC C1
C298:60 91 FB 20 89 C2 AD 22 09
C2A0:C3 91 FB 20 7E C2 60 A5 53
C2A8:01 09 01 85 01 60 20 80 B3
```

Program 2: Dynamic Windows Demo

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
BP 20 IFA=0THENA=1:POKE2,0:LOA
      D"WINDOW.OBJ",8,1
RD 30 P1=49838:P2=49839:REM PO
      KEP1,32:POKEP2,0
XS 40 FORK=1TO5:READB(K):NEXT:
      DATA 32,102,214,127,215
BM 50 POKE53280,6:POKE53281,12
      :PRINT"{BLK}{CLR}":N=102
      4
EQ 60 PRINT"{CLR}{10 DOWN}"TAB
      (12)"COPYRIGHT 1988"
MS 70 PRINTTAB(7)"COMPUTE! PUB
      LICATIONS, INC."
KH 80 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED"
HP 90 FORJ=1TO25:FORK=1TO40:PO
      KEN,122:N=N+1:NEXTK:NEXT
      J
KS 100 M$="4↑ DEMO MENU44 1) O
       PEN SMALL WINDOW4 2) OP
       EN LARGE"
SF 110 M$=M$+" WINDOW4 3) CLOS
       E 1 WINDOW4 4) CLOSE AL
       L WINDOWS4 5) EXIT"
RX 120 M$=M$+" DEMO44
       {4 SPACES}MAKE SELECTIO
       N"
JD 130 POKEP1,B(INT(RND(0)*5+1
       ))
HH 140 SYS49152,13,16,12,24,2,
       M$
AR 150 POKEP1,B(INT(RND(0)*5+1
       ))
KF 160 GETX$:IFX$<"1"ORX$>"5"T
       HEN160
CQ 170 PRINT"{HOME}@@@@@@@@@@@
       @@@@@@@@@@@"
SB 180 SYS49155:REM CLOSE MENU
        WINDOW
GS 190 ONASC(X$)-48GOTO200,240
       ,280,300,340
CP 200 IFPEEK(2)>9THENPRINT"
       {HOME}{RVS} TOO MANY WI
       NDOWS OPEN!":SYS49155,P
       EEK(2):GOTO130
HG 210 R%=RND(0)*6+2:C%=RND(0)
       *25+1:GOSUB360
XS 220 SYS49152,R%,C%,10,11,X%
       ,"4 THIS IS4 A SMALL4 W
       INDOW44{2 SPACES}PRESS4
        ANY KEY"
SB 230 GOTO320
CG 240 IFPEEK(2)>9THEN PRINT"
       {HOME}{RVS} TOO MANY WI
       NDOWS OPEN!":SYS49155,P
       EEK(2):GOTO130
BC 250 R%=RND(0)*10+2:C%=RND(0
       )*11+1:GOSUB360
RE 260 SYS49152,R%,C%,12,28,X%
       ,"444{2 SPACES}THIS IS
       {SPACE}A LARGE WINDOW44
       44↑ PRESS ANY KEY"
SE 270 GOTO320
MP 280 IFPEEK(2)=0 THEN PRINT"
       {HOME}{RVS} NO WINDOWS
       {SPACE}OPEN!{6 SPACES}"
       :GOTO130
AF 290 SYS49155:GOTO130
FA 300 IFPEEK(2)=0THEN280
XQ 310 SYS49155,PEEK(2):GOTO13
       0
CB 320 GETX$:IFX$=""THEN320
AG 330 GOTO130
JA 340 IFPEEK(2)THENSYS49155,P
       EEK(2)
BA 350 FORK=1TO2000:NEXT:PRINT
       "{CLR}":END
CH 360 X%=RND(0)*15+1:IF(PEEK(
       53281)AND15)=X%THEN360
DR 370 RETURN
```

1526 PrintScreen

See instructions in article on page 86 before typing in.

