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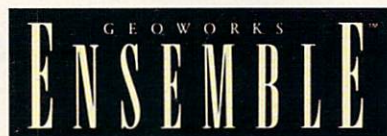
For home or occasional users, applications in the easy Appliance level have a simple set of choices, clearly shown in push-button form on-screen. For business or advanced users there's the Professional level, where applications have power that rivals stand alone programs.

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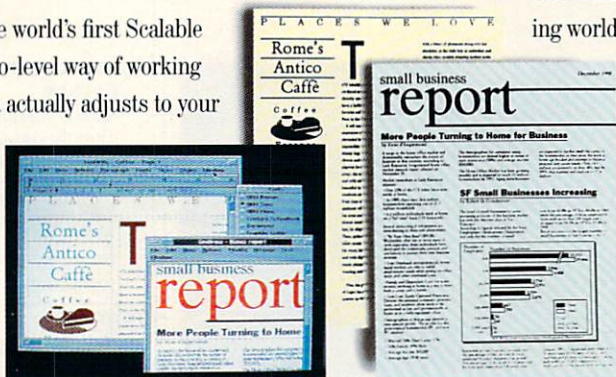
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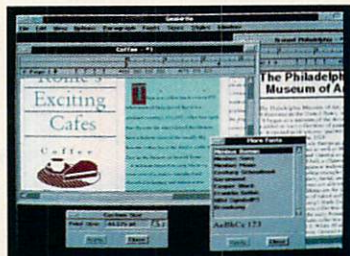
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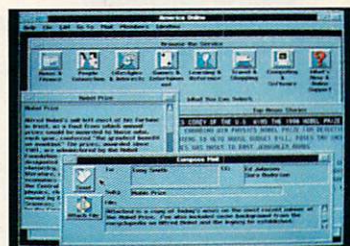
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Circle Reader Service Number 152

COMPUTE

MAY 1991

VOLUME 13 • NO. 5 • ISSUE 129

Editorial License 6

PETER SCISCO

This issue of *COMPUTE* has some exciting changes. Here's a road map to what's new inside.

News & Notes 8

ALAN R. BECHTOLD

IBM moves into multimedia in a big way. Ashton-Tate loses a major court battle against Fox Software. *Lotus 1-2-3* visits Mother Russia, an 82-year-old retired Navy captain makes some exciting discoveries, computer consultants get a new labor law, faster laptops may be on the horizon, and more.

Feedback 16

READERS

Reverse engineering a classic, why a VIC-20 and an AT don't get along, looking for program listings, changing the border on a VGA monitor, 286 buying dilemma, and more.

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RICHARD C. LEINECKER

Put a move on *Windows* files with *Click! Filer*, design your own *Windows* icons with *PBIcon*, make your home budget work with *PCBUDGET*, and create a world-class résumé with *Résumé Professional*.

COMPUTE Readership Survey 58

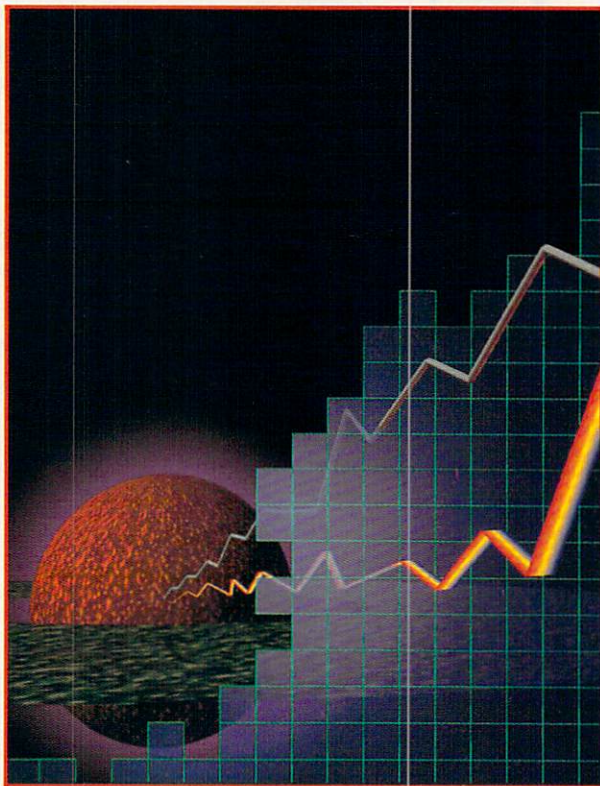
How are we doing? This issue's survey gives you an opportunity to let us know what you think about the magazine. You'll also get a chance to tell us a little about yourself—what kind of computers and peripherals you use and what your interests are.

IN FOCUS

State of Computing: Europe 20

JACK SCHOFIELD

From his home in the U.K., Jack Schofield takes a hard look at home computing in Europe, especially in the U.K., Germany, and France. Unlike the United States, which, despite its diversity, still has one predominant language and culture, Europe has a computing community which is complex, with its host of languages and differing cultural attitudes. IBM, Apple, Commodore, and Atari are the big players, with PC compatibles making great gains in the last few years.



ON THE COVER

Artist Doug Struthers created this issue's cover with a Silicon Graphics Personal Iris workstation. This machine's powerful geometry engine is fueled by a MIPS RISC chip, 32MB of RAM, and a 1.2 gigabyte disk drive. Doug used his own software to model the image, which is based on spline surfaces, not more commonly used polygons. The finished image is 4000 pixels high by 4000 pixels wide and four bytes deep.

COMPUTE Your Complete Home Computer Resource (ISSN 0194-357X) is published monthly in the United States and Canada by COMPUTE Publications International Ltd., 1965 Broadway, New York, NY 10023-5965, Volume 13, Number 5, Issue 129. Copyright © 1991 by COMPUTE Publications International Ltd. All rights reserved. Tel. (212) 496-6100. COMPUTE is a registered trademark of COMPUTE Publications International Ltd. Printed in the USA and distributed worldwide by Curtis Circulation Company, P.O. Box 9102, Pennsauken, NJ 08109. Second-class postage paid at New York, NY and at additional mailing offices. POSTMASTER: Send address changes to COMPUTE Magazine, P.O. Box 3245, Harlan, IA 51537-3041. Tel. (800) 727-6937. Entire contents copyrighted. All rights reserved. Nothing may be reproduced in whole or in part without written permission from the publisher. Subscriptions: US, AFO - \$19.94 one year; Canada and elsewhere - \$25.94 one year. Single copies \$2.95 in US. The publisher disclaims all responsibility to return unsolicited matter, and all rights in portions published thereof remain the sole property of COMPUTE Publications International Ltd. Letters sent to COMPUTE or its editors become the property of the magazine. Editorial offices are located at 324 West Wendover Avenue, Suite 200, Greensboro, NC 27408. Tel. (919) 275-9809.

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KRISTEN STERNBERG

From the vantage point of a traveler behind the Iron Curtain, Kristen Sternberg illuminates the computing landscape of the Soviet Union. In a country where bread and meat are in short supply, can personal computer technology provide tangible benefits?

TEST LAB

Seven Systems Go Head to Head 33

Our all-new Test Lab makes its debut with detailed analysis of seven computer systems ranging from superlight laptops to high-powered desktops. We took systems from Packard Bell, LASER Computer, Tandy, Zeos, Sanyo, Sun Moon Star, and Veridata; ran each through a grueling series of benchmarks; and gave each unit to a *COMPUTE* editor for a hands-on, in-depth review. If you're in the market for a new PC, don't miss this roundup.

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How to Choose a Hard Disk 60

MARK MINASI

Choosing the right hard disk is a tricky business. Do you want an ST506, ESDI, SCSI, or IDE interface? What kind of encoding is best—MFM or RLL? Is 65 megabytes large enough? This information-packed feature has everything you need to know to make the right hard disk choice.

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JOYCE SIDES

How to draw without a mouse in *TurboPaint*, why the *PC Disk* is different, making the *Star Blaster* connection with a Tandy, solving a *DISKTRAK* dilemma, and more.

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READERS

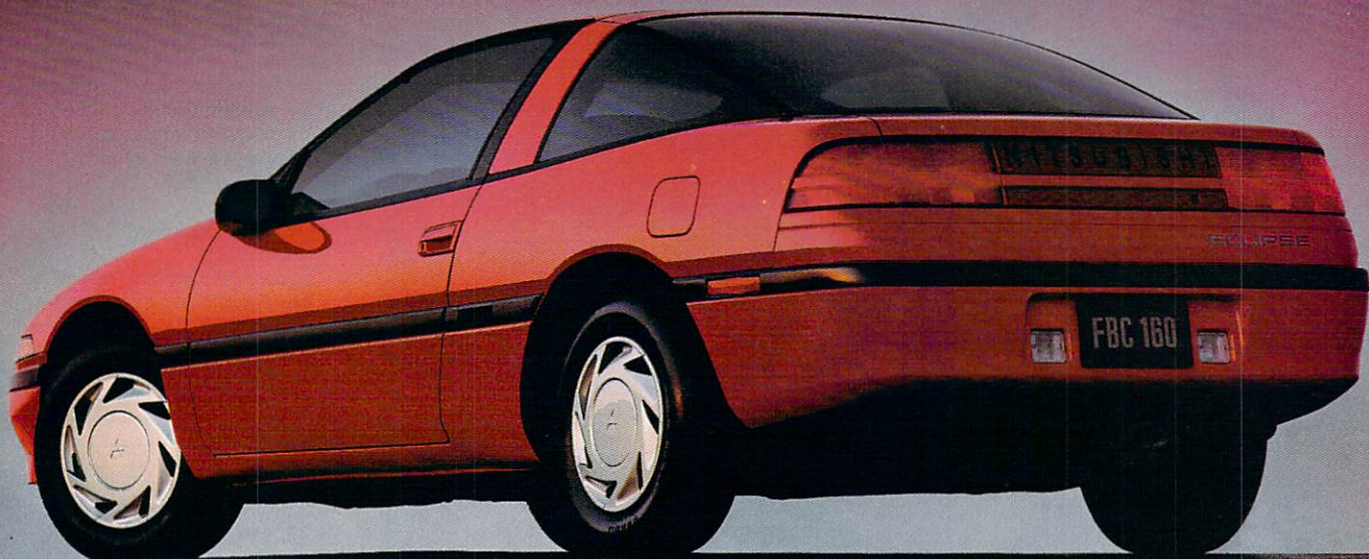
Don't be bashful about using FOR loops in batch files, find hidden *Windows* icons, design your own tower system, speed up *dBase*, double-time your data with a cache, and more.

Programming Power 69

TOM CAMPBELL

Find the strings hidden inside EXE, COM, and OBJ files with this month's super *QuickBASIC* program, *Snooper*.

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COMPUTE

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CLIFTON KARNES

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Faces, Fonts, and Points 72

WILLIAM HARREL

Take a laser printer, add the expert advice found in this feature, mix well, and you'll produce dazzling documents every time.

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CONTRIBUTING EDITORS

Four top professionals—contributing editors Tony Roberts, George Campbell, Alan R. Bechtold, and Tom Campbell—give us the inside story on their favorite interfaces, word processors, telecommunications software, utilities, disk managers, databases, spreadsheets, graphics or desktop publishing programs, programming languages, and more. You'll undoubtedly discover that our pros are using some of your software favorites, but a few of their choices may surprise you.



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STEVEN ANZOVIN

Is a vacation on Mars in your future? With advances in modern computer technology, you may be taking one sooner than you think.

Rad CAD 98

MICHAEL PERKINS and KELLY RIVERS

We usually think of CAD as the ultra-high-powered software used for designing everything from spaceships to luxury cars. But CAD has started appearing in our schools as software for kids, and therein lies a story.

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To really bring a game to life, you need to have the right tools. Here's a look inside an expert's toolkit.

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The time is World War II; the place, the icy waters of the North Atlantic. Americans and Germans engage in a brutal confrontation in the most deadly environment on earth. How could this battle have been turned around? Using two naval warfare simulations, *WolfPack* from Brøderbund and *Action Stations* from Conflict Analytics, and careful historical analysis, *COMPUTE*'s Richard Sheffield finds out.

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PETER SCISCO and CLIFTON KARNES

Advance looks at two hot soon-to-be-released software packages: *Simulated Sports Boxing*, from Brøderbund, and *Publisher's Paintbrush for Windows*, from ZSoft.

Michael S. Hedgepeth
14020 LOCUST STREET · PHILADELPHIA · PA 19100

21 January 1991

Ed Bates
Bates Industries, Inc.
241 Batesway Drive
Kenney, PA 02123

Dear Ed:

Well, we're finally settled in.

The kids are registered in school. We've unpacked everything but the pictures. And I'm in my new digs.

Wonder of wonders, I actually have a window!

And -- as you can see -- no more 9-pin printer. Funny thing, one morning I sat down at my desk and there was a brand new Panasonic printer hooked up to the PC. Oh well, what are birthdays for? It's an 1123. And it has a lot of the same features as the 1124 you use at the shop. Just more affordable.

I love it. That is, when I can get to it. Barbara's putting all her recipes on computer. And John's at the age where it seems like there's a term paper due every week.

Well, gotta run. You're not the only one with deadlines to meet.

Give my best to everyone in the department. Tell Pete he still owes me a beer. You collect it for me.

Can't wait for you and Ann to come visit.

Bye for now.

He

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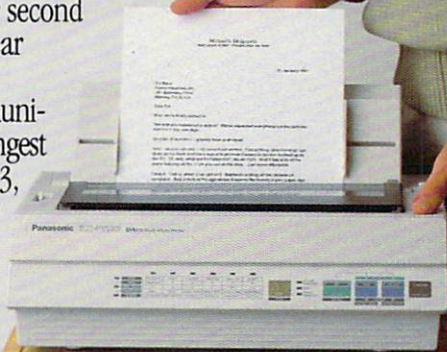
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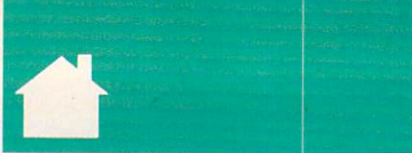
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P E T E R S C I S C O

This issue of *COMPUTE* brings with it some exciting changes. Over the last several months, the editors have worked diligently to refine the focus of the magazine and to define *COMPUTE* as a total resource for computing at home. From what many of you have said, in letters and in phone calls, we're on the right track.

Your feedback is doubly encouraging because it endorses a vision shared by the *COMPUTE* editors. From its inception more than ten years ago, *COMPUTE* has attracted an active audience that was willing to experiment with personal computer technology even when it required long hours of work to reap the rewards. A lot has changed since then. The software applications and the hardware platforms we use now are so complex and sophisticated that (and this is the central paradox of personal computing) they make computers easier to use for all of us.

Access to power. That's what computing at home is all about. The power to make the right decision

when you go to buy that new laptop. The power to make the most of your favorite software program. The power to influence the decisions your company makes—whether you're the president or the rookie. The power to help your children realize their potential. The power of electronic entertainment, a world of wonder only imagined a decade ago.

Access to power. That's what *COMPUTE* is all about, too. And this month, we want to share that access with you. Our new Test Lab section gives you the information you need when shopping for new equipment, spelled out in language that's easy to understand, designed for easy access.

Our expanded Tech Support section (formerly the PC section) solves the tough technical questions that can hamper your productivity. This month, find out how to choose the right hard disk for your computer. With insight into graphical computing, as well as hardware and software strategies, Tech Support is sure to become a valuable resource in your home and office.

Last, but certainly not least, we have expanded our Reviews section to include as many software and hardware reviews as possible. Whether it's a laser printer or the latest flight simulator, you'll find it in these pages.

COMPUTE will continue to be the essential guide for the PC activist. It will continue to provide an avenue for the exploration and implementation of computer technology at home. Our readers will continue to be the forward-looking advocates they have always been, exponents of the computing lifestyle. And as more and more people adopt computer technology, *COMPUTE* and its readers will be there to share and encourage their excitement and discoveries.

This month, *COMPUTE* launches itself on a journey of discovery across the Atlantic, where we explore the world of personal computing as it exists in Europe—and beyond. It's rank fallacy, of course, to talk of Europe as one big nation of computer users. The platforms that are hottest in the United Kingdom may be eschewed in Germany or France. The software admired in France may be coolly dismissed across the Channel. Business software must adhere to differing governmental regulations. Cultural attitudes toward violence, arcade halls, and narrative many times flavor discussions of entertainment software.

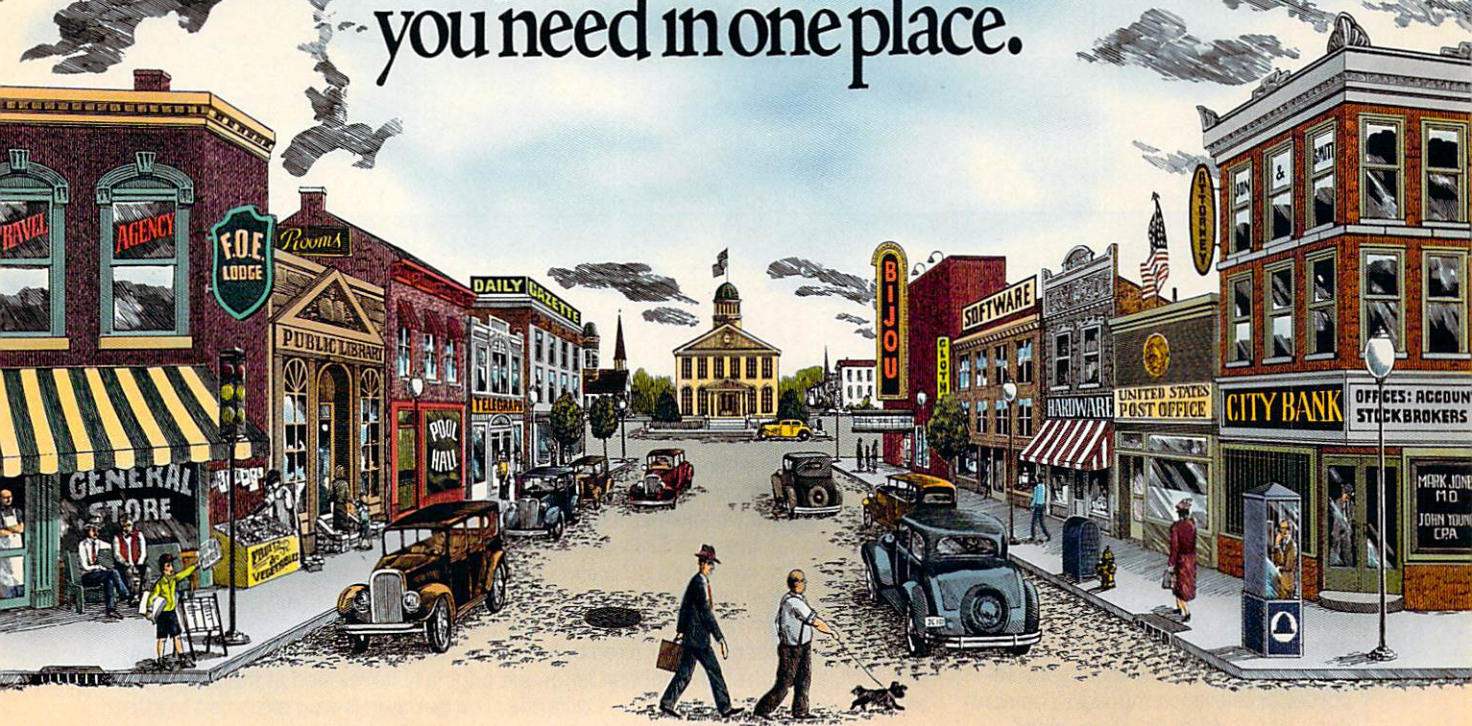
The burgeoning number of PCs moving into European homes is slowly growing to critical mass. And as the community grows, so does the opportunity for shared ideas and perspectives.

The idea of home computer users linked globally through networks and software applications is but a glimmer of a random thought, and a long way from replacing television broadcasts and telephone calls.

But the idea persists. And it's worth considering how a different culture might influence the design and use of home computers, suggesting a perspective we may never gain from our own explorations. □



There's nothing new about having everything you need in one place.

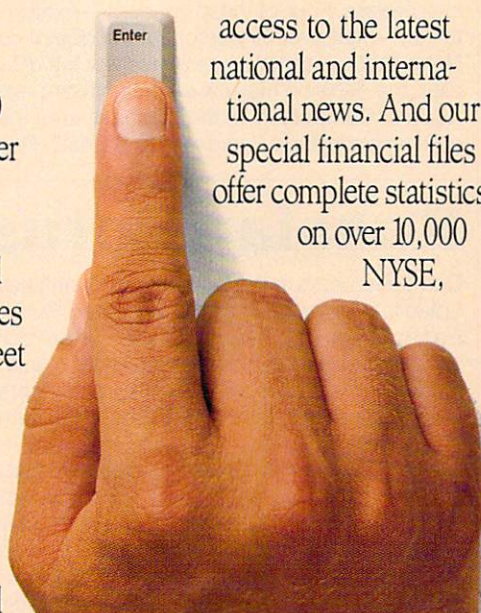


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NEWS & NOTES

At the Movies

IBM continues to build its multimedia arsenal by enhancing existing graphics-presentation software. IBM's Audio Visual Connection (AVC) now provides touchscreen capabilities that ease authoring and viewing multimedia presentations. AVC 1.03 also includes a new video-out option that allows users to send draft or finished presentations to a videocassette recorder or television monitor. The company's M-Control Program, which enables full-motion video presentations using the M-Motion Video Adapter/A, now supports *Microsoft Windows 3.0* and improves the speed of performance when run with the OS/2 Presentation Manager.

Storyboard Live!, IBM's animation, motion video, and enhanced presentation software, now lets users create onscreen presentations that incorporate drawing, painting, animation, motion video, music, and voice. Users can also play back *Storyboard Live!* audio and video without additional hardware, allowing them to distribute presentations on disks for viewing by individuals with standard computer hardware. New background templates and automatic frame-sequencing capabilities enable users to quickly and easily create presentations. *The Video Editor*, formerly part of an add-on program from Krepec Publishing, has now also been fully integrated into *Storyboard Live!*. This allows users to capture video sequences for a presentation with a video-capture board and any video source, such as a VCR, laser disc, or video camera, and then play back the sequences from the computer's hard drive. Tagged Image File Format (TIFF), Picture Exchange Files (PCX), Windows Bitmap files (BMP), and Graphic Image Files (GIF), in addition to IBM Linkway, OS/2, and Audio Visual Connection files, are also now supported.

The Backfire Heard 'Round the World

Ashton-Tate might not own *dBase*! In a legal decision that could have major implications for the entire database market and for the software industry as a whole, a federal judge in Los Angeles ruled that Ashton-Tate's original copyright for *dBase III Plus* was invalid. The ruling came in a look-and-feel suit brought by Ashton-Tate against Fox Software, in which Ashton-Tate claimed that Fox had infringed on Ashton-Tate's *dBase III Plus* copyright. The judge dismissed Ashton-Tate's current lawsuit against Fox Software "with prejudice," precluding Ashton-Tate from refiling a new suit in the same court.

Judge Terrence Hatter ruled that *dBase III Plus* is a "derivative work" from JPL/DIS, a mainframe database language originally developed at the Jet Propulsion Laboratories in Pasadena, California. The decision is also expected to affect *dBase IV*, which is primarily derived from *dBase III Plus*. This decision is expected to strengthen the *dBase* aftermarket for *dBase*-compatible databases and follow-on products by encouraging independent implementations of the *dBase* language.

There are currently ten vendors marketing *dBase* language compilers and interpreters. Four of these vendors—Ashton-Tate, WordTech, Fox, and Nantucket—hold over 90 percent of the *dBase*-compatible market. Coupled with Nantucket's recent moves to eschew the *dBase* market and reposition its compiler, the decision may cause a significant reshuffling among the *dBase* market leaders. Competitors in the database area that are not specifically *dBase*-compatible include *Paradox* and *R:BASE*. Both can import *dBase* files, however.

Russian Lotus

Computer users in the Soviet Union won't have to do without their *Lotus 1-2-3*. Lotus is now shipping a fully translated Russian version of *1-2-3* in the U.S.S.R. Esther Dyson, a U.S. expert on the Soviet computer industry, said, "Until now, word processing and databases had a higher share of the software applications market in the Soviet Union than spreadsheets. As the economy loosens up and the need for financial analysis grows, the demand for spreadsheets will increase significantly."

In related news, Lotus has also made several moves regarding its market activities in the Soviet Union. Lotus has appointed VNIPI StatInform as its first Soviet distributor. In addition, the Leningrad International Management Institute has been named the first Lotus Authorized Training Center in the U.S.S.R. Lotus also will open a Soviet sales office in the first quarter of 1991. It will be managed by Jane Kitson, who was recently appointed business development manager for the U.S.S.R.

"The Soviet market represents both a significant opportunity and a challenge for Lotus," said Steve Crummey, senior vice president of Lotus's International Business Group. "Currently there are an estimated 300,000 PC users in the Soviet Union. As the price of PCs in the U.S.S.R. drops and their availability increases, the number of users is expected to grow significantly. At the same time, the country's economy is in upheaval, and conducting business under these conditions is difficult, especially for a foreign company. VNIPI StatInform's existing infrastructure will assist us in making this transition easier." >

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NEWS & NOTES

Senior Hacker

An 82-year-old retired Navy captain who was aboard the U.S.S. *Yorktown* when it was sunk during the Battle of Midway has been named Senior Adult Student of the Year. Vane M. Bennett was selected from more than 100 nominations as part of Salute to Older Adults Day, when adult schools all over California honored their oldest students. Bennett is involved in an avid study of databases, spreadsheets, and hard disk management at Grossmont Adult School in La Mesa, California.

