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April 1988

COMPUTE!

The Leading Magazine of Home, Educational, and Recreational Computing

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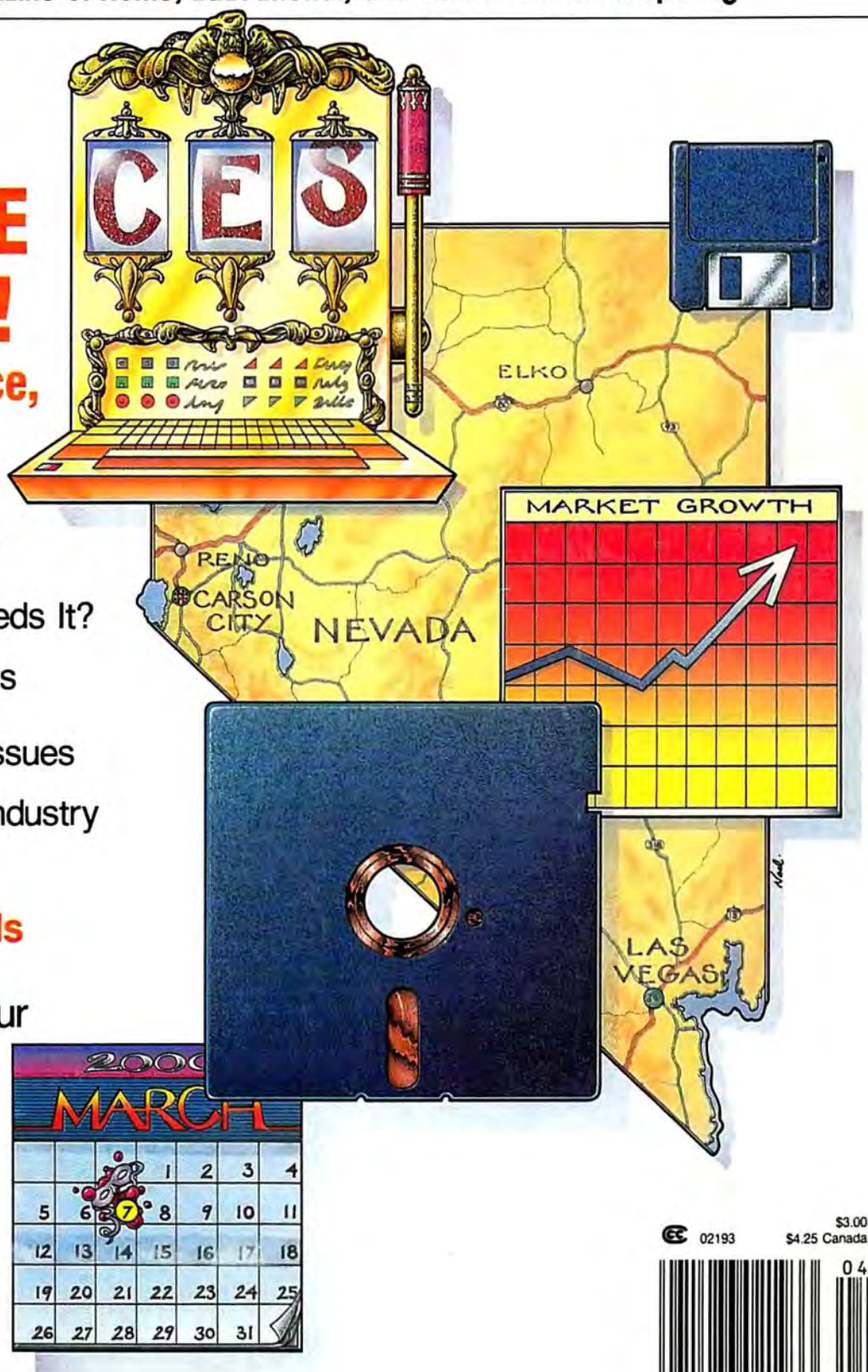

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COMPUTE!

APRIL 1988
VOLUME 10
NUMBER 4
ISSUE 95

The Leading Magazine of Home, Educational, and Recreational Computing

FEATURES

REVIEWS

COLUMNS AND DEPARTMENTS

THE JOURNAL

NOTE: See page 88 before typing in programs.

AP Apple, **GS** Apple IIGS, **Mac** Macintosh, **AT** Atari ST, **ST** Atari ST, **AM** Amiga, **64** Commodore 64, **128** Commodore 128, **PC** IBM PC, **PCjr** IBM PCjr, • General interest

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Editor's Notes

The dramatic evolution thus far in the life of the personal computer industry will be historically regarded as a unique phenomenon: Never have so many fundamental changes occurred so rapidly, and in an industry that virtually didn't exist a dozen years ago.

To get a sense of this startling evolution, look back only six years to the state of personal computer technology and compare it with today's. In terms of speed, memory, graphics, and almost all other hardware criteria, the computers of 1988 are several orders of magnitude beyond what was then available. In software, the same dramatic changes have occurred. Look at some of the first commercially successful programs written for the Apple II or Commodore 64, and compare them with almost any from the current stock. Or look at the changes in telecommunications, display monitors, and data storage devices. The differences are dramatic.

There's no better place to gain an understanding of just how great those changes have been than in the pages of the leading computer magazines. Since 1979, COMPUTE Magazine has had a front row seat at this spectacle. Our goal (and our delight) continues to be in following the continually evolving personal computer market to see where it's headed and to join with our readers in trying to understand how best to use this amazing technology. (For example, to see what was on our readers' minds in the early 1980's, see "Our Back Pages" on page 12.)

Despite the popularity of our machine-specific magazines—COMPUTE!'s Gazette for Commodore 64 and 128, COMPUTE!'s PC Magazine for IBM and compatibles, COMPUTE!'s Apple Applications for Apple II and Macintosh, and COMPUTE!'s Atari ST Disk & Magazine—we're convinced that there continues to be an important place for a wide-ranging horizontal computer magazine that brings to computer users the best in news, reviews, in-depth features, and hands-on tutorials. One of the hallmarks of COMPUTE!'s success has been its ability to evolve along with the industry. And we're pleased to say that this is just what we're doing again.

Beginning next month, COMPUTE! will have an exciting new design, new columns, and a different approach to features and product reviews. Taking the helm as editor will be Gregg Keizer, who has been with COMPUTE! Publications for nearly five years and remains as editor of Apple Applications. I'll be staying on as editor of Gazette and will increase my involvement with our PC magazine.

COMPUTE!'s new look will showcase some of the best and most knowledgeable writers and columnists in the computer industry. These writers and the experienced staff here at COMPUTE! Publications are expanding the number and scope of our feature articles to take on a variety of the most important topics each month. We'll show you what you can do with your computer now, and what you can expect from it in the future.

Our new columns, by such popular writers as educator and software developer David Thornburg and renowned science fiction writer Orson Scott Card, will give you insights on everything from industry trends to the latest and greatest entertainment software.

More product reviews in next month's COMPUTE! means more information for you, and more informed buying decisions. Our reviewers will examine the most promising software in the entertainment, education, home productivity, professional, and small business arenas. And we'll look at hardware—new computers, printers, disk drives, add-on cards, and the like—for the first time on a regular basis.

Even though COMPUTE! is written for *all* computer owners, no matter what system they may own, we'll continue to provide the hottest machine-specific information in a new department—COMPUTE! Specific.

If you care about what you can do with your computer, if you want to know how what's happening in the industry affects you, if you want the latest information about emerging trends like desktop video, CD-ROM, second-generation paint programs, and more, then you're going to like the new COMPUTE!.

Look for us next month. You'll be glad you did.

Lance Elko, Editor

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The Leading Magazine Of Home, Educational, And Recreational Computing

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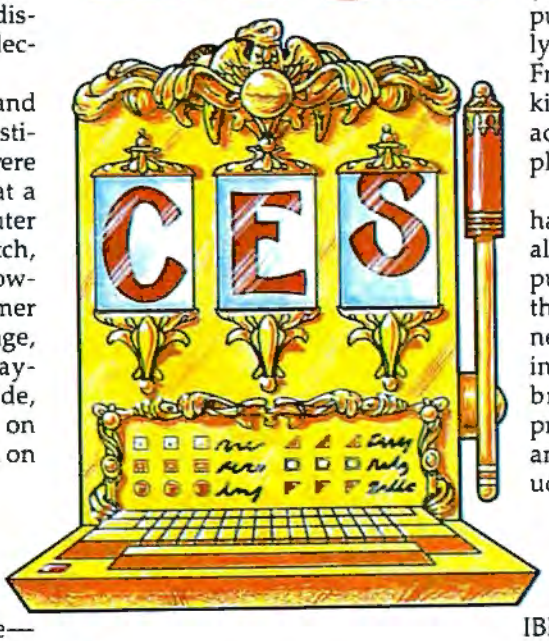


Computer owners emerged as big winners in Las Vegas this past January, judging by the products on display at the Winter Consumer Electronics Show.

On both the hardware and software fronts, increasing sophistication and user friendliness were much in evidence. It is clear that a third generation of microcomputer hardware, with software to match, is being unleashed. Hardware power continues to climb. Consumer software is truly coming of age, demonstrating heightened playability on the entertainment side, vastly increased performance on the productivity side, innovation on all sides.

Computerized Hot Spot

While some of the traditional areas of consumer electronic strength—VCRs, for example—showed signs of slippage and saturation ("How," one dealer was overheard saying, "do you sell that *third* VCR into a household?"), computers and software remained a CES hot spot. More than a few observers expressed confidence that the emergence of a large home computer market is just beginning to take place.

Consumer software publishers and compatibles manufacturers are going after that market in a big way, enthusiastic despite a resurgent videogame industry and the possibility of economic downturn.

There was a sense of a vast, as yet untapped, market on the brink of waking up. It's a new market (the millions of first-time computer buyers), but one increasingly comfortable with computers. From VCRs to automobiles to kitchen appliances, consumers are accustomed to programmable appliances, electronic displays.

It's a market whose children have lived with microcomputers all their lives, for whom a computer is something that's not in the house *yet*, not something that never will be. The home computer industry is ready to break out, bringing new products, new prices, and new directions. Here's an overview of some of the products on display at CES.

It was quite a show! The Winter Consumer Electronics Show this past January marked an important turning point for the computer/ software industry. There were more consumer products than ever before—so many that we couldn't mention all of them in this article—and the products reflected a new spirit of adventure and growth, exemplars of an industry that is becoming a full-fledged member of both consumer electronics and the media establishment. After a couple of slow seasons, home computing is back with a vengeance—and this time, many feel, it's here to stay.

Hardware

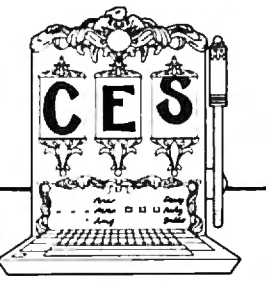
The overwhelming majority of machines on display were IBM compatibles. Commodore and Atari passed on appearing at CES, while IBM and Apple have never been present at the show.

That left the field open to the compatibles manufacturers, most of whom stressed the growing size and importance of the home office market, although an increased awareness of the consumer market was also evident.

Amstrad continued to press its menu of configurations, offering consumers their choice of bundled software. Purchasers may choose either Migent's *Ability*, an integrated package, or Amstrad's proprietary *Discover Kit*, developed by Learning Technologies, which in-

Keith Ferrell, Features Editor

Report From The Winter



cludes applications software as well as product samples from leading software publishers. The software bundles accompany the PC 1512, Amstrad's desktop computer, or the company's new entry, the PPC 512, a portable computer. The PPC 512 can be run on AC, an automobile cigarette lighter, or regular "C" batteries. The 512K portable is available for $949 (single 3½-inch drive) or $1,049 (dual 3½-inch drives).

Blue Chip president John Rossi sponsored a press breakfast featuring a speech by Julian Cohen, head of the American Home Business Association. Cohen stressed the size and untapped market potential of the home office market, citing figures that show more than 13 million home offices, with an average annual income of over $50,000. Blue Chip is addressing that market aggressively with an expanded IBM-compatible product line including an AT (the pcPopular AT, 640K RAM, one 1.2-megabyte floppy disk drive, priced at $1,499) and an XT (the pcPopular XT, 512K RAM, one floppy disk drive, and a 20-megabyte hard disk, priced at $1,199). For mobile users, Blue Chip introduced the MasterPC Portable, a 19-pound portable AT offering 1MB of memory, a supertwist backlit screen, and an 80286 central processor.

Vendex continued and extended its HeadStart campaign, proclaiming its PC, with bundled software and DOS tutorial/interface, the easiest of all for the first-time buyer, with features appreciated by power users. Much present was Vendex spokesman, wrestler King Kong Bundy. Confident that first-time buyers will quickly become power users, Vendex used CES as a showplace for its line of "Easy Does It" peripherals, including a 21-megabyte hard disk ($599) and a Memory Upgrade kit ($99.95), which lets users boost RAM from 512K to 748K. Also making its debut at CES was the HeadStart Mouse, produced for Vendex by Logitech and priced at $99.95. It comes bundled with Logitech's *Paint Show* graphics package.

Laser (Video Technologies) used CES to remind attendees that not all the compatibles manufacturers were restricted to the IBM market. At CES, the company introduced a variety of machines in its successful line of both Apple and IBM compatibles. On the Apple front, Laser showed its new Laser 128 EX ($579.95), boasting faster processing speed than the Apple II, memory expansion to over 1MB on an *AppleWorks*-compatible RAM board, built-in disk drive and peripherals interfaces. On the IBM compatibles side of the line, the company showed its Laser Compact XTE ($599), with 512K RAM (expandable to 640K), multiple video mode support, and built-in disk drive. The Laser Compact XTE ($699) delivers 640K RAM, built-in expanded memory standard, and EGA graphics support. Coming later in the year from Laser are a IIGS compatible, tentatively priced at under $600, and an IBM AT compatible for under $800.

Productivity

Productivity and applications software is available, by now, for every machine and every budget. The new products on display in Las Vegas sported enhanced capabilities, easy-to-use interfaces, and competitive prices.

Timeworks tackled the desktop publishing market across the board with *Publish It!* (MS-DOS, $149.95; Apple II series, $99.95;) and *Desktop Publisher ST* (ST, $129.95; 64/128 version to be introduced later this year). For the MS-DOS market, the company debuted *The Executive Word Writer PC* ($149.95), a full-featured word and outline processor, with built-in spelling and style checkers. To manage taxes, there was *Sylvia Porter's SwifTax* (MS-DOS, Apple II, $69.95).

PaperClip Publisher ($49.95) from **Electronic Arts** brings an Amiga-style interface to the 64/128 desktop publishing environment.

Having created a strong market with its 64/128 *GEOS* series of packages, **Berkeley Softworks** let audiences at CES know that the operating system would be ported to the Apple environment. Berkeley also showed *geoProgrammer* (64/128, $69.95).

Learning Tools

The marriage of microcomputers and education is entering its second decade, with educational software publishers seeing dramatic growth in the home market for their products.

Davidson showed *Read 'N Roll* (Apple II, $49.95; MS-DOS to come later in 1988), which allows teachers and parents to tailor reading exercises aimed at helping students better understand the contexts and inferences of words, as well as their meanings.

"Know Thyself" might be the advice followed by **Three-Sixty** with *Bridges* (MS-DOS, Macintosh), a psychological profile/motivational package developed by psychologist and NASA consultant Dr. Taibi Kahler.

With *Sesame Street Print Kit* (MS-DOS, Apple II, 64/128, Atari 8-bit, $14.95), from **Hi Tech Expressions**, students can put familiar characters from the popular PBS program to work in banners, greeting cards, and other printed materials.

Consumer Electronics Show

CES Report

Also announced was *Sesame Street Learning Library* (MS-DOS, 64/128, $24.95) a three-volume bundle of activity software. Older students (ages 7–12) can visit *The Computer Clubhouse* (MS-DOS, Apple II, $14.95) an integrated package of application and utility software developed with kids in mind, including word processor, calculator, name and address file, and a cartoon program called "Sideshow," which can be viewed while other applications are running.

For children wishing to create their own books, **Compu-Teach** debuted *Once Upon A Time* (MS-DOS, Apple II, $39.95), an interactive desktop publishing program that comes with a variety of graphics images. The package is aimed at children ages 6–12.

Weekly Reader's emphasis was on two new products. *Vocabulary Development* (MS-DOS, Apple II, $39.95), designed for grades 3–6, aims at aiding in mastering skills such as synonyms, antonyms, prefixes, suffixes, and other aspects of vocabulary. The program allows teachers and parents to design and print their own exercises. *Reading Comprehension* (MS-DOS, Apple II, $39.95) for grades 4–6, stresses reading skills including distinguishing between main idea and details, cause and effect; the package contains 30 stories, and allows for teacher or parent customization, and tailoring to individual children.

Utility

More and more software publishers are providing materials to help computer users use their computers more efficiently.

Spinnaker introduced *Running Start* (MS-DOS, $39.95), which includes instruction in DOS operation, typing, and word processing.

Design Software (distributed by Electronic Arts) unveiled a variety of utilities, including *DS Backup* (MS-DOS, $79.95), a backup/restore program, and *DS Tutor* (MS-DOS, $39.95), an instructional package, as well as several other utility packages.

Publishing International continues to extend its line of *Byte Size* products. Aggressively priced at under $20, new additions to the list include *Telecommunications*, *Gift List*, and *Coupon Finder*.

Targeting telecommunications for the Apple IIGS is **Activision**, with *Teleworks Plus* ($99.95; available for $50 in exchange for page 1 of the user's current communications manual).

Pretty Pictures

Activision displayed *Paintworks Gold* (Apple IIGS with minimum 1.25MB RAM, $99.95) which offers color masking, page switching, transparent colors, and other features.

Photon Paint (Amiga, $99.95) from **Microillusions** (distributed by Activision) is a hold-and-modify paint program able to bring more than 4,000 colors to the screen at once.

Photon Paint

IBM artists were addressed by **Spinnaker** with *Splash* (price not set), which takes full advantage of VGA's 256,000 colors and provides tools to work with them. MS-DOS painters were also addressed by **Electronic Arts**, which announced the translation of *DeluxePaint II* ($149.95) to the MS-DOS environment.

Desktop video, unheard of a couple of years ago, is a category experiencing sharp growth. EA showed *DeluxeProductions* (Amiga, $199.95), a hi-res graphics animation package aimed at the computer presentation market. A companion product *DeluxePhotoLab* (Amiga, $99.95) offers photographic-quality image manipulation.

Also entering the desktop video market is **Epyx**, with *Home Video Producer* (MS-DOS, 64/128, Apple II, $49.95), a package that adds text, graphics, and special effects to camcorder videos. **Microillusions** announced *Cell Animator* (Amiga, $149.95), which permits manipulation of image and sound.

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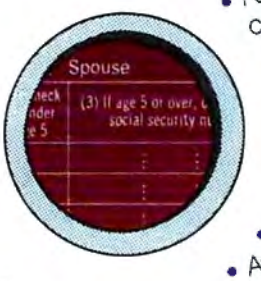

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CES Report

Videogames Redux

The computer wing at CES struck some industry insiders as a remembrance of CESs past: Videogame cartridge manufacturers came close to dominating the floor. Nintendo and Sega, riding high on the best videogame year in years, mounted huge exhibits, touting the increased sophistication of their videogames, many of which are translations of established software hits.

Software publishers are aware that dedicated videogame machine sales may represent lost computer sales, but they're also confident of their ability to produce games that are more exciting, more playable, and more attractive than those currently on cartridges.

Besides which, one of the most obvious entertainment software trends at CES was the software industry's determination to beat the cartridge manufacturers at, as it were, their own games.

Arcade Comeback

Responding to the Nintendo/Sega surge, as well taking advantage of increased machine capability and programming skill, software publishers rolled out perhaps more arcade action software than at any show in years, pumping energy into the revitalization of a classic software form.

At **Activision** and **Arcadia** (an Electronic Arts affiliate), monsters wreak havoc in *Rampage* (from Activision for the 64 and Apple II series, $34.95; MS-DOS, $37.95) and *Aaargh* (from Arcadia for the Amiga, $39.95). Both games are translations of established coin arcade hits. For MS-DOS arcade fans, Arcadia has *Rockford* (MS-DOS, $39.99), a sequel to *Boulderdash*.

Epyx announced an array of arcade games including *Impossible Mission II* (64/128, ST, Apple II series, MS-DOS, $39.95), the sequel to *Impossible Mission*, marking the return of evil genius Elvin; *Metrocross* (64/128, ST, $24.95 through the company's new U.S. Gold line), in which players race a clock through an obstacle-filled urban setting; and *Street Cat* (64/128, MS-DOS, ST, Amiga, $24.95, also from U.S. Gold), which offers feline competition to determine the town's toughest cat.

Translating coin-op games to home computers is something of a specialty at **Data East**, whose 1988 list includes such arcade favorites as the off-road action of *Speed Buggy* (64/128, $29.95; ST, $44.95), the ninja maneuvers of *Kid Niki* (64/128, $29.95; Apple II, $34.95), and the commandos of *Ikari Warriors*

Kid Niki

(Apple II, $34.95, MS-DOS, $39.95).

Arcade addicts can customize their own games with **Brøderbund**'s *Arcade Construction Kit* (64/128, $29.95). The package includes seven complete games and provides tools by which players can build their own arcade games, setting different levels of animation, sound, and design.

Arcade Plus

Arcade elements mingle with strategy and tactics in a variety of packages.

Accolade lets players take the role of French resistance fighters in *The Train: Escape to Normandy* (64/128, $29.95), and must seize, hold, and run a locomotive through Nazi lines; in *Power at Sea* (64/128, $29.95), players must coordinate operations during the Battle of Leyte Gulf.

In **Datasoft**'s *BattleDroidz* (64/128, $24.95; ST and Amiga, $34.95) players attempt to conquer alien enemies. Also from the EA affiliate is *The Rubicon Alliance* (64/128, $19.95), whose players face an alien enemy.

Ebonstar, (Amiga, MS-DOS, 64/128, Apple IIGS, $39.95) from **Microillusions**, (distributed by Activision) involves a search for rogue black holes. Cosmic conquest is the theme of the company's *Galactic Invasion* (Amiga, 64/128, Apple IIGS, MS-DOS, $24.95).

The Topic Is Topical

Global hot spots came to life on computer screens throughout CES as publishers introduced products aimed at putting players in charge of tough tactical decisions.

Strike Fleet (64/128, $29.95), from **Lucasfilm Games** (distributed by EA), gives players command of modern fleets, weapons systems, and strategies, with emphasis upon accuracy of detail and opponents including the Soviet Navy and Ayatollah-inspired fanatics.

Red Storm Rising

Microprose brought out its big guns with bestseller Tom Clancy's *Red Storm Rising* (64/128, $39.95). The adaptation preserves much of the novel's narrative, leaving the results of global confrontation to the player.

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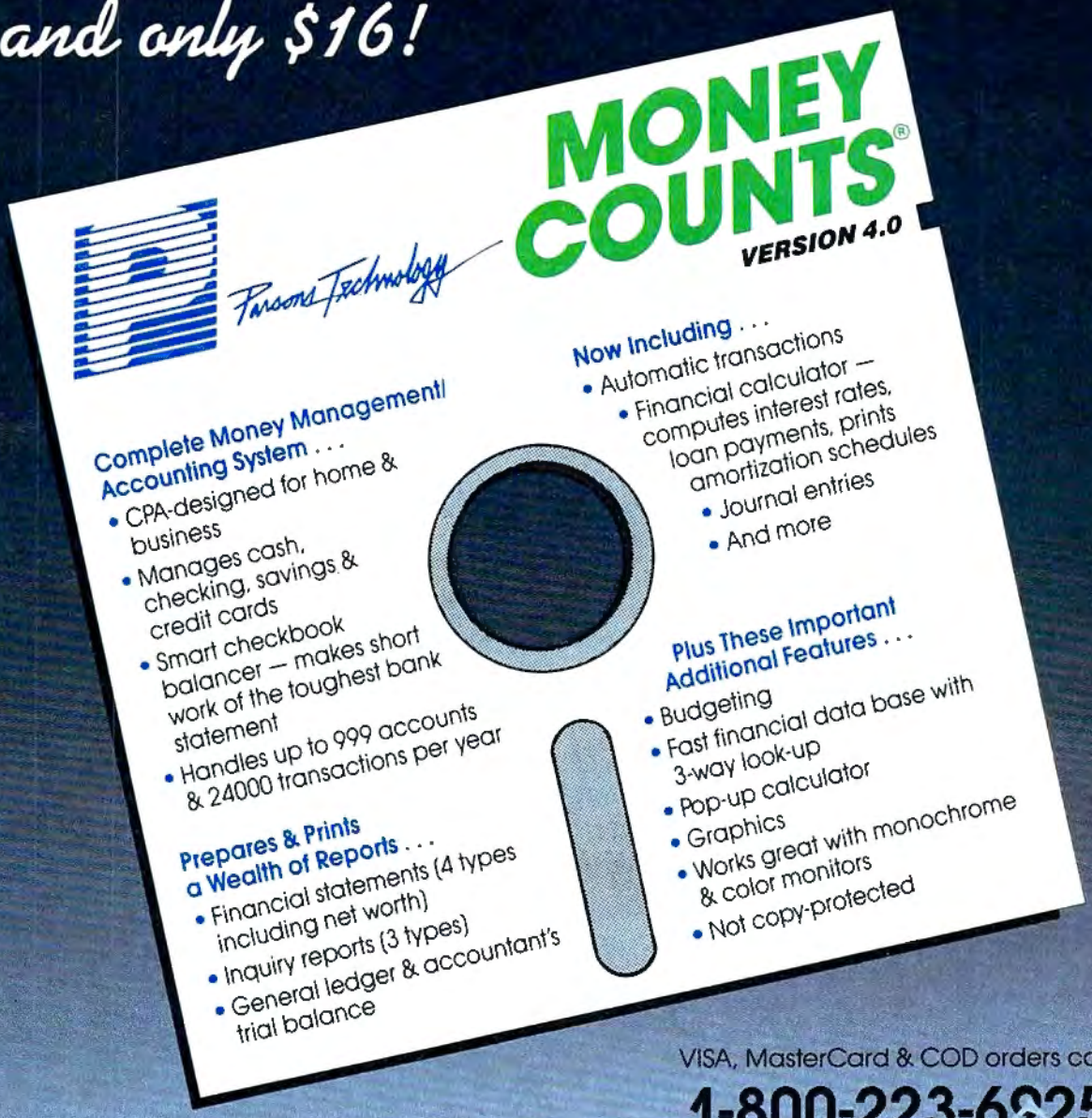

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CES Report

Another Clancy bestseller makes its appearance from **Datasoft**, with *The Hunt for Red October* (ST, Amiga, IBM, $49.95; 64/128, $39.95; to be released in mid-1988 are Atari 8-bit and Apple II versions, $39.95, and a Macintosh version, $49.95).

Cosmi gives players a shot at navigating at the deadly Straits of Hormuz in *NAVCOM 6: The Gulf Defense* (64/128, $24.95), with players in the control center of a modern warship charged with protecting oil tankers negotiating the straits of Hormuz. The company also brings the dangers of international terrorism home in *The President Is Missing* (64/128, $24.95; MS-DOS, $29.95), which comes with an audio tape containing the terrorists' demands, as well as possible clues. Financial terrorists, of a sort, get the home computer treatment in Cosmi's *Corporate Raider* (MS-DOS, $24.95).

Harpoon (MS-DOS, Macintosh, $49.95), from **Three-Sixty**, is based upon Larry Bond's board game, which influenced, among others, Tom Clancy. The computer version gives players command of allied forces during a showdown in the North Atlantic, uses actual Navy icons, and operates in realtime.

Finally, for those who seek transcendence over world tensions, there's *Global Commander* (Atari 8-bit, 64/128, Apple II, $29.95; MS-DOS, Amiga, ST, $39.95), in which you must monitor the status of 16 separate nations, allocating food, raw materials, and weapons without upsetting the world's balance.

Strategy And Tactics

Historical—and futuristic—strategy and tactics weren't overlooked, either.

SSI harks back to the earliest days of our nation in *Sons of Liberty* (64/128, $34.95; Apple II, MS-DOS, Atari 8-bit, $39.95), which recreates several of the major battles of the Revolutionary War. A more recent simulation can be found in *Panzer Strike!* (64/128, $44.95; Apple II, $49.95) a World War II simulation that includes most of the ground weapons employed during several campaigns.

Dan Bunten's Sport of War (64/128, $34.95) from **Electronic Arts** is a modem wargame that allows players to pit their strategic skills against other gamers, including those playing on Apple IIs or MS-DOS machines. Also from EA, *Interceptor* (Amiga, $49.95) gives players the choice of flying an F-18 Hornet or F-16 Falcon in defense of San Francisco Bay.

SSG (distributed by EA) introduced *Decisive Battles of the American Civil War, Volume 1* (Apple II, 64/128, $39.95), which includes the battles of First and Second Bull Run, Shiloh, Antietam, Fredericksburg, and Chancellorsville.

Interstel (through EA) displayed two additions to *Starfleet: Empire* (MS-DOS, Amiga, ST, $49.95), a planetary conquest game, and *Starfleet II: Krellan Commander* (MS-DOS, $54.95).

Epyx's *Dive Bomber* (Apple II, 64/128, MS-DOS, ST, and Amiga, $39.95) challenges players to fly a carrier-launched torpedo bomber against a variety of German aircraft, mine fields, and ships, including the *Bismarck*.

Fantasy Time

Citadel (Macintosh 512K, $49.95) from **Mindscape** is a fantasy role-playing game in which players create characters from the moment of birth, developing their personalities throughout the game.

Questron II (64/128, $39.95; MS-DOS, Apple II, $44.95; ST, Amiga, $49.95) from **SSI** is a sequel, in which players must journey back in time to prevent the Evil Book from ever coming into existence.

Citadel

Death Sword (64/128, Apple II, ST, MS-DOS, $24.95) from **Epyx** is an animated fantasy contest in which players must use their sword skills in an attempt to win freedom for a captive princess.

Land of Legends (Amiga, $49.95; 64/128, IIGS, MS-DOS versions to follow)) is an animated fantasy role-playing game from **Microillusions**.

Electronic Arts goes boldly into both science fiction and fantasy with *Futuremagic* (MS-DOS, no price set), which mingles magic with science in an animated adventure.

Suspense

Paragon (distributed by EA), fresh from the success of the graphics adventure *Master Ninja*, moved into a new form with *Twilight's Ransom* (MS-DOS, $34.95; translations for other machines to follow) which combines text with graphics in a race against time to solve a mystery.

Commando Cody, rocket-packed airman of World War II returns in **Cinemaware**'s *Rocket Ranger* (64/128, $34.95; MS-DOS, $44.95; Amiga, Apple IIGS, ST, $49.95). It's up to you, your rocket pack, and your dukes to save the world from Nazi domination, time travel, and Zombie Women of the Moon.

Epyx's "Masters Collection" line gets another addition with *L.A. Crackdown* (64/128, Apple II, MS-

L.A. Crackdown

DOS, $39.95), in which players attempt to crack a major drug smuggling ring.

Sierra gives a glimpse of a grim future in *Manhunter* (MS-DOS, $49.95), set against the backdrop of a conquered earth, with players attempting to crack an underground (literally) resistance movement. The company moves back in time with *Gold Rush* (MS-DOS, price not set).

The suspense and majesty of James Clavell comes to computers in **Thunder Mountain**'s *Tai Pan* (64/128, ST, $14.95). The Mindscape division is also introducing *Murder by the Dozen* (64/128, Apple II, Macintosh, MS-DOS, $9.95), a mystery game for up to three players.

On a lighter criminal note, Carmen San Diego is on the loose again in **Brøderbund**'s *Where in Europe Is Carmen San Diego?* (Apple II, MS-DOS, $44.95; 64/128, $39.95). The latest in the popular series includes a Crimestopper's notebook, an on-screen map of Europe, and an online database filled with European information.

Here Come The Comics

Not all of the entertainment software was games. **Infocom** displayed its first nontext product, *Infocomics* (Apple II, MS-DOS, 64/128, $12), developed by **Tom Snyder Productions**, which are comic books on disk.

Viewers can page through the comic-book stories at the touch of a key; a keystroke likewise allows for a shift in the point-of-view from which the stories are told. Using line graphics, Infocomics delivers cinema-style effects, including pans, zooms, and wipes. The first Infocomics: *Lane Mastodon vs. the Blubbermen*, a spoof of 1930's sci-

Gamma Force in Pit of a Thousand Screams

ence fiction; *Gamma Force in Pit of a Thousand Screams*, a superhero action/adventure; and *Zorkquest: Assault on Egreth Castle*, a fantasy. Each Infocomic provides four to five hours of viewing.

Comic effects of a different sort are on display in **Cinemaware**'s *The Three Stooges* (64/128, $34.95; MS-DOS, $44.95; Amiga, Apple IIGS, ST, $49.95), an interactive movie in which the player maneuvers Larry, Moe, and Curly through a series of (mis)adventures as they try to save an orphanage from foreclosure.

Good Sports

John Madden Football (Apple II, $44.95) from **Electronic Arts** is a football game that distills the former coach's experience, giving players an on-disk playbook, as well as the chance to design their own plays.

EA's latest sports offerings also included *World Tour Golf* (Amiga, $39.95) and *Ferrari Formula One* (Amiga, $49.95).

Boxing fans are invited to ringside in **Gamestar**'s *Star Rank Boxing II* (64/128, $29.95; Apple II, $34.95; MS-DOS, $42.95), which challenges players not only to perform well in the ring, but also to train and workout for a fight.

Epyx announced *Street Sports Soccer* (64/128, Apple II, MS-DOS, $39.95). *Soccer* continues the series's urban playground motif, with players selected from neighborhood kids, and games taking place in city parks or on streets. Endorsed by *The Sporting News*, Epyx's *Sporting News Baseball* (64/128, MS-DOS, Apple II, $39.95) lets players assemble teams whose performance is affected by their statistical history. With *4 X 4 Offroad Racing* (64/128, Amiga, MS-DOS, $39.95), players can configure their own vehicle for rough country.

4 × 4 Offroad Racing

The Games—Winter Edition (64/128, Apple II, MS-DOS, $39.95) sports a setting in the mountains above Calgary and includes competition events such as Oval-track Speed Skating, Luge, Slalom, Downhill Skiing, and others.

Sedentary types can play three types of poker with Ronald Reagan, Mikhail Gorbachev, and Margaret Thatcher in **Accolade**'s *Card Sharks* (64/128, $29.95), or players may enjoy a fast game of Hearts or Blackjack with those or other characters included in the game.

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2350 Bayshore Parkway
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[Ed. Note: Most of the products described in this article are scheduled for release during the first half of 1988. Space limitations precluded us from listing release dates for specific products.]

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Our Back Pages

A Decade Of Reader's Feedback

Take a quick look at the volume number on the cover of this magazine, and you'll notice that COMPUTE! is now in its tenth year. The computer industry has undergone radical changes in the past decade, and a retrospective of COMPUTE!'s pages reflect many of those changes. We decided to scan back issues and see what topics and questions were on readers' minds. Here's a sampling of "Reader's Feedback" from our back pages.

September/October 1980

On Merging Our Two Magazines

What happened to *Nuts and Volts?*

Include OSI in COMPUTE!. My C2-4PMF has more in common with the Apple or PET than with a SYM. . . .

First of all, Nuts and Volts moved to compute II when we established that single-board computer magazine. Secondly, I admit that compute II wasn't necessarily the place for OSI machines.

Our ability to go monthly has in part been defined by the merger of our two magazines. We announced in the August/ September issue of compute II that we were merging the two magazines effective with the November/December issue of COMPUTE!. In that issue, you'll find the return of the Single-Board Gazette (covering the 6502 based KIM, SYM, and AIM systems), and the addition of an OSI Gazette. You OSI owners will in part determine the stability of the OSI Gazette by your submissions, so get writing!

Issue 7 of COMPUTE! (November/ December) will be one united issue again, and in January you'll receive the first monthly issue of COMPUTE!

UPDATE: The OSI (Ohio Scientific), AIM, KIM, and SYM computers are long gone. Single-board computers were literally computers on a board. For example, the SYM was a computer on a circuit board that featured a hexadecimal keyboard and an LED alphanumeric display. As the price of home computers went down, the SBCs disappeared. *Compute II* covered the SBCs while COMPUTE! covered home computers. In the early days, COMPUTE! was divided into "Gazettes," each of which covered a different computer.

October 1981

I saw a cryptic comment—I think in COMPUTE! #10:"PET Exec Hello" by Gordon Campbell. Second paragraph: POKE 59458,62 (this may damage your machine). Can I damage a PET with POKES?? It scared me. We just got a (used) PET—Original ROMs. I heard you have published a PET book based on old issues of COMPUTE!. How can I get this?

Felix Rosenthal

You can damage the computer with this POKE. Luckily, it is the only POKE which is known to be risky, as far as we know. You can POKE freely anywhere else. For a more complete explanation of this peculiarity, see the warning in COMPUTE! #14, page 63. To answer your second question: Yes, COMPUTE! is publishing two such collections, one for PET and one for ATARI. These books contain much from the early, out-of-print COMPUTE! issues (as well as some previously unpublished pieces). For ordering information, see the ads elsewhere in this issue.

UPDATE: Don't let the POKE scare you. Other than the early PETs, no computer can be damaged as a result of anything you enter on the keyboard. The books mentioned were *The First Book of PET* and *The First Book of ATARI*.

June 1984

I own a VIC-20. I would like to know if Commodore has decided to stop making VIC-20s. If so, why? If they have, will you be able to buy Commodore software and hardware for it?

Jon Fedyk

We've received many inquiries about this. Commodore asserts that they do not now plan to stop production on either the VIC or the 64. Commodore and third-party software and hardware for both computers should also continue to be available for some time.

As a point of interest, there are now two million VICs out there.

UPDATE: We later found out that just as we were answering this question, Commodore stopped manufacturing VICs. Today, 64s are still going strong. At last count, over seven million have been sold.

October 1983

In your April issue, you published two interesting Atari programs, "Scriptor" and "Video 80." Here are a few questions. How many pages can you store in a 48K Atari 400 when using Scriptor with 8K BASIC? What is the memory required for Video 80? Can Scriptor and Video 80 be merged, and, if so, what changes would have to be made?

On another subject, how would I "hook up" an Epson MX-80 series printer to my 48K Atari 400 with or without the Atari 850 interface?

Ed Hallinan

Scriptor adapts itself to either 24K, 32K, or 48K and will display the number of lines free when you first run it. Each line is 38 characters. Since a printed page (double-spaced) takes about thirty 75-column lines, just divide the "lines free" by 15 for a rough estimate.

Video 80 requires about 2K for the driver routine and another 8K for the high-resolution GRAPHICS 8 screen. Due to this, there is not enough memory left over in a 40K or a 48K to let you store the programs and text.

You can attach almost any Centronics parallel or RS-232C serial printer to the Atari via the Atari 850 Interface Device. The new Atari 1025 80-column printer does not require the 850, however.

UPDATE: *SpeedScript* historians take note, Scriptor was Charles Brannon's first published ancestor of *SpeedScript*, versions of which eventually appeared for the 64, VIC, Apple, and Atari computers.

June 1982

I have a question. Sometimes, after I type in a long program and run it a few times, my keyboard locks up (after you press RETURN, you can't do anything else). Is there any way I can unlock it—besides powering down? Oh, I have an Atari 800.

Jon Chow

This "lock-up" is caused by a bug in the BASIC cartridge. It can occur when editing or deleting long program lines. There is no way to "uncrash," other than turning the power off and back on. It's best to save programs often and to avoid using very long program lines.

UPDATE: In attempting to fix this bug, Atari accidently made it worse. Version A of BASIC (in the 400, 800, and 1200XL) had the original bug. Version B (in the 600XL and 800XL) had a related bug that could crash the computer when you *entered* a line (not just when you edited or deleted one.) Version C (in the 65XE, 130XE, and XE Game System) corrected the bugs.

June 1985

What is the difference between the Commodore 1701 and 1702 monitors?

Andy Nagai

There is no appreciable difference between these monitors. The 1701 model changed to 1702 when Commodore began using a different picture tube supplier in late 1983. Cosmetically, it's nearly impossible to tell the two apart. They're virtually identical in appearance, and the electrical connections appear to be the same in both models. We have a number of both models here at COMPUTE!, and we've noticed that the resolution appears slightly sharper on the 1702s, but this is only because they're newer than the 1701s. (The color on a monitor gradually fades after prolonged use.)

Commodore also makes the 141 Color Monitor, essentially a 1702 with a charcoal-gray color designed to match the Plus/4 and Commodore 16. It's compatible with the VIC-20 and 64. Commodore's newest monitor entries are the 1901 Monochrome Monitor and the 1902 RGBI/Composite Monitor. Each was announced at the Winter CES in support of the Commodore 128.

UPDATE: Commodore recently changed the name of another monitor. The Amiga 1080 evolved into the Commodore 1084 so that it could be sold with the Commodore 128 and Commodore PCs, as well as with the Amigas.

March 1984

I am considering purchasing a VIC or a 64, and I plan to use the family TV with the computer. Do the images from a computer damage a TV by leaving imprints on the screen?

Timothy J. Prusinski

The problem you are describing is known as image burn-in. It usually affects a video unit on which the same message is displayed continuously in the same place on the screen. This practice causes uneven wear in the screen's phosphor coating, which eventually results in the message being visible on the screen even when the unit is turned off. Using your TV with a computer will not cause image burn-in unless you leave your computer on and continually display the same pattern on the TV for a very long time—several days, at least.

—Compiled by Rhett Anderson, Assistant Editor

GBA Championship Basketball: Two-On-Two

James Trunzo

Requirements: Apple IIGS (reviewed here), 512K required; Commodore 64; Amiga; Atari ST; Apple II; IBM PC, XT, AT, and true compatibles with 256K and CGA card.

Remember the way *One-on-One* burst onto the scene when Electronic Arts released its basketball arcade simulation, featuring Larry Bird and Julius Erving? Even today, years after its release, *One-on-One* remains a popular diversion and graphic pleasure. Activision's newest release doubles the pleasure and the fun by adding one (player, that is) to each side and getting *GBA Championship Basketball: Two-on-Two.*

Two-on-Two is a delightful game whether you're playing or just watching. It can be played with either keyboard or joystick and can be played in any number of ways: one player against the computer, two players against a computer team, or two players against each other. Additionally, the game allows the player to practice (and engage in delightful games of Around the World and Horse), play an exhibition game, or start a full season by competing in a 24-team, four-division tournament that climaxes with the GBA Championship game.

How Good Are You?

After making initial choices from the graphic chalkboard that serves as a menu, players create their on-court persona by adjusting their ratings on the Scouting Report screen. Here, qualities are grouped in sets of two, and you can allot eight points to each pair: inside and outside shooting, dribbling and quickness, and stealing and jumping. If you set your inside shooting ability at 5, then your outside shot must be set at 3. These initial ratings determine the type of player you are on the court.

One other choice is made at the Scouting Report screen, that being the race of your player. Incidentally, the fact that you can vary your player type brings with it a tremendous variety in game play. In one game, you can be the slick, ball-hawking guard with the great outside shot; in another game, you can be the strong rebounding front-court man with a deadly short hook and slam dunk.

Magic Or Larry?

After selecting your own qualities, your next major choice is that of a partner with whom to play. Ten superstar teammates are available, and all ten are patterned after famous NBA players. For example, select Kareem Ugrin, and you get a partner with a great inside shot who can also hit the boards. Select Oscar Dunbar, and your partner will score inside and out and pass brilliantly but seldom be a force under the boards. Then there's Larry Berg, Magic Lyndon, and others to provide you with more enjoyment and variety.

But choosing a teammate isn't to be taken lightly; he should complement the type of player you've created for yourself. For example, if you're strong on the boards with a good inside shot, you might pick a partner who can score from the outside and play strong defense.

The Tip-Off

The real fun begins when the roar of the crowd goes up, the buzzer sounds to begin the game, and the dribbling of the ball echoes throughout the arena.

Offensively, you can choose from one of five play patterns; defensively, you can set up in one of four different ways. Select your play and be on your toes because this is as close as you can get to the intensity of two-on-two basketball without sweating.

The animation is superb. Players and their moves are sharply defined, and there is no problem discerning when a player is making his move. Be quick though. Your opponent can anticipate your passes and pick them off or time your jump and block your shot. All the nuances of basketball are faithfully reproduced in *Two-on-Two.* You must position yourself for rebounds, time the release of your shots, and pass quickly to the open player if you expect to

Two-on-Two *offers outstanding graphics, animation, and playability.*

compete with the computer.

Additionally, there are included all the violations you can think of—for both teams, thankfully. Move your player into an opponent after he's established position, and you'll get called for charging. Send your teammate under the basket and let him stand there without the ball, and hear the buzzer sound for a lane violation. Watch a three-second violation result in a turnover. Fail to release the ball after going up with it for a shot, and you've traveled. Fouls, timeouts, fakes, and three-point shots—they're all part of *Two-on-Two.*

Check Out Those Stats

When the game is over, the screen turns into the sports page of the *Gamestar Gazette,* and you can read all about it. A full statistical summary is displayed: field goals made, shooting percentage, rebounds, steals, blocked shots, assists, and fouls for each player. The leading scorer gets his name emblazoned at the top of the page, and (of course) attendance is announced.

Two-on-Two's graphics are excellent; each player displays a wide range of moves, both inside and out; the sound effects are realistic; and the game play itself is smooth and challenging. I thought perhaps the play selection would become repetitive, and that the computer players would become predictable—and they do on occasion. Repetitive patterns occur at random, but by the time you realize that they are occurring, you've lost the opportunity to exploit them.

A final note before the next tip-off: The IIGS version requires the new 2.0

ROM chip to ensure game play. If your GS still contains the old ROM, *Two-on-Two* may bomb at any time during play, although you might get lucky and play several games before this unpredictable bug fouls you out of the contest. Time now to take off the sweats. *Two-on-Two* is a classic that will keep calling you to center court.

GBA Championship Basketball: Two-on-Two
Activision
2350 Bayshore Pkwy.
Mountain View, CA 94043
$34.95 Commodore 64 version
$39.95 Apple II and Atari ST versions
$42.95 IBM PC and compatibles version (includes 5¼- and 3½-inch disks)
$44.95 Apple IIGS and Amiga versions

Beyond Zork

James V. Trunzo

Requirements: IBM PC and 100-percent compatibles; Apple II series (including GS); Macintosh; Amiga; Commodore 128. Some game features unavailable on some computers.

Certain venerable software titles instantly conjure images of the early days of computer gaming. Mention *Pac-Man* or *Space Invaders* and one immediately recalls countless hours of mindless but enjoyable entertainment. Wax nostalgic about *Wizardry*, and computer adventurers tend to gaze into the distance, recollecting their climactic encounter with Werda. Then mention text adventures and see what title springs to mind. There can be only one—and it is *Zork*.

Now, years after *Zork III*, the final saga of the *Zork Trilogy*, comes yet another text adventure spawned from those early classics and resurrecting the beloved title of its forebears. This new adventure continues the legend and at the same time advances the genre. From Infocom comes the latest in interactive fiction: *Beyond Zork*. And lest you think that this is just an extension of a tried-and-true theme, read on.

The Next Stage

Beyond Zork introduces the next stage in interactive fiction, blending the richness of the standard text adventure with the uniqueness of role playing. No longer are you faced with just solving the intricate puzzles that are the trademark of Infocom games; no longer is the character in the adventure one dimensional. Now, you must design your own character, determining which attributes you wish to emphasize: size, dexterity, strength, intelligence, luck, or compassion. Choose wisely: You'll literally live or die with your selections.

Beyond Zork places you in the land of Quendor, sending you on a quest for the fabled Coconut of Quendor, an artifact so powerful that it alone can prevent evil from dominating the land. If the theme sounds familiar, even trite, you needn't worry. Your adventure will be anything but commonplace. Traps, puzzles, and monsters appear with exciting regularity, and the game's interface is fresh and new.

Innovative Features

Besides the role-playing element, *Beyond Zork* contains so many innovative features that if it weren't for the richness of the text, you might not recognize the product as having come from Infocom. To begin with, the screen presentation is unlike any other Infocom game. It provides the user with more information than ever. For example, onscreen mapping offers you help in determining where you are, where you've been, and where you might go. The map, however, shows only a small area of Quendor, so mapping skills are still necessary.

In the Apple II version, the status line no longer shows a point score: Instead, it displays your ever-changing characteristics as well as your current character level. Wounds reduce your endurance; potions increase or decrease your strength. If you want to see your intelligence take a dive, type a profanity and watch what happens. What about the text? Dialog boxes now hold the information that normally commanded 98 percent of the screen.

Another feature making its debut in *Beyond Zork* is the use of function keys. Previous games allowed the user to take a shortcut by pressing one key to represent a word (N for north, for example). In *Beyond Zork*, you can now define a single keystroke to represent an entire sentence. For example, you can create what amounts to a macro for the command *Attack the monster with your sword.* From that point on, simply press a key to carry out that particular command. The game comes with function keys programmed with the most commonly used commands; however, any or all of the default commands can be changed.

Seven new commands make their first appearance in *Beyond Zork:* COLOR allows you to change the colors on your screen. DEFINE lets you create the macros discussed above. MODE allows you to make the screen look like the standard Infocom screen, if the maps and other features distract you. MONITOR automatically monitors your character's endurance, which is the most important characteristic because it determines if you're alive or dead, and NAME lets you give a name to items and living things. You can name your weapon, for example, and *Beyond Zork* will use that name in its descriptions. NOTIFY is like MONITOR, except it tracks all other attributes. UNDO allows you to back up one move. ZOOM allows you to see more mapped area on your screen but in less detail. (Note: the UNDO command is not available on the standard Apple II version.)