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:32 00 00 00 00 00 A0 00 B9 6E
0811:90 08 99 00 CF C8 D0 F7 D9
0819:84 FD A2 90 86 FB A2 08 B9
0821:E8 86 FC A9 D8 85 FE 78 D4
0829:A9 30 85 01 A2 07 B1 FB 6B
0831:91 FD C8 D0 F9 E6 FC E6 FB
0839:FE CA D0 F2 A9 37 85 01 FA
0841:58 20 00 CF A0 00 B9 53 4E
0849:08 F0 06 20 D2 FF C8 D0 55
0851:F5 60 0D 31 35 32 36 20 28
0859:50 52 49 4E 54 53 43 52 FC
0861:45 45 4E 20 49 53 20 4E 57
0869:4F 57 20 41 43 54 49 56 63
0871:45 2E 0D 54 4F 20 50 52 84
0879:49 4E 54 2C 20 55 53 45 51
0881:20 43 3D 2F 52 45 53 54 AF
0889:4F 52 45 2E 0D 0D 00 78 76
0891:20 8A FF AD 26 03 8D 54 DB
0899:CF AD 27 03 8D 55 CF AD 21
08A1:00 03 8D 45 CF AD 01 03 B2
08A9:8D 46 CF A9 38 8D 00 03 A1
08B1:A9 CF 8D 01 03 AD 18 03 4E
08B9:8D A1 CF AD 19 03 8D A2 60
08C1:CF 18 6E E5 CF 58 60 48 D4
08C9:A9 47 8D 26 03 A9 CF 8D 80
08D1:27 03 68 4C 00 00 48 A9 42
08D9:56 8D 18 03 A9 CF 8D 19 6C
08E1:03 68 4C 00 00 78 48 2C B5
08E9:E5 CF 30 42 38 6E E5 CF 22
08F1:8A 48 98 48 A5 01 48 A9 5C
08F9:36 85 01 A9 7F 8D 00 DC 50
0901:AD 01 DC EA CD 01 DC D0 71
0909:F7 C9 DF D0 16 AD 01 DC D8
0911:EA CD 01 DC D0 F7 C9 FF F3
0919:D0 F3 20 A3 CF 20 00 10 DD
0921:20 A3 CF 68 85 01 68 A8 56
0929:68 AA 18 6E E5 CF 68 4C 8F
0931:00 00 78 A9 10 8D BE CF F0
0939:8D C7 CF A9 D8 8D C4 CF EE
0941:8D CD CF A2 07 A0 00 A9 16
0949:30 85 01 B9 00 10 8D E6 D2
0951:CF B9 00 D8 99 00 10 AD F1
0959:E6 CF 99 00 D8 C8 D0 EB 7D
0961:EE BE CF EE C4 CF EE C7 8E
0969:CF EE CD CF CA D0 DC A9 D2
0971:36 85 01 60 AE 00 AA AA 9B
0979:AA AA AA AA AA AA AA AA 8B
0981:AA AA AA AA AA AA AA AA 93
0989:AA AA AA AA AA AA AA EE DF
0991:20 D0 A5 FB 8D 7C 10 A5 80
0999:FC 8D 7D 10 A5 FD 8D 7E FC
09A1:10 A5 FE 8D 7F 10 AD 15 8A
09A9:D0 8D 80 10 A9 00 8D 15 16
09B1:D0 A5 9D 8D 81 10 20 95 44
09B9:10 A9 E0 A0 E0 A2 20 20 56
09C1:00 15 CE 20 D0 AD 7C 10 3B
09C9:85 FB AD 7D 10 85 FC AD 69
09D1:7E 10 85 FD AD 7F 10 85 C8
09D9:FE AD 80 10 8D 15 D0 AD F7
09E1:81 10 85 9D 60 5F 60 02 86
09E9:19 60 0A 01 0D 05 13 60 F4
09F1:08 0F 13 14 60 60 02 19 11
09F9:60 0A 01 0D 05 13 60 08 EC
0A01:0F 13 14 60 AA AA AA AA E9
0A09:AA AA AA AA AA AA AA AA 1D
0A11:AA AA AA AA AA AA AA AA 25
0A19:AA AA AA AA AA AA AA AA 2D
0A21:AA AA AA AA AD 00 DD 49 A7
0A29:03 0A 0A 0A 0A 0A 0A 8D 3D
0A31:67 10 AD 18 D0 29 0E 0A 85
0A39:0A 18 6D 67 10 AA A0 36 1F
0A41:29 7F C9 10 D0 06 A2 D0 B8
0A49:A0 32 D0 08 C9 18 D0 04 29
0A51:A2 D8 A0 32 8E 68 10 8C E6
0A59:69 10 AD 18 D0 29 F0 4A B4
0A61:4A 18 6D 67 10 8D 6A 10 60
0A69:AD 11 D0 29 20 F0 0F AD D5
0A71:68 10 29 E0 A2 20 A0 E0 A8
0A79:20 00 15 4C 67 11 A9 00 D7
0A81:8D 6B 10 8D 6C 10 AD 11 22
0A89:D0 29 40 8D 6D 10 AD 69 A1
0A91:10 85 01 A9 00 85 FD A9 85
0A99:E0 85 FE AD 6B 10 85 FB DC
0AA1:AD 6C 10 18 6D 6A 10 85 E5
0AA9:FC A0 00 B1 FB AE 6D 10 05
0AB1:F0 02 29 3F 84 FC 0A 26 2A
0AB9:FC 0A 26 FC 0A 26 FC 85 CB
0AC1:FB 18 A5 FC 6D 68 10 85 11
0AC9:FC B1 FB 91 FD C8 C0 08 FD
0AD1:D0 F7 A5 FD 18 69 08 85 DC
0AD9:FD 90 02 E6 FE EE 6B 10 5A
0AE1:D0 03 EE 6C 10 AD 6B 10 E1
0AE9:C9 E8 D0 07 AD 6C 10 C9 B0
0AF1:03 F0 03 4C 0C 11 EA A9 0D
0AF9:36 85 01 AD 80 10 8D 86 6B
0B01:10 AD 1D D0 8D 87 10 AD 93
0B09:17 D0 8D 88 10 AD 10 D0 41
0B11:8D 89 10 A0 00 8C 8A 10 B3
0B19:A0 00 8C 8B 10 84 FC 8C E2
0B21:8C 10 8C 8D 10 8C 8F 10 CD
0B29:8C 8E 10 A9 F8 85 FD AD 4D
0B31:6A 10 18 69 03 85 FE AC F2
0B39:8A 10 B1 FD A2 05 0A 26 12
0B41:FC CA 10 FA 85 FB 18 A5 2C
0B49:FC 6D 67 10 85 FC 4E 89 6D
0B51:10 2E 8F 10 4E 87 10 2E CC
0B59:8D 10 4E 88 10 2E 8C 10 EE
0B61:4E 86 10 B0 03 4C 8C 12 C1
0B69:AD 8A 10 0A AA BD 00 D0 B8
0B71:38 E9 18 8D 8E 10 AD 8F 99
0B79:10 E9 00 8D 8F 10 BD 01 24
0B81:D0 38 E9 32 8D 70 10 EA A7
0B89:A0 FF 8C 90 10 A0 00 8C 1A
0B91:94 10 B1 FB 8D 92 10 8C 4F
0B99:93 10 AD 8F 10 8D 6F 10 D1
0BA1:AD 8E 10 8D 6E 10 A0 FF 02
0BA9:8C 91 10 C8 8C 74 10 0E 5D
0BB1:92 10 2E 74 10 20 EC 14 11
0BB9:A9 01 18 6D 6E 10 8D 6E FB
0BC1:10 A9 00 6D 6F 10 8D 6F 67
0BC9:10 EE 91 10 AE 91 10 EC 9F
0BD1:8D 10 D0 E1 EE 93 10 AE 7F
0BD9:93 10 E0 08 D0 C8 A0 00 45
0BE1:8C 93 10 AC 94 10 C8 B1 18
0BE9:FB 8D 92 10 8C 94 10 C0 4C
```


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```
0BF1:03 D0 B3 EE 70 10 EE 90 55
0BF9:10 AE 90 10 EC 8C 10 D0 61
0C01:8C A9 03 18 65 FB 85 FB CD
0C09:A9 00 65 FC 85 FC EE 8B FB
0C11:10 AE 8B 10 E0 15 F0 03 8F
0C19:4C F9 11 EE 8A 10 AE 8A 63
0C21:10 E0 08 F0 03 4C 89 11 F6
0C29:EA A9 00 8D 71 10 85 90 61
0C31:20 90 FF 78 AD 14 03 8D 56
0C39:82 10 AD 15 03 8D 83 10 03
0C41:AD 18 03 8D 84 10 AD 19 48
0C49:03 8D 85 10 A9 B4 8D 18 4B
0C51:03 8D FA FF 8D FE FF A9 BF
0C59:14 8D 19 03 8D FB FF 8D 1C
0C61:FF FF A9 C3 8D 14 03 A9 57
0C69:14 8D 15 03 A9 0A 20 19 90
0C71:15 20 B7 FF 29 83 F0 03 4F
0C79:4C 01 14 A2 0A A9 0D 20 D5
0C81:46 15 A9 0A 20 29 15 A9 51
0C89:06 20 19 15 A2 06 A9 14 B5
0C91:20 46 15 A9 06 20 29 15 A0
0C99:A9 07 20 19 15 A9 05 20 57
0CA1:19 15 A9 14 8D 66 10 A9 D1
0CA9:07 20 39 15 A0 00 A9 20 3E
0CB1:20 A8 FF C8 C0 14 D0 F6 7F
0CB9:A9 00 8D 6E 10 8D 6F 10 E4
0CC1:A9 00 8D 7B 10 AD 71 10 42
0CC9:8D 70 10 A9 00 8D 76 10 94
0CD1:8D 73 10 20 D5 14 4E 74 A1
0CD9:10 2E 73 10 EE 70 10 EE 3D
0CE1:76 10 AE 76 10 E0 08 D0 5B
0CE9:EA AD 73 10 AE 7B 10 9D 73
0CF1:56 10 EE 6E 10 D0 03 EE B6
0CF9:6F 10 E8 8E 7B 10 E0 08 B9
0D01:D0 C3 A2 00 BD 56 10 DD 0E
0D09:5E 10 D0 07 E8 E0 08 D0 8C
0D11:F3 F0 34 A2 07 A9 8D 20 2C
0D19:46 15 A9 05 20 39 15 A0 D1
0D21:00 B9 56 10 99 5E 10 20 FB
0D29:A8 FF C8 C0 08 D0 F2 20 46
0D31:AE FF A9 07 20 39 15 A0 F8
0D39:00 A9 20 20 A8 FF C8 CC 67
0D41:66 10 D0 F5 20 AE FF A2 6A
0D49:07 A9 FE 20 46 15 AE 66 7D
0D51:10 E8 8E 66 10 E0 3C F0 53
0D59:03 4C 31 13 A2 07 A9 0D F0
0D61:20 46 15 AD 71 10 18 69 FF
0D69:08 8D 71 10 C9 C8 B0 03 EF
0D71:4C 13 13 A2 07 A9 0D 20 1C
0D79:46 15 A9 07 20 29 15 A9 1B
0D81:05 20 29 15 A9 0A 20 19 6B
0D89:15 A9 0D A2 0A 20 46 15 D6
0D91:A9 0A 20 29 15 78 AD 82 02
0D99:10 8D 14 03 AD 83 10 8D FA
0DA1:15 03 AD 84 10 8D 18 03 EE
0DA9:AD 85 10 8D 19 03 60 A9 16
0DB1:75 85 FD A9 10 85 FE A9 80
0DB9:00 8D 75 10 AD 70 10 C9 FF
0DC1:C8 B0 10 AD 6F 10 C9 01 99
0DC9:90 0A D0 07 AD 6E 10 C9 4A
0DD1:40 90 01 60 AD 70 10 4A EF
0DD9:4A 4A 8D 77 10 AD 6F 10 FA
0DE1:4A AD 6E 10 6A 4A 4A 8D F9
0DE9:78 10 AD 70 10 29 07 8D C1
0DF1:79 10 AD 6E 10 49 FF 29 38
0DF9:07 8D 7A 10 A9 01 AE 7A 74
0E01:10 F0 04 0A CA D0 FC 8D A3
0E09:7A 10 A9 00 85 FE AD 78 97
0E11:10 0A 26 FE 0A 26 FE 0A 5D
0E19:26 FE 18 6D 79 10 85 FD F6
0E21:A5 FE 69 E0 85 FE AE 77 08
0E29:10 F0 10 18 A9 40 65 FD 24
0E31:85 FD A9 01 65 FE 85 FE 06
0E39:CA D0 F0 78 A0 00 A9 35 22
0E41:85 01 60 78 48 AD 0D DD E4
0E49:AD 0D DC A9 8F 8D 19 D0 6B
0E51:68 40 78 AD 0D DD AD 0D E3
0E59:DC A9 8F 8D 19 D0 68 A8 9E
0E61:68 AA 68 40 A9 00 8D 74 4A
0E69:10 20 20 14 B1 FD 2D 7A 35
0E71:10 F0 03 EE 74 10 A9 36 8E
0E79:85 01 60 AD 74 10 F0 0A 4F
0E81:20 20 14 B1 FD 0D 7A 10 7C
0E89:91 FD A9 36 85 01 60 85 FC
0E91:FC 84 FE A0 00 84 FB 84 C5
0E99:FD B1 FB 91 FD C8 D0 F9 68
0EA1:E6 FC E6 FE CA D0 F2 60 1D
0EA9:48 A9 04 20 B1 FF 68 09 3E
0EB1:F0 20 93 FF 20 AE FF 60 DC
0EB9:48 A9 04 20 B1 FF 68 09 4E
0EC1:E0 20 93 FF 20 AE FF 60 E4
0EC9:48 A9 04 20 B1 FF 68 09 5E
0ED1:60 20 93 FF 60 48 8A 20 F1
0ED9:39 15 68 20 A8 FF 20 AE 1B
0EE1:FF 60 00 00 00 00 00 00 16
```