Bennett says he's "hooked on computers" and his goal is to become computer literate so he "can take advantage of all the things computers can do." His teachers at the Foothills Center near San Diego describe him as "incredibly energetic" and "committed to the pure joy of learning." His fellow students, all younger, often seek him out for advice and answers to their questions.

Most adult school classes for older adults are tuition-free. Many have outreach programs that send teachers and aides to senior centers and convalescent homes.

Enabling the Disabled

"Computer technology is providing solutions that help many of the estimated 43 million Americans with disabilities to lead more independent lives," said James G. Parkel, IBM director of corporate support and community programs. To help enable the disabled, IBM is making available \$4.5 million in computer systems to federally funded disabilities support centers being established nationwide. Under the program, dubbed the IBM Disabilities Assistance Network, personal computers and software will be loaned at no charge to the agencies and nonprofit organizations designated by the states and U.S. territories to operate the centers.

"This program builds on the partnerships IBM has established with state agencies and nonprofit organizations that work with people who have disabilities," Parkel said. The computers will be available to centers receiving federal grants to help them assess needs, coordinate resources, and answer telephone inquiries. The equipment also will be used to provide demonstrations of computer-technology solutions that assist people with disabilities.

Through the program, centers will be eligible for IBM Personal System/2 models, peripherals, software, and databases that assist people with disabilities. IBM products designed to assist people with hearing, vision, speech, and other disabilities will also be available to the centers. The loan program will be managed by the company's National Support Center for Persons with Disabilities, located in Atlanta.

Demanding Lower Wages

Computer consultants are celebrating a new labor bill which exempts hourly computer employees from receiving time-and-a-half for overtime as a major victory. Normally, people aren't too happy about lower wages, but National Association of Computer Consultant Businesses (NACCB) president Bill Campbell says most computer professionals will actually make more money as a result of the new law.

"Typically, employers have been reluctant to pay the steep overtime costs, averaging \$75 per hour," Campbell said. "Many of them would simply stipulate that employees could not exceed 40 hours each week on a project, even if it required more time."

Now, the association reasons, computer employees will at least be given the opportunity to work additional hours for their regular hourly pay. The landmark change occurred after more than four years of lobbying efforts by the NACCB. For more information, contact Lynee Leaf, NACCB Publicity Chair, Northern California Chapter, (415) 835-1004.

Faster Laptops?

IBM's *next* laptops might run faster than anything we've seen today. IBM researchers have unveiled some new transistors that could revolutionize personal computers—especially laptops—by speeding them up dramatically. The transistors are built out of a promising new computer-chip material called "silicon-on-insulator," and they reportedly run three times faster than their comparable pure-silicon counterparts.

The new transistors are the Complementary Metal Oxide Semiconductor (or CMOS) type of electronic devices, a mainstay of computer chips that power laptop and personal computers. IBM research staff member Dr. Ghavam Shahidi said the new silicon-on-insulator material could someday speed operation and decrease errors in computer circuits.

Inoculate Your Computer Now!

VirusCure might be just what the doctor ordered for your PC. According to its maker, the program can actually cure your computer of a broad spectrum of known virus infections.

From International Microcomputer Software (1938 Fourth Street, San Rafael, California 94901), *VirusCure* scans disks and memory and identifies all files infected with known viruses. It then removes the viruses from all infected files and repairs infected programs where possible. *VirusCure* also identifies any boot-sector or partition-table virus that may be present. If a virus is discovered, *VirusCure* will open a window in the center of the screen, listing the name of the infected program and the name of the virus. The company claims that most COM files and up to 80 percent of EXE files can be successfully repaired by *VirusCure*. *VirusCure* also works on a network.

The new version, developed in association with McAfee Associates, can detect more viruses (over 230). It retails for \$89.95. >

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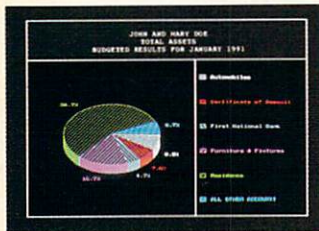
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NEWS & NOTES

Software That Throws a Fit

Mannequin is a program for computer-aided design (CAD) and graphics-design users who need to fit their designs to the human form. The program actually implements the human fit into the design process by creating moving, fully dimensional human likenesses on the screen. These likenesses can see, walk, bend, and grasp objects in a quantifiable, ergonomic manner. Ken Goodman, vice president and general manager of *Mannequin* publisher Humancad, said the program "can dramatically improve the appeal of thousands of products by allowing designers to meet individual customers' needs by matching product designs to different human body types."

The program uses extensive ergonomic data to allow users to combine specific likenesses of men, women, and children of different sizes, shapes, and nationalities into a design. It can be integrated with most popular CAD and graphics software packages, such as *AutoCAD*, *Generic CADD*, *Corel Draw*, *Micrografx Designer*, *Harvard Graphics*, and *Aldus Pagemaker*, to provide the user with a variety of design options. According to Goodman, the program can assist companies in improving overall customer satisfaction by providing more comfortable, higher-quality, better-designed products and environments, from entire buildings to automobiles, home and office furniture, hand tools, and kitchen appliances.

Mannequin draws human figures from ten world populations, including North and South America, Europe, and the Far East. The package also draws five different body sizes, from extra small to extra large. Specific body parts, such as arms, legs, or heads, can be drawn to different scales as well. In addition to drawing human physiological characteristics, *Mannequin* offers animation capabilities, allowing the program to evaluate range of motion, vision (including peripheral vision), and distance judgment. The program retails for \$699, and all customers who register the program immediately also receive a free copy of Humancad's extensive ergonomic database, including 44 world populations of male, female, children, disabled, and military figures. For more information contact Humancad, 1800 Walt Whitman Road, Melville, New York 11747.

NCR and AT & T: No Peace in Our Time

NCR chairman of the board and chief executive officer C. E. Exley Jr. has placed himself and his company in a defensive position against a takeover attempt by AT & T. In a public letter addressed to AT & T chairman of the board Robert E. Allen, Exley said: "NCR's Board of Directors has been and remains unwaveringly committed to protecting the vital interests of NCR's shareholders, customers, employees, and other important stakeholders. We believe that all of our shareholders and other stockholders are best served by continuing to build NCR's enormous inherent value as an independent company."

The NCR board has rejected a \$90 stock-for-stock merger offer from AT & T, and, in his letter, Exley called the offer "grossly inadequate and unfair." NCR went on to let AT & T know it would consider an offer of "not less than \$125 per share." Such an offer has not been forthcoming, so NCR broke off negotiations, and a bit of name-calling and breast-beating by both parties ensued. In his letter, Exley referred to AT & T's offer as "a desperate attempt to salvage AT & T's disastrous foray into the computer business." Should AT & T continue alleged hostile attempts to take over NCR, NCR "will use every means at [its] disposal to protect [its] shareholders and other stakeholders."

NCR then filed a lawsuit against AT & T, alleging that its tender offer filings were "false, manipulative, and misleading" and in violation of the Securities Exchange Act of 1934 and the rules and regulations of the Securities & Exchange Commission.

So AT & T has attempted to take over NCR with what NCR refers to as an unfair offer. Now NCR stands ready to go to legal war to protect its interests.

Finally! An IBM Laptop!

Yes, it's true. According to recent reports, IBM's long-awaited laptop computer is finally about ready to ship. At this writing, IBM executives have reported the new PC will be more fully loaded than any of the other so-called notebook class of laptops currently on the market. Reports indicate the machine will have a 386SX microprocessor, a 60MB hard drive, and a slanted full-size keyboard. Reports indicate the new IBM notebook computer will weigh 7 to 7½ pounds and will come equipped with 2MB of RAM (expandable to 18MB). The suggested retail price is expected to be \$5,000-\$5,500.

RISC-y Business

Portability and RISC-based computing don't usually go hand in hand. Now TriGem may have solved the problem with the introduction of a battery-powered RISC-based laptop PC. The company claims it's an industry first.

The new laptop workstation weighs only 8.5 pounds and comes equipped with 8MB of RAM, a 100MB hard disk, and a 13-inch monochrome screen capable of 1152 × 900 pixels of resolution. The 4-pound battery provides 2-6 hours of continuous usage. The new laptop's SPARC architecture (or *SPARCitecture*, as it's called at *COMPUTE*) was developed by Sun Microsystems. It can execute about 15.8 million instructions per second (MIPS), compared to about 5-6 MIPS for computers based on Intel's 386 chip running at the same speed. The laptop can also emulate CISC processors and run DOS software at the same speed as a 286 PC, and it's also capable, according to the company, of running Macintosh software faster than a Macintosh SE. The price is expected to run between \$7,000 and \$12,000. More information about this machine can be obtained by writing to Neale-May & Partners, 4920 El Camino, Los Altos, California 94022. ▸

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NEWS & NOTES

To Catch a Thief

It's getting harder to catch a thief these days. According to a report by the National Academy of Sciences' National Research Council, "The modern thief can steal more with a computer than with a gun." The statement may set the tone for how computers and the precious data they contain are viewed in the 1990s.

In its report, the council also encourages Congress to form an Information Security Foundation to serve as a center for computer-system security research, as many corporations are just beginning to understand how vulnerable they are to theft or destruction of vital corporate information.

Twice the Football

A special promotion from Data East combines the fun of a fast-action computerized football simulation with the pleasure of real-life football in a single bundle. Data East's new football bundle combines its *ABC Monday Night Football* software with ABC Sports' 20th anniversary videotape, *Monday Night Madness*.

ABC Monday Night Football delivers the same action-packed excitement as the original version, plus much more. The program is an upgrade that delivers improved graphics and sound, offering players 256-color VGA graphics and Ad Lib sound board support. Additionally, players can take advantage of the game's improved use of artificial intelligence. And with improved broadcast-style statistics, players can keep track of the scoring drive, including downs, yardage statistics, losses, and pass completions for more accurate gameplay.

The *Monday Night Madness* VHS tape highlights some of the most memorable moments in NFL history. The video is a collection of the heroes and villains, including such legends as the Juice, the Fridge, and Broadway Joe, who have made "ABC Monday Night Football" one of the highest-rated television shows ever.

A Three-Way 1-2-3

Lotus Development's new Network Edition of its popular 1-2-3 release 3.1 is specifically designed for Local Area Networks (LANs) running under DOS or Windows 3.0. The new Network Edition, which simplifies the task of installing and running the popular spreadsheet on LANs, is available in three editions: Standard, Server, and Node.

The Standard edition is intended for use in a stand-alone or networked environment, including full documentation, software, and a single-user license. The Server edition is licensed for shared use from a central network file server and includes complete network administration software and documentation, product software and documentation, and a single-user license. The Node edition provides an additional license for network use and contains complete documentation and software.

Each of the new editions provides the ability to share 1-2-3 data and program files, as well as network resources, such as printers and fonts. Server and Node editions of 1-2-3 release 3.1 are available at a retail price of \$795 and \$495, respectively. The Server edition includes 5¼-inch and 3½-inch disk media in the same package.

Hazardous Waste Fine for Seagate

Computers can actually help save our environment by cutting down on waste (think of the paper and energy saved every day by electronic mail). But some computer manufacturers have actually been found to be contributing to the possible deterioration of our environment by their manufacturing processes.

According to a published report, one such company, Seagate Technology, was recently fined \$850,000 for an environmental violation involving hazardous waste. According to the report, Seagate allegedly gave more than 500,000 gallons of copper sulfate solution from its disk-drive plant in Fremont, California, to Stapleton Technologies in Long Beach, California, for disposal during a period from mid 1987 to late 1988. The fine has been referred to as one of the largest environmental penalties in the history of California's Santa Clara County.

Quest for Merger

Two of the country's biggest consumer software companies, Sierra On-Line and Brøderbund, announced in March their intentions to merge their operations into a single company. The proposed merger is a means of broadening their respective product lines and gaining clout on retail shelves.

Under the terms of the agreement, Sierra, which had about 3.6 million shares outstanding at the time of the announcement, will issue 4.1 million new shares of common stock in exchange for all outstanding shares of Brøderbund. Sierra-Brøderbund will become a wholly owned subsidiary of Sierra. The transaction is subject to approval by both companies' shareholders and other contingencies. Susan Lee-Merrow, director of marketing at Brøderbund, expects the deal to become final sometime in mid to late April.

Ken Williams, Sierra's current CEO, will be chairman, president, and CEO of the consolidated company. Doug Carlston, Brøderbund's chairman and CEO, will be president of Sierra-Brøderbund. Williams said that the combination of the two firms will have "the financial and technological resources to compete effectively on a global basis." The only anticipated change, from the consumer's point of view, is wider software availability. □

—PETER SCISCO

"News & Notes" is by Alan R. Bechtold, editor of *Info-Mat Magazine*, an electronic news weekly published by BBS Press Service.

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FEEDBACK

LETTERS FROM OUR READERS

Where Are They Now?

Does anyone remember *Papermate*? It was the first truly powerful word processor for the Commodore 8032. It was written almost entirely in BASIC, so it could be revised readily for special uses. It was the ideal first word processor, and I have adapted it to the PC. I'd like to give it away to my school, along with the source listing (it's compiled with *Microsoft QuickBASIC*). The question is whether Michael Riley, the author of the original *Papermate*, would permit it. Can you get me an answer to this question, or alternately, can you put me in touch with Mr. Riley?

ALFRED D'ATTORE
DOVER, DE

If your program "looks and feels" like the original, you'll probably need to get permission from the copyright holder before distributing it. Check the initial screen of the program for a copyright notice. Even if Michael Riley is the author, the copyright might be in someone else's name. We aren't aware of the whereabouts of Mr. Riley, but we hope that someone reading this will help us track him down.

Brickbat Roundup

After I saw the new *COMPUTE*, my feelings about it were affirmed. I must say that I really enjoyed the magazine as it was because it provided various articles for various computers. Now the magazine seems to be concentrating on the IBM PC, with little or no attention given to the Amiga or the Apple II. There are other publications designed for the IBM, and there are few that provide general information about many kinds of computers. I wonder what happened to the well-rounded magazine.

CECILIA MCKINLEY
LOWER LAKE, CA

Get with the Program

I like the new *COMPUTE*. If I remember correctly, *COMPUTE* used to have programs. That was how I be-

came interested in BASIC and computers. If possible, could you put a small, useful program in once in a while to tempt your programmers? Keep up the great job!

RICK WIKOFF
FPO SAN FRANCISCO, CA

Check out Tom Campbell's "Programming Power" column. Each installment will provide a short, useful program that illustrates how to program the PC with BASIC and other languages.

Dark Victory

This fall we purchased an AT clone for our family. We especially appreciate the educational programs we've purchased, but we'd also like to have more recreational games. Several years ago we owned a Commodore VIC-20 and a large collection of games for it. However, the VIC-20 finally died, and the repair shop lost it, leaving us with all these games and no computer to play them on. Is it possible to have these game cartridges transferred to 3½-inch disks and play them on the AT? If so, which company do I contact, and what would be the cost?

WILLIAM H. VICKERS
BARBOURVILLE, KY

There is no way to play VIC-20 games on an AT. Even if you could somehow transfer the code on the ROM chips in the cartridges to a PC disk, the two computers use utterly different central processing units. The VIC's 6502 code would be gibberish to the AT's 80286. It seems to us that you have two options: Sell or donate the games to someone with a VIC-20 or advertise to purchase one of these units from someone else. There must be someone in your area with a VIC collecting dust in a closet.

Born to Upgrade

I have an IBM XT clone with a hard drive and a 5¼-inch drive. I plan to add a 3½-inch drive. I have DOS 3.3,

the BIOS, and space available to upgrade my system. My question is what kind of 3½-inch drive I should get—720K or 1.44MB. I notice that some of the new software is using high-density disks. My worry is that if I get a high-density drive, I won't be able to use any of the current popular software on 720K disks. Are they compatible?

Yes, with the exception of some early 720K drives, 720K and 1.44MB disk drives are completely compatible. You will have to use a slightly different format command to format 720K disks on a 1.44MB drive, but other than that the capacity of the disk should be of no concern to you. Not only are they compatible, but the price difference between the drives is almost negligible—often only \$10 or \$20 by mail order.

What ought to be of concern to you is that some BIOSs are completely unable to cope with the 1.44MB drive itself. To make sure that your BIOS is compatible, read your documentation or call your computer's manufacturer.

Border Skirmish

My new VGA monitor has a black border around the color screen. How can I eliminate this black border?

ADAIR D. WILSON
OCEAN SPRINGS, MS

All VGA screens have a border around them. There are three solutions to the problem. You could write a program that makes a BIOS call that results in a thin border of a color other than the background color. This doesn't eliminate most of the border, though.

You could change the palette so that the border is some color other than black, but then everywhere something black appears on the screen, it would be changed to this new color.

Finally, you can usually adjust the size of the picture using the knobs on the back of the monitor. If

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you can adjust the vertical and horizontal spread on the screen so the image is large enough, you can make the border essentially disappear.

Where It's AT

I have decided to buy a computer with an 80286 microprocessor, but the market is flooded with them. Is there any difference between a generic computer and a brand name? Are you just paying extra for the name? Also, I see that there are different types of BIOSs around. What is a BIOS, and which is the best one? Phoenix and AMI seem to be the most popular.

ADAM JULIUS
 BELLMORE, NY

You sound as if you have made up your mind, and we hate to throw in another source of confusion, but you ought to consider a 386 or 386SX machine. These computers have come down in price to the point that they rival their 286 cousins, and they are faster and much more capable.

There isn't much difference between one AT compatible and another. If there were significant differences, the word compatible would lose all its meaning. A compatible that wasn't compatible would never find a place in the market and would soon die of neglect. The price differences you see among computers are based in part upon the value of a brand name, but the value goes beyond a recognizable nameplate. A brand-name manufacturer (like Compaq, Dell, Tandy, or AST) is unlikely to disappear overnight, so you will have a service department to back you up. The woods are full of fly-by-night PC companies offering incredible deals but little assurance of stability or longevity.

A BIOS (Basic Input/Output System) chip is the ROM at the very heart of a computer. It provides the primitive routines that allow a computer to operate. Both AMI and

Phoenix have been around for a long time and offer good quality BIOS chips. You're right to be concerned about the BIOS. Early PC clones offered BIOS chips with a low level of compatibility, resulting in computers that wouldn't run some PC software. This is a problem of the past, however.

Watch out for mail-order PCs that seem to offer an unbelievably low price. These computers may be shipped without RAM, video card, disk drives, keyboard, or ports. You would be left with a motherboard in a steel case and a long shopping list of extras to buy. Another concern is computers that have no expansion slots. They aren't expandable or user-configurable, so you lose out on many of the things that make a PC valuable to a user.

Once you have decided on the equipment that you need (say, a VGA card, a multisync monitor, a 120MB hard drive, a 1.2MB 5¼-inch and a 1.44MB 3½-inch floppy drive), you need to decide what brand you should specify, and in the case of the hard drive, you need to decide on a format. All of this can be incredibly perplexing.

Although it may end up costing more, a beginner is usually best off buying a brand-name computer from a hometown dealer. Dealers will offer advice over the telephone, stand behind repairs and enhancements, and go the extra mile to be sure you are satisfied with your machine.

Readers whose letters appear in "Feedback" will receive a free COMPUTE's PC clock radio while supplies last. Do you have a question about hardware or software? Or have you discovered something that could help other PC users? If so, we want to hear from you. Write to COMPUTE's Feedback, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. We regret that we cannot provide personal replies to technical questions. □

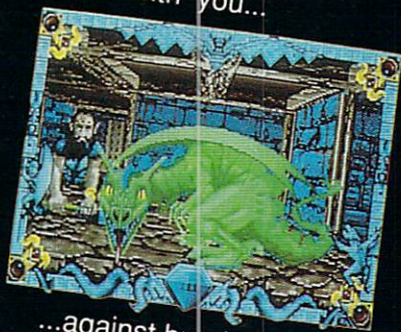
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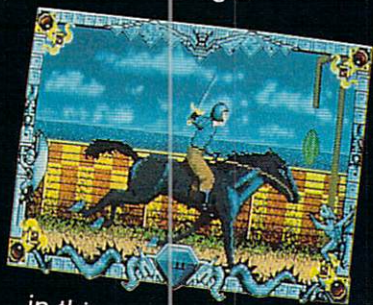
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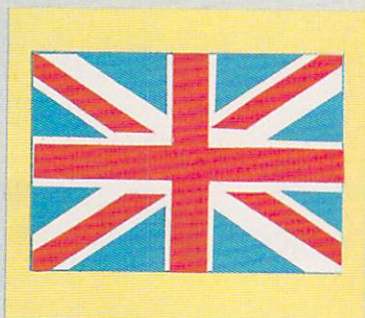
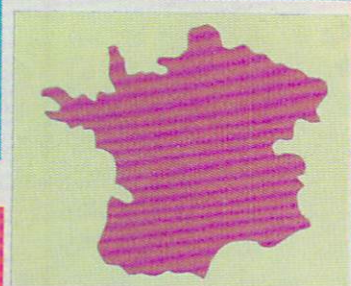
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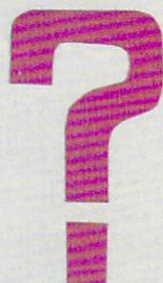
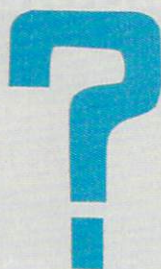
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JRFARY

STATE OF COMPUTING:

Europe

Americans tend to think of Europe as one place, and a lot of Europeans are trying to make that idea a reality. But it isn't. Where Britain and the U.S. are said to be divided by a common language, Europeans are divided by more than a dozen. Imagine if all of Apple's software and manuals were written in French, while all of Compaq's were in German and Tandy's were in Portuguese. Suppose Microsoft wrote everything in Dutch, while Lotus only dealt in Italian. Western Europe is like that, only worse. It isn't going to get easier as Hungarian, Polish, and other languages come into the fold.

And it isn't just language. The Sinclair ZX-81 and Spectrum micros—sold in the U.S. by Timex—were a huge success in France. The reason was simple: Sinclair made the effort to produce a special version with an AZERTY keyboard and the Secam television standard, which are different from the U.K.'s QWERTY and PAL. Some countries, such as Belgium and Switzerland, have more than one language and more than one standard keyboard.

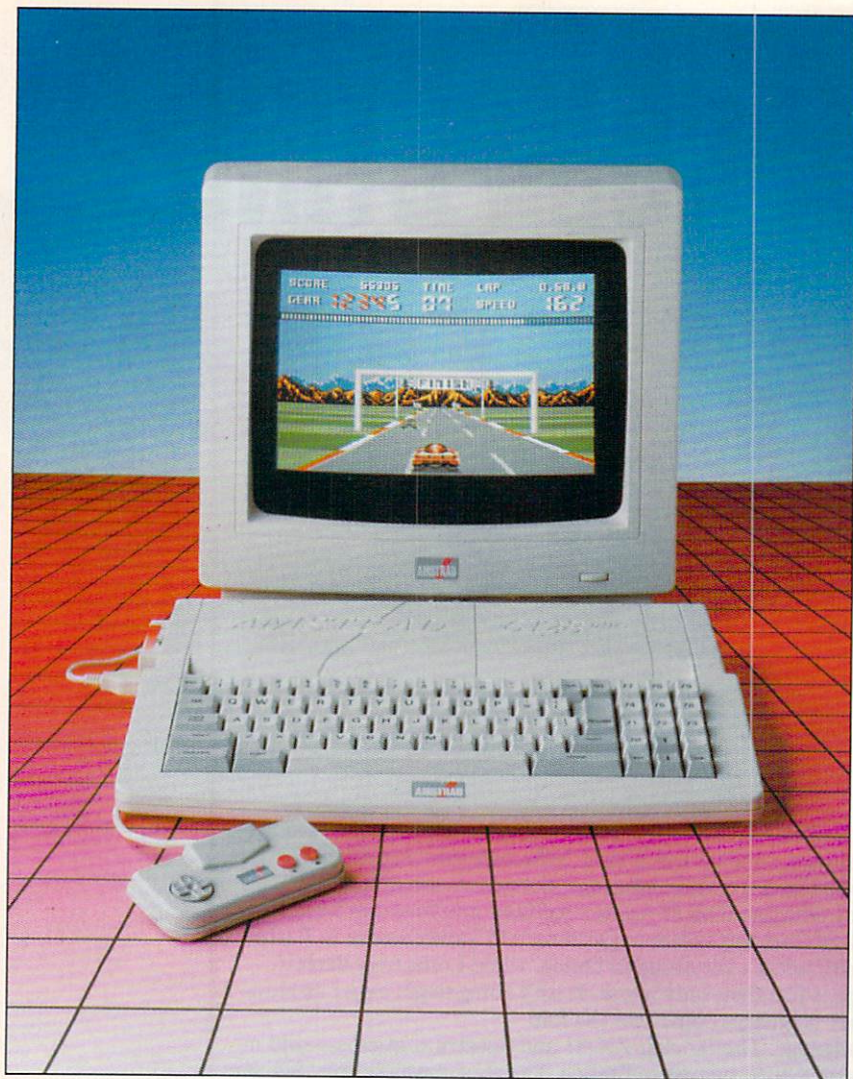
Compatibility on the Menu

If you write a program with pull-down menus, it's a mistake to leave just enough room for the English words: Swap them for German equivalents, and they all spill over the edge. Text isn't the only problem. Just try fitting Italian lire into the columns allowed by a business program written for Deutsche marks.