Land Of Plenty

It's easy to see that *Beyond Zork* is aptly named. The new screen appearance and the plethora of new commands speak for themselves as worthy additions to text adventure programs. These features alone would be more than enough to satisfy jaded game players, but Infocom has added trimmings to this feast by making *Beyond Zork* its largest program yet. *Beyond Zork* spans an area at least four times the size of any existing text adventure, giving you a huge land in which to develop your character.

More frills? Certainly. This is Infocom, after all. A beautifully done, illustrated handbook titled "The Lore and Legends of Quendor" provides important information on the beasties (plant and animal alike) that inhabit Quendor, as well as well-disguised hints on dealing with these obstacles to your success. Also, a map of the Southland of Quendor provides a useful overview of the world in which you are about to adventure.

A final note: *Beyond Zork* is available for a wide variety of machines, and while most of the information in this review holds true no matter which computer is used to play the game, certain versions contain even more features, especially in the area of graphics. For example, the Amiga, IBM, Macintosh, and IIGS versions allow the use of a mouse to move from area to area on the onscreen maps. All of the above machines—as well as the Commodore 128—use colorful bar charts to display attribute levels. Also, some systems allow up to four colors on the screen at one time, as opposed to the two-tone screens of less-sophisticated systems.

Regardless of which machine is used to play *Beyond Zork*, the result will be the same: hours of enjoyment. Highly recommended, *Beyond Zork* reaffirms Infocom's position as king of the text adventures.

Beyond Zork
Infocom
125 Cambridge Park Dr.
Cambridge, MA 02140
$49.95 IBM PC/compatibles, Apple II, GS, Macintosh, and Amiga versions
$44.95 Commodore 128 version

3-D Helicopter Simulator

Ervin Bobo

Requirements: Any IBM PC, XT, AT, Personal System/2, or compatible with at least 256K; runs with EGA, CGA, or Hercules graphics cards. The game includes an option that permits play via modem (1200 baud) or between linked computers.

To date, the best helicopter simulators have placed an emphasis on accuracy in the control panel and the flight controls of the craft (within home computer limitations), while getting by with a landscape that can at best be considered generic.

3-D Helicopter Simulator from Sierra turns that trend around by providing you with a generic helicopter, while taking pains to give you authentic landscapes over which to fly and fight. There is both good and bad in this approach; I'll try to take the features one at a time.

Since they did not opt for a catchy title like Gunhawk, Whirlybird, or Rotary Death, I assume that the scenery and the ability to share airspace via a modem link were always foremost in the minds of the creators. The helicopter itself is almost an afterthought. No matter, for it lifts into the air and goes places, and that is about all you need.

Realistic Scenery

You fly over scenic places that are as good as the views in Microsoft's *Flight Simulator*—perhaps even better in some instances, for the 3-D objects are solid rather than wire-frame. Seattle's Space Needle is convincing, and Los Angeles seems shrouded in smog. Further, note that a good part of the excitement in the movie *Blue Thunder* was generated by deadly helicopter battles taking place over a major city, and some of that same excitement is present in *Helicopter*.

Because the scenery in some flight areas is denser than in others—thus causing a slower screen updating—these areas are indicated on the menu with an asterisk. The idea is that you should fly these skies at your computer's "turbo" speed or be prepared for a slow flight. This is good thinking on the part of Sierra, and I wish other producers of simulators would do the same.

Other scenery areas include Spaceport U.S.A. (where I blew up the Vehicle Assembly Building), Houston, Port City, Yosemite, and Farmland. The first three are dense scenery areas. If you're going to try to emulate *Blue Thunder*, I'd recommend you do it in Houston or Port City, both of which consist of half a dozen buildings. Farmland is mostly trees and a heliport; Yosemite is two mountains and a heliport; and Los Angeles is two or three buildings near the airport.

3-D Helicopter Simulator *offers head-to-head competition via modem.*

Fly Around It

Though the structures are solid 3-D graphics, the documentation states that certain compromises in programming make it possible to fly through some of these structures, but not all of them. Make it a point to fly around everything.

Control of the craft is by keyboard or by a combination of keyboard and joystick. Pushing the N and M keys controls ascending and descending, and your joystick or numeric keypad controls the direction of movement.

Because the *Helicopter* is generic and follows no set form, your armament consists of 60 unspecified missiles. Since I consistently have destroyed buildings and only occasionally destroyed an enemy chopper, I'm pretty sure these missiles are unguided, as well as unspecified. Press the space bar, and you'll see a black triangle moving out from your ship. When it impacts with something, there is a soundless explosion that is indicated by multiple crosses, somewhat like stylized fracture lines. Since combat is one of the main reasons for having the program, I wish these routines had been better realized.

Combat By Modem

In combat, you can contend against the computer or against a friend on another computer. A main feature of *Helicopter* is the head-to-head combat against friends who are connected to you by modem and who also own a copy of the program (though it isn't necessary they have the same computer). I can see where this could be a lot of fun, especially when playing tag among the canyons of a city, but with combat routines that are both slow (even at turbo speed) and noiseless, quite a bit is left to be desired.

There is also more to be desired in the way of graphics. As noted above, the scenery is impressive, the control panel is well done and easy to read, but the aircraft graphics are disappointing. By switching views, you can watch yourself fly from Ground, Tracking, or Satellite viewpoints, but there really seems little point in doing this. All you will see is a box with what might be an attached rotor.

The numeric keypad provides cockpit views in eight directions, and this is one of the niceties of 3-D scenery. When you fly past a building, you can switch to a rear view and see it receding in the distance. Further, since all objects on the console radar screen are white blocks, switching viewpoints tells you whether an object is a building or an enemy chopper.

Strategy

In summation, I think the chief excitement of *3-D Helicopter* is the ability to strategically use solid structures for evasion and concealment during combat, either against the computer or against a friend on the other end of a modem link. The trade-off for the scenery is a reduced speed in screen updating, thus slowing the apparent speed of the helicopter and making the movement somewhat choppy. Though the sound is less than satisfactory and the shapes of the choppers anything but aerodynamic, I realize some of this is due to the limitations of the PC itself and not to shortcuts in programming.

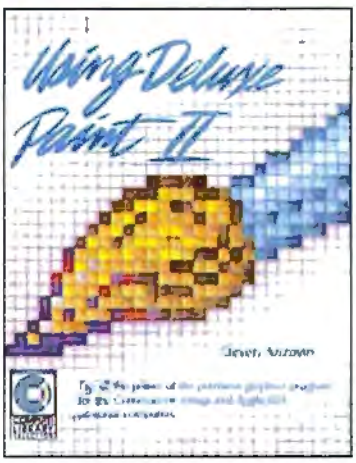
Documentation

Documentation is good and complete without being overbearing, and there is a rather large quick-reference card to help you sort out the many keyboard commands. Most of these have to do with invoking options rather than controlling the craft. *3-D Helicopter Simulator* runs on the IBM PC and PCjr, as well as Tandy and other MS-DOS computers with 256K or more. It supports CGA, EGA, or Hercules graphics cards, can be installed on a hard disk (though the floppy will be required as a key disk during booting), and also supports 100-percent Hayes-compatible modems. As currently available, the package contains both a 5¼-inch and a 3½-inch disk.

3-D Helicopter Simulator
Sierra On-Line
Sierra On-Line Building
P.O. Box 485
Coarsegold, CA 93614
$39.95

New Apple IIGS Books from COMPUTE!

Easy-to-use tutorials and ready-to-type-in programs show you how to get more from your Apple IIGS—from booting up the machine and programming in machine language to utilizing the advanced sound and graphics capabilities. Written in COMPUTE!'s clear, concise style, these books contain all the information you need to access the power of your IIGS.



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Steven Anzovin

ISBN 0-87455-111-0 $18.95

Create the most spectacular art possible on a personal computer with this comprehensive, yet understandable, guide to *Deluxe Paint II*, the state-of-the-art graphics program for the Commodore Amiga and Apple IIGS. Simple drawing skills, customizing brushes, sophisticated palettes, special color effects, tools, styles, patterning, and perspective are just some of the techniques illustrated. Learn how to use every feature of *Deluxe Paint II*, from merging foreground and background to mixing graphics and text. A COMPUTE! Library Selection.

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William B. Sanders

ISBN 0-87455-096-3 $16.95

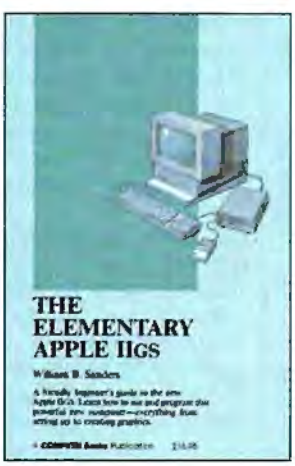
The impressive new machine from Apple holds the promise of dazzling graphics and symphonic sound—if you know how to use them. This tutorial, by the author of *The Elementary Apple IIGS*, begins by showing how to create graphics and sound using Applesoft BASIC, but it doesn't stop there. The book includes a multitude of programs, routines, and utilities with which you can open the IIGS's Toolbox, a sophisticated set of programming tools, so that you can produce truly amazing sights and sounds. A COMPUTE! Library Selection.

The Elementary Apple IIGS

William B. Sanders

ISBN 0-87455-072-6 $15.95

A friendly, easy-to-use guide to the newest Apple computer, this book leads you through the steps of connecting the computer, loading programs, creating graphics, and writing programs. For both novice and seasoned programmers, it's an introductory text for everyone.



COMPUTE!'s Apple IIGS Machine Language for Beginners

Roger Wagner

ISBN 0-87455-097-1 $19.95

The latest in a series of introductory machine language books, *COMPUTE!'s Apple IIGS Machine Language for Beginners* is a clear and concise tutorial to learning the IIGS's native language. Written by noted Apple columnist Roger Wagner, this book includes many programming examples and clear explanations that make learning 65816 machine language easy. For beginning and intermediate machine language programmers as well as those who know another machine language and want to move up to this fast 16-bit language. A COMPUTE! Library Selection.

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Printrix

Ervin Bobo

Requirements: Apple IIe with 80-column card and 128K memory, or Apple IIc; IBM PC, XT, AT, or compatible, with 256K. (Apple version reviewed here; IBM version differs in some respects.)

Printrix is a program that offers a nice midway step between word processing and desktop publishing. Unlike too many programs lately, this one doesn't pretend to be a full-fledged desktop publisher. *Printrix* is an interim program—its subtitle is *Personal Typsetting Software*—that succeeds at what it sets out to do.

Printrix formats text from an outside source into a variety of fonts. Layout is accomplished through a simple but very complete formatting menu in which paper size, margins, tabs, justification, linefeeds, and page numbering are set from an easy-to-use onscreen listing.

Type Styles And Sizes

The text can then be enhanced via *Printrix*'s different print styles and sizes. The program also is able to read fonts from its cousin, *Fontrix*. *Printrix* comes with 15 fonts, or type styles, ranging in size from 15 to 70 points. The largest type size produces screaming headlines; in-between sizes can be used for subheadings; and 15-point type produces print somewhat larger than you are accustomed to seeing on normal printed pages.

This last characteristic I consider one of the package's few shortcomings: *Printrix* would be even more usable with a few fonts in the eight- to ten-point range.

Since *Printrix* is, in essence, a graphics printing program, the number of fonts available to you does not depend upon the number built into your printer. The only necessity is that your printer must have the ability to print graphics.

Individual fonts can be reconfigured from a Change Font Parameters menu. This feature lets you select proportional printing, spacing and linefeed gaps, italics, and other typesetting tools.

(In a similar manner, *Printrix* allows the use of graphics in your published work. Several are included with the program, and you may also use clip art from programs such as *Print Shop*.)

Text From All Over

Files from almost any word processor may be used. *Printrix* supports *AppleWorks*, *AppleWriter*, *Word Juggler*, and *WordPerfect*. For other word processors, *Printrix* reads files saved in standard ASCII ProDOS format. (ASCII files created with DOS 3.3 have to be converted to ProDOS files before they can be read.)

It's a simple matter to print a file with *Printrix*. The Text Formatting screen tells you the page size and then tells you to select one of the four fonts on the program disk. (Two double-sided disks are included with *Printrix*. One holds the program and fonts; the other holds Configuration and more fonts. The second disk contains fonts on both sides.) This will print a document using only one font, but the program is capable of much more than that.

When you start using *Printrix*, the configuration program prompts you for details as to your computer, printer, interface card, word processor, and so on. This information is saved to the program disk, ensuring that subsequent startups automatically configure the program to your system.

Fonts And Features

Through the use of commands embedded in your word processing file, it is possible to use as many as four fonts per line and an unlimited number of fonts per page. A command for a font looks like this: *^F=1* (which prints the font loaded in the first position) or *^F-2* (which switches to the second font). Since there is no command for turning a font off, your file continues in font 2 until it reaches a command to revert to font 1.

In contemplating the use of multiple fonts, be aware that each font must be read into memory before it can be used, and that the Font Load and Text Formatting routines allow for only four numbered fonts at a time. To take the program to its limits, you have to pause printing while changing the numbered font designations and then do a great deal of disk swapping to load those fonts into computer memory.

I think the easiest course is to compose your files with only four fonts in mind: one for headlines, one for subheadings, one for standard text, and one special font for calling attention to a particular item. Things will also go easier if you plan your work so that the four chosen fonts are all on the same side of the disk or, if you're using two disks drives, on only two disks.

Start The Presses

Though *Printrix* will work with almost any graphics printer, it offers an extra feature to users who own printers with reverse linefeed. Should you be one of those, you may choose two-column printing from the Text Format menu. *Printrix* prints the first column, reverses your paper to the top of the page, and prints the second column.

If you're searching for the newsprint look of other desktop publishing systems, two-column printing will bring you a bit closer, but keep in mind that *Printrix* has no system for dividing columns with lines, as do other newsprint programs.

On balance, I find *Printrix* is exactly what it says it is: a text-formatting program. With a variety of fonts, layout functions, an ability to incorporate graphics, and clear documentation that explains how to put it all together, *Printrix* allows you to get your feet wet in desktop publishing and perhaps helps you decide whether to pursue the real thing at a greater expense.

Whether or not you elect to go all the way, *Printrix* adds some attention-getting visuals to whatever you have to print: letters, reports, broadsides, or manifestos.

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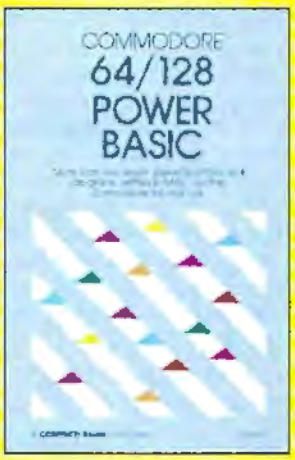

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Edited
Collected in this one volume are more than two dozen short BASIC programs from *COMPUTE!'s Gazette*'s popular monthly column, "Power BASIC." Included are utilities that add an 8K RAM disk; read and write to disk sectors; make programs read joysticks more quickly; and automatically generate line numbers. There are also programs such as "Stop and Go," which creates a pause button to temporarily halt a program, and "Time Clock," which puts a digital clock on your screen. *There is a companion disk available for $12.95 which includes all the programs from the book.* (998BDSK)
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Seven of the best machine language games for the 64 have been gathered into one volume in this follow-up to the popular *COMPUTE!'s Machine Language Games for the Commodore 64*. Selected from recent issues of *COMPUTE!* and *COMPUTE!'s Gazette*, the games range from the frantic "Prisonball" to the delightful "Biker Dave." This is more than just a collection of exciting fast-action games, though, because complete and commented source code for each program is included in the book. Machine language programmers can see exactly how each game is written and what design techniques are used. *A disk is available for $12.95 which includes all the programs in the book, including source code.* (947BDSK).
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CPS-500 Power Supply For Amiga

Scott Thomas

In my opinion, the Amiga 500 is the ultimate home computer. Dollar for dollar, the 500 delivers more processing, graphics, and sound capability than any other personal computer on the market. Building on the knowledge and experience acquired through the development of the Amiga 1000, Commodore has produced a low-priced but power-packed computer. Its quality of construction is for the most part good, but the power supply for the Amiga 500 is marginal, at best.

Commodore has had a history of problems with power supplies that dates back to the Commodore 64. It seems that in an effort to make its home computers competitively priced, Commodore sacrifices quality in its power supplies. This continues to be true. Many purchasers of the first Amiga 500s off the assembly line were greeted with a dead power source within minutes of power-up. Although Commodore has corrected the problem, the new power supply still is taxed to its limits on a 500 equipped with the internal 512K RAM expansion and an external drive.

Outside Power Source

Fortunately, numerous third-party manufacturers have developed hardware peripherals for the Amiga 500 even though the 500 has only been on the market for a few months.

One of these peripherals is the CPS-500 from Phoenix Electronics. The CPS-500 is a replacement or alternate power supply that provides the 500 with more than enough power to support an external drive and the internal 512K RAM expansion. The CPS-500 5V rating is 6 amps, which is 1.7 amps higher than the Commodore power supply.

The CPS-500, however, does not stop with an amp-rating improvement alone. The power supply includes three auxiliary 117 VAC 60 Hz 100-watt reciprocals with transient/spike suppression and RFI and EMI filtering. The unit has a five-amp primary fuse accessible from the rear of the unit.

The power supply, therefore, acts as both the power supply for the computer and a power strip for your other peripherals, such as your monitor and printer. By flipping the on/off switch on the CPS-500, you turn the power on for all of your computer hardware. The CPS-500 weighs six pounds and is encased in a sturdy metal housing that can be opened for servicing. The size of the unit is 10½ inches deep by 6¾ inches in width by 3 inches in height.

A Good Investment

With all of its superior features and its one-year warranty, the CPS-500 is a wise investment for owners of the Amiga 500. Since the on/off switch for the computer is on its power supply, combining the power supply with a fused, spike-suppressed, filtered power strip for all your hardware makes good sense. The unit is well constructed and its parts are easily accessible for servicing. The extra amp rating of the CPS-500 can mean the difference between staring at a blank screen or high-powered processing. I highly recommend the CPS-500 to all Amiga 500 owners.

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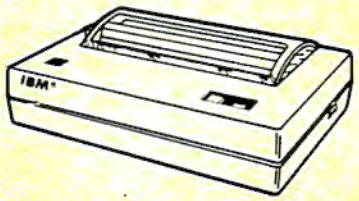

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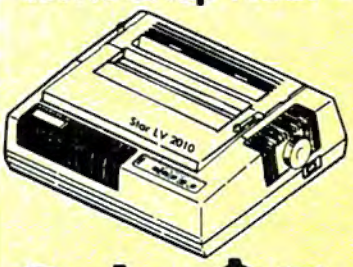

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GALACTICON

Bill Chin and George Miller, Editorial Programmers

Protect your planetary system from deadly solar fireballs in this exciting high-speed arcade-style game. For the Atari ST, Commodore 64, and Apple II series of computers. The ST version requires GFA BASIC *and a color monitor. The 64 version requires a disk drive and a joystick. The Apple II version runs under either DOS 3.3 or ProDOS. It works with joystick, mouse, or keyboard.*

It is a time in the distant future. Aliens have inserted a deadly device into the center of the sun. This device periodically throws a small fireball into the path of the planets. As of yet, Earth's scientists haven't found a way to disable the device, so you must destroy each and every fireball that's in danger of hitting one of your planets. Be careful not to overheat your blaster—you may need it at any moment.

"Galacticon" demands quick thinking and a sure trigger-finger for high scores. As you complete each level, you'll move on to faster and more difficult screens. When the last planet has been destroyed, the game ends.

Commodore 64 Version

In the 64 version of Galacticon, the fireballs come out of the sun on the tips of solar flares. The blue flares do no damage, so track and shoot only the yellow ones. Use a joystick plugged into port 2 to move the crosshairs. In this version of the game, your crosshairs turn red if you fire too often. Allow them to cool before shooting again.

After you've destroyed several flares, the level ends and you move on to a more difficult challenge. Each planet can take several hits before it is destroyed. When your last planet has been destroyed, the game ends.

Galacticon for the 64 is divided into two programs, a BASIC program and a machine language program. Type in Program 1 using "MLX," the machine language entry program found elsewhere in this issue. When MLX prompts you for starting and ending addresses, respond with the following values:

Starting address: C000
Ending address: C7F7

After you have typed in all the data for Program 1, be sure to save a copy before exiting MLX. Use the name GALACT.ML when you save the program. The BASIC program looks for a file with this name when it runs.

Program 2 is written in BASIC. Carefully type it in and save it to disk.

To run Galacticon, type in the following line in direct mode (without a line number):

```
POKE 642,64:SYS58260
```

Now, load and run the BASIC program, and the game will begin. If you forget to enter the POKE and the SYS, the BASIC program will give you the information you need to start the program.

Apple II Version

Galacticon for the Apple II series is made up of two programs—Program 3, a machine language program, and Program 4, a BASIC program. Use "Apple MLX," found elsewhere in this issue, to enter the data for Program 3. When asked for starting and ending addresses, respond with the following values:

Starting address: 8000
Ending address: 8AEF

After you've entered the data, be sure to save it to disk before leaving MLX. When you save the program, use the name GALACT.ML. Program 4 looks for a file of that name when it runs.

Next, type in and save a copy of Program 4, which is written in BASIC.

To run Galacticon, type HIMEM:6572 in direct mode (without a line number). Then load and run the BASIC program.

You are now asked what control device to use. Press M for mouse, J for joystick, or K for keyboard. After a brief pause, the game starts. Move the crosshairs to any fireballs that leave the sun and shoot to destroy. The energy bar at the bottom of the screen indicates the amount of firing power available to you.

If you are using the keyboard as a control device, use the keys W, E, R, S, F, X, C, and V to move and use the space bar to shoot. Note that the joystick mode does not work properly on the Apple IIGS.

Atari ST Version

The ST version of Galacticon is written in *GFA BASIC*. You must own a copy of *GFA BASIC* in order to type in and use the game. Using the *GFA BASIC* editor, type in the program and save it to disk.

To play the game, use the VIEW menu's SET PREFERENCES item to switch to low resolution. Go to *GFA BASIC* and load Galacticon. Start the game by selecting RUN from the BASIC menu.

The sun is in the center of the screen. Soon, a fireball will leave the sun and head out toward the planets. Use the mouse to position your crosshairs. Press the left mouse button to fire. If you hit the fireball, it will explode. If you let the fireball get too far, it may run into a planet and destroy it. The energy bar at the bottom of the screen indicates the amount of firepower available.

After you've eliminated a certain number of fireballs (depending on the level), you'll move on to a tougher challenge. The game ends when all your planets have been destroyed.

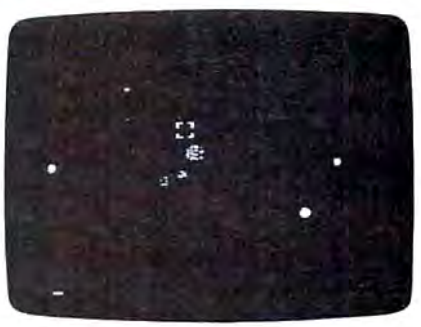
For instructions on entering these programs, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

Galacticon—64 Version—Machine Language Section

```
C000:20 0A C7 20 E8 C2 20 DF 81
C008:C4 20 2F C6 20 9F C0 AD F4
C010:6F 1C F0 07 AD 15 D0 29 6B
C018:07 D0 E8 AD 11 D0 29 DF 47
C020:8D 11 D0 AD 16 D0 29 EF D7
C028:8D 16 D0 AD 18 D0 29 F7 39
C030:8D 18 D0 A0 02 B9 27 D0 B8
C038:18 69 01 29 0F C9 0F F0 81
C040:03 99 27 D0 88 10 EE AD AB
C048:71 1C 85 FB AD 72 1C 85 EE
C050:FC 60 8D 6E 1C 8A 48 98 35
C058:48 AE 6E 1C BC 8F C0 A9 88
C060:00 99 04 D4 BD 8B C0 99 4D
C068:05 D4 BD 93 C0 99 06 D4 DF
C070:BD 97 C0 D0 03 AD 1B D4 B5
C078:99 01 D4 BD 9B C0 99 04 94
C080:D4 49 01 99 04 D4 68 A8 65
C088:68 AA 60 3B 29 04 00 00 02
C090:07 0E 00 00 00 04 A4 01 73
C098:02 E4 16 80 80 80 21 A2 0A
C0A0:02 8E 5C 1C BD 32 18 10 0B
C0A8:2B AE 5C 1C 8A 0A 18 69 CE
C0B0:10 85 FE 85 FC E6 FC A9 FA
C0B8:00 85 FD 85 FB BD 12 18 C6
C0C0:A8 B1 FD 9D 22 18 B1 FB 6D
C0C8:9D 2A 18 C8 98 DD 04 C7 3F
C0D0:90 02 A9 00 9D 12 18 CA 80
C0D8:10 C7 A2 02 A0 04 BD 22 7B
C0E0:18 48 38 E9 0C 4A 9D 00 EA
C0E8:18 68 99 00 D0 C9 2C 90 5A
C0F0:0C AD 10 D0 3D FC C6 8D EB
C0F8:10 D0 4C 10 C1 AD 10 D0 F6
C100:1D F4 C6 8D 10 D0 BD 22 62
C108:18 4A 18 69 7A 9D 00 18 26
C110:BD 2A 18 99 01 D0 38 E9 3F
C118:29 9D 09 18 88 88 CA 10 46
C120:BD 60 49 FF 18 69 01 60 8C
C128:30 F8 60 A2 18 A9 00 9D 3D
C130:00 D4 CA 10 FA A9 0F 8D 6D
C138:18 D4 A9 FF 8D 0F D4 A9 2E
C140:80 8D 12 D4 AD 15 D0 09 63
C148:80 8D 15 D0 A9 26 8D FF 20
C150:07 A9 01 8D 2F D0 A0 3F F7
C158:A9 00 99 40 03 88 10 FA 3D
C160:A0 19 A2 00 BD CF C6 99 23
C168:40 03 E8 C8 C8 C8 C0 28 89
C170:D0 F2 AD 11 D0 09 20 8D 58
C178:11 D0 AD 16 D0 09 10 8D 28
C180:16 D0 AD 18 D0 09 08 8D C2
C188:18 D0 A0 FA A9 76 99 00 6A
C190:04 99 FA 04 99 F4 05 99 60
C198:EE 06 A9 0C 99 00 D8 99 23
C1A0:FA D8 99 F4 D9 99 EE DA 48
C1A8:88 C0 FF D0 DF A9 20 8D 21
C1B0:BD C1 A9 00 8D BC C1 A2 3E
C1B8:00 A9 00 9D 00 40 E8 D0 24
C1C0:FA AC BD C1 C8 8C BD C1 76
C1C8:C0 40 90 EF A2 2F A9 FF F2
C1D0:9D 9C 18 A9 00 9D CC 18 10
C1D8:CA E0 FF D0 F1 A9 0D 8D E4
C1E0:F8 07 8D F9 07 8D FA 07 5F
C1E8:A2 02 AD 1B D4 9D 12 18 FE
C1F0:A9 FF 9D 32 18 CA 10 F2 1F
C1F8:A9 50 8D 07 18 A9 64 8D 45
C200:10 18 A9 00 8D 3A 18 8D DB
C208:3B 18 A9 00 85 FD A9 23 01
C210:4A 66 FD 4A 66 FD 85 FE ED
C218:85 FC A5 FD 85 FB E6 FC 1B
C220:A0 3F B1 FD 8D 67 1C 4A 68
C228:0D 67 1C 91 FB 88 10 F2 BF
C230:A9 04 8D 6D 1C A5 02 0A 99
C238:0A 0A 18 69 20 8D 70 1C 13
C240:8D 6F 1C A9 00 8D 71 1C BB
C248:8D 72 1C 60 A0 06 B9 F4 40
C250:C6 2D 15 D0 D0 04 88 10 EB
C258:F5 60 B9 00 18 38 ED 08 AD
C260:18 20 28 C1 D9 6E C6 B0 E1
C268:ED B9 09 18 38 ED 11 18 A9
C270:20 28 C1 D9 76 C6 B0 DE F4
C278:8A 48 A9 FF 9D 9C 18 20 3A
C280:B4 C4 8C 5D 1C C0 03 B0 93
C288:23 A9 03 20 52 C0 98 AA DD
C290:BD 27 D0 38 E9 01 9D 27 12
C298:D0 29 0F D0 18 A9 00 20 47
C2A0:52 C0 A0 08 20 CD C5 A9 81
C2A8:15 9D 32 18 AE 6F 1C F0 44
C2B0:04 CA 8E 6F 1C A2 03 20 45
C2B8:1E C6 30 24 A0 08 20 CD 7A
C2C0:C5 A9 17 9D 32 18 A9 01 96
C2C8:20 52 C0 AE 5E 1C BD 7C 51
C2D0:1A 18 6D 71 1C 8D 71 1C 44
C2D8:AD 72 1C 69 00 8D 72 1C 23
C2E0:68 AA AC 5D 1C 4C 56 C2 32
C2E8:A2 2F 8E 5C 1C BD 9C 18 4C
C2F0:30 7A BD 7C 1A F0 54 A9 93
C2F8:10 8D 6A 1C 20 F9 C3 AE 18
C300:5C 1C 20 5C C4 AE 5C 1C 3C
C308:BD 9C 18 9D 11 18 BD 3C 12
```

"Galacticon" for the 64—a fast-paced arcade shoot-'em-up.

"Galacticon" for the Atari ST features superb animation and sound effects.



The Apple II version features keyboard, joystick, or mouse control.

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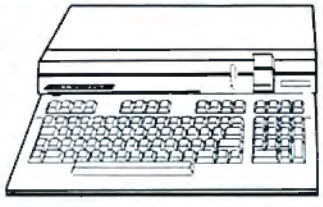

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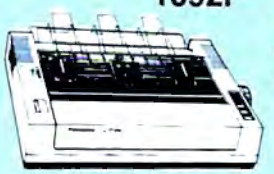

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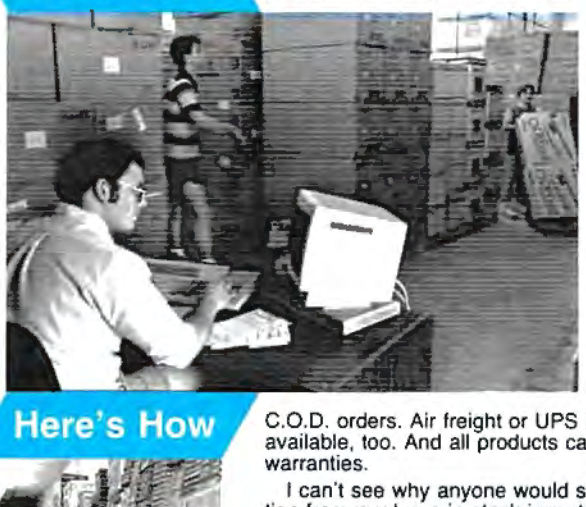

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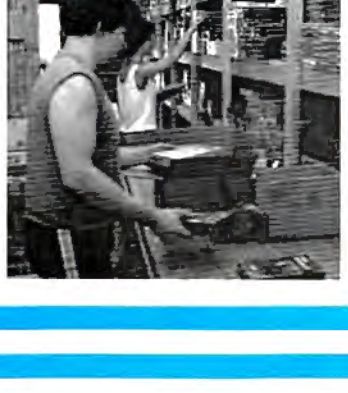

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C400:1C 1D DC C6 91 FD 60 A9 D5
C408:00 8D 5F 1C BD 9C 18 4A 7D
C410:6E 5F 1C 4A 6E 5F 1C 7D 77
C418:9C 18 69 20 85 FE BD 3C 05
C420:18 0A 0A 0A 90 02 E6 FE 73
C428:18 6D 5F 1C 85 FD 90 02 0E
C430:E6 FE BD FC 18 4A 4A 4A 3D
C438:4A 4A 29 06 18 8D 6B 1C E8
C440:6D 6A 1C 8D 6A 1C BD 5C 13
C448:19 4A 4A 4A 4A 4A A8 AE 5A
C450:6B 1C BD D4 C6 8D 6B 1C FA
C458:AE 6A 1C 60 BD BC 19 18 88
C460:7D FC 18 9D FC 18 BD BC 45
C468:19 30 08 90 12 FE 3C 18 B1
C470:4C 78 C4 B0 0A DE 3C 18 3E
C478:BD 3C 18 C9 28 B0 27 BD 9F
C480:1C 1A 18 7D 5C 19 9D 5C 58
C488:19 BD 1C 1A 30 08 90 12 08
C490:FE 9C 18 4C 9B C4 B0 0A E3
C498:DE 9C 18 BD 9C 18 C9 19 89
C4A0:B0 04 BD 9C 18 60 A9 FF 9A
C4A8:9D 9C 18 E0 30 B0 F3 BD 23
C4B0:7C 1A F0 00 BD DC 1A 9D 50
C4B8:EC 19 BD 3C 1B 9D 4C 1A 7C
C4C0:BD 9C 1B 9D 2C 19 BD FC CB
C4C8:1B 9D 8C 19 BD 7C 1A 9D 1C
C4D0:AC 1A A9 13 9D 6C 18 A9 16
C4D8:0C 9D CC 18 A9 FF 60 AD A6
C4E0:8D 02 C9 01 F0 F9 AD 00 C5
C4E8:DC 8D 67 1C 29 0F C9 0F 1B
C4F0:D0 08 A9 00 8D 3A 18 8D 2D
C4F8:3B 18 4E 67 1C B0 0B AC CC
C500:3B 18 88 C0 FB F0 03 8C 82
C508:3B 18 4E 67 1C B0 0B AC DD
C510:3B 18 C8 C0 05 F0 03 8C E2
C518:3B 18 4E 67 1C B0 0B AC ED
C520:3A 18 88 C0 FD F0 03 8C 32
C528:3A 18 4E 67 1C B0 0B AC 7D
C530:3A 18 C8 C0 03 F0 03 8C 72
C538:3A 18 AD 07 18 18 6D 3A 43
C540:18 C9 A1 B0 03 8D 07 18 FD
C548:AD 10 18 18 6D 3B 18 C9 85
C550:C8 B0 03 8D 10 18 AD 07 E8
C558:18 48 C9 7A B0 13 AD 10 20
C560:D0 29 7F 8D 10 D0 68 0A 06
C568:18 69 0C 8D 0E D0 4C 81 82
C570:C5 AD 10 D0 09 80 8D 10 CE
C578:D0 68 38 E9 7A 0A 8D 0E 51
C580:D0 AD 10 18 69 29 8D 0F 7D
C588:D0 AD 6D 1C 4A 4A 4A 4A B1
C590:18 69 01 8D 2E D0 AD 6C F7
C598:1C F0 13 CE 6C 1C 4E 67 95
C5A0:1C 90 0A AD 6D 1C C9 03 EC
C5A8:90 03 CE 6D 1C 60 4E 67 54
C5B0:1C B0 FA A2 04 20 1E C6 A3
C5B8:30 F3 A9 02 20 52 C0 AD 28
C5C0:6D 1C 8D 6C 1C 18 69 02 98
C5C8:8D 6D 1C A0 07 B9 00 18 3B
C5D0:9D 00 18 B9 09 18 9D 09 B6
C5D8:18 BD 00 18 C9 7A 90 0C C6
C5E0:AD 10 D0 1D F4 C6 8D 10 21
C5E8:D0 4C F5 C5 AD 10 D0 3D 97
C5F0:FC C6 8D 10 D0 8A 0A A8 CC
C5F8:BD 00 18 0A 69 0C 99 00 B5
C600:D0 BD 09 18 18 69 29 99 5A
C608:01 D0 A9 20 9D F8 07 A9 0A
C610:00 9D 32 18 AD 15 D0 1D 4D
C618:F4 C6 8D 15 D0 60 EA AD 60
C620:15 D0 3D F4 C6 F0 07 E8 54
C628:E0 07 D0 F3 A2 FF 60 A2 B9
C630:00 BD F8 07 30 32 BD 32 B4
C638:18 30 2D A8 B9 AD C6 9D BD
C640:27 D0 B9 86 C6 30 18 48 A4
C648:18 69 20 9D F8 07 68 A8 77
C650:B9 7E C6 9D 6E C6 0A 9D 4D
C658:76 C6 FE 32 18 D0 09 AD 99
C660:15 D0 3D FC C6 8D 15 D0 8B
C668:E8 E0 07 D0 C4 60 02 02 3E
C670:02 05 00 00 00 00 03 03 49
C678:03 0A 00 00 00 00 00 01 0B
C680:03 05 04 01 FF 05 00 01 76
C688:02 02 03 03 03 03 03 03 55
C690:03 03 04 04 04 04 05 05 60
C698:05 05 FF 00 00 00 00 00 E9
C6A0:01 02 07 07 07 07 07 07 E9
C6A8:07 07 07 07 FF 01 01 07 D9
C6B0:0A 0A 07 07 0A 0A 0A 0F B2
C6B8:0F 0F 0F 0C 0B 0B 0C 0F DF
C6C0:01 01 01 01 01 01 01 01 4E
C6C8:01 01 01 01 01 01 01 1C 71
C6D0:3E 3E 3E 1C 3F 3F CF CF FC
C6D8:F3 F3 FC FC C0 C0 30 30 66
C6E0:0C 0C 03 03 80 80 20 20 6E
C6E8:08 08 02 02 40 40 10 10 10
C6F0:04 04 01 01 01 01 02 04 08 D1
C6F8:10 20 40 80 FE FD FB F7 86
C700:EF DF BF 7F FE C8 50 00 2B
C708:00 00 A0 00 A2 00 86 FD CB
C710:A9 08 85 FE BD 67 C7 C9 FB
C718:FC F0 43 C9 FD D0 0A A9 58
C720:00 91 FD 20 61 C7 4C 5B F3
C728:C7 C9 FE D0 0F A9 00 91 AB
C730:FD 20 61 C7 91 FD 20 61 95
C738:C7 4C 5B C7 C9 00 D0 16 AC
C740:E8 BD 67 C7 8D 5C 1C A9 DC
C748:00 91 FD 20 61 C7 CE 5C 22
C750:1C D0 F6 4C 5B C7 91 FD E0
C758:20 61 C7 E8 D0 B6 4C 2B FC
C760:C1 C8 D0 02 E6 FE 60 00 31
C768:1F 18 00 3C 3C FE 66 FE FA
C770:3C 00 30 08 FE 91 FE 4A 2B
C778:80 01 18 FD 01 66 80 FD 0C
C780:18 80 01 52 FE 89 FE 10 AD
C788:00 21 10 FE 8A FD 02 50 F2
C790:80 09 29 FD 04 52 20 11 62
C798:08 90 04 A5 20 09 12 50 C4
C7A0:02 4A 40 04 91 20 01 08 23
C7A8:80 FD 92 FE 08 00 24 14 D6
C7B0:FE 4A FD 01 10 80 FD A5 46
C7B8:FD 01 48 80 FD 52 FE 89 59
C7C0:FE 10 00 30 08 FE 14 FE 3A
C7C8:08 00 26 07 C3 E0 08 FD 41
C7D0:10 0A FD 50 09 FD 90 08 19
C7D8:FD 10 08 24 10 08 FD 10 5B
C7E0:08 24 10 08 FD 10 09 FD 40
C7E8:90 0A FD 50 08 FD 10 07 67
C7F0:C3 E0 00 10 FC 00 00 00 83
```

Galacticon—64 Version—BASIC Section

```
XD 100 REM COPYRIGHT 1988 COMP
       UTE! PUBLICATIONS, INC.
       {2 SPACES}ALL RIGHTS RE
       SERVED.
GE 110 IF PEEK(642)=64 THEN190
GM 120 PRINT"{CLR}{DOWN}
       {2 SPACES}YOU MUST TYPE
       ":PRINT
EJ 130 PRINT"{2 SPACES}POKE 64
       2,64:SYS58260":PRINT
AG 140 PRINT"IN DIRECT MODE BE
       FORE LOADING AND"
RC 150 PRINT"RUNNING THIS PROG
       RAM.{2 SPACES}IF YOU JU
       ST"
QB 160 PRINT"TYPED THIS IN, SA
       VE IT TO DISK NOW"
SB 170 PRINT"(BEFORE YOU DO: P
       OKE 642,64:SYS58260).
HR 180 STOP
AA 190 IF A=0 THEN A=1:PRINT"L
       OADING ML FILE":LOAD"GA
       LACT.ML",8,1
BP 200 PRINT"{CLR}"
GS 210 X=14:Y=10:GOSUB730:PRIN
       T"COPYRIGHT 1988"
HM 220 X=8:Y=11:GOSUB730:PRINT
       "COMPUTE! PUBLICATIONS,
        INC."
PQ 230 X=12:Y=12:GOSUB730:PRIN
       T"ALL RIGHTS RESERVED."
HF 240 X=12:Y=20:GOSUB730:PRIN
       T"CALCULATING ORBITS"
XD 250 DIM X(255,2),Y(255,2)
PQ 260 XC=172:YC=138:YR=140:XR
       =70
JD 270 READ IT,P,YR,XR:IF P=-1
        THEN GOTO360
QH 280 GOSUB310:GOTO270
MQ 290 REM ORBITS{2 SPACES}#,X
       R,YR,PERIOD
CG 300 DATA 0,127,125,80, 1,10
       0,100,60, 2,40,80,50, -
       1,-1,-1,-1
KC 310 C=0:FOR I=0 TO 2*↑ STEP
       ↑/P
AF 320 X(C,IT)=SIN(I)*YR+XC:Y(
       C,IT)=COS(I)*XR+YC
SF 330 T=4096+IT*512:T2=T+256:
       POKE T+C,X(C,IT)AND 255
       :POKE T2+C,Y(C,IT)
HE 340 C=C+1:NEXT:RETURN
AX 350 HI=0:BN=0
ER 360 POKE 53281,0:POKE 53280
       ,12:POKE 646,15
FB 370 V2=135:L=0:SC=0:V=53248
XJ 380 POKE V+39,6:POKE V+40,8
       :POKEV+41,10
AD 390 POKE 2,L
XQ 400 PRINT"{CLR}":X=17:Y=5:G
       OSUB730:PRINT"LEVEL ";L
       +1
BS 410 X=17:Y=6:GOSUB730:PRINT
       "SCORE ";SC
DJ 420 IF HI>0 THEN X=14:Y=8:G
       OSUB730:PRINT"OLD HIGH
       {SPACE}";HI
XE 430 X=17:Y=10:GOSUB730:PRIN
       T"READY":FOR I=1 TO 499
       :NEXT I
DF 440 X=17:Y=10:GOSUB730:PRIN
       T" SET ":FOR I=1 TO 399
       :NEXT I
JA 450 X=17:Y=10:GOSUB730:PRIN
       T" GO{2 SPACES}":FOR I=
       1 TO 299:NEXT I
CQ 460 POKE V+21,V2
QQ 470 SYS 49152:V2=PEEK(53269
       ):POKE V+21,0
KC 480 FOR I=0 TO 2
BP 490 T=(PEEK(V+39+I) AND 15)
       +BN:IF T>15 THEN T=15
FC 500 POKE V+39+I,T
JB 510 NEXT
CB 520 IF (7 AND V2)>0 THEN640
```

```
BS 530 PRINT"{CLR}"
SK 540 X=14:Y=5:GOSUB730:PRINT
       "LEVEL ";L+1
BD 550 SC=SC+PEEK(251)+PEEK(25
       2)*256
FF 560 X=14:Y=6:GOSUB730:PRINT
       "SCORE ";SC
QK 570 IF SC>HI THEN HI=SC:X=1
       4:Y=7:GOSUB730:PRINT" A
        NEW HIGH SCORE"
HM 580 X=16:Y=11:GOSUB730:PRIN
       T"GAME OVER"
KA 590 X=14:Y=13:GOSUB730:PRIN
       T"PLAY AGAIN (Y/N)?"
EE 600 POKE 198,0:REM CLEAR KE
       YBOARD BUFFER
KR 610 GETA$:IF A$="Y" THEN360
       0
CE 620 IF A$="N" THEN END
QP 630 GOTO610
MS 640 SC=SC+PEEK(251)+PEEK(25
       2)*256
JX 650 L=L+1:IF(L AND 3)>0 THE
       N390
SS 660 POKE V+21,0
MD 670 PRINT"{CLR}":X=7:Y=12:G
       OSUB730:PRINT"GET READY
        FOR SAFE ROUND!"
QK 680 FOR I=1 TO 1499:NEXT I
AS 690 POKE 53281,6:POKE 49798
       ,0:POKE V+21,V2
PM 700 SYS49152:L=L+1:BN=BN+1
SQ 710 POKE 53281,0:POKE 49798
       ,3:POKE V+21,0
QC 720 GOTO390
AR 730 POKE 781,Y:POKE 782,X:P
       OKE 783,0:SYS65520:RETU
       RN
```

Galacticon—Apple Version—Machine Language Section