Quick!

See instructions in article on page 82 before typing in.

Program 1: Quick!

```
9B00:4C 0B 9B A9 A5 A2 F4 A0 70
9B08:00 F0 45 A9 00 85 33 85 C0
9B10:37 A9 9B 85 34 85 38 D0 12
9B18:31 0D 51 55 49 43 4B 20 B8
9B20:44 49 53 41 42 4C 45 44 5C
9B28:0D 00 0D 51 55 49 43 4B 3E
9B30:20 41 43 54 49 56 41 54 EF
9B38:45 44 0D 00 4D 2D 57 C0 53
9B40:06 20 43 52 38 38 5A 41 A8
9B48:4B 59 A0 11 A9 62 A2 9B 58
9B50:8D 30 03 8E 31 03 B9 19 C5
9B58:9B F0 06 20 16 E7 C8 D0 0F
9B60:F5 60 85 93 A5 BA C9 08 48
9B68:90 1F A2 0F A9 A0 9D 00 FF
9B70:9F CA 10 FA A0 00 A2 00 26
9B78:B1 BB C9 30 D0 07 C8 B1 99
9B80:BB C9 3A F0 13 C9 24 D0 37
9B88:05 A5 93 4C A5 F4 B1 BB 03
9B90:C9 0D F0 09 9D 00 9F E8 B3
9B98:C8 C4 B7 90 F1 20 E0 9C D3
9BA0:20 8F 9C A9 55 20 A8 FF 76
9BA8:A9 43 20 A8 FF 20 AE FF F1
9BB0:20 AF F5 A9 13 8D 00 DD E9
9BB8:20 E1 FF F0 1B AD 00 DD F4
9BC0:C9 13 D0 F4 A9 0B 8D 11 B0
9BC8:D0 20 99 9C A4 C3 A6 C4 B3
9BD0:AD 00 9F 10 08 A9 04 2C EE
9BD8:A9 00 38 B0 7D 48 29 40 96
9BE0:8D 00 9F 68 29 07 C9 02 54
9BE8:08 D0 0A A5 B9 F0 06 AC 3E
9BF0:02 9F AE 03 9F 84 AE 86 0A
9BF8:AF 28 D0 07 A2 04 D0 05 68
9C00:20 99 9C A2 02 A0 00 AD AD
9C08:00 9F 30 67 D0 04 AC 01 96
9C10:9F C8 84 64 A5 93 F0 03 82
9C18:4C 6A 9C A4 AF C0 9A 90 36
9C20:1A F0 0D C0 A0 B0 14 20 60
9C28:5A 9C 20 03 9B 4C 89 9B A6
9C30:8A 38 E5 64 49 FF 18 65 9F
9C38:AE B0 EC A0 00 BD 00 9F 33
9C40:91 AE C8 E8 E4 64 D0 F5 E5
9C48:98 18 65 AE 85 AE 90 02 75
9C50:E6 AF AD 00 9F D0 A9 85 B7
9C58:90 18 A2 1B 8E 11 D0 A2 E2
9C60:33 8E 00 DD A6 AE A4 AF 9D
9C68:58 60 A0 00 BD 00 9F D1 F8
9C70:AE F0 13 98 18 65 AE 85 62
9C78:39 A5 AF 69 00 85 3A A9 78
9C80:1D 45 93 4C DA 9B C8 E8 90
9C88:E4 64 D0 E0 4C 48 9C A5 D7
9C90:BA 20 B1 FF A9 FF 4C 93 DE
9C98:FF A0 00 A5 91 C9 7F D0 D7
9CA0:05 68 68 4C D8 9B AD 00 D8
9CA8:DD C9 93 D0 EE 78 A9 03 72
9CB0:8D 00 DD AD 00 DD C9 43 95
9CB8:D0 F9 A2 04 CA D0 FD A2 A5
9CC0:04 AD 00 DD 0A 08 0A 26 EF
9CC8:95 28 26 95 CA D0 F2 A9 1E
9CD0:13 8D 00 DD A5 95 49 FF EA
9CD8:99 00 9F C8 D0 D0 58 60 3A
9CE0:A9 0F 85 FF A9 31 85 FB 7C
9CE8:A9 9D 85 FC A9 00 A0 05 72
9CF0:8D 3F 9B 8C 40 9B 20 8F 3D
9CF8:9C A0 00 B9 3C 9B 20 A8 7D
9D00:FF C8 C0 06 90 F5 A0 00 83
9D08:B1 FB 20 A8 FF C8 C0 20 6E
9D10:90 F6 20 AE FF A5 FB 18 E6
9D18:69 20 85 FB 90 02 E6 FC D7
9D20:18 AD 3F 9B AC 40 9B 69 7B
9D28:20 90 01 C8 C6 FF D0 C0 DC
9D30:60 A0 00 8C 00 18 A0 84 B2
9D38:84 B4 A9 F0 8D 4F 02 20 F4
9D40:42 D0 A0 02 8C 00 18 78 12
9D48:88 A9 12 8D 00 03 8C 01 73
9D50:03 20 ED 05 A0 03 84 3C 79
9D58:A9 02 85 3B A0 00 B1 3B F0
9D60:10 11 A0 03 B9 CC 06 C9 03
9D68:2A F0 26 C9 3F F0 1D D1 20
9D70:3B F0 19 A5 3B 18 69 20 30
9D78:90 E0 AC 00 03 F0 03 4C F7
9D80:20 05 CE 00 03 20 9A 05 B9
9D88:58 4C 45 D9 C8 C0 13 90 49
9D90:D3 A0 00 B1 3B 29 07 48 CD
9D98:C8 B1 3B 8D 00 03 C8 B1 34
9DA0:3B 8D 01 03 20 ED 05 68 58
9DA8:AE 00 03 F0 02 09 40 8D EC
9DB0:00 03 8A 48 20 9A 05 68 60
9DB8:B0 10 8D 00 03 F0 0B 20 14
9DC0:ED 05 20 9A 05 AD 00 03 C3
9DC8:D0 F5 60 A0 00 8C 00 18 4A
9DD0:AD 00 18 4A 90 04 8C 00 38
9DD8:03 60 29 02 D0 F2 AD 00 A0
9DE0:18 29 04 D0 F9 B9 00 03 B9
9DE8:85 85 A2 04 A9 02 8D 00 4D
9DF0:18 A9 00 06 85 2A 0A 06 F1
9DF8:85 2A 0A 8D 00 18 CA D0 62
9E00:F0 A2 03 CA D0 FD A9 00 3D
9E08:8D 00 18 C8 F0 09 AD 00 A2
9E10:18 29 04 D0 C9 F0 F7 A9 DC
9E18:02 8D 00 18 18 60 AC 01 D7
9E20:03 84 07 AD 00 03 C5 06 59
9E28:85 06 F0 10 A9 B0 85 00 E3
9E30:58 24 00 30 FC 78 A5 00 BA
9E38:C9 01 D0 58 A9 03 8D FF AE
9E40:06 A9 EE 8D 0C 1C A9 06 CB
9E48:85 32 A9 00 85 33 85 30 3E
9E50:A9 03 85 31 20 75 06 50 1A
9E58:FE B8 AD 01 1C 99 00 03 53
9E60:C8 D0 F4 A0 BA 50 FE B8 AC
9E68:AD 01 1C 99 00 01 C8 D0 40
9E70:F4 20 E0 F8 A5 38 C5 47 BC
9E78:F0 04 A9 22 D0 09 20 E9 5B
9E80:F5 C5 3A F0 09 A9 23 CE 84
9E88:FF 06 D0 A0 F0 09 A9 EC 57
9E90:8D 0C 1C 60 18 69 18 85 3D
9E98:44 A9 FE 8D 00 03 20 9A 02
9EA0:05 A5 44 4C C8 C1 20 7B 20
9EA8:06 4C B7 06 A5 12 85 16 E9
9EB0:A5 13 85 17 A5 06 85 18 10
9EB8:A5 07 85 19 A9 00 45 16 BA
9EC0:45 17 45 18 45 19 85 1A 44
9EC8:20 34 F9 A2 5A 20 B7 06 55
9ED0:50 FE B8 AD 01 1C D9 24 38
9ED8:00 D0 06 C8 C0 08 D0 F0 50
9EE0:60 CA D0 E9 A9 20 D0 AF D8
9EE8:A9 D0 8D 05 18 A9 21 2C 07
9EF0:05 18 10 A3 2C 00 1C 30 BC
9EF8:F6 AD 01 1C B8 A0 00 60 A7
```