There's only one computer language that unites Europe. The key words include *zap!*, *pow!*, and—for those with long memories—*kaboom!* Everyone can recognize a fire button. American TV series and Hollywood movies may be painfully dubbed into a dozen European languages, but there aren't too many words in the average computer game. Anyone can learn the cockpit layout for *F-19 Stealth Fighter*, and *RoboCop* doesn't need translating at all. Only Germany is a problem: Swastikas are verboten, and because violence is considered obscene, sales of war games may be limited to sex shops.

It wasn't supposed to be like this. Most European countries had great hopes for their native computer industries. Most supported national champions—Bull and Thomson in France, Siemens and Nixdorf in Germany, ICL in the U.K., Olivetti in Italy, Norsk Data in Norway, Philips in the Netherlands, and so on. But they found it hard to compete with transnationals like IBM and Digital Equipment. Now they're under new pressure from the Japanese. >

J A C K S C H O F I E L D



and some places have a smattering of MSX. But on the whole the generalization holds true.

The Sinclair Spectrum is still popular in the U.K. and Spain, but it's in decline. Amstrad (Alan Michael Sugar TRADing) took over the Sinclair computer operation in 1986, improving the Spectrum's design and repackaging the machine in a bigger box. This extended its life, but the boom days are over. However, the Spectrum has become a sort of standard in the Soviet Union, where there are dozens of unofficial Spectrum clones. One of them, the Hobbit, may even be exported.

It was the success of the Amstrad CPC—which, like the Spectrum, is a Z80-based home micro—that forced Sir Clive Sinclair to sell out. The CPC is still doing well in much of Europe, especially in France. Indeed, Amstrad has just launched an upgraded series of CPC Plus models and added a games console. All of the cases have been changed to make them look just like the Atari ST and Amiga. Nevertheless, CPC sales have also been falling as the market moves gradually from 8-bit to 16-bit machines.

The 64 Still in Front

The exception that proves this rule is the Commodore 64. It was a huge hit when it came out, yet Commodore (U.K.) claims it sold more C64s last year than in any previous year. It's also very strong in Germany, Austria, and Italy.

Perhaps this isn't such a surprise. Every year there are new kids on the block lusting after their first home micro. And most of the machines that used to compete with the C64—the Acorn Electron, Alice, Dai, Oric, Lynx, Enterprise, Video Genie, VIC-20, Commodore 16, Plus/4, and a dozen or so Japanese MSX machines—have faded away. ▸

No Hits and Two Outs

The microcomputer offered a second chance, but this time Europe did even worse. Acorn, ACT, Dai, Dragon, Oric, Matra, Thomson, and many more proved unable to compete with IBM, Apple, Commodore, and Atari. Strength in one country was still not enough to sustain an international market. Only Amstrad, from the U.K., managed to build a large European business. Its turnover from sales of the CPC series of machines, PCW word processors, and PC clones is about \$1 billion annually. Amstrad is bigger than Commodore or Atari, its main rivals.

Americans are often surprised at the European strength of Commodore and Atari. Both do the majority of their business in Europe. It isn't hard to explain. Europeans generally don't have high disposable incomes. Both Atari and Commodore offered cheap machines, whereas Apple and IBM demanded very high prices. For example, an Apple II with two drives cost over \$5,000, and my first IBM PC XT with a printer was over

\$10,000 in 1983. Commodore was considered local: It had factories in Germany and, briefly, in Corby, a former steel town in England.

Hundreds of small software houses had started writing for cheap micros such as the Sinclair Spectrum. They responded to sales of the Commodore 64, Atari ST, and later the Commodore Amiga by supplying the market with games for these U.S. machines. Software availability drove hardware sales and vice versa. Once such a virtuous circle was established, it was hard for rivals to break in. Not even the 500-pound gorilla named Nintendo has managed to crack the market.

The Battle of the Byte

Today, Western Europe has three dominant 8-bit home computer formats and three 16-bit ones. The 8-bit formats are the Sinclair Spectrum, Amstrad CPC, and Commodore 64. The 16-bit formats are the Atari ST, Commodore Amiga, and the DOS-based PC. There are local variations—for example, the Apple Macintosh is very popular in France,



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Though much more sophisticated than their 8-bit competition, 16-bit micros had a tough time becoming established in Europe. Initially they were too expensive. In fact, the Atari ST, Commodore Amiga, and Apple Macintosh were all introduced as serious business machines. Several firms provided multiuser operating systems—BOS, Mirage, OS/9—which let you attach a couple of dumb terminals to an Atari ST and use it like a minicomputer.

In Germany, the Atari ST did manage to grab away from the Apple Macintosh a slice of the business and home/education markets. This is why most top ST software—*Calamus*, *Signum II*, *GFA Basic*, *Pro-24*, and so forth—is German in origin. But sales of STs and Amigas didn't take off in the rest of Europe until the prices were slashed and the machines retargeted at the home/games market.

Amiga Makes New Friends

Today, the Atari ST and Commodore Amiga dominate the three biggest leisure markets: Germany, France, and the U.K. In Germany, the Amiga seems to be ahead as a games machine, while in France the ST has long had the edge. In the U.K., the ST became dominant, but last year the Amiga 500 caught up and has now overtaken it. Overall, European sales are still comparable with those of the old 8-bit machines, but the value of those sales is much higher.

In particular, the ST and Amiga have received strong support from

software houses because game prices are much higher. The bulk of the Spectrum market is for low-cost games that cost \$6 on tape cassette. ST and Amiga games usually sell for about \$40–\$50 each. PC game prices are even higher, but sales are much lower. Naturally, most effort goes into high-priced 16-bit games, and 8-bit owners have to settle for conversions that appear later (or never).

However, the ST and Amiga hegemony is now under attack from both ends of the spectrum. Japanese games consoles are competing for the games market, while the PC compatible is at last being accepted for home use. Instead of buying one machine for home office and pleasure, the consumer is being tempted to buy two: a PC and a games console.

Little Consolation

In general, Europe has not been a very good market for consoles. People have bought computers partly for educational reasons, and that has meant something with a keyboard and built-in BASIC. But as parents have learned, home micros are used mostly for playing games. As this has become more acceptable, consoles have become acceptable, too.

Another factor is that Nintendo was so involved with supplying the U.S. market that it didn't have much time to bother with Europe. This allowed Sega to become established with the Master and, more recently, Megadrive consoles. Now Nintendo is targeting Europe, and the computer

manufacturers are fighting back. Atari, Amstrad, and Commodore have all produced console versions of their 8-bit micros (though the C64 Game System does not seem to be sold outside the U.K.). With the arrival of hand-held games machines such as the Lynx and Nintendo Game Boy, Europe may be about to go console crazy.

European software houses are not bucking the trend. In the early days, even the best programmers wrote only for the most popular local machines. Many a flower was born to blush unseen except on the obscure Acorn BBC B.

Toward the end of the 1980s, when cross-European software marketing deals became popular, programmers

started to write for the most popular European micros. Nowadays they are aware of the worldwide market, including the PC. And what they want most of all is a big hit on the Nintendo format, because sales in the U.S. and Japan have been demonstrated to generate huge profits.

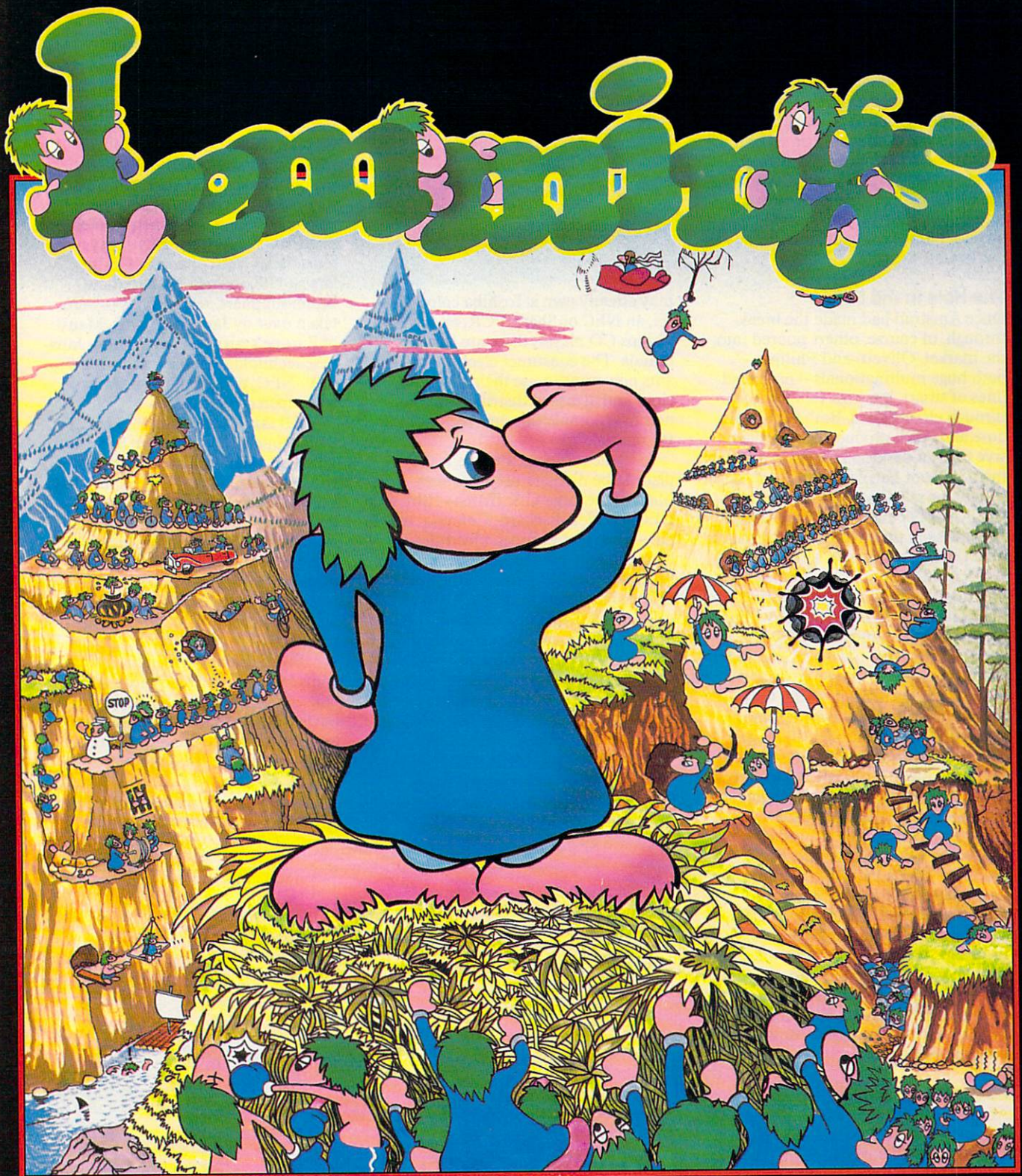
The PC Moves Home in Europe

In the past, PCs were seen purely as business machines, unsuitable for home or educational use. Now they have a wide distribution through department stores and chains, which makes them acceptable to consumers.

The arrival of EGA and especially VGA graphics has brought screen displays that stand comparison with those of STs and Amigas in the shops. Also, there is a ready supply of PC games, though the vast majority are high-priced U.S. imports.

The movement was started by Amstrad with the launch of its 512K 8086-based PC-1512 in 1986. At a U.K. price of £399 plus tax, it was dramatically less expensive than any other brand-name PC on the market. Corporate buyers sniffed at its CGA graphics, lack of flexibility, and unsophisticated appearance—they preferred the new Compaq Deskpro 386—but home users snapped it up by the hundreds of thousands.

The PC-1512, built for Amstrad in South Korea, was a success all across Europe. In Germany, however, it was sold by its distributor, Schneider, under its own name. This turned out to have unfortunate conse-



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quences. Amstrad started to buy up its European distributors, but its relationship with Schneider went sour. Schneider reacted by designing and building its own line of machines. It succeeded in capitalizing on its brand awareness in Germany and then expanding into other countries. Amstrad has remained the leading European brand for home (not business) PC buyers, but retaining its position has been a struggle.

The Hole in the Dike

Once Amstrad had made the breakthrough, of course, others poured into the market. Olivetti and Philips—both huge multinationals—produced lines of smart, low-cost PCs for sale through chain stores. Both Commodore and Atari produced comprehensive lines of desktop PCs (or brought them in from Far East firms such as Mitac) for sale through the same outlets. And of course, the Japanese and Taiwanese manufacturers competed under their own names, too.

Even IBM made an attempt at the home-user PC market, offering huge discounts to chain stores willing to take huge volumes of its PS/2 Model 30. But this was not a success, and IBM has since returned to its traditional business market. In the U.K., for example, the PS/1 is being sold without its modem under the slogan *Five minutes and you're in business*. If that's not bizarre enough, it's even being pushed at sophisticated corporate buyers, such as merchant banks.

The growth of the PC industry is a threat to Commodore and Atari, too. Most of the PC-clone vendors have only a tiny slice of the market. However, there are so many of them, surveys show the most popular brand in Europe is now Other. Only one company pushes the ST, and only one pushes the Amiga, but hundreds compete in the PC market. This is driving performance up and prices down. The pressure must tell.

Portents of Change

Another threat to the ST and Amiga hegemony is the appearance of the notebook-sized portable PC. There are many people who would like a computer at home but who don't want a desktop PC dominating their living room or study—and they don't want an ST or Amiga interfering with family TV viewing. Notebook PCs are a tempting solution. These now have good-quality built-in LCD (Liquid Crystal Display) screens. And when you've finished using one, you can just fold it up and put it in a drawer.

Consumers are happy to buy notebook PCs from firms such as Toshiba, Sharp, NEC, and Philips. They

WESTERN EUROPEAN PC MARKET ESTIMATES

1989	1990	1991
21,831	26,891	31,678

END USER REVENUES IN
MILLIONS OF DOLLARS

may already own a Toshiba color TV set, an NEC or Sharp VCR, and a Philips CD player; these are leading brands. The consumer electronics giants now want to use their marketing clout and access to distribution channels to dominate this new sector of the PC market.

At the moment, Europe is the place to be if you're not European. Most of the large U.S. firms—IBM, DEC, Hewlett-Packard, Compaq, Apple—have had European factories for a long time. Now the Japanese are getting ready for the arrival of the Single European Market at the start of 1993 by opening plants in European Community countries. Many of them already manufacture printers, TV sets, or VCRs here; PCs will follow. Last year, for example, Toshiba started building notebook PCs in Germany.

One European country might have been too small a market to bother with. But the pan-European market represents a third of the world's computer sales and can't be ignored.

Japanese Invade Europe

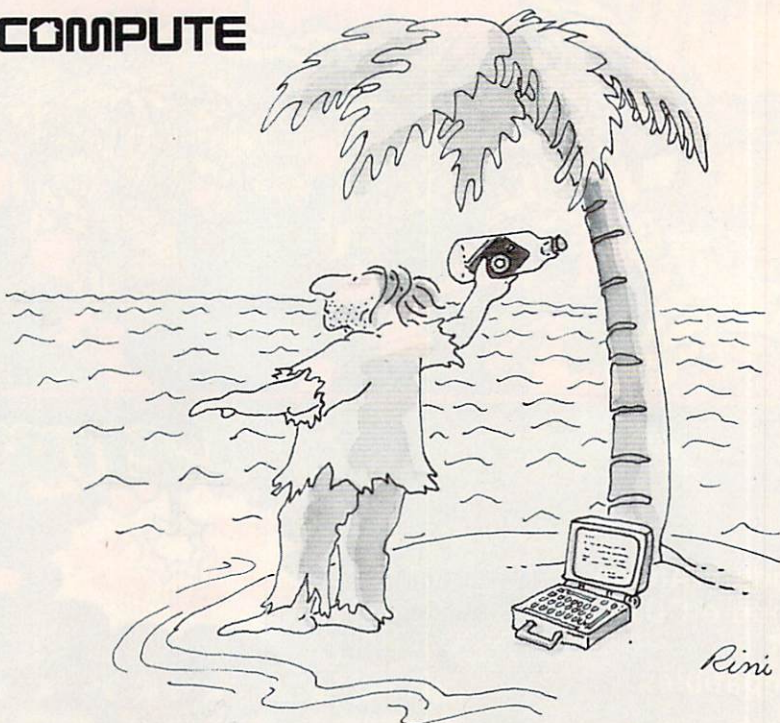
Sadly, Europe is not such a good place to be if you *are* European. Many of the local suppliers are under strain. Last year Philips (the Netherlands), Olivetti (Italy), and Groupe Bull (France) all announced they were laying off thousands of staff. Nixdorf (Germany) hit the skids and was taken over by Siemens, which formed Siemens-Nixdorf Information systems. Both Apricot and ICL—the largest U.K.-owned PC and mainframe suppliers, respectively—were taken over by Japanese firms. Many of Europe's survivors depend on Japanese technology, being resellers of Fujitsu, NEC, or Hitachi mainframes and supercomputers.

All this activity ought to make the European market more homogeneous and standardized. No doubt it will. But alas, there is no chance of all Europeans using the same keyboards, the same character sets, the same TV standard, or the same currency—let alone the same language. The 12-member European Community is a permanent struggle, and a United States of Europe is far from being practical.

But it is a noble ideal. And if it helps limit rapid-fire infantry attacks, tank maneuvers, bombing raids, and nuclear explosions to the computer screen—and keep them out of real life—few of us will ask for more. □

Jack Schofield is the computer editor of the *Guardian*, a London-based newspaper.

COMPUTE



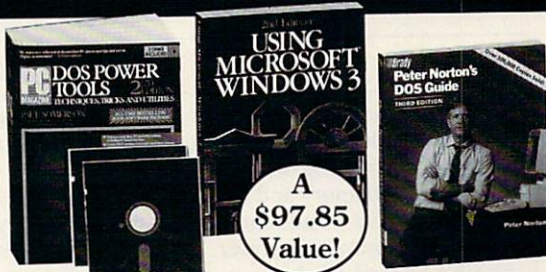
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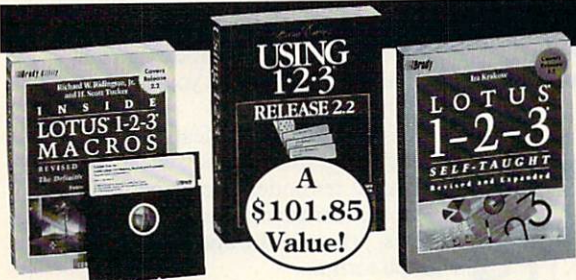
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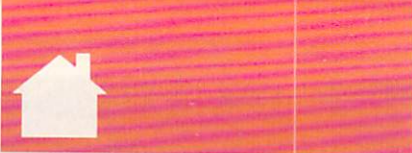
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Click! Filer Version 1.1

Developed for *Microsoft Windows* 3.0, *Click! Filer* gives you the combined features of *Program Manager* and *File Manager*. You also get hooks to most of the popular archive utilities so you can easily compress and decompress files.

When the program runs, you see a source file list and a destination file list. Buttons below the lists offer all of the disk options you'll need. You can copy, move, rename, delete, edit, and run files. Making and deleting directories is as easy as pushing a button, too. Using the lists makes disk navigation easy—just click the mouse, and you're in another directory or drive. And to make things even easier, you can change the file mask so only the files you want to see will show.

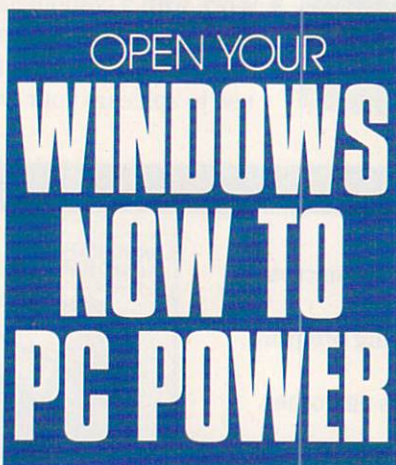
You can tag multiple files for easy multiple copying or deleting. This feature can really come in handy when you're cleaning up your hard drive. Especially handy is the ability to copy entire subdirectories and the embedded subdirectories.

Using this program with *Windows* will simplify those clumsy and

awkward disk operations and make *Windows* a friendlier environment.

PBIcon Version 1.1

Making your own icons for *Windows* applications can be fun. *PBIcon* lets you capture virtually anything on the screen to use as an icon. You can capture graphics that are part of the *Windows* environment, part of other programs, or portions of pictures that you create with *PaintBrush*.



Using the program is easy. Just run the program, capture an image, paste it into the *PBIcon* work area, and then save your new icon to disk. And you can cut a larger image than what's required for an icon and use the scroll bars to position the exact area you're going to use.

Customizing *Windows* lets you feel more at home in what can be an intimidating environment. And that translates into better productivity. Besides having fun, you might gain benefits you hadn't expected.

PCBUDGET

If you're like most people, you'd like to be better about budgeting your money. *PCBUDGET*, written for MS-DOS, does just that with its pull-down menus, windows with slider bars, and online help. Thus, besides being very useful and functional, the program is

attractive and easy to use with its great *Windows*-like interface.

Your finances are probably complicated like those of most other Americans these days. But *PCBUDGET* handles those complications, factoring in income, expenses, liabilities, assets, credit cards, and multiple bank accounts. And it keeps track of tax-related items so that doing your tax return is easier and you won't miss anything.

There are tons of features. You can create a mailing list, start a list of payment reminders, do loan amortizations, search your budget file for items, print checks, and view data in graph format.

If you're serious about your budget, this program will help. It's a great tool for the fiscally minded person who wants to get ahead.

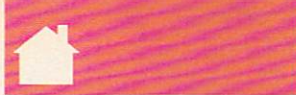
Résumé Professional Version 1.6

If you've ever looked for a job, you know how hard it is to write a good résumé. This program, written for MS-DOS, gives you everything you need to create the best résumé possible, even if you've never written one before.

Dialog boxes tell you what information to enter and how to place things in the final version. All the important areas are covered: educational background, work experience, objectives, references, and personal information. Then you can save your résumé to disk to work on it or update it later.

Pull-down menus, dialog boxes, alerts, a file selector, and edit windows make you think you're in a new environment that's similar to *Microsoft Windows*. You can open two windows. One lets you do a final edit, and the other lets you create a cover letter. You can cut and paste text between the windows and print your creations to disk.

If you think you'll ever write a résumé, this program is for you. With it, you might well have an edge over your competition when you apply for that next important position. □



SHAREPAK

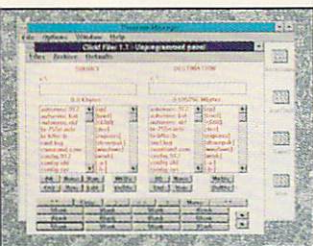
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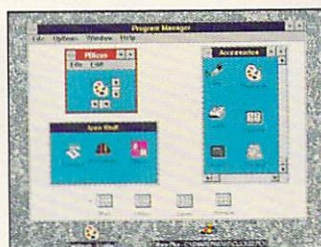
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SAVE MONEY—each disk includes two to five programs for one low price

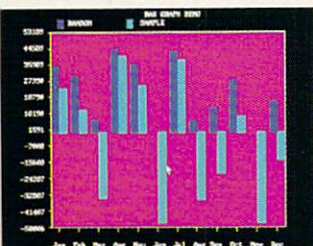
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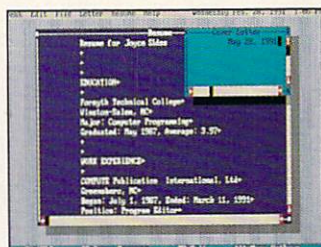
Click! Filer Version 1.1



PBIcon Version 1.1



PCBUDGET



Résumé Professional Version 1.6

COMPUTE's SharePak disk contains the best of shareware—handpicked and tested by our staff—to complement this month's In Focus topic. You'll sample entertainment, learning, or home office software at a great savings. Each SharePak disk includes two to five programs plus complete documentation for one low price:

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COMPUTING IN THE OTHER EUROPE

Even as the bitter wind cut through our winter coats and boots, we were glowing with excitement at the prospect of spending three weeks in the Soviet Union. The cramped seating and bumpy flight made all 22 of us—17 high school students and five teachers—happy to disembark from the Aeroflot plane that had brought us to Moscow from Finland.

The state of technology in the Soviet Union forces the people to rely on their own resources. Because even electronic calculators are unheard of, shopkeepers ring up purchases with an abacus instead of a cash register. Business people can fax information, but there are only 16 international telephone lines out of the Soviet Union, so a message can wait for days to be sent out of the country.

As a computer teacher in the United States, I was naturally interested in how the Soviet citizens were using what new technology was available. I knew there were computer hackers out there. After all, it was a Russian who created the challenge of *Tetris*.

My mission started in Moscow. I had seen ads for computers on Russian television, and I carried with me some references from American magazines about computer

conventions in Russia. I quizzed everyone I met who could speak English, but no one could give me any information about computer conventions. No one could direct me to a computer store, a software store, or even a magazine store. There just weren't any. No one I talked to had ever even used a computer. I drew a complete blank in Moscow.

My sleuthing days appeared to be numbered. The people I spoke to were interested in computers, they believed computers could be useful, and their kids were up to date on all the titles of the latest games. Yet they could not buy computers for their homes or their schools.