```
8000: 4C AD 83 4C F5 88 20 60 3A
8008: 88 20 B0 81 20 6B 81 20 55
8010: 6B 83 20 9B 83 20 E4 85 51
8018: 20 0C 87 20 1D 88 20 5C C6
8020: 85 20 A0 85 20 59 86 20 EB
8028: 54 83 AD 00 C0 C9 9B F0 3F
8030: F9 AD 85 7D F0 DC 60 BD 9B
8038: 10 7C 8D E1 8A BD 30 7C 58
8040: 8D DF 8A BD 20 7C 8D E2 1E
8048: 8A BD 40 7C 8D E0 8A BD 90
8050: 70 7C 8D E3 8A 20 9E B0 2B
8058: 4C F9 B0 BD CA 8A 11 EC 79
8060: 91 EC 4C 00 81 A5 4E 0A 38
8068: 0A 38 65 4E 85 4E 8D 72 01
8070: B0 AD 00 65 3D CA 8A 11 AE
8078: EC 91 EC 4C 00 81 A5 4E 56
8080: 0A 0A 38 65 4E 85 4E 8D 19
8088: 8B B0 AD 00 65 65 4E 3D BF
8090: CA 8A 91 EC 4C 00 81 A9 A9
8098: 00 91 EC 4C 00 81 AD E1 A3
80A0: 8A A8 B9 00 62 8D E4 8A E5
80A8: AD E3 8A A8 B9 00 7C 18 34
80B0: 6D E4 8A 8D 5D 00 8D 76 4A
80B8: B0 8D 91 B0 B9 F8 7B 8D CD
80C0: 5C B0 8D 75 B0 8D 90 B0 F4
80C8: AD E3 8A A8 B9 4C 8A 8D 17
80D0: C6 8A B9 54 8A 8D C4 8A F2
80D8: AD E2 8A 4A 4A 4A 4A 4A B9
80E0: 8D E5 8A 0A 0A 48 20 27 EC
80E8: 81 68 18 65 ED 85 ED A9 29
80F0: 07 38 ED E5 8A 8D E5 8A B0
80F8: 60 A2 00 A0 00 4C 97 B0 BD
8100: C8 E8 CC C4 8A D0 F6 A5 B2
8108: ED 18 69 04 85 ED CE C6 BD
8110: 8A F0 13 CE E5 8A 10 E3 41
8118: EE E0 8A 20 27 81 A9 07 B7
8120: 8D E5 8A 4C FB B0 60 AD C9
8128: E0 8A A8 B9 84 8A 18 6D DA
8130: DF 8A 85 EC B9 6C 8A 6D 47
8138: DC 8A 85 ED 60 BD C0 7C D3
8140: 8D E1 8A BD E0 7C 8D DF A3
8148: 8A BD D0 7C 8D E2 8A BD AC
8150: F0 7C 8D E0 8A BD 60 7D 34
8158: 8D E3 8A 20 C8 B0 4C F9 49
8160: B0 A5 4E 0A 0A 38 65 4E C1
8168: 85 4E 60 A9 00 8D 50 C0 FF
8170: 8D 57 C0 8D 54 C0 8D 52 14
8178: C0 20 7F 81 4C B4 81 A9 0D
8180: 20 4C B6 81 A9 40 8D 8F B8
8188: 81 A9 00 A0 20 8D 00 20 18
8190: EE 8E 81 D0 F8 EE 8F 81 10
8198: 88 D0 F2 60 A9 05 8D D8 CD
81A0: 8A 8E D9 8A E8 EC D9 8A A9
81A8: D0 FA CE D8 8A D0 F5 60 1E
81B0: A9 00 8D C1 8A 85 EE A9 48
81B8: 30 85 EF A9 A6 85 EC A9 9C
81C0: B9 85 ED AE C1 8A 20 F6 02
81C8: 81 E8 E0 08 D0 F8 A9 00 21
81D0: 85 EC 85 EE A9 30 85 ED 78
81D8: A9 60 85 EF 20 26 82 AE C5
81E0: C1 8A E8 8E C1 8A E0 08 6F
81E8: D0 F2 CE C1 8A 30 06 20 48
81F0: D7 82 4C EA 81 60 EA BD D9
81F8: 4C 8A 8D C6 8A BD 54 8A 61
8200: 8D C5 8A CE C5 8A A0 00 15
8208: B1 EC 09 80 91 EE 20 4D 20
8210: 83 20 46 83 CE C5 8A D0 53
8218: EF A9 00 91 EE 20 4D 83 AE
8220: CE C6 8A D0 D8 60 EA AE 69
8228: C1 8A BD 54 8A 8D C4 8A 4C
8230: 9D 08 7C BD 4C 8A 8D C6 DF
8238: 8A A8 C0 01 F0 0D BD 08 14
8240: 7C 18 6D C4 8A 9D 08 7C DA
8248: 88 D0 EF A5 EE 9D F8 7B 79
8250: A5 EF 9D 00 7C BD 08 7C 3F
8258: 8D C8 8A A0 00 B1 EC 29 7B
8260: 7F 99 00 20 C8 CC C8 8A 23
8268: D0 F3 A9 00 8D D2 8A AC B1
8270: D2 8A B9 00 20 29 01 D0 31
8278: 13 98 18 6D C4 8A 8D D2 45
8280: 8A CD C8 8A 90 E9 20 AA 17
8288: 82 4C 6A 82 A0 00 B9 00 CF
8290: 20 91 EE C8 CC C8 8A D0 E3
8298: F5 A5 EE 18 6D C8 8A 85 8A
82A0: EE 85 EC 90 04 E6 EF E6 A7
82A8: ED 60 EA AC C8 8A 88 18 7E
82B0: B9 00 20 4A 99 00 20 90 D8
82B8: 08 B9 FF 1F 89 80 99 FF 9F
82C0: 1F 88 C0 FF D0 EA A0 00 03
82C8: B9 00 20 29 7F 99 00 20 C3
82D0: C8 CC C8 8A D0 F2 60 EA 2D
82D8: AE C1 8A A9 06 8D D6 8A 30
82E0: BD 54 8A 8D C4 8A BD 4C 1C
82E8: 8A 8D C6 8A 8D C7 8A BD 76
82F0: 08 7C 8D C8 8A BD F8 7B 10
82F8: 85 EC 85 EE BD 00 7C 85 08
8300: ED 18 69 04 85 EF A0 00 9E
8308: 20 27 83 CE C7 8A D0 F8 49
8310: AD C6 8A 8D C7 8A A5 ED 6B
8318: 18 69 04 85 ED 69 04 85 01
8320: EF CE D6 8A D0 E0 60 EA 0C
8328: AD C4 8A 8D C5 8A 18 08 F1
8330: 28 B1 EC 2A 91 EE 10 04 64
8338: 38 4C 3D 83 18 08 C8 CE 8F
8340: C5 8A D0 EC 28 60 E6 EC 33
8348: D0 02 E6 ED 60 E6 EE D0 41
8350: 02 E6 EF 60 AD DC 8A C9 D5
8358: 40 A9 00 2A AA BD 54 C0 42
8360: AD DC 8A 85 E6 49 60 8D C9
8368: DC 8A 60 A2 00 8E 87 7D 7D
8370: 8E 85 7D 20 61 81 09 B0 75
8378: 9D 00 65 CA D0 F5 20 61 A7
8380: 81 3D 00 65 9D 00 65 CA 70
8388: D0 F4 AE 82 7D A9 00 9D 63
8390: 30 7D 9D 00 7D CA E0 04 9F
8398: D0 F5 60 A9 00 8D E7 8A BC
83A0: AD 86 7D D0 03 4C 2E 84 07
83A8: 10 43 4C 26 B9 AD 86 7D 02
83B0: C9 01 F0 19 A0 14 20 71 93
83B8: B9 A0 C4 B9 B8 06 30 F4 14
83C0: A0 14 20 71 B9 A0 C4 B9 4A
83C8: B8 06 10 F4 60 AD 6C C0 52
83D0: 30 FB A2 00 20 1E FB AD 62
83D8: 61 C0 10 01 60 AD 6D C0 28
83E0: 30 FB A2 01 20 1E FB AD 82
83E8: 62 C0 10 E1 60 AD 6C C0 C4
83F0: 30 FB A2 00 20 1E FB AD 82
83F8: 61 C0 10 03 EE E7 8A 98 D7
8400: 20 28 84 B9 5C 8A 8D 50 C7
8408: 7C AD 6D C0 30 FB A2 01 2C
8410: 20 1E FB AD 62 C0 10 03 44
8418: EE E7 8A 98 20 28 84 B9 D1
8420: 5C 8A 8D 60 7C 4C 63 84 12
8428: 4A 4A 4A 4A A8 60 AD 00 F8
8430: C0 CD BC 8A D0 09 2C 10 60
8438: C0 EE E7 8A 4C 63 84 A0 9C
8440: 0F D9 9C 8A F0 0E 88 10 64
8448: F8 A9 00 8D 50 7C 8D 60 01
8450: 7C 4C 63 84 98 4A A8 B9 58
8458: AC 8A 8D 50 7C B9 B4 8A CF
8460: 8D 60 7C A2 00 20 D8 84 B8
8468: AD DB 8A F0 1D AD DA 8A 7F
8470: F0 18 AD 80 7C 8D 10 7C 6C
8478: AD A0 7C 8D 30 7C AD 90 48
8480: 7C 8D 20 7C AD B0 7C 8D AD
8488: 40 7C AD E7 8A F0 03 4C 6F
8490: 9F B6 60 A9 00 9D 40 7C 25
8498: 9D 30 7C 8D B0 7C 9D C0 D9
84A0: 7C BD A0 7C 9D E0 7C BD 5A
84A8: 90 7C 9D D0 7C BD B0 7C 92
84B0: 9D F0 7C BD 50 7D 9D 60 44
84B8: 7D BD 10 7C 9D 80 7C BD 5F
84C0: 30 7C 9D A0 7C BD 20 7C 56
84C8: 9D 90 7C BD 40 7C 9D B0 10
84D0: 7C BD 70 7C 9D 50 7D 60 E6
84D8: 20 9B 84 A9 00 8D DA 8A 7A
84E0: 8D DB 8A BD 50 7C 18 7D F6
84E8: 80 7C 9D 10 7C 08 BD 50 D5
84F0: 7C 30 19 28 90 29 EE DB CC
84F8: 8A BD A0 7C 69 00 9D 30 49
8500: 7C CD BD 8A 90 19 EE DA BE
8508: 8A 4C 1F 85 28 B0 10 EE BA
8510: DB 8A BD A0 7C E9 00 9D 96
8518: 30 7C 10 03 EE DA 8A BD 42
8520: 60 7C 18 7D 90 7C 9D 20 27
8528: 7C 08 BD 60 7C 30 19 28 30
8530: 90 29 EE DB 8A BD B0 7C 92
8538: 69 00 9D 40 7C CD BE 8A D2
8540: 90 19 EE DA 8A 4C 5B 85 27
8548: 28 B0 10 EE DB 8A BD B0 B9
8550: 7C E9 00 9D 40 7C 10 03 05
8558: EE DA 8A 60 AE 82 7D 8E F1
8560: C2 8A A9 97 8D FE 80 A9 31
8568: 80 8D FF B0 BD 30 7D F0 B9
8570: 28 20 3D 81 AE C2 8A BD AA
8578: 30 7D C9 01 D0 1B 20 93 0B
8580: 84 AD DC 8A 48 49 60 8D 33
8588: DC 8A 20 3D 81 68 8D DC 22
8590: 8A AE C2 8A A9 00 9D 30 46
8598: 7D CA 8E C2 8A 10 CD 60 A3
85A0: A9 7E 8D FE B0 A9 B0 8D FA
85A8: FF B0 A2 0F 20 37 B0 A9 A1
85B0: 65 8D FE B0 A9 B0 8D FF 24
85B8: B0 AE B2 7D 8E C2 8A BD 2A
85C0: 30 7D C9 02 90 06 20 37 B0
85C8: B0 AE C2 8A CA 8E C2 8A 61
85D0: 30 11 E0 04 D0 E9 A9 5B 71
85D8: 8D FE B0 A9 B0 8D FF B0 CF
85E0: 4C BF 85 60 A2 04 BD 30 B9
85E8: 7D F0 5E 20 9B 84 BD 50 77
85F0: 86 85 EC 18 7D 54 86 85 BF
85F8: EE BD 4C 86 85 ED 69 00 93
8600: 85 EF FE 40 7D BD 40 7D 90
8608: DD 54 86 90 05 A9 00 9D 5F
8610: 40 7D A8 A9 00 9D 10 7C 5F
8618: 9D 20 7C B1 EC 9D 10 7D 22
8620: 4A 7E 10 7C 4A 7E 10 7C A4
8628: CD BD 8A B0 03 9D 30 7C 53
8630: B1 EE 9D 20 7D 4A 7E 20 B9
8638: 7C 4A 7E 20 7C 4A 7E 20 12
8640: 7C CD BE 8A B0 03 9D 40 8C
8648: 7C CA D0 9A 60 1C 1C 1E D3
8650: 1E 00 E0 0C 0C 70 96 FA 93
8658: FA AD E7 8A D0 14 CE DE 47
8660: 8A D0 0F A9 0E 8D DE 8A 52
8668: AD DD 8A C9 1E B0 03 EE 5A
8670: DD 8A AC DD 8A F0 11 A9 66
8678: FF 99 D4 47 99 D4 4B 99 4B
8680: D4 27 99 D4 2B 88 10 F1 CF
8688: AC DD 8A A9 00 99 D4 47 A6
8690: 99 D4 4B 99 D4 27 99 D4 ED
8698: 2B C8 C0 23 D0 EF 60 AD 6C
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86A0: DD 8A F0 FA CE DE 8A D0 E4
86A8: 05 A9 03 8D DE 8A CE DD 78
86B0: 8A A2 00 20 48 87 AE 82 ED
86B8: 7D BD 30 7D C9 02 D0 46 10
86C0: BD 30 7C CD BF 8A D0 08 F6
86C8: BD 40 7C CD C0 8A F0 36 79
86D0: A0 00 20 A1 87 B0 2F AD 57
86D8: 87 7D 18 69 01 8D 87 7D 6D
86E0: CD 88 7D 90 05 A9 01 8D 0E
86E8: 85 7D AD 82 7D 18 6D 80 9D
86F0: 7D 8D 80 7D 90 03 EE 81 F7
86F8: 7D 20 CD 87 E0 05 F0 06 02
8700: 20 61 81 9D 00 7D CA E0 ED
8708: 04 D0 AE 60 AE 82 7D 8E 32
8710: C3 8A BD 30 7D F0 04 C9 DF
8718: 02 B0 0B BD 00 7D 30 1C 04
8720: 20 ED 87 4C 3C 87 20 D8 89
8728: 84 AE C3 8A AD DA 8A F0 25
8730: 08 A9 01 9D 30 7D 4C 3C F3
8738: 87 20 6F 87 AE C3 8A CA DD
8740: 8E C3 8A E0 04 D0 CB 60 42
8748: BD 40 7C 9D 20 7D BD 20 42
8750: 7C 0A 3E 20 7D 0A 3E 20 9A
8758: 7D 0A 3E 20 7D BD 30 7C 32
8760: 9D 10 7D BD 10 7C 0A 3E 92
8768: 10 7D 0A 3E 10 7D 60 20 5B
8770: 48 87 A0 04 B9 30 7D C9 2D
8778: 02 D0 22 20 A1 87 B0 1D AC
8780: 20 CD 87 A9 01 99 30 7D EA
8788: AD 31 7D 0D 32 7D 0D 33 10
8790: 7D 0D 34 7D 29 02 D0 05 F7
8798: A9 FF 8D 85 7D 88 D0 D4 0B
87A0: 60 BD 20 7D 38 F9 20 7D 92
87A8: CD 8A 7D B0 0A BD 10 7D E0
87B0: 38 F9 10 7D CD 8A 7D 60 28
87B8: 20 61 81 2D 84 7D CD 83 6C
87C0: 7D B0 F5 48 4A 90 04 68 03
87C8: 49 FF 60 68 60 A9 03 9D 5C
87D0: 30 7D A9 00 9D 70 7D AD E3
87D8: 90 89 9D 40 7D AD 84 89 7F
87E0: 9D 70 7C AD 9B 89 9D 50 D3
87E8: 7C 9D 60 7C 60 20 B8 87 ED
87F0: 9D 50 7C 20 B8 87 9D 60 F3
87F8: 7C 1D 50 7C F0 EF AD BF C1
8800: 8A 9D 30 7C AD C0 8A 9D AE
8808: 40 7C A9 02 9D 30 7D A9 FF
8810: 03 9D 70 7C 60 10 05 49 76
8818: FF 18 69 01 60 AE 82 7D AC
8820: BD 30 7D C9 03 D0 33 A9 D3
8828: 00 9D 50 7C 9D 60 7C DE B8
8830: 40 7D D0 26 FE 70 7D BD AF
8838: 70 7D A8 B9 84 89 F0 15 D2
8840: 9D 70 7C B9 90 89 9D 40 BD
8848: 7D B9 9B 89 9D 50 7C 9D 57
8850: 60 7C 4C 5A 88 A9 01 9D 6A
8858: 30 7D CA E0 04 D0 C1 60 BF
8860: A2 00 8A 9D 10 7C 9D 00 1C
8868: 7C E8 D0 F7 BD C7 89 09 B4
8870: 00 9D C7 89 E8 E0 7B D0 4D
8878: F3 A2 00 BE CA 8A A0 25 FB
8880: AD CA 8A 9D 00 62 E8 F0 92
8888: 0E 88 10 F4 AD CA 8A 18 D9
8890: 69 04 8D CA 8A 10 E7 AD C7
8898: BF 8A 8D 30 7C 8D A0 7C B8
88A0: 8D E0 7C 8D 3F 7C AD C0 21
88A8: 8A 8D 40 7C 8D B0 7C 8D E7
88B0: E0 7C 8D 4F 7C A2 04 A9 18
88B8: 02 9D 30 7D 8A 9D 70 7C 38
88C0: CA 10 F4 20 61 81 8D 43 4B
88C8: 7D 20 61 81 6D 43 7D 8D E5
88D0: 44 7D A9 20 85 E6 49 60 55
88D8: 8D DC 8A A9 1E 8D DD 8A 41
88E0: A9 04 8D DE 8A A9 1F 8D 2E
88E8: 84 7D A9 04 8D 89 7D A9 48
88F0: 06 8D 7F 7C 60 A0 19 20 F7
88F8: 71 89 A0 12 A9 01 20 71 5D
8900: 89 2C 10 C0 A0 17 A9 00 A5
8908: 8D 78 04 8D 78 05 8D F8 45
8910: 05 A9 9F 8D F8 04 A9 00 08
8918: 20 71 89 A0 17 A9 01 20 54
8920: 71 89 2C 00 C0 60 A0 14 B0
8928: 20 71 89 A2 00 20 9B 84 3F
8930: A9 00 8D E7 8A 8D 10 7C 6F
8938: A0 C4 B9 B8 03 8D 10 7D 7B
8940: 4A 2E 10 7C 4A 8D 30 7C 33
8948: 2E 10 7C B9 38 04 48 8D 91
8950: 20 7D 4A 4A 4A 8D 40 7C 46
8958: 68 4A 6A 6A 6A 29 E0 8D 6D
8960: 20 7C B9 B8 06 10 06 8D 6F
8968: E7 8A 4C 9F 86 60 4C 00 E3
8970: 04 48 B9 00 C4 A2 C4 A0 A9
8978: 40 8D 6F B9 8E 70 89 68 47
8980: 20 6E 89 60 03 04 05 06 AE
8988: 07 06 05 04 03 02 01 00 A3
8990: 02 03 05 08 0B 05 03 02 FA
8998: 02 02 01 DC DC DC DC C0 EF
89A0: 24 24 24 24 24 24 70 43 6B
89A8: 07 30 00 06 30 00 06 30 69
89B0: 00 06 00 00 00 00 00 00 45
89B8: 00 00 00 00 00 00 30 00 2C
89C0: 06 30 00 06 70 43 07 0C ED
89C8: 1E 0C 1C 3E 3E 3E 1C 3C B4
89D0: 7E 7E 7E 7E 3C 00 1E 00 98
89D8: 3F 40 7F 40 7F 40 7F 00 8B
89E0: 3F 00 1E 00 1E 00 00 3F 87
89E8: 00 40 7F 00 60 7F 01 60 5F
89F0: 7F 01 60 7F 01 40 7F 01 11
89F8: 40 7F 00 00 3E 00 00 3F 3D
8A00: 00 60 7F 01 70 7F 03 78 2D
8A08: 7F 07 78 7F 07 78 7F 07 C5
8A10: 78 7F 07 78 7F 07 70 7F 22
8A18: 03 60 7F 01 00 3F 00 00 C3
8A20: 3F 00 60 7F 01 70 7F 03 A4
8A28: 78 7F 07 7C 7F 0F 7E 7F B6
8A30: 0F 7E 7F 1F 7E 7F 1F 7E FC
8A38: 7F 1F 7C 7F 0F 7C 7F 0F D4
8A40: 78 7F 07 70 7C 03 60 7F 89
8A48: 01 00 3F 00 0B 03 05 06 3A
8A50: 07 09 0B 0F 04 02 02 02 AB
8A58: 03 04 04 04 B7 B8 C0 D0 A3
8A60: E0 E0 00 00 00 00 20 20 7E
8A68: 30 40 48 49 00 00 01 01 46
8A70: 02 02 03 03 00 00 01 01 9A
8A78: 02 02 03 03 00 00 01 01 A2
8A80: 02 02 03 03 00 80 00 80 2A
8A88: 00 80 00 80 28 A8 28 A8 A2
8A90: 28 A8 28 A8 50 D0 50 D0 AA
8A98: 50 D0 50 D0 D7 F7 C5 E5 31
8AA0: D2 F2 C6 E6 D6 F6 C3 E3 21
8AA8: D8 F8 D3 F3 D0 00 30 30 39
8AB0: 30 00 D0 D0 D0 D0 D0 00 70
8AB8: 30 30 30 00 A0 24 14 12 C7
8AC0: 0A 00 00 00 00 00 00 00 DA
8AC8: 00 00 00 00 00 00 00 00 DD
8AD0: 00 00 00 00 00 00 00 00 E5
8AD8: 00 00 00 00 00 00 00 00 ED
8AE0: 00 00 00 00 00 00 00 00 F5
8AE8: 35 36 2C 35 30 2C 35 30 CB
```

Galacticon—Apple Version—BASIC Section

```
9F 100 REM Copyright 1988 COMPUTE! Publications, Inc. All rights reserved.
0C 110 D$ = CHR$ (4): HOME : HTAB 1: VTAB 9: PRINT "Copyright 1988 COMPUTE! Publications"
7A 120 HTAB 11: VTAB 13: PRINT "All rights reserved."
B0 130 A = FRE (0): IF A < 0 OR A > 4500 THEN PRINT : PRINT "You must type HIMEM : 6572 in direct": PRINT "mode before running this program.": STOP
E3 140 PRINT : PRINT "Loading ml file": PRINT D$"BLOAD GALACT.ML"
63 150 PRINT "Calculating orbits"
9C 160 DIM XA(2),YA(2):PI = 3.14159265
B6 170 FOR I = 0 TO 2: READ XA(I),YA(I): NEXT
D4 180 DATA 7168,7280,7392,7542,7692,7942
2B 190 XC = 79:YC = 76
26 200 FOR N = 0 TO 2
54 210 READ P,XR,YR:C = 0
FA 220 FOR I = 0 TO 2 * PI STEP PI / P
13 230 TX = SIN (I) * YR + XC:TY = COS (I) * XR + YC
39 240 POKE XA(N) + C,TX: POKE YA(N) + C,TY
47 250 C = C + 1: IF C = P * 2 THEN I = 2 * PI
EA 260 NEXT I
6F 270 NEXT N
0E 280 DATA 56,50,50, 75,55,58, 125,68,65
B0 290 MF = 6:MSPD = 25:R = 5:LEV = 1:KF = 9:C = 32774: POKE 32128,0: POKE 32129,0 : POKE 32132,31
9E 300 HOME : HTAB 2: VTAB 4: PRINT "Press K for keyboard, J for joystick,": HTAB 8: PRINT "M for mouse"
C0 310 A = PEEK (49152): IF A = 235 OR A = 203 THEN US = 0: GOTO 350
33 320 IF A = 205 OR A = 237 THEN PRINT "mouse selected": US = 255: GOTO 370
5A 330 IF A = 234 OR A = 202 THEN US = 1: PRINT : PRINT " joystick selected": GOTO 380
96 340 GOTO 310
E5 350 HTAB 11: VTAB 7: PRINT "W E R": HTAB 11: PRINT " S F": HTAB 11: PRINT "X C V": PRINT : PRINT " space bar to fire"
B5 360 R = 6:MSPD = 16: GOTO 380
55 370 CALL 32771
55 380 POKE 32130,MF: POKE 32131,MSPD: POKE 32138,R: POKE 32136,KF: POKE 32134,US
F0 390 FOR I = 1 TO 2999: NEXT
1D 400 HOME : HTAB 10: VTAB 5: PRINT "score "; PEEK (32128) + PEEK (32129) * 256
C3 410 HTAB 11: VTAB 7: PRINT "level "LEV
41 420 IF US < > 0 THEN HTAB 12: VTAB 9: PRINT "press fire to continue": CALL 32768: GOTO 450
23 430 HTAB 12: VTAB 9: PRINT "return to continue"
E1 440 A = PEEK (49152): IF A < > 141 THEN 440
24 450 CALL C: TEXT : HOME :C = 32780
4B 460 IF PEEK (32133) = 1 THEN 520
21 470 HTAB 9: VTAB 9: PRINT "game over": HTAB 2: VTAB 11 : PRINT "final score " PEEK (32128) + PEEK (32129) * 256"   level "LEV
51 480 HTAB 4: VTAB 13: PRINT "Play again (y/n)?"
03 490 A = PEEK (49152): IF A = 249 OR A = 217 THEN 290
D6 500 IF A = 238 OR A = 206 THEN END
1B 510 GOTO 490
7C 520 MF = MF + 1: IF MF > 14 THEN MF = 14
78 530 LEV = LEV + 1:MSPD = MSPD + 5: IF MSPD > 31 THEN POKE 32132,63
37 540 IF MSPD > 63 THEN POKE 32132,127
D2 550 KF = KF + LEV: IF KF > 255 THEN KF = 255
A3 560 GOTO 380
```

Galacticon—Atari ST Version

```
' Copyright 1988 COMPUTE! Publications, Inc.
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DIM x%(5,200),y%(5,200),sx%(30),sy%(30)
DIM pal%(15),s%(32554/4),fx%(7),fy%(7)
DIM px%(25),py%(25),yp%(25),xp%(25),d!(5)
DIM ex_1%(15),ex_2%(15),ls%(15)
DIM hit!(25),pj$(25),pt$(5)
GRAPHMODE 2
rez%=XBIOS(4)
start:
@init_game
DO
  @count_em
  EXIT IF p_c%=5
  MOUSE gx%,gy%,gk%
  IF gk%=2
    @wait
  ENDIF
  SWAP a%,b%
  VSYNC
  VOID XBIOS(5,L:a%,L:b%,-1)
  SPUT m_scrn$
  p%=0
  WHILE p%<5
    IF d!(p%)
      PUT x%(p%,c%),y%(p%,c%),pt$(p%)
    ENDIF
    INC p%
  WEND
  PUT fp_1%,191,b$
  IF (TIMER-t)/200>2 AND fp_1%<259
    PUT fp_1%,191,a$
    ADD fp_1%,10
    t=TIMER
  ENDIF
  INC c%
  IF c%>200
    c%=1
  ENDIF
  SPRITE gt$,gx%,gy%
  @move_it(c%)
  IF gk%=1 AND f%<>gk%
    @fire_it(gx%,gy%)
  ELSE
    f%=gk%
  ENDIF
LOOP
PAUSE 20
IF NOT win!
  PRINT AT(10,13);"All Planets destroyed!"
  score$="Final Score: "+STR$(sc%)
  l%=20-INT((LEN(lev$)/2))
  PRINT AT(l%,10);score$
  VSYNC
  VOID XBIOS(5,L:a%,L:a%,-1)
  @taps
ENDIF
SHOWM
IF win!
  @win_routine
ENDIF
IF sc%>pscore%
  PRINT AT(13,15);"A New Record!"
  @rec_song
  alrt$="|Save Record Score?"
  ALERT 2,alrt$,1,"Save it|No",b
  IF b=1
    DEFMOUSE 2
    OPEN "O",#1,d$
    PRINT #1,name$
    PRINT #1,sc%
    CLOSE #1
    DEFMOUSE 0
  ENDIF
ENDIF
CLS
lrt$="|  Play Again?"
ALERT 2,lrt$,1,"Yes|Quit",b
IF b=1
  GOTO start
ENDIF
CLS
RESERVE FRE(0)+32000
@r_pal
END
PROCEDURE count_em
  LOCAL i%
  p_c%=0
  i%=0
  WHILE i%<5
    IF NOT d!(i%)
      INC p_c%
    ENDIF
    INC i%
  WEND
RETURN
PROCEDURE move_it(c%)
  LOCAL i%
  il%=0
  REPEAT
    IF hit!(il%)
      GOTO end_move
    ENDIF
    ADD yp%(il%),py%(il%)
    ADD xp%(il%),px%(il%)
    IF xp%(il%)>319 OR xp%(il%)<0
      @axis(il%)
      xp%(il%)=160
      yp%(il%)=100
    ENDIF
    IF yp%(il%)>165 OR yp%(il%)<10
      @axis(il%)
      xp%(il%)=160
      yp%(il%)=100
    ENDIF
    SPRITE pj$(il%),xp%(il%),yp%(il%)
    IF xp%(il%)>170 OR xp%(il%)<150 AND yp%(il
    %)<90 OR yp%(il%)>110
      i%=0
      REPEAT
        IF (x%(i%,c%)-xp%(il%)<5 AND x%(i%,c%)
        -xp%(il%)>-15) AND (y%(i%,c%)-yp%(il%)
        <2 AND y%(i%,c%)-yp%(il%)>-15) AND d!(
        i%)
          d!(i%)=FALSE
          PUT x%(i%,c%),y%(i%,c%),ex$
          VOID XBIOS(32,L:ex_1%)
          i%=4
        ENDIF
        INC i%
      UNTIL i%>4
    ENDIF
    end_move:
    INC il%
  UNTIL il%=le%+1
RETURN
PROCEDURE hit_something(il%,c%)
  LOCAL i%
  IF xp%(il%)>170 OR xp%(il%)<150 AND yp%(il%)
  <90 OR yp%(il%)>110 AND hit!(il%)<>1
    i%=0
    REPEAT
      IF (x%(i%,c%)-xp%(il%)<15 AND x%(i%,c%)-
      xp%(il%)>-15) AND (y%(i%,c%)-yp%(il%)<15
       AND y%(i%,c%)-yp%(il%)>-15) AND d!(i%)
        d!(i%)=FALSE
        PUT x%(i%,c%),y%(i%,c%),ex$
        VOID XBIOS(32,L:ex_1%)
        i%=4
      ENDIF
      INC i%
    UNTIL i%>4
  ENDIF
RETURN
PROCEDURE axis(il%)
  py%(il%)=RANDOM(sp%)-INT(sp%/2)
  px%(il%)=RANDOM(sp%)-INT(sp%/2)
  IF px%(il%)=0 AND py%(il%)=0
    @axis(il%)
  ENDIF
RETURN
PROCEDURE fire_it(gx%,gy%)
```

```
  LOCAL i%
  t=TIMER
  IF (gx%<170 AND gx%>150) AND (gy%<110 AND gy
  %>90)
    GOTO no_fire
  ENDIF
  IF fp_1%<60
    GOTO no_fire
  ENDIF
  i%=1
  REPEAT
    fx%(i%)=gx%
    fy%(i%)=gy%
    f%=gk%
    ADD i%,2
  UNTIL i%>7
  VOID XBIOS(32,L:la%)
  COLOR 2
  POLYLINE 8,fx%(),fy%()
  @hit
  SUB fp_1%,10
  no_fire:
RETURN
PROCEDURE hit
  LOCAL i%
  i%=0
  REPEAT
    IF (gx%-xp%(i%)<5 AND gx%-xp%(i%)>-5) AND
    (gy%-yp%(i%)<5 AND gy%-yp%(i%)>-5) AND hit
    !(i%)=0
      SPUT m_scrn$
      sc%=sc%+(10*le%)*sp%
      sc$=STR$(sc%)
      lg%=40-(LEN(sc$)+7)
      PRINT AT(lg%,23);"Score: "+sc$
      SGET m_scrn$
      hit!(i%)=TRUE
      SPRITE pj$(i%)
      PUT xp%(i%),yp%(i%),ex$
      VOID XBIOS(32,L:ex_2%)
      COLOR 2
      POLYLINE 8,fx%(),fy%()
      INC count%
      IF count%=le%+1
        @next_level
      ENDIF
      i%=le%
    ENDIF
    INC i%
  UNTIL i%>le%
RETURN
PROCEDURE next_level
  ARRAYFILL hit!(),FALSE
  ARRAYFILL xp%(),160
  ARRAYFILL yp%(),100
  sp%=sp%+le%
  i1%=0
  IF game!
    INC le%
    IF le%=26
      win!=TRUE
      GOTO e_lvl
    ENDIF
    PAUSE 20
    VOID XBIOS(5,L:b%,L:b%,-1)
    DEFTEXT 16,0,0,6
    lev$="Entering Level "+STR$(le%)
    l%=20-INT((LEN(lev$)/2))
    PRINT AT(8,c1%);cg$
    PRINT AT(10,l%);lev$
    @song
    count%=0
    SPUT m_scrn$
    PRINT AT(2,23);"Level: ";le%
    SGET m_scrn$
  ENDIF
  FOR i%=0 TO le%
    @axis(i%)
  NEXT i%
  VOID FRE(0)
  e_lvl:
RETURN
PROCEDURE init_game
  IF rez%<>0
    alrt$="Please switch to|Low Resolution."
    ALERT 3,alrt$,1,"OK",b
    END
  ENDIF
  HIDEM
  RESTORE
  IF NOT game!
    RESERVE FRE(0)-32000
    @save_palette
    a%=XBIOS(3)
    b%=VARPTR(a%(0))+255 AND &HFFFF00
  ENDIF
  win!=FALSE
  game!=FALSE
  CLS
  @planets
  count%=0
  p_c%=0
  ARRAYFILL d!(),TRUE
  le$="1"
  i1%=0
  CLS
  GET 1,1,50,50,a$
  DEFTEXT 2,5,0,32
  TEXT 60,80,"Galacticon!"
  DEFTEXT 7,0,0,4
  TEXT 20,100,"Copyright 1988 COMPUTE! Publica
  tions, Inc."
  @rec_song
  DEFMOUSE 2
  drive=GEMDOS(&H19)
  d$=DIR$(drive)
  d$=CHR$(drive+65)+":\"+d$+"galacti.txt"
  IF EXIST(d$)
    OPEN "I",#1,d$
    DO
      EXIT IF EOF(#1)
      INPUT #1,pname$
      INPUT #1,pscore%
    LOOP
    CLOSE #1
    DEFMOUSE 0
    DEFTEXT 2,0,0,6
    record$="Record: "+STR$(pscore%)+" Scored
    by "+pname$
    TEXT 30,120,record$
  ENDIF
  @init_arrays
  @gt
  @project
  @ex_1
  @ex_2
  @le
  PRINT AT(5,20);
  PRINT "Enter your name: ";
  FORM INPUT 10 AS name$
  cg$="Congratulations, "+name$+"!"
  c1%=20-INT(LEN(cg$)/2)
  name$=UPPER$(name$)
  sc%=0
  get_level:
  PRINT AT(5,22);"Select level (1-10)?";
  FORM INPUT 2 AS le$
  le%=VAL(le$)
  IF le%<1 OR le%>10
    GOTO get_level
  ENDIF
  CLS
  alrt$="|Difficulty Factor"
  ALERT 2,alrt$,1,"Easy|Med|Hard",b
  sp%=b%4
  @next_level
  game!=TRUE
  CLS
  @set_star
  @m_screen
RETURN
PROCEDURE save_palette
  FOR i%=0 TO 15
```

```
    pal%(i%)=XBIOS(7,W:i%,W:-1)←
  NEXT i%←
RETURN←
PROCEDURE r_pal←
  SHOWM←
  FOR i%=0 TO 15←
    SETCOLOR i%,pal%(i%)←
  NEXT i%←
RETURN←
PROCEDURE set_star←
  COLOR 16←
  FOR i%=0 TO 30←
    sx%(i%)=RANDOM(319)+1←
    sy%(i%)=RANDOM(168)+1←
    PLOT sx%(i%),sy%(i%)←
  NEXT i%←
RETURN←
PROCEDURE planets←
  ck%=0←
  FOR i%=1 TO 32←
    READ rd←
    colr$=colr$+CHR$(rd)←
  NEXT i%←
  VOID XBIOS(6,L:VARPTR(colr$))←
  FOR x%=0 TO 4←
    READ len,w,h,r←
    FOR i%=1 TO len←
      READ rd←
      ck%=ck%+rd←
      pt$(x%)=pt$(x%)+CHR$(rd)←
    NEXT i%←
  NEXT x%←
  IF ck%<>47646←
    PRINT CHR$(7);"Error in data statements"←
    PAUSE 250←
    @r_pal←
    EDIT←
  ENDIF←
  DATA 0,0,7,0,7,48,7,80,7,112,4,112,0,112,0,1
  17,0,119,0,87,0,39,0,7,7,83,3,32,7,112,7,119
  ←
  DATA 78,9,8,0←
  DATA 0,9,0,8,0,4,0,0,0,0,0,0,0,0,30,0,0,0,0,
  0,0,0,63,0,0,0,0,0,0,0,127,128,0,0,0,0,0,0,1
  27,128,0,0,0,0,0←
  DATA 0,127,128,0,0,0,0,0,0,63,0,0,0,0,0,0,0,
  30,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0←
  DATA 278,19,16,0←
  DATA 0,19,0,16,0,4,0,0,0,0,0,0,0,0,0,0,0,0,0
  ,0,0,0,0,0,0,0,1,248,0,0,0,0,0,0,0,0,0,0,0
  ,1,248,7,254,0←
  DATA 0,0,0,0,0,0,0,0,0,0,0,1,252,31,255,0,0,
  0,0,0,0,128,0,0,0,60,0,63,254,3,255,0,0,160,
  0,160,0,64,0,0,0,28,0,31,227←
  DATA 35,255,0,0,32,0,224,0,192,0,0,0,124,62,
  127,195,3,193,0,60,96,0,224,0,128,0,0,0,77,1
  24,66,131,50,131,61,124,32,0,224,0,192,0,0,0
  ,98←
  DATA 255,101,1,29,0,26,254,192,0,192,0,32,0,
  0,0,72,62,71,192,55,193,56,62,0,0,0,0,224,0,
  0,0,32,30,39,224,95,225,24,31,0,0,0,0,224,0←
  DATA 128,0,24,14,31,240,39,241,0,15,0,0,0,0,
  192,0,0,0,62,0,63,248,1,255,0,7,0,0,0,0,192,
  0,128,0,31,15,31,255,0,240,0,0,0,0,0←
  DATA 0,128,0,0,0,0,6,0,126,7,248,0,0,0,0,0,0
  ,0,0,0,0,0,12,0,12,1,240,0,0,0,0,0,0,0,0,0,0
  ,0,0,0,0,0,0,0,0,0←
  DATA 0,0,0,0,0,0,0,0,0←
  DATA 294,19,17,0←
  DATA 0,19,0,17,0,4,0,0,0,0,0,0,0,0,0,0,0,0,0
  ,0,0,0,0,0,128,1,248,0,128,1,248,0,0,0,0,0,0,0
  ,0,0,126,7,254,0,126,7←
  DATA 254,0,0,0,0,0,0,0,0,0,0,28,31,255,0,28,31
  ,255,0,0,128,0,0,0,128,0,0,0,63,255,15,0,48,
  255,0,0,192,0,0,0,192,0,0,0,59,255←
  DATA 31,128,36,127,0,0,192,0,0,0,192,0,0,0,1
  23,255,31,220,100,35,0,0,224,0,0,0,224,0,0,0
  ,123,255,15,252,116,3,0,0,224,0,0,0,224,0,0←
  DATA 0,125,255,15,248,114,7,0,0,224,0,0,0,22
  4,0,0,0,123,255,15,248,116,7,0,0,224,0,0,0,2
  24,0,0,0,127,255,15,240,112,15,0,0,224,0,0,0
  ←
  DATA 224,0,0,0,127,255,7,240,120,15,0,0,224,
  0,0,0,224,0,0,0,63,255,3,184,60,71,0,0,192,0
  ,0,0,192,0,0,0,63,255,3,0,60,247,0,0,192←
  DATA 0,0,0,192,0,0,0,28,255,3,0,31,247,0,0,1
  28,0,0,0,128,0,0,0,7,254,1,128,6,126,0,0,0,0
  ,0,0,0,0,0,0,1,248,0,128,1,120←
  DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
  ,0,0,0←
  DATA 86,10,9,0←
  DATA 0,10,0,9,0,4,0,0,0,0,0,0,0,0,0,0,31,0,0
  ,0,0,0,0,0,55,128,0,0,0,0,2,0,125,192,2,0,2,
  0,16,0,111,192,16,0,16←
  DATA 0,2,128,125,64,2,128,2,128,52,0,75,192,
  52,0,52,0,0,0,63,128,0,0,0,0,0,0,31,0,0,0,0,
  0,0,0,0,0,0,0,0,0,0←
  DATA 326,23,19,0←
  DATA 0,23,0,19,0,4,0,0,0,0,0,0,0,0,0,0,0,255
  ,0,212,0,1,0,0,0,0,0,255,0,0,0,48,0,48,0,48,
  0,48,0,0,0,0,3,255,0←
  DATA 0,0,48,0,48,192,48,0,48,0,0,0,0,15,255,
  0,0,0,48,0,48,240,48,0,255,0,0,0,0,31,255,0,
  0,0,0,0,255,248,254,0,97,0,0,0,0←
  DATA 63,255,0,0,0,48,0,48,252,48,0,48,0,0,0,
  0,63,255,0,0,0,48,0,48,252,48,0,48,0,0,0,0,1
  27,255,0,0,0,255,0,214,254,1,0,255,0←
  DATA 0,0,0,127,255,0,0,0,48,0,48,254,48,0,48
  ,0,0,0,0,127,255,0,0,0,48,0,48,254,48,0,48,0
  ,0,0,0,127,255,0,0,0,48,0,255,254,216←
  DATA 0,0,0,0,0,0,127,255,0,0,0,254,0,97,254,
  97,0,48,0,0,0,0,127,255,0,0,0,48,0,48,254,48
  ,0,48,0,0,0,0,63,255,0,0,0,48,0←
  DATA 48,252,48,0,48,0,0,0,0,63,255,0,0,0,255
  ,0,254,252,97,0,97,0,0,0,0,31,255,0,0,0,48,0
  ,48,248,48,0,48,0,0,0,0,15,255,0,0←
  DATA 0,48,0,48,240,48,0,48,0,0,0,0,3,255,0,0
  ,0,255,0,254,192,0,0,255,0,0,0,0,0,255,0,0,0
  ,48,0,48,0,48,0,48,0,0,0,0,0←
  DATA 0,0,0,0,48,0,48,0,48,0,48←
RETURN←
PROCEDURE rec_song←
  RESTORE rec_song←
  DO←
    READ n%,o%←
    EXIT IF n%=0←
    SOUND 1,15,n%,o%,5←
  LOOP←
  SOUND 1,15,1,6,18←
  SOUND 1,0←
  rec_song:←
  DATA 8,4,1,4,10,4,8,4,1,4,1,5←
  DATA 8,4,1,4,10,4,8,4,1,4,1,5←
  DATA 8,4,1,4,10,4,8,4,1,4,5,5,1,5←
  DATA 3,5,5,5,6,5,8,5,10,5,12,5,0,0←
RETURN←
PROCEDURE init_arrays←
  FOR p%=0 TO 4←
    READ xc,yc,yr,xr,c%←
    FOR i=0 TO 2*PI STEP PI/100←
      x%(p%,c%)=INT(SIN(i)*yr+xc)←
      y%(p%,c%)=INT(COS(i)*xr+yc)←
      INC c%←
      IF c%>200←
        c%=0←
      ENDIF←
    NEXT i←
  NEXT p%←
  c%=1←
RETURN←
DATA 155,75,150,75,0←
DATA 155,78,145,74,150←
DATA 120,80,115,65,100←
DATA 120,80,115,65,20←
DATA 130,75,120,65,70←
PROCEDURE gt←
  gt$=MKI$(7)+MKI$(7)←
  gt$=gt$+MKI$(0)←
  gt$=gt$+MKI$(0)←
  gt$=gt$+MKI$(15)←
  FOR i%=1 TO 16←
    READ fg,bg←
    gt$=gt$+MKI$(bg)+MKI$(fg)←
  NEXT i%←
```

```
  FOR i%=0 TO 7
    READ fx%(i%),fy%(i%)
  NEXT i%
  DATA 33026,0,16644,0,8456,0,4368,0,256,0,0,0
  ,0,0,63550,0
  DATA 0,0,0,0,256,0,4368,0,8456,0,16644,0,330
  26,0,0,0
  DATA 1,1,0,0,1,199,0,0,319,1,0,0,319,199,0,0
  
RETURN
PROCEDURE project
  pj$=MKI$(8)+MKI$(7)
  pj$=pj$+MKI$(0)
  pj$=pj$+MKI$(0)
  pj$=pj$+MKI$(4)
  FOR i%=1 TO 16
    READ fg,bg
    pj$=pj$+MKI$(bg)+MKI$(fg)
  NEXT i%
  FOR i%=0 TO 25
    pj$(i%)=pj$
  NEXT i%
  DATA 0,0,0,0,0,0,0,0,1168,0,672,0,448,0,2032
  ,0
  DATA 448,0,672,0,1168,0,0,0,0,0,0,0,0,0,0,0
RETURN
PROCEDURE wait
  SWAP a%,b%
  VOID XBIOS(5,L:a%,L:b%,-1)
  SPUT m_scrn$
  DO
    EXIT IF MOUSEK=1
  LOOP
RETURN
PROCEDURE m_screen
  fp_1%=259
  FOR i%=0 TO 90
    COLOR RANDOM(4)+1
    r=RANDOM(5)+5
    y=160-(SIN(i%)*r)
    p=100-(COS(i%)*r)
    DRAW 160,100 TO y,p
  NEXT i%
  GET 150,90,170,110,ex$
  PRINT AT(2,23);"Level: ";le%
  PRINT AT(31,23);"Score: 00"
  COLOR 16
  DEFLINE 0,3
  RBOX 1,170,319,199
  DEFLINE 0,1
  BOX 50,190,270,195
  GET 259,191,269,194,b$
  DEFFILL 2
  FILL 55,191
  GET 259,191,269,194,a$
  DEFTEXT 2,0,0,4
  TEXT 35,194,"0%"
  TEXT 273,194,"100%"
  DEFTEXT 16
  TEXT 115,187,"Energy Level"
  SGET m_scrn$
RETURN
PROCEDURE ex_1
  RESTORE ex_1
  ex_1%=VARPTR(ex_1%(0))
  FOR j%=0 TO 14
    READ ex_1%(j%)
  NEXT j%
  ex_1:
  DATA &he8,&h103,&h2dc,&h305,&h4d0,&h507,&h61
  7,&h7c7
  DATA &h81f,&h91f,&ha1f,&hb20,&hc4e,&hd09,&hf
  f00
RETURN
PROCEDURE ex_2
  RESTORE ex_2
  ex_2%=VARPTR(ex_2%(0))
  FOR j%=0 TO 14
    READ ex_2%(j%)
  NEXT j%
  ex_2:
  DATA &he8,&h103,&h2dc,&h305,&h4d0,&h507,&h60
  d,&h7c7
  DATA &h81f,&h91f,&ha1f,&hb58,&hc1b,&hd00,&hf
  f00
RETURN
PROCEDURE ls
  RESTORE ls
  la%=VARPTR(ls%(0))
  FOR j%=0 TO 14
    READ ls%(j%)
  NEXT j%
  ls:
  DATA &haa,&h100,&h282,&h300,&h478,&h500,&h60
  4
  DATA &h7e1,&h81f,&h91f,&ha1f,&hbc4,&hc09,&hd
  0f,&hff00
RETURN
PROCEDURE song
  WAVE 0,0
  RESTORE song
  DO
    READ v1%,dur%,oct%
    EXIT IF v1%=0
    SOUND 1,15,v1%,oct%,dur%*5
    SOUND 1,0,0,0,1
  LOOP
  song:
  DATA 3,2,4,3,1,4,3,1,4,3,2,4,3,2,4,10,2,3
  DATA 3,2,4,7,2,4,7,1,4,7,1,4,7,2,4,7,2,4
  DATA 3,2,4,7,2,4,10,2,4,10,1,4,10,1,4,10,2,4
  
  DATA 12,2,4,7,2,4,10,2,4,3,4,4,0,0,0
RETURN
PROCEDURE taps
  RESTORE taps
  WAVE 0,0
  DO
    READ v1%,dur%,oct%
    EXIT IF v1%=0
    SOUND 1,15,v1%,oct%,dur%*4
    SOUND 1,0,0,0,1
  LOOP
  taps:
  DATA 8,3,4,8,1,4,1,12,5,8,4,4,1,1,5,5,12,5,1
  ,3,5
  DATA 5,1,5,8,8,5,5,4,5,1,4,4,8,12,3,8,3,3,1,
  12,4,0,0,0
RETURN
PROCEDURE win_routine
  VOID XBIOS(5,L:a%,L:b%)
  DEFTEXT 2,5,0,32
  TEXT 25,50,"Congratulations!"
  DEFTEXT 7,0,0,4
  TEXT 20,70,"You have successfully defended t
  he Solar System!"
  @rec_song
  @rec_song
RETURN
```

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Readers Feedback

The Editors and Readers of COMPUTE!

If you have any questions, comments, or suggestions you would like to see addressed in this column, write to "Readers' Feedback," COMPUTE!, P.O. Box 5406, Greensboro, NC 27403. Due to the volume of mail we receive, we regret that we cannot provide personal answers to technical questions.

IBM Mouse And Joystick

I have a Leading Edge computer with two disk drives, 640K of memory, a modem, and an RGB monitor. I want to buy a mouse and a joystick for my computer, but I'm not sure what this involves. What are some of the things I need to consider before I buy?

Marion C. Bass

Nothing can enhance the PC's user interface more than a mouse, but there are certain things you should know about before buying a mouse for your PC.

For a mouse to be really useful, you'll need software that fully supports it. Although there is relatively little software available now that allows mouse input, more and more is released every day. And since the mouse is such a powerful computing aid, it won't be long before most software packages support the device.

Microsoft Corporation took an early promouse stand by both manufacturing a mouse itself and supporting the mouse in its software. Now, most Microsoft PC products offer full mouse support with other manufacturers following Microsoft's lead.

Another consideration depends on your computer's hardware. There are two types of PC mice: serial and bus. The serial mouse simply connects to one of your computer's serial ports—the same type of port your modem uses. The bus mouse has a card that goes in an empty slot inside your machine, and the mouse connects to this card. If you've got an extra serial port, then the serial mouse is the easiest to install. If you don't have a free serial port, you'll have to use one of your empty slots for a bus mouse's card.

The last consideration is the software that comes with the mouse itself. Mice require a special mouse driver program which you either specify in your CONFIG .SYS file or load as a TSR (Terminate-and-Stay-Resident) program. (Most mouse packages will have both kinds of drivers.) First, the driver should be Microsoft compatible. Second, the supplied software should allow you to construct menus—or mouse shells—that allow you to use the mouse with programs that don't support the mouse themselves. A mouse shell usually doesn't make a program as easy to use as one that supports the mouse internally, but it still can offer an improvement over a keyboard-driven, nonmouse interface.

Things are simpler with a joystick. First, you'll need a joystick that is intended especially for the PC. In addition, you'll need a game controller. Game controllers usually come with other options—parallel or serial ports—on a multifunction card that goes in a slot inside your PC. Your system may already have one. Check your manual.

Graphics And Music In Amiga Basic

Is there a relatively easy way to load *Deluxe Paint II* pictures into Amiga Basic? Also, can I load *Musicraft* music files into my BASIC programs?

M. J. Phillips

You can load Deluxe Paint II *files into your BASIC programs. In fact, there's even a program on the Version 1.2 Extras disk that comes with every Amiga sold. The program works with just about every video mode available on the Amiga, with the exception of HAM and Extra-Half-Brite modes (these modes require six bitplanes, while Amiga Basic allows only five.)*

We know of no way to load Musicraft *(now sold as* Sonix*) files or any other music files into Amiga Basic. Even if you could load the files, the limitations of BASIC sound would probably make for disappointing music. There might be a way to add music commands to BASIC, but we haven't seen that done yet.*

MS-DOS Emulation For The 64

Can a Commodore 64 emulate MS-DOS? Speed is not important. If it can emulate MS-DOS, could you suggest any manufacturers that might have such an emulator?

Mike Warick

Yes, it's possible for a 64 to emulate an IBM PC, in the same sense that it's possible to bail out Lake Michigan with a teaspoon. Unfortunately (or perhaps fortunately), both are impractical. We understand why readers are so interested in emulators, but when it comes to emulators, the news is rarely good.

Emulation is a complex business, but here's one rule of thumb: The only way to successfully emulate a machine is with a much more powerful machine. An IBM PC would be a better candidate for emulating a 64 than vice versa (even then, the graphics and sound emulation would be embarrassing, at best.) Let's look at two examples.

First, there are emulators that allow Commodore's Amiga to emulate a Commodore 64. The Amiga uses a 32-bit 68000 microprocessor running at about 7 MHz and has vast amounts of memory. When the powerful Amiga emulates the 64's 1 MHz 6502, the results are disappointing. The emulation runs at about one-fourth a 64's normal speed. Much too slow for games and irritatingly sluggish for most other applications.

Another emulator allows an MS-DOS 8086-based computer to emulate CP/M Z80. This emulation results in an 8-MHz 8086 emulating Z80 running at between 1 and 2 MHz. This emulation is fairly successful because the 8086 family of microprocessors is somewhat compatible with the 8080/Z80 family. Even though this emulation is usable for some applications, it is too slow for many others.

Why are emulators so much slower? A computer's microprocessor is an interpreter of machine language. It fetches an instruction, decodes it, and executes it. A software emulation of this procedure must follow the same process of interpreting individual machine language instructions, with the result that the code is interpreted twice—once by the software emulator and once by the host's microprocessor.

Microprocessor emulation is a formidable task, but it is only the first problem to face when designing an emulator. In addition to the microprocessor, a computer system has its own special memory organization, input, and output.

When considering I/O, some emulations are impossible. The 64's video cannot emulate a Hercules Graphic Card or IBM's EGA (Enhanced Graphic Adapter); the hardware just isn't there. With disks, the problem is sufficiently complex to be considered impossible. Imagine trying to

simulate a 20-megabyte hard disk with 125 subdirectories and 600 user files on a Commodore 1571 with 15 boxes of floppies.

When imagining a 64 or 128 emulating a 512K 8086-based MS-DOS computer, a few back-of-the-envelope calculations show a speed degradation of about 1000:1. This means that a program that normally takes 30 seconds to load on an IBM PC would take over eight hours on a 64 emulating an MS-DOS machine. So, although it might be possible *for a 64 or 128 to emulate an MS-DOS machine, by the time the emulation software's been developed and you've run your first program, MS-DOS may no longer be the popular operating system it is today.*

Disks And DOS

I recently purchased *COMPUTE!'s Best of Atari.* It comes with a magazine and disk. However, neither side of the disk would boot. How can I use this disk?

Iva Reed

All COMPUTE! disks for Atari computers are shipped without DOS. To use one of these disks, insert a DOS 2.0 or 2.5 system disk into the drive before you boot your computer. If you boot up in BASIC, you'll see the message READY. To see a directory, go to the DOS menu by typing DOS, then press A, and then press RETURN twice; you'll see a list of all the programs on the disk. Machine language programs can usually be loaded by using the L menu option. Load BASIC programs from within BASIC itself.

COMPUTE! quarterly disks (but not the Best of Atari *disk) have a menu program to make the process a bit easier: Just type RUN"D:MENU" from BASIC for this menu.*

File Check And Improved Input

I would like to make my Applesoft BASIC program check to see if a file exists on a disk. I need this for a database program I am writing. If I have this feature, I can keep people from accidently deleting their work.

I also have a question about INPUT. In your February "Reader's Feedback," you told a Commodore 64 user about two POKEs that put quotation marks into the keyboard buffer before input strings. Can you do this in Applesoft BASIC?

James B. Sullivan

Here's a short example program that checks for an existing file. This program segment cannot be used as a subroutine (the ON ERR statement would destroy the return address.) The program keeps asking for a filename until you give one that doesn't exist.