Program 2: New Quick

```
HE 10 REM COPYRIGHT 1988 COMPU
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BE 20 PRINT"{CLR}{N}{H}
      {3 SPACES}COPYRIGHT 1988
       COMPUTE! PUB., INC."
JD 30 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED":PRINT"
      {2 DOWN}"
MP 40 PRINTTAB(12)"QUICK RELOC
      ATOR{2 DOWN}"
HQ 50 PRINT"A COPY OF QUICK MU
      ST BE RESIDENT IN"
JG 60 PRINT"MEMORY BEFORE RELO
      CATING.{DOWN}"
XK 70 INPUT"SOURCE BLOCK(DEC)"
      ;OA
```


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```
FJ 80 INPUT"{DOWN}DESTINATION
      {SPACE}BLOCK";M
CE 90 IFM>203OR(M<192ANDM>155)
      ORM<54THEN80
QE 100 IFM=0ATHEN210
HF 110 OA=OA*256:SA=M*256
KG 120 IFM<160THENPOKE56,M:POK
      E52,M:POKE51,0:POKE55,0
RH 130 FORI=0TO1023:POKESA+I,P
      EEK(OA+I):NEXT
PB 140 IFM<160THENPOKE1+SA,11:
      GOTO160
GH 150 POKE1+SA,74:SS=SA:MM=M
FK 160 SS=SA:MM=M:II=15:GOSUB3
      40
EM 170 SS=SA:MM=MM+1:II=9:GOSU
      B340
JM 180 MM=MM+1:POKESS+233,MM
JH 190 SS=SA:MM=MM+2:II=13:GOS
      UB340
QM 200 POKE SS+36,MM+1:POKESS+
      30,M-1
AJ 210 PRINT"{DOWN}SAVE FILE [
      {RVS}Y{OFF}/{RVS}N{OFF}
      ] ";
PE 220 GETS$:IFS$<>"N"ANDS$<>"
      Y"THEN220
HB 230 PRINTS$:IFS$="N"THENEND
FP 240 PRINT:INPUT"FILENAME [W
      ITHOUT '0:']";N$
DP 250 N$="0:"+N$
DE 260 L=LEN(N$):LM=0:HM=M+4:M
      M=LM+HM*256:POKE157,255
FJ 270 FORI=0TOL-1:POKEMM+I,AS
      C(MID$(N$,I+1,1)):NEXT:
      POKEMM+L,13
CG 280 POKE780,L+1:POKE781,LM:
      POKE782,HM:SYS189+255*2
      56
XP 290 POKE780,1:POKE781,8:POK
      E782,1:SYS186+255*256
BM 300 POKE251,0:POKE252,M:POK
      E780,251:POKE781,0:POKE
      782,M+4:SYS216+255*256
EH 310 OPEN15,8,15:INPUT#15,A,
      B$,C,D:CLOSE15
KH 320 IFA<>0THENPRINT:PRINTA;
      B$;C;D
DM 330 END
KD 340 FORI=1TOII:READA:IFA<0T
      HENSS=SS+256:NEXT
PD 350 POKESS+A,MM
SQ 360 NEXT:RETURN
FB 370 DATA2,18,79,88,-1,44,47
      ,133,165,242,245,253,-1
      ,35,38
RK 380 DATA159,162,203,-1,2,26
      ,41,142,248
BH 390 DATA112,150,210,226,241
      ,244,-1,9,16,63,84,110,
      218
```

Machine Language Programming

Article on page 60.

```
RC 100 DATA 162,0,189,92,32,32
       ,210,255
PG 110 DATA 232,201,32,208,245
       ,162,0
JB 120 DATA 142,0,33,32,207,25
       5,174,0
GD 130 DATA 33,157,1,33,232,14
       2,0
QS 140 DATA 33,201,13,208,239,
       169,13
KD 150 DATA 32,210,255,162,0,1
       89,95,32
SQ 160 DATA 32,210,255,232,201
       ,32,208,245
QX 170 DATA 32,228,255,201,49,
       144,249
CX 180 DATA 201,58,176,245,32,
       210,255
CB 190 DATA 41,15,168,169,13,3
       2,210,255
RK 200 DATA 162,0,189,1,33,32,
       210,255,232
HH 210 DATA 201,13,208,245,136
       ,208,240,96
GC 220 DATA 84,63,32,78,63,32
KR 230 FOR J=8192 TO 8289
AM 240 READ X:T=T+X
RS 250 POKE J,X
EG 260 NEXT J
KH 270 IF T<>12810 THEN STOP
EE 280 SYS 8192
```

Double Take

Article on page 41.