I was later told that there were no computer stores available to the public

K R I S T E N S T E R N B E R G

in Russia. Only used computers were to be found, and these were all sold or traded privately, not in stores. There was also a very long waiting list for them. New computers had to be brought in, one at a time, from outside the country, which meant they had to pass through the numerous and thorough customs officials.

Moving useful technology through customs is almost impossible. In the rare event that a computer becomes available for sale, the price is outrageous. It can cost a Russian family four times as much as a car, or up to about 40,000 rubles. This sum may not seem large when you translate it into dollars (40,000 rubles is a little less than \$700), but a Soviet citizen might earn less than 100 rubles (about \$18) per month.

At that rate you'd have to save every single penny for well over three years for a computer. And the computer might be a used computer, not even new or up to date.

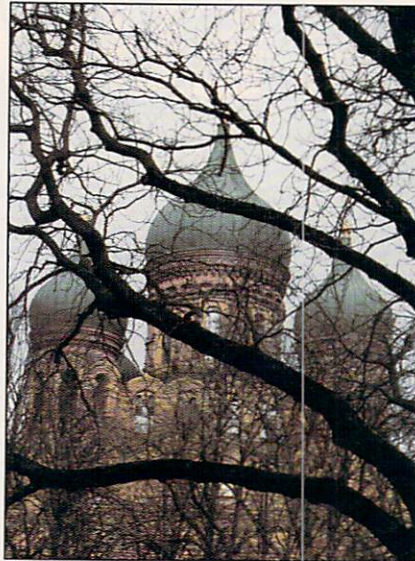
The second leg of my trip was Estonia. I immediately noticed differences when I crossed from Russia into Estonia. Most obvious was the presence of stores—food stores, clothing stores, handicrafts stores, and pharmacies. It was apparent that the Estonians enjoyed more comforts and choices than the Russians.

Our group was participating in an academic exchange with a high school in Tallinn, the capital city. As a part of the exchange, the previous autumn we had arranged for the school to have an Apple IIe computer and printer. We also provided it with some indispensable tool software: word processing, database, greeting card/sign making, and various logic and skill-building programs. I was eager to see how the computer was being used and what kinds of problems the Estonian teachers and students had come across. I wasn't even sure if they had been able to set it up.

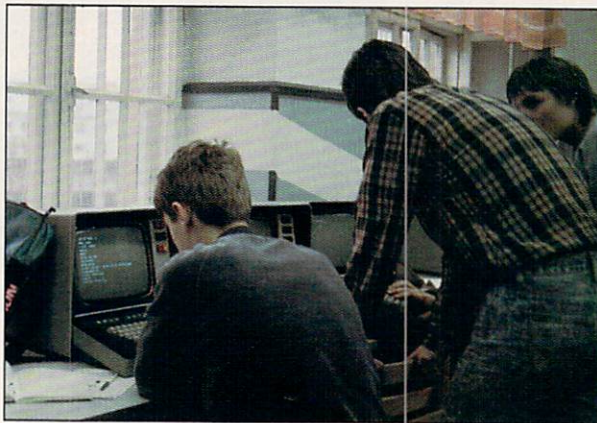
My fears about their having the computer up and running were put to rest the minute I walked into the school. Some of the high school students who specialized in computer studies were waiting in the lobby to take me to their Apple and show me everything they had done with it. Many of them were very experienced in BASIC and machine language programming by this time, and they had also taught themselves to use all of the software. Some of the students had even reprogrammed the word processor so that the menus were shown in Estonian. They trea-

sured the computer and kept a careful watch over it, locking it behind several doors each time they were finished using it. The computer was heavily used—and not only during school hours.

The American students reported that their Estonian friends spent many Friday nights and Saturdays using the computer in the school. They were astounded that the Estonians would voluntarily spend Saturday at school. But



Russian Orthodox Church, Tallinn, Estonia



Time-sharing at School No. 21, Tallinn, Estonia

to the Estonians it was a privilege to be there with the computer.

In another part of the school, during regular class times, many students were busy writing programs to simulate a password-protection scheme. The BASIC programming language they used was an interesting mixture of English and Estonian. I tried to help debug one student's program, but the only command I could recognize was STOP. I was amazed to find a third-generation computer still in use: This Bulgarian minicomputer dated

from the 1960s, and its technology was passé long before that in America. It supported a total of five terminals, was hard-wired to run only BASIC, and—believe it or not—allowed only 64K of RAM.

In addition to their computer classes at school, many students traveled after school every day to a nearby university to work on an IBM system. There they would wait in long lines for a turn to work at one of the terminals.

However serious they were, the students managed to find time to play computer games. What did they spend their free time playing? Do you remember *Sea Fox*, *Star Blazer*, *Super Puckman*, *Sneakers*, or *Spy's Demise*? Although we may think of these games as old-fashioned, they were new to the Estonians.

I discovered a second Apple computer in Estonia. I also found an old IBM PC. This machine was in a doctor's office and was used for research. The doctor had taught herself to use the computer without any help other than a manual (which was printed in English). Her greatest need was for blank disks on which to store her information.

The majority of computer enthusiasts in the school were boys, but some girls were also interested, and everybody shares the computer equally. So far, the students monopolize the computer, but the interest on the part of teachers is growing.

Times are definitely changing in the Soviet Union. Some major universities are becoming computerized, and students are allowed more access to the computers for their research. Online information services are beginning to spring up in major cities. A new line of microcomputers is scheduled for release throughout the U.S.S.R. When and if these micros are made available to homes, businesses, and schools, we'll begin to see a lot more activity in the computer world.

After three weeks of travel in Russia and Estonia, my strongest impressions were of the changing political situation throughout the Soviet Union, the food shortages, the lack of choices available to the population, and the incredible warmth and caring of the people. Russia is caught between an old world and a new one. Traditions remain while technology languishes. Even where the equipment is available—as in the case of the doctor trying to do research—the accessories can't be found. □



TEST LAB

WELCOME

Each month *COMPUTE's* Test Lab will focus on a specific kind of hardware and offer you the information you need to guide your understanding of the technology and to make informed buying decisions. Our comprehensive system benchmarks are accompanied by in-depth explanations of the tests and the technology. Attractive graphics clarify differences in features and performance. You also get the expert product reviews that PC activists have come to expect from *COMPUTE*. This month, Test Lab examines three desktop computers and four laptops—seven capable computers representing a range of technologies and prices and suitable for a wide range of computer users.

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LASER PAL 286

I shamefully admit that my first impression of this small-footprint system was less than favorable. I never thought a machine this small could ever compete with the 386SX I use every day at work.

Surprised that I had the system up and running in less than ten minutes, I decided to keep an open mind. (I recommend that amateurs follow the instructions in the Quick Start Guide or watch the installation videotape provided before they hook up any cables.)

As I found out and as the name implies, the Pal is user-friendly. The 40MB hard drive formatted with DOS 4.01 comes installed with *GeoWorks Ensemble* and *Prodigy*. A few nonessential but appreciated extras include a 2400-baud Hayes-compatible modem, a high-resolution VGA monitor with a tilt-swivel stand, and a 15-pin game port.

Additional hardware includes dual disk drives, 1MB of memory, a parallel port, a Microsoft-compatible mouse, and an enhanced keyboard with 102 keys—firm but not stiff.

LASER COMPUTER
800 N. Church St.
Lake Zurich, IL 60047
(708) 540-8086

CPU Type: 80286; CPU Speed: 12 MHz
Conventional Memory: 640K; Extended Memory: 384K
Ports: 2 serial, 1 parallel, 1 mouse, 1 game
Drives: 5¼-inch 1.2MB floppy, 3½-inch 1.44MB floppy, 42MB hard
Video Modes: text, CGA, EGA, VGA
List Price: \$1,995.00
Street Price: \$1,416.58*



*Test Lab street prices are an average of prices advertised in computer magazines and national newspapers during February 1991.

That adds up to a lot of punch for a computer that measures no more than 14 inches square and 5 inches high.

You can easily expand the Pal's memory to four megabytes if the one megabyte of installed RAM isn't enough. The hardware reference guide discusses the type of RAM you should purchase, and it gives complete instructions on where and how to install the RAM modules.

There's no math coprocessor, but one can easily be installed in the available socket. Installation instructions are in the hardware reference. The four AA alkaline batteries are easily accessible when it's time to replace them. Of the four horizontally placed card slots, two are open for simple installation of any additional cards.

The system runs at either 8 or 12 MHz, and you can set the speed easily with the turbo button. The current speed appears in an LCD display lo-

cated on the front of the system above the turbo key. The reset button and the keyboard lock key are also easily accessible on the front of the system.

Hardware isn't the only surprise included with the Pal. A free month's service is offered for *Prodigy*, a well-known online service. The *Prodigy* software, a hardware reference book, an MS-DOS manual, and a *GeoWorks Ensemble* manual are also included.

If the Pal has an Achilles heel, it's the cooling system. The cooling vents are located on the top rear of the CPU box. If you place the monitor on top of the unit and cover the cooling vents, you risk overheating the system. Since the monitor's base is almost as large as the computer, it would be easy for this to go unnoticed.

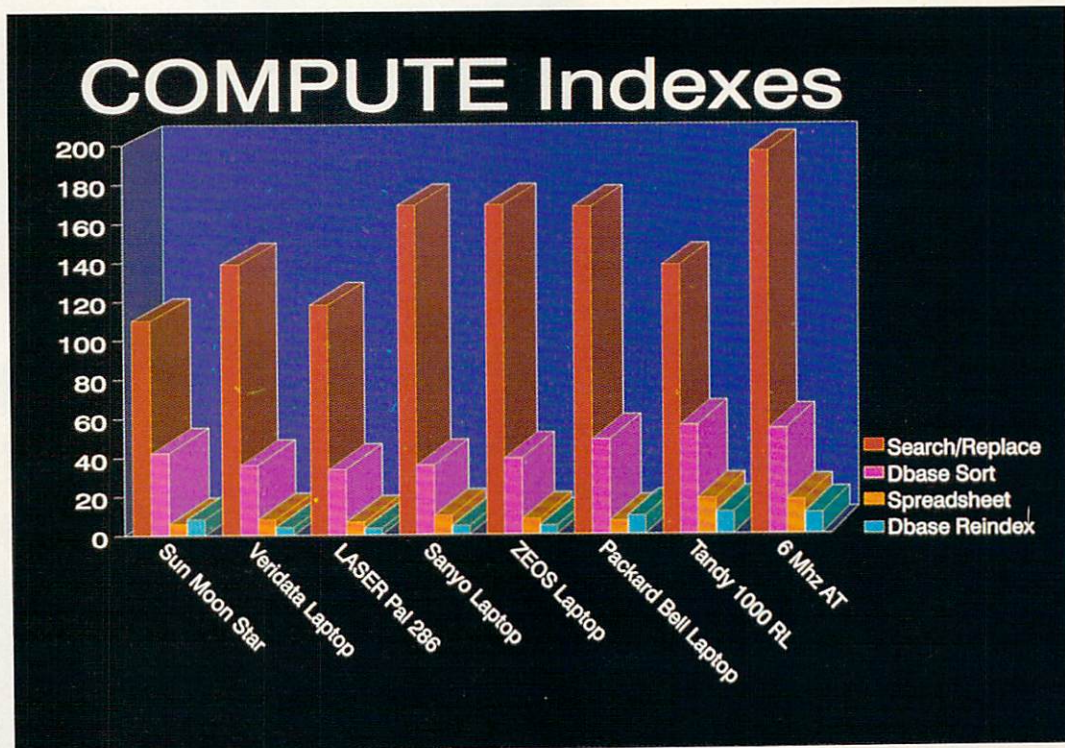
It's true that a single computer can't be all things to all people, but if you're looking for a reliable and full-featured system, the LASER Pal 286

COMPUTE Application Indexes

Since the Test Lab section is designed to give you the best information about how systems will perform when you take them home or to your office, we performed a set of tests involving commonly used applications.

The timings indicate how long it took a particular computer to reindex a database, sort a database, perform a search and replace in a word processor, and recalculate a spreadsheet.

can fill the bill. As a matter of fact, I keep hinting to my superiors that I'd like to keep the Pal for all the hard work I do around here, but I don't think they're getting the message.
JOYCE SIDES



PACKARD BELL PB286NB NOTEBOOK

Compact design, crisp display, and performance options make Packard Bell's PB286NB a solid contender in the notebook arena, although the list price isn't as competitive as the marketplace demands.

The PB286NB is a capable road warrior, as I found out while taking it on several cross-country jaunts. The unit's size and weight made it practically unnoticeable during transport. I found it quite easy to set up and use during plane rides, without breaking the tray tables or crowding the passengers around me.

The PB286NB stretches its ni-cad battery life with a series of power-down options that you can define during setup. Automatic power-saving functions help to extend the reach of the system whenever you're running it from the battery and include a slower rate of DRAM refresh, shutdown of the floppy drive if it isn't in use, and a slowdown of the CPU (from the standard selectable 12- or 6-MHz clock speed to 0.125 MHz) when processing activity is absent.

You can disable or add to these power-saving functions during setup. At this point, you can set the screen backlight and LCD screen power to shut off when not in use, disable ports, and set the hard disk to shut down after a predetermined period of inactivity. I found that setting the power-saving functions to their maximum efficiencies did not adversely affect my work with the system.

If the PB286NB can be singled out for praise, it must be for its sharp LCD display. The VGA-compatible resolution of 640 × 480 maps 16-color ap-

PACKARD BELL
9425 Canoga Ave.
Chatsworth, CA 91311
(818) 773-4400

CPU Type: 80286; CPU Speed: 12 MHz

Conventional Memory: 640K; Extended Memory: 384K

Ports: 1 serial, 1 parallel, 1 VGA, 1 keyboard/keypad, 1 floppy drive, 1 mouse

Drives: 3½-inch 1.44MB floppy, 21MB hard

Video Modes: text, CGA, EGA, VGA

Screen Type: LCD with CCFT backlight

List Price: \$3,995.00

Street Price: \$2,008.79





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The GSX-140 is the ultimate executive business tool for office and home. PC Magazine has awarded it their Editor's Choice for best 24-wire printer.

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often changed. It remembers your four favorite software programs and sets them up just the way you like them, every time you use them.

Blending 192 cps, logic seeking, bidirectional printing and high speed paper feed, the GSX-140's high throughput design quietly cranks out page after page far faster than any of the competition.

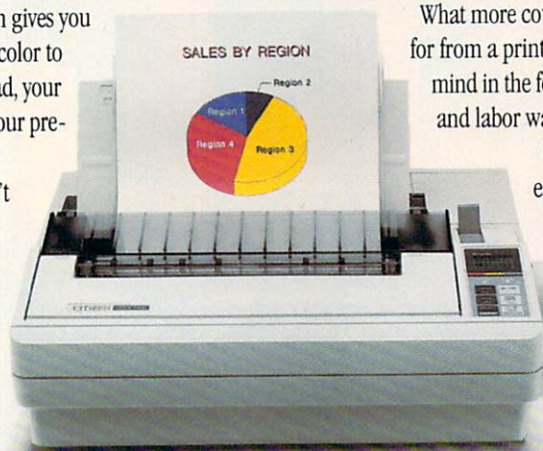
What more could a busy executive ask for from a printer? How about peace of mind in the form of a 24-month parts and labor warranty.

Once you've tried the new GSX-140, it'll be easy to see how it makes your reports brighter and life easier. For the dealer near you, just call 1-800-441-2345, ext. 34 in Calif., 1-800-556-1234 ext. 34 outside Calif.

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Circle Reader Service Number 140



plications to 16 shades of gray. A 256-color video mode will map to 32 shades of gray, giving you a clear view of even your most advanced graphics applications.

Expandability must also play a role in a well-designed mobile system. Packard Bell has built into the PB286NB the capabilities for attaching external options like a mouse, a keypad, an external keyboard, an external monitor, and an external floppy drive. The traditional parallel and serial ports and the usual external bus connector (for connecting an external chassis that can hold two AT-class interface cards) round out the expansion options.

All of the ports are concealed behind hinged television-style doors that pop open at the press of a finger. Although I like the look and operation of this design, I have reservations about its stability. Small hinges and quick-release doors don't hold up on the road too well. Sliding covers made

of high-quality plastics and possessing fewer parts tend to hold up much better.

The field of notebook computers is full of competitively priced machines that will let you take your office on the road without sacrificing

ever, you should know that the actual selling price is closer to \$1,800. That price is much more in line with current market trends and may attract mobile computer users who need a topnotch display for their applications.

PETER SCISCO

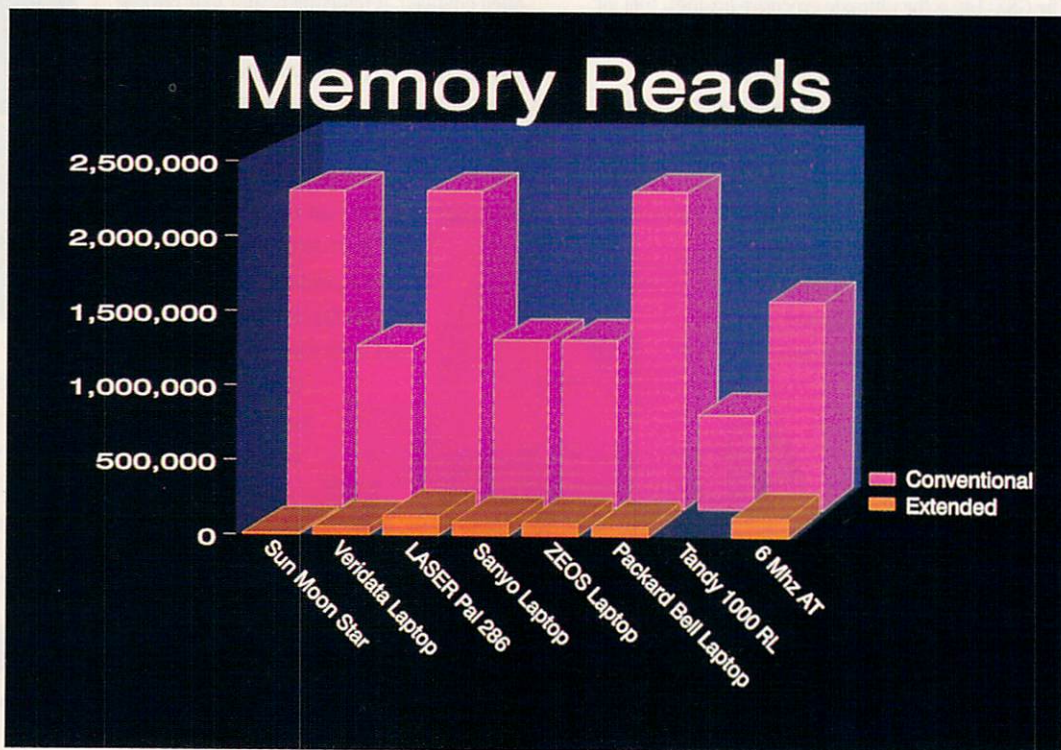
**If the PC286NB
can be singled out
for praise, it must
be for its sharp
LCD display.**

your ability to perform. The PB286NB notebook is no exception. It brings all the performance most mobile workers will need to a compact system. Its comparatively high list price (\$3,995) will discourage the casual traveler. If you're interested in this system, how-

Memory Tests

The memory tests performed by COMPUTE's *BenchMark* program count the number of memory reads the microprocessor can make in a second. The resulting indication of memory speed, along with computer speed and processor type, determines how well a system performs in real life.

These tests may not yield results directly proportional to the speed of a computer or the processor type. Other factors such as memory speed, bus size, and DRAM refresh affect overall performance.



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800-875-7580



NOVA Computers manufactured by: **ComputersFirst**

27 West 20th Street New York, N.Y. 10003

Circle Reader Service Number 138

SANYO MBC-17NB PERSONAL COMPUTER

It's tiny, it's fast, and it comes with *Windows* and *Works* installed on its 20MB hard drive. The backlit screen is bright and clear. What's not to like about the 80286-based Sanyo MBC-17NB notebook computer? (An 80386-based 18NB is slated and will probably be released by the time you see this.)

The list of attractive features is long, including a keyboard that is remarkably comfortable to the fingers and an eight-gray-scale screen that provides a clear, sharp image as long as the "grays" displayed are black and white (more about this later). As shipped, the 17NB is equipped with 1MB of RAM. An optional modem and memory expansion to 5MB are available. The computer and its power supply/recharger fit comfortably in an average-sized briefcase, leaving enough room for a couple of magazines and a legal pad. (Note to inventors: The industry desperately needs a portable computer power source that can fit in a shirt pocket.)

Two important issues for assessing notebook computers are the quality of the screen and the feel of the keyboard. Perfect gray-scale representation might simply be too much to ask of a flat-screen monitor at this stage in the development of display technology. This screen is touted as an eight-gray-scale display, but unless an image contrasts dramatically with the rest of the screen, it fades into the background.

The keyboard is fast and responsive, though the awkward lower-left placement of the Function key (which, for example, turns the up- and down-arrow keys into page-up and -down keys respectively) makes it an easy target for the left hand while typing, resulting in some strange typos until you become accustomed to it. >



SANYO BUSINESS SYSTEMS

51 Joseph St.
Moonachie, NJ 07074
(800) 524-0048

CPU Type: 80286; **CPU Speed:** 12.5 MHz

Conventional Memory: 640K; **Extended Memory:** 384K

Ports: 1 serial, 1 parallel, 1 video

Drives: 3 1/2-inch 1.44MB floppy, 21MB hard

Video Modes: text, CGA, EGA, VGA

Screen Type: ST backlit LCD

List Price: \$2,999.00

Street Price: \$1,999.95

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The SupraModem 2400 Plus adds MNP classes 2-5 and CCITT V.42bis to the popular SupraModem 2400, providing high-speed, error-free communications. MNP 5 lets you communicate with any MNP 5 modem with throughput up to 4800 bps — *2 times faster than regular 2400 bps modems*. CCITT V.42bis, the international standard for error correction and data compression, gives up to 9600 bps error-free throughput — *a 4 times speed improvement over regular 2400 bps modems*. All this means you can get more done with less time spent on line, so all your costs are less!

With the SupraModem 2400 Plus, you can simply set your terminal to 9600 bps and then forget about rate and protocols. The SupraModem automatically determines what kind of modem is at the other end of the phone line — V.42bis, MNP, 2400, 1200, or 300 bps — and then adjusts its rate and protocol for optimal communication with the other modem.

Fast error-free communication has never been so affordable. Contact your local dealer or Supra Corporation to find out more today!

Also Available: SupraModem 2400 Plus IBM™ internal \$199.95, SupraModem 2400 MNP external \$199.95, SupraModem 2400 MNP IBM internal \$149.95.



Supra Corporation

1133 Commercial Way, Albany, Oregon 97321 USA
PHONE: 503-967-9075 • FAX: 503-926-9370

O R D E R S 1 - 8 0 0 - 7 2 7 - 8 7 7 2

SupraModem 2400 Plus, SupraModem 2400i Plus, SupraModem 2400 MNP, and SupraModem 2400i MNP are trademarks of Supra Corporation. IBM is a trademark of International Business Machines Corp.

The batteries last a couple of hours—enough for most purposes—and they are compact enough that you could carry a couple of charged-up spares in an overcoat pocket. At a desk, you can use the charger as a power supply, which leads me to one complaint about this machine that would be easy to fix. The power supply/battery charger unit has a three-foot power cord, but the cable from the charger to the computer is only about 18 inches long, which means that the power supply has to sit on the same surface as the computer when it's in use. Sanyo should have provided a long cord to the computer, allowing the transformer to sit on the floor, out of the way.

The low-battery light gives you a little warning when the battery pack is breathing its last, but don't think you have enough time to do one more recalculation on your spreadsheet.

Storage Media Device Tests: Contiguous Read, Fragmented Read, Contiguous Write, Fragmented Write

Regardless of the speed and computing power of a computer, the storage devices are often a bottleneck. COMPUTE's *BenchMark* program performs four different tests that can help rate the speed of a drive.

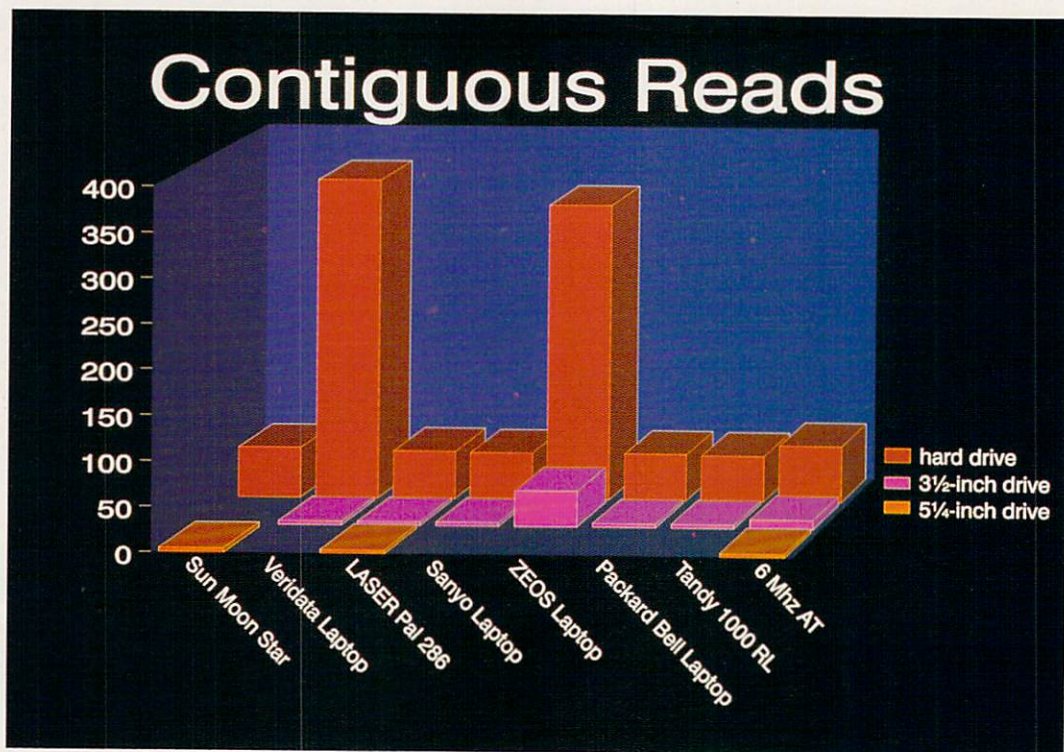
Our tests read and write sectors to the drive with a timer running. That way we know how many sectors have been accessed in a second. The more sectors read or written, the better the performance and the faster your applications will run.