```
14 5 REM test for an existing fi
     le
27 10 INPUT " enter file name ";
     F$
62 20 EX = 0: ONERR GOTO 60
8A 30 PRINT CHR$ (4)"verify "F$
8E 40 IF EX = 0 THEN PRINT "file
      exists, try again": GOTO
     20
B4 50 PRINT "file does not exist
     "
4A 54 GOTO 70
98 60 EX = 1: POKE 216,0: GOTO 4
     0
99 70 REM put the rest of your p
     rogram here
```

The answer to the second question is no, you cannot POKE quotation marks into the keyboard buffer on the Apple. One way to allow commas and colons in an INPUT string is to use a custom subroutine for input. The program below uses a subroutine at line 890 for input. In addition to allowing commands, the delete key and left cursor key are active, and the Escape key allows you to restart input.

```
88 100 REM  subroutine to allow
       commas and colons in inpu
       t
AF 110 PRINT "test input ";
F2 120 GOSUB 890: PRINT "you ent
       ered "AM$
8F 130 END
84 890 PRINT "?";
0E 900 GET A$: IF A$ = CHR$ (13)
        THEN 970
7D 910 IF A$ < > CHR$ (8) AND A$
       < > CHR$ (127) THEN 940
27 920 IF LEN (AM$) < 2 THEN AM$
       = "": GOTO 940
A9 930 AM$ = LEFT$ (AM$, LEN (AM
       $) - 1): GOTO 960
F4 940 IF A$ = CHR$ (27) THEN FO
       R I = 1 TO LEN (AM$): PRI
       NT CHR$ (8);: NEXT :AM$ =
       "": GOTO 960
9C 950 AM$ = AM$ + A$:AM$ = LEFT
       $ (AM$,38)
36 960 PRINT A$;: GOTO 900
80 970 PRINT : RETURN
```

Sequential File Overwrite

Is it possible to write over a sequential file with another sequential file of the same name? I have a 64.

D. J. Bumbarger

You can overwrite a sequential file using the DOS save-with-replace command. For this file type, you would use the format OPEN2,8,2,"@x:SEQ FILE,S,W", where x *is the drive number (usually 0) and* SEQ FILE *is the filename of the sequential file you wish to replace.*

However, because of a bug in older 1541 and 1571 drives (which may destroy some data on your disk), a better approach is to simply scratch the old file before saving the new one. The short program below uses this technique.

```
10 OPEN15,8,15,"S0:SEQ FILE":C
   LOSE15
20 OPEN2,8,2,"0:SEQ FILE,S,W"
30 PRINT#2,"DATA"
40 CLOSE2
```

Catching Bits In BASIC

I own an Atari 1040ST. I would like to know how to accept data bits through the parallel bus using *GFA BASIC* or assembly language. Are there certain POKEs that I can do for this?

Gregory A. Macey

It's quite easy to do this in GFA BASIC. *Here's a short program that reads a byte from the keyboard and displays it on the screen. Any other input device can be read in the same way; just change the device number as indicated.*

```
device=2
' device = 0 Printer Port
' device = 1 Serial Port (RS-232)
' device = 2 Keyboard
' device = 3 Midi
CLS
DO
  IF INP?(device) THEN
    a=INP(device)
    PRINT CHR$(a);
  ENDIF
LOOP
```

Saving The Screen

Can you provide me with a program that will save the screen to disk on the Commodore 64?

Ron Jentz

When saving a screen to disk, you'll want to save both text and color memory. The following BASIC loader POKEs a machine language program into memory at location 828. After running the program, the screen will be saved anytime you press the Commodore logo key and f1 simultaneously.

```
RG 10 FORI=828TO988:READA:X=X+
      A:POKEI,A:NEXT:IFX<>2132
      0THENPRINT"DATA ERROR.":
      STOP
CE 20 SYS828:END
MX 30 DATA 120,169,78,141,20,3
      ,169,3,141,21
RR 40 DATA 3,169,0,141,219,3,8
      8,96,173,219
DS 50 DATA 3,240,3,76,49,234,1
      65,203,201,4
FF 60 DATA 208,124,173,141,2,2
      01,2,208,117,141
XQ 70 DATA 219,3,165,157,141,2
      20,3,169,0,133
HA 80 DATA 157,162,1,134,205,1
      66,207,208,252,169
KR 90 DATA 1,133,204,173,0,221
      ,73,3,133,252
XP 100 DATA 173,24,208,41,240,
       102,252,106,102,252
BJ 110 DATA 106,133,252,169,0,
       133,251,169,1,162
KQ 120 DATA 8,160,0,32,186,255
       ,173,167,2,162
GS 130 DATA 168,160,2,32,189,2
       55,162,232,24,165
CA 140 DATA 252,105,3,168,169,
       251,32,216,255,162
KM 150 DATA 0,134,251,160,216,
       132,252,173,184,2
GB 160 DATA 162,185,160,2,32,1
       89,255,169,251,162
```

```
QS 170 DATA 232,160,219,32,216
      ,255,169,0,141,219
EF 180 DATA 3,173,220,3,133,15
      7,76,49,234,0,0
```

Before you attempt to save a screen, you must choose filenames for the text and color memory files. The following two-line program will store the filenames in memory for you. Decide on the filenames and substitute them for the default names given in line 10.

```
10 T$="TEXT":S=679:GOSUB20:T$=
   "COLOR":S=696:GOSUB20:END
20 L=LEN(T$):POKE,L:FORI=1TOL:
   POKES+I,ASC(MID$(T$,I,1)):N
   EXT:RETURN
```

When you have a screen that you want to save, press Commodore-f1. If you wish to save another screen, use the program above to change the filenames. Otherwise, you'll get a disk error when the program attempts to overwrite your previously saved screen.

To load the saved screens, use the following program. Change lines 20 and 30 to specify the filenames you used when saving the screen.

```
10 IFA=0THENA=1:POKE53265,PEEK
   (53265)AND239:REM BLANK SCR
   EEN
20 IFA=1THENA=2:LOAD"TEXT",8,1
30 IFA=2THENA=3:LOAD"COLOR",8,
   1
40 POKE53265,PEEK(53265)OR16:R
   EM TURN ON SCREEN
50 GOTO50
60 REM CONTINUE BASIC PROGRAM
```

This last program could be to load a title screen for your own programs. Just change line 50 to a delay loop and continue your program from there.

Redefining The ST Keyboard

I'm an Atari 520ST owner from Sweden and I wish I could print the characters å, ä, and ö. I wonder if there is any way to redefine three keys, for instance [,], and \, so when I press one of these keys, å, ä, and ö will appear.

Johan Melander

It's certainly possible to redefine the keyboard map. Within the ST ROMs is an XBIOS function called Keytbl(), which resets the pointers to the translation tables used to convert keyscan codes into ASCII character codes. To use it, first set up three arrays of 128 characters, one array each for normal characters, Shift characters, and Caps Lock characters. Next, call Keytbl(), passing the addresses of the three arrays. The keys will be redefined from that point forward.

One small problem is that when the keyboard redefinition program ends, the conversion table is normally erased, which locks up the keyboard or causes it to print strange characters when you type. The solution is the Ptermres() function, which tells the operating system that the current program is to "terminate but stay resident." The program ends, but it's not erased from memory.

The keyscan codes for the keys labeled [,], and \ are 91, 93, and 92 respectively. The ST's character codes for å, ä, and ö are 143, 142, and 153 for the uppercase versions of these characters, and 134, 132, and 148 for the lowercase versions.

You can use virtually any language except ST BASIC to write the program that calls Keytbl() and Ptermres(). Here's an example written in C:

```
#include <stdio.h>
#include <osbind.h>

static char nk[3][128];
struct table{
   char *norm;
   char *shift;
   char *caplock;
} *keys;

main(){
int i,j;
char *(m[3]);
long mem;

   appl_init();
   keys = (struct table *) Keytbl(-1L,
      -1L,-1L);
   m[0]=keys->norm;
   m[1]=keys->shift;
   m[2]=keys->caplock;
   for(i=0; i<3; i++)
      for(j=0; j<128; j++)
         nk[i][j]= *(m[i]+j);
   nk[0][26] = 134;
   nk[0][27] = 132;
   nk[0][43] = 148;
   nk[1][26] = nk[2][26] = 143;
   nk[1][27] = nk[2][27] = 142;
   nk[1][43] = nk[2][43] = 153;
   Keytbl(nk[0], nk[1], nk[2]);
   appl_exit();
   Ptermres(12000L,0);
}
```

The 12,000 bytes reserved for the program and variables in the last line should be sufficient. If your version of C allows you to determine the actual memory used, you could calculate the size of the program and its variables and substitute that value in the Ptermres() function. Once the keys are redefined, they'll stay that way for word processors, languages, games, and so on, until you reset or reboot your ST.

SpeedScript Utilities

Does COMPUTE! publish a disk with nothing but *SpeedScript*-related programs on it? There are many of us that use *SpeedScript* and would love to have such a disk.

John Reaves

For Atari, Apple, and Commodore users there's a handy way to get some of the best SpeedScript *utilities on one disk, along with lots of other great programs.*

COMPUTE!'s Best of Apple, Best of COMPUTE! & GAZETTE for Commodore 64 & 128, and COMPUTE!'s Best of Apple each come bundled with a disk which includes the latest version of SpeedScript *and some first-rate* SpeedScript *utilities. These issues may be available at your local newsstand, a bookstore, or from a computer dealer.*

In The Fast Lane

In the August 1987 "Reader's Feedback" column, a reader wanted to make a Commodore 64 run faster. I sometimes want to make my AT&T PC-6300 run slower. I have several games that were written for the standard-speed IBM PC that run too fast on my computer. I would like to be able to select a slower speed for the games and a faster one for other software. How do I do this?

Irvin E. Poston

The IBM PC uses an Intel 8088 microprocessor running at 4.77 MHz. Your AT&T PC-6300 uses an Intel 8086 microprocessor running at 8 MHz. The 8086 is a true 16-bit processor, and in your case it is running at almost twice the speed of the IBM's, so your games will definitely play faster. Unfortunately, there's no way to switch your processor to a slower speed. Some other clones have a hardware or software switch to select the original 4.77 MHz speed, but AT&T intended their PC-6300 to be used as a business machine, and in that environment, "the more speed, the better" is usually the rule. ©

Creativity With Constraints

As someone who spends most of his professional life in creative pursuits, I'm used to using computers as support tools in the creative process. Graphic design tools, idea processors, text layout programs and music programs are used in my office almost every day.

Because I'm so familiar with these tools and their value in supporting my creative process, I'm occasionally puzzled when one of my friends tells me that he or she feels intimidated by a creativity tool that starts with a blank screen. Whether the blank screen is associated with a word processor, graphics program, or music composition tool, many people would rather have tools that guide them in their creative process.

I remember that when the Macintosh first came out, it was shipped with both a word processor and a graphics program. While almost all Mac users found the word processor to be easy to use, many failed to master the graphics program. The sample graphics supplied by Apple were of such high quality that most users had a hard time even coming close to this level of graphic quality so gave up trying. Many Mac users were frustrated because they wanted to incorporate graphics into their documents, but felt they lacked the patience or experience needed to create their own drawings.

Within a few months, a brisk market in disk-based clip art rose to meet the needs of those of us who lacked the skill to draw in any medium, let alone the computer screen.

Clip Art Creativity

The availablity of clip art allowed a wide range of creative expression by anyone adept at using the computer without requiring a high level of artistic skill. Pictures could be copied and pasted into place to create new images. While the user was constrained in the breadth of available pictures from which to start, the myriad possible arrangements and combinations of pictures allowed a tremendous freedom of creative expression.

This ability to support creativity in the absence of highly refined skills is a major feature of computers. It not only supports the needs of a large market, but also encourages those who want to develop their skills to the point where products like clip art aren't needed so much. It turns a major step (from zero skill to artiste) into a gentle ramp, providing some freedom of expression while skills are being developed and refined.

Music For The Rest Of Us

I was reminded of this recently when I visited my local computer store and noticed that Brøderbund's product, *Jam Session*, was in the hands of most people standing by the cash register. *Jam Session* is a Mac-based music program that allows the user to play along with the computer using the keyboard to accompany background passages played by the computer itself. Because the computer knows what key it is in, and where the music is going, the user's keys only play tones appropriate for that portion of the music. People who would love to create their own music but who lack proficiency with an instrument have found that tools like *Jam Session* open the door to their own creative expression.

My first exposure to a program like this came a few years back with *Dancin' Feats* on the Atari 800. I have no idea if the folks who did that product are still in business, but it was one of the most wonderful Atari programs I've ever seen. *Dancin' Feats* was set up to allow jamming in the blues, jazz, and swing styles with user control over tempo and other stylistic variables. The performer played with the joystick, which played notes from a scale appropriate to the chord progression of the piece.

About two years ago at a multimedia show, I had a member of the

A background scene for country music jamming with Jam Session.

audience play with *Dancin' Feats* while I filled in from a separate synthesizer. In the beginning, my helper was timid and just worked the joystick between two or three notes. Within a minute she was wailing away at the blues and the audience was clapping in rhythm to the music. She could have gone on all afternoon, but we stopped the piece after a few minutes.

This experience is not uncommon. People who are too timid to play music are skeptical when they start working with a computer program that does the hard part for them. But, once started, the music hiding in the player starts to emerge through the joystick, and the result is invigorating for all concerned.

Jam Session

Jam Session has the same effect on people as *Dancin' Feats*. A "backup band" (shown in animation on the display screen) establishes the progression for the jamming in almost any style you want. For example, you can jam with anything from a walking bass or country music to Chopin or heavy metal. Each style of music has its own display screen. Once the background music gets started, most people start playing with a few of the keys to see what they do. Since dissonance is blocked, all notes sound good. After a while, the user is playing away at complex passages that sound exceptionally good.

Music Minus 1

Because I don't play with a group, I've been using *Jam Session* to work on my ensemble skills. For example, I set up a walking bass progression from which I can then play my own melodies on my piano. This ability to jam along with a tireless backup group is wonderful.

It also shows that products like this can support the user from the beginning of musical interest to the development of independent performance skills on traditional instruments. Again, the giant step is replaced by a gentle slope.

But Is It Creative?

Some purists might argue that clip art disks and music programs of the sort I've described are just training wheels that sugar coat the creative process and act to inhibit the true development of the skills needed to be truly creative.

My perspective is a bit more gentle than that. For one thing, I don't think that creativity needs to have a rigid definition. Inventions that build on existing ideas can be as valuable as those that start from nothing. For every major idea like the laser or transistor, there have been thousands of wonderful inventions based on improvements in existing technologies. I'm a firm believer in the idea that creative activities should be fun.

Yes, skills need to be developed, and that can be a painful process. But training wheels can ease the pain, keeping the creative spirit alive while basic skills are developed.

Dr. Thornburg welcomes letters from readers and can be reached at P.O. Box 1317, Los Altos, CA 94023. ©

The National Gallery Of Art In Your Computer

Dr. Gerri Sinclair, professor of education at Simon Fraser University in Vancouver, British Columbia, is one of a large group of pioneers in Apple's new *HyperCard* environment. Dr. Sinclair and her graduate students work at Simon Fraser's EXCITE (Exemplary Center for Interactive Technologies) on three Macintosh computers: a Plus, an SE, and a Mac II. Their goal is to link the 1,645 color slides of works of art on the National Gallery of Art videodisc with a stack of *HyperCard* cards stored on Macintoshes.

Using Dr. Sinclair's stackware, an art history student at the university can call up a particular work of art just by typing *Find* followed by the artist's name, such as *Find Picasso* or *Find Leonardo*. On the *HyperCard* card, there is information concerning the painting, drawing, or sculpture, including the name of the artist, the name of the work, the date the work was completed, the medium, the period in art history to which the work belongs, and so on. Each card is linked with a representative slide on the videodisc. As you browse through the stack of cards, the card itself appears on a Mac screen and each work of art appears—in full color—on a monitor.

A Mini-Tour

The cards students browse through also have other unusual characteristics.

Each card in the stack has a number of buttons which link it to other cards and other information. For example, if a student clicks on a *video clip* button on the Mac screen, the student is taken on a mini art-history tour of the National Gallery that features the work of art he or she is studying. According to Dr. Sinclair, there are 25 full-motion video sequences in the stack excerpted from a 27-minute Tour of the National Gallery which appears at the end of the videodisc.

After taking a brief tour of the gallery, if a student presses the Interactive Comment button, a notepad appears on the screen. The student's remarks, once entered, become annotations to the information linked to the particular work of art. Also, if the student feels inspired by the work of art, he or she may press the *sketchpad* button to call up a sketchpad for drawing. Or the student may enter keywords which will link the work of art to other works in a report he or she is compiling. To retrieve the National Gallery's collection of Cubist works, for example, a student would type *Find Cubism*. All the cards representing Cubist works would flash on one screen, and the works themselves would flash on another. At the same time, an instant report (listing all cards) would be compiled by *HyperCard*. Last, the student could press the *biography* button to automatically retrieve the biography of the artist whose work is onscreen. (The search would be conducted through *Grolier's Online Encyclopedia*.)

Toward A Multimedia Database

Dr. Sinclair and her assistants have put in about 200 of the National Gallery slides into the *HyperCard* stack and have created a significant template for a multimedia database. She is excited about turning the template over to students and art history professors. "I am convinced that putting together a database is one of the most important activities we should offer students in a classroom today," she says. "Through the act of compiling a database, one not only learns research skills and collects a great deal of information on a given field of study, but, perhaps more importantly, one learns how to manage information."

The *Grolier Encyclopedia* is currently maintained online at Simon Fraser University, but this makes looking up information in the encyclopedia relatively slow compared to the quick access to the cards on the Mac hard drive and the video images on the videodisc drives. In the future, Dr. Sinclair hopes the encyclopedia will come on a compact disc in a Hitachi or Apple CD-ROM drive connected to her multimedia database. Dr. Sinclair says: "There is a public domain stack I am using that enables you to make any word in a piece of text 'hot' or 'linkable' to any place in a stack or any other stack. With the CD-ROM in place, when you hit the *biography* button on the Picasso card, you will be taken to the encyclopedia articles on Picasso on the CD-ROM. And if you find more topics you'd like to pursue while reading the Picasso article (let's say you want to find out more about the Spanish Civil War after reading about Picasso's "Guernica"), then you just click on a particular word or phrase and you will go directly to another article on the CD-ROM which contains the information you are interested in."

Dr. Sinclair feels that her *HyperCard* environment will transform the way students research a topic or look up information. *HyperCard* has the ability to build an audit trail that keeps track of where you have gone in the associative web of information in which you are browsing. That way students never get lost or off-track. In fact, getting off-track becomes an integral part of the learning process.

For more information, contact: Dr. Gerri Sinclair, Faculty of Education, Simon Fraser University, Burnaby, B.C. V5A 1S6, Canada.

Microscope

Sheldon Leemon

The Hazards Of *HyperCard*

Macintosh owners have always been unusually devoted to their computers, but lately they've become little more than zombies glued in front of those platinum plastic cases. The reason is a program called *HyperCard*, which now comes bundled with the Macintosh system. There are a number of reasons that *Hypercard* is having such a big impact. First, the program is the brainchild of Bill Atkinson, a mythic figure in the Mac community. Actually, Bill ranks somewhat higher than a mythic figure. After all, Prometheus just brought fire to mankind, but Bill has produced both *MacPaint* AND *HyperCard*. Secondly, *HyperCard* is the software incarnation of a new computer buzzword, *hypertext*.

In the fast-changing world of the computer industry, there's constant speculation on what's going to happen in the future (like six months from now). Buzzwords like *desktop video* and *hypertext* serve as mantras for the meditations of industry prognosticators. Developments such as *HyperCard* give industry analysts the chance to make predictions like "The next significant program for the Mac will be a *HyperCard* application."

I agree with that prediction, but not because I'm convinced that *HyperCard* is functionally better than all other methods of computing. The reason I think that most of the significant new Mac software will be *HyperCard*-based is because Mac users won't be able to tear themselves away from it long enough to create anything else. Many people have described *HyperCard* as being extremely interactive. Where a normal manual might tell you "push that button and this happens," with the *HyperCard* manual, you actually push that button, and the results happen instantly, before your eyes. In a society so geared to instant gratification, characterizing this as "interactive" may be putting it a bit mildly. *HyperCard* is interactive the way that potato chips or pistachios are interactive. You may be in charge when you eat the first one, but by about the fifth or sixth one, that old hand is moving into the bag all by itself.

Leftover Whale Blubber

Another feature of *HyperCard* that's widely touted is the way in which it allows the user to access information in any order in which he chooses, not according to how some author has arranged it. You might be reading an article on Eskimo life, click on the section about diet, and find yourself reading a cookbook entry entitled "Twelve New Ways to Use Leftover Whale Blubber." While it's nice to be able to pursue side trails, novices may soon lose the main path entirely. I mean, can you imagine what a hypertext magazine might be like? One article and a hundred-fifty-three sidebars!

And do we really want to give hypertext to young school children, who already have plenty of distractions? After all, if a child is studying a lesson in ancient history, we really don't want him to click on the section where the Chinese invent gunpowder and end up in a chemistry lesson on how to create fireworks in the basement. Such a student might be better served by a *HypoCard* application, one in which every distraction which he chooses to avoid studying leads him right back to the subject he'll be tested on.

The Harder Stuff

While interacting with your computer may not be bad for you in and of itself, it can lead to the harder stuff—like interacting with your TV. We've already seen a primitive form of this, first with simple VCR games, and now with the new Captain Power series of toys, tapes, and TV shows. Captain Power uses interactive computer technology to allow children to shoot at characters on TV, and vice versa, with a toy gun registering hits on both sides. While I'm usually in favor of all new computer technology, Mattel has finally found a way to exceed even my limits of tolerance. The "P word" is a definite no-no at my house.

And things could get even worse. What if these crude beginnings lead to full-fledged HyperTube? Imagine you're watching *Gilligan's Island* reruns, and you decide you want to know more about the Professor. You move the mouse pointer to his image, click the button, and instantly, you're watching a spin-off series in which he plays the lead role. Or maybe clicking on his picture gives you a comparative history of similar roles, like Fred MacMurray as the Absent-Minded Professor, or Jerry Lewis as the Nutty Professor. Imagine, if you will, the havoc that might be wrought by interactive soap operas. Some viewers might never be heard from again. The Couch Potato would transform into a HyperTuber.

Who knows where all of this might lead? So far, *HyperCard* has been a rich man's toy, available only to Mac owners who can afford lots of memory and possibly a hard disk. But if this trend continues, we may soon see things like interactive household appliances. Imagine a toaster that selects bread darkness based on your mood or how well you slept the night before. We should all remember that *HyperCard* and *hypertext* both start with the word *hype*. And when it comes to hype, my advice is "just say no."

ST Outlook

Philip I. Nelson

Printing ST Pictures On A Laser Printer

With the current explosion of interest in desktop publishing, more and more laser printers are appearing in offices and even a few homes. Unlike a dot-matrix printer, which forms images by hitting an inked ribbon with wire pins, a laser printer uses the same graphics engine as a photocopier, offering vastly improved print quality. Laser printers are so good, in fact, that many professional publishers use them in place of conventional, and much more expensive, phototypesetting equipment.

This month's program shows how you can combine the ST's superb graphics capabilities with the high resolution of a laser printer. It works with the Apple LaserWriter, one of the most popular laser printers, and it lets you make a full-page printout of any monochrome *DEGAS* picture. Although it's written in *GFA BASIC*, the program is so simple that you shouldn't have much difficulty converting it to the language of your choice.

When you run the program, it asks for the name of the file you wish to convert. This must be a *DEGAS*-format monochrome (.PI3) picture file. Then the program creates a *PostScript* output file named POSTSCPT.OUT (*PostScript* is described below). The output file is hefty—over 96,000 bytes—so be sure that your disk has enough room before you begin, and be prepared to wait a few minutes if you're writing to a floppy disk. After POSTSCPT.OUT is created, you can rename it with any valid GEMDOS name.

The Laser Connection

To print the *PostScript* file, you need to send it to the laser printer. Communicating with a LaserWriter is straightforward, since it's a serial device, just like a modem. And the *PostScript* file is plain ASCII text, so you can send it to the printer with any telecommunications program that has upload capability.

Few people have a laser printer at home, but there are small-scale publishers popping out of the bushes all over the Western world, many of whom will print anything you like on a per-page basis. You supply the *PostScript* file and a small fee, and they provide the printout. Or, you might be lucky enough to know someone with a laser printer who doesn't mind making an occasional printout for a friend.

If you can't transmit the *PostScript* output file directly to a printer, you may need to copy the file to a non-ST disk. Most Apple LaserWriters are connected to Apple Macintosh or IBM PC/compatible computers. In the latter case, you might be able to take advantage of the fact that an ST disk drive can read and write to 3½-inch disks that are formatted on a PC-compatible system. Another option is to use one of the new PC-compatible 5¼-inch drives that plugs directly into the ST.

Landscape Or Portrait Mode

As listed, the program prints the picture in landscape mode, or sideways on the paper, occupying all but a thin margin on all four sides. If you change 0 to 1 in the first nonremark line, the program prints in portrait, or normal, mode, placing the image upright and centered on the page. Landscape mode gives you a much larger printout, although it slightly alters the picture's proportions to fit it neatly on the page. (The ST's screen proportions don't quite match those of an 8½ × 11 paper.)

Speaking In *PostScript*

The program takes advantage of the fact that the LaserWriter speaks *PostScript*, a language built for *page description*, which is a fancy term for the business of putting words and images on paper. *PostScript* has much in common with other computer languages: It allows you to create loops, execute subprocedures, perform math, manipulate data structures like strings and arrays, and so on. But while most computer languages are general-purpose in nature, *PostScript* has a single, albeit complex, purpose: telling a high-resolution output device how to print a document. Thus, it has a wealth of special graphics- and typography-related functions in addition to the generic features that every language needs.

PostScript is a stack-oriented language similar to Forth or the languages used by some high-powered scientific calculators. If you're not familiar with Forth, the simplest way to describe its syntax is "backward." To explain, compare the BASIC statement PRINT 2 + 2 with the English statement "Put the hat on your head." In both cases the verb (or keyword, in BASIC) is followed by the objects (arguments) that it acts upon.

Backward Is Faster

PostScript, like Forth, reverses the familiar verb-object order of English. First come the objects, followed by the *PostScript operator*, or keyword, that tells what to do with them. Instead of "add 2 plus 2" (English) or PRINT 2 + 2 (BASIC), you have "2 2 add" *(PostScript)*. In each case the result is 4, although the last form may take some getting used to.

The reward for tolerating this peculiar syntax is speed. Stack-oriented languages are easy for a computer to interpret, and hence they're very fast. Speed is essential for a printer, which most of us treat as a magical black box rather than a computer-based device that has to read and interpret a program just to

print a document.

The *PostScript* Program

Although the output file is large, the *PostScript* program itself is very brief. Here's a view of the entire program:

```
/Bitmap
<...> def
20 600 translate
640 400 scale
640 400 1 [640 0 0 -400 0 0] {Bitmap} image
showpage
```

The first two program lines define a string named Bitmap. In place of the three dots, the real program would contain 32,000 hexadecimal numbers that represent the 32,000 picture bytes in a *DEGAS* file. This immense string gives the program the raw data that it needs to recreate the picture.

The third line tells the printer to move to position (20, 600) before forming an image, while the fourth tells it to scale the image up, using the same 640 × 400 proportions as the original ST screen.

The fifth program line actually creates the image. The first three numbers indicate that our image is a 640 × 400 bitmap in which each bit represents one dot. The array in square brackets makes up a transform matrix that maps our image into the *PostScript* coordinate system. Inside the curly braces is the name of the string that holds our bitmap data. The line ends with the *image* operator that acts upon all the preceding information.

The last line of the program consists of a *showpage* operator, which makes the printer print the page that the preceding statements describe. This version of the program prints in portrait mode. To switch to landscape mode, we start printing at the normal origin (position (0, 0), the lower-left corner of the upright page) and then rotate the image 90 degrees and scale it to fill most of the page.

If this example whets your interest in *PostScript*, try to get your hands on the *PostScript Language Tutorial and Cookbook*, written by Adobe Systems (the inventors of *PostScript*) and published by Addison-Wesley. It's chock-full of examples and does a good job of teaching a computer language at the elementary level without condescension. If you get serious about *PostScript*, the same publisher offers *The PostScript Language Reference Manual*, a comprehensive reference to the language.

PostScript Printer

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
' POSTPRNT.BAS
' Convert DEGAS monochrome (.PI3) picture file
 to
' PostScript format for output to a laser prin
ter.
' To switch from landscape (sideways) printing
 mode
' to portrait (upright) mode, change the 0 to
1
' in the next line.
prtmode=0
'
INPUT "Enter DEGAS monochrome (.PI3) filename
: ",filename$
IF LEN(filename$)=0 OR (RIGHT$(filename$,4)<>"
.PI3" AND RIGHT$(filename$,4)<>".pi3") THEN
  PRINT "Invalid filename (not .PI3 file)."
  END
ENDIF
CLOSE
OPEN "I",#1,filename$
PRINT "Reading ";filename$
' Discard DEGAS file header.
junk$=INPUT$(34,#1)
' Read DEGAS picture data from disk.
picture$=INPUT$(32000,#1)
CLOSE
PRINT "Ready to write PostScript file."
PRINT "Press any key when ready..."
WHILE INKEY$=""
WEND
'
' Write PostScript file to disk.
OPEN "O",#2,"a:\POSTSCPT.OUT"
PRINT
PRINT "Creating Postscript file..."
PRINT #2,"/Bitmap";CHR$(13);CHR$(10);"<";
FOR bytecount=1 TO 32001
  temp=ASC(MID$(picture$,bytecount,1)+CHR$(0))
  
  temp$=HEX$(255-temp)+CHR$(32)
  IF LEN(temp$)<3 THEN
    temp$="0"+temp$
  ENDIF
  PRINT #2,temp$;
NEXT bytecount
PRINT #2,"> def"
'
' Default is landscape mode.
IF prtmode=1 THEN
  RESTORE portrait
ENDIF
'
FOR j=1 TO 2
  READ x$
  PRINT #2,x$
NEXT j
'
RESTORE both
FOR j=1 TO 2
  READ x$
  PRINT #2,x$
NEXT j
CLOSE
'
CLS
PRINT "Conversion finished!"
PRINT "PostScript file is named POSTSCPT.OUT"
'
landscape:
DATA "90 rotate"
DATA "800 600 scale"
'
portrait:
DATA "20 600 translate"
DATA "640 400 scale"
'
both:
DATA "640 400 1 [640 0 0 -400 0 0] {Bitmap} im
age"
DATA "showpage"
```

AmigaView

Sheldon Leemon

Another Month, Another Show

It seems like no sooner do I get home from one show than I'm back on the road for another. This time it was the second AmiExpo, which was held in January in Los Angeles. Despite miserable weather and a couple of competing shows, the turnout was large and the crowds enthusiastic. Though this show was held only a few weeks after the World of Commodore in Toronto, which itself was only a few weeks after Comdex, there was still a lot to see that was new and exciting.

It was interesting, for example, that a number of software houses specializing in Atari ST software are branching into the Amiga market as well. AmiExpo saw the debut of the Amiga versions of Soft Logik's *Publishing Partner* and Dr. T's music software. Abacus was also at the show with new books and programs for the Amiga, including *DataTrieve*, *TextPro*, and *AssemPro*.

Amiga Painting

As usual, graphics programs generated much of the excitement. MicroIllusions' *Photon Paint*, a powerful 4096-color paint program, is almost ready to ship, but already it has some strong competition. NewTek announced that it will soon release *Digi-Paint II*, which has such new features as full overscan support, superbitmap pictures that are larger than the screen size, rubber sheeting for stretching brushes and wrapping them around objects, improved HAM pictures and text fonts, and dithering for more apparent colors. Unlike the first version, it operates in any mode. It even allows you to digitize pictures from within the program.

As if these weren't enough, Digital Creation's *D'Buddy* program has been picked up by Electronic Arts. It will be released as *Deluxe Photo Lab*. With this program, you can create and edit pictures of up to 1,000 × 1,000 pixels in any drawing mode, including HAM and Extra Half-Brite mode. It will even allow you to create multiple screens at the same time, each with a different resolution. I've also heard that Jim Kent of Dancing Flame was working on *Zoetrope*, which allows you to edit several animation frames simultaneously.

Videoware

There was plenty of new video hardware on hand. There were two new Genlock interfaces, the long-awaited SuperGen from Digital Creations and Progressive Peripherals' ProGen, both of which allow you to transfer full-screen Amiga graphics cleanly to video or to overlay those graphics over a live video image. Progressive Peripherals was also showing its Frame Grabber, a $500 fast color digitizer that produces remarkable results. NewTek had a prototype Video Toaster, a board that allows you to turn your 2000 into a sophisticated special-effects generator.

Lots of new video software to go with the hardware was also there. InnoVision Technology was showing *Video Effects 3D*, a 3-D titling and logo animation program. This program not only provides standard 2-D transitions between screens, including fades, wipes, and dissolves, but also offers a new class of effects such as compress, zoom, tumble, turn, and spin—all with true 3-D perspective. Other effects include moving shadow cast and 3-D solid logo extrusion from flat text. NewTek announced that its video production package, *Digi-FX*, would also include many of the same 3-D effects.

Meanwhile, in the area of 3-D animation, Byte by Byte was showing *Animate 3D*, the add-on that turns *Sculpt 3D* into a full-fledged professional 3-D animation studio. Those who have seen the 3-D animations created with this program know that they rival the graphics created with half-million-dollar systems. Meanwhile, at the Aegis booth, Allan Hastings was showing *Videoscape 3D 2.0*, which adds HAM ray-tracing, transparent objects, and more.

The Brains Of The Machine

Not all the news at the show was related to new products, however. For example, Richard McIntyre, Commodore's VP of Marketing and Sales, stated that we'd probably see not one, but two Workbench revisions this year.

Workbench 1.3 (which is nearly completed) adds enhanced printer support, making it easier for developers of desktop publishing programs to provide fast and accurate output. A Fast File System has been added to speed up hard disk access times. Provisions have been made to interface the 68881 floating-point coprocessor as a peripheral device. This means that the '881 chip on boards will automatically be recognized by the system at start-up time, and it makes it more likely that software manufacturers will support the floating-point chip. Finally, the version 1.3 Workbench program is said to be capable of doing things that previously required CLI.

The version 1.3 Kickstart adds provisions for booting Workbench from a hard disk or network. Amiga owners who have Kickstart in ROM will only need new chips if they want to boot from hard disk.

Some members of the original Amiga team have been brought back for version 1.4. It will support overscan and allow both higher resolution monitors and graphics networking. And they may throw in a few surprises, too. C

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The Beginner's Page

C. Regena

Using Disks

I started programming on microcomputers about eight years ago, when programs were most often saved on cassette tape. Cassettes were a reliable, easy, and inexpensive means of program storage for home computers, and disk drives were fragile and expensive. In fact, I still use cassettes for program storage on some of my computers. However, nearly all computers now are sold with at least one disk drive as standard hardware. This month I'm going to describe how beginners can use disk drives and what some of the basic disk commands are.

The most common use for disks is to save programs. Saving and retrieving programs by disk is much faster than using cassettes, so most all users and programmers eventually move to a disk system. Here's how to get started using disks.

There are two sizes of floppy disks for personal computers: 5¼-inch and 3½-inch. In general, a program saved to disk on a particular brand of computer cannot be loaded into a different brand of computer. For example, a program for the Apple II cannot be loaded and run on a Commodore 64.

First Step

A blank disk can be used for any brand of computer and disk drive, as long as the size of the disk and drive are compatible. To use a blank disk, you must first prepare it. This process is called *formatting* or *initializing* the disk. You might think of it as preparing the disk for a recording format acceptable to your computer. The formatting process usually checks for disk errors then sets up a directory so the disk can accept files (programs). I like to prepare several disks before I start programming so that they'll be ready to go when I need them.

On MS-DOS computers, the command to initialize a disk is FORMAT, and there are several options (consult your DOS manual). In a two-drive system, you may specify each drive, such as A: for the first disk drive or B: for the second disk drive. You may specify /S in the FORMAT command to copy the operating system files to the new disk (making it a "bootable" disk). You may specify /V to use a volume label, or a name for that particular disk. These commands are DOS commands and are used when you see the DOS prompt (A>). Some examples are FORMAT, FORMAT A:/S, FORMAT A:/S/V.

If you use the /V option, the disk will first be formatted; then you will be asked to supply a volume label. You type in a name for the disk, such as GAMES, and then press the Enter key.

To prepare a disk on mouse-based computers (Macintosh, Amiga, Atari ST), first click on the disk's icon with the mouse. Next, move the mouse pointer to the drop-down menu for disk operations and then select FORMAT or INITIALIZE.

To format a disk on the Atari eight-bit computers, type DOS to return to the DOS menu, then select the format disk option.

On the Commodore 64, you must open a command channel to send commands to the disk drive. Start by entering the command OPEN 15,8,15. This tells the computer to open channel 15 to use the disk drive, which is device number 8. The last 15 indicates you will send commands rather than data. Now type PRINT#15 to send commands to the disk. To format the disk, use the NEW command: PRINT#15,"NEW:*name,id*" where *name* is the name you wish to give the disk, and *id* is a two-character identification. For example, PRINT #15,"NEW:GAMES,88". When the format is complete, close channel 15 by entering CLOSE 15.

The procedure for formatting a disk on the Apple depends on which DOS you are using. For DOS 3.3, load your favorite Hello program into memory, place a blank disk in the drive, and type "INIT HELLO". When using ProDOS, use the system utilities to format the disk. After formatting, copy the files PRODOS and BASIC.SYSTEM to it if you want the disk to be a boot disk.

Notice that when you use a formatting command, the disk drive light goes on and the disk is busy for a few moments. Keep in mind that when you format a disk, all previous data on the disk will be lost. You can format a used disk—if you are sure you no longer need any of the files on it. After formatting, it will be just like a new disk.

Saving And Loading

After you have formatted a disk, it is ready for you to store programs on it. When you've finished writing a program, you'll want to save it to disk. Most computers use the SAVE command with the title of the program (for example, SAVE TESTPROG or SAVE GAME1).

The eight-bit Atari computers require quotation marks and the drive number followed by the program name. For example, SAVE "D:TEST saves the program as TEST to drive 1 (D: is the same as D1:). SAVE "D2:TEST saves the program to drive 2.

The Commodore 64 and 128 require quotation marks around the title, followed by a comma and the device number (8 for drive 1, 9 for drive 2). SAVE "TEST",8 saves the program to the first drive, while SAVE "TEST",9 saves the program to the second drive.

The mouse-based computers with windows usually have a SAVE

option listed in one of the drop-down menus. Select the SAVE option with the mouse pointer; then type in a program name (filename).

On the Amiga, DF0: and DF1: are used to refer to the internal and external disk drives. While in Amiga Basic, use SAVE "DF0: TEST" to save to the internal drive, and SAVE "DF1:TEST" to save to the external drive.

When you save a program, be sure it has a unique name. If there is already a program by that name on the disk, the new program will replace the old one. You may wish to save different versions of a program with numbered titles, such as TEST1, TEST2, TEST3, and so on.

After you have saved programs on your disk, you can later retrieve them, usually with a LOAD command followed by the title (for example, LOAD TEST1).

On the Commodore 64, you must use quotation marks and the device number, as in LOAD "TEST1",8 and LOAD "TEST2",9.

Eight-bit Atari computers require a beginning quotation mark (but the quote may or may not be closed) and the drive number, as in LOAD "D: TEST1 and LOAD "D2: TEST2.

In addition to the normal LOAD command, Apple users can load and run a BASIC program with the command RUN TEST1. Apple ProDOS users can load and run a program by preceding the program name with a hyphen, as in -TEST1.

On the mouse-based computers, go to the drop-down menus and select LOAD or OPEN. The available files will then be listed for you to select again, or you may type in the name of the program you want.

Again, DF0: and DF1: are used to refer to the internal and external drives on the Amiga. From Amiga Basic, LOAD "DF0:TEST1" loads from the internal drive and LOAD "DF1:TEST2" loads from the external drive.

Getting A Directory

As a disk user, you'll always want to be able to find out what files are contained on your disks. This can be done by typing a command to get a disk directory. On MS-DOS computers, if you are in DOS, use the command DIR for directory. If you are in BASIC, you can use the command FILES (your program will not be lost while you check the disk contents).

On the Commodore 64, type LOAD "$",8. When the computer comes back with READY, type LIST. The directory is then listed. Note that any program you are working on will be lost, so use this command with care.

On the Amiga, use DIR DF0: to get a directory of the disk in the internal disk drive (use DF1: for the external drive).

On an eight-bit Atari, type DOS to return to the DOS menu, then select the show directory option.

On the Atari ST, from the COMMAND window of ST BASIC, type DIR, and the disk directory will be printed in the COMMAND window.

On Apple II computers, use the CATALOG command to get a list of the files on the disk. C

INSIGHT: Atari

Bill Wilkinson

That Month Again

Amazing Product Rallies Information Lunatics

By now, most of you have heard that Atari has announced that it is, indeed, going to sell a CD-ROM. The advantage of a CD-ROM is that a single optical disk can hold hundreds of megabytes of information. The disadvantage is that CD-ROMs are exactly what the second part of their acronyms suggest: Read Only Memory. The computer can not write to such a device.

But the computer industry is working very hard to overcome this restriction. Welcome to the world of the WORM—Write Once Read Many. Special optical disk drives have already been introduced that use lasers to write information. The data thus written cannot be changed, but it can effectively be "erased" and a later, updated copy can be written to another part of the disk. A typical home user could probably use a single such optical disk for a couple of years before needing to copy the most recent versions of all files to a new, clean disk. But don't hold your breath waiting to buy one—at least not unless you'd rather buy one than, say, a new sports car. However . . . .

Fantastic Option OverLooked!

I know it may be hard to believe, but the designers of the original eight-bit Atari computers, way back in 1979, included a close relative of the WORM in their design. True, it is slower than a WORM, and it isn't as easy to use, but it works! And yes, the WORN is built into each Atari eight-bit computer!

There are a couple of ways to use an Atari WORN, but here is one of the simplest. From BASIC, just type in the command:

```
POKE 803,87
```

Then load a BASIC program type:

```
SAVE "WORN:TEST"
```

Presto! Your program will be saved to this marvelous device. (Hit RESET to disable the WORN.)

Of course, you should be careful not to rely on the WORN. Certainly, compared to a WORM, recovering programs saved to this Write Once Read Never device can take a while. If you happen to have a LAND device handy, you can make a quick copy of small programs saved to the WORN, but otherwise you will probably have to ensure a reliable connection between your biological optical devices and your digital extremity input devices.

WYSIWYG

Another marvelous acronym, pronounced "wizz-ee-wigg," is an old one that is relatively new to computers: What You See Is What You Get. Usually applied to word processing programs, where it means that the printed copy will look like the screen display (implying a higher-resolution display than that of an eight-bit Atari), this time I use it in its old meaning, the one a flea market vendor might use. Take another look at just the initial letters of the words in my headings up until now. Together they make a single acronym. One very appropriate to this month's issue.

Actually, my tale of the WORN device owes much to tales of WOM (Write Only Memory) devices that have abounded in computer folklore for ages. (Well, 10 or 15 years is "ages" when it comes to computers, right?) I remember one article that showed a picture of a water tower and claimed it was a WOM big enough for a whole town. So, if you don't like jokes, I apologize, but I haven't pulled an April Fool jest in a couple of years. It was time. (Oh, yes, the *LAND* above is not an acronym: I was referring to a Polaroid Land camera. And *biological optical devices* are your eyes, and *digital extremity input devices* are your fingers, of course.)

Without Honor?

A couple of my columns lately have turned out to be mildly prophetic of other COMPUTE! articles. One article that related to some of my recent comments was "Tri-Sort for Atari" on page 88 of the February issue, in which Arthur Horan provides you with a fast machine language sort that you can use with the pseudofields and pseudorecords I described in my February and March columns. The Shell-Metzner sort used by Mr. Horan is not the fastest for very large arrays of data, but it is probably quite well suited for the number of records you can pack into an Atari BASIC string. In my March column (which, of course, was written long before I saw the February issue) I said that I hoped you wouldn't use my quick-and-dirty bubble sort. With the help of Mr. Horan, you don't have to.

Last month, I also promised to return to the subject of my December article: Acrostic and other word puzzles. Well, in the December issue I said that I had yet to see a really good crossword puzzle program. Lo and behold, on page 61 of the February issue is a review of *Crossword Power* (for IBM PCs) that shows indeed how limited such programs are. I think the program did a creditable job with the number of words it was given, but the result was far from ideal.

For example, a typical newspaper crossword puzzle is perhaps 5–10-percent black space. The one shown in that review was more like 75-percent black space. Too, it is considered less than ideal for words in a newspaper puzzle to have more than one uncrossed letter. In the puzzle of the review, several

words are "hooked in" by a single letter! In at least one case, this results in a clue with two answers. (See 21 Across: A musical instrument. Is it a piano or cello?) Granted, the reviewer gave the program very few words to work with (only 35), but I can't help but wonder how *long* it would take to generate a *good* puzzle if one gave it a list of a couple of thousand words.

More Words About Words

In this same vein, several readers wrote to give comments and suggestions about the acrostics problem. (To refresh your memory: The problem is to write a program that will produce all valid five-by-five acrostics or word squares from a given list of five-letter words. Assume that there are 5000 words in the list.) One gentleman suggested that I was making the problem too hard: I should limit the number of words and accept the first puzzle produced. Well, yes, that wouldn't take as long, but that is kind of like building a chess-playing program that can only take over after a human has played the first 40 moves, and even then it can only play until it finds the first check (but not mate). As a practical matter, perhaps the gentleman is right. As a mathematician (which I was, once, I think), I want to see a problem solved, not sidestepped.

I even got two versions for other computers. An Amiga version took about three times as long on the Amiga as on the eight-bit Atari. But that is because of the inefficient way that Microsoft BASIC strings are implemented.

As for myself, I haven't had time to put together a complete solution, but I have started a couple of paper designs. I am convinced that, as with so very many computer problems, a really good solution depends on finding the right way to represent the data (in this case, the word list).