```
HE 10 REM COPYRIGHT 1988 COMPU
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PH 20 POKE646,0:POKE53280,15:P
      OKE53281,15:PRINT"{CLR}"
      ;TAB(11)"COPYRIGHT 1988"
RD 25 PRINTTAB(6)"COMPUTE! PUB
      LICATIONS, INC."
FK 30 PRINTTAB(9)"ALL RIGHTS R
      ESERVED{3 DOWN}"
DQ 40 FORI=1TO9:READA$:NEXT:FO
      RI=1TO380:READA:X=X+A:NE
      XT
QR 50 IFX<>14781THENPRINT"ERRO
      R IN DATA STATEMENT.":ST
      OP
PF 60 RESTORE:GOTO130
RC 70 GOSUB1740:PRINT"{BLK}
      {HOME}{4 DOWN}"SPC(14)"I
      T'S A DRAW":GOTO90
EX 80 GOSUB1740:POKE646,CL(PL)
      :PRINT"{HOME}{4 DOWN}"SP
      C(8)"PLAYER"PL+1"{LEFT}
      {SPACE}IS THE WINNER"
MB 90 POKE646,I:PRINT"{HOME}
      {22 DOWN}"SPC(8)"PRESS F
      IREBUTTON TO PLAY"
RS 100 I=I+1:IFI>=15THENI=0
EM 110 JB=16-PEEK(56320)AND16:
      IFJB=0THENRUN
GR 120 GOTO90
KD 130 GOSUB1740:PRINT"{CLR}";
      :POKE53280,15:POKE53281
      ,15:POKE53289,5
KC 140 PRINTSPC(13)"{BLK}{A}I
      {DOWN}{2 LEFT}BBOUBLE
      {UP}C{R}CCC{DOWN}":PRIN
      TSPC(13)"{Z}K{5 SPACES}
      {UP}{2 SPACES}BAKE"
FA 150 PRINTSPC(22)"{Z}":PRINT
      "{8 DOWN}"SPC(12)"{RVS}
      1{OFF} OR {RVS}2{OFF} J
      OYSTICKS":C$=""
DQ 160 POKE198,0:WAIT198,1:GET
      C$:IFC$<"1"ORC$>"2"THEN
      160
PS 170 F2=VAL(C$)-1
QQ 180 PRINTSPC(10)"{UP}P L E
      {SPACE}A S E{2 SPACES}W
       A I T"
FE 190 DIMDU(25),B(2,25),FL(2,
      25),A$(2,25),AN(2,25),Z
      Z(25),BB(25,4),BC(2,30)
AK 200 CR$="{RVS}TU{DOWN}
      {2 LEFT}VW":DN=189:UP=9
      3:LM=45:RM=126
QE 210 FORI=1TO9:READTE$(I):NE
      XT
AD 220 FORI=1TO25:BC(1,I)=2:BC
      (2,I)=2:NEXT
FG 230 TV=53248:POKETV+21,4:PO
      KE2042,11:FORI=0TO62:RE
      ADQ:POKE704+I,Q:NEXT
HK 240 ML$="{I}"+CHR$(8)+"{X}<
      "+CHR$(3)+"{2}XJ"+CHR$(
      16)+CHR$(248)+"L{B}{T}"
      :POKE835,0
FD 250 POKE53272,PEEK(53272)AN
      D240OR12
PQ 260 POKE836,208:POKE830,0:P
      OKE831,216:POKE828,0:PO
      KE829,56:POKE56334,0
SA 270 POKE1,51:ML$=ML$:SYS(PE
      EK(51)+256*PEEK(52)):PO
      KE1,55:POKE56334,1
RQ 280 FORI=13312TO13503:READJ
      :POKEI,J:NEXT
GH 290 FORI=1TO25:READZZ(I):NE
      XT
DH 300 FORI=1TO25:FORX=1TO4:RE
      ADBB(I,X):NEXT:NEXT
DR 310 FORQ=1TO2:FORI=1TO25:DU
      MMY(I)=1:NEXT:FORI=1TO2
      5
PH 320 X=INT(25*RND(1))+1:IFDU
      MMY(X)=0THEN320
QG 330 B(Q,I)=X:DUMMY(X)=0:NEX
      T
AK 340 FORI=1TO25:IFB(Q,I)<10T
      HENA$(Q,I)=TE$(B(Q,I)):
      GOTO360
KG 350 A$(Q,I)=RIGHT$(STR$(B(Q
      ,I)),2)
CK 360 NEXTI,Q
JF 370 FORI=1TO25:AN(1,I)=B(1,
      I):FORZ=1TO25
XH 380 IFB(2,Z)=AN(1,I)THENAN(
      2,I)=Z:Z=25:NEXTZ,I:GOT
      O400
EH 390 NEXTZ
FH 400 PRINT"{HOME}{6 DOWN}{8}
      {2 RIGHT}";:A=1:B=5
CH 410 FORI=1TO5:FORW=ATOB
PQ 420 PRINT"{RIGHT}"A$(1,W);:
      NEXT:PRINT"{5 RIGHT}";
KG 430 FORW=ATOB:PRINT"{RIGHT}
      "A$(2,W);:NEXT:PRINT"
      {DOWN}"
HF 440 A=A+5:B=B+5:PRINT"
      {DOWN}{2 RIGHT}";:NEXTI
JX 450 POKE53280,11:POKE53281,
      11:CL(0)=14:CL(1)=7
QD 460 PRINT"{HOME}{4 DOWN}
      {BLK}"
BJ 470 PRINT"{2 SPACES}{A}CC
      {R}CC{R}CC{R}CC{R}CC{S}
      {4 SPACES}{A}CC{R}CC{R}
      CC{R}CC{R}CC{S}"
DG 480 PRINT"{2 SPACES}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B{4 RIGHT}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B"
XG 490 PRINT"{2 SPACES}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B{4 RIGHT}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B"
QX 500 FORI=1TO4:PRINT"
       {2 SPACES}{Q}CC+CC+CC+C
       C+CC{W}{4 SPACES}{Q}CC+
       CC+CC+CC+CC{W}"
CF 510 PRINT"{2 SPACES}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B{4 RIGHT}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B"
```


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```
JD 520 PRINT"{2 SPACES}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B{4 RIGHT}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B{2 RIGHT}B
       {2 RIGHT}B":NEXT
AE 530 PRINT"{2 SPACES}{Z}{CC
       E}{CC}{E}{CC}{E}{CC}{E}{CC}{X}
       {4 SPACES}{Z}{CC}{E}{CC}{E}
       {CC}{E}{CC}{E}{CC}{X}{HOME}";
MG 540 QX=95:QY=45:MT=1:GOSUB1
       020
DK 550 POKETV+4,QY:POKETV+5,QX
       :POKE53271,PEEK(53271)O
       R(2↑2)
GP 560 POKE53289,CL(PL):GOSUB8
       90
PS 570 IFBC(1,MT)<>2THENPOKE53
       280,CL(PL):FORI=1TO1000
       :NEXT:POKE53280,11:GOTO
       560
HE 580 POKE646,CL(PL):UV=MT
GG 590 P=MT:Y1=5:GOSUB810:PRIN
       TCR$:BC(1,MT)=PL:MM=MT:
       XR=R1
SB 600 IFBB(MT,1)=0THEN620
MA 610 IFBC(1,BB(MT,1))=-PL+1A
       NDBC(1,BB(MT,2))=-PL+1T
       HEN Y1=5:GOTO650
RR 620 IFBB(MT,3)=0THEN690
QX 630 IFBC(1,BB(MT,3))=-PL+1A
       NDBC(1,BB(MT,4))=-PL+1T
       HENY1=5:GOTO670
HB 640 GOTO690
EE 650 BC(1,BB(MT,1))=PL:BC(1,
       BB(MT,2))=PL:P=BB(MT,1)
MJ 660 GOSUB810:PRINTCR$:P=BB(
       MT,2):GOSUB810:PRINTCR$
       :GOTO620
RC 670 BC(1,BB(MT,3))=PL:BC(1,
       BB(MT,4))=PL:P=BB(MT,3)
SS 680 GOSUB810:PRINTCR$:P=BB(
       MT,4):GOSUB810:PRINTCR$
DX 690 P=AN(2,MT):PP=P:KT=1:GO