Not only have we read and written whole blocks of information from the disk with our contiguous read and write tests, but we've also developed a test that addresses the disk in a fragmented order that's closer to real-life drive performance conditions. Seek time, interleave factor, and other statistics are condensed into four easy-to-understand numbers.

You'd be well advised to save your work immediately, or you'll have an unpleasant surprise.

You might want to know that Sanyo makes the ZEOS and Commo-

dore notebook computers, which are virtually identical to the Sanyo. Whichever you choose, you'll be getting a handy, well-designed computer.
ROBERT BIXBY



SUN MOON STAR 386SX

Ease of setup, a small footprint, and opportunities for expansion make the Sun Moon Star 386SX a system you should consider, especially if you're new to computing.

The Sun Moon Star is quite easy to set up. You'll find all the usual manuals and setup guides, but you also get an extremely helpful VHS videotape that walks you through the entire installation process.

The unit I reviewed came with 1MB of RAM, with room for up to 8MB on the motherboard. The system allows a flexible RAM configuration; you can populate with 256K chips, 1MB chips, or a combination of both. You can thus upgrade cost effectively and without using up one of your slots.

This computer has five slots: three 16-bit AT slots and two 8-bit XT

slots. The AT-bus FDD/HDD controller card can handle up to two hard disks and two floppy drives, saving you money, because you don't have to buy an additional controller card. And it frees a slot for later expansion.

A fast (28ms), formatted 44MB hard disk comes with the unit, with DOS installed. In just a few minutes, I had the computer up and running.

You get a crisp, clear picture on the Sun Moon Star analog RGB monitor. The 256-color VGA graphics are very impressive, offering photographic-quality displays. I was disappointed that it wasn't possible to plug the monitor's power cord into the back of the computer. The setup video in-



SUN MOON STAR
1941 Ringwood Ave.
San Jose, CA 95131
(800) 545-4786

CPU Type: 386SX; **CPU Speed:** 16 MHz
Conventional Memory: 640K; **Expanded Memory:** 384K
Ports: 2 serial (mouse attaches to serial port), 1 parallel, 1 game
Drives: 5¼-inch 1.2MB floppy, 43MB hard
Video Modes: text, CGA, EGA, VGA
List Price: \$2,195
Street Price: \$1,799

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THE NEW TANDY® 2810 HD NOTEBOOK PC,

286 Power

The 80C286 micro-processor runs at 16 MHz for speed-intensive applications like Microsoft® Windows.

VGA Graphics

Brilliant clarity with 640 x 480 graphics and a sharp 16/32-gray scale.

Built-In Hard Drive

20 megabytes of internal storage for rapid access, plus a 3.5" 1.44MB floppy drive.

MS-DOS® 4.01

The latest version of MS-DOS (4.01) comes already installed on the built-in hard drive.

DeskMate® Interface

The DeskMate Graphical User Interface with ten applications is installed on the hard drive for instant-on ease of use.

Resume Mode

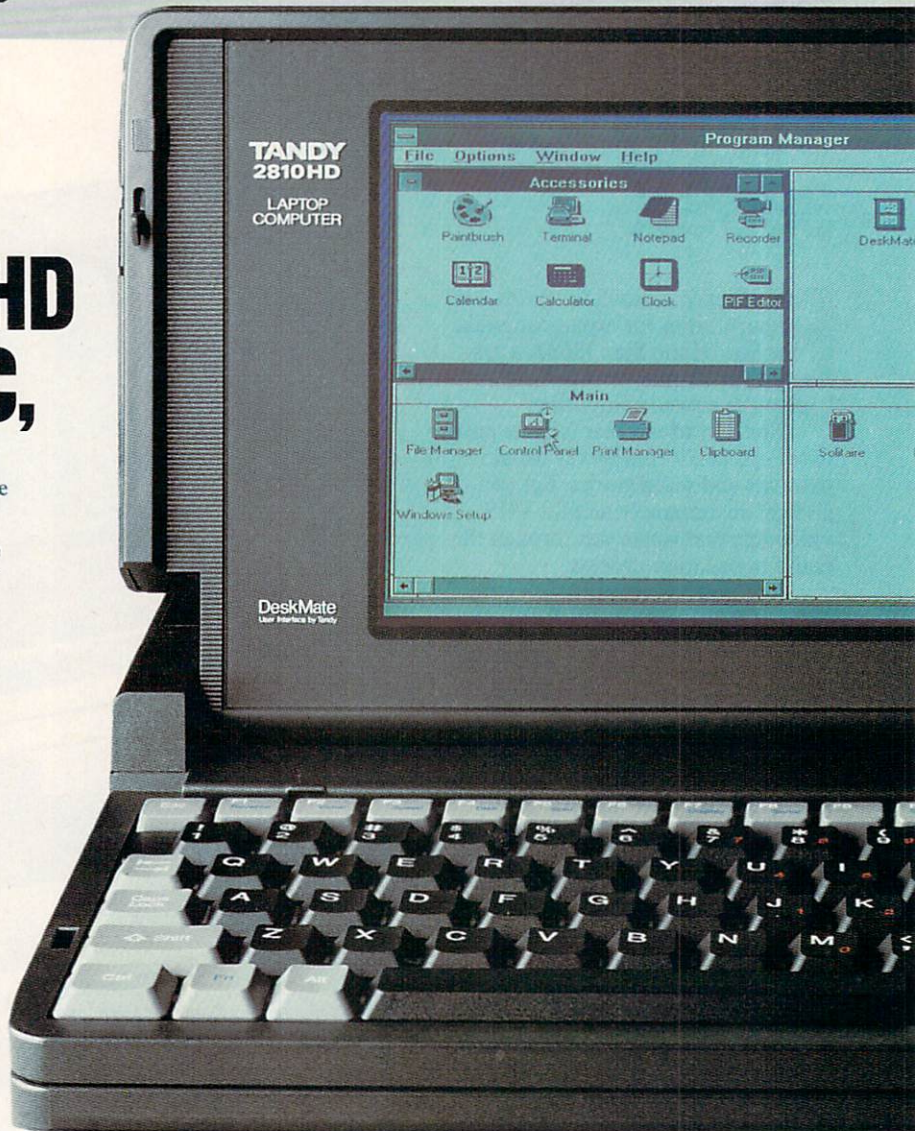
Lets you shut off and come back right where you left off—also shuts down automatically to save battery life.

External Support

Attach a 101-key keyboard, a VGA color monitor, a printer, an external floppy drive and more.

1MB Memory

Expandable to five megabytes.



DESKTOP PERFORMANCE IN A 6.7-lb. PORTABLE

Continuing our tradition of innovation, the Tandy 2810 HD is a lightweight laptop for heavy use—at the office, at home, or on the road. With extremely durable construction, it's built for travel—but it can also support a full-size keyboard and monitor for true desktop power. AT® compatibility, stunning VGA graphics and DeskMate® productivity software. Only at Radio Shack. Again.

Radio Shack®
AMERICA'S
TECHNOLOGY
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Face to Face With Graphical User Interfaces

structs you to plug it into the rear power connector, but it just doesn't fit.

This system comes with some useful software. *CheckIt* is a full-fledged PC diagnostic package that will check your system for software and hardware problems. *GEM/3 Desktop* is an interactive user interface that allows you to run programs by pointing and clicking on icons. *Draw Plus* is a full-featured paint program. As you can see, there's plenty included to get you started.

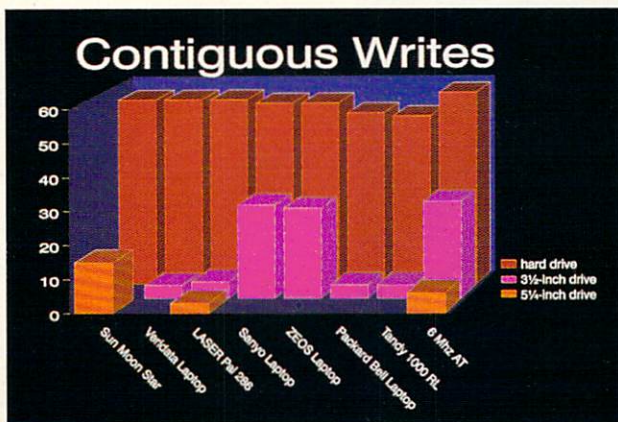
I found no major design flaws in the Sun Moon Star, although there are a few things that I don't like. First, the keyboard doesn't have that springy, metallic click I've come to expect with most PC keyboards. I found the mouse too small for my liking and awkward to hold.

The system allows a flexible RAM configuration; you can populate with 256K chips, 1MB chips, or a combination of both. You can thus upgrade cost effectively.

On the plus side, I found the Sun Moon Star an attractive computer. It's only 15 inches wide by 16 inches deep and about 7 inches tall. You won't lose any desktop space with this little computer. It operates very quietly and appears to be shielded very well, too. Nearly every computer brought into my house interferes with my television, but the Sun Moon Star doesn't.

Sun Moon Star offers an attractive three-year warranty, including six months of on-site service and six months of carry-in service. According to the company, there are more than 800 service centers nationwide.

TROY TUCKER



Power users are turning to graphical user interfaces (GUIs) for the ease of use they provide. But what about those of us *without* 386 VGA systems? Fortunately, there are GUIs designed to make computing easier on 8088, 8086 and 80286-based systems, and one of the most important decisions you'll make is choosing which GUI to work with.

Can We Talk?

First, you'll want to choose a GUI that "speaks" your language—English, plain and simple. That way you won't have to learn how to communicate with your computer before you start to use it—you'll already be on speaking terms.

Easy Operation

Second, your GUI should have neat, organized displays that present your options clearly and concisely. Easy-to-follow graphics make it simple for you to see exactly where you are in a program. Handy pull-down menus keep your options tucked away and out of sight until you call for them. And pop-up dialog boxes guide you through tasks, making sure that your computer does what you want it to.

Something in Common

GUIs provide a uniform operating environment, which alleviates the frustration and confusion of switching from one task to the next. Programs based on the same GUI have the same look and feel to them, making each new application easier to learn. Of course, you'll also want to choose a GUI supported by many of the leading software publishers. That way you'll be sure to find readily available software for home, school or business.

Those Little Extras

Another feature to look for in a GUI is a help function that's *context sensitive*—one that's able to "sense" which task you're currently running and provide help for that specific task.

For true convenience, your GUI should operate with just the point and click of a mouse cursor controller. The mouse makes it quick and easy for you to select your choices from menus and dialog boxes, taking the mazes of getting around the many computing options your GUI offers.

Fortunately, there is just such a user-friendly GUI: Tandy's DeskMate® Graphical User Interface. It's affordable, too—the proven format of DeskMate gives you instant convenience without having to upgrade your system memory beyond 384K. And it's available from over 7000 Radio Shack stores across the country. So take a scroll through DeskMate and discover for yourself just how easy computing can be.

TANDY 1000 RL/HD

Tandy's sleek 1000 RL has an interface especially designed to appeal to new computer users and hardware that reflects some sound but conservative and controversial design and manufacture decisions.

Tandy's decision to use an 8086 processor, rather than the 286 or even 386SX, places some limitations on the machine's performance. RL/HD owners will have some difficulty using high-end spreadsheets and databases and playing some of the more sophisticated entertainment software. The

RL's video refresh is fast enough for most games, however; and at between 9 and 10 MHz, the machine is as fast as an AT, still the workhorse of the computer industry.

This is a household computer, not a terrific machine for handling complex work from the office. You're not going to be running *Windows* on the RL. With its kernel in ROM, Tandy's *DeskMate* flies on the RL, obviating for many users the need for any other environment than MS-DOS.

The machine reviewed here is the

hard disk version, which is the one I recommend. The hard disk is fast and comes loaded with system and applications software, making setup almost foolproof. Tandy has offered a special deal, including a mouse, which is essential to new users' enjoyment and control of their systems. New users should also be persuaded to purchase color systems, and it's hoped that Tandy will add a VGA option to the RL line.

Several ports—for a printer, joysticks, an earphone, a microphone, a

RADIO SHACK
A Division of Tandy
700 One Tandy Center
Fort Worth, TX 76102
(817) 878-4969

CPU Type: 8086; CPU Speed: 10 MHz
Conventional Memory: 512K; Expanded/Extended Memory: None
Ports: 1 serial, 1 parallel, 1 mouse, 1 game
Drives: 3½-inch 720K floppy, 21MB hard
Video Modes: text, CGA, Tandy 16-color
List Price: \$999.90 with hard drive, \$599.95 without hard drive
Street Price: \$794.00 with hard drive, \$499.00 without hard drive



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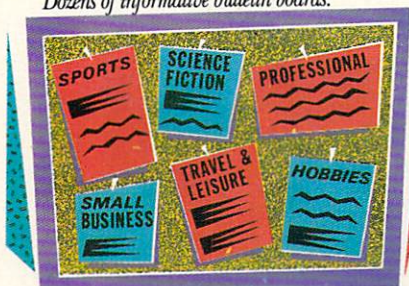
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mouse, and serial peripherals—are built right in. Tandy's volume control is a feature that other manufacturers should emulate. Some RL owners, as they grow in capability and ambition, will find the lack of expansion slots (there's only one) daunting. A solution—an add-on expansion box for the RL and at least one more slot in the next generation of RLs—will help the machine grow along with its users.

The decision to include only 512K of RAM, while probably price-based, needs to be corrected. For better or worse, today's software designers are assuming a megabyte of RAM as standard. At the very least, the motherboard should be socketed for a meg. Understand me: I get 90 percent of my work done in less than 512K on my 386. The 1000 RL will do the very same. You can run most

word processors, some spreadsheets, and many other packages just fine.

Despite these caveats, I think the RL is a fine system, especially for users who are new to computing. It's a system that will work beautifully for 90 percent of household use. With Home Organizer, the *DeskMate* enhancement, users might actually computerize whole aspects of household operation.

I think Tandy has taken a large step in the right direction with the 1000 RL/HD. But the walk is not yet finished. As an introductory and functional computer system with some special features and enhancements designed to put new users at ease, the 1000 RL is a sound, safe purchase for people who are curious about using a computer in the home.

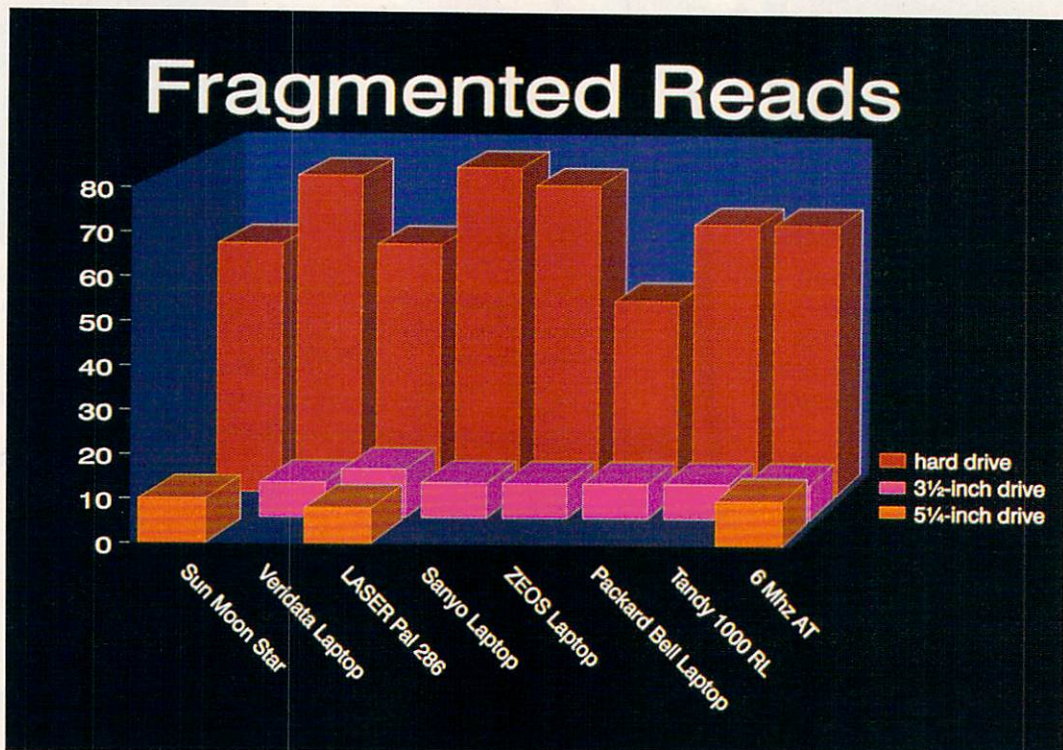
KEITH FERRELL

FCC Classification

There are two radio-emission classifications for computing devices or electronic digital devices: Class A and Class B.

Class A applies to the industrial or business setting, where radio-frequency (RF) interference is not an important concern. In comparison to Class B, Class A enjoys generally relaxed limits on the intensity of RF emissions.

Class B devices, however, are suitable for a residential setting. The rating ensures reasonable protection against RF interference to television or radio within ten meters of the device and with at least one wall between the device and the receiver.



Now with NRI's new training you can enjoy the rewards of a career in computer programming

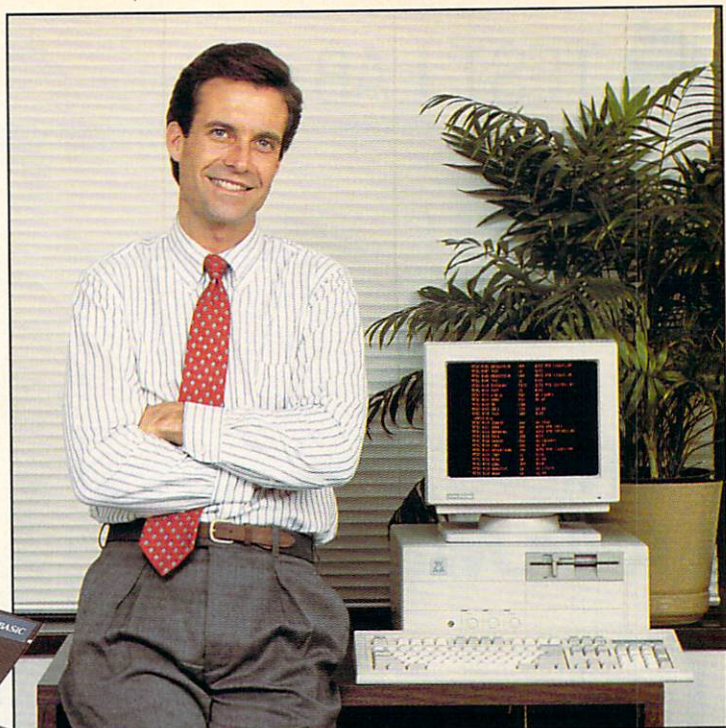
A top-paying career in computer programming is no longer out of your reach. Now you can get the practical training and experience you need to succeed in this top-growth field.

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Plus you explore the extraordinary capabilities of not one or two but **four** in-demand computer languages. You learn to design, code, run, debug, and document programs in BASIC, Pascal, C, and COBOL. In the process you become uniquely prepared for the wide variety of programming opportunities available today.

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tant fundamentals to real-world methods and techniques. With the help of your NRI instructor—offering one-on-one, personal guidance throughout your course—you quickly gain the skills you need to handle with confidence a wide variety of programming applications. You even use your modem to "talk" to your instructor, meet other NRI students, and download programs through NRI's exclusive programmers network, PRONET.

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VERIDATA LAPPOWER 286/40

You don't have to leave your powerful programs in the office and settle for stripped-down, floppy-based software any more. With a detachable keyboard, VGA graphics, a speedy 40MB hard drive, a 1.44MB floppy drive, and a moderately powerful processor, the Veridata LapPower 286/40 may sound a lot like the system on your desktop.

The LapPower's boxy case contains a system of moderate power.

The 12-MHz 80286 processor is rapidly heading toward obsolescence in the desktop world, but it's only now becoming the low-end standard in the laptop world. Unless you find yourself using *Windows* a lot, though, or playing games in your spare time, you'll find the Veridata's performance acceptable. The system ran *GeoWorks*, *WordPerfect*, and *QModem* with no perceptible loss of performance compared to my desktop system.

The VGA graphics are a welcome change from the blocky CGA displays found on older laptops. Hard and floppy disk drive performance are on a par with the performance of similar drives in a 286 desktop unit. Only the keypadless keyboard and LCD screen serve to remind you that you're using a laptop system.

Even these minor limitations can be remedied, though. The computer has an external VGA port, which pro-

VERIDATA
11901 Goldring Rd.
Arcadia, CA 91006
(818) 303-0613

CPU Type: 80286; **CPU Speed:** 12 MHz
Conventional Memory: 640K; **Extended Memory:** 384K

Ports: 1 serial, 1 parallel, 1 video, 1 keyboard/keypad, 1 floppy drive, 1 expansion chassis

Drives: 3½-inch 1.44MB floppy, 41MB hard

Video Modes: text, CGA, EGA, VGA

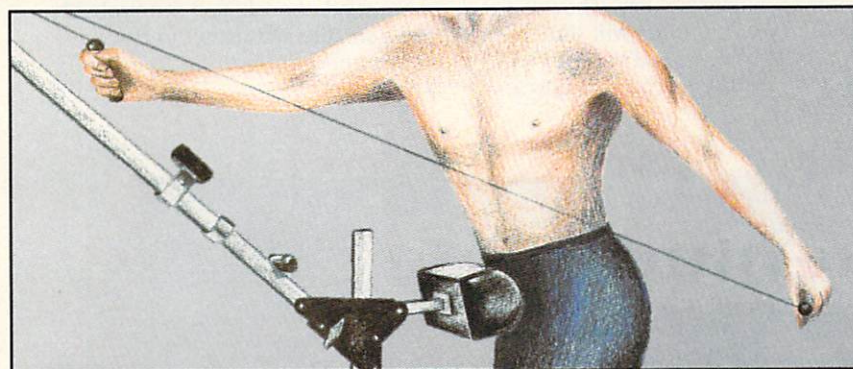
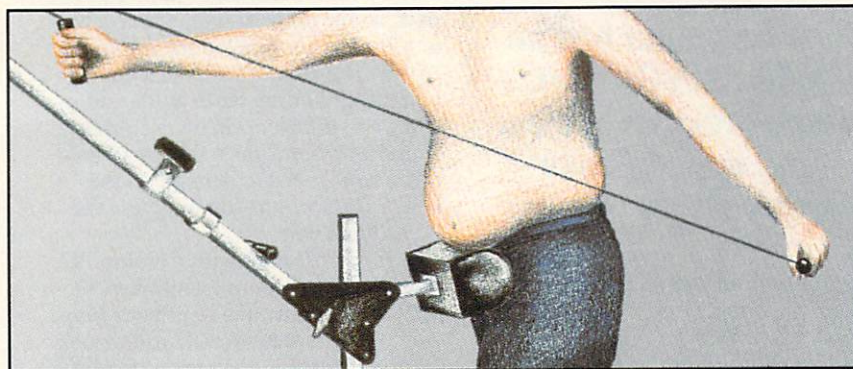
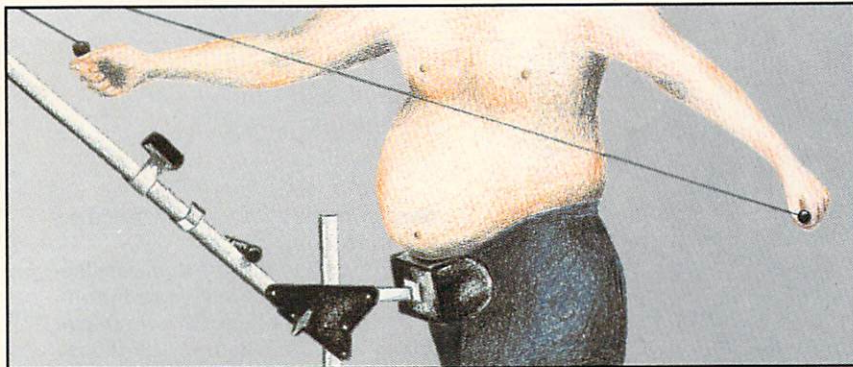
Screen Type: ST backlit LCD

List Price: Not available

Street Price: \$2,049.50



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NordicTrack provides a total-body workout.