One possibility is this: How about a "map" wherein every single possible five-letter word is represented by a YES/NO flag? (That is, yes or no that the flagged word exists in our word list.) In compact form, such a map requires 26^5 bits, or about 1.5 megabytes. In a more practical form (use a 32-bit computer word for each set of 26 bits), one still needs just a little under 1.9 megabytes. Hmmm . . . anybody with a four-megabyte ST listening out there? (Actually, for efficiency, you would want four maps of increasing size—26^2, 26^3, 26^4, and 26^5—to represent the possible sequential letter sets. With some intelligent compression, all this might be possible in a half megabyte or so.)

I also tend to think that building the valid word set via a linked tree or list would work (albeit probably slower than the brute force approach, above). At worst, such a list would need about 75,000 bytes. Given the likely letter patterns in 5000 English words, I wouldn't be surprised to find that we could make do with 30,000 bytes or fewer. (Now we're down in eight-bit territory again!)

Are you asking "What is a linked list?" That's a big topic. For now, let me show you a way of simulating a word tree in Atari BASIC. The accompanying listing looks long, but you will quickly find that the bulk of it is nothing but simple DATA statements. This program has no real practical value, so don't feel that you need to type it in unless you are curious. But I do hope that at least some of you will look at my word tree and become inspired. If you are, write to me (P.O. Box 710352, San Jose, CA, 95171-0352).

Word Tree

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
DB 100  DIM COUNT(3),LINE(3),
        MAX(3)
PC 110  DIM WORD$(3),LETTER$(
        1)
BE 120  GRAPHICS 0
KA 200  LEVEL=0:LINE(LEVEL)=1
        000
HK 220  STOP
HP 300  REM RECURSIVE SUBROUT
        INE
KJ 310  RESTORE LINE(LEVEL)
JH 320  READ MAX
HP 330  LEVEL=LEVEL+1
BD 340  COUNT(LEVEL)=1:MAX(LE
        VEL)=MAX
II 350  RESTORE LINE(LEVEL-1)
        +COUNT(LEVEL)
PN 360  READ LETTER$,LINE
CI 370  WORD$(LEVEL,LEVEL)=LE
        TTER$:LINE(LEVEL)=LIN
        E
NL 380  IF LINE=0 THEN PRINT
        WORD$
HP 390  IF LINE<>0 THEN GOSUB
        300
HF 400  COUNT(LEVEL)=COUNT(LE
        VEL)
BF 410  IF COUNT(LEVEL)<=MAX(
        LEVEL) THEN 350
CB 420  LEVEL=LEVEL-1
HH 430  RETURN
DL 1000 DATA 8,(FIRST LETTER
        S)
AL 1001 DATA A,1100
AO 1002 DATA B,1200
BB 1003 DATA C,1300
BH 1004 DATA L,1400
CA 1005 DATA N,1500
CB 1006 DATA O,1600
CB 1007 DATA P,1700
CH 1008 DATA T,1800
AA 1100 DATA 1,(SECOND LETTE
        RS,A$)
BO 1101 DATA R,1110
BC 1110 DATA 1,(THIRD LETTER
        S, AR$)
HP 1111 DATA E,0
AC 1200 DATA 1,(SECOND LETTE
        RS, B$)
BB 1201 DATA E,1210
AH 1210 DATA 1,(THIRD LETTER
        S, BE$)
IP 1211 DATA T,0
AF 1300 DATA 2,(SECOND LETTE
        RS, C$)
BB 1301 DATA A,1310
CB 1302 DATA O,1320
AH 1310 DATA 3,(THIRD LETTER
        S, CA$)
IK 1311 DATA N,0
IH 1312 DATA P,0
JC 1313 DATA T,0
BE 1320 DATA 1,(THIRD LETTER
        S, CO$)
JB 1321 DATA T,0
AP 1400 DATA 2,(SECOND LETTE
        RS, L$)
BB 1401 DATA A,1410
CB 1402 DATA O,1420
AP 1410 DATA 1,(THIRD LETTER
        S, LA$)
IH 1411 DATA P,0
BO 1420 DATA 1,(THIRD LETTER
        S, LO$)
ID 1421 DATA P,0
BB 1500 DATA 1,(SECOND LETTE
        RS, N$)
BJ 1501 DATA E,1510
BB 1510 DATA 1,(THIRD LETTER
        S, NE$)
JC 1511 DATA T,0
BD 1600 DATA 1,(SECOND LETTE
        RS, O$)
CI 1601 DATA R,1610
CF 1610 DATA 1,(THIRD LETTER
        S, OR$)
IE 1611 DATA E,0
BB 1700 DATA 2,(SECOND LETTE
        RS, P$)
BH 1701 DATA E,1710
CJ 1702 DATA O,1720
BL 1710 DATA 2,(THIRD LETTER
        S, PE$)
ID 1711 DATA N,0
BL 1800 DATA 2,(SECOND LETTE
        RS, T$)
BL 1801 DATA A,1810
CL 1802 DATA O,1820
BH 1810 DATA 3,(THIRD LETTER
        S, TA$)
ID 1811 DATA B,0
JA 1812 DATA N,0
JB 1813 DATA P,0
CL 1820 DATA 2,(THIRD LETTER
        S, TO$)
JA 1821 DATA N,0
JB 1822 DATA P,0
```

Arlan R. Levitan

Burning Issues In A Campaign Year

It's hard to ignore the fact that 1988 is an election year. Fertilizer sales are up dramatically, and both my paper and electronic mailboxes are full of epistles enjoining me to lend my vote and as many bucks as I can spare. Unfortunately, most of the presidential aspirants' positions on the burning telecomputing issues of our day are not widely publicized.

Judging from the response to last year's proposed communications surcharges by the FCC, our readers are actively involved in the political process. Spurred on by a sense of editorial duty and the thought of being able to write off an April vacation in Washington D.C., I managed to corral a fistful of candidates and hosted a brief luncheon at Georgetown's swank Looflirpa Deli. While it would be inappropriate for me to endorse any one candidate, here are some selected questions and answers from our wide-ranging and informative session.

Arlan: Mr. Hart, many commercial information service users have been complaining that their user IDs and access to certain types of databases have suspended. What's your position on this matter?

Hart: Arlan, its obvious to me that these persons need new IDs, and I've been a proponent of New IDs for some time now. It's obvious to me that our system has to be open to everyone, regardless of position or rank, and that with New IDs we can move forward and put away the old IDs of the past.

Arlan: Mr. Robertson, some of your opponents have called your stance on telecommunications policy "reactionary." Your supporters call it a common sense approach. Could you elaborate on the basis of your proposals?

Robertson: We need to return to the telecomputing fundamentals that made this network great. The "fast" data lifestyle being promoted by the computing media and the manufacturers of 9600-bps modems has impaired our ability to judge values. Many of our young telecomputers can't tell an XON from an XOFF. Like my daddy used to sing while typing away on his 110-baud mechanical teletype, "Give me that old-time transmission. . . ."

Arlan: Mr. Dupont, you're generally acknowledged as a telecomputing arch-conservative. How would you deal with the spread of dangerous programs created by malicious whackers?

Dupont: A lot of users have been sharing data and interfacing willy-nilly with systems they have just a casual acquaintance with. The spread of computer viruses is a problem that has to be nipped in the bud to preserve the safety of this great nation's file structure. If elected I would enact mandatory data integrity checking and quarantine infected operating systems until effective anti-viral programs can be developed.

Arlan: Mr. Jackson, although you're consistently ranked among the frontrunners, there is a general consensus that your proposed telecomputing programs are not really compatible with present conventions, and your proposed file transmission standards are non-correctable.

Jackson: Arlan, I really don't understand why the computer press keeps making these remarks about my data not being correctable. You don't hear the press harping about the number of retrys that Gary Hart has gone through! Let me assure you that my base of support includes a veritable rainbow of file transmission standards from ASCII to ZModem. Most of today's problems with telecomputing have arisen from the failure of the data net. I would expand the scope and breadth the present network to address the needs of the memory-poor and those who are completely computerless.

Arlan: Mr. Bush, it's widely rumored that your telecomputing policy statements are written by one Dr. Bonzo, a simian associate of the commander-in-chief. Is there any truth to these allegations?

Bush: You know, I'm sick and tired of hearing about this so called "chimp-factor." I am not a chimp, and my expertise in telecommunications is a matter of record! As ambassador to China, I became well versed in all types of protocol. While director of the CIA, I worked with data encryption techniques on a regular basis. I am also heavily involved in Washington's old-boy network.

Arlan: Mr. Biden, although you've officially dropped out of the race, we're still interested in your thoughts on PC Pursuit's two-year delay in implementing 2400-bps service.

Biden: Never have so many waited so long for so little throughput. Still, ask not what your network can do for you, but what you can do for your network. In the end it will be said that this was their finest hour of connect time. You're not taping this, are you? ©

IBM Personal Computing

Donald B. Trivette

Mother Goose

The folks at Sierra On-Line have done it again. The new *Mixed-Up Mother Goose* is great for small children and even better for nostalgic adults—remember Jack-Be-Nimble and Little Tommy Tucker? I hadn't though about them in years.

Mixed-Up Mother Goose is an adventure game in the tradition of the *King's Quest* series. The idea is that all the nursery-rhyme characters—there are 18 classic Mother Goose rhymes represented—have misplaced something. Jack can't find his candlestick, Bo Peep has lost her sheep, and Mary can't find her lamb. As you gallivant around Mother Goose Land, any missing object you find automatically attaches to your character until you deliver it to the rightful owner. Reunite Jack with his candlestick, for example, and you win points.

Mixed-Up Mother Goose was designed for young children ages four and up. It's not necessary for the child to read, however. As you approach Bo Peep, for instance, a cartoon balloon appears over her head with the picture of sheep. Miss Peep pines for her sheep, as any four-year-old knows. Either the cursor or a joystick can be used to pilot your character around the land. When tests showed that small children had a heavy finger on the cursor keys, Sierra changed the program to accommodate them.

A particularly nice touch allows the child to select an icon of his or her own race and sex with which to identify. This is the only adventure game I've seen where the hero can be a black girl, if the player wishes.

The documentation and literature are equally well done. A colorfully illustrated wall poster has the text of all 18 rhymes for those of us who can't quite remember what Jack Sprat did. A user's manual has help and tips for adults and explains things like how to save sessions. I can't think of a better way to teach kids the classical nursery rhymes.

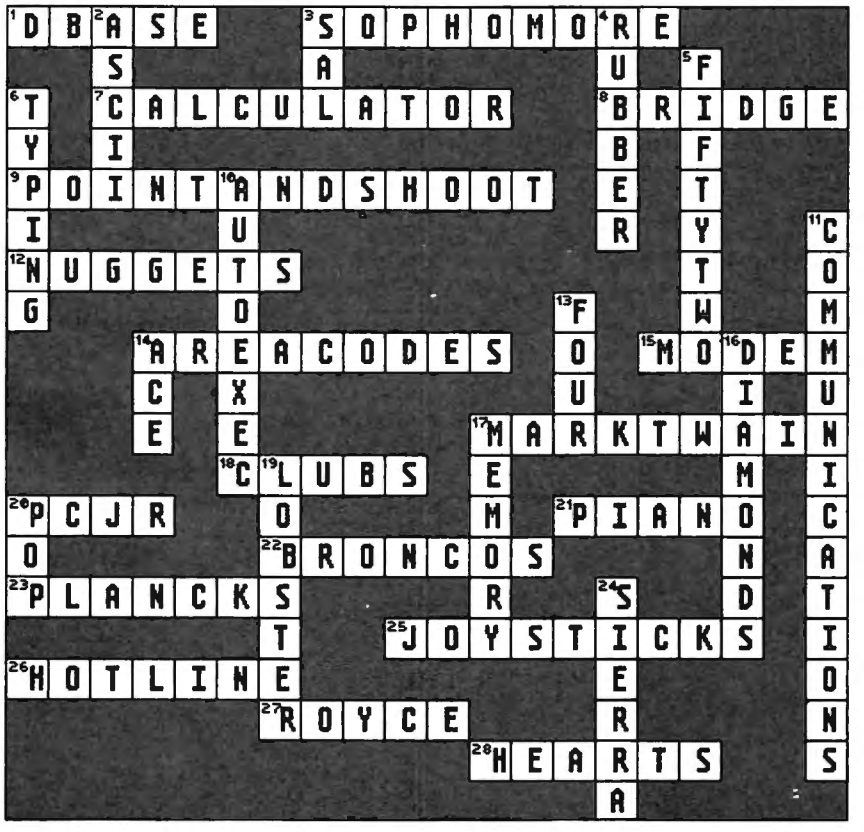
Mixed-Up Mother Goose requires a PC or compatible with 256K, CGA, EGA, VGA, or Hercules graphics (joystick and hard disk optional); both 3½- and 5¼-inch disks, copy-protected, are included. Price is $29.95.

Crossword Puzzle Winners

Congratulations to Brian Sanders of Burton, Michigan; Mary Rininsland of Dallas, Texas; and Tina Lemire of Lexington, Kentucky for submitting the first three correct answers in this column's Crossword Puzzle contest from the February 1988 issue of COMPUTE!. They'll each receive a complimentary copy of the crossword-puzzle-generating software from Wiseco Computing in Wisconsin Rapids, Wisconsin.

Honorable mentions go to Sue Holmer, Isabel Fernandez, Dan Rogers, and Michael Seeberger for correct answers which were postmarked a few days too late. And thanks to the rest of you who took the time to complete and send in the puzzle.

Donald B. Trivette is the author of A Quick & Easy Guide to Dow Jones News/Retrieval *published by COMPUTE! Books.*



Answers to February crossword.

The Elementary Amiga

Part 5

Jim Butterfield, Contributing Editor

In this final installment, Jim takes a close look at the CLI's RUN command. After describing several other commands, he explains the often-misunderstood AmigaDOS pattern-matching features.

The Commodore Amiga comes with excellent documentation. Both the *Introduction* and the *Amiga Basic* manuals take you gently through the first steps, and the *AmigaDOS User's Manual* will bring you into the CLI environment. But the facts don't always give you the flavor of the machine. This time, we'll discuss some of my favorite CLI (Command Line Interface) commands and talk more about multitasking.

Multitasking is easy, convenient, and sometimes even (dare I say it?) fun. It often takes place without your realizing it. For example, when you put a disk into the drive, you may notice that the drive light comes on for a few seconds. That's a separate task, or program, that the computer has generated. This task will do its job without interfering with anything else that may be happening. It vanishes when it has finished.

By the way, that's part of the reason you should wait a few moments when you first crank up your Amiga. Following the LOADWB (load Workbench) command, a task looks through the Workbench disk, checking that everything is in order. You can start clicking or typing right away—which would start a new task in motion—but it's not a good idea. Chances are, whatever you wanted to do would involve use of the disk drive. The two tasks (yours and the continuing one) might fight for access to the disk, moving the head back and forth, wasting everybody's time.

You will usually create multiple tasks in one of three ways. The most obvious method is to click on a Workbench icon to start something going. The Workbench doesn't go away, so if you want to set something else in motion, all you need is another double-click (perhaps with a little rearranging of windows to permit visibility), and the next task is under way.

A related method is to click on the CLI icon repeatedly. Each time the user does so, a new CLI is created, complete with its own window. Each CLI is capable of performing a separate task. By clicking into a CLI window and giving a command, a new job begins.

Once any CLI process is open, we can create new tasks in two ways. The command NEWCLI, as the name suggests, asks for a new CLI window to be opened. You may then click into the new window and start whatever work you want.

Using RUN

But the handiest way of starting a new and separate task is to use the command RUN. The keyword RUN is prefixed to whatever else you want to do.

Thus, instead of ED S/START-UP-SEQUENCE, you might command RUN ED S/STARTUP-SEQUENCE. What's the difference? ED by itself means that your CLI will go and do the ED job; you can give no more CLI commands until the edit is finished (at least not in *that* CLI window). But RUN ED . . . means that the Amiga will start a new CLI and give it the ED job. In the latter case, you could click out of the editor window to go to your original CLI, for example, to look at a disk directory while the edit is still under way.

To take this example a step further: You could compare, side by side, two text files by using two ED programs at the same time. Let's follow the command sequence to do this:

```
RUN ED DF0:S/STARTUP-SEQUENCE
```

Now, shrink the edit window, click back into your original CLI window, and then type

```
RUN ED DF1:S/STARTUP-SEQUENCE
```

Shrink the second edit window, too, and drag it so that you can see both windows. You might arrange them side-by-side or one window above the other. It's easy to compare text files this way.

Don't forget to click into each edit window and abandon the edits with ESC Q. Or, if you do something you want to keep on disk, the sequence is ESC X.

RUN Windows

In contrast to the NEWCLI command, RUN does not create a new CLI window. As you experiment

with various commands, you'll see that some use the current window, some set up a new one, and some commands (such as AMIGABASIC) set up whole screens.

Suppose we want to perform a directory listing as a separate task: While the directory is appearing, we'd like to be doing something else. DIR performs a directory list, as does LIST. But if we type RUN DIR, we may have problems, since the results pour into the same window in which we're trying to work. It's messy, to say the least.

Redirection is the answer to this problem. By using a phrase such as >XXX immediately behind the command word, the results will go to XXX. XXX could be a file, for example, or the printer; or it could be a window that we set up specially for the job. Let's use the window option (CON:) to illustrate a point about placement of the redirection command.

I stated that you should put the redirection signal directly behind the command. But now there are two commands (RUN and DIR). Which one should it follow? Try both of the following commands:

```
RUN >CON:20/20/500/100/files DIR
  DF0:
RUN DIR >CON:20/20/500/100/files
  DF0:
```

Aha! We see that the output of RUN is a simple notice, *[CLI 2]*, but the output of DIR is, of course, the directory itself. So, the second form of the command is the one we want, redirecting the output of DIR. Now we can better understand the reason why the redirection has to be carefully placed.

Indeed, we can have more than one redirection. Let's suppose you have a hatred of that CLI 2 notice. You could throw it away by redirecting it to nowhere, or device NIL:. Here's how:

```
RUN >NIL: DIR >CON:20/20/500/100/
  files DF0:
```

You can see that the CLI notice was thrown away, while the directory came out as usual.

All this is not completely satisfactory, however. The window we set up vanishes the moment the DIR command finishes, giving us no time to read the last few files. We could get around this by setting up a script file containing the DIR command followed by a WAIT and then commanding RUN EXECUTE >CON:, but that seems like a lot of work. We could use NEWCLI, do the job in the new, permanent window and then end the task with ENDCLI.

But there's an easier way. Try this:

```
RUN DIR >RAM:FILES DF0:
```

This will redirect the directory listing to a file in the ramdisk called FILES. At your convenience, you may TYPE RAM:FILES and later delete the file.

ECHO

At first, the ECHO command seems to belong only in the STARTUP-SEQUENCE file. It turns out to be quite handy. If you make your own script file which you will execute later, ECHO gives you useful status reports.

I find myself using ECHO frequently with redirection. If I want to set up a disk file called TEST which contains the words *testing 123*, I can quickly type ECHO >DF0:TEST "TESTING 123" There are many other ways to do the same thing, of course—ED will do the job and so will the command COPY * TO DF0:—but ECHO is quick when you have a simple job to do.

Before listing a file to the printer, I like to add extra information such as the date. ECHO >PRT: "Today is Apr 14, 1988" will do the trick.

You may even use ECHO to send special formatting commands to the printer. The technical details are beyond the scope of this article, but it's interesting to know that ECHO >PRT: "*e[4w" will switch my printer into "condensed print" mode ("*e[0w" puts it back) and may well do the same on yours.

COPY And JOIN

COPY makes a copy of a file (you probably guessed this), and JOIN can do the same thing. JOIN FILE1 AS FILE2 makes a copy in exactly the same way as COPY FILE1 FILE2.

If you want to move a file from one directory to another on the same disk, don't use COPY. RENAME will do the job more neatly.

Keep in mind that COPY and JOIN don't need to use disk files: Any appropriate device will do. You might use the console ("*") or the printer (PRT:). Thus, to list a file, you don't need to use the TYPE command. COPY FILE * will deliver to the CLI window; COPY FILE PRT: will deliver to the printer. You can even create an instant word processor with the command COPY * PRT: if you wish. In this case, keep in mind that CTRL- \ will end the file transfer.

If you want to print several files, JOIN FILE1 FILE2 FILE3 AS PRT: will do the job. To separate the file listings, you might wish to create a dummy file with some blank lines or a vertical-tab (paper eject) and cause that to be printed between each of the other files.

I think the keyword here is versatility. At first sight, a command seems to do one thing, but as you learn of the system's flexibility, it becomes capable of much more.

ASSIGN, INFO, And STATUS

I use ASSIGN, INFO, and STATUS frequently. They are designed to give you an understanding of what's happening within your computer.

We've mentioned ASSIGN before. It can be used creatively, to identify special disks in the session, or routinely, to reassign a resource such as fonts to another disk (or to the ramdisk). You also can use it just for information; the ASSIGN command alone gives you an idea of how your system is set up.

INFO tells you about your disk resources. It tells you how full each disk is, plus other useful information.

STATUS tells you about the tasks, mostly the CLI activities, in your machine. It's more for "inner space" enthusiasts, but it will give you an idea of the bookkeeping taking place within the Amiga. Try STATUS FULL for more details (you don't need to understand everything you see there.)

DATE And SetClock

DATE allows you to see the current date and time. DATE followed by other material allows you to set these values.

If you have an Amiga 2000 or a 500 with the memory expansion fitted, SETCLOCK OPT LOAD will read in the date and time from the built-in clock.

If you don't have a built-in clock, it's a good idea to keep the date current. When you write to disk, the files are time- and date-stamped. Accurate dates are a great help in identifying program versions. There are even some backup programs that update files if their recorded date is too old.

Your system disk records the last time and date at which a file was written. If you don't have a built-in clock, it's a good idea to update this each time you use the Amiga. For example, try the sequence:

```
ECHO >K "X"
DELETE K
```

This writes a tiny file (named K) and then immediately deletes it. Even so, the disk has recorded the current date and time. If you're a frequent user, remember that a command such as DATE TOMORROW will move things ahead one day, or DATE FRIDAY will move the date ahead to the following Friday. It's easier than typing in the whole date.

Pattern Matching

Some commands allow you to partially specify a file and then find it (or a group of files) by using pattern matching. The simplest characters are:

#	any number of the following character or pattern
?	any character
|	inclusive "or" for characters or patterns

For example, A#B means an *A* followed by any number of *B*'s, which would match A, AB, ABB, and so on. The two characters *#?* used together are very powerful, meaning "any number of any characters." Thus, *A#?* would match any filename beginning with A, and *#?.info* would match any file ending with .info—a very powerful feature indeed.

The "or" symbol can save you a lot of typing. You might type:

```
DELETE DOG|CAT|MUTT#?
```

This would delete any file named DOG, any file named CAT, and all files whose names begin with the characters MUTT.

Not all commands permit pattern matching, but it's useful when it's there. ©

Apple ProDOS Date And Time Stamper

Peter J. McLoone

Don't have a clock card, but want to time stamp your files? This program is just what you need. ProDOS is required.

Like many Apple II users, I don't have a clock card for my Apple, but I'd like to be able to time stamp my files. And since I usually boot my system several times in a session, I'd appreciate being able to set the date only once, and have some way for the computer to remember what it was when I reboot. Even better, when I boot the system a day or two later, I'd like to be able to use the previous date and time information and change only what needs to be changed—usually the day of the month and the time. "Date and Time Stamper" solves these problems with a short easy-to-use program you can customize for your own particular needs.

Getting Started

Since Date and Time Stamper is written entirely in BASIC, simply type it in, save a copy to disk, and type RUN. When you run the program for the first time, it prompts you for the values for month, day, year, hour, and minute. You enter these values as five numbers separated by slashes (/). You must enter legitimate values for all five fields.

The time-of-day values are based on a 24-hour clock—that is, 00:00 through 23:59. If you're primarily interested in the date, you may want to set the time of day to midnight by entering zeros. For example, 11/5/87/0/0 sets the date to November 5, 1987 and the time of day to midnight. Likewise, 11/5/87/15/38 sets the time of day to 3:38 p.m. The values you enter become the defaults.

When you run the program and it finds a default date, it displays the date, provides instructions on how to change it, and prompts you for any changes. Pressing RETURN will keep the defaults. You may keep as many of the defaults as you like by using slashes as a place holder. For example: ///16/15 keeps the defaults for the month, day, and year while setting the time of day to 16:15 (4:15 p.m.). If you type /6 followed by RETURN, the day of the month is changed to 6 and the defaults will be used for the other values.

How It Works

The program works by examining the MODIFIED field in the ProDOS catalog entry for the file identified by the variable FI$. If it has a date, the program uses it to determine default values. If it doesn't, then the program prompts you to enter all five fields. Once you provide a legitimate set of values, the program sets the appropriate locations in memory so ProDOS will start using it, and then saves itself to a file named FI$, putting the new date into the MODIFIED field in its ProDOS catalog entry. If you don't change any fields, it sets the appropriate memory locations and stops.

One way to use Date and Time Stamper is in your startup routine. You may want to add the following statement to the end of your START-UP file:

```
PRINT CHR$(4);"-SET.DATE.TIME"
```

This will run the program automatically when you boot. Another pos-

sibility is to make Date and Time Stamper itself your STARTUP program. Anything you'd like to do at startup can be placed into the program in lines 100 to 1999. You must also change the value of FI$ in line 10:

```
10 FI$="STARTUP"
```

The program assumes the startup drive is device 1 in slot 6 (the usual) and searches the main directory on that volume for FI$. Line 60 needs changing if your startup device location is different. The program also sets the screen to 80 columns. Delete line 50 if your Apple doesn't have this capability. You'll also want to revamp the print statements in lines 3600–3835 and 5100–5300 to provide a more pleasing output with a 40-column display.

Date and Time Stamp has a simplified check for leap year that won't fail until 2100, so it shouldn't present a problem. If you're still using your Apple II in the year 2000, however, the year check in line 26200 can be modified.

Date and Time Stamper

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
94 5 REM COPYRIGHT 1988 COMPUTE!
     PUBLICATIONS, INC.
63 8 REM ALL RIGHTS RESERVED.
7D 10 FI$ = "SET.DATE.TIME": REM
     make sure file name is U
     PPER case
40 20 D$ = CHR$ (4):NULL = - 1
0F 50 PRINT D$;"pr#3": REM  Set
     screen to 80 columns
0A 60 PRINT D$;"prefix ,s6,d1":
     REM  Set prefix to the nam
     e of the usual startup dri
     ve
C8 70 PRINT "The ProDOS Date and
      Time Stamper"
C3 80 PRINT "Copyright 1988 COMP
     UTE! Publications, Inc.":
     PRINT "All rights reserved
     ."
86 90 :
37 2000 REM ----- Find catalog e
     ntry for FI$ and
25 2100 REM     see if it has a d
     ate modified -----
A7 2200 PRINT D$;"prefix": INPUT
     L1$
72 2300 PRINT "Volume: "; MID$ (
     L1$,2, LEN (L1$) - 2)
0A 2400 PRINT D$;"open"L1$",tdir
     ": PRINT D$;"read "L1$
A7 2500 INPUT L1$: INPUT L1$: IN
     PUT L1$: REM  skip first
      three lines
7D 2600 INPUT CE$: REM Catalog E
     ntry
82 2700 IF CE$ = "" THEN PRINT D
     $;"close ": GOTO 5000
6C 2800 IF MID$ (CE$,2, LEN (FI$
     )) < > FI$ THEN 2600
04 2850 PRINT D$;"close "
04 2899 :
0F 2900 IF MID$ (CE$,31,9) = "<N
     O DATE>" THEN 5000
20 2950 REM ------ there is a de
     fault date -----
0D 3000 DY = VAL ( MID$ (CE$,31,
     2)):MO$ = MID$ (CE$,34,3
     ):YR = VAL ( MID$ (CE$,3
     8,2))
24 3300 I = 1
6F 3400 IF MO$ < > MID$ ("JANFEB
     MARAPRMAYJUNJULAUGSEPOCT
     NOVDEC",I,3) THEN I = I
     + 3: GOTO 3400
79 3500 MO = (I + 2) / 3:HR = VA
     L ( MID$ (CE$,41,2)):MN
     = VAL ( MID$ (CE$,44,2))
C5 3590 PRINT : PRINT "Default d
     ate: "MO;"/";DY;"/";YR;"
          Default time: ";HR;
     ":";: IF MN < 10 THEN PR
     INT "0";
0C 3595 PRINT MN: PRINT
A5 3600 PRINT "You may change an
     y portion of the default
      date.  Enter up to"
1B 3800 PRINT "five one or two d
     igit values separated by
      slashes in the order"
1A 3810 PRINT "month/day/year/ho
     ur/minute. If you desire
     to change only"
96 3820 PRINT "a few items, then
     enter only a slash for
     the items you wish"
04 3830 PRINT "to skip. For exam
     ple /5///30 changes only
     the day and minute and"
34 3835 PRINT "/28 changes only
     the day. A return will k
     eep all the defaults."
B6 3900 PRINT : INPUT "Enter new
     date/time:";L1$
41 3950 IF L1$ = "" THEN GOSUB 3
     0000: END
07 3999 :
1C 4000 GOSUB 10000: REM  to par
     se the date/time string
AD 4050 IF ER THEN 3900
27 4200 IF S(1) < > NULL THEN MO
     = S(1)
DC 4300 IF S(2) < > NULL THEN DY
     = S(2)
52 4400 IF S(3) < > NULL THEN YR
     = S(3)
46 4500 IF S(4) < > NULL THEN HR
     = S(4)
1B 4600 IF S(5) < > NULL THEN MN
     = S(5)
9E 4700 GOSUB 20000: REM  to che
     ck whether date time is
     valid
0A 4800 IF ER < > 0 THEN 3000
64 4900 GOTO 6000
B3 4950 REM ----- there is NO de
     fault date -----
23 5000 REM  can't find file FI$
     or file FI$ has no date
97 5100 PRINT : PRINT "Enter the
      date and time as five v
     alues separated by slash
     es, i.e.,"
B0 5200 PRINT "month/day/year/ho
     ur/minute. For example,
     10/5/86/15/30 is
14 5300 PRINT "October 3, 1986,
     military time 15:30 or 3
     :30 pm."
D9 5350 PRINT "All values must b
     e entered.
89 5400 PRINT : INPUT "Enter dat
     e/time:";L1$
27 5500 GOSUB 10000: REM  to par
     se the date/time string
0B 5600 IF ER GOTO 5100
1B 5650 MO = S(1):DY = S(2):YR =
      S(3):HR = S(4):MN = S(5
     )
9F 5700 GOSUB 20000: REM  to che
     ck whether date time is
     valid
C9 5800 IF ER THEN 5100
1D 5900 :
99 6000 PRINT : PRINT "New date:
     ";MO;"/";DY;"/";YR;"
      New time: ";HR;":";: I
     F MN < 10 THEN PRINT "0"
     ;
3B 6100 PRINT MN: PRINT
89 6200 GOSUB 30000: REM to stor
     e new date in memory
4A 6300 PRINT D$;"UNLOCK ";FI$:
     PRINT D$;"SAVE ";FI$: PR
     INT D$;"LOCK ";FI$
89 6400 PRINT "If the new date i
     s incorrect rerun ";FI$;
     "."
D1 6500 END
E0 10000 REM ==========PARSE
AC 10100 ER = 0:B = 1:P = 1:L1$
     = L1$ + "/////"
44 10270 FOR J = 1 TO 5
CD 10300 IF MID$ (L1$,P,1) < > "
     /" THEN P = P + 1: GOTO
      10300
14 10350 IF B = P THEN S(J) = NU
     LL: GOTO 10800
AE 10400 IF B < P THEN OK = 1: F
     OR I = B TO P - 1:C$ =
     MID$ (L1$,I,1):OK = OK
     AND (C$ > = "0" AND C$
     < = "9") OR C$ = " ": N
     EXT
12 10500 IF OK THEN S(J) = VAL (
      MID$ (L1$,B,P - B))
3B 10700 IF NOT OK THEN ER = 1:
     PRINT "Field ";J;" is n
     ot a number."
5F 10800 P = P + 1:B = P: NEXT
65 19000 RETURN
7E 20000 REM  ==========CHECK
8C 20050 ER = 0
3E 20100 IF MO < 1 OR MO > 12 TH
     EN ER = 1: PRINT "Inval
     id value for month."
A8 20600 IF MO = 9 OR MO = 4 OR
     MO = 6 OR MO = 11 THEN
     MAX = 30: GOTO 23000
39 20700 IF MO < > 2 THEN MAX =
     31: GOTO 23000
9C 22000 MAX = 28: IF (YR / 4 -
     INT (YR / 4)) = 0 THEN
     MAX = 29
C9 23000 IF DY < 1 OR DY > MAX T
     HEN ER = 1: PRINT "Inva
     lid value for day."
9E 26200 IF YR < 87 OR YR > 99 T
     HEN ER = 1: PRINT "Inva
     lid value for year."
61 26300 IF HR < 0 OR HR > = 24
     THEN ER = 1: PRINT "Inv
     alid value for hour."
F8 26400 IF MN < 0 OR MN > = 60
     THEN ER = 1: PRINT "Inv
     alid value for minute."
66 29000 RETURN
38 30000 REM  ==========STORE
58 30050 REM  destroys MO DY YR
FA 30100 YR = YR * 2
C8 30200 IF MO > 7 THEN YR = YR
     + 1:MO = MO - 8
98 30300 DY = DY + MO * 32
51 30400 POKE 49041,YR: POKE 490
     40,DY: POKE 49043,HR: P
     OKE 49042,MN
6D 30600 RETURN
```

Screen Print For Atari

Richard Tietjens

Transfer your favorite computer artwork and illustrations from screen to paper with this excellent screen-dump program—the best we've ever published for Atari computers. For the Atari 400, 800, XL, and XE with disk drive and printer (Epson or Epson-compatible, Okimate 10, Big Blue Printer, or Star NP-10).

When I first bought my Okimate 10 color printer, I tried several screen-dump programs to print pictures. Unfortunately, I wasn't happy with any of them—they were all too slow, and they didn't support enough picture formats. To solve the problem, I wrote *Screen Print*, a powerful and fast screen dump that supports a variety of file formats and several printers.

Screen Print prints any picture file created with *Micro Painter*, *Micro Illustrator*, and *Fun with Art*. It can also print the GRAPHICS 8 and GRAPHICS 9 files that many BASIC programs create. Depending on what printer you use, you can print in color or black-and-white. Screen Print produces a full-width printout that's better than the dumps produced by most commercial programs.

Typing It In

The program is written mostly in BASIC, but machine language routines are used for the time-critical sections. Type in Program 1 and save it to disk with the command LIST"D:MAIN.LST". Do not attempt to run the program yet.

Program 2 is designed to create the machine language strings used in the program. Type in Program 2. If you plan to use this program with the Star NP-10 printer, make the indicated change in line 3210. Save the program to disk, and then type RUN. It should create the file DATALINE.LST on disk.

Programs 3–6 contain program lines that enable Screen Print to work with your printer. Type in the appropriate program and save it to disk with the command LIST"D:MYPRINT.LST".

To make a working version of Screen Print for your printer, type the following commands:

```
NEW
ENTER"D:MAIN.LST"
ENTER"D:DATALINE.LST"
ENTER"D:MYPRINT.LST"
```

If you're using the Big Blue Printer version of the program, delete line 400 and lines 4100–4170 from the program.

Be sure to save the program to disk.

Printing Pictures

When you're ready to try Screen Print, load and run the program. If you're using a 130XE with DOS 2.5, you may first want to use the DOS copy command to move your picture file to the ramdisk. This will make printing significantly faster.

When the title screen appears, you can view the directory of any disk by pressing the number of the drive. Press 8 for a directory of the ramdisk. From the directory listing, you may use the cursor keys and the SELECT key to select a picture to print. To return to the title screen, press RETURN.

After you select a picture, it is loaded and displayed on the screen. Depending on your printer, up to four keys are now active. Press 8 to print a GRAPHICS 8 screen, 9 to print a GRAPHICS 9 screen, M to print in monochrome, or C to print in color.

If you chose to print a GRAPHICS 8 or 9 screen, you may now press OPTION to reverse all screen colors. This feature lets you print "negative" images.

If you chose monochrome mode, all colors change to a shade of gray. You can change the brightness and contrast by pressing a number in the range 1–4. Use whichever combination is most pleasing.

Finally, if you chose a color printout, a color menu appears. Make sure that you have a color ribbon installed in your printer. You can now use the cursor keys and the numbers 0–7 to change the screen colors for the best printout.

When you're ready to print your screen, press START. A tone sounds. Make sure that your printer is online. If you have an Epson printer and are printing in color, use a pencil to make index marks on the paper at the tear-off bar. Press START again to begin printing or SELECT to return to the title screen.

If you are using an Epson or compatible printer, you will be prompted to reinsert and realign the paper for each pass. For the best picture quality, be as accurate as possible.

For instructions on entering these programs, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