       SUB800:YR=R2:BC(2,P)=PL
       :TM=P:IFBB(TM,1)=0THEN7
       10
JM 700 IFBC(2,BB(TM,1))=-PL+1A
       NDBC(2,BB(TM,2))=-PL+1T
       HEN740
PA 710 IFBB(TM,3)=0THEN780
DM 720 IFBC(2,BB(TM,3))=-PL+1A
       NDBC(2,BB(TM,4))=-PL+1T
       HEN760
XE 730 GOTO780
PG 740 BC(2,BB(TM,1))=PL:BC(2,
       BB(TM,2))=PL:P=BB(TM,1)
       :KT=1
HS 750 GOSUB810:PRINTCR$:P=BB(
       TM,2):KT=1:GOSUB810:PRI
       NT CR$:GOTO710
DJ 760 BC(2,BB(TM,3))=PL:BC(2,
       BB(TM,4))=PL:P=BB(TM,3)
       :KT=1
KS 770 GOSUB810:PRINTCR$:P=BB(
       TM,4):KT=1:GOSUB810:PRI
       NTCR$
GB 780 GOSUB1460:PL=-PL+1:TURN
       =TURN+1:IFTURN=25THEN70
FK 790 GOTO560
AS 800 GOSUB810:PRINTCR$:RETUR
       N
SH 810 POKE646,CL(PL):IFP<6THE
       NCK=1:KC=1:GOTO860
RG 820 IFP<11THENCK=2:KC=4:GOT
       O860
KR 830 IFP<16THENCK=3:KC=7:GOT
       O860
MA 840 IFP<21THENCK=4:KC=10:GO
       TO860
DG 850 CK=5:KC=13
QG 860 IFKTTHENTEMP=5*CK-P:XX=
       (38-TE*3)-3:YY=Y1+KC:GO
       SUB880:KT=0:R2=CK:RETUR
       N
SF 870 TEMP=5*CK-P:XX=(24-TE*3
       )-9:YY=Y1+KC:GOSUB880:R
       1=CK:RETURN
BC 880 POKE783,0:POKE781,YY:PO
       KE782,XX:SYS65520:RETUR
       N
RK 890 JY=15-(PEEK(56320+PL*F2
       )AND15):JB=PEEK(56320+P
       L*F2)AND16
HS 900 IFJB=0THENRETURN
DG 910 IFJY=8THENJY=3
JM 920 IFJY<1ORJY>4THEN890
EE 930 ONJYGOTO940,960,980,100
       0
EC 940 IFQX-4<UPTHEN890
ED 950 QX=QX-24:MT=MT-5:GOSUB1
       020:GOTO890
SG 960 IFQX+4>DNTHEN890
GR 970 QX=QX+24:MT=MT+5:GOSUB1
       020:GOTO890
CD 980 IFQY+4>RMTHEN890
KJ 990 QY=QY+24:MT=MT+1:GOSUB1
       020:GOTO890
FJ 1000 IFQY-4<LMTHEN890
FE 1010 QY=QY-24:MT=MT-1:GOSUB
       1020:GOTO890
HG 1020 POKETV+4,QY:POKETV+5,Q
       X:RETURN
MG 1030 DATA "01","02","03","0
       4","05","06","07","08"
       ,"09"
QG 1040 DATA255,255,252,192,0,
       12,192,0
JG 1050 DATA12,192,0,12,192,0,
       12,192
HH 1060 DATA0,12,192,0,12,192,
       0,12
BE 1070 DATA192,0,12,192,0,12,
       255,255
AP 1080 DATA252,0,0,0,0,0,0,0
EK 1090 DATA0,0,0,0,0,0,0,0
FM 1100 DATA0,0,0,0,0,0,0,0
CM 1110 DATA0,0,0,0,0,0,0
DH 1120 DATA 0,0,0,0,60,102,10
       2,110
PB 1130 DATA 0,0,0,0,24,24,56,
       24
GB 1140 DATA 0,0,0,0,60,102,6,
       12
MG 1150 DATA 0,0,0,0,60,102,6,
       28
HK 1160 DATA 0,0,0,0,6,14,30,5
       4
PK 1170 DATA 0,0,0,0,126,96,96
       ,124
AM 1180 DATA 0,0,0,0,60,102,96
       ,96
BQ 1190 DATA 0,0,0,0,126,102,1
       2,24
BB 1200 DATA 0,0,0,0,60,102,10
       2,60
PX 1210 DATA 0,0,0,0,60,102,10
       2,102
FG 1220 DATA 118,102,102,60,0,
       0,0,0
ES 1230 DATA 24,24,24,126,0,0,
       0,0
JC 1240 DATA 12,48,96,126,0,0,
       0,0
KB 1250 DATA 28,6,102,60,0,0,0
       ,0
XR 1260 DATA 102,127,6,6,0,0,0
       ,0
HH 1270 DATA 6,6,102,60,0,0,0,
       0
KD 1280 DATA 124,102,102,60,0,
       0,0,0
KR 1290 DATA 24,24,24,24,0,0,0
       ,0
JS 1300 DATA 60,102,102,60,0,0
       ,0,0
DC 1310 DATA 62,6,102,60,0,0,0
       ,0
MD 1320 DATA 0,7,31,63,127,127
       ,255,255
MX 1330 DATA 0,224,248,252,254
       ,254,255,255
ME 1340 DATA 255,255,127,127,6
       3,31,7,0
RS 1350 DATA 255,255,254,254,2
       52,248,224,0
EG 1360 DATA 2,3,3,3,2
MM 1370 DATA 3,4,4,4,3
XP 1380 DATA 3,4,4,4,3
QJ 1390 DATA 3,4,4,4,3
QH 1400 DATA 2,3,3,3,2
SX 1410 DATA 2,6,0,0,1,3,0,0,2
       ,4,0,0,3,5,0,0,4,10,0,
       0
RC 1420 DATA 1,11,0,0,6,8,2,12
       ,7,9,3,13,8,10,4,14,5,
       15,0,0
KR 1430 DATA 6,16,0,0,11,13,7,
       17,12,14,8,18,13,15,9,
       19,10,20,0,0
DR 1440 DATA 11,21,0,0,16,18,1
       2,22,17,19,13,23,18,20
       ,14,24,15,25,0,0
SQ 1450 DATA 16,22,0,0,21,23,0
       ,0,22,24,0,0,23,25,0,0
       ,20,24,0,0
DD 1460 FORD=1TO2
PB 1470 JJ=0
EQ 1480 FORI=1TO5:GOSUB1530:NE
       XTI:GOSUB1560
DF 1490 FORI=6TO10:GOSUB1530:N
       EXTI:GOSUB1560
RK 1500 FORI=11TO15:GOSUB1530:
       NEXTI:GOSUB1560
GG 1510 FORI=16TO20:GOSUB1530:
       NEXTI:GOSUB1560
PB 1520 FORI=21TO25:GOSUB1530:
       NEXTI:GOSUB1560:NEXTD:
       GOTO1580
SG 1530 IFBC(D,I)=2THENJJ=JJ+1
       5:GOTO1550
MC 1540 JJ=JJ+BC(D,I)
ED 1550 RETURN
KA 1560 IFJJ/5=PLTHEN80
JR 1570 JJ=0:RETURN
DP 1580 FORD=1TO2
PK 1590 JJ=0
QQ 1600 FORI=1TO21STEP5:GOSUB1
       650:NEXTI:GOSUB1680
KS 1610 FORI=2TO22STEP5:GOSUB1
       650:NEXTI:GOSUB1680
HD 1620 FORI=3TO23STEP5:GOSUB1
       650:NEXTI:GOSUB1680
CF 1630 FORI=4TO24STEP5:GOSUB1
       650:NEXTI:GOSUB1680
JS 1640 FORI=5TO25STEP5:GOSUB1
       650:NEXTI:GOSUB1680:NE
       XTD:GOTO1700
FA 1650 IFBC(D,I)=2THENJJ=JJ+1
       5:GOTO1670
MM 1660 JJ=JJ+BC(D,I)
EP 1670 RETURN
KJ 1680 IFJJ/5=PLTHEN80
HF 1690 JJ=0:RETURN
QA 1700 FORD=1TO2
XB 1710 IFBC(D,1)=PLANDBC(D,7)
       =PLANDBC(D,13)=PLANDBC
       (D,19)=PLANDBC(D,25)=P
       LTHEN80
HG 1720 IFBC(D,5)=PLANDBC(D,9)
       =PLANDBC(D,13)=PLANDBC
       (D,17)=PLANDBC(D,21)=P
       LTHEN80
AD 1730 X=(YR*5)-4:C1=PP-((YR*
       5)-4)+1:JJ=0:I=X:NEXT
       {SPACE}D:RETURN
CM 1740 POKE53252,0:POKE53253,
       0:RETURN
```