Unlike most in-home exercisers, NordicTrack exercises all the major muscle groups of the body. The upper body exerciser works the extensor muscles of the back, trunk, rotators, biceps, triceps, chest and upper back. The leg exerciser works hip flexors, gluteus muscles of the buttocks, thighs, hamstrings, knee extensors and calves.

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The best part about losing weight with NordicTrack is that it feels good. Mentally, it brings your productivity and creativity up, and your stress down. Physically, it makes you look as good as you feel.

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141C Jonathan Blvd. N., Chaska, MN 55318

vided a clear and speedy color display on my Mitsubishi Diamondscan color monitor. Veridata offers an optional strap-on numeric keypad that attaches to the right side of the laptop's detachable keyboard. You can also attach any standard PC keyboard that uses the PS/2 style connector, an option you may want to consider if you don't like soft, mushy keyboards. The LapPower's keyboard is quiet but has a very short throw and doesn't provide much tactile feedback.

The 16-gray-scale LCD display is crisp but suffers from severe smearing and ghosting. Brightness and contrast are adjustable but not enough to eliminate the ghosting. While the LCD display is OK for use on the road, you'll want to keep a VGA monitor in the office.

There's an expansion connector on the back of the LapPower for an optional expansion box that accepts industry-standard cards. You'll also

find a port for an external 5¼-inch disk drive, and an internal 2400-baud modem can be added by your dealer. Attach the card box, full-size keyboard, disk drive, monitor, and serial mouse to the laptop and close the

The computer has an external VGA port, which provided a clear and speedy color display on my monitor.

LCD display; and you'll never know you're using a laptop.

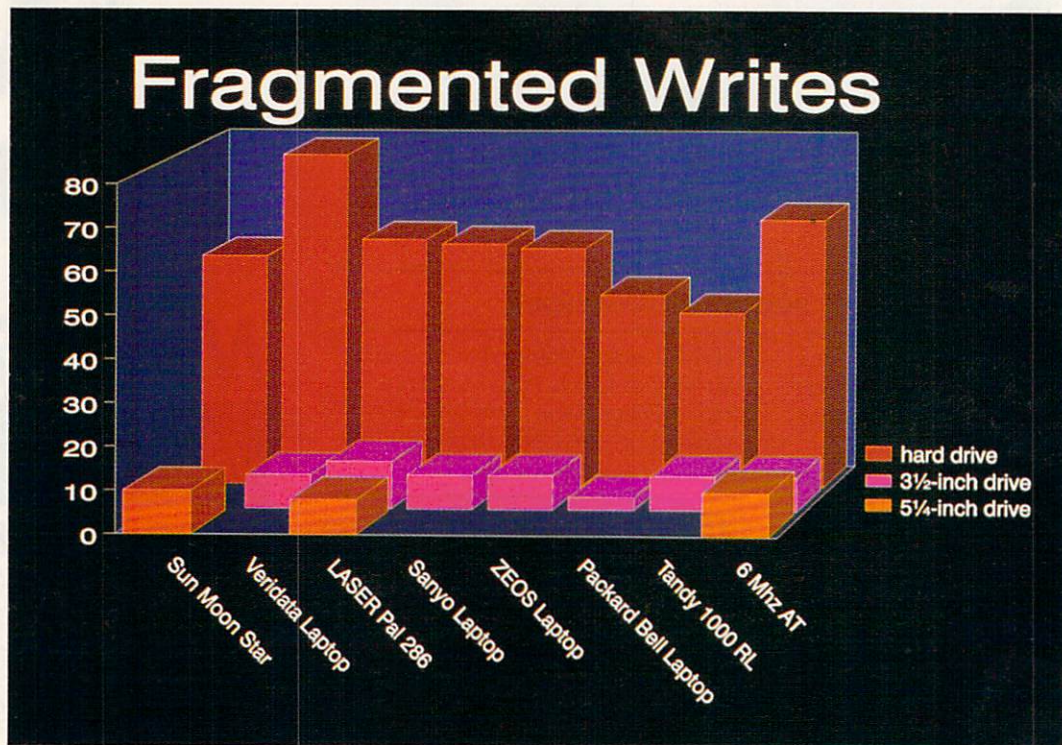
The system has a battery life of about two hours with the LCD and hard drive in constant use. The included PowerCon utility will shut down the hard drive and backlit LCD and toggle the microprocessor into a

standby mode after a user-defined period of inactivity.

Other than the less-than-satisfactory LCD display, the only real problem with the LapPower is poor documentation. The LapPower 286/40 is sold by companies other than Veridata, so the program includes a generic 179-page book called the *Laptop Operation Manual* that's inadequate as a tutorial or reference guide and includes no information on customer support or even how to contact Veridata. You'll need to depend on the dealer from whom you purchase the unit for support.

If you're looking for a laptop PC that can also serve as an all-purpose desktop machine, the LapPower may be the machine for you. If you're looking for a machine to use specifically on the road, though, you can probably find a smaller and lighter unit at a comparable price.

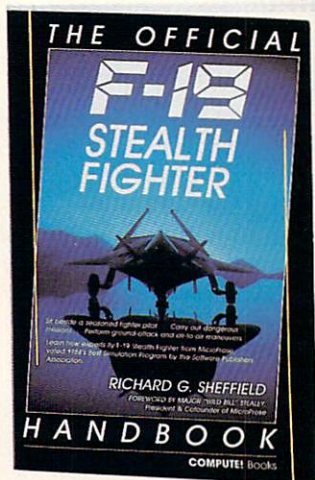
DENNY ATKIN



WHATEVER YOUR HOME COMPUTING NEEDS, COMPUTE IS YOUR HOME COMPUTING RESOURCE

The Official F-19 Stealth Fighter Handbook
by Richard G. Sheffield
Foreword by Major "Wild Bill" Stealey,
president and cofounder of MicroProse
\$14.95 192pp

Learn the ins and outs of flying MicroProse's new *F-19 Stealth Fighter* flight simulator. Study the practical hints and tips for flying the simulator and performing ground-attack and air-to-air tactics. Then read all the background information in the book to learn to fly the real F-19. In the final section of the book, you'll find yourself looking over the shoulder of an expert *F-19 Stealth Fighter* game player as he carries out several dangerous missions.



Easy 1-2-3 for Small Business
by Sandra Cook Jerome, C.P.A.
\$18.95 320pp

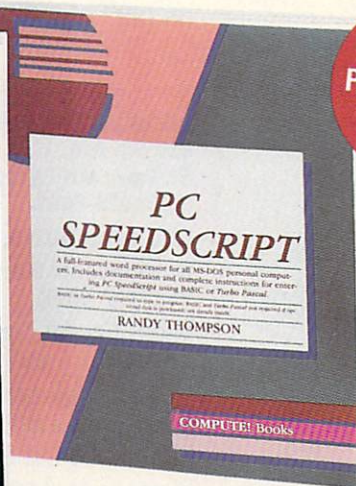
This hands-on guide is perfect for small-business owners who need financial reports and information quickly. It is more than just another tutorial on *Lotus 1-2-3*; it's a guide to building practical spreadsheets. You get complete instructions for creating more than a dozen spreadsheets, including income statements, job costing, tax planning, balance sheets, and accounts-receivable aging. You'll even learn to write a business plan. Although written specifically for *Lotus 1-2-3* releases 2.2 and 3, the spreadsheets in *Easy 1-2-3 for Small Business* are also compatible with release 2.01.

COMPUTE!'s Guide to Nintendo Games
by Steven A. Schwartz
\$9.95 272pp

A valuable buyer's guide, this book is packed with tips for better play and reviews of available game cartridges for the Nintendo Entertainment System. Each game description includes a screen shot; basic information such as type of game, number of players, and controller type; and ratings for the essential elements such as sound and graphics quality, violence, difficulty, and overall play value.

Quick & Easy Guide to Using MS-DOS, Second Edition
by Bonnie Derman and Strawberry Software
\$14.95 224pp

The second edition of this easy-to-use guidebook covers all versions of MS-DOS through version 4. Commands and directions are logically arranged for quick reference. Topics include directories, files, disk commands, screen and printer output, and more. It's the only MS-DOS book that employs a truly task-oriented approach.



PC SpeedScript
by Randy Thompson, associate editor
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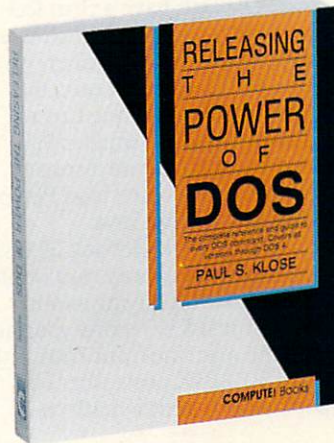
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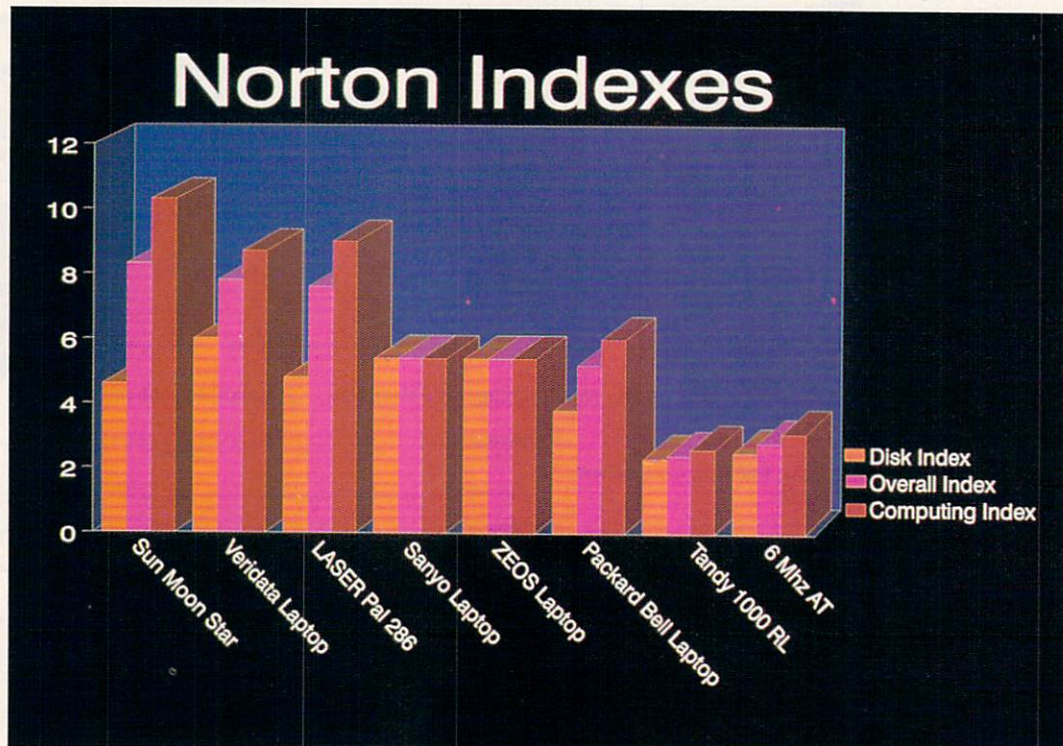
trying out the keyboard. The Notebook 286's keyboard has 82 full-size keys, 12 function keys, and an embedded numeric keypad—all with a full key travel. The keys have a firm feel (not too mushy), and they're extremely quiet (you won't disturb others on a plane). On the downside, I miss the audible click of the keys, the Enter and right Shift keys are smaller than usual, and you have to use a special Fn key to access the embedded PgUp, PgDn, Home, and End keys.

While the Zeos Notebook 286 is, indeed, a great little laptop, you would actually be better off buying another machine. For just \$300 more, you can buy the same machine from Zeos with a 16-MHz 80386SX processor. The Notebook 386SX adds a math co-

processor option and includes a black-and-white screen instead of the Notebook 286's blue-and-white screen. With either machine, you'll have enough power to run *Windows 3.0*. Zeos has proven that good things do come in small packages.

DAVID ENGLISH

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- Laptop
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- I don't own a computer.

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- Hercules
- CGA
- EGA
- MCGA or VGA
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- 5¼-inch disk drive
- 3½-inch disk drive
- Hard disk
- Dot-matrix printer
- Letter-quality printer
- Laser printer
- PostScript printer
- Modem
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How much memory does your computer have?

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- 640K
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- Pascal
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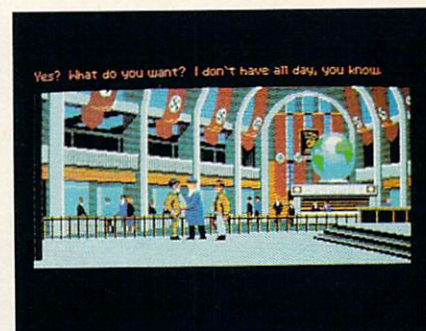
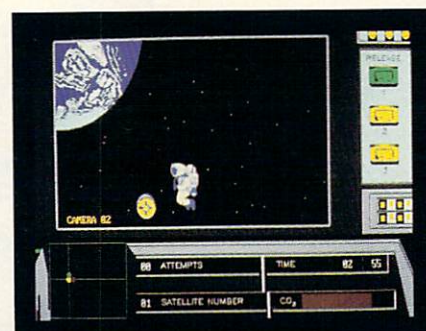
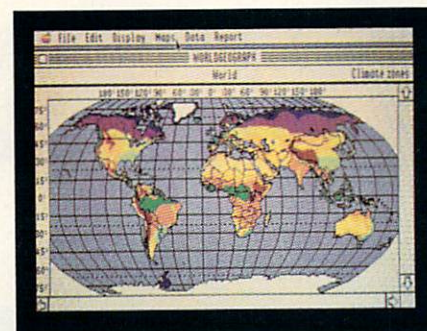
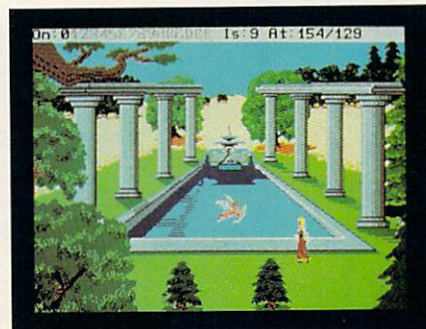
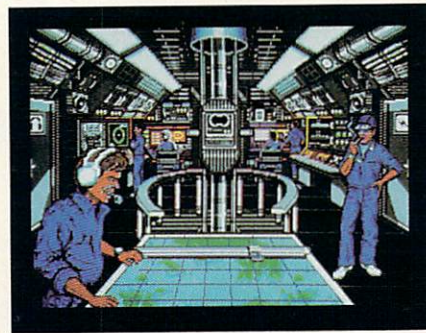
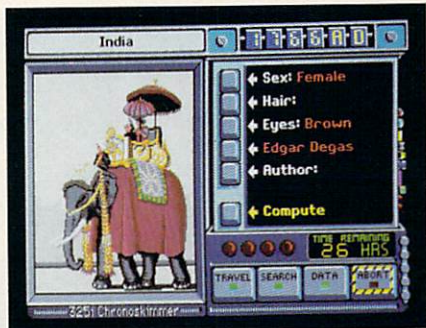
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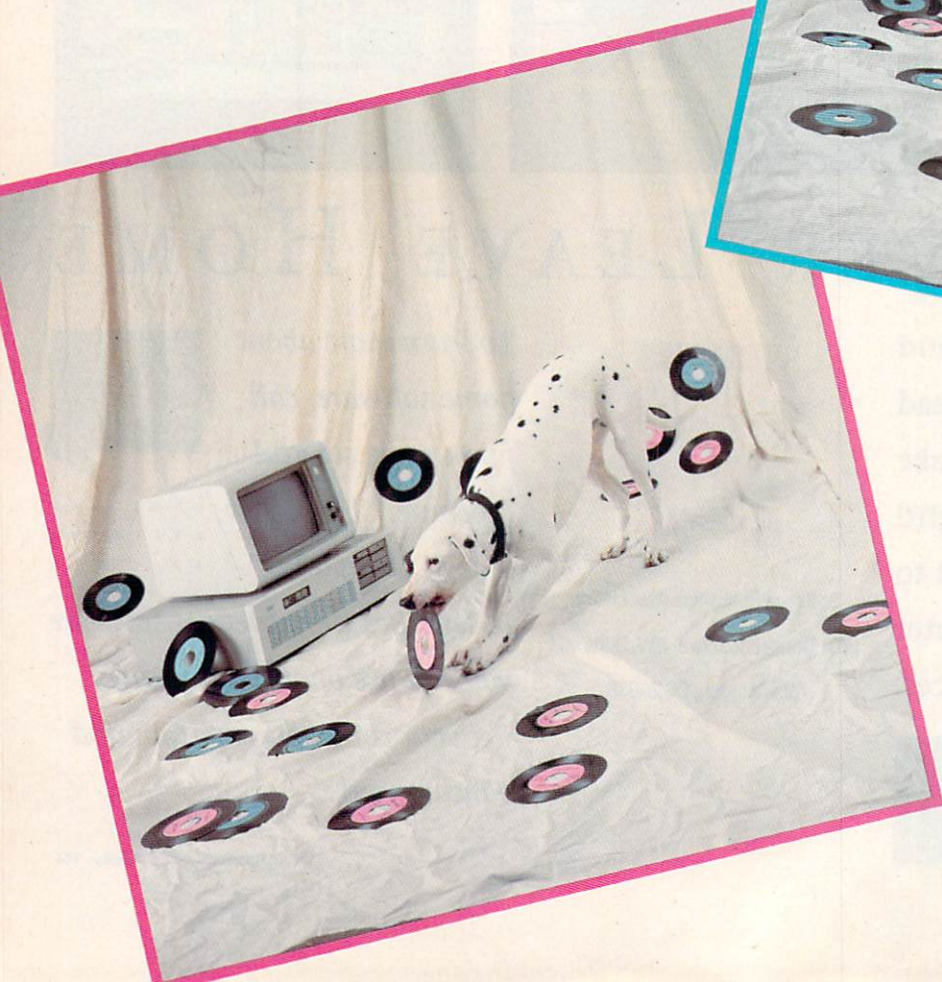
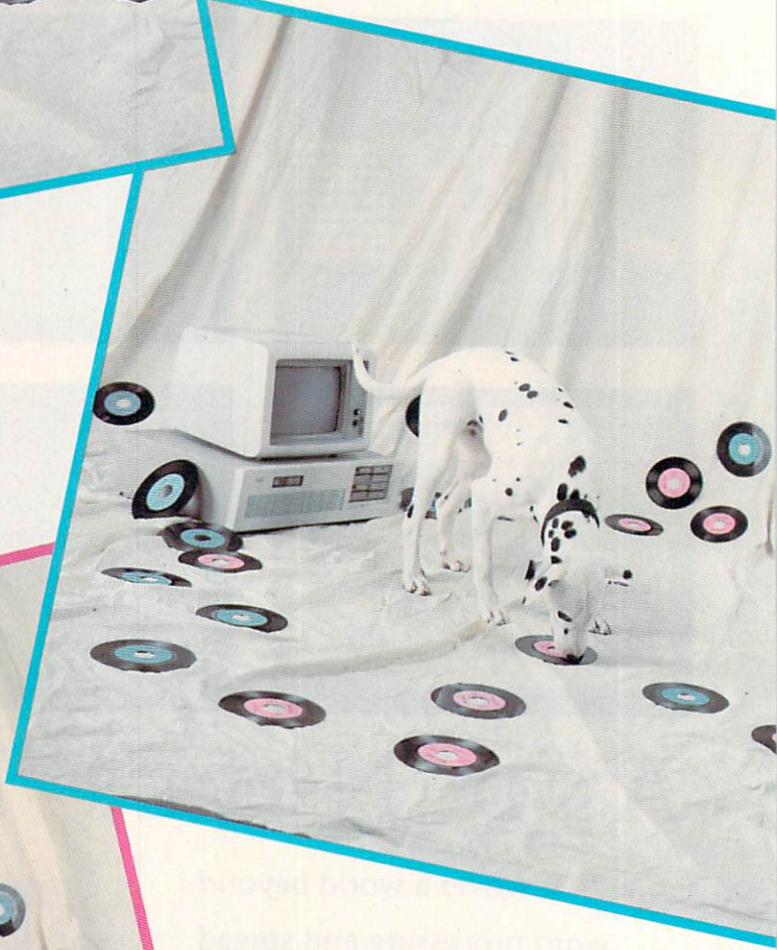


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HOW TO CHOOSE A HARD DISK

CHOOSING A HARD DISK CAN BE TRICKY.
HERE'S EXPERT ADVICE.

Buying a hard disk is confusing nowadays. How big? What brand? How about RLL? There's a lot to worry about. Here's how to kick the tires and read the EPA mileage sticker when you're shopping for a drive (or a PC with a drive).

Your hard disk subsystem consists of two pieces: the hard disk itself and the hard disk controller board. The controller is usually a circuit board in your PC, although some newer computers put the controller's electronics right on the main PC circuit board, the motherboard.

A few years ago, you wouldn't worry about buying a controller; you'd just use the one that came standard with your machine (in the case of an AT-type system) or buy a disk/controller combination all at once (in the case of an XT-type system). Since you have a variety of choices in drives and controllers, you've got to make sure that they can talk to each other.

Making these choices may seem a bit daunting, but read on—hard drives aren't tough to understand. And having a grasp of the terms found here will allow you to pick the right drive for your system. Here's a quick look at your options.

Drive options. You must choose size, seek time (which affects speed), band stepper or voice coil, and the drive's self-parking capability.

Controller options. Here you choose XT, AT, or PS/2; the interleave factor (which affects speed); whether or not to get an on-board cache; and the drive's sector translation.

Matching drive and controller. There are several items that must match on the drive and controller, including the interface (ST506, SCSI, ESDI, or IDE) and encoding scheme (MFM or RLL). >

M A R K M I N A S I

What Size Is Best?

Many computers these days are advertised as coming with 40MB drives, but assess your needs carefully before jumping at such a package. The sad truth is that virtually every program you buy will demand a few megabytes of your disk's space, and you'll soon be looking for more room.

For example, the popular *Micrografx Designer* drawing program gobbles up five megabytes in a basic configuration (it can take much more), *Windows 3.0* takes up about seven megabytes without a swap file, and even old *Lotus 2.1* requires a couple of megs.

That doesn't even consider the real biggies, like OS/2 (more than 30MB when its *Extended Edition* is loaded). Downloadable fonts can suck up space in no time. And greater use of graphics strains the disk further. For example, a nongraphic computer screen can be stored in just 4K; a graphical screen can take up a megabyte. Your 40 megabytes of space will disappear in no time.

Economics seems to favor 80MB or larger drives. The typical 42MB drive (the Seagate ST251-1 is the most common) runs about \$300.00 discounted, or about \$7.50 per megabyte. In contrast, Maxtor's 80MB drive is now selling for as low as \$410.00, or \$5.13 per megabyte. Further, the Maxtor is a voice-coil drive, which is preferable to the 251-1's band-stepper design. (Fear not, explanations of voice coil and band stepper are coming up soon.)

And when shopping for really big drives, watch out for an old scam, reporting "unformatted" drive capacity. Drives must give up as much as 30 percent of their capacity for system overhead. For example, a 20MB drive may actually have 26MB of capacity, but the extra 6MB is required for system overhead.

Every drive has this meaningless "unformatted" capacity that looks impressive but is of no value to the buyer. Look out for unscrupulous dealers who report the larger, useless unformatted capacity in their magazine ads. (By the way, *format* in this article means *low-level*—not the familiar DOS—*format*; it's something generally handled by your dealer.)

Seeking the Fastest Drive

Part of what makes a drive subsystem fast is how fast a drive can move its read/write head over the data you want—that is, how long it takes to find the data. The average time to find an area on disk is called the *seek time*, and it's measured in milliseconds (ms, thousandths of seconds). The lower the number, the better.

Hard Drive Interfaces

Interface	Transfer Rate	Encoding Method
ST506	250K–750K/second	MFM or RLL
SCSI	1MB–3MB/second	RLL
ESDI	1MB–3MB/second	RLL
IDE	1MB/second	ARLL

Don't buy a drive with a seek time larger than 28 ms. The best on the market are in the 10–12 ms range—you'll know from the price tag which those are.

Band Steppers and Voice Coils

A lot of what makes a drive fast or slow is whether it moves its read/write head with a band stepper or a voice coil.

Cheaper drives move the head to and fro over the disk surface with a combination of flexible metal bands and a stepper motor, hence the name *band stepper*. They rely on a mechanical approach to find data, an approach that isn't reliable in the long term, as the mechanical parts do not display consistent behavior over time; telling a new drive head to move 1/1000 inch may yield different actual movement than making the same request of an older drive.

The alternative is a voice coil. Named after the voice-coil circuit used in telephone electronics, this is a coil with a cylindrical rod at its middle. When the coil is energized, the rod moves in or out of the coil, depending on how much energy is used. The rod is connected to the heads, so energizing the coil moves the heads in or out. Meanwhile, as the heads are moving, they're reading address information from the drive; that way, the head knows whether it's found the desired data or not.

Which is better? The voice coil, for three reasons. First, and most important, the voice coil is a constantly self-adjusting system; the mechanical parts may change with time, but the head will always find the data. The stepper acts on the unrealistic idea that its mechanicals will never change as time goes on. Second, the voice coil parks its head automatically when the drive is shut down, thus protecting the disk. Most steppers require you to run a head-parking program of some kind. Third, voice coils are generally faster than band steppers.

You'll find that most 80MB and larger drives are voice coil, so buying large drives will pay off in reliability and speed as well as capacity.