Program 1: Screen Print Main Program

```
08 10  REM COPYRIGHT 1988 COM
       PUTE! PUBLICATIONS, IN
       C.  ALL RIGHTS RESERVE
       D
EM 190  N106=106:TOP=PEEK(N10
       6):GOTO 1000
BM 200  IF GMODE=N8 OR GMODE=
       N9 THEN 2190
GL 210  IF  NOT CLF THEN GOSU
       B 2070:GOTO 260
AL 220  FOR I=N1 TO N3:COLOUR
       (I)=PEEK(N707+I):NEXT
        I:COLOUR(N0)=PEEK(N7
       12):COLOUR(N4)=N0:POK
       E N106,TOP-N32:GOSUB
       1680
NB 230  GRAPHICS N0:POKE N106
       ,TOP
DJ 240  GRAPHICS N63:GOSUB 14
       80:FOR I=N1 TO N3:POK
       E N707+I,COLOUR(I):NE
       XT I:POKE N712,COLOUR
       (N0):GOSUB 2900
PB 250  IF CLF THEN LET DUMP$
       (N106)=PIX$
KO 260  FOR Y=N15 TO N0 STEP
       -0.5:SOUND N0,Y,N10,Y
       :NEXT Y
DP 265  FOR I=N0 TO LEN(DUMP$
```

```
    ):POKE PAGE6+I,PEEK(A
    DR(DUMP$)+I):NEXT I
HK 267 GRF1$="  START TO PRI
    NT(6 SPACES)SELECT TO
     ABORT  ":GOSUB 2980
BJ 270 FOR Y=N15 TO N0 STEP
    -0.25
OP 280 SOUND N0,N15,N10,INT(
    Y):NEXT Y
MK 290 IF PEEK(CONSOL)=N5 TH
    EN POKE N106,TOP:GOTO
     1150
CO 300 IF PEEK(CONSOL)<>N6 T
    HEN 290
MA 315 GRF1$="(14 SPACES)PRIN
    TING...(14 SPACES)":GO
    SUB 2980
EE 330 GRF1$=CHR$(N0):GRF1$(
    N480)=GRF1$:GRF1$(N2)
    =GRF1$:GRF2$=GRF1$:GR
    F3$=GRF1$:GRF4$=GRF1$
BB 380 X=USR(PAGE6,ADR(GRF4$
    ),DM)
LK 390 GRF1$=GRF4$:DM=DM+N40
AP 400 X=USR(PAGE6,ADR(GRF4$
    ),DM)
LE 410 GRF2$=GRF4$:DM=DM+N40
BB 420 X=USR(PAGE6,ADR(GRF4$
    ),DM)
LH 430 GRF3$=GRF4$:DM=DM+N40
BD 440 X=USR(PAGE6,ADR(GRF4$
    ),DM)
MK 450 IF PASS THEN DM=DM+N4
    0
CO 460 X=USR(ADR(ADD$),ADR(G
    RF1$),ADR(GRF2$),ADR(
    GRF3$),ADR(GRF4$),N48
    0,PASS)
BJ 530 POKE 77,N0:GOTO 1150
HO 550 REM READ DIRECTORY/S
    ELECT SCREEN
EF 560 CLOSE #N1:OPEN #N1,N1
    2,N0,"S:"
LF 565 POKE N709,N0:POKE N71
    0,N10:POKE N712,N8:PO
    KE N752,N1:? #N1;" ":
    GOSUB 1480
DI 570 POSITION N14,N0:? #N1
    ;"Active Keys:":? #N1
    ;"(B)SELECT(V) 1 2 3
    6(3 SPACES)(DEL LINE)
     (CLR TAB) (SET TAB)
    (INS LINE) (B)RETURN
    (V)"
KH 575 T$="D1:*.*":T$(N2,N2)
    =DN$:FIL$=""
BE 580 TRAP 960:CLOSE #N5:OP
    EN #N5,N6,N0,T$:F=N0
HB 590 TRAP 630:INPUT #N5;FN
    $
FO 600 T$=FN$(N11,N13):IF T$
    ="SYS" OR T$="COM" OR
     T$="BAS" OR T$="SAV"
     OR FN$(N4,N8)=" FREE
    " THEN 590
BL 610 IF VAL(FN$(N15,N17))>
    83 THEN 590:REM MAX
    SIZE FOR FUN W/ART FI
    LE
FF 620 ROW=INT(F/N3):COL=(F-
    ROW*N3)*N13:POSITION
    COL+N1,ROW+N3:? #N1;F
    N$(N3,N13):FIL$(F*N11
    +N1)=FN$(N3,N13)
CB 625 F=F+N1:GOTO 590
EI 630 POSITION N2,N24-N1:?
    #N1;"After Loading pr
    ess B, E, G, or M(V)"
    ;
KC 635 CLOSE #N5:OPEN #N5,N4
    ,N0,"K:":FN=N0
MP 640 IF LEN(FIL$)=N0 THEN
    670
GN 645 WHERE=FN*N11+N1:ROW=I
    NT(FN/N3):COL=(FN-ROW
    *N3)*N13:POSITION COL
    +N1,ROW+N3:FN$=FIL$(W
    HERE,WHERE+N10):T$=FN
    $
IA 650 X=USR(ADR(INV$),ADR(T
    $))
GL 660 ? #N1;T$;
DB 670 IF PEEK(CONSOL)=N5 TH
    EN GOTO 810
CB 680 IF PEEK(CH)=N255 THEN
     670
PB 690 GET #N5,KP:POKE CH,N2
    55
PB 700 IF KP=28 OR KP=45 THE
    N GOSUB 770:FN=FN-N3:
    GOTO 780
PE 710 IF KP=29 OR KP=61 THE
    N GOSUB 770:FN=FN+N3:
    GOTO 780
DM 720 IF KP=30 OR KP=43 THE
    N GOSUB 770:FN=FN-N1:
    GOTO 780
OM 730 IF KP=31 OR KP=42 THE
    N GOSUB 770:FN=FN+N1:
    GOTO 780
MB 740 IF KP>47 AND KP<52 OR
     KP=56 THEN DN$=CHR$(
    KP):CLOSE #N5:GOTO 56
    0
JE 750 IF KP=155 THEN 1150
HD 760 GOTO 670
KD 770 ROW=INT(FN/N3):COL=(F
    N-ROW*N3)*N13:POSITIO
    N COL+N1,ROW+N3:? #N1
    ;FN$;:RETURN
GO 780 IF FN<N0 THEN FN=F-N1
HD 790 IF FN>F-N1 THEN FN=N0
GL 800 GOTO 640
MB 810 T$=FN$:FN$="D1:":FOR
    I=N1 TO N8:IF T$(I,I)
    <>" " THEN FN$(I+N3)=
    T$(I,I)
IH 820 NEXT I:IF T$(N9,N11)<
    >"(3 SPACES)" THEN FN
    $(LEN(FN$)+N1)=".":FN
    $(LEN(FN$)+N1)=T$(N9,
    N11)
LH 830 FN$(N2,N2)=DN$:TRAP 9
    60:CLOSE #N5:OPEN #N5
    ,N6,N0,FN$:INPUT #N5,
    T$:CLOSE #N5:CLOSE #N
    1:PTYPE=N0
GL 840 IF T$(N15,N17)="045"
    AND T$(N3,N4)="OP" TH
    EN PTYPE=N1:REM POKE
    R
KN 850 IF T$(N15,N17)="062"
    THEN PTYPE=N2:REM MI
    CRO PAINTER
CB 860 IF  NOT PTYPE THEN CL
    OSE #N5:OPEN #N5,N4,N
    0,FN$:GET #N5,B1:GET
    #N5,B2:GET #N5,B3:GET
     #N5,B4:CLOSE #N5
MC 870 IF  NOT PTYPE THEN IF
     B1=N254 AND B2=B1 TH
    EN PTYPE=N3:REM FUN
    W/ART
BF 880 IF  NOT PTYPE THEN IF
     B1=N255 AND B2=N128
     AND B3=201 AND B4=199
     THEN PTYPE=N4:REM M
    ICRO ILLUSTRATOR
DC 890 IF  NOT PTYPE THEN CL
    OSE #N1:? "(CLEAR)
    (3 BELL)NOT A RECOGNI
    ZED PICTURE FILE!":GO
    TO 1370
MC 900 GRAPHICS N32-N1:GOSUB
     1480:Q=PEEK(N559):PO
    KE N559,Q:CLOSE #N1:O
    PEN #N1,N4,N0,FN$
PJ 910 ON PTYPE GOSUB 1390,1
    390,1560,1500
CH 920 POKE N559,Q:CLOSE #N5
    :OPEN #N5,N4,N0,"K:"
PM 930 GET #N5,KP:IF KP<>67
    AND KP<>77 AND KP<>56
     AND KP<>57 THEN 930
DA 940 CLF=(KP=67):GMODE=KP-
    N48:IF GMODE>N9 THEN
    GMODE=N15
GH 950 FOR Y=N15 TO N0 STEP
    -0.5:SOUND 0,N254,N10
    ,INT(Y):NEXT Y:GOTO 2
    00
IB 960 GOSUB 980:? "(3 BELL)
    (3 DOWN)ERROR - ";PEE
    K(195);" ON DISK ACCE
    SS!(3 DOWN)":GOTO 137
    0
DO 970 GOSUB 980:? "(3 BELL)
    ERROR - ";PEEK(195);"
     WHILE PRINTING!":GOT
    O 1370
MC 980 GRAPHICS N0:POKE N710
    ,99:POKE N712,99:POKE
     N709,N14:GOTO 1480
LI 990 REM INITIALIZE
MD 1000 N0=0:N1=1:N2=2:N3=3:
    N4=4:N5=5:N6=6:N7=7:
    N8=8:N9=9:N10=10:N11
    =11:N12=12:N13=13:N1
    4=14:N15=15:N16=16:N
    17=17
MO 1005 N20=20:N24=N8*N3:N30
    =N10*N3:N32=N16*N2:N
    40=N10*N4:N48=N16*N3
    :N63=63:N101=101:N12
    8=N16*N8:N254=254:N2
    55=255
MH 1010 N256=N128*N2:N480=N4
    8*N10:N559=559:N707=
    707:N708=708:N709=70
    9:N710=710:N712=712:
    N752=752:PAGE6=N256*
    N6
DF 1020 POKE N106,TOP:GRAPHI
    CS N2+N16:POKE N710,
    N0:GOSUB 1480:? #N6:
    ? #N6;"INITIALIZING.
    .."
PM 1030 CONSOL=53279:POKE 77
    ,N0:CH=764
KA 1040 DIM GRF1$(N480),GRF2
    $(N480),GRF3$(N480),
    GRF4$(N480),GR15DUMP
    $(117),GR9DUMP$(189)
    ,CIO$(N7)
AA 1050 DIM PIC$(N30),K$(N2)
    ,FN$(N30),T$(N30),IN
    V$(N30),FIL$(704),CO
    LOUR(N6),ADD$(110),R
    EV$(N30)
IJ 1060 DIM DUMP$(189),PIX$(
    36),C$(N24),DN$(N1),
    KOALA$(344),CRYPT$(3
    00):DN$=CHR$(49)
AM 1070 GOSUB 3010
DC 1150 GRF1$=" ":GRF1$(N40)
    =GRF1$:GRF1$(N2)=GRF
    1$:M88=(TOP-N32)*N25
    6:GOSUB 2980
LP 1155 GRAPHICS N2+N16:POKE
     N710,N0:GOSUB 1480:
    LET DUMP$=GR15DUMP$:
    POKE 195,N1
MP 1170 ? #N6:? #N6;"
    (3 SPACES)COYRIGHT 1
    988(10 SPACES)COMPUTE
    !"
PI 1180 ? #N6:? #N6;"  PRESS
     SPACE BAR":? #N6;"
    FOR INSTRUCTIONS"
```

```
MN 1190 ? #N6;? #N6;"  PRESS
        [1] [2] [3] or [8]":? #N6;"
        (3 SPACES)FOR  DIREC
        TORY"
GB 1200 B1=N0:B2=N15:B3=0.25
        :B4=N0:CLOSE #N5:OPE
        N #N5,N4,N0,"K:"
DA 1210 FOR I=B1 TO B2 STEP
        B3:POKE N710,I
HD 1220 IF PEEK(CH)=N255 THE
        N 1250
EH 1230 GET #N5,X:POKE CH,N2
        55:IF X=N32 THEN POP
         :GOTO 1200
LP 1240 IF (X>N48 AND X<52)
        OR X=56 THEN DN$=CHR
        $(X):POP :CLOSE #N5:
        GOTO 560
FJ 1250 IF PEEK(77)=N254 THE
        N 1530
JM 1255 IF X=67 THEN POP :DO
        S
FB 1260 NEXT I
ME 1270 B4=B1:B1=B2:B2=B4:B3
        =-B3:GOTO 1210
EH 1280 GRAPHICS N0:POKE N71
        0,50:POKE 712,50:POK
        E 752,N1:GOSUB 1480
ML 1290 RESTORE 3920:CLOSE #
        N5:OPEN #N5,N4,N0,"K
        :":Y=N0:POKE CH,N255
BK 1300 TRAP 1320:READ GRF1$
        :IF GRF1$="\" THEN 1
        320
IG 1310 ? GRF1$;? :Y=Y+N2:IF
         Y<N20 THEN 1300
JC 1320 IF PEEK(195)=N6 THEN
         POSITION N1,N20+N2:
        ? "PRESS (B)[ESC](V) T
        O RETURN TO TITLE PA
        GE":GOTO 1340
JE 1330 POSITION N1,N20+N2:?
         "(B)[SPACE BAR](V) TO
         CONTINUE (B)[ESC](V)
        TO QUIT";
BN 1340 GET #N5,KP:IF KP=N32
         THEN ? "(CLEAR)":Y=
        N0:GOTO 1300
IP 1350 IF KP=27 THEN 1150
ML 1360 GOTO 1340
DJ 1370 CLOSE #N5:OPEN #N5,N
        4,N0,"K:":POKE 195,N
        6:POKE 752,N1:GOTO 1
        320
AN 1380 REM [LOAD A PICTURE
        SCREEN]
CA 1390 POKE 850,N7:POKE 852
        ,PEEK(88):POKE 853,P
        EEK(89):POKE 856,N0:
        POKE 857,N30
AD 1400 IF PTYPE=N1 THEN POK
        E 856,224:POKE 857,2
        1
KO 1410 X=USR(ADR(CIO$),N16)
MN 1420 TRAP 1440
DL 1430 GET #N1,X:POKE N712,
        X:FOR I=N0 TO N2:GET
         #N1,X:POKE N708+I,X
        :NEXT I
EE 1440 IF PTYPE<>N1 THEN CL
        OSE #N1:RETURN
AK 1450 GET #N1,CRYPT
FI 1460 DM=PEEK(88)+256*PEEK
        (89)
NB 1470 X=USR(ADR(CRYPT$),DM
        ,5600,CRYPT):RETURN
LO 1480 POKE N16,112:POKE 53
        774,112:RETURN
KE 1490 TRAP 960
IB 1500 RESTORE 3250:FOR I=N
        0 TO N20:READ B1:POK
        E PAGE6+I,B1:NEXT I
EE 1510 A=USR(ADR(KOALA$))
PK 1520 CLOSE #N1:RETURN
DL 1530 POP :Q=PEEK(N559):PO
        KE N559,N0
HK 1540 IF PEEK(CH)=N255 THE
        N 1540
KC 1550 POKE N559,Q:GOTO 115
        0
BB 1560 GET #N1,B1:GET #N1,B
        1:GET #N1,B1:POKE N7
        12,B1:FOR I=N0 TO N2
        :GET #N1,B1:POKE N70
        8+I,B1:NEXT I
OO 1570 POKE 850,N7:POKE 852
        ,PEEK(88):POKE 853,P
        EEK(89):POKE 856,N0:
        POKE 857,N1
LB 1580 X=USR(ADR(CIO$),N16)
OP 1590 POKE 850,N7:POKE 852
        ,PEEK(88):POKE 853,P
        EEK(89):POKE 856,240
        :POKE 857,15
KP 1600 X=USR(ADR(CIO$),N16)
PE 1610 DM=PEEK(88)+N256*PEE
        K(89):DM=DM+240+N256
        *N15:B2=INT(DM/N256)
        :B1=DM-B2*N256
DK 1620 POKE 850,N7:POKE 852
        ,B1:POKE 853,B2:POKE
         856,N16:POKE 857,N0
LC 1630 X=USR(ADR(CIO$),N16)
HD 1640 POKE 850,N7:POKE 852
        ,B1:POKE 853,B2:POKE
         856,N16:POKE 857,N1
        4
LE 1650 X=USR(ADR(CIO$),N16)
PP 1660 CLOSE #N1:RETURN
CA 1670 REM [COLOR PALETTE]
BE 1680 POKE 731,N255:TRAP 4
        0000
MN 1690 RESTORE 3620:FOR A=N
        0 TO 51:READ B:POKE
        PAGE6+A,B:NEXT A
FA 1700 FOR I=N1 TO N5:POKE
        PAGE6+I,COLOUR(I-N1)
NJ 1710 B1=PEEK(PAGE6+I)+N10
        :T=B1-N256*(B1>N255)
        :POKE PAGE6+I+N6-N1,
        T:NEXT I
JC 1720 GRAPHICS N0:POKE N71
        0,N0
IA 1730 GOSUB 1480:DL=PEEK(5
        60)+N256*PEEK(561):F
        OR I=DL+N10 TO DL+N2
        +N16 STEP N2:POKE I,
        PEEK(I)+N128:NEXT I
FL 1740 POKE 512,N11:POKE 51
        3,N6:POKE 54286,192
KB 1750 C$=CHR$(N0):C$(N24)=
        C$:C$(N2)=C$
BK 1760 REM [GET COLOR PRINT
        INFO]
CC 1770 ? "(DOWN)Set Colors
        to Print:";? "0=[WHIT
        E]  1=YELLOW  2=RED
        (4 SPACES)3=ORANGE"
DB 1780 ? "4=BLUE(3 SPACES)5
        =GREEN(3 SPACES)6=VI
        OLET 7=BLACK"
HD 1785 POSITION N0,N4:? "CO
        LOR":POSITION N0,N5:
        ? "LUME"
JE 1790 FOR Y=N6 TO N12 STEP
         N2:B1=COLOUR(INT((Y
        -N6)/N2)):B2=INT(B1/
        N16):B3=B1-B2*N16
IB 1792 POSITION N2,Y:? B2;P
        OSITION N2,Y+N1:? B3
JD 1795 FOR X=N10 TO N30 STE
        P N10:POSITION X,Y:?
         N0;POSITION X,Y+N1:
        ? N0;NEXT X:NEXT Y
MP 1797 POSITION N2,N16:? "P
        ress(B)[START](V)to ex
        it Color Menu"
MN 1800 CLOSE #N5:OPEN #N5,N
        4,N0,"K:":X=N10:Y=N6
        :POSITION X,Y:? "
        (RIGHT)(LEFT)";
FL 1810 IF PEEK(CONSOL)=N6 T
        HEN 1940
ML 1820 IF PEEK(CH)=N255 THE
        N 1810
AF 1830 POSITION X,Y:? "
        (RIGHT)(LEFT)";:GET
        #N5,KP:POKE CH,N255:
        C=(Y-N6)*N3+X/N10
EB 1840 IF KP>47 AND KP<56 T
        HEN ? CHR$(KP);:C$(C
        ,C)=CHR$(KP-N48):X=X
        +N10:GOTO 1890
JA 1850 IF KP=28 OR KP=45 TH
        EN Y=Y-N1:GOTO 1890
IO 1860 IF KP=29 OR KP=61 TH
        EN Y=Y+N1:GOTO 1890
AF 1870 IF KP=N30 OR KP=43 T
        HEN X=X-N10:GOTO 189
        0
LB 1880 IF KP=31 OR KP=42 TH
        EN X=X+N10:GOTO 1890
OO 1890 IF X>N30 THEN Y=Y+N1
        :X=N10
BL 1900 IF Y>13 THEN Y=N6:X=
        N10
OH 1910 IF X<N10 THEN Y=Y-N1
        :X=N30
BN 1920 IF Y<N6 THEN Y=13:X=
        N30
JB 1930 POSITION X,Y:? "
        (RIGHT)(LEFT)";:GOTO
         1810
FO 1940 CLOSE #N5:POKE 752,N
        1:POSITION N2,N16:?
        "Working; Please sta
        nd by...(4 SPACES)"
JN 1942 FOR Y=N15 TO N0 STEP
        -0.5:SOUND N0,N101,
        N10,Y:NEXT Y
LK 1945 PIX$=CHR$(N0):PIX$(N
        48-N4)=PIX$:PIX$(N2)
        =PIX$
CA 1950 BYTE=N0:STRING=ADR(P
        IX$):FOR C=N1 TO N24
         STEP N6:FOR B=N0 TO
         N2:X=ASC(C$(C+B))
KC 1960 BLUE=INT(X/N4):X=X-B
        LUE*N4
IJ 1970 RED=INT(X/N2):YELLOW
        =X-RED*N2
MN 1980 POKE STRING+BYTE,YEL
        LOW:POKE STRING+BYTE
        +N12,RED:POKE STRING
        +BYTE+N24,BLUE:BYTE=
        BYTE+N1:NEXT B
MN 1990 BYTE=BYTE-N3:FOR B=N
        3 TO N5:X=ASC(C$(C+B
        ))
JE 2000 BLUE=INT(X/N4):X=X-B
        LUE*N4
ML 2010 RED=INT(X/N2):YELLOW
        =X-RED*N2
LC 2020 POKE STRING+BYTE,PEE
        K(STRING+BYTE)+YELLO
        W*N2
BK 2030 POKE STRING+BYTE+N12
        ,PEEK(STRING+BYTE+N1
        2)+RED*N2
LO 2040 POKE STRING+BYTE+N24
        ,PEEK(STRING+BYTE+N2
        4)+BLUE*N2
KH 2050 BYTE=BYTE+N1:NEXT B:
        NEXT C:RETURN
OO 2060 REM [ADJUST COLOR SHAD
        ES]
HI 2070 POKE N712,N0:POKE N7
        08,N4:POKE N709,N8:P
        OKE N710,N12:CLOSE #
```

```
        N5:OPEN #N5,N4,N0,"K
        :"
BJ 2075 GOSUB 2900
FB 2080 IF PEEK(CONSOL)=N6 T
        HEN 2160
HL 2090 IF PEEK(CH)=N255 THE
        N 2080
BK 2100 GET #N5,KP:POKE CH,N
        255
AH 2110 IF KP=N48+N1 THEN PO
        KE N712,PEEK(N712)+N
        4
DE 2120 IF KP>N48+N1 AND KP<
        N48+N5 THEN POKE 706
        +KP-N48,PEEK(706+KP-
        N48)+N4
BF 2130 FOR I=N708 TO N712:P
        OKE I,PEEK(I)*(PEEK(
        I)<N16):NEXT I
MK 2140 GOTO 2080
MB 2150 REM POKE COLOR REG
        DATA INTO DUMP$
HA 2160 POKE (ADR(DUMP$)+N10
        1),N9-PEEK(N712)/N4*
        N3
BJ 2170 FOR I=N1 TO N3:POKE
        (ADR(DUMP$)+N101+I),
        N9-PEEK(N707+I)/N4*N
        3:NEXT I
MF 2180 CLOSE #N5:POKE CH,N2
        55:CLF=N0:RETURN
GH 2190 GRAPHICS N40+N1:GOSU
        B 1480:LET DUMP$=GR9
        DUMP$:GOSUB 2900
OG 2195 IF GMODE=N8 THEN GRA
        PHICS N40+N16:GOSUB
        1480:LET DUMP$=GR15D
        UMP$:RESTORE 3135:GO
        SUB 2900
FL 2197 IF GMODE=N8 THEN FOR
         I=N0 TO N12-N1:READ
         B1:LET DUMP$(N106+I
        )=CHR$(B1):NEXT I
JH 2200 IF PEEK(CONSOL)=N3 T
        HEN X=USR(ADR(REV$))
CA 2210 IF PEEK(CONSOL)=N6 T
        HEN 260
KD 2220 GOTO 2200
AH 2890 REM {B}ADD TEXT LINE
        AT TOP{V}
CO 2900 DL=PEEK(560)+N256*PE
        EK(561):Q=PEEK(N559)
        :POKE N559,N0
PD 2910 DL=DL-N2:POKE DL,112
        :POKE DL+N1,112:B2=I
        NT(DL/N256):B1=DL-B2
        *N256
IL 2920 POKE DL+202,B1:POKE
        DL+203,B2:POKE 560,B
        1:POKE 561,B2
ED 2930 B2=INT(MSG/N256):B1=
        MSG-B2*N256
FL 2940 POKE DL+N3,B1:POKE D
        L+N4,B2:POKE DL+N2,6
        6
FF 2950 IF GMODE=N8 OR GMODE
        =N9 THEN GRF1$="  OP
        TION TO INVERT
        {5 SPACES}START TO P
        RINT  "
BB 2960 IF  NOT CLF AND GMOD
        E=N15 THEN GRF1$="
        1 2 3 4 FOR SHADES
        {3 SPACES}START TO P
        RINT  "
BO 2980 POKE N559,Q:FOR I=N0
         TO N40-N1:POKE MSG+
        I,PEEK(ADR(GRF1$)+I)
        -N32:NEXT I
BH 2990 POKE 195,N1:RETURN
OG 3050 RESTORE 3120:FOR I=1
        06 TO 117:READ B1:GR
        15DUMP$(I)=CHR$(B1):
        NEXT I
IH 3120 REM PIXEL DATA FOR
        B&W
BF 3130 DATA 0,0,0,1,0,2,1,2
        ,1,3,3,3
BM 3135 DATA 3,3,3,3,3,0,0,0
        ,3,0,0,0
PJ 3140 REM 24 BYTES
PJ 3240 REM KOALA LOADER PR
        GE 6 DATA
HM 3250 DATA 162,16,169,1,15
        7,72,3,169,0,157,73,
        3,32,86,228,48,1,96,
        104,104,96
PK 3270 REM 21 BYTES
HF 3610 REM COLOR MENU DLI
        DATA
ON 3620 DATA 0,0,0,0,0,0,0,10,
        10,10,10,10,72,138,7
        2,152,72
LL 3630 DATA 169,255,141,10,
        212,174,0,6,189,1,6,
        141,24,208,189,6
MA 3640 DATA 6,141,23,208,23
        2,224,5,208,2,162,0,
        142,0,6,104,168
JI 3650 DATA 104,170,104,64
AB 3660 REM 52 BYTES
CF 3700 RESTORE 3740:B1=N1
AK 3710 TRAP 3720:READ B2:GR
        9DUMP$(B1)=CHR$(B2):
        B1=B1+N1:GOTO 3710
KM 3720 RETURN
EI 3740 DATA 104,104,133,204
        ,104,133,203,104,133
        ,206,104,133,205,160
        ,0,24
ED 3750 DATA 177,205,41,240,
        106,106,106,106,32,3
        0,6,76,53,6,170,152
CD 3760 DATA 72,189,92,6,170
        ,160,0,189,107,6,145
        ,203,232,200,192,6
MO 3770 DATA 208,245,104,168
        ,96,24,169,6,101,203
        ,133,203,165,204,105
        ,0
DL 3780 DATA 133,204,177,205
        ,41,15,32,30,6,24,16
        9,6,101,203,133,203
CX 3790 DATA 165,204,105,0,1
        33,204,200,192,40,20
        8,180,96
AC 3800 REM 93 BYTES
BK 3810 REM OFFSET FOR GR9
        DATA
FE 3820 DATA 0,6,6,12,18,24,
        24,30,36,42,42,48,54
        ,60,60,66
AA 3830 REM 16 BYTES
KB 3840 REM GR9 PIXEL DATA
NC 3850 DATA 3,3,3,3,3,3,3,2
        ,3,3,3
KE 3860 DATA 3,3,2,3,2,3,2,1
        ,2,3,2,3,2,1,2,3
JB 3870 DATA 2,1,2,1,2,1,2,1
        ,2,1,2,1,0,1,2,1
IK 3880 DATA 2,1,0,1,0,1,0,1
        ,0,1,0,1,0,0,0,1
BP 3890 DATA 0,0,0,0,0,1,0,0
        ,0,0,0,0,0
AD 3900 REM 48 BYTES
KG 3910 REM INSTRUCTIONS
AA 3930 DATA The menu will d
        isplay all filenames
        ,except those with t
        he following
FD 3940 DATA filename extens
        ions: SYS COM BAS SA
        V
BM 3950 DATA Use the arrow k
        eys to highlight the
HJ 3960 DATA file you wish t
        o load; press a numb
        er
BE 3970 DATA key to get a ne
        w directory;
BD 3980 DATA or press {B}SEL
        ECT{V} to load the,h
        ighlighted file.
AK 3990 DATA After the pictu
        re appears
BF 4000 DATA press {B}C{V} f
        or a color print;
DI 4010 DATA press {B}M{V} f
        or a monochrome prin
        t;
FK 4015 DATA press {B}8{V} f
        or a Graphics 8 prin
        t;
PP 4020 DATA press {B}9{V} f
        or a Graphics 9 prin
        t.,\,
HP 4030 DATA If you select G
        raphics 8 or 9 you c
        an
DE 4040 DATA press {B}OPTION
        {V} to invert all sc
        reen
JK 4050 DATA colors.  Repeat
         as desired.,\,
OD 4060 DATA For a monochrom
        e print press,{B}1
        {V}{B}2{V}{B}3{V} or
         {B}4{V} to adjust t
        he
PH 4070 DATA gray shades on
        the screen.  The
GE 4080 DATA printed picture
         will follow the
JF 4090 DATA screen shades.,
        \
LB 4100 DATA A color print w
        ill pause after you
PC 4110 DATA press {B}C{V} w
        hile the color menu
        is
MB 4120 DATA created.  When
        it appears the top
LP 4130 DATA of the screen w
        ill list the colors
ML 4140 DATA available and t
        he four color bands
MF 4150 DATA display your cu
        rrent choices. Press
MH 4160 DATA a number key to
         select a color or
IE 4170 DATA an arrow key to
         move the cursor.,\,
JH 4230 DATA The {B}START
        {V} key ends the adj
        ustment
AH 4240 DATA phase of all du
        mps: Be sure the
BF 4250 DATA printer is set
        up for the type of
PK 4270 DATA in place; paper
         positioned properly
        )
JB 4280 DATA and press {B}ST
        ART{V} to print it;
MB 4290 DATA or press {B}SEL
        ECT{V} to return to
        the
EH 4300 DATA title page with
        out printing.
```

Program 2: Data Line Maker

```
MI 10 REM COPYRIGHT 1988
EF 20 REM COMPUTE! PUBLICATI
      ONS, INC.
HP 30 REM ALL RIGHTS RESERVE
      D.
HH 180 REM
```

```
MO 1020 GRAPHICS 0:POKE 710,
        10:POKE 712,128:POKE
         709,0:POKE 752,1:?
EJ 1025 ? "Please insert dis
        k containing":? :? "
        MAIN.LST in Drive 1
        and":? :? "press
        (B)START(V)"
HG 1030 IF PEEK(53279)<>6 TH
        EN 1030
DO 1035 ? CHR$(125):? :? "Wr
        iting DATALINE.LST":
        ? :? "Please Wait...
        "
JF 1040 DIM GR15DUMP$(117),C
        IO$(7)
FC 1050 DIM INV$(30),ADD$(11
        0),REV$(30)
FB 1060 DIM DUMP$(189),CRYPT
        $(300),KOALA$(342)
GN 1065 CLOSE #1:OPEN #1,8,0
        ,"D:DATALINE.LST"
MC 1070 RESTORE 3010:FOR I=1
         TO 7:READ B1:CIO$(I
        )=CHR$(B1):NEXT I
AB 1075 ? #1;"3010 CIO$=";CH
        R$(34);CIO$;CHR$(34)
HP 1080 RESTORE 3040:FOR I=1
         TO 105:READ B1:GR15
        DUMP$(I)=CHR$(B1):NE
        XT I
MM 1085 ? #1;"3040 GR15DUMP$
        =";CHR$(34);GR15DUMP
        $(1,60);CHR$(34)
PC 1087 ? #1;"3045 GR15DUMP$
        (61)=";CHR$(34);GR15
        DUMP$(61,105);CHR$(3
        4)
DD 1090 RESTORE 3160:FOR I=1
         TO 110:READ B1:ADD$
        (I)=CHR$(B1):NEXT I
OF 1095 ? #1;"3160 ADD$=";CH
        R$(34);ADD$;CHR$(34)
KK 1110 RESTORE 3530:FOR I=1
         TO 42:READ B1:CRYPT
        $(I)=CHR$(B1):NEXT I
MM 1115 ? #1;"3530 CRYPT$=";
        CHR$(34);CRYPT$
AI 1120 RESTORE 3580:FOR I=1
         TO 30:READ B1:INV$(
        I)=CHR$(B1):NEXT I
BJ 1125 ? #1;"3580 INV$=";CH
        R$(34);INV$
AK 1130 RESTORE 3680:FOR I=1
         TO 30:READ B1:REV$(
        I)=CHR$(B1):NEXT I
BL 1135 ? #1;"3680 REV$=";CH
        R$(34);REV$
LI 1150 RESTORE 3280:FOR I=1
         TO 342:READ B1:IF B
        1=155 THEN B1=0
LB 1155 KOALA$(I)=CHR$(B1):N
        EXT I
EF 1160 ? #1;"3280 KOALA$=";
        CHR$(34);KOALA$(1,75
        )
GP 1165 ? #1;"3290 KOALA$(76
        )=";CHR$(34);KOALA$(
        76,150)
LH 1170 ? #1;"3300 KOALA$(15
        1)=";CHR$(34);KOALA$
        (151,227)
EK 1175 ? #1;"3310 KOALA$(22
        8)=CHR$(155)"
HG 1180 ? #1;"3320 KOALA$(22
        9)=";CHR$(34);KOALA$
        (229,300)
LH 1185 ? #1;"3330 KOALA$(30
        1)=";CHR$(34);KOALA$
        (301,342)
PL 1200 CLOSE #1:? :? "Finis
        hed!":POKE 752,0:? :
        END

KG 3000 REM CIO STRING DATA
        
LE 3010 DATA 104,104,104,170
        ,76,86,228
EN 3020 REM 7 BYTES
FI 3030 REM DUMP DATA: COLO
        R & BAK
EN 3040 DATA 104,104,133,207
        ,104,133,206,104,133
        ,209,104,133,208,160
        ,0,24
EL 3050 DATA 177,208,41,192,
        106,106,106,106,106,
        106,32,32,6,76,68,6
KC 3060 DATA 170,152,72,189,
        101,6,170,160,0,189,
        105,6,145,206,232,20
        0
AM 3070 DATA 192,3,208,245,1
        04,168,169,3,24,101,
        206,133,206,165,207,
        105
EN 3080 DATA 0,133,207,96,17
        7,208,41,48,106,106,
        106,106,32,32,6,177
BN 3090 DATA 208,41,12,106,1
        06,32,32,6,177,208,4
        1,3,32,32,6,200
LC 3100 DATA 192,40,208,171,
        96,0,3,6,9
KG 3110 REM 105 BYTES
PO 3150 REM STRING ADDER DA
        TA
ML 3160 DATA 104,104,133,209
        ,104,133,208,104,133
        ,211,104,133,210,104
        ,133,213
OB 3170 DATA 104,133,212,104
        ,133,215,104,133,214
        ,104,133,217,104,133
        ,216,104
MG 3180 DATA 104,133,218,169
        ,0,168,24,177,210,10
        ,10,113,208,145,208,
        24
FF 3190 DATA 177,212,10,10,1
        0,10,113,208,145,208
        ,24,177,214,10,10,10
FB 3200 DATA 10,10,10,113,20
        8,166,218,224,0,240,
        1,106,41,127,145,208
AM 3210 DATA 200,240,8,166,2
        17,224,0,208,205,240
        ,14,198,217,230,209,
        230
CP 3214 REM THE FOLLOWING LI
        NE REPLACES LINE 321
        0 FOR NP-10 PRINTERS
HM 3215 REM DATA 200,240,8,2
        34,234,234,234,234,2
        34,234,234,234,217,2
        30,209,230
PB 3220 DATA 211,230,213,230
        ,215,169,0,240,189,1
        96,216,208,185,96
KF 3230 REM 110 BYTES
GB 3280 REM KOALA LOADER ST
        RING DATA
AB 3290 DATA 104,162,16,169,
        7,157,66,3,169,232,1
        57,68,3,169,0,157
CJ 3300 DATA 69,3,169,1,157,
        72,3,169,0,157,73,3,
        169,0,133,224
LH 3310 DATA 32,0,6,165,224,
        201,7,240,13,201,13,
        240,16,201,26,240
GG 3320 DATA 60,230,224,24,1
        44,234,165,232,133,2
        34,24,144,244,165,23
        2,141
JP 3330 DATA 196,2,230,224,3
        2,0,6,165,232,141,19
        7,2,230,224,32,0
OB 3340 DATA 6,165,232,141,1
        98,2,230,224,32,0,6,
        165,232,141,199,2
AE 3350 DATA 230,224,32,0,6,
        165,232,141,200,2,24
        ,144,196,169,0,133
IF 3360 DATA 236,133,230,165
        ,88,133,224,133,228,
        165,89,133,225,133,2
        29,32
IA 3370 DATA 0,6,192,136,240
        ,94,169,0,133,227,16
        5,232,41,128,133,235
HD 3380 DATA 165,232,41,127,
        133,226,208,14,32,0,
        6,165,232,133,227,32
CE 3390 DATA 0,6,165,232,133
        ,226,198,226,165,235
        ,208,28,32,0,6,165
MK 3400 DATA 232,133,233,24,
        144,47,198,226,169,2
        55,197,226,208,245,1
        98,227
OJ 3410 DATA 169,255,197,227
        ,208,237,240,183,32,
        0,6,165,232,133,233,
        24
BJ 3420 DATA 144,19,198,226,
        169,255,197,226,208,
        238,198,227,169,255,
        197,227
EN 3430 DATA 208,230,240,155
        ,96,169,2,197,234,24
        0,82,240,201,165,233
        ,160
MM 3440 DATA 0,145,224,24,16
        9,80,101,224,133,224
        ,169,0,101,225,133,2
        25
AB 3450 DATA 230,230,169,96,
        197,230,208,47,169,1
        ,197,236,208,24,24,1
        69
BA 3460 DATA 1,101,228,133,2
        28,133,224,169,0,133
        ,236,133,230,101,229
        ,133
EN 3470 DATA 229,133,225,24,
        144,17,230,236,24,16
        9,40,101,228,133,224
        ,169
KF 3480 DATA 0,133,230,101,2
        29,133,225,165,235,2
        40,176,208,149,165,2
        33,160
JL 3490 DATA 0,145,224,24,16
        9,1,101,224,133,224,
        169,0,101,225,133,22
        5
FI 3500 DATA 165,235,240,151
        ,208,229
KN 3510 REM 342 BYTES
OE 3520 REM POKER DECRYPT D
        ATA
BJ 3530 DATA 104,104,133,204
        ,104,133,203,104,133
        ,205,230,205,104,170
        ,232,104
PK 3540 DATA 104,133,206,160
        ,0,177,203,69,206,14
        5,203,230,206,208,20
        8,2
DP 3550 DATA 230,204,202,208
        ,240,198,205,208,236
        ,96
PP 3560 REM 42 BYTES
FH 3570 REM STRING INVERT DA
        TA
BH 3580 DATA 216,104,104,133
        ,204,104,133,203,169
        ,0,168,162,11,177,20
        3,73
```

```
LE 3590 DATA 128,145,203,200
        ,202,200,246,96
PK 3600 REM 24 BYTES
LJ 3670 REM FULL SCREEN INS
        ERT DATA
JB 3680 DATA 216,104,165,89,
        133,204,165,88
FH 3690 DATA 133,203,169,0,1
        60,162,31,177
KL 3700 DATA 203,73,255,145,
        203,200,200,247
CB 3710 DATA 230,204,202,208
        ,242,96
PK 3720 REM 30 BYTES
```

Program 3: Line Changes For Okimate 10

```
BL 40 REM FOR OKIMATE-10 PR
      INTER
BN 320 TRAP 970:CLOSE #N1:OP
       EN #N1,N8,N0,"P:":? #
       N1;CHR$(27);CHR$(66);
       CHR$(27);CHR$(37)
JP 350 DM=PEEK(88)+N256*PEEK
       (89):PA88=N0
CP 360 FOR Y=N0 TO 191-50*(P
       TYPE=N1) STEP 3.5:LIN
       E=DM
BE 370 IF CLF THEN FOR C=N0
       TO N2:FOR I=N0 TO N3:
       POKE PA8E6+N101+I,C*N
       12+I*N3:NEXT I:DM=LIN
       E
LI 465 IF  NOT CLF THEN 500
JJ 470 IF C=N0 THEN ? #N1;CH
       R$(153);
BN 480 ? #N1;8RF1$:IF C=N2 T
       HEN ? #N1;CHR$(138);C
       HR$(N14);
BP 490 NEXT C
AM 500 IF  NOT CLF THEN ? #N
       1;8RF1$;CHR$(138);CHR
       $(N14);
AE 510 PA88= NOT PA88:NEXT Y
PB 520 ? #N1;CHR$(145):CLOSE
        #N1
ME 1160 ? #N6;"(4 SPACES)Scr
        een dumps":? #N6;"
        (6 SPACES)FOR  THE":
        ? #N6;"(5 SPACES)oki
        mate-10"
BN 3920 DATA This screen dum
        p program is set up,
        for the OKIMATE-10 p
        rinter.
KB 4260 DATA dump chosen (ri
        bbon or thermal pape
        r
```

Program 4: Line Changes For Epson

```
MN 40 REM FOR EPSON/COMPATI
      BLE PRINTER
MO 240 GOSUB 2240
FL 320 TRAP 970:CLOSE #N1:OP
       EN #N1,N8,N0,"P:":? #
       N1;CHR$(27);CHR$(65);
       CHR$(N7):REM 7777" L
       INE FEEDS
BO 340 TRAP 970
BF 350 IF CLF THEN FOR C=N0
       TO N2:FOR I=N0 TO N3:
       POKE PA8E6+N101+I,C*N
       12+I*N3:NEXT I:GOSUB
       2250
KA 360 DM=PEEK(88)+N256*PEEK
       (89):PA88=N0
AM 370 FOR Y=N0 TO 191-50*(P
       TYPE=N1) STEP 3.5
CO 460 X=USR(ADR(ADD$),ADR(8
       RF4$),ADR(8RF3$),ADR(
       8RF2$),ADR(8RF1$),N48
       0,PA88)
OB 490 ? #N1;CHR$(27);"K";CH
       R$(224);CHR$(N1);8RF4
       $
AD 500 PA88= NOT PA88:NEXT Y
KL 510 IF CLF THEN NEXT C
MK 520 ? #N1:CLOSE #N1
KB 1160 ? #N6;"(4 SPACES)Scr
        een dumps":? #N6;"
        (8 SPACES)FOR":? #N6
        ;"epson-type printer
        s"
CF 1480 POKE N16,N16*N7:POKE
         53774,PEEK(N16):RET
        URN
KA 1770 POKE 82,N1:? "(DOWN)
        Set Colors to Print:
        ":? "0=WHITE  1=YELL
        OW  2=RED(5 SPACES)3
        =ORANGE"
FE 2230 REM RESTORE SCREEN
        AND COLORS
AM 2240 8RAPHICS N63:8OSUB 1
        480:FOR I=N1 TO N3:P
        OKE N707+I,COLOUR(I)
        :NEXT I:POKE N712,CO
        LOUR(N0):RETURN
MC 2250 REM CHANGE RIBBONS
MF 2260 POKE N106,TOP-N32:8R
        APHICS N2+N16:? #N6:
        ? #N6;"(4 SPACES)ALI
        8N PAPER;":? #N6
BE 2270 ? #N6;" LOAD ";:IF C
        =N0 THEN ? #N6;"YELL
        OW";:POKE N712,N24:P
        OKE N708,N16*N7
DL 2280 IF C=N1 THEN ? #N6;"
          RED  ";:POKE N712,
        N48
BE 2290 IF C=N2 THEN ? #N6;"
         BLUE ";:POKE N712,N
        16*N7
FI 2300 ? #N6;" RIBBON":? #N
        6:? #N6;"(4 SPACES)P
        RESS RETURN":? #N6;"
        (5 SPACES)WHEN READY
        "
8B 2310 POKE 764,N255:CLOSE
        #N5:OPEN #N5,N4,N0,"
        K:"
OC 2320 8ET #N5,K:IF K<>155
        THEN 2310
D8 2330 POKE N106,TOP:8OTO 2
        240
EN 3920 DATA This screen dum
        p program is set up,
        for EP8ON-type print
        ers.
CP 4180 DATA You will need t
        hree ribbons for a,c
        olor print: blue; ye
        llow; and red.
8B 4190 DATA The screen will
         prompt you for the,
        correct ribbon color
        .,\,
CN 4200 DATA (8)IMPORTANT!
        (V),Be sure to make
        an 'alignment mark',
        at the top of the pa
        ge before
FA 4210 DATA starting a colo
        r print (Align paper
        ;,mark left edge wit
        h fine pencil
CA 4220 DATA where it crosse
        s the tear-off bar).
        , ,Pin-feed paper wi
        ll work best.,\,
AL 4260 DATA dump chosen (ri
        bbon and paper
```

Program 5: Line Changes For Big Blue Printer

```
JB 40 REM FOR "BIG BLUE" PR
      INTER
CC 320 TRAP 970:CLOSE #N1:OP
       EN #N1,N8,N0,"P:"
80 340 TRAP 970
KA 360 DM=PEEK(88)+N256*PEEK
       (89):PA88=N0
AM 370 FOR Y=N0 TO 191-50*(P
       TYPE=N1) STEP 3.5
CO 460 X=USR(ADR(ADD$),ADR(8
       RF4$),ADR(8RF3$),ADR(
       8RF2$),ADR(8RF1$),N48
       0,PA88)
IN 490 ? #N1;"(4 SPACES)";CH
       R$(27);"K";CHR$(224);
       CHR$(1);8RF4$;CHR$(27
       );"A";CHR$(7)
AD 500 PA88= NOT PA88:NEXT Y
MK 520 ? #N1:CLOSE #N1
EM 630 POSITION N2,N10+N10:?
        #N1;"After Loading p
       ress S, S, or M(V)"
PH 930 8ET #N5,KP:IF KP<>77
       AND KP<>56 AND KP<>57
        THEN 930:REM ONLY "
       M", "8" OR "9" ACCEPT
       ED
MK 1160 ? #N6;"(4 SPACES)Scr
        een dumps":? #N6;"
        (6 SPACES)FOR  THE":
        ? #N6;"big blue prin
        ter"
CF 1480 POKE N16,N16*N7:POKE
         53774,PEEK(N16):RET
        URN
DL 3920 DATA This screen dum
        p program is set up,
        for the Big Blue pri
        nter.
PH 4260 DATA dump chosen (tu
        rned on, paper
```

Program 6: Line Changes For Star NP-10

```
DC 40 REM (8)FOR THE STAR NP
      -10 PRINTER(V)
FN 320 TRAP 970:CLOSE #N1:OP
       EN #N1,N8,N0,"P:":? #
       N1;CHR$(27);CHR$(65);
       CHR$(N8):REM 8/22" L
       INE FEEDS
ON 370 FOR Y=N0 TO 191-50*(P
       TYPE=N1) STEP N4
MF 450 DM=DM+N40
CN 500 NEXT Y
DI 1160 ? #N6;"(4 SPACES)Scr
        een dumps":? #N6;"
        (8 SPACES)FOR":? #N6
        ;"star np-10 printer
        s"
BE 2260 ? #N1;CHR$(27);CHR$(
        12);:POKE N106,TOP-N
        32:8RAPHICS N2+N16:?
         #N6:? #N6:? #N6
8N 3920 DATA This screen dum
        p program is set up,
        for the Star NP-10 p
        rinter.
DI 4200 REM DELETE LINE 4200
        & 4210
ON 4220 DATA Pin-feed paper
        will work best.,\,
```

The Pyramid Game

Ronald Bobo

Test your problem-solving abilities with this intriguing puzzle for the Amiga. Careful attention to detail and great graphics make this game an impressive one. 512K of memory and Workbench 1.2 are required.

"The Pyramid Game" is a classic strategy puzzle that demonstrates the power of Amiga Basic. It's a stacking game in which you rearrange disks on a stick, attempting to sort them by size.

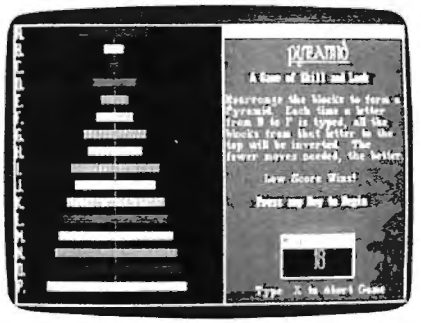
I wrote the first version of The Pyramid Game in C for an IBM-compatible computer. Suprisingly, the Amiga Basic version is nearly as fast as the original.

The Pyramid Game requires luck, skill, and logic for the best scores. If you're a programmer, take a close look at the Amiga Basic listing. You'll learn about using fonts in BASIC programs. You'll also learn how to move graphic images quickly.

Typing It In

The Pyramid Game is written entirely in Amiga Basic. Type it in and save it to disk.

The Pyramid Game requires two system files: graphics.bmap and diskfont.bmap. You can find these files on your Extras disk. Use the CLI to copy them from the Extras disk to the libs directory of your Workbench disk. The Pyramid Game uses several system fonts, so be sure to boot up with a Workbench disk that has all the fonts (the Workbench disk that came with your computer should work.)



In this game, the player is well on the way to solving the puzzle.

To run The Pyramid Game, simply double-click on its icon from the Workbench. AmigaBASIC will load, and The Pyramid game will start automatically. It is very important to start the program by double-clicking on it's icon, rather than loading Amiga Basic from the CLI, otherwise you'll get an "Out of heap space" error on an Amiga with 512K of memory. Don't try to run other programs at the same time; otherwise, you'll get the same error.

Solving The Puzzle

When the game begins, you'll see the title screen. Press a key to begin. The Pyramid Game is divided into two windows. The left window shows the puzzle itself. The right window shows the status of the game, including how many moves you've made and how to exit the game.

The puzzle is a stack of 16 rectangluar pieces, each a different size. The pieces are scrambled at the beginning of the game; press a key to stop the movement.

Each position is labeled with a letter from *A* to *P*. When a corresponding key is pressed, all pieces from that letter to the top are inverted. For example, if you press the D key, the piece at *A* will swap places with the piece at *D*, and the piece at *B* will swap places with the piece at *C*.

With a little luck and some careful thought, you should be able to arrange the pieces into a pyramid. When you've solved the puzzle, a window labeled "options" appears on the screen. This window gives you a short menu. You can choose X to exit the game, R to replay the same game, or N to start a new one.

The R option is useful when you want to try to better your previous score with the same puzzle, or when you're competing with a friend. Use the N option for a new configuration of the puzzle pieces.

Incidentally, you should *not* exit from the game with the Amiga Basic Quit menu option, or with Control-C. If you do, the custom screen used by The Pyramid Game remains open, and thus uses valuable memory.

About The Program

The Amiga Basic GET and PUT statements use the powerful Amiga hardware to move image blocks, so they're very fast. The 16 puzzle pieces are first drawn on the screen with line commands, and then stored in a two-dimensional array with the GET command. Another array is used to keep track of the position of the pieces as they are shuffled and then moved.

The Pyramid Game also demonstrates how to use disk-based fonts in Amiga Basic.

The Pyramid Game

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
REM         --=<  PYRAMID Game - BASIC Version Co
pyright c  1988<
<
<
DEFLNG a-w<
REM --=< DECLARE FUNCTIONS AND NAME LIBRARIES US
ED IN PROGRAM<
<
LIBRARY "graphics.library"<
LIBRARY "diskfont.library"<
DECLARE FUNCTION OpenFont() LIBRARY<
DECLARE FUNCTION OpenDiskFont() LIBRARY<
<
Font$="":height%=0:DIM Font(5)<
CALL SetUpFonts(Font$,height%,Font())<
DEFSNG barray,temp<
Bsize=140<
DIM barray(Bsize,15),temp%,HoLder%(15),Backup%(1
5),Work%(15)<
FOR Count%=0 TO 15:HoLder%(Count%)=Count%:NEXT<
RANDOMIZE TIMER<
<
REM --=< CREATE CUSTOM SCREEN AND WINDOW<
<
SCREEN 1,640,200,3,2<
IF TDispLay = 1 GOTO Game<
WINDOW 2,"The Pyramid Game -  COMPUTE! Publicati
ons, Inc.",,22,1<
<
REM --=< INITIALIZE VARIABLES<
<
Under$=STRING$(50,176)<
<
REM --=< SET UP COLORS<
<
PALETTE 4,.47,.87,1<
PALETTE 5,.99,0,0  'Fire engine red<
PALETTE 6,1,.85,.13 'YeLLow<
PALETTE 7,.33,.87,0<
<
IF TDispLay = 1 GOTO Game<
REM :: -=< DISPLAY TITLE SCREEN:<
<
attr=1<
CALL SetFont (WINDOW(8),Font(1))<
CALL SetSoftStyLe (WINDOW(8),attr,255)<
COLOR 5,2:CLS<
LOCATE 3,13<
CALL PrLine ("P Y R A M I D")<
CALL SetFont (WINDOW(8),Font(2))<
attr=2<
CALL SetSoftStyLe (WINDOW(8),attr,255)<
COLOR 1,2<
LOCATE 10,15<
CALL PrLine("A Game of Skill and Luck")<
attr=0<
CALL SetSoftStyLe (WINDOW(8),attr,255)<
LOCATE 12,9<
CALL SetFont (WINDOW(8),Font(3))  <
COLOR 6,2<
CALL PrLine ("COMPUTE! Publications, Inc.  Copyr
ight 1988")<
LOCATE 15,12<
COLOR 5,2<
CALL PrLine ("All  Rights  Reserved")<
CALL SetFont (WINDOW(8),Font(0))<
COLOR 7,2<
CenterString 14, Under$<
CenterString 20, Under$<
COLOR 4,2<
CenterString 22,"Press any key..."<
a$=INPUT$(1)<
WINDOW CLOSE 2<
<
Game:<
y=110:x1=320:y1=120<
x=310<
WINDOW 3,,(0,0)-(340,186),16,1<
COLOR 6,2:CLS<
WINDOW 4,"Pyramid",(340,0)-(630,186),16,1<
PALETTE 5,.99,0,0  'Fire engine red<
PALETTE 6,1,.85,.13 'YeLLow<
COLOR 6,5<
CLS<
WINDOW OUTPUT 3<
COLOR 6,2<
<
REM --=< PRINT LETTERS ON LEFT SIDE OF WINDOW 3<
CALL SetFont (WINDOW(8),Font(4))<
CALL SetSoftStyLe (WINDOW(8),attr,255)<
LOCATE 1,1<
FOR x=1 TO 15<
  PRINT CHR$(x+64)+"."<
NEXT<
PRINT "P.";<
<
REM --=< GENERATE GAME BLOCKS<
LINE(162,6)-(164,181),5,bf<
w=155:x=1:y=170:z=6:co=0<
FOR Count%=0 TO 15<
  LINE(w,x)-(y,z),co,bf<
  co=co+1:IF co=2 THEN co=co+1<
  IF co=8 THEN co=0<
  w=w-7:y=y+7:x=x+12:z=z+12<
NEXT<
w=36:x=1:y=275:z=6<
<
REM --=< AND STORE IN ARRAY barray()<
FOR Count%=0 TO 15<
  GET(w,x)-(y,z),barray(0,Count%)<
  x=x+12:z=z+12<
NEXT<
<
REM --=< PRINT INSTRUCTIONS IN WINDOW 4<
WINDOW OUTPUT 4<
attr=1<
CALL SetFont (WINDOW(8),Font(1))<
CALL SetSoftStyLe (WINDOW(8),attr,255)<
COLOR 6,5:CLS<
LOCATE 1,6<
CALL PrLine ("PYRAMID")<
attr=0<
CALL SetFont (WINDOW(8),Font(0))<
CALL SetSoftStyLe (WINDOW(8),attr,255)<
COLOR 1,0<
CALL CenterString(4," A Game of Skill and Luck "
)<
LOCATE 6,1<
CALL SetFont (WINDOW(8),Font(2))<
CALL SetSoftStyLe (WINDOW(8),attr,255)<
COLOR 6,5<
CALL PrLine("Rearrange the blocks to form a")<
CALL PrLine("Pyramid.  Each time a letter")<
CALL PrLine("from B to P is typed, all the")<
CALL PrLine("blocks from that letter to the")<
CALL PrLine("top will be inverted.  The")<
CALL PrLine("fewer moves needed, the better.")<
LOCATE 13,5<
CALL PrLine("Low Score Wins!")<
FOR Count%=1 TO 5000:NEXT<
<
REM --=< GET INTO ACTUAL GAME<
NewGame:<
CALL SetFont (WINDOW(8),Font(0))<
CALL SetSoftStyLe (WINDOW(8),2,255)<
COLOR 1,0<
CALL CenterString(15," Press any Key to Begin ")
<
WINDOW OUTPUT 3<
<
REM --=< SHUFFLE BLOCKS<
WHILE INKEY$=""<
FOR Low%=0 TO 15<
  rnum=INT(RND*15) MOD (15-Low%+1)+Low%<
  temp%=HoLder%(rnum)<
  HoLder%(rnum)=HoLder%(Low%)<
  HoLder%(Low%)=temp%<
NEXT <
w=36:x=1:y=275:z=6<
FOR Low%=0 TO 15<
  PUT(w,x),barray(0,HoLder%(Low%)),PSET<
  x=x+12<
NEXT  <
WEND<
<
REM --=< COPY BLOCK POSITIONS TO BACKUP ARRAY (F
```

```
OR REPLAYING GAME)<
FOR Count%=0 TO 15:Backup%(Count%)=HoLder%(Count
%):NEXT<
<
StartPLay:<
<
REM --=< PUT MOVE COUNTER ON SCREEN<
WINDOW 5,"Moves",(430,150)-(540,168),16,1<
<
attr=0<
CALL SetFont (WINDOW(8),Font(5))<
CALL SetSoftStyLe (WINDOW(8),attr,255)<
COLOR 6,2<
CLS<
WINDOW OUTPUT 4<
CALL SetFont (WINDOW(8),Font(2))<
CALL SetSoftStyLe (WINDOW(8),attr,255)<
COLOR 6,5<
LOCATE 23,4<
CALL PrMsg("Type "+CHR$(32)+"X"+CHR$(32)+"to Abo
rt Game")<
<
<
REM --=< MOVE ROUTINE<
WINDOW OUTPUT 3  <
CALL DispLay(HoLder%())<
Move%=0:x%=0:FLag%=0:Score%=0<
Move:<
a$=INKEY$:IF a$="" THEN GOTO Move<
IF UCASE$(a$)="X" THEN GOTO BaiLout<
Move%=ASC(UCASE$(a$))-65:x%=Move%<
IF (Move% < 1 OR Move% > 16) THEN GOTO Move<
FOR Counter%=0 TO Move%<
  Work%(Counter%)=HoLder%(x%):x%=x%-1<
NEXT  <
FOR Counter%=0 TO Move%<
  HoLder%(Counter%)=Work%(Counter%)<
NEXT  <
CALL DispLay(HoLder%())<
Score%=Score%+1:SC$=STR$(Score%)<
WINDOW OUTPUT 5:COLOR 7,2<
CLS<
LOCATE 1,3<
CALL PrMsg(SC$)<
WINDOW OUTPUT 3<
<
REM --=< CHECK IF GAME OVER<
FOR Counter%=1 TO 15<
  IF HoLder%(Counter%) > HoLder%(Counter%-1) THE
N<
    FLag%=1<
  ELSE<
    FLag%=0<
  END IF<
  IF FLag%=0 THEN<
    Counter%=16<
    GOTO Move<
  END IF<
NEXT Counter%<
<
REM --=< GAME OVER<
WINDOW CLOSE 5<
REM WINDOW OUTPUT 4<
REM LOCATE 15,1<
REM CALL CLearScreen(WINDOW(8))<
REM LOCATE 15,7<
<
REM --=< PUT OPTIONS MENU WINDOW ON SCREEN<
WINDOW 5,"Options",(340,93)-(630,186),16,1<
CALL SetFont (WINDOW(8),Font(2))<
CALL SetSoftStyLe (WINDOW(8),attr,255)<
COLOR 2,6:CLS<
LOCATE 2,7<
PrMsg(SC$+" Moves")<
LOCATE 4,3<
PrMsg("X ..................... Exit")<
LOCATE 6,3<
PrMsg("R ..................... Replay Game")<
LOCATE 8,3<
PrMsg("N ..................... New Game")<
<
Choose:<
a$=INKEY$:IF a$="" THEN Choose ELSE a$=UCASE$(a$
)<
b%=INSTR("XRN",a$)<
PRINT b%<
IF b%=0 THEN Choose<
REM LOCATE 15,1<
REM CALL CLearScreen(WINDOW(8))<
WINDOW CLOSE 5<
ON b% GOTO BaiLout,RepLay,SetWin<
<
BaiLout:<
WINDOW CLOSE 3<
WINDOW CLOSE 4<
COLOR 1,0<
GOTO Quit<
<
RepLay:<
FOR Count%=0 TO 15<
  HoLder%(Count%)=Backup%(Count%)<
NEXT<
CALL SetFont (WINDOW(8),Font(0))<
CALL SetSoftStyLe (WINDOW(8),2,255)<
COLOR 1,0<
WINDOW OUTPUT 3<
GOTO StartPLay<
<
SetWin:<
WINDOW OUTPUT 4<
GOTO NewGame<
<
REM --=< END GAME<
<
Quit:<
CLS<
FOR i%=0 TO 4<
  CLoseFont Font(i)<
NEXT<
SCREEN CLOSE 1<
END<
<
SUB DispLay(HoLder%()) STATIC <
SHARED barray()<
w=36:x=1:y=275:z=6<
FOR Count%=0 TO 15<
  PUT (w,x),barray(0,HoLder%(Count%)),PSET<
  x=x+12<
NEXT<
END SUB<
<
SUB SetUpFonts(Font$,height%,Font()) STATIC<
FOR i=0 TO 5<
  READ Font$,height%<
  CALL GetFont (Font$,height%,Font(i))<
NEXT<
END SUB<
<
DATA topaz.font,8,emeraLd.font,20,ruby.font,8,ga
rnet.font,9,diamond.font,12,diamond.font,20<
<
' Opens fonts in RAM or on disk<
' handLe is the designator for the various fonts
<
SUB GetFont(fontname$,height%,handLe) STATIC<
TextAttr&(0)=SADD(fontname$+CHR$(0))<
TextAttr&(1)=65536&*height%<
IF fontname$="topaz.font" THEN<
  handLe=OpenFont(VARPTR(TextAttr&(0)))<
ELSE<
  handLe=OpenDiskFont(VARPTR(TextAttr&(0)))<
END IF<
END SUB<
<
SUB PrLine(msg$) STATIC<
  CALL PrMsg (msg$):PRINT <
END SUB<
<
SUB PrMsg(msg$) STATIC<
  CALL Text (WINDOW(8),SADD(msg$),LEN(msg$))<
END SUB<
<
REM: Center text on screen<
<
SUB CenterString(row%,a$) STATIC<
  Center=WINDOW(2)/7.9/2<
  LOCATE row%,Center-(LEN(a$)/2)<
  PrLine a$<
END SUB<
<
<
```

Tokenized And Untokenized Disk Files

A Tutorial

Eugene Koh

If you're a programmer, it's important to understand the two different methods that Atari BASIC uses to store disk files. The tutorial ends with a clever program that autoruns files saved with the LIST command. For the Atari 400, 800, XL, and XE with disk drive.

The Atari Input/Output (I/O) system is versatile. You can store any information to any device. For instance, you can send a program or data to a printer, modem, disk drive, cassette drive, or any other device that you may have connected to your system.

In BASIC, LIST is the command you use to send your program. You can send it to your disk drive with LIST"D:FILE.BAS", to DOS 2.5's ramdisk with LIST"D8:FILE.BAS", to a printer with LIST"P:", or to cassette with LIST"C:".

The LIST command's mirror image is ENTER. This command is used to enter a program from any device. An example is ENTER"D:FILE.BAS". Keep in mind that ENTER does not clear memory before bringing in the program, so it's a good idea to type NEW before using the ENTER command (unless you want to merge two programs).

SAVE And LOAD

LIST and ENTER work with straight ASCII text. For this reason, you can use LIST to save a program to disk, use a word processor to edit it, and then use ENTER to load the program back into memory.

The problem with this approach is that LIST and ENTER are very slow. Atari BASIC *tokenizes* programs. For instance, the PRINT command is saved as a single byte. LIST and ENTER must translate between ASCII and tokenized programs.

Tokenization is designed to save memory and time. Two commands—SAVE and LOAD—work with tokenized programs only. SAVE"D:FILE.BAS" is similar to LIST"D:FILE.BAS", and LOAD"D:FILE.BAS" is similar to ENTER"D:FILE.BAS". When you use SAVE and LOAD, you'll notice that they're much faster than LIST and ENTER. If you get a directory, you'll also notice that most LISTed programs are larger than their SAVEd counterparts.

Because SAVE and LOAD work with tokenized programs, they are normally used only for disk files (CSAVE and CLOAD are used for cassette).

Autorunning

Normally, you must type RUN to start a BASIC program. However, you can use RUN"D:FILE.BAS" to load and run a program. RUN used with this syntax works only with tokenized files (those saved with the SAVE command).

The accompanying program can be used to make LISTed files autorun. Type it in and save it to disk with the name "AMAKER.BAS".

When you're ready to make a file autorun, load and run AMAKER.BAS. You'll be asked for the filename of the program you want to alter. Make sure that this program is indeed a LISTed BASIC program. AMAKER will append several bytes to the end of the file that will make it autorun when entered. (The bytes are 82, 85, 78, 155. These are the ASCII values for RUN, followed by a RETURN. When the file is entered, the RUN command will be treated as a direct-mode command.)

When you're ready to try the new autorun file, type NEW and then ENTER"D:filename". The program should load and run.

AMAKER

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
AF 0 REM AUTORUN UNTOKENIZED
     FILES
EH 1 REM COPYRIGHT 1988 COMP
     UTE! PUBL.
CA 2 REM ALL RIGHTS RESERVED
LC 100 GRAPHICS 0:POKE 710,1
       78:POKE 712,178:TRAP
       210
PM 110 DIM A$(20),B$(20):POK
       E 65,3
JJ 120 PRINT :PRINT "{CLEAR}
       {4 SPACES}AUTORUN UNT
       OKENIZED FILES"
CD 130 ? "Copyright 1988 COM
       PUTE! Publications ":
       ? "{7 SPACES}All Righ
       ts Reserved":PRINT
MO 140 ? "Enter work filenam
       e:":INPUT #16,B$:IF B
       $="" THEN RUN
IH 150 A$="D:":A$(3)=B$:PRIN
       T
AA 160 ? "Press any key to b
       egin procedure... ";:
       POKE 764,255
NI 170 ON PEEK(764)=255 GOTO
        170:POKE 764,255
BK 180 ? CHR$(156);"
       {10 SPACES}-$- WORKING
       ! -$-":? :OPEN #1,9,0
       ,A$
HE 190 FOR JNK=0 TO 3:READ B
       YTE:PUT #1,BYTE:NEXT
       JNK
FF 200 CLOSE #1:? "
       {8 SPACES}-$- ALL FIN
       ISHED -$-":END
NN 210 ? :? :? "ERROR # ";PE
       EK(195);"!";CHR$(253)
       :END
BC 300 DATA 82,85,78,155
```

Movable Feasts: Calculating Easter

Jim Butterfield, Contributing Editor

Planning a Mardi Gras celebration for the year 2000? You'll need this program, which finds the dates for those spring holidays that fall on different days each year. Although the program is written in Amiga Basic, it may be easily translated to other BASICs.