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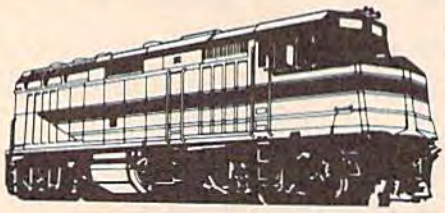

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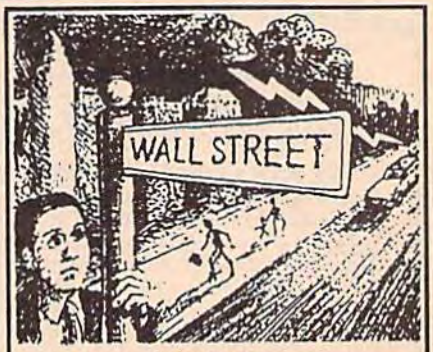

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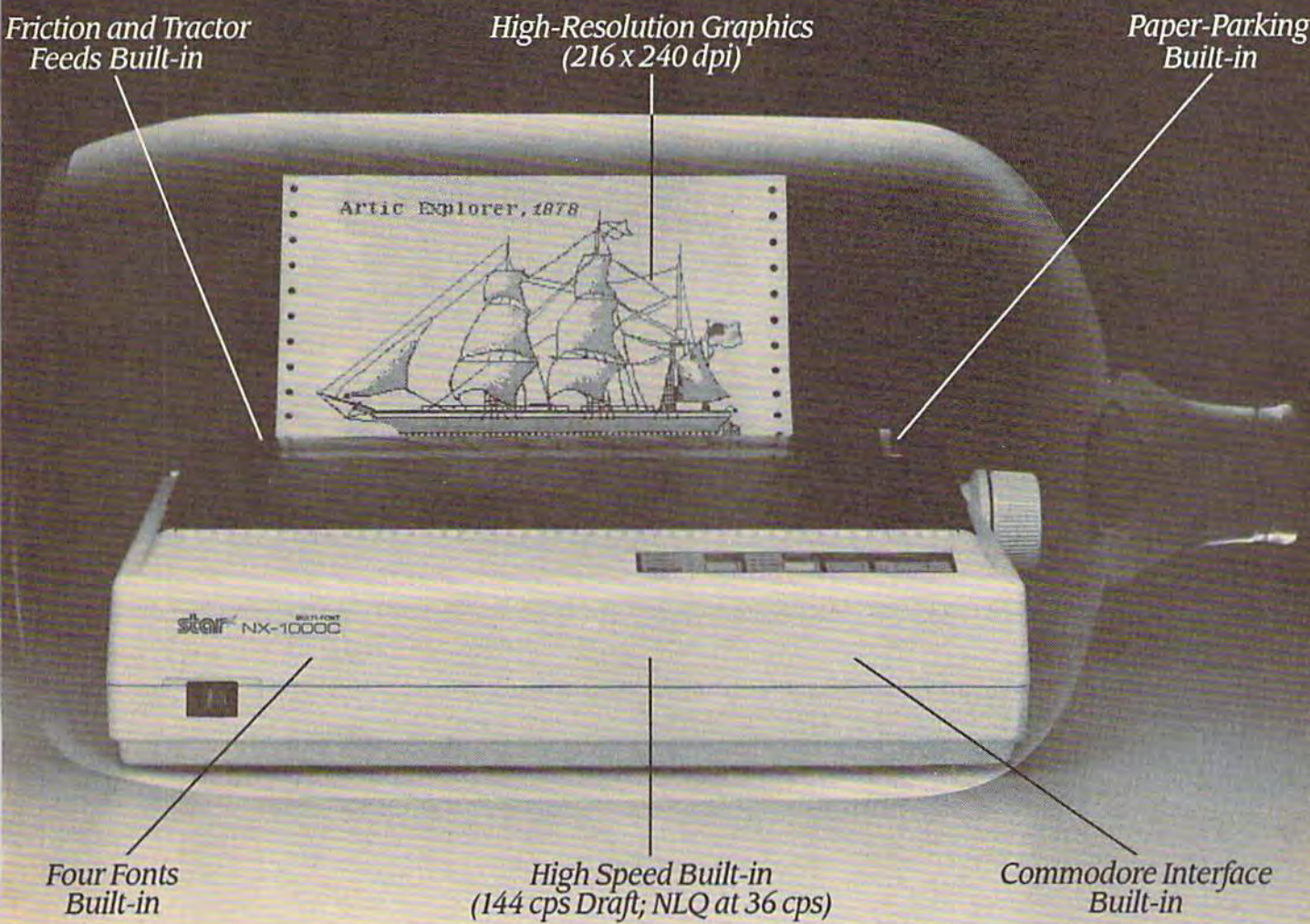

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MLX Machine Language Entry Program For Commodore 64

Ottis Cowper

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

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

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

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

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

Entering A Listing

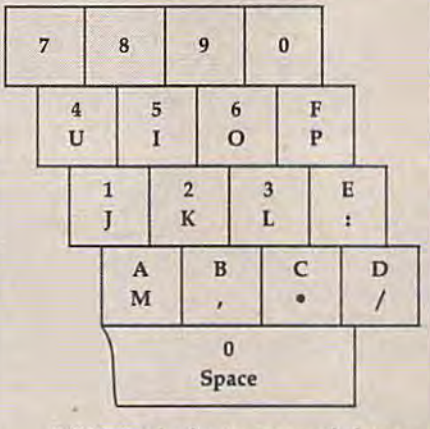
Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex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

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

Invalid Characters Banned

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

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



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

Editing Features

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

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

Display Data

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

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

Other Menu Options

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

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

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

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

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

The Finished Product

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

An Ounce Of Prevention

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

MLX For Commodore 64

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


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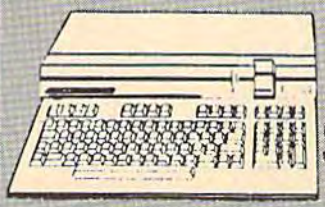

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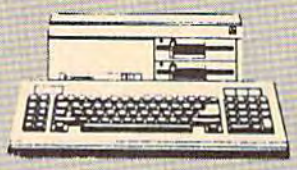

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```
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
       [4]";:GOSUB300:IF IN$<>
       N$ THEN GOSUB1030:IF F
       {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
       {SPACE}":GOSUB400:IF IN
       $=N$ THEN220
JK 430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

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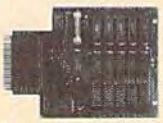