Get in Control

If your computer already has a controller, you needn't worry about picking a new one. Or should you?

Superpowerful controllers now appearing on the market can squeeze the last ounce of performance out of a drive.

First, make sure your PC can use the controller! Your controller must be made to work with your computer. Vendors sell XT-type controllers, also called *8-bit controllers*, and AT-style controllers, also called *16-bit controllers*. An XT controller can work in an AT system (albeit slowly), but an AT controller generally won't work in an XT system. There are some PS/2 microchannel controllers, but the market for them isn't large, as all the PS/2 microchannel computers come standard with a fairly fast controller.

Next, make sure it's a speedy controller. We've seen that an important determinant of a drive's speed is its seek time. Controllers also contribute to the speed of your disk subsystem with their interleave factor.

The seek time refers to how long it takes to find the data on disk. The interleave factor tells how quickly the disk subsystem can read the data, once it's been found. Interleave factors look like 1:6, 1:3, 1:1, and the like. A lower second number is better, so 1:1 is the best. Controllers that feature 1:1 interleave used to be very expensive—\$400 or more for AT systems—but now they're about \$120, only about \$20 more than the more common and slower 1:2 controllers.

If you're buying an AT system (286, 386SX, or 386) today, insist on 1:1. Buyers of XT systems will find 1:3 controllers their best bargain; there aren't any 1:1 XT controllers, and the 1:2 controllers are a bit expensive. All microchannel PS/2 systems come standard with 1:1 controllers.

Maintaining Cache Flow

Most 1:1 controllers include a speed-enhancing feature called *on-board cache*. A cache is necessary because hard disks retrieve data thousands of times more slowly than your computer's RAM. Every time the computer needs to read the hard disk, it must twiddle its thumbs, waiting (and waiting and waiting . . .) for a device that seems, in terms of CPU speeds, positively geological in time scale.

It would be nice just to copy the whole hard disk to the much-faster RAM, but that's impractical. Buying even enough RAM to accommodate a

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- **Tree View (1418)** - A superior DOS command shell with pull-down menus.
- **Telix (1422)** - The best telecommunications program available. **HD**

SPREADSHEET

- **On Side (1506)** - Prints your spreadsheets (or any file) sideways.
- **As-Easy-As (1805)** - A fantastic Lotus 1-2-3 compatible spreadsheet.
- **Lotus Learning Sys. (1810,1811)** A complete package that makes it easy to learn Lotus 1-2-3. (2 disks) **HD**

MS WINDOWS 3.0

These programs require Windows 3.0.

- **Almanac (1470)** - An excellent calendar/information utility.
- **Icon Library (1481)** - Customize your Windows operating environment with this collection of over 300 icons.
- **Wallpaper (1484)** - A collection of wallpaper to decorate your Windows.
- **Active Life (1472)** - A powerful system for managing your active business and personal life.
- **Icondraw (1478)** - Create your own icons to use with Windows.
- **Command Post (1474)** - Allows you to create custom menus that can execute applications automatically.
- **Metz Desktop Applications (1485)** - Create menus and easily access files and directories.
- **Screen Peace (1486)** - A FANTASTIC screen saver with many beautiful and interesting variations.
- **Change Cursor Utility (1487)** - Allows you to design your own arrow and hourglass cursors to use with Windows.

HOME & FAMILY

- **Family Tree Journal (1122, 1123)** - Presents your genealogical information in book form. (2 disks) **HD**
- **Home Inventory (1105)** - Keeps track of all your personal property.
- **Personal Budget Tools (1108)** - Provides a simple way to plan for annual, semi-annual, and quarterly expenses.
- **Edna's Cookbook (1118,1119)** - An electronic cookbook with several great recipes - add your own! (2 disks)
- **Will Kit (1343)** - Create your own will valid in all 50 states.
- **C.A.R.S. (1126)** - Keeps a complete record of your auto expenses.
- **Cash Control (1127)** - Manage your bank accounts the fast and easy way with this great program. **320K**
- **Topp's Grocery Program (1136)** - Helps you prepare grocery lists, manage coupons, and track savings. **HD**

WORD PROCESSING

- **WP 5.0/5.1 Clip Art (1875,1876)** - A large collection of clip art to add spice to your WP documents. (2 disks)
- **PC Write 3.03 (1851-1853)** - A very popular full-featured word processor. (3 disks) **HD, 512K**
- **WP 5.1 Learning System (1865-1867)** - Be a more proficient WP user. (3 disks) **HD, 512K**
- **Readability Plus (1340)** - A computerized writing style analyzer.
- **Grab Plus/Laser Label (1883, 1884)** - Takes addresses from a word processor and sends them to the printer. **HD**

APPLICATIONS

- **Trip Planner (1331)** - A computerized road map. Computes best route. Very popular!
- **Melody Maker (1918)** - A fun and easy-to-use program for new or experienced music students. Comes with several songs.
- **PC Beat (1909)** - Turns your computer into a drum machine. A lot of fun!
- **Calendar Mate (1344)** - A full-featured program designed to create personalized calendars.
- **Lotto! (1313)** - Win the lottery with the help of your computer!
- **By the Numbers (1342)** - Provides you with a complete numerical interpretation. **HD, 340K**
- **Bowl 101 (1346)** - A user-friendly bowling league management program.
- **The Electric Almanac (1341)** - A source for lots of useful information.

GRAPHICS

- **PrintShop Graphics (1503)** - A large collection of PrintShop clip art.
- **Picture Label (1501)** - An excellent label printing program that uses PrintMaster or PrintShop graphics.
- **Banner Maker (1502)** - Prints banners in various sizes, styles, and fonts.
- **Dazzle (1530)** - An amazing randomized color pattern generator. Performance art for the eyes! **EGA or VGA**

GAMES

- **Double Blocks (1970)** - A TERRIFIC Tetris clone for 1 or 2 players. Records top scores. You will love this!!
- **Video Poker/Ultima 21 (1945)** - The BEST poker and blackjack games!
- **Miramar Flight Simulator (1967)** - You are in control of all the speed and fire-power an F-18 has to offer! (will not work with Tandys) **CGA**
- **Pharaoh's Tomb (1974)** - Face monsters and traps as you explore the pyramid. Your goal is to survive.
- **Bass Tour (1925)** - Fish in your choice of lakes. Try to win the trophy.
- **ZZT (1921)** - Test your problem solving ability and your arcade skills as you battle your way through 43 rooms.
- **Field General (1931)** - Experience the excitement of a pro football game from a coach's point of view. **CGA, HD**
- **Insanity (1936)** - Find your way out of this maze before going insane! **CGA**
- **The Monuments of Mars! (1920)** - Many tough levels filled with puzzles, traps and creatures. **350K, CGA**

VGA GAMES

- **Shooting Gallery (1990)** - Seven variations of a shooting range on your computer screen. **VGA, mouse**
- **VGA Sharks (1992)** - Recover lost treasure in shark infested waters in this action arcade game. **VGA**
- **Beyond Tetris/Joust (1997)** - Beyond is like Tetris with a twist. Joust is a VGA rendition of the classic. **VGA**
- **VGA Jigsaw (1993)** - Uses beautiful pictures to create puzzles for you to put back together. **VGA**

EGA GAMES

- **The Last Half of Darkness (1962)** - Scary graphics and mysterious puzzles to challenge your mind. **EGA, HD**
- **Dark Ages (1964)** - A brilliant arcade/adventure game with superb graphics and animation. **400K, EGA, 286 or faster machine.**
- **Poker Slot (1989)** - Plays just like the video poker machines you see in casinos. Great graphics! **EGA, mouse**
- **Commander Keen (1986)** - One of the best games we have ever seen. Exceptional play and graphics. **EGA**
- **Snarf (1987)** - Travel through various mazes while you pick up treasures and avoid the Snarfs. **EGA**

IMPORTANT

CGA = Requires Color Computer
EGA = Requires min. EGA adapter
HD = Requires Hard Drive
512K = Requires 512K RAM
For multi-disk sets
count all disks in set

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COM5

20MB disk would be prohibitively expensive.

Computer designers have noticed, however, that most of us seem to return to the same areas on the disk over and over again. Even though your hard disk is 20MB in size, you may do 90 percent of your work in just 2MB or so. That's where a cache comes in.

A cache is a TSR (memory-resident) program that sets aside some of your PC's memory as a temporary holding area. It then monitors your disk usage. Every time DOS goes to read a file, the cache transparently copies that file's contents to its holding area in memory. Then, if DOS needs to reread that file later, the

cache supplies the file to DOS, fooling DOS into thinking that the information came from the disk drive.

The benefit? The file reread occurs by transferring information from memory to memory, rather than from disk to memory, yielding much faster apparent disk performance. If you have expanded or extended memory that you aren't using, putting in a cache program is an ideal way to speed up your disk subsystem.

PC Tools, *Mace*, and *The Norton Utilities* all include cache programs, or you may want to pick up a copy of Multisoft's *PC-Kwik* (call Multisoft at 503-644-5644). If you've got the memory for one, a 512K cache will speed up apparent disk speed quite a bit. Now that computer memory is so much cheaper, you may want to spend some cash on memory so you can spend that memory on cache (sorry—couldn't resist).

Thus far, I've explained caches as add-on software. But some hard disk-controller designers have gone a bit farther and actually have implemented small hardware caches right on the controller. The caches tend to be 8K–32K in size.

It sounds like a good idea, but it often isn't. The problem is that a cache that tiny doesn't do much. An 8K cache makes a disk look really fast to the kind of small speed-test programs that computer magazines run when writing reviews, but they don't help much for real-world applications.

Further, built-in caches can confuse many disk-tester programs like *SpinRite*, *Disk Technician*, and the like. The cache makes them think the system is a good bit faster than it actually is. The bottom line is this: If your controller has an on-board cache, fine. But make sure you can disable the caching so you can reliably run a disk-maintenance program in the future.

Sector Translation

The last thing to look out for when shopping for a controller is sector translation. When hard disks first became popular in the PC world around 1983, they used a disk-encoding method called *MFM* (Modified Frequency Modulation, discussed in the next section).

This slowly is being replaced by RLL (Run Length Limited). RLL makes it easier to build large-capacity drives, and it, too, is discussed in the next section.

In 1986, when RLL first appeared on the PC scene, some PC programs had trouble talking to RLL-type disk subsystems because they looked different from the MFM-type disk subsystems that the programs had been designed to expect.

That's not a problem with today's software, but at the time, the makers of RLL disk controllers decided to solve the problem with sector translation.

Sector translation makes a newer RLL disk subsystem look like an older MFM disk subsystem. Most translating controllers give you the option to disable translation and "come clean" about their RLL-ness.

Why disable translation? Again, because of *SpinRite* and the crowd. Disk-fixer and -maintenance programs are greatly hampered in what they can do for your disk if the controller is translating. Make sure you've got the option to disable translation. You'll also see translation on some of the 300MB and larger drives, as well as on many IDE drives, discussed in the next section.

Interface Basics

Up to now, you've seen the characteristics that a drive or a controller can have; these characteristics can be mixed and matched in just about any way. But the drive and controller have to agree on how to communicate; that's determined by their interface type and encoding scheme.

How does the controller talk to the drive? Originally (before 1983), you'd buy a controller and a drive from the same company, so you wouldn't worry about the interface. Nowadays, it's likely that you'll want to buy a controller from one vendor, like Western Digital or Data Technology, and a drive from another vendor, like Seagate, Maxtor, or Mitsubishi. This implies that both the drive and controller must support some common standard interface.

Originally, the now-defunct Shugart Technologies used something it called the ST 506/412 interface, or as it's more commonly known, ST506. Most PC drives use ST506 to this day. It can support a maximum data-transfer rate of 7.5 million bits per second (Mbps). That doesn't sound slow, but it is, and that's one reason why it's slowly fading from the scene. The other reason is that it's noise prone.

Real muscle drives these days are using a replacement interface called *ESDI* (Enhanced Small Device Interface). ESDI, like all other interfaces after the ST506, reduces noise and boosts speed and reliability by putting part of the controller right on the drive. ESDI could theoretically support 24 Mbps. The ESDI interface has another useful feature; the drive can describe itself to the controller, which makes drive setup easier.

Another interface that high-end machines are using more and more goes by the unfortunate acronym

Hard-Driving Acronyms

ARLL. Advanced Run Length Limited is a data-encoding method used in IDE drives that allows storage of 50 percent more data than standard RLL and 100 percent more data than MFM.

ESDI. Enhanced Small Device Interface is an interface standard that puts some controller functions on the drive itself. ESDI allows for data transfers of 1MB–3MB per second and can be used for drives up to 1 gigabyte in size.

IDE. Integrated Drive Electronics, like SCSI, is an interface design that puts the controller on the drive itself. IDE, however, only offers ST506 performance.

MB. One megabyte is 1,000,000 bytes, or 1,000K.

MFM. Modified Frequency Modulation is a data-encoding method that has been the standard until recently. Now, RLL is more common, at least for high-capacity drives.

ms. One millisecond is 1/1000 second. Milliseconds are commonly used to measure a hard disk's seek time.

RLL. Run Length Limited, like MFM, is a data-encoding method, but RLL allows storage of 50 percent more data than MFM.

SCSI. Small Computer System Interface is an interface standard that puts most of the controller functions on the drive itself. It offers transfer speeds of 1MB–4MB per second. SCSI also allows as many as eight devices to be daisy-chained together.

ST506. Shugart Technologies' 506/412 interface is an interface that supports transfer speeds of about 500K per second and is limited to a hard disk of 127.5MB or smaller.

SCSI (pronounced *scuzzy* and standing for Small Computer Systems Interface). IBM's recent announcement of some PS/2 models with a SCSI interface and the U.S. government's recent gigantic purchase of SCSI-equipped PCs under its Desktop III contract will boost SCSI acceptance in the PC world.

SCSI transfers data at up to 20 megabits per second. Eventually SCSI will support over 100 megabits per second, but for now it's in the ESDI range of speed. Taking things a bit farther than ESDI, SCSI actually puts the whole controller on the drive—the board in the computer really doesn't have much to do and is, strictly speaking, not a controller but a host adapter.

SCSIs are also neat because the interface lets you daisy-chain up to eight devices. That means theoretically you could run a couple of SCSI hard disks, a CD-ROM player (which also uses SCSI), and a scanner all off a single host adapter. While SCSI is probably a better interface in the long run, ESDI is currently better suited to the DOS environment and probably the better bet for now.

IDE (Integrated Drive Electronics) is basically a SCSI-like approach to ST506. The electronics can't handle SCSI speeds, and the interface relies on ST506 technology, but the controller is, again, located right on the drive, allowing greater transfer rates. The resulting stream of digital data is already preformatted for an IBM-type bus on a 40-pin connector, rather than using the more common two-cable approach. Compaq uses IDE extensively in its systems.

Sound good? It is, basically, with one twist: You can't maintain IDE with software. You're not supposed to low-level format it, and in fact I've seen a low-level format damage a Compaq drive. *The Norton Utilities* will work for some data recovery, but, again, disk-fixer programs can't help you much because IDEs tend to be sector-translating systems. Further, there's not really a standard IDE interface. In fact, one data-recovery firm reports at least 25 different kinds of IDE. There's something a bit too disposable about these drives; they're basically reliable, but you're helpless if they do develop a problem. IDE would be a very good idea if programs could reformat the drive and the IDE manufacturers would agree on a standard. These things may be the case in a year or two. Right now, be careful.

What About Hardcards?

Several firms offer hardcards, which are controller boards with a slim drive mounted right on them. They don't

take up a drive bay, but they do take up a slot. Some, in fact, are designed so badly that they take up three slots—look out for these!

Hardcards are nice if you need a means to transport a lot of information, such as if you had to set up 20 identical machines in a learning lab. You'll probably want to avoid them, however, since they tend to be IDE and many generate a fair amount of heat near your other circuit boards.

The Great Encoding Debate

Part of a disk-system designer's job is figuring out how best to pack data on a drive. That's called the disk's *encoding scheme*, and it's always a matter of compromise—more data in an area means less reliability. Most PC drive/controller combinations prior to 1988 used modified frequency modulation (MFM).

Around 1986, a newer encoding scheme, run length limited (RLL—the idea was borrowed from mainframe drive design), started appearing on PC systems. It took any given drive and packed 50 percent more data on it—a drive that held 20MB when connected to an MFM controller could hold 30MB when paired with an RLL controller.

Obviously, the extra 50 percent doesn't come without cost. You can't just hook up an RLL controller to a drive that's been doing MFM, reformat, and instantly get more space. The drive has to be engineered better to be able to reliably store the more compact RLL format. That's why you see drives rated as either MFM or RLL quality.

For example, the Seagate ST4096 (an 80MB MFM drive) and the ST4144R (a 120MB RLL drive) are basically the same drive—120MB is 50 percent larger than 80MB. The 4144R is just built a bit better, and it costs a little more. The 4096 is \$527 discounted; the 4144R is \$589 discounted.

RLL has unfairly gotten a bad name in some circles because some computer dealers in the late 1980s matched up MFM-quality drives with RLL controllers. The result was larger-capacity, unreliable drives and a legion of headaches for PC fix-it people.

So when you're buying an RLL controller, buy an RLL-quality drive. Or you could buy a little insurance by matching up an RLL-quality drive with an MFM controller. Consider this: The ST4096 is a good drive, but why not spend \$60 more for the ST4144R and format it under MFM as 80MB? After all, \$589 is still a reasonable price for an 80MB drive, and you'd have an overengineered system

that's very reliable.

By the way, when people advertise MFM or RLL drives, they really mean MFM- or RLL-encoded ST506. ESDI, SCSI, and IDE all encode with RLL.

Recommendations

Growing program sizes, downloadable fonts, and graphics make drives of 80MB and larger a necessity. The Maxtor or Seagate 80MB drives are both good and widely discounted. If you buy a 40-megger now, you'll only save a little money over an 80, you'll end up buying a larger drive in a year or two, and you'll be giving up a voice coil for a band stepper.

For an XT system, buy a 1:3 controller like the Western Digital (WD) XT-GEN or the Data Technology (DT) 5150 CX; both are good, basic, inexpensive 8-bit MFM controllers that can support a wide variety of drives. For XT RLL, try the WD 1004-27X. Avoid the Seagate ST-11R XT RLL controller, as it has a peculiarity that limits data reconstruction and recovery possibilities, and, besides, it only supports Seagate drives.

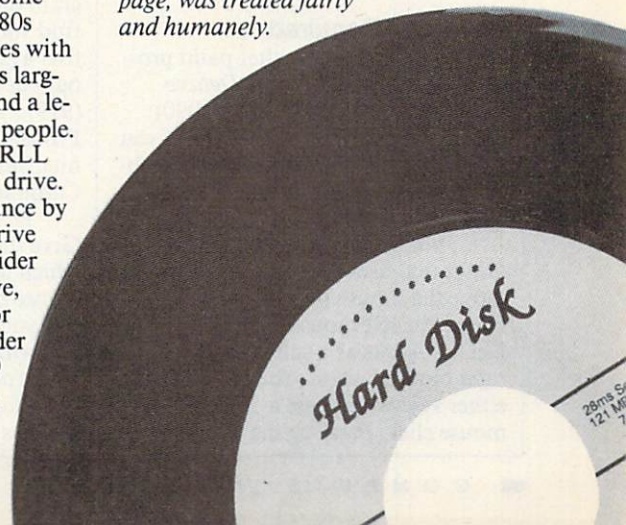
For an AT system, WD offers the 1006V-MM2 MFM controller and the 1006V-SR2 RLL controller. DT's 7280 MFM controller is also quite trouble-free. All three are 1:1 controllers, and each can be had for about \$120.

If you need something larger (over 120MB), you'll probably have to go ESDI. CDC Imprimus (now owned by Seagate) makes good drives, as do Maxtor and Micropolis.

When buying computers, think twice about IDE drives. Again, IDE is a good idea, and you'll save a few bucks, but it robs you of a lot of disk-maintenance options. That means you should be careful about buying hardcards.

Ensure that on-board cache and sector translation, if present, can be disabled to get the maximum benefit from disk-maintenance programs. □

**Gidget, the dog on our title page, was treated fairly and humanely.*





PC DISK UPDATE

J O Y C E S I D E S

There's been some confusion about the difference between COMPUTE's two disk products: our *SharePak* disk and *COMPUTE's PC Disk*. The monthly *SharePak* disk is a thematic disk filled with two to five shareware programs. You can order a single disk for \$5.95 for the 5¼-inch disk or \$6.95 for the 3½-inch disk. Or you can subscribe to the monthly disk.

The subscription rate per year for the *SharePak* is \$59.95 for the 5¼-inch disk and \$64.95 for the 3½-inch disk. To see a description of the programs on the *SharePak* disk, look for the *SharePak* ad in *COMPUTE*.

PC Disk is different. It appears every two months and is filled with at least five commercial-quality free or shareware programs with a focus on utility and productivity software. We search through hundreds of programs and publish only the best. The *PC Disk* costs \$9.95 for a single disk or \$49.95 for a one-year subscription.

The bimonthly "On Disk" column in *COMPUTE* describes the programs and includes four screen shots to help you get a feel for each.

The "PC Disk Update" column covers reader tips and questions about the *PC Disk*. Questions concerning the *SharePak* should be sent to our customer service department at 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408, or you may call (919) 275-9809.

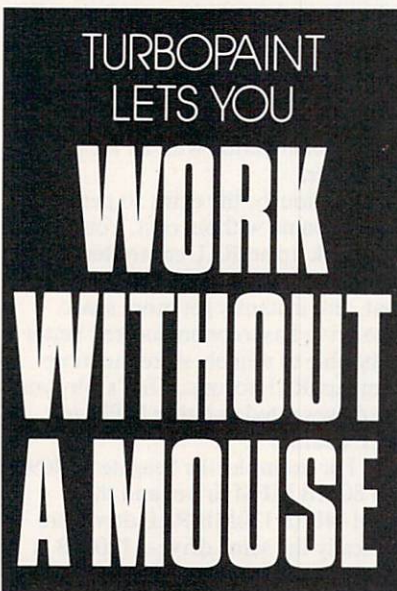
No Mouse Required

Unlike almost every other paint program I've used (including *Deluxe Paint*), *TurboPaint* (October 1990) doesn't require a mouse to run. If you try to load other paint programs without a mouse driver installed, you won't get very far.

TurboPaint includes a keyboard driver that uses the cursor keys to move the mouse pointer. The 5 key acts as the left mouse button, and the Del key works as a substitute for the right mouse button. You have to press either key twice to get a complete mouse click. Pressing the 5 or Del key

once tells *TurboPaint* that you're holding the button down. Use this when you want to drag the mouse pointer. Press the key the second time to release the button.

Of course, using the keyboard isn't as flexible as using the mouse, but it gives users who don't own a mouse the chance to try the program.



Starry-Eyed Tandys

Star Blaster (December 1990) may not work on your Tandy. If the program displays a message that it can't find your graphics card and you know that a graphics card is installed, call our customer service department at (919) 275-9809 or write to *PC Disk Problems*, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

Be specific about the problem. Give the program name, the issue in which the program was published, the nature of the problem, and the disk size you require. A disk will be sent to you with a version of *Star Blaster* that works on Tandy computers. We're sorry for any inconvenience this problem has caused our Tandy readers.

Mousing with Screen Saver

If you've had trouble installing the mouse option for *Screen Saver* (December 1990), here's how you do it. First, install *Screen Saver* using the *SCSAVINS.EXE* installation program. Choose option 8, *Ignore mouse movement*, and make sure the option is set to No. Save your changes and reboot the computer.

Install your mouse driver. Now run *Screen Saver* by entering *SCSAVER ON* at the DOS prompt. The install message should say *Mouse support enabled*.

To test the installation, run a program that uses a mouse. Wait for the timing interval to pass. When the screen blanks, press a mouse button. Please note that this option only works in programs that use a mouse.

DISKTRAK-tion

If you get the message *Advanced feature not available . . .* when you run *DISKTRAK* (December 1990), you're probably using a version of DOS earlier than DOS 3.0.

The author, Birk Binnard, advised me that he had updated the program since it was published in *COMPUTE*. The updated version still doesn't run under early versions of DOS, but it has a few bug fixes and added features such as path support for data files, a Restore function, and printer controls for printing reports.

The newest version is *DISKTRAK 5.10*, which you can get by downloading the program from CompuServe. It's located in area 6 of the IBM Utilities Forum.

If you don't have a modem or a CompuServe account, you can send a formatted disk plus \$0.50 for postage in a reusable disk mailer to the address below. If you'd like to register the program, send a check for \$15.00, or if you've already registered, send \$5.00 to cover the cost of the disk, disk mailer, and postage to Peninsula Software, 28510 Blythewood Drive, Palos Verdes, California 90274. Make sure you include information about the size disk you need. □



TIPS & TOOLS

J O Y C E S I D E S

You can't nest FOR loops in batch files, as useful as this might be. A line entered in a batch file like the following won't work:

```
FOR %%t IN (C: \ TP6 D: \ TP) DO
FOR %%p IN (*.PAS) DO DIR
%%t %%p
```

Try it, and DOS will inform you curtly that FOR loops can't be nested. So what can you do when you want one command to apply to several disks or directories? You can fake it by employing COMMAND/C. (So you thought DOS 3.3 made COMMAND/C obsolete?)