From the Book of Common Prayer, Church of England, 1910:

> To find the Golden Number, of Prime, add One to the Year of our Lord, and then divide by 19; the Remainder, if any, is the Golden Number; but if nothing remaineth, then 19 is the Golden Number.
>
> To find the Dominical or Sunday Letter, according to the Calendar, until the Year 2099 inclusive, add to the Year of our Lord its Fourth Part, omitting Fractions, and also the Number 6: Divide the Sum by 7; and if there is no Remainder, then *A* is the Dominical Letter; But if any Number remaineth, then the Letter standing against that Number in the small annexed Table, is the Dominical Letter. . . .

When I read this, I have an image of missionaries in far lands, out of touch with the mainstream of civilization, turning to their prayer books and carefully working through the dates of the sacred holidays. As they looked at the procedures and tables, they may have wondered just how far ahead the Church planned—amazingly, the complete set of tables extends to the year 8500.

The method of calculation is well spelled out and involves several alternative methods. The program accompanying this article is good for the years from 1900 to 2099.

Finding Easter

Easter is often thought of as the first Sunday following the first full moon after the spring equinox. Actually, it's somewhat more complex than that. Fortunately, the calculation of Easter's date has been standardized for so long that there is little danger of confusion.

Several other dates depend on Easter. Shrove Tuesday (also known as *Pancake Tuesday, Fat Tuesday,* or *Mardi Gras*) is the last day before Lent. The first day of Lent is known as *Ash Wednesday.* Good Friday is two days before Easter Sunday. Seven weeks after Easter is a lesser-known event called *Whitsunday,* or *Pentecost.* It seems that it doesn't get too much attention in England these days, but I did discover that every year near this date, the gypsies in Britain head for a gathering at Appleby Bridge in northern England. They still do this, with caravans, ponies, and all the trappings.

If you wish to compare the program (I used Amiga Basic, but you shouldn't have much trouble converting the program to other related dialects) to the formal description, you'll find that the variable G is used as the Golden Number, and the variable D is the Dominical Letter (actually a number from 0 to 6 rather than a letter from *A* to *G*).

The program uses the MOD operator to calculate remainders. However, there's an oddity to the MOD function that must be allowed for: It doesn't give the correct answer if the number is negative. For example, Amiga Basic says that $-12 \bmod 7$ is -12. If you examine the code, you'll see that I add 700 to the number to ensure that it's positive. *(Editor's note: The latest version of Amiga Basic returns the correct answer $-12 \bmod 7 = -5$.)*

You can use this program as it stands to find Easter for any given year. If you're ambitious, you can incorporate it into your own calendar program.

Movable Feasts

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
'      Copyright 1988 
' COMPUTE! Publications, Inc.
'   All Rights Reserved.
DIM g(18),m(6,2)
PRINT "Movable Feast Dates     Jim Butterfield"
PRINT
DATA 86,104,93,82,101,90,108,98
DATA 87,106,95,84,103,92,81,100
DATA 89,107,97
DATA 0,31,59,90,120,151
FOR g=0 TO 18
 READ g(g)
 t=t+g(g)
NEXT g
FOR j=1 TO 6
 READ x
 t=t+x
 m(j,0)=x:m(j,1)=x
 IF j>2 THEN m(j,1)=x+1
NEXT j
IF t<>2254 THEN PRINT "Error in DATA":STOP
m$="..JanFebMarAprMayJun"
INPUT "Year (0 = Quit)";y
WHILE y<>0
 IF y<1900 OR y>2099 THEN
  PRINT "Year must be from 1900 to 2099"
 ELSE
  GOSUB FindEaster
  v=e-47:PRINT "Shrove Tuesday: ";
  GOSUB PrintDate
  v=e-46:PRINT "Ash Wednesday:  ";
  GOSUB PrintDate
  v=e-2:PRINT "Good Friday:    ";
  GOSUB PrintDate
  v=e:PRINT "Easter Sunday:  ";
  GOSUB PrintDate
  v=e+49:PRINT "Whitsunday:      ";
  GOSUB PrintDate
 END IF
 INPUT "Year (0 = Quit)";y
WEND
END

FindEaster:
 LeapYear=0:IF y=4*INT(y/4) THEN LeapYear=1
 g0=y+1
 g=g0 MOD 19
 d0=y+INT(y/4)+5
 d=6 - d0 MOD 7
 p=g(g)
 pl=(700+d-p) MOD 7 + 1
 e=p+pl+LeapYear
RETURN

PrintDate:
 m=6
 WHILE v<=m(m,LeapYear)
  m=m-1
 WEND
 PRINT MID$(m$,3*m,3);v-m(m,LeapYear)
RETURN 
```

Credit Scroll For The 64

Kenny Lawson

Give your home VCR movies a professional touch with this program for Commodore 64 and VCR owners. With it, your movies can display a scrolling screen of credits that you create and design.

Many people enjoy making home movies with a video camera and showing them to their friends and family on their VCR. With "Credit Scroll," you can add professional-looking scrolling credits to any home movie. Credit Scroll lets you enter lines of text, keyboard graphics, center text, and create scrolls up to 2000 lines long.

Getting Started

Credit Scroll is written entirely in BASIC. Type it in and save a copy to disk. Before you can use the program with your VCR, however, you need to make some connections.

Connecting your 64 to a VCR is easy. The only additional piece of hardware you'll need is a Y-connector with three RCA plugs—two female going to one male. Using Commodore's standard three-jack video cable, plug the chroma and luma (or video) connectors from the monitor end of the cable into the female ends of the Y-connector. Next, plug the video cable's remaining male plug into the VCR's audio dubbing jack, and plug the Y-connector's male plug into the video dubbing jack. These jacks will usually be on the front panel of your VCR, though some VCRs may have them on the rear. Now the VCR is ready to tape the output from your 64.

You should be able to see your computer's screen output on the TV connected to your VCR. If you can't, it's possible to create your credits with your computer connected to your usual monitor and then connect it to the VCR to record the credits (explained below). You'll have to experiment to find the solution that works best with your equipment.

Roll The Credits

Now, simply load Credit Scroll and type RUN. The screen prompts will explain how the program works. All you need to do is enter a line of less than 40 characters. If you enter more than 40 characters, the program reminds you. To enter blank lines, just press RETURN at the prompt.

After you've entered all of your text, type END at the prompt and press RETURN. The screen will tell you to press any key, and you'll have about three seconds before the actual scrolling begins. Before you press the key to start the scrolling, be sure your VCR is set up to record and is properly connected to your 64.

Program Notes

The machine language portion of Credit Scroll—contained in the DATA statements—uses the 64's vertical fine-scrolling register at location 53265 to move the lines of text upward vertically by one row of pixels at a time. Once the register is at the minimum value, the program uses a variation of the technique called *double buffering*—relocating the active screen memory while the scrolling register is reset—to give flicker-free text movement.

If you want to create scrolls longer than the current limit of 2000 lines, you can make one small adjustment to the program: Simply increase the number in the DIM statement in line 60 to the number of lines you'd like to be able to use.

Credit Scroll

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
FK 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. A
      LL RIGHTS RESERVED.
SR 20 PRINT"{CLR}COPYRIGHT 198
      8":PRINT"COMPUTE! PUBLIC
      ATIONS, INC."
AQ 30 PRINT"ALL RIGHTS RESERVE
      D."
BK 60 DIM LI$(2000)
RS 70 FORX=828TO918:READA:POKE
      X,A:CT=CT+A:NEXT
BJ 80 IFCT<>11693THENPRINTCHR$
      (147)"ERROR IN DATA STAT
      EMENTS!":END
SE 90 POKE53281,0:POKE53280,0:
      PRINTCHR$(147)
EK 100 INPUT"CHOOSE A CHARACTE
       R COLOR (1-15)";CC
SP 110 IFCC<>INT(CC)THENPRINTC
       HR$(145)CHR$(145):GOTO9
       0
QP 120 IFCC<1ORCC>15THENPRINTC
       HR$(145)CHR$(145):GOTO9
       0
EP 130 PRINT:PRINT"DO YOU WISH
        CENTERING? (Y/N)";:INP
       UTC$
PR 140 POKE646,CC:PRINT:PRINT"
       NOW YOU CAN ENTER THE L
       INES THAT YOU"
AF 150 PRINT"WANT TO SCROLL UP
        THE SCREEN."
```

```
QJ 160 PRINT:PRINT"IF YOU WISH
        A BLANK LINE (OR LINES
       )"
BA 170 PRINT"IN BETWEEN THE CH
       ARACTER LINES,":PRINT"J
       UST HIT <RETURN> ALONE
       {SPACE}AT"
JD 180 PRINT"THE PROMPT, ONCE
       {SPACE}FOR EACH BLANK L
       INE":PRINT"YOU WANT."
EC 190 PRINT:PRINT"ENTER THE W
       ORD {RVS}END{OFF} WHEN
       {SPACE}YOU HAVE ALL"
QK 200 PRINT"OF YOUR LINES ENT
       ERED."
EM 210 POKE214,23:PRINT:PRINTT
       AB(6)CHR$(18)"PRESS ANY
        KEY TO BEGIN INPUT";
BG 220 GETA$:IFA$=""THEN220
PK 230 REM INPUT ROUTINE
EK 240 NL=1
CB 250 PRINTCHR$(147)CHR$(17)C
       HR$(17)
EK 260 PRINT"ENTER LINE NUMBER
       "NL:PRINT:INPUTLI$(NL)
EG 270 IFLEN(LI$(NL))<40THEN29
       0
FJ 280 PRINT:PRINT"DON'T USE M
       ORE THAN 39 CHARACTERS!
       ":FORX=1TO1500:NEXT:GOT
       O250
SE 290 IFLI$(NL)<>"END"THENNL=
       NL+1:GOTO250
SS 300 PRINT"{15 DOWN}PRESS AN
       Y KEY FOR 3 SECOND DELA
       Y"
KD 310 GETA$:IFA$=""THEN310
FF 320 PRINT"{CLR}":FORX=1TO22
       00:NEXT
CQ 330 POKE648,48:PRINTCHR$(14
       7):POKE648,4:PRINTCHR$(
       147)
PQ 340 POKE53265,PEEK(53265)AN
       D247OR7:FORX=1TONL-1
GE 350 IFC$="N"THEN380
RE 360 POKE214,23:PRINT:PRINTS
       PC(20-LEN(LI$(X))/2)LI$
       (X);
CR 370 POKE648,48:POKE214,22:P
       RINT:PRINTSPC(20-LEN(LI
       $(X))/2)LI$(X);:GOTO390
SM 380 POKE214,23:PRINT:PRINTL
       I$(X);:POKE648,48:POKE2
       14,22:PRINT:PRINTLI$(X)
       ;
XE 390 POKE648,4:SYS828:NEXT
CR 400 FORX=1TO24:SYS828:NEXT:
       POKE198,0
DP 410 GETA$:IFA$=""THEN410
BR 420 POKE53265,155:POKE53280
       ,14:POKE53281,6:POKE646
       ,14:PRINTCHR$(147):END
GG 430 DATA 169,6,133,251
RQ 440 DATA 173,17,208,16,251,
       41,248,5,251,141,17,208
       ,198,251,165,251
XA 450 DATA 160,115,162,160,20
       2,208,253,136,208,248
MX 460 DATA 201,255,208,226,17
       3,24,208,41,15,9,192,14
       1,24,208,169,48,141,136
       ,2
QR 470 DATA 169,4,141,136,2,17
       3,17,208,41,248,9,7,141
       ,17,208,32,234,232
MP 480 DATA 173,24,208,41,15,9
       ,16,141,24,208,169,48,1
       41,136,2
SE 490 DATA 32,234,232,169,4,1
       41,136,2,96
```


Converter

Vincent C. O'Connor

Apple owners who send and receive files via a modem will appreciate this BASIC utility. By converting binary files into text, you can transfer non-text files without the usual hassles. And the text files created are self-converting: Simply EXEC the text file from BASIC, and the binary version is automatically written to disk. For any Apple II+, IIe, IIc, or IIGS running either DOS 3.3 or ProDOS.

One of the advantages of owning a modem is being able to send and receive programs and data files. Often, however, there's a problem transferring binary files such as shape tables, hi-res pictures, and binary programs: Many terminal programs are set up to send ASCII text files only. And although there are programs for transferring binary files, different communications software use different protocols, which means that to transfer a binary file to or from a bulletin board, the bulletin board must use the same protocol that your terminal program uses.

"Converter" converts binary files to text files. It works under DOS 3.3 and ProDOS. When run under ProDOS, Converter not only converts binary files, but AppleWorks files as well. Converter includes extensive error checking and even allows you to catalog a disk from within the program.

Getting Started

Type in and save Programs 1 through 3 using "The Automatic Proofreader" program found elsewhere in this issue. Save Program 1 using the filename CONVERT, Program 2 using the filename CONVERT1, and Program 3 using the filename CREATE.TEST. Because Program 1 runs Program 2, you must save both of these programs to the same disk.

When you've saved each program to disk, enter the command

```
RUN CREATE.TEST
```

After a few moments, the message DONE appears. The CREATE .TEST program creates a binary file called TEST on your disk. We're going to use this file to test run Converter. Also, by converting TEST into a text file and then converting it back to binary again, you'll learn how to use the Converter program.

Binary To Text

Reboot your system to clear the binary file TEST from your computer's memory. Now, load and run Converter by entering

```
RUN CONVERT
```

After a few moments, you're asked to enter a filename, or you can type in CAT for a catalog of the disk. (If you ever forget the name of a file or need to search several disks for a particular program, this catalog function is very useful.) To test-run the program, enter the filename TEST and press Return. After a moment, the screen clears and prints the message CONVERSION IN PROCESS. When the conversion is complete, the computer displays

```
CONVERSION COMPLETE.
RUN AGAIN (Y/N)?
```

Press *N* for no. If you catalog your disk, you'll see the file TEST.TXT. This is the converted binary file, now in standard text format.

Back To Binary

To convert the text file back into binary, simply EXEC it. As an example, let's convert the text file TEST.TXT back into binary format. Reboot your computer to remove the binary file from memory. Next, type

```
DELETE TEST
```

to delete the binary file from disk. Now, enter the command

```
EXEC TEST.TXT
```

A number of asterisks appear on the left side of the screen, followed by the message

```
PLACE DISK YOU WANT BINARY FILE
SAVED ON IN DRIVE 1, THEN TYPE
RUN AND PRESS <RETURN>
```

Enter RUN and press Return.

The disk whirs as the file is saved. If you enter CATALOG, you'll see that the binary file TEST is once again on the disk.

Restrictions

There are a few restrictions when using Converter. First, you cannot convert VAR or SYS files under ProDOS. Second, text files created by Converter tend to be two to three times larger than the original binary file. Finally, you cannot convert files that occupy the same memory locations as the BASIC Converter program. If you do, the program aborts with the message BINARY FILE HAS OVERWRITTEN PROGRAM.

How It Works

When a binary file is converted, it is translated into a text file that contains a series of BASIC and monitor commands. These commands, when executed by Applesoft's EXEC statement, reassemble the binary file in memory and then save it out to disk.

The first command the text file contains is a CALL −151 to enter the monitor. Next, the entire binary file is placed into memory using monitor commands, and the monitor is exited via a 3D0G.

Following the monitor commands is a one-line program—two lines if the file was originally an AppleWorks file (see below)—that saves the binary file back to disk. When you type RUN and press Return, the program is executed, saving the binary file and erasing the program from memory.

If the file you're converting is from AppleWorks, the program created by the EXEC file is two lines long instead of one. This is because under ProDOS, any file BSAVEd with the T parameter must first be created using the CREATE command. If the file being converted is an AppleWorks word processing file, for example, then it's created like this:

```
PRINT CHR$(4)"CREATE
  FILENAME,TAWP"
```

Programming Techniques

There are some useful programming techniques used in Converter that can be easily adapted for use in your own programs. The first is in line 10. By PEEKing memory location 48896, Converter can determine if you are using DOS 3.3 or ProDOS. If this location contains a decimal 76, the computer is running under ProDOS. Otherwise DOS 3.3 is assumed to be active.

Another useful routine is the decimal-to-hex conversion routines found in lines 50 and 55. The conversion routine in line 55 produces a two-character hexadecimal number between 0 and 255. Line 50 produces four-digit hexadecimal numbers ranging from 0 to 65535.

The subroutine at line 100 demonstrates an efficient way to display a catalog from BASIC, regardless of the disk operating system being used. If PR is set to 1, then ProDOS is active and the abbreviated CAT command is issued, insuring a directory that fits on the 40-column screen. If PR is set to 0, then DOS 3.3 is active and the longer CATALOG command is used. By replacing the PR = 1 in line 100 with PEEK(48896), you can place this subroutine directly into your own programs.

The subroutine beginning at line 200 shows how to access a ProDOS directory from BASIC. It begins by setting the prefix to a null path (PRINT D$"PREFIX/"). Next, the volume name of the last drive accessed is read (PRINT D$"PREFIX":INPUT DR$). Then, the catalog is opened and read just like a sequential text file. When you open a catalog, however, you must use the T parameter to indicate the type of file that you're accessing. In this case, the program specifies type DIR, for directory.

For instructions on entering these programs, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

Program 1: CONVERT

```
D7 10 POKE 103,1: POKE 104,96: P
      OKE 24576,0
C3 15 PRINT CHR$ (4)"RUN CONVERT
      1"
```

Program 2: CONVERT1

```
74 5 REM COPYRIGHT 1988 COMPUTE!
     PUBLICATIONS, INC. ALL RIG
     HTS RESERVED.
19 6 ONERR GOTO 250
6F 7 D$ = CHR$ (13) + CHR$ (4):A
     1 = 43634:A2 = 43635:A3 = 4
     3616:A4 = 43617: DIM B$(16)
     ,F$(64):Q$ = CHR$ (34)
93 10 IF PEEK (48896) = 76 THEN
     PR = 1:D$ = CHR$ (4):A1 =
     48855:A2 = 48856:A3 = 4885
     9:A4 = 48860
3F 15 G = PEEK (103) + PEEK (104
     ) * 256:H = PEEK (115) + P
     EEK (116) * 256: TEXT : HO
     ME : HTAB 8: INVERSE : PRI
     NT "COPYRIGHT 1988 COMPUTE
     !": PRINT : POKE 34,2: NOR
     MAL
4F 20 R$ = CHR$ (34): HOME : VTA
     B 3: PRINT "ENTER FILE NAM
     E, OR CAT FOR DISK CATALOG
     ": VTAB 5: INPUT "NAME: ";
     FL$: IF FL$ = "CAT" THEN G
     OSUB 100: HOME : GOTO 20
46 23 IF FL$ = "" THEN 85
9A 25 ER = 0: GOSUB 150: IF ER =
      1 THEN ER = 0: VTAB 23: P
     RINT "INVALID FILENAME-PRE
     SS A KEY TO CONTINUE";: WA
     IT - 16384,128: POKE - 163
     68,0: HOME : GOTO 20
E0 26 F1$ = FL$ + ".TXT":F2$ = F
     L$:Q = 11 * (PR = 1) + 26
     * (PR = 0): IF LEN (FL$) >
      Q THEN F1$ = LEFT$ (FL$,Q
     ) + ".TXT"
27 27 IF PR = 1 THEN ER = 0: GOS
     UB 200: IF ER = 1 THEN ER
     = 0:FL$ = "":R$ = CHR$ (34
     ): GOTO 20
C4 28 IF PR = 1 AND TY$ < > "BIN
     " THEN FL$ = FL$ + ",A8192
     ,T" + TY$
84 30 PRINT D$"BLOAD"FL$:A = PEE
     K (A1) + PEEK (A2) * 256:L
      = PEEK (A3) + PEEK (A4) *
      256: IF A < = H AND (A. >
     = G OR A + L > = G) THEN H
     OME : VTAB 12: PRINT "BINA
     RY FILE HAS OVERWRITTEN PR
     OGRAM": POKE 103,1: POKE 1
     04,8: POKE 2048,0:
AD 35 HOME : VTAB 12: PRINT "CON
     VERSION IN PROCESS...":L1
     = L - 1
8C 40 PRINT D$"OPEN"F1$: PRINT D
     $"WRITE"F1$: PRINT "CALL -
     151"
F9 45 J = 0: FOR I = 0 TO L1:J =
      J + 1
1D 50 IF J = 1 THEN N = I + A:AD
     $ = "": FOR V = 3 TO 0 STE
     P - 1:N(V + 1) = INT (N /
     16 ^ V):N = N - (16 ^ V) *
      N(V + 1):AD$ = AD$ + MID$
      ("0123456789ABCDEF",N(V +
     1) + 1,1): NEXT :
99 55 N = PEEK (I + A):B$(J) = "
     ": FOR V = 1 TO 0 STEP - 1
     :N(V + 1) = INT (N / 16 ^
     V):N = N - (16 ^ V) * N(V
     + 1):B$(J) = B$(J) + MID$
     ("0123456789ABCDEF",N(V +
     1) + 1,1): NEXT :
53 60 IF J = 16 OR I = L1 THEN P
     RINT AD$":";: FOR K = 1 TO
      J: PRINT " "B$(K);: NEXT
     : PRINT :J = 0
```

```
5F 65 NEXT : PRINT "3DØG": PRINT
      "PRINT"Q$"PLACE DISK YOU
      WANT BINARY FILE"Q$: PRINT
      "PRINT"Q$"SAVED ON IN DRI
      VE 1, THEN TYPE"Q$: PRINT
      "PRINT"Q$"RUN AND PRESS <R
      ETURN>"Q$
03 67 IF PR = 1 AND TY$ < > "BIN
      " THEN R$ = ",T" + TY$ + R
      $: PRINT "Ø PRINT CHR$(4)"
      Q$"CREATE "F2$R$
E7 70 PRINT "1 PRINT CHR$(4)"Q$"
      BSAVE "F2$",A"A",L"L;R$":N
      EW": PRINT D$"CLOSE"F1$: H
      OME : VTAB 12: PRINT "CONV
      ERSION COMPLETE": VTAB 14:
       PRINT "RUN AGAIN (Y/N)?";
6F 75 WAIT - 16384,128:A = PEEK
      ( - 16384): POKE - 16368,Ø
58 80 Z = 1 + (A = 217) + 2 * (A
      = 206): ON Z GOTO 75,20,8
      5
2A 85 PRINT D$"CLOSE": POKE 103,
      1: POKE 104,8: POKE 2048,Ø
      : POKE 34,Ø: HOME : NEW
9F 100 HOME : PRINT D$ LEFT$ ("C
      ATALOG",7 - 4 * (PR = 1))
      : PRINT : PRINT "PRESS AN
      Y KEY TO CONTINUE": WAIT
      - 16384,128: POKE - 16368
      ,Ø: RETURN
9F 150 IF PR = Ø THEN 165
D9 152 IF LEN (FL$) > 15 THEN ER
       = 1: RETURN
ØD 155 C = 1: FOR I = 1 TO LEN (
      FL$):K = ASC ( MID$ (FL$,
      I,1)):C = ((K > 64 AND K
      < 91) OR (K = 46) OR (K >
       47 AND K < 58 AND I > 1)
      ) AND C = 1: NEXT : IF C
      = Ø THEN ER = 1
1D 160 RETURN
C2 165 K = ASC ( LEFT$ (FL$,1)):
       IF LEN (FL$) > 30 OR K <
       65 OR K > 90 THEN ER = 1
      : RETURN
1F 170 RETURN
DF 175 NEXT : RETURN
C4 200 PRINT D$"PREFIX/": PRINT
      D$"PREFIX": INPUT DR$: PR
      INT D$: PRINT D$"OPEN"DR$
      ",TDIR": PRINT D$"READ"DR
      $
9A 205 TY$ = "": FOR I = 1 TO 3:
       INPUT A$: NEXT
E7 210 INPUT F$(W): IF F$(W) = "
      " THEN 225
22 215 IF MID$ (F$(W),2, LEN (FL
      $)) = FL$ THEN TY$ = MID$
       (F$(W),18,3): GOTO 225
7C 220 W = W + 1: GOTO 210
E5 225 IF TY$ < > "AWP" AND TY$
      < > "ADB" AND TY$ < > "AS
      P" AND TY$ < > "BIN" THEN
       VTAB 20: PRINT "FILE MUS
      T BE A BINARY OR APPLEWOR
      KS FILE": PRINT "PRESS AN
      Y KEY TO CONTINUE": WAIT
      - 16384,128: POKE - 16368
      ,Ø:ER = 1
72 230 PRINT D$"CLOSE"DR$: RETUR
      N
50 250 POKE 216,Ø: CALL - 3288:
      VTAB 21: HTAB 1: CALL - 9
      58:ER = PEEK (222):LN = P
      EEK (218) + PEEK (219) *
      256
2D 255 IF ER = 3 THEN PRINT "DRI
      VE IS NOT READY - READY D
      RIVE": GOTO 285
5A 260 IF ER = 4 THEN PRINT "DIS
      K IS WRITE PROTECTED - RE
      MOVE TAB": GOTO 285
98 265 IF ER = 6 THEN PRINT "FIL
      E NOT FOUND - CHECK FOR C
      ORRECT DISK": GOTO 285
8E 270 IF ER = 8 THEN PRINT "I/O
       ERROR - CHECK DISK AND D
      RIVE DOOR": GOTO 285
2C 275 IF ER = 77 THEN PRINT "IN
      SUFFICIENT MEMORY TO CONT
      INUE": GOTO 285
32 280 PRINT "ERROR # "ER" ENCOU
      NTERED IN LINE "LN
C3 285 PRINT "PRESS RETURN TO CO
      NTINUE, ESCAPE TO END";:
      WAIT - 16384,128:Z = PEEK
       ( - 16384): POKE - 16368
      ,Ø
41 290 IF Z = 155 THEN 85
Ø6 295 ONERR GOTO 250
67 300 RESUME
```

Program 3: CREATE.TEST

```
4A 5 HOME : FOR I = 1 TO 80: POK
     E 767 + I,I: NEXT
FC 10 PRINT CHR$ (4)"BSAVE TEST,
     A768,L80"
14 15 VTAB 12: PRINT "TEST FILE
     CREATED"
```

States And Capitals

Elmer Larsen and M. D. Perry, Jr.

This educational game makes learning fun. There are three ways to play, each a variation that's just right for any member of the family. A color/graphics adapter or equivalent hardware is required, along with BASICA for the PC or GW-BASIC for compatibles.

If you think geography is boring, wait until you start playing "States and Capitals." After a few minutes you'll be hooked. And best of all, you'll be learning something about the U.S. With variations that allow you to work on states, capitals, or both states and capitals, this game can entertain and educate children *and* adults.

Getting Started

Since States and Capitals is written entirely in BASIC, type it in, save a copy to disk, and type RUN. The first thing you'll see is the main menu, which lists the playing options.

You can guess states only, capitals only, or combine the two and guess both states and capitals. Let's say, for example, that you choose the *Capitals* option from the menu. After making your selection, you'll see a green map of the continental U.S. with each state's borders clearly marked and the state with the first mystery capital highlighted in red. Below the map is a sentence informing you of which state has been selected and asking you to name its capital.

Simply type in the name of the state's capital at the prompt. Since States and Capitals is not case sensitive, you can type your answers either in upper- or lowercase. If your answer is correct, the program responds with a RIGHT! and changes the state's color to brown. If you're wrong, the computer gives you the correct answer, returns the state's color to green, and remembers the state so it can ask you the capital again later.

The game continues in this fashion until you've answered every capital correctly and every state on the map is colored brown. When you finish, you have the option of playing again or returning to BASIC.

The *States*-only version of the game is like *Capitals*. One by one, each state is highlighted on the map with red, and you're asked its name. If you answer correctly, the state's color changes to brown, and you continue. If you're incorrect, you'll get another chance later.

For the *States and Capitals* version of the game, you must identify both the state *and* the capital to win the state. Please note that in this and the other variations, spelling is important. We should also note that States and Capitals doesn't accept abbreviations. St. Paul, for example, must be spelled as *Saint* Paul, and South Dakota must include the full spelling, not *S.* for *South*.

Program Notes

The section of States and Capitals that draws the map of the U.S (lines 130–800) is from *Icons and Images: A Graphics Collection for the IBM PC and PCjr*, (available from COMPUTE! Books). This routine creates a realistic representation of the continental U.S., with each state's boundary accurately outlined.

The information on each state and capital is stored in four arrays of 48 elements each. This information includes the *x* and *y* coordinates of a point within the state for the PAINT command, the name of the state, and the capital. The arrays are filled by simply READing the DATA statements that begin in line 840.

"States And Capitals," an educational game for the whole family.

States and Capitals uses the random number generator to obtain each state's index number. As a player correctly identifies each state or capital, or both (depending on the variation of the game being played), the state is removed from the array and the number of states available decreases by one. This prevents a state from being selected a second time after the state has been correctly identified. When the number of states reaches 0, all states have been correctly identified and the game is over.

States and Capitals

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
NC 100 REM Copyright 1988, COMPU
       TE! Publications, Inc. -
       All Rights Reserved
NO 120 POKE &H417,PEEK(&H417) OR
        64
MM 130 SCREEN 0:WIDTH 40:COLOR 1
       4,1,0
CO 140 CLS:LOCATE 3,12:PRINT "ST
       ATES and CAPITALS":LOCATE
        5,3:PRINT "Copyright 198
       8 COMPUTE! Publ., Inc.":L
       OCATE 6,12:PRINT"All Righ
       ts Reserved"
II 150 LOCATE 9,8:PRINT"[1] Stat
       es"
EK 160 LOCATE 10,8:PRINT"[2] Cap
       itals"
```

```
FP 170 LOCATE 11,8:PRINT"[3] States and Capitals"
NL 180 LOCATE 12,8:PRINT"[4] Quit"
EP 190 LOCATE 15,14:INPUT"Selection";M$
JK 200 IF M$<"1" OR M$>"4" THEN 190
LO 210 IF M$="4" THEN CLS:END
HA 220 DIM H(48),V(48),ST$(48),CAP$(48)
PD 230 SCREEN 1,0:  CLS:  KEY OFF
CO 235 COLOR 0,0
MO 240 LINE (50,5)-(269,20),3,B
PN 250 LOCATE 2,12:PRINT "STATES and CAPITALS"
MN 260 REM LOCATE 3,4:PRINT " ***********************************";
BC 280 X=70:  Y=30
KB 290 BDY=1
GI 300 GOSUB 370:REM *** USA OUTLINE ***
CE 310 LL$=CHR$(200):UL$=CHR$(201):UR$=CHR$(187):LR$=CHR$(188):VT$=CHR$(186):HZ=205
BF 320 PAINT (X+8,Y+4),1,BDY
JC 330 BDY=0
MK 340 GOSUB 540:REM *** STATE BOUNDARIES ***
BE 350 GOTO 820
DM 360 REM *** USA OUTLINE S/R ***
EG 370 PSET (X,Y),BDY '--start at NW corner
JN 380 DRAW "NR90F2D1L1D3G2H1U4L3U1L2D4R1D6M-1,+10M-2,+5D5G1D3F1"
IE 390 DRAW "D5M+4,+10R2D3M+3,+10R3F5M+3,+6R3E1R4D2M+14,+7R13U2"
IP 400 DRAW "R5F3R1F3R1D2R1D2F4R1E3R4F2R1F2F5R1D3M+9,+3R2M-2,-7"
KF 410 DRAW "U2M+13,-11R8E1R1F2R1E1R1NR1F2NU2E1H2E1R3U1R2U1R6"
KH 420 DRAW "U1R7F2R1E1M+7,+5D3R1D3M+4,+6M+6,+4D1F1R2E2U5M-10,-16"
AF 430 DRAW "U3E2U1E2R2E2U1R2M+9,-8U1H1NL1E1U1H3L2M-3,-6L1U8R2D4"
DJ 440 DRAW "R1D2F2U2E1U1L1U4H1U3F1R2F1R1E1U1H2E2E2ND1F1D1NE2U1"
PB 450 DRAW "NE2BH1U1E2R2E1F1ND1F1M+6,-2NG1NH1BL3H2U6E1U2E2"
DC 460 DRAW "M+4,-5R1E1U1H2U1L1U3H2L2G1H1M-2,+10G1L2L14G1L1G2"
IE 470 DRAW "D2G1L2G1L4G1L3G1F2M-8,+5M-5,+2L2H1L1H1E1U1E1U4"
OM 480 DRAW "M-2,-3G1D2H2U3H3BL2D1G2D2G1D3F1D5G1D1G2L1H2U3H1U3"
BB 490 DRAW "E1U4E1U3E1R1E2R3F1E1R1E1U1NR1H1L2H1L2G1L2H1L2U2"
HI 500 DRAW "E1L1G2L1M-4,+2L2U1G1M-4,+1U1E4R1E1R1H1L2H1L3G1L1H1"
OH 510 DRAW "G1H2L3G1H2L2U1H1D2"
MD 520 RETURN
IN 530 REM *** STATE BOUNDARIES S/R ***
BF 540 PSET (X-7,Y+33),BDY
DF 550 DRAW "NL3R13NR31D14M+17,2202F1G1D1NG2BU10U3R3U3NR74U25"
CC 560 DRAW "L8U9E1H2E3U1H1NU16G1L9G1L3H1L3U2H1L4"
CG 570 PSET (X+62,Y),BDY
EO 580 DRAW "D13NR26D5NL23D9NR21D10R8ND21L26ND47L6U19"
PJ 590 PSET (X+23,Y),BDY:  DRAW "D6F1D3F3D4R1E1F2D1F2R3E1"
HL 600 PSET (X+86,Y),BDY
IL 610 DRAW "D6F1D3F1D4G1D1F2D4NR15D3F1D3H2L2H1NL3BF5NU1"
BE 620 DRAW "M+4,+10NL23F2G1F3D12NR13M+3,+16F1D3F2D6" '-KA,OK
CB 630 PSET (X+51,Y+82),BDY
ID 640 DRAW "R14U21NU2R12D7R3F1R3F1R3F2E1R3F1E1R2F1"
JA 650 PSET (X+104,Y+10),BDY
OM 660 DRAW "NR2D3G2D4M+4,+5D2F2NR11F3D3G1L1G1D2NL15"
PK 670 DRAW "D3F2D1F2D2G1F1D1F2D3F2D1G2D2L2U2BR2D1M-2,+11NL10"
CD 680 DRAW "F1D4G1D4R10D3BR4BU1M+1,-13U5NL13R10M+3,+8D6NF1L9D3"
KP 690 PSET (X+158,Y+80),BDY
ML 700 DRAW "L2G2L13BU15NL4R2NR6E2R1E2R1E2U1NL2NR23"
DB 710 DRAW "BD8BL2M+10,+8NF1BR9BU4H5L6U1L7G1BU7L24D1L10" '-GA,SC,NC,TN
OM 720 PSET (X+121,Y+33),BDY
AC 730 DRAW "D14G1D4 G1D1NG3R2E1R1E2R1E2U1E1R2NU16R1F1R3"
EN 740 DRAW "F2R2F5NG4R2M+7,-6U1E1U1F2E1U2E2F3D1F2R1F1"
ND 750 PSET (X+124,Y+30),BDY
GL 760 DRAW "R12BR9BE2BR2NR20NH1BL2D11U4G2D4NM-6,+10BE2R23E2U1"
IB 770 DRAW "H2U1E2NH2M+4,+3F1NF1BE2H1U13L1U6BR5M-2,+13"
NG 780 DRAW "NL2R5NU13NR2BD3NF3L2ND2L4"
JA 790 PSET (X+120,Y+15),BDY:  DRAW "H4L5H2"
GH 800 PSET (X+153,Y+40),BDY:  DRAW "D2R1E1R3F3BU5BR7R3D10NR2"
ME 810 RETURN
QJ 820 REM *** BEGIN MAIN ROUTINE ***
PB 830 RESTORE:FOR I=1 TO 48:READ H(I),V(I),ST$(I),CAP$(I):NEXT
KD 840 DATA 202,106,ALABAMA,MONTGOMERY
PG 850 DATA 100,100,ARIZONA,PHOENIX
GK 860 DATA 176,95,ARKANSAS,LITTLE ROCK
LM 870 DATA 70,80,CALIFORNIA,SACRAMENTO
OI 880 DATA 125,80,COLORADO,DENVER
BL 890 DATA 250,61,CONNECTICUT,HARTFORD
KL 900 DATA 242,75,DELAWARE,DOVER
DA 910 DATA 225,120,FLORIDA,TALLAHASSEE
HD 920 DATA 218,108,GEORGIA,ATLANTA
ON 930 DATA 93,50,IDAHO,BOISE
BG 940 DATA 185,70,ILLINOIS,SPRINGFIELD
EA 950 DATA 195,70,INDIANA,INDIANAPOLIS
EK 960 DATA 168,60,IOWA,DES MOINES
BL 970 DATA 155,80,KANSAS,TOPEKA
FP 980 DATA 200,85,KENTUCKY,FRANKFORT
BM 990 DATA 176,110,LOUISIANA,BATON ROUGE
JI 1000 DATA 260,40,MAINE,AUGUSTA
PP 1010 DATA 235,72,MARYLAND,ANNAPOLIS
CB 1020 DATA 253,57,MASSACHUSETTS,BOSTON
LM 1030 DATA 198,55,MICHIGAN,LANSING
AE 1040 DATA 168,40,MINNESOTA,SAINT PAUL
ID 1050 DATA 190,106,MISSISSIPPI,JACKSON
KI 1060 DATA 175,80,MISSOURI,JEFFERSON CITY
JA 1070 DATA 115,40,MONTANA,HELENA
MF 1080 DATA 147,65,NEBRASKA,LINCOLN
JA 1090 DATA 85,75,NEVADA,CARSON CITY
KB 1100 DATA 253,50,NEW HAMPSHIRE,CONCORD
AD 1110 DATA 244,67,NEW JERSEY,TRENTON
PL 1120 DATA 125,100,NEW MEXICO,SANTA FE
KP 1130 DATA 240,50,NEW YORK,ALBANY
KP 1140 DATA 235,93,NORTH CAROLINA,RALEIGH
FE 1150 DATA 145,35,NORTH DAKOTA,BISMARCK
NH 1160 DATA 210,65,OHIO,COLUMBUS
GD 1170 DATA 155,95,OKLAHOMA,OKLAHOMA CITY
FG 1180 DATA 75,55,OREGON,SALEM
MK 1190 DATA 230,63,PENNSYLVANIA,HARRISBURG
DP 1200 DATA 256,61,RHODE ISLAND,PROVIDENCE
GH 1210 DATA 230,100,SOUTH CAROLINA,COLUMBIA
PN 1220 DATA 145,50,SOUTH DAKOTA,PIERRE
LK 1230 DATA 200,95,TENNESSEE,NASHVILLE
BH 1240 DATA 150,110,TEXAS,AUSTIN
KP 1250 DATA 102,80,UTAH,SALT LAKE CITY
HN 1260 DATA 249,46,VERMONT,MONTPELIER
NC 1270 DATA 225,85,VIRGINIA,RICHMOND
BJ 1280 DATA 75,40,WASHINGTON,OLYMPIA
LJ 1290 DATA 220,75,WEST VIRGINIA,CHARLESTON
OH 1300 DATA 183,51,WISCONSIN,MADISON
DD 1310 DATA 122,60,WYOMING,CHEYENNE
PJ 1320 :
GL 1330 REM --- MAIN ---------
LP 1340 SR=48
OA 1350 WHILE SR>0
JK 1360 :    GOSUB 1450    :REM RANDOMIZE
OB 1365 :    V = 0
MJ 1370 :    IF M$="1" THEN GOSUB 1490
MM 1380 :    IF M$="2" THEN GOSUB 1580
QM 1390 :    IF M$="3" THEN GOSUB 1490:IF S=1 THEN GOSUB 1580
HJ 1400 :    IF V=1 THEN GOSUB 1670 :ELSE GOSUB 1680
```

```
FN 1410 WEND
HP 1420 END
PO 1430 :
GA 1440 REM --- RANDOMIZE ---
FG 1450 RANDOMIZE TIMER:RN=INT(R
        ND*SR)+1:GOSUB 1710
JF 1460 RETURN
QK 1470 :
AG 1480 REM --- STATE -------
HN 1490 LOCATE 19,11:PRINT"ENTER
         NAME OF STATE: "
LH 1500 LOCATE 21,14:LINE INPUT
        LI$:IF LEN(LI$)<4 THEN 1
        490
FD 1510 GOSUB 1780:IF CS$=ST$(RN
        ) THEN 1540 ELSE 1520
LL 1520 S=0:LOCATE 23,1:PRINT "S
        ORRY, THE STATE IS  ";
NJ 1530 PRINT ST$(RN);:LOCATE 24
        ,5:PRINT"YOU WILL SEE TH
        IS STATE AGAIN !";:GOSUB
         1720
OH 1532 FOR I=1 TO 3000:NEXT
KQ 1534 RETURN
JK 1540 S=1:LOCATE 24,16:PRINT "
        RIGHT!";:V=1:GOSUB 1730
JE 1550 RETURN
QJ 1560 :
QI 1570 REM --- CAPITAL'-------
HJ 1580 FOR Y=19 TO 24:LOCATE Y,
        1:PRINT SPACE$(39);:NEXT
OH 1590 LOCATE 19,3:PRINT"ENTER
        STATE CAPITAL OF ";ST$(R
        N)
DL 1600 LOCATE 21,14:LINE INPUT
        LI$:IF LEN(LI$)<4 THEN 1
        600
DL 1610 GOSUB 1780:IF CS$=CAP$(R
        N) THEN 1630
IB 1620 LOCATE 23,3:PRINT"SORRY,
         THE ANSWER IS ";CAP$(RN
        );:V=0:GOSUB 1740:RETURN
JD 1630 LOCATE 24,14:PRINT"RIGHT
        !";:V=1:GOSUB 1730
JD 1640 RETURN
QI 1650 :
BI 1660 REM --- UPDATE -----
JH 1670 FOR I=RN TO SR-1
DK 1672 H(I)=H(I+1) :V(I)=V(I+1)
         :ST$(I)=ST$(I+1) :CAP$(
        I)=CAP$(I+1)
IF 1674 NEXT:SR=SR-1:IF SR=0 THE
        N GOSUB 1750:GOTO 1760
HL 1680 FOR Y=19 TO 24:LOCATE Y,
        1:PRINT SPACE$(39);:NEXT
KC 1690 RETURN
PL 1700 :
ND 1710 PAINT(H(RN),V(RN)),2,BDY
        :RETURN
KH 1720 PAINT (H(RN),V(RN)),1,BD
        Y:RETURN
ND 1730 PAINT (H(RN),V(RN)),3,BD
        Y:RETURN
QI 1740 LOCATE 24,5:PRINT "YOU W
        ILL SEE THIS STATE AGAIN
         !";:PAINT (H(RN),V(RN))
        ,1,BDY:FOR I=1 TO 3000:N
        EXT
CK 1750 FOR I=19 TO 24:LOCATE I,
        1:PRINT SPACE$(39);:NEXT
        :RETURN
LF 1760 LOCATE 19,2:PRINT "GOOD
        FOR YOU. YOU COMPLETED T
        HE TEST !";
DL 1770 LOCATE 21,1:PRINT "TO DO
         IT AGAIN, JUST PRESS 'F
        2'.":END
ME 1780 CS$="":FOR I=1 TO LEN(LI
        $):L=ASC(MID$(LI$,I,1)):
        IF L>96 AND L<123 THEN L
        =L AND 223
EN 1790 CS$=CS$+CHR$(L):NEXT:RET
        URN                    ©
```

Automatic Menus For IBM PC

Charles L. Banks

You might think that the easy-to-use, pop-up menus found in commercial software are too difficult to create and incorporate in your own programs, but with "Automatic Menus," they're a snap. BASICA is required for the PC, GW-BASIC for compatibles, or Cartridge BASIC for the PCjr.

A neat, user-friendly menu adds a professional touch to any piece of software, but writing and debugging menus for each new program can be both tedious and time consuming. And menus can use a lot of your computer's memory. "Automatic Menus" is a subroutine that you can include in any of your BASIC programs that will solve your menu problems and will give your programs a professional shine.

Getting Started

Since the Automatic Menus Demo is written entirely in BASIC, simply type it in, save a copy to disk, and type RUN.

In the demonstration program, lines 40–80 show how to use the menu subroutine which begins in line 1000. The Demo displays a 14-item menu, but any number up to 22 is possible. The RESTORE statement resets the DATA pointer and makes the menu reusable.

To call the Automatic Menus subroutines, first set M equal to the number of items in your menu (again, 22 is the maximum). Then load the ITEM$ array with your menu choices. The demonstration program shows an easy and efficient way to do this. Now, a GOSUB to the Automatic Menus subroutine in line 1000 instantly displays a simple, attractive menu in a box in the center of the screen.

The user selects an item by moving the up- and down-cursor keys and pressing Enter to activate the choice. Automatic Menus stores the selection in the variable SEL and returns to your main program.

Arranging The Array

Two statements are needed at the beginning of your main program for Automatic Menus to work as it's written. DIM ITEM$(22) creates the array for your list of menu items. OPTION BASE 1 causes all arrays to start with an index of 1 instead of 0. Having array indexes begin with 1 makes it much easier to keep track of selections and to use an ON SEL GOSUB command to process the user's menu selection. Remember,

this affects *all* arrays in your program and must appear before any DIM statements.

Automatic Menus is written for 80-column text mode and it will work with any monitor—color or monochrome—though the COLOR statements may need to be modified for some displays. The program will also work in 40-column mode, but the value 40 in line 1050 must be changed to 20—the center of a 40-column screen. You may want to experiment with various colors to find which ones work best with each program.

How It Works

When Automatic Menus is entered, it first decides on which line the top menu item should be printed to center it vertically. It then calculates the length of the longest menu item and uses that value to center the menu horizontally. Next, a double-line box is drawn one character wider than the text. Finally, the menu items are printed in the box.

At this point, the program enters a loop to move through the menu to get the user's selection. First, the current selection is printed in reverse video. Then, any leftover keystrokes are cleared from the keyboard buffer, and an INKEY$ statement is used to get the next keystroke.

When a key is pressed, the current selection is reprinted in normal video. If the key was the down cursor, SEL is incremented by 1 or is wrapped back to the top of the menu. If the key was the up cursor, SEL is decremented by 1 or is wrapped to the bottom of the menu. The IF statements check for both the cursor keys and the numbers 2 and 8. This way, the routine works with or without the NUM LOCK key depressed.

When the Enter key is pressed, the screen clears and Automatic Menus returns to the main program with the user's menu selection stored in SEL.

Automatic Menus Demo

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
EC 1 ' Copyright 1988 COMPUTE! P
     ublications, Inc.
FH 2 '                All Rights Res
     erved
IJ 3 '                        AUTOMENU.BA
     S
PJ 4 '
PK 5 '
CA 10 ' ***** Initialize *****
GF 20 KEY OFF : SCREEN 0 : COLOR
      6,0,0 : OPTION BASE 1 : D
      IM ITEM$(22)
DH 30 ' ***** Demonstration Prog
      ram *****
ML 40 RESTORE 500
KC 50 M=14 : FOR I = 1 TO M : RE
      AD ITEM$(I) : NEXT
MM 60 GOSUB 1000
OM 70 LOCATE 12,32 : PRINT "You
      chose ";ITEM$(SEL)
DK 80 END
JN 500 DATA Item One,Item Two,It
       em Three,Item Four,Item F
       ive,Item Six,Item Seven,I
       tem Eight,Item Nine,Item
       Ten,Item Eleven,Item Twel
       ve,Item Thirteen,Item Fou
       rteen
AC 999 ' ***** Menu Subroutine *
       *****
JB 1000 CLS : SEL=1 : W=1 : PRIN
        T : PRINT TAB(20)"Copyri
        ght 1988 COMPUTE! Public
        ations, Inc."
PB 1005 PRINT TAB(31)"All Rights
         Reserved"
KJ 1010 IF M=22 THEN TOP=2 ELSE
        TOP=12-INT(M/2)
MP 1020 FOR I=1 TO M
EQ 1030 IF LEN(ITEM$(I)) > W THE
        N W=LEN(ITEM$(I))
QI 1040 NEXT
EB 1050 START=40-INT(W/2)
CH 1060 J=START-1 : K=START+W
DA 1070 COLOR 3,0,0
QL 1079 ' ***** Draw frame *****
EB 1080 LOCATE TOP-1,J : PRINT C
        HR$(201);
CP 1090 FOR I=1 TO W : PRINT CHR
        $(205); : NEXT : PRINT C
        HR$(187)
OL 1100 LOCATE TOP,1
IO 1110 FOR I=1 TO M : PRINT TAB
        (J);CHR$(186);TAB(K);CHR
        $(186) : NEXT
NO 1120 LOCATE TOP+M,J : PRINT C
        HR$(200);
JF 1130 FOR I=1 TO W : PRINT CHR
        $(205); : NEXT : PRINT C
        HR$(188);
LH 1139 ' ***** Display menu ite
        ms *****
CJ 1140 COLOR 6,0,0 : LOCATE TOP
        ,1
KH 1150 FOR I=1 TO M : LOCATE TO
        P+I-1,START : PRINT ITEM
        $(I) : NEXT
DL 1159 ' ***** Process keyboard
         input *****
JA 1160 COLOR 0,7,0 : LOCATE TOP
        +SEL-1,START : PRINT ITE
        M$(SEL) : COLOR 6,0,0
AH 1170 DEF SEG=0 : POKE 1050,PE
        EK(1052) ' Clear keyboar
        d buffer
CB 1180 X$=INKEY$ : IF X$="" THE
        N 1180
MD 1190 LOCATE TOP+SEL-1,START :
         PRINT ITEM$(SEL)
FC 1200 IF MID$(X$,2,1)="P" OR X
        $="2" THEN IF SEL<M THEN
         SEL=SEL+1 ELSE SEL=1
BF 1210 IF MID$(X$,2,1)="H" OR X
        $="8" THEN IF SEL>1 THEN
         SEL=SEL-1 ELSE SEL=M
HJ 1220 IF ASC(X$)=13 THEN CLS :
         RETURN
NN 1230 GOTO 1160
```

©

The New, Improved Bubble Sort

Jim Butterfield

If you dismissed the bubble sort as slow and old fashioned, you were right. But that was the bubble sort before Butterfield. In this article, Jim blows the dust off this old sorting method and teaches it some powerful new tricks.