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The Automatic Proofreader

Philip I. Nelson

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

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

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

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

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

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

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

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

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

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

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

The New Automatic Proofreader

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

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

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

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

Special Characters

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

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

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

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

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

The Quote Mode

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

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

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

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

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

For Commodore 64 Only

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

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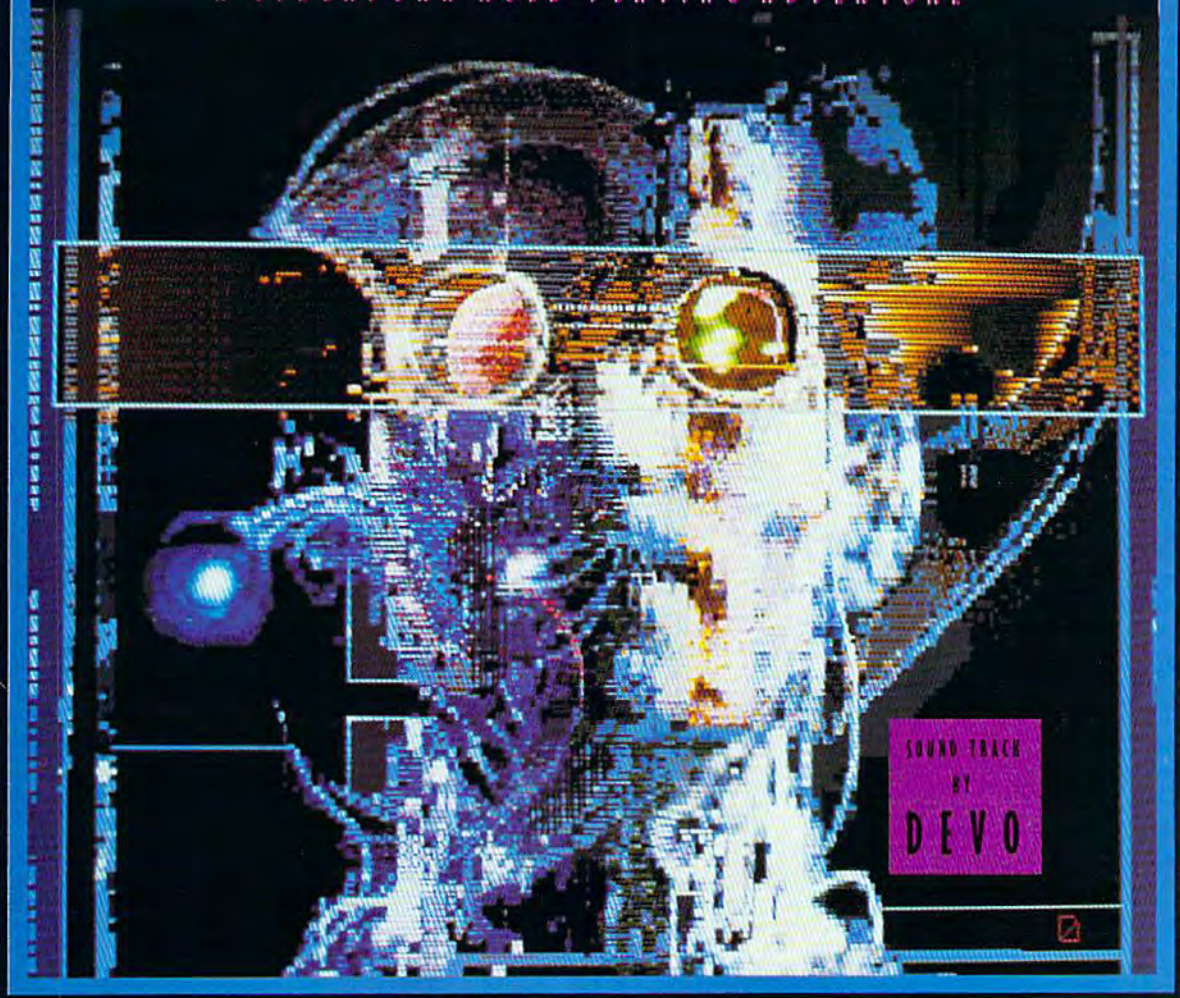

Actual C64 Screens

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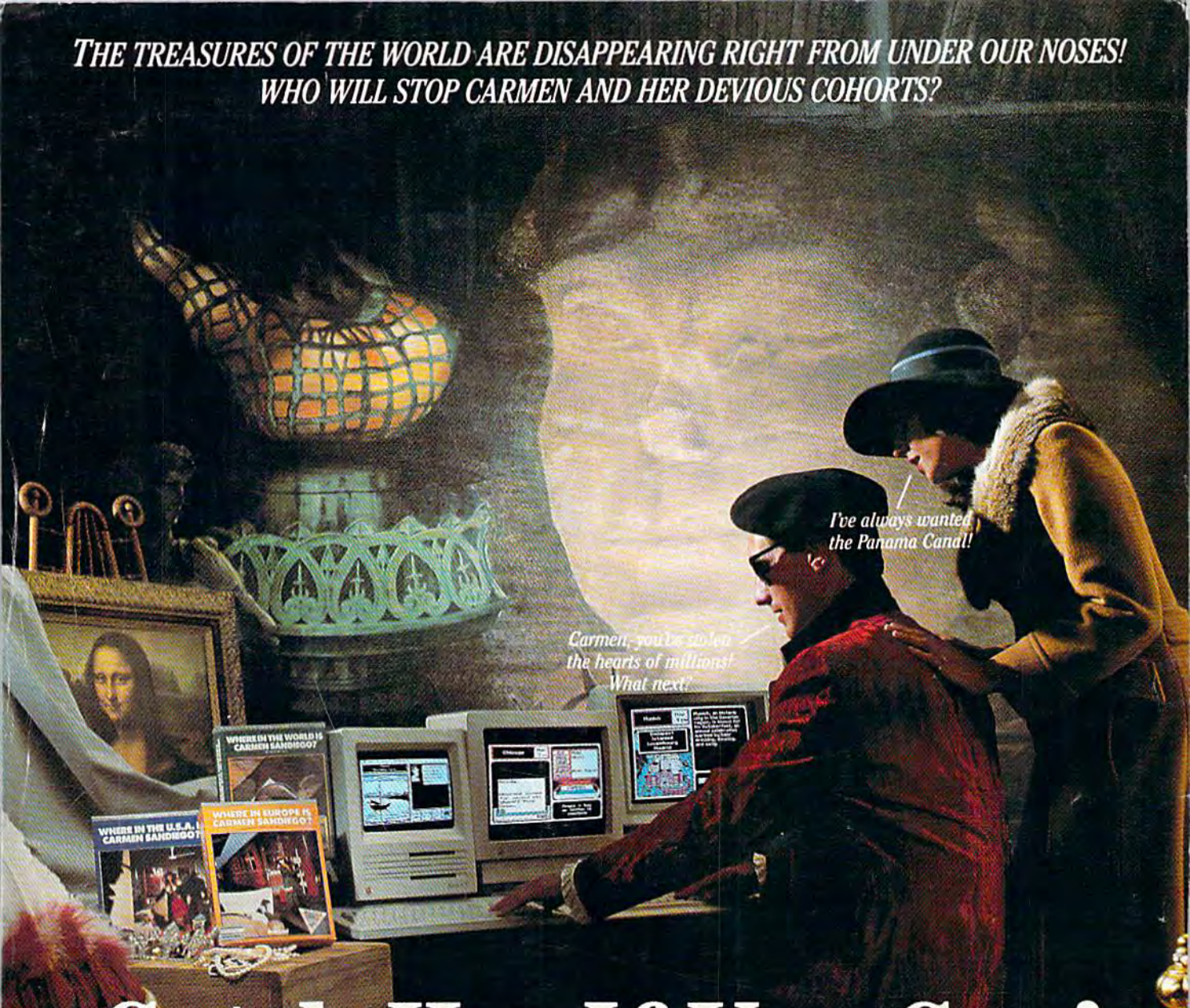

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