Recently, I was writing a program that needed to do some sorting. A simple sorting method, well known to beginners—the *bubble* or *exchange* sort—had features that I liked, but it became slower and slower as the number of items increased. My problem was to find a way to modify the basic bubble sort to make it faster. In this article, we'll examine the nature of the bubble sort and explore some methods to improve its performance.

The Basic Bubble

The idea behind a bubble sort is quite simple: Sweep through the items, comparing each adjacent pair. If you find a pair out of order, swap them and continue the sweep. When a sweep is finished, ask yourself if you did any swaps that time. If the answer is yes, do the sweep again. If the answer is no, you're finished—the items are sorted.

An example might illustrate this method. Suppose we wish to alphabetize the following words:

AN APPLE EACH DAY MAKES THE DEALER HAPPY

Sweeping from left to right (we could go either way), we first compare AN with APPLE. They're in the right order, so we move on to APPLE and EACH. Still OK, but the next pair (EACH and DAY) are out of order, so we swap them. The next comparison will be between EACH and MAKES (the word EACH has moved, remember), and since they're OK, we move along. Eventually, our first sweep yields:

AN APPLE DAY EACH MAKES DEALER HAPPY THE

The highest word, THE, has bubbled up to the top of the list. On the next sweep, the next highest word, MAKES, will bubble to the top. You can see where the name *bubble sort* comes form.

Problems

Computer scientists do not think well of the bubble sort. Most simple sorting methods are classified as *N Squared* sorts. This means that as you double the number of items to be sorted, the time required to do the sort is increased by a factor of four. Big numbers make this type of sort impractical—it works fine on a dozen items, but it's hopelessly slow for sorting a thousand.

Here's why: A bubble sort compares each item against almost every other item. If we had a dozen items, we might need to make up to 11 sweeps through the data, making 11 comparisons on each sweep. Total comparisons: up to 121. We can live with that, but the arithmetic shows us what happens when we have 1000 units—999 sweeps with 999 comparisons each makes it obvious that timing will be disastrously slow.

That's why computer scientists have come up with a number of other sorting methods that will lessen this crushing time barrier. The newer generation of sorts include Quicksort (generally agreed to be fastest), Heapsort, and Selective Replacement. The number of comparisons made by these sorting methods will grow much more slowly as the data increases. They are classified as *N LOG N* sorts. For a dozen items, the number of comparisons required might be about 45. Increasing the number of items to 1000 might call for about 10,000 comparisons. That's a lot, but it's much better than the huge numbers called for by the bubble sort.

Some Pointers

There's another criticism of the bubble sort that's not completely fair. It's said that the bubble sort moves data around too much. Data movement is time-consuming and may cause your program to run afoul of the dreaded garbage collection problem, which is a major time waster. But that problem is easy to eliminate from the bubble sort or any other sort. Here's the method: Instead of moving the data, we move an *index* that points to the data. We'll use this method in our example below.

An index array becomes very useful when your data has a number of fields in each record. For each record, you might have such elements as date, account, and amount. If you don't use an index, you have to move the data itself, and that can become clumsy.

Bubble Advantages

I was writing an accounting program and I wanted to use the bub-

ble sort despite its slow speed. Why? Let me outline some of the advantages that concerned me.

First, the bubble sort is very good on items that are almost in the correct order before the sort starts. For my application, the accounting data would normally have been entered in order by date, and I expected that many of the sorted reports would still be at least partially in chronological order. There are many other types of sorts that derive no advantage from a nearly sorted set of data, but the bubble sort might straighten things out in two or three sweeps.

Second, the bubble behaves well when there are a lot of "don't care" situations in the sorting order. If my accounting system contained, say, four accounts (auto, food, house, miscellaneous), and the user wanted to sort by account, there would be many situations where we would compare similar items (auto versus auto). In such a case, the bubble sort would just skip along, leaving the items as they were found.

Third, I wanted to use a sort in which output could take place before the sort was finished. I was concerned with the user's perception of the system here. Is it better to wait for a full sort—say, five minutes—with nothing happening on the screen? Or would it be preferable to have the first item printed out in 30 seconds or so with the remaining items following at suitable intervals? You can argue the point either way. I chose the latter.

Reverse Sweep And Flags

It doesn't matter if you sweep from bottom to top or from top to bottom. For me, the top-down method works better, since each sweep guarantees at least one new item to be output (the next lowest item will bubble down to the bottom).

Here's where the speed improvement comes in. Every time a swap takes place, the *upper* item is marked as having been moved (a *flag* is set on that item). We don't need to worry about marking the lower item: We're sweeping in a downward direction so we'll test that against something new almost immediately.

On the next sweep, only the items that have moved up will need to be tested against the next higher piece of data. (If an item moves to the top, it won't need this kind of test, of course). So, the following sweep will compare only those items that need it.

An example should clear things up. We'll show flagged items in uppercase. At the beginning, all items are flagged (except the one at the top), since all pairs will need to be compared.

Here we go:

```
AN APPLE EACH DAY MAKES THE
  DEALER happy
```

Sweeping from the top, we compare DEALER with HAPPY. No swap there, so we keep going, comparing THE with DEALER. Yes: We swap and flag the higher value (THE). Completing the sweep, we get:

```
an apple day EACH dealer
  MAKES THE happy
```

Note the flags. The words EACH, MAKES, and THE have moved up, and they're marked as candidates for the next sweep. Only these three words will be compared with the words above.

By the way, we can also mark EACH as the bottom point in our next sweep. We'll never need to go below this. In fact, we can now output the words AN, APPLE, and DAY—that part of the sort is now complete.

Continuing on the next sweep, THE and HAPPY are out of order and are swapped. MAKES and HAPPY are also out of order, so that exchange takes place, also. DEALER is not flagged, so it's not compared with happy. Instead, we move on and find that EACH and DEALER are out of order. The result:

```
an apple day dealer EACH
  happy MAKES the
```

At this point, we know that the sort is complete up to and including the word DEALER. In fact, the whole sort is complete, but we don't know that yet. We'll find that out when we make the last two comparisons (MAKES versus THE, and EACH versus HAPPY).

The Program

Below is a simple demonstration program showing the method. Keep in mind that even with these revisions, the bubble sort is not in a league with the *N Log N* sorting methods mentioned above. It does, however, run quite a bit faster than it would otherwise.

The program invites you to input a number of names (or words). It places these words in an *array* (or table) called N$. In a practical data processing operation, it's likely these names would be input from a file.

At line 180, we start the sort. J tells us how many items are completely sorted (and output) so far. Its initial value is 0. Lines 190–220 build the index array. With no sorting information so far, the index is simple: The first item will be 1, the next will be 2, the next, 3, and so on.

One special aspect of the index array: It also holds the flag that tells us whether or not a value needs to be compared with the next higher value. It does this by taking on a *negative* value. At the start, we want to compare all values except the top one, so all elements of array I are made negative.

Last adjustment before we go into the sort proper: When we do a sweep, how far down should we go? Variable J8 holds this value, and at the beginning, we set this to value 1, since we want to sweep all the way down the first time.

Here, we are at line 240. We'll come back here to start a new sweep. Take the value of J8 and copy it to J7. J8 will be set above the top of the list. As we sweep, we'll update it.

The loop from line 250 to 330 performs the sweep by itself. We're working at position J9 in the index table. From this table, we extract the identity of the actual strings to be compared from positions J9 and J9 + 1. These identity numbers are called X2 and J3—but wait—X2 might be negative (the flag). Indeed, we'll only do the comparison if X2 *is* negative. Let's get the positive value by using the *absolute value* function, ABS, calling the result J2.

If X2 is positive, we don't need to do a comparison and can skip to the NEXT statement at line 330. Otherwise, we compare items J2 and J3. If they're in the wrong order, we need do several things. We swap the index entries (not the data), remembering to flag the upper value by making it negative.

And we note, in variable J8, that on the next sweep, we must come down at least this far.

After completing a sweep, we clear the flag in the topmost entry, again using the ABS function. At this point, we would expect a conventional bubble sort to go back and do another sweep, if necessary. Not this one. We'll do some output first.

At line 350, we allow our output pointer (J) to almost catch up with *outsweep* pointer (J8), sending output as we go. We'll always output something on each sweep. When we've caught up to J8, back we go to do another sweep—unless we're finished and have already output everything.

Conclusion

The new, improved bubble sort does what I wanted to do in my program. By adding extra logic, I was able to reduce the long sorting time and make this sort practical for my application.

Improved Bubble Sort Demo

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
100 REM COPYRIGHT 1988 COMPUTE
    ! PUBL., INC. -- ALL RIGHTS
    RESERVED
110 PRINT "NEW, IMPROVED BUBBL
    E SORT"
120 PRINT:INPUT "HOW MANY NAME
    S";H
125 DIM I(H),N$(H)
130 FOR J=1 TO H
140 PRINT "NAME";J;
150 INPUT N$(J)
160 NEXT J
170 PRINT:PRINT"HERE COMES A S
    ORTED LIST"
180 J=0
190 FOR J9=1 TO H
200 I(J9)=-J9
210 NEXT
220 I(H)=H
230 J8=1
240 J7=J8:J8=H+1
250 FOR J9=H-1 TO J7 STEP -1
260 X2=I(J9)
270 J2=ABS(X2)
280 I(J9)=J2
290 J3=I(J9+1)
300 IF X2>0 GOTO 330
310 REM COMPARE ITEMS J2 AND J
    3
320 IF N$(J2)>N$(J3) THEN J8=J
    9+1:I(J9)=J3:I(J9+1)=-J2
330 NEXT J9
340 I(H)=ABS(I(H))
350 J=J+1:J1=J0:J0=I(J)
360 PRINT N$(J0)
370 IF J+1<J8 GOTO 350
380 IF J<H GOTO 240
```

COMPUTE!'s Guide To Typing In Programs

Computers are precise—type the program *exactly* as listed, including necessary punctuation and symbols, except for special characters noted below. We have provided a special listing convention as well as a set of programs to check your typing—"The Automatic Proofreader."

Programs for the IBM and those in ST BASIC for Atari ST models should be typed exactly as listed; no special characters are used. Programs for Commodore, Apple, and Atari 400/800/XL/XE computers may contain some hard-to-read special characters, so we have a listing system that indicates these control characters. You will find these characters in curly braces; *do not type the braces.* For example, {CLEAR} or {CLR} instructs you to type the character which clears the screen on the Atari or Commodore machines. A complete list of these symbols is shown in the tables below. For Commodore, Apple, and Atari, a single symbol by itself within curly braces is a control key or graphics key. If you see {A}, hold down the CONTROL key and press A. This will produce a reverse video character on the Commodore (in quote mode), a graphics character on the Atari, and an invisible control character on the Apple.

For Commodore computers, graphics characters entered with the Commodore logo key are enclosed in a special bracket: [<A>]. In this case, you would hold down the Commodore logo key as you type A. Our Commodore listings are in uppercase, so shifted symbols are underlined. A graphics heart symbol (SHIFT-S) would be listed as S. One exception is {SHIFT-SPACE}. When you see this, hold down SHIFT and press the space bar. If a number precedes a symbol, repeat the character the indicated number of times. For example, {5 RIGHT}, {6 S}, and [<8 Q>], mean, respectively, that you should enter five cursor rights, six shifted S's, and eight Commodore-Q's. On the Atari, inverse characters (white on black) should be entered with the inverse vid-

Atari 400/800/XL/XE

When you see	Type	See	
{CLEAR}	ESC SHIFT <	↖	Clear Screen
{UP}	ESC CTRL -	↑	Cursor Up
{DOWN}	ESC CTRL =	↓	Cursor Down
{LEFT}	ESC CTRL +	←	Cursor Left
{RIGHT}	ESC CTRL *	→	Cursor Right
{BACK S}	ESC DELETE	◂	Backspace
{DELETE}	ESC CTRL DELETE		Delete character
{INSERT}	ESC CTRL INSERT		Insert character
{DEL LINE}	ESC SHIFT DELETE		Delete line
{INS LINE}	ESC SHIFT INSERT		Insert line
{TAB}	ESC TAB	▸	TAB key
{CLR TAB}	ESC CTRL TAB		Clear tab
{SET TAB}	ESC SHIFT TAB		Set tab stop
{BELL}	ESC CTRL 2		Ring buzzer
{ESC}	ESC ESC		ESCape key

Commodore PET/CBM/VIC/64/128/16/+4

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	
{PUR}	CTRL 5	
{GRN}	CTRL 6	
{BLU}	CTRL 7	
{YEL}	CTRL 8	

When You Read:	Press:	See:
[<1>]	COMMODORE 1	
[<2>]	COMMODORE 2	
[<3>]	COMMODORE 3	
[<4>]	COMMODORE 4	
[<5>]	COMMODORE 5	
[<6>]	COMMODORE 6	
[<7>]	COMMODORE 7	
[<8>]	COMMODORE 8	
{F1}	f1	
{F2}	SHIFT f1	
{F3}	f3	
{F4}	SHIFT f3	
{F5}	f5	
{F6}	SHIFT f5	
{F7}	f7	
{F8}	SHIFT f7	
[<4>]	←	

eo key (Atari logo key on 400/800 models).

Whenever more than two spaces appear in a row, they are listed in a special format. For example, {6 SPACES} means press the space bar six times. Our Commodore listings never leave a single space at the end of a line, instead moving it to the next printed line as {SPACE}.

Amiga program listings and Atari ST program listings in GFA BASIC contain only one special character, the left arrow (←) symbol. This character marks the end of each program line. Wherever you see a left arrow, press RETURN to enter that line into memory. (For the Amiga, you can also enter the line simply by moving the cursor off the line.) Don't try to type in the left arrow symbol; it's there only as a marker to indicate where each program line ends.

The Automatic Proofreader

Type in the appropriate program listed below, then save it for future use. The Commodore Proofreader works on the Commodore 128, 64, Plus/4, 16, and VIC-20. Don't omit any lines, even if they contain unfamiliar commands or you think they don't apply to your computer. When you run the program, it installs a machine language program in memory and erases its BASIC portion automatically (so be sure to save several copies before running the program for the first time). If you're using a Commodore 128, Plus/4 or 16, do *not* use any GRAPHIC commands while the Proofreader is active. You should disable the Commodore Proofreader before running any other program. To do this, either turn the computer off and on or enter SYS 64738 (for the 64), SYS 65341 (128), SYS 64802 (VIC-20), or SYS 65526 (Plus/4 or 16). To reenable the Proofreader, reload the program and run it as usual. Unlike the original VIC/64 Proofreader, this version works the same with disk or tape.

The IBM Proofreader is a BASIC program that simulates the IBM BASIC line editor, letting you enter, edit, list, save, and load programs that you type. Type RUN to activate. Be sure to leave Caps Lock on, except when typing lowercase characters.

On the Atari, run the Proofreader to activate it (the Proofreader remains active in memory as a machine language program); you must then enter NEW to erase the BASIC loader. Pressing SYSTEM RESET deactivates the Atari Proofreader; enter PRINT USR (1536) to reenable it.

The Apple Proofreader erases the BASIC portion of itself after you run it, leaving only the machine language portion in memory. It works with either DOS 3.3 or ProDOS. Disable the Apple Proofreader by pressing CTRL-RESET before running another BASIC program.

Once the Proofreader is active, try typing in a line. As soon as you press RETURN, either a hexadecimal number (on the Apple) or a pair of letters (on the Commodore, Atari, or IBM) appears. The number or pair of letters is called a *checksum*.

Compare the value displayed on the screen by the Proofreader with the checksum printed in the program listing in the magazine. The checksum is given to the left of each line number. Just type in the program a line at a time (without the printed checksum), press RETURN or Enter, and compare the checksums. If they match, go on to the next line. If not, check your typing; you've made a mistake. Because of the checksum method used, do not type abbreviations, such as ? for PRINT. On the Atari and Apple Proofreaders, spaces are not counted as part of the checksum, so be sure you type the right number of spaces between quote marks. The Atari Proofreader does not check to see that you've typed the characters in the right order, so if characters are transposed, the checksum still matches the listing. The Commodore Proofreader catches transposition errors and ignores spaces unless they're enclosed in quotation marks. The IBM Proofreader detects errors in spacing and transposition.

IBM Proofreader Commands

Since the IBM Proofreader replaces the computer's normal BASIC line editor, it has to include many of the direct-mode IBM BASIC commands. The syntax is identical to IBM BASIC. Commands simulated are LIST, LLIST, NEW, FILES, SAVE, and LOAD. When listing your program, press any key (except Ctrl-Break) to stop the listing. If you enter NEW, the Proofreader prompts you to press Y to be especially sure you mean yes.

Two new commands are BASIC and CHECK. BASIC exits the Proofreader back to IBM BASIC, leaving the Proofreader in memory. CHECK works just like LIST, but shows the checksums along with the listing. After you have typed in a program, save it to disk. Then exit the Proofreader with the BASIC command, and load the program as usual (this replaces the Proofreader in memory). You can now run the program, but you may want to resave it to disk. This will shorten it on disk and make it load faster, but it can no longer be edited with the Proofreader. If you want to convert an existing BASIC program to Proofreader format, save it to disk with SAVE *"filename"*,A.

Program 1: Atari Proofreader

By Charles Brannon

```
100 GRAPHICS 0
110 FOR I=1536 TO 1700:RE
    AD A:POKE I,A:CK=CK+A
    :NEXT I
120 IF CK<>19072 THEN ? "
    Error in DATA Stateme
    nts.  Check Typing.":
    END
130 A=USR(1536)
140 ? :? "Automatic Proof
    reader Now Activated.
    "
150 END
160 DATA 104,160,0,185,26
    ,3,201,69,240,7
170 DATA 200,200,192,34,2
    08,243,96,200,169,74
180 DATA 153,26,3,200,169
    ,6,153,26,3,162
190 DATA 0,189,0,228,157,
    74,6,232,224,16
200 DATA 208,245,169,93,1
    41,78,6,169,6,141
210 DATA 79,6,24,173,4,22
    8,105,1,141,95
220 DATA 6,173,5,228,105,
    0,141,96,6,169
230 DATA 0,133,203,96,247
    ,238,125,241,93,6
240 DATA 244,241,115,241,
    124,241,76,205,238
250 DATA 0,0,0,0,0,32,62,
    246,8,201
260 DATA 155,240,13,201,3
    2,240,7,72,24,101
270 DATA 203,133,203,104,
    40,96,72,152,72,138
280 DATA 72,160,0,169,128
    ,145,88,200,192,40
290 DATA 208,249,165,203,
    74,74,74,74,24,105
300 DATA 161,160,3,145,88
    ,165,203,41,15,24
310 DATA 105,161,200,145,
    88,169,0,133,203,104
320 DATA 170,104,168,104,
    40,96
```

Program 2: Commodore Proofreader

By Philip Nelson

```
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
```

Program 3: IBM Proofreader

By Charles Brannon

```
10 'Automatic Proofreader Ver
   sion 3.0 (Lines 205,206 ad
   ded/190 deleted/470,490 ch
   anged from V2.0)
100 DIM L$(500),LNUM(500):COL
    OR 0,7,7:KEY OFF:CLS:MAX=
    0:LNUM(0)=65536!
110 ON ERROR GOTO 120:KEY 15,
    CHR$(4)+CHR$(70):ON KEY(1
    5) GOSUB 640:KEY (15) ON:
    GOTO 130
120 RESUME 130
130 DEF SEG=&H40:W=PEEK(&H4A)
140 ON ERROR GOTO 650:PRINT:P
    RINT"Proofreader Ready."
150 LINE INPUT L$:Y=CSRLIN-IN
    T(LEN(L$)/W)-1:LOCATE Y,1
160 DEF SEG=0:POKE 1050,30:PO
    KE 1052,34:POKE 1054,0:PO
    KE 1055,79:POKE 1056,13:P
    OKE 1057,28:LINE INPUT L$
    :DEF SEG:IF L$="" THEN 15
    0
170 IF LEFT$(L$,1)=" " THEN L
    $=MID$(L$,2):GOTO 170
180 IF VAL(LEFT$(L$,2))=0 AND
     MID$(L$,3,1)=" " THEN L$
    =MID$(L$,4)
200 IF ASC(L$)>57 THEN 260 'n
    o line number, therefore
    command
205 BL=INSTR(L$," "):IF BL=0
    THEN BL$=L$:GOTO 206 ELSE
     BL$=LEFT$(L$,BL-1)
206 LNUM=VAL(BL$):TEXT$=MID$(
    L$,LEN(STR$(LNUM))+1)
210 IF TEXT$="" THEN GOSUB 54
    0:IF LNUM=LNUM(P) THEN GO
    SUB 560:GOTO 150 ELSE 150
220 CKSUM=0:FOR I=1 TO LEN(L$
    ):CKSUM=(CKSUM+ASC(MID$(L
    $,I))*I) AND 255:NEXT:LOC
    ATE Y,1:PRINT CHR$(65+CKS
    UM/16)+CHR$(65+(CKSUM AND
     15))+" "+L$
230 GOSUB 540:IF LNUM(P)=LNUM
     THEN L$(P)=TEXT$:GOTO 15
    0 'replace line
240 GOSUB 580:GOTO 150 'inser
    t the line
260 TEXT$="":FOR I=1 TO LEN(L
    $):A=ASC(MID$(L$,I)):TEXT
    $=TEXT$+CHR$(A+32*(A>96 A
    ND A<123)):NEXT
270 DELIMITER=INSTR(TEXT$," "
    ):COMMAND$=TEXT$:ARG$="":
    IF DELIMITER THEN COMMAND
    $=LEFT$(TEXT$,DELIMITER-1
    ):ARG$=MID$(TEXT$,DELIMIT
    ER+1) ELSE DELIMITER=INST
    R(TEXT$,CHR$(34)):IF DELI
    MITER THEN COMMAND$=LEFT$
    (TEXT$,DELIMITER-1):ARG$=
    MID$(TEXT$,DELIMITER)
280 IF COMMAND$<>"LIST" THEN
    410
290 OPEN "scrn:" FOR OUTPUT A
    S #1
300 IF ARG$="" THEN FIRST=0:P
    =MAX-1:GOTO 340
310 DELIMITER=INSTR(ARG$,"-")
    :IF DELIMITER=0 THEN LNUM
    =VAL(ARG$):GOSUB 540:FIRS
    T=P:GOTO 340
320 FIRST=VAL(LEFT$(ARG$,DELI
    MITER)):LAST=VAL(MID$(ARG
    $,DELIMITER+1))
330 LNUM=FIRST:GOSUB 540:FIRS
    T=P:LNUM=LAST:GOSUB 540:I
    F P=0 THEN P=MAX-1
340 FOR X=FIRST TO P:N$=MID$(
    STR$(LNUM(X)),2)+" "
350 IF CKFLAG=0 THEN A$="":GO
    TO 370
360 CKSUM=0:A$=N$+L$(X):FOR I
    =1 TO LEN(A$):CKSUM=(CKSU
    M+ASC(MID$(A$,I))*I) AND
    255:NEXT:A$=CHR$(65+CKSUM
    /16)+CHR$(65+(CKSUM AND 1
    5))+" "
370 PRINT #1,A$+N$+L$(X)
380 IF INKEY$<>"" THEN X=P
390 NEXT :CLOSE #1:CKFLAG=0
400 GOTO 130
410 IF COMMAND$="LLIST" THEN
    OPEN "lpt1:" FOR OUTPUT A
    S #1:GOTO 300
420 IF COMMAND$="CHECK" THEN
    CKFLAG=1:GOTO 290
430 IF COMMAND$<>"SAVE" THEN
    450
440 GOSUB 600:OPEN ARG$ FOR O
    UTPUT AS #1:ARG$="":GOTO
    300
450 IF COMMAND$<>"LOAD" THEN
    490
460 GOSUB 600:OPEN ARG$ FOR I
    NPUT AS #1:MAX=0:P=0
470 WHILE NOT EOF(1):LINE INP
    UT #1,L$:BL=INSTR(L$," ")
    :BL$=LEFT$(L$,BL-1):LNUM(
    P)=VAL(BL$):L$(P)=MID$(L$
    ,LEN(STR$(VAL(BL$)))+1):P
    =P+1:WEND
480 MAX=P:CLOSE #1:GOTO 130
490 IF COMMAND$="NEW" THEN IN
    PUT "Erase program - Are
    you sure";L$:IF LEFT$(L$,
    1)="y" OR LEFT$(L$,1)="Y"
     THEN MAX=0:LNUM(0)=65536
    !:GOTO 130:ELSE 130
500 IF COMMAND$="BASIC" THEN
    COLOR 7,0,0:ON ERROR GOTO
     0:CLS:END
510 IF COMMAND$<>"FILES" THEN
    520
515 IF ARG$="" THEN ARG$="A:"
     ELSE SEL=1:GOSUB 600
517 FILES ARG$:GOTO 130
520 PRINT"Syntax error":GOTO
    130
540 P=0:WHILE LNUM>LNUM(P) AN
    D P<MAX:P=P+1:WEND:RETURN
560 MAX=MAX-1:FOR X=P TO MAX:
    LNUM(X)=LNUM(X+1):L$(X)=L
    $(X+1):NEXT:RETURN
580 MAX=MAX+1:FOR X=MAX TO P+
    1 STEP -1:LNUM(X)=LNUM(X-
    1):L$(X)=L$(X-1):NEXT:L$(
    P)=TEXT$:LNUM(P)=LNUM:RET
    URN
600 IF LEFT$(ARG$,1)<>CHR$(34
    ) THEN 520 ELSE ARG$=MID$
    (ARG$,2)
610 IF RIGHT$(ARG$,1)=CHR$(34
    ) THEN ARG$=LEFT$(ARG$,LE
    N(ARG$)-1)
620 IF SEL=0 AND INSTR(ARG$,"
    .")=0 THEN ARG$=ARG$+".BA
    S"
630 SEL=0:RETURN
640 CLOSE #1:CKFLAG=0:PRINT"S
    topped.":RETURN 150
650 PRINT "Error #";ERR:RESUM
    E 150
```

Program 4: Apple Proofreader

By Tim Victor, Editorial Programmer

```
10 C = 0: FOR I = 768 TO 768
   + 68: READ A:C = C + A: PO
   KE I,A: NEXT
20 IF C < > 7258 THEN PRINT "
   ERROR IN PROOFREADER DATA
   STATEMENTS": END
30 IF PEEK (190 * 256) < > 76
    THEN POKE 56,0: POKE 57,3
   : CALL 1002: GOTO 50
40 PRINT CHR$ (4);"IN#A$300"
50 POKE 34,0: HOME : POKE 34,
   1: VTAB 2: PRINT "PROOFREA
   DER INSTALLED"
60 NEW
100 DATA 216,32,27,253,201,14
    1
110 DATA 208,60,138,72,169,0
120 DATA 72,189,255,1,201,160
130 DATA 240,8,104,10,125,255
140 DATA 1,105,0,72,202,208
150 DATA 238,104,170,41,15,9
160 DATA 48,201,58,144,2,233
170 DATA 57,141,1,4,138,74
180 DATA 74,74,74,41,15,9
190 DATA 48,201,58,144,2,233
200 DATA 57,141,0,4,104,170
210 DATA 169,141,96
```

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 machine langauge (ML) programs from COMPUTE!. 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

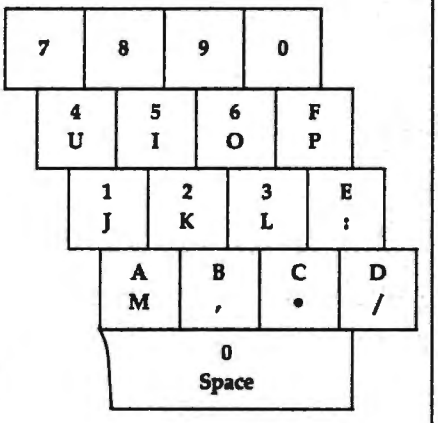
Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex 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, a numeric keypad 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 redisplayed. 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, 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, 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 ensure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

MLX For Commodore 64

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

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```
        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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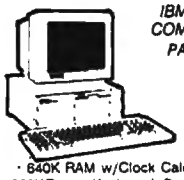

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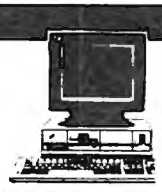

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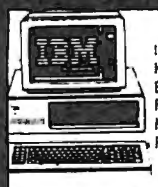

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MLX Machine Language Entry Program For Apple

Tim Victor

To make it easier to enter machine language programs into your computer without typos, COMPUTE! is introducing its "MLX" entry program for the Apple II series. It's our best MLX yet. It runs on the II, II+, IIe, and IIc, and with either DOS 3.3 or ProDOS.

A machine language (ML) program is usually listed as a long series of numbers. It's hard to keep your place and even harder to avoid making mistakes as you type in the listing, since an incorrect line looks almost identical to a correct one. To make error-free entry easier, COMPUTE! generally lists ML programs for Commodore and Atari computers in a format designed to be typed in with a utility called "MLX." The MLX program uses a checksum system to catch typing errors almost as soon as they happen.

Apple MLX checks your typing on a line-by-line basis. It won't let you enter invalid characters or let you continue if there's a mistake in a line. It won't even let you enter a line or digit out of sequence. Best of all, you don't have to know anything about machine language to enter ML programs with MLX. Apple MLX makes typing ML programs almost foolproof.

Using Apple MLX

Type in and save some copies of Apple MLX on disk (you'll want to use MLX to enter future ML programs in COMPUTE!). It doesn't matter whether you type it in on a disk formatted for DOS 3.3 or ProDOS. Programs entered with Apple MLX, however, must be saved to a disk formatted with the same operating system as Apple MLX itself.

If you have an Apple IIe or IIc, make sure that the key marked CAPS LOCK is in the down position. Type RUN. You'll be asked for the starting and ending addresses of the ML program. These values vary for each program, so they're given at the beginning of the ML program listing and in the program's accompanying article. Find them and type them in.

The next thing you'll see is a menu asking you to select a function. The first is (E)NTER DATA. If you're just starting to type in a program, pick this. Press the E key, and the program asks for the address where you want to begin entering data. Type the first number in the first line of the program listing if you're just starting, or the line number where you left off if you've already typed in part of a program. Hit the RETURN key and begin entering the data.

Once you're in Enter mode, Apple 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 bytes and a checksum. When you enter a line and hit RETURN, Apple MLX recalculates the checksum from the eight bytes and the address. If you enter more or less than nine numbers, or the checksum doesn't exactly match, Apple MLX erases the line you just entered and prompts you again for the same line.

Invalid Characters Banned

Apple MLX is fairly flexible about how you type in the numbers. You can put extra spaces between numbers or leave the spaces out entirely, compressing a line into 18 keypresses. Be careful not to put a space between two digits in the middle of a number. Apple MLX will read two single-digit numbers instead of one two-digit number (F 6 means F and 6, not F6).

You can't enter an invalid character with Apple MLX. 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), nothing happens. This safeguards against entering extraneous characters. Even better, Apple MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, Apple MLX will catch your mistake.

Apple MLX also checks to make sure you're typing in the right line. The address (the number to the left of the colon) is part of the checksum recalculation. If you accidentally skip a line and try to enter incorrect values, Apple MLX won't let you continue. Just make sure you enter the correct starting address; if you don't, you won't be able to enter any of the following lines. Apple MLX will stop you.

Editing Features

Apple MLX also includes some editing features. The left- and right-arrow keys allow you to back up and go forward on the line that you are entering, so you can retype data. Pressing the CONTROL (CTRL) and D keys at the same time (*delete*) removes the character under the cursor, shortening the line by one character. Pressing CTRL-I (*insert*) puts a space under the cursor and shifts the rest of the line to the right, making the line one character longer. If the cursor is at the right end of the line, neither CTRL-D nor CTRL-I has any effect.

When you've entered the entire listing (up to the ending address that you specified earlier), Apple MLX automatically leaves Enter mode and redisplays the functions menu. If you want to leave Enter mode before then, press the RETURN key when Apple MLX prompts you with a new line address. (For instance, you may want to leave Enter mode to enter a program listing in more than one sitting; see below.)

Display Data

The second menu choice, (D)ISPLAY DATA, examines memory and shows the contents in the same format as the program listing. You can use it to check your work or to see how far you've gotten. When you press D, Apple MLX asks you for a starting address. Type in the address of the first line you want to see and hit RETURN. Apple MLX displays program lines until you press any key or until it reaches the end of the program.

Save And Load

Two more menu selections let you save programs on disk and load them back into the computer. These are (S)AVE FILE and (L)OAD FILE. When you press S or L, Apple MLX asks you for the filename. The first time you save an ML program, the name you assign will be the program's filename on the disk. If you press L and specify a filename that doesn't exist on the disk, you'll see a disk error message.

If you're not sure why a disk error has occurred, check the drive. Make sure there's a formatted disk in the drive and that it was formatted by the same operating system you're using for Apple MLX (ProDOS or DOS 3.3). If you're trying to save a file and see an error message, the disk might be full. Either save the file on another disk or quit Apple MLX (by pressing the Q key), delete an old file or two, then run Apple MLX again. Your typing should still be safe in memory.

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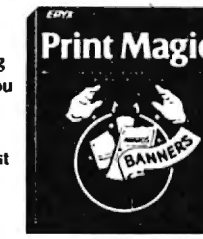

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Apple MLX: Machine Language Entry Program

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
35 100 N = 9: HOME : NORMAL : PR
       INT CHR$ (17);"APPLE MLX
       V1.1": POKE 34,2: ONERR G
       OTO 610
CC 110 VTAB 1: HTAB 20: PRINT "S
       TART ADDRESS";: GOSUB 530
       : IF A = 0 THEN PRINT CHR
       $ (7): GOTO 110
8C 120 S = A
E3 130 VTAB 2: HTAB 20: PRINT "E
       ND ADDRESS  ";: GOSUB 530
       : IF S > = A OR A = 0 THE
       N PRINT CHR$ (7): GOTO 13
       0
20 140 E = A
B5 150 PRINT : PRINT "CHOOSE: (E)
       NTER DATA";: HTAB 22: PRI
       NT "(D)ISPLAY DATA": HTAB
        8: PRINT "(L)OAD FILE  (
       S)AVE FILE  (Q)UIT": PRIN
       T
AE 160 GET A$: FOR I = 1 TO 5: I
       F A$ < > MID$ ("EDLSQ",I,
       1) THEN NEXT : GOTO 160
93 170 ON I GOTO 270,220,180,200
       : POKE 34,0: END
AF 180 INPUT "FILENAME: ";A$: IF
        A$ < > "" THEN PRINT CHR
       $ (4);"BLOAD";A$;",A";S
A1 190 GOTO 150
6D 200 INPUT "FILENAME: ";A$: IF
        A$ < > "" THEN PRINT CHR
       $ (4);"BSAVE";A$;",A";S;"
       ,L";E - S
92 210 GOTO 150
C2 220 GOSUB 590: IF B = 0 THEN
       150
9E 230 FOR B = B TO E STEP 8:L =
        4:A = B: GOSUB 580: PRIN
       T A$;": ";:L = 2
B5 240 FOR F = 0 TO 7:V(F + 1) =
        PEEK (B + F): NEXT : GOS
       UB 560:V(9) = C
F2 250 FOR F = 1 TO N:A = V(F):
       GOSUB 580: PRINT A$" ";:
       NEXT : PRINT : IF PEEK (4
       9152) < 128 THEN NEXT
94 260 POKE 49168,0: GOTO 150
CC 270 GOSUB 590: IF B = 0 THEN
       150
48 280 FOR B = B TO E STEP 8
A6 290 HTAB 1:A = B:L = 4: GOSUB
        580: PRINT A$;": ";: CAL
       L 64668:A$ = "":P = 0: GO
       SUB 330: IF L = 0 THEN 15
       0
F9 300 GOSUB 470: IF F < > N THE
       N PRINT CHR$ (7);: GOTO 2
       90
27 310 IF N = 9 THEN GOSUB 560:
       IF C < > V(9) THEN PRINT
       CHR$ (7);: GOTO 290
72 320 FOR F = 1 TO 8: POKE B +
       F - 1,V(F): NEXT : PRINT
       : NEXT : GOTO 150
0E 330 IF LEN (A$) = 33 THEN A$
       = O$:P = O: PRINT CHR$ (7
       );
22 340 L = LEN (A$):O$ = A$:O =
       P:L$ = "": IF P > 0 THEN
       L$ = LEFT$ (A$,P)
E0 350 R$ = "": IF P < L - 1 THE
       N R$ = RIGHT$ (A$,L - P -
       1)
55 360 HTAB 7: PRINT L$;: FLASH
       : IF P < L THEN PRINT MID
       $ (A$,P + 1,1);: NORMAL :
        PRINT R$;
7D 370 PRINT " ";: NORMAL
E6 380 K = PEEK (49152): IF K <
       128 THEN 380
C1 390 POKE 49168,0:K = K - 128
5B 400 IF K = 13 THEN HTAB 7: PR
       INT A$;" ";: RETURN
A7 410 IF K = 32 OR K > 47 AND K
        < 58 OR K > 64 AND K < 7
       1 THEN A$ = L$ + CHR$ (K)
        + R$:P = P + 1: GOTO 330
C7 420 I = FRE (0): IF K = 4 THE
       N A$ = L$ + R$
5F 430 IF K = 9 THEN A$ = L$ + "
        " + MID$ (A$,P + 1,1) +
       R$
0A 440 IF K = 8 THEN P = P - (P
       > 0)
93 450 IF K = 21 THEN P = P + (P
       < L)
9D 460 GOTO 330
37 470 F = 1:D = 0: FOR P = 1 TO
        LEN (A$):C$ = MID$ (A$,P
       ,1): IF F > N AND C$ < >
       " " THEN RETURN
BB 480 IF C$ < > " " THEN GOSUB
       520:V(F) = J + 16 * (D =
       1) * V(F):D = D + 1
5F 490 IF D > 0 AND C$ = " " OR
       D = 2 THEN D = 0:F = F +
       1
0B 500 NEXT : IF D = 0 THEN F =
       F - 1
17 510 RETURN
B5 520 J = ASC (C$):J = J - 48 -
        7 * (J > 64): RETURN
AB 530 A = 0: INPUT A$:A$ = LEFT
       $ (A$,4): IF LEN (A$) = 0
        THEN RETURN
6F 540 FOR P = 1 TO LEN (A$):C$
       = MID$ (A$,P,1): IF C$ <
       "0" OR C$ > "9" AND C$ <
       "A" OR C$ > "Z" THEN A =
       0: RETURN
2D 550 GOSUB 520:A = A * 16 + J:
        NEXT : RETURN
28 560 C = INT (B / 256):C = B -
        254 * C - 255 * (C > 127
       ):C = C - 255 * (C > 255)
29 570 FOR F = 1 TO 8:C = C * 2
       - 255 * (C > 127) + V(F):
       C = C - 255 * (C > 255):
       NEXT : RETURN
DA 580 I = FRE (0):A$ = "": FOR
       I = 1 TO L:T = INT (A / 1
       6):A$ = MID$ ("0123456789
       ABCDEF",A - 16 * T + 1,1)
        + A$:A = T: NEXT : RETUR
       N
1F 590 PRINT "FROM ADDRESS ";: G
       OSUB 530: IF S > A OR E <
        A OR A = 0 THEN B = 0: R
       ETURN
0D 600 B = S + 8 * INT ((A - S)
       / 8): RETURN
B6 610 PRINT "DISK ERROR": GOTO
       150
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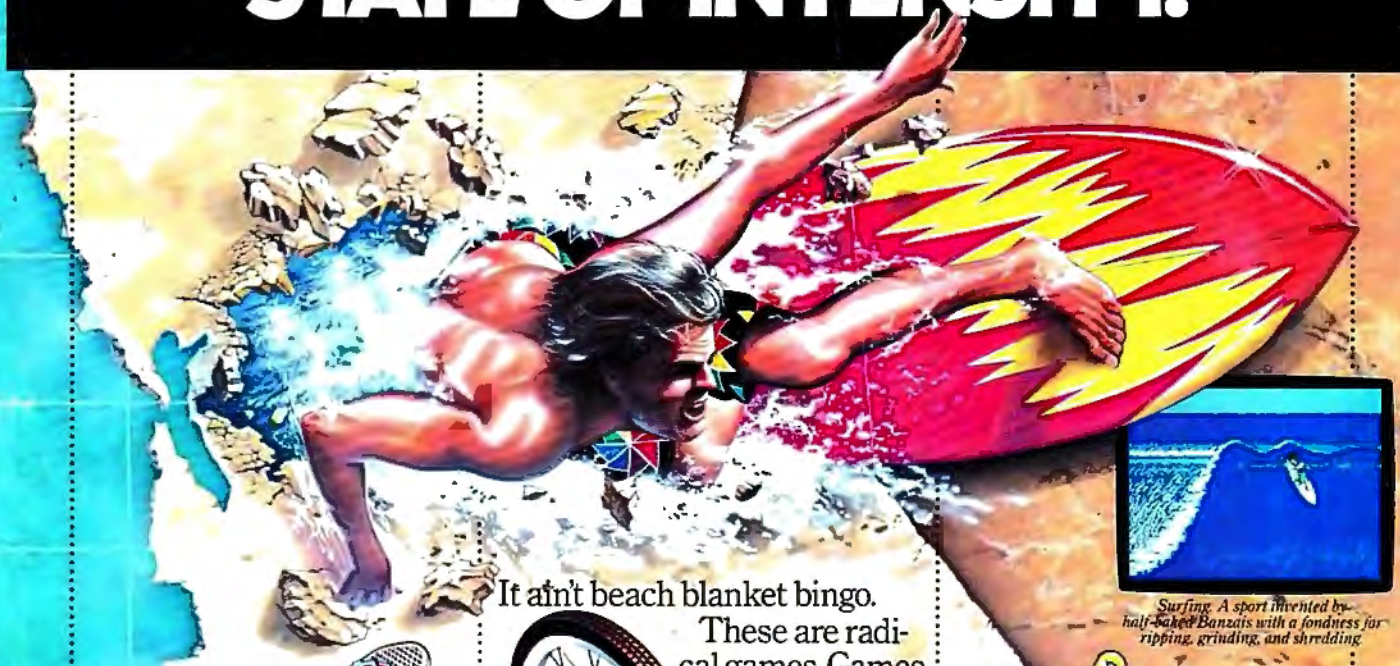

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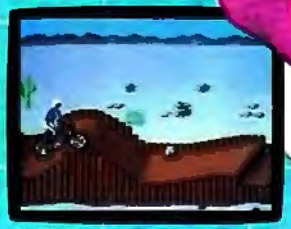

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