The following is a tiny batch file I use to copy all my Pascal files from my D drive for *Turbo Pascal* version 5, and my C drive with the experimental version 6 files, all to a high-capacity disk in drive A.

```
FOR %%A IN (D: \ TP C: \ TP6)
DO COMMAND/C FOR %%B
IN (%%A \ *.PAS) DO copy
%%B A:
```

This horrifyingly convoluted program shows the best and the worst of the batch-file language. The best because it can do the job we want it to. The worst because doing it's unaesthetic!

The %%A stands in for the D: \ TP directory and then the C: \ TP6 directory. The FOR following the COMMAND/C is executed once for each directory in that first set of parentheses; there could be other directories listed as long as the entire line didn't exceed 128 characters. The COMMAND/C executes another copy of COMMAND.COM, so the second FOR statement has no idea that it's being executed from within another FOR statement.

*Tom Campbell
Irvine, CA*

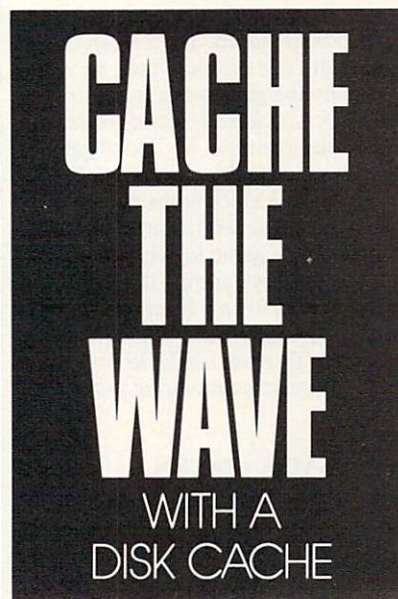
Windows 3.0 Switch-a-roo

The colorful icon of a *Windows* 3.0 application is probably the first thing a new *Windows* user notices. And it's neat that once a *Windows* application

is installed in Program Manager, the icon for that program is automatically placed in the active window.

But did you know that many *Windows* programs give you a choice of icons? You can change the *Windows* 3.0 icons with a few mouse clicks. For example, *Corel Draw* and *Crosstalk for Windows* come equipped with two optional icons—the default icon that most of us use and a second icon that's there, if you know how to get to it.

In Program Manager, locate the



program that you'd like to check for alternate icons, *Corel Draw*, in my example. Click on the program once (don't run the program).

In Program Manager's menu, select the File menu and then the Properties option. You'll see the window Program Item Properties. Click on the Change Icon button.

When the Select Icon window appears, click on the View Next button, and cycle through the icons that the program contains. Not every *Windows* application has multiple icons. For instance, *Micrografx Designer* only has one icon, but *Corel Draw*,

Tetris, and *Crosstalk for Windows* have two icons each. Experiment with your *Windows* programs to find which ones have extra icons.

*Mark Minasi
Arlington, VA*

Tipped Off

Are you thinking of turning that extra junk room into a computer room or an office? You may find that there isn't enough desk space for your CPU unit, monitor, keyboard, mouse pad, and so on among all the other paraphernalia in the room.

You could solve the space problem by turning your desktop computer into a tower unit. Of course, to do this, you should have enough room on the floor to place the unit. You should also make sure the system will get enough ventilation. It shouldn't be squeezed into a place where the fan can't circulate the air to cool the unit.

First, go to a computer accessory store and buy a stand specifically for converting units into tower systems. Then back up your hard drive (just in case), and install the unit in the stand.

Some computer dealers advise reformatting a hard drive once a desktop system has been installed as a tower unit. There could be a problem with misalignment of the read/write heads which might render the data on the disk unreadable (hence the reason for backing up your hard drive first). Reformatting the disk corrects any potential problems.

You don't have to perform a destructive format. You can do a low-level format that serves the same purpose as a complete format for aligning the disk drive heads, and it doesn't destroy the data on the disk. Use a program such as Gibson Research's *SpinRite II* to make sure the job is done right.

*Peter Michaels
San Francisco, CA*

Speed Up dBase

If your *dBase* databases are growing large, you can speed up processing by using the SET ODOMETER com-



TIPS & TOOLS

mand. When you use commands such as COPY, JOIN, COUNT, or SUM, *dBase* keeps you posted on its progress by posting a running counter, or odometer, on the screen as it moves through the records.

This slows processing because *dBase* has to refresh the screen after processing each record. If you use the command SET ODOMETER TO 10, or SET ODOMETER TO 100, the screen will be updated every 10 or 100 records. On large databases, this saves significant amounts of time, yet it still provides you with a progress report so you know *dBase* is still working.

SET ODOMETER TO 0 is similar to SET TALK OFF in that *dBase* does not report on its progress through the database. But unlike SET TALK OFF, SET ODOMETER TO 0 provides a count of the records processed when the task has completed.

*Tony Roberts
Greensboro, NC*

Cache the Wave

The most demanding mechanical activities for a drive are starting up in the morning and moving the head throughout the day. You can relieve the first problem by leaving your machine on all the time and avoid the second with a cache program. A disk cache minimizes the number of movements that the read/write heads in your disk drive must perform. In the process, it also helps speed up the system's activities.

Disk caches transfer data from memory to memory, which is much faster than disk-to-memory transfers. Disk drives respond to read and write requests hundreds of thousands of times more slowly than RAM memory responds to read and write requests. Disk caches let your system use the disk less and RAM more.

Part of COMMAND.COM is reread after you exit any large program. This means disk access. If you've ever noticed a quick flash of the hard disk light when you exit a program, you've seen the COMMAND.COM reload. Rather than firing up the disk drive and moving the head to reread COMMAND.COM, a disk cache files a copy of COMMAND.COM in memory and reads the file from the copy instead of from the COMMAND.COM disk file.

That's the idea of a cache. It's a

memory-resident program that watches disk reads and writes and makes copies of disk activity in a section of memory (usually extended or expanded memory, since a cache of one to two megabytes is preferable).

Disk caches relieve your disk drive of work, and this might save on disk repairs.

SMARTDRV.SYS, shipped with MS-DOS and *Windows*, is a simple cache program that does the job. My favorite cache, however, is Multisoft's *SUPER PC-KWIK* cache, which costs less than \$100. To get a copy of *SUPER PC-KWIK*, call Multisoft at (503) 644-5644.

*Mark Minasi
Arlington, VA*

Time Out

If the clock in your PC occasionally forgets the time, the battery might need to be replaced. Then again, it might not. The problem may be caused by the games you're playing.

Jack Nicklaus' Greatest Holes of Golf is one example. My Northgate AT forgets what time it is when I play the game. The clock stops during gameplay; however, it starts up again as soon as the game is over. I handle this problem by running the game as a menu choice, from a batch file running under *Automenu*. You can run the batch file from the DOS prompt if you're not using a menuing system.

```
D:
CD \GAMES \JACKN
GOLF E
C:
TIME
MENU
```

The batch file is called NICK.BAT, and you should enter the command NICK to run the batch file. You should also include the correct drive IDs and subdirectory names to fit your system.

*James Condon
Gloversville, NY*

Exporting Data the Easy Way

Almost everyone knows how to use OPEN and PRINT# in *QuickBASIC*. But you might not know that there's an embarrassingly simple way to create comma-delimited ASCII files. Just about every database program and spreadsheet in the world can import

ASCII files. It's the universal format.

The WRITE # statement is a quick back door to the most popular data-management programs in the world, from *Lotus 1-2-3* to *dBase* to *Quattro Pro*.

Try running this program; it asks you for information similar to what you might put in a customer list. To stop it, simply press Enter instead of typing in the last name.

```
OPEN "DATA.TXT" FOR
OUTPUT AS #1
DO
LINE INPUT "Name: ";
NAME$
IF Name$ = " " THEN EXIT
DO
LINE INPUT "Address: ";
ADDRESS$
LINE INPUT "City: "; CITY$
LINE INPUT "State: ";
STATES$
LINE INPUT "ZIP: "; ZIP$
WRITE #1, NAME$, ADDRESS$,
CITY$,STATES$,ZIP$
LOOP
CLOSE #1
```

The output looks something like this:

```
"Tom Campbell", "8 Hazelnut",
"Irvine", "CA", "92714"
"John Seagull", "1 McCartney
Ave.", "Hollywood",
"CA", "97114"
```

Note that all the data, numeric or not, is surrounded by quotation marks when written to the file with WRITE #. Items separated by semicolons in the WRITE # statement are separated by commas in the record. Each record ends with a carriage return or linefeed. The most difficult thing to remember about using WRITE # is never, under any circumstances, to let anyone know how easy this feature was to program.

*Tom Campbell
Irvine, CA*

If you have an interesting tip that you think would help other PC users, send it along with your name, address, and Social Security number to COMPUTE's Tips & Tools, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. For each tip we publish, we'll pay you \$25-\$50 and send you a COMPUTE's PC LCD clock radio while supplies last. □



PROGRAMMING POWER

T O M C A M P B E L L

Computer files come in different flavors. Some have a predictable structure—like text files or files of fixed-length records—but most are unpredictable. This month we'll learn how to read files with an unknown composition (notably COM, EXE, and OBJ files), and we'll see how to pick out the text strings hiding inside.

But before we begin, let's step back and look at what files actually are. A file is anything stored on disk. This includes what you normally think of as data files, such as the WK2 files from a spreadsheet, DOC files from a word processor, or DBF files from a database. But it also includes DOS, contained in hidden files on your boot disk; COMMAND.COM, your command line interpreter; and programs like DBASE.EXE, WP.EXE, and XCOPY.EXE.

It's no accident that DOS stands for *Disk Operating System*. Many people become confused when they discover that the operating system itself is usually nothing more than a file. But because they are files, DOS and executable programs can be read like any other data files.

That's why this month's program, *SNOOP*, can read through any kind of file looking for messages in ASCII text format. To use *SNOOP*, just enter SNOOP and a filename at the command line. Any messages the file contains will be written on the screen. Try entering these commands (supplying your system's path to each file):

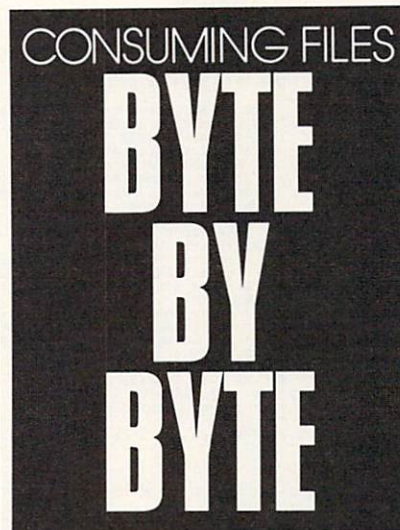
```
SNOOP QB.EXE
SNOOP COMMAND.COM
SNOOP MODE.COM
```

Many have claimed that MS-DOS is arbitrary, illogical, and difficult to learn; and that may be true of some of its aspects. But file handling is one of the exceptions. To appreciate how logically DOS handles files, consider the peculiar foibles of the early Macintosh operating system.

Apple tried to avoid the term *file*

when the Macintosh was introduced. Instead, programs (executable files) were called *applications*, and the files they created were known as *documents*.

It was a noble but misguided idea. Applying the term *document* to a 200-layer CAD drawing or a database containing 10,000 employees didn't make the notion of files more concrete but only added another confusing level of abstraction.



In short, a file is anything stored on disk, and the steps you take in using a disk file are analogous to the steps you would take with a manila folder. You must

1. Open the file.
2. Use the file (read it or write to it).
3. Close the file.

You deal with Manila folders the same way. You can't take anything out of a file before you open it, and you'll run into problems if you don't close the file and put it away when you're finished.

The next larger unit of the operating system is the subdirectory, roughly equivalent to a filing cabinet. DOS's

earliest version left out subdirectories, and even after a tree subdirectory system was featured, many programs were unable to make use of it.

In *QuickBASIC*, a formal syntax chart of the OPEN command looks scary:

```
OPEN @file$ [FOR mode] [ACCESS
access] [lock] AS [#]filename%
[LEN=reclen%]
```

Indeed, the options are almost overwhelming, but we'll pay attention only to the configuration of this month's OPEN statements. The first courtesy owed a user by a program that uses existing files (as opposed to one that creates files) is to ensure that the requested file exists and to display a suitable error message if it doesn't.

QuickBASIC, like *Turbo Pascal*, doesn't have a particularly attractive means of doing that. You have to lie in wait with ON ERROR, open a file for sequential access (that is, as if it were a text file), input only, and wait for runtime error 53, which will occur when a file with that name doesn't exist. I couldn't find runtime errors (which is what ON ERROR traps) listed in the *QuickBASIC* documentation, so this information comes to you by way of experimentation. Other modes, such as BINARY and RANDOM, create a file if the file doesn't already exist. Then you must close the file and start your program—in this case, by immediately reopening the file in binary mode.

The first OPEN in the program, the dummy one whose only purpose in life is to see if the requested file is available, looks like this:

```
OPEN COMMAND$ FOR INPUT
AS #1 ' Make sure the file exists.
```

This means *Open the file named on the command line for sequential access, and use file descriptor number 1*. Note that the word *sequential* doesn't appear anywhere. This is because of the history of file management. BASIC originally could open only text



PROGRAMMING POWER

files, and other modes were tacked onto the syntax later. File handling is one of the features that seem to be completely different on each implementation of BASIC on minis and mainframes and among dialects in those environments.

As mentioned, opening a nonexistent file triggers a branch to the user's error-handling routine at runtime; this month's ON ERROR has a hard-coded check for error 53 because that's *QuickBASIC*'s internal error code for *File not found*. If the file exists, execution continues. We close the file immediately (because it's been opened in the wrong mode) and reopen it in the next statement:

OPEN COMMANDS FOR BINARY AS #1

Binary access means the file is treated as a row of bytes on the disk, which the program is responsible for managing. In a text file, INPUT # searches for delimiters such as carriage returns instead of reading a certain number of bytes. So if you wanted to look for text strings in a file such as COMMAND.COM or WP.EXE, all kinds of nasty errors could happen because you have no guarantee that a delimiter will appear *anywhere* in a nontext file.

The best way to deal with a file of bytes is to create a data type that contains only one byte. You could use TYPE, but the easiest alternative here is to create an anonymous data type and immediately allocate space for it, a trick that C has had for years, Pascal still doesn't have, and *QuickBASIC* has acquired recently.

DIM NextByte AS STRING * 1

This statement creates a variable called NextByte that holds just one byte of data. We retrieve a byte from the input file this way:

GET #1, NextByte: ' Get the next character from the input file.

The empty parameter between #1 and NextByte is the record-length parameter used in RANDOM mode. It's not necessary here, but it must be retained as a placeholder. In the program the GET statement is placed in a normal WHILE NOT EOF/WEND loop. □

```
' SNOOP.BAS -- Finds messages in a file.
' Format: SNOOP [d:]pathfilename[.ext]
' Forward declarations--these routines are used in the program.
DECLARE SUB HandleError ()
DECLARE FUNCTION IsAlpha! (NextByte$)
DECLARE FUNCTION IsPrint# (NextByte$)
DECLARE SUB Pause ()
ON ERROR GOTO HandleError

' This creates a data type with no name. It lets us read one byte
' at a time from the file.
DIM NextByte AS STRING * 1
CONST MinStr = 5 ' Minimum # of printable characters that form a word.
CONST True = -1, False = NOT True ' Constants for clarity.
DEFINT A-Z ' All variables are integers unless a suffix character is used.
NextByteASC = 0 ' Do a CHR on this only once, to speed things up.
Position = 0 ' Tracks byte offset into the file.
StrSize = 0 ' # of chars in printable string so far.
Word$ = "" ' Initialize the word collect so far.

OPEN COMMAND$ FOR INPUT AS #1 ' Make sure the file exists.
CLOSE #1 ' It does. Close it.
' READ necessary because RANDOM mode defaults to read-write.
OPEN COMMAND$ FOR BINARY AS #1
PRINT "Processing file "; COMMAND$
PRINT "Press (Esc) to quit or (Space) to pause."
PRINT
WHILE NOT EOF(1) ' Continue until file 1, the input, has been read through.
  GET #1, NextByte: ' Get the next character from the input file.
  Pause ' The user may pause output or quit now.
  NextByteASC = ASC(NextByte)
  ' If it's extended ASCII, reset the string and exit the loop.
  IF NextByteASC AND 128 THEN
    StrSize = 0
  ELSE
    ' If it's an end-of-string character,
    IF (NextByte = CHR$(13)) OR (NextByte = CHR$(0)) OR (NextByte = '$') THEN
      ' and the accumulated string is long enough,
      IF StrSize >= MinStr THEN
        ' success! Print the string!
        PRINT Word$
        ' And start back at square one by reinitializing state variables.
        StrSize = 0: Word$ = ""
      ELSE
        ' EOS found, but string was too short. Reset state variables.
        StrSize = 0: Word$ = ""
      END IF ' StrSize >= MinStr
    ELSE
      ' Not an EOS character. See if it's printable.
      ' If there's no string yet,
      IF StrSize = 0 THEN
        ' and if this is a letter,
        IF IsAlpha(NextByte$) THEN
          ' then assume the first letter of a valid string has been found.
          StrSize = 1: Word$ = NextByte
        END IF ' IsAlpha
      ELSE
        ' This isn't the first letter of the word.
        IF IsPrint#(NextByte$) THEN
          ' Another printable char has been found, so add it to the
          ' uninterrupted string of printable chars.
          StrSize = StrSize + 1: Word$ = Word$ + NextByte
        ELSE
          ' A string of printable chars has been interrupted by an
          ' unprintable char. This makes the whole string invalid,
          ' and we must start back at square one.
          StrSize = 0: Word$ = ""
        END IF
      END IF ' IF StrSize = 0
    END IF ' IF NextByte = Chr$(13)
  END IF ' IF NextByteASC AND 128
WEND
CLOSE #1 ' Return the file's resources to DOS.
END

' Display this if a runtime error occurs.
HandleError:
IF ERR = 53 THEN ' Handle the most common case.
  PRINT "File "; COMMAND$; " doesn't exist."
ELSE
  PRINT "Runtime error #"; ERR
END IF
END

DEFSNG A-Z
FUNCTION IsAlpha (NextByte$) ' Returns True if the character NextByte$
  SELECT CASE NextByte$ ' is a letter.
    CASE "A" TO "Z" ' If it's in the range of uppercase letters,
      IsAlpha = True ' return a nonzero value.
    CASE "a" TO "z" ' If it's in the range of lowercase
      IsAlpha = True ' letters, return a nonzero value (True).
    CASE ELSE ' If it's not in the prescribed range,
      IsAlpha = False ' the function call fails.
  END SELECT
END FUNCTION

FUNCTION IsPrint# (NextByte$) ' Returns a nonzero value (True) if the
  SELECT CASE NextByte$ ' character NextByte$ is printable.
    CASE " " TO "*" ' Printable means not a control character
      IsPrint# = True ' or not an extended ASCII character.
    CASE ELSE ' If it's not printable, return a zero
      IsPrint# = False ' value (False).
  END SELECT
END FUNCTION

SUB Pause
  GetKey$ = INKEYS ' Check for a keystroke. If it's the space
  IF GetKey$ = CHR$(27) THEN ' bar, wait for another keystroke. If it's
    PRINT "Interrupted" ' the (Esc) key, exit the program.
    CLOSE #1 ' (Esc) has been pressed. Say so.
    RETURN ' Return file resources to DOS.
  END ' Return to DOS.
ELSE ' (Space) was pressed.
  IF GetKey$ = " " THEN ' If any other key, ignore.
    PRINT "Pausing..." ' Print status message.
    DO ' Wait for any other keystroke.
      LOOP WHILE INKEYS = "" ' This returns to DOS if a key hasn't been
    PRINT "Continuing" ' pressed. Continues here when a key has
  END IF ' been pressed.
END IF
END SUB
```




POINT & CLICK

C L I F T O N K A R N E S

What's the hottest programming tool to hit the PC since the original *Turbo Pascal*? Without a doubt, it's Asymetrix's *ToolBook for Windows* (Asymetrix, 110 110th Avenue NE, Suite 717, Bellevue, Washington 98004; 206-462-0501; \$395).

Like *Windows* itself, *ToolBook* is an object-oriented, event-driven environment. This means that a program waits for events from the user and takes action based on the nature of these events. The user is in control, and the program is passive.

In *ToolBook*, this environment has two main elements: graphics objects and object handlers. Almost everything you see on the screen is an object, and a program communicates with these objects by sending messages to them whenever an event involving the object occurs. Objects, in turn, act on these events by executing handlers written in *ToolBook*'s OpenScript programming language.

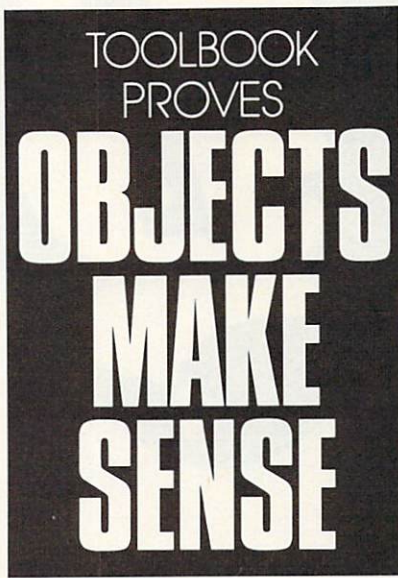
As an example, let's look at the familiar OK button. This button is an object, and when you click on it, this event causes the operating environment to send a message to the button telling it that it has been clicked. If you want to do something when this event occurs, you attach a message handler to the button. In the case of an OK button, the message handler might dismiss a dialog box.

That's the essence of *ToolBook* programming—objects and handlers, interacting by way of event-caused messages. *ToolBook* takes care of notifying you of events and sending messages. You have to create the objects for these events and attach handlers.

Creating objects using *ToolBook*'s design tools is a pleasure. The program offers a high-quality set of object-based drawing tools, including Bezier curves, which rival those found in many dedicated drawing programs. Add to that support for millions of colors, most in dithered patterns, and you have an interface construction set that most programmers only dream about.

To help with interface design, *ToolBook* offers two basic groups of predefined objects: buttons and fields. (A third type of object, a hotword, is really a special type of button whose object is a word.)

Standard buttons come in a variety of types including push buttons, radio buttons, and check-box buttons. Styles are rectangular, rounded-corners, shadowed, and transparent.



Fields are used to display text or other objects and have as much flexibility as buttons. You can have scrolling, bordered, transparent, and record fields; record fields are just one example of *ToolBook*'s special support for database construction.

If these objects aren't enough, you can create your own, and you can combine any number of objects into a group. And all objects can be moved, resized, and recolored at any time.

Behind the objects that make up a *Toolbook* program's interface are handlers written in OpenScript. As a programming language, it is complete, powerful, and very English-like. You can do almost anything in it that you can do in C or Pascal, but since OpenScript is interpreted, it can be slower.

As far as large-scale organization goes, *ToolBook* was inspired, at least in part, by the Macintosh-based *HyperCard* and its HyperTalk programming language. *ToolBook* uses a book metaphor in much the same way that *HyperCard* uses the stack.

Programs in *ToolBook* consist of one or more pages in a book. A page, like a book itself, is an object and can be used to represent almost anything—a record in a database, the main window of a word processor, a dialog box, or a page of text in a hyperlinked document.

ToolBook is so powerful and deep that it's hard to describe. I've been working with it for months, and I don't feel like I've really tapped its full potential. My only complaint with *ToolBook* is its speed. Although it does some things extremely fast—like putting graphics on the screen and sorting—no program can ever be too fast or too small. With careful design and coding, however, a *ToolBook* program can be made fairly speedy.

If you decide to take the *ToolBook* plunge, there are two additional packages you should know about. The first is Asymetrix's *Author's Resource Kit*, or *ARK* (\$450). *ARK* is intended for developers, and although it comes with a very useful utility, *BookLook*, its big draw is its license to distribute the *ToolBook* runtime. If you plan to market your *ToolBook* applications, you'll need *ARK*.

The second package is *R-Spy* (Syndetic Management Systems, 15530 SE 184th Street, Renton, Washington 98058; 206-228-4026; \$125). *R-Spy* is a programmer's utility that gives you instant access to any *ToolBook* script or object. With *R-Spy*, you can simply click the right mouse button on any *ToolBook* object (this hot click can be redefined), and you'll see a dialog box that lets you edit the script of the target, the book, the current page, or the page's background. You can also change the target and edit or view its properties. If you're serious about programming in *ToolBook*, *R-Spy* is essential. □



Iot long ago, the word *laser* brought to mind sophisticated weaponry, radio transmissions bouncing off the moon, microsurgery, and other futuristic images. Who would've thought that by 1990 literally millions of people would have laser devices sitting on their desks?

Like every other facet of the computer world, printing has evolved substantially. We used to be amazed at



the speed of daisywheel printers. They were little more than computer-driven typewriters, but at speeds ranging around 200 words per minute (with no errors), they left human typists in the dust.

Dot-matrix printers seemed wonderful devices—they printed fast and were capable of producing graphics. Later, near-letter-quality (NLQ) printing allowed dot-matrix printers to be used for important business letters. NLQ involved nothing more than teaching the printer to put more ink in a smaller space, or increasing the reso-

lution—the dots per inch (dpi).

Increasing print quality slowed a dot-matrix printer significantly, however—often to half its draft-mode speed. Printer technology had come a long way, but it was far from perfect. It wasn't until laser printers hit the market that computer hardcopy output reached exceptional quality.

Laser Technology

Laser printers use a technology similar to that of copy machines: The paper is electrically charged as it passes through the device so that a fine black powder called *toner* will leap from a device known as a *printer drum* to the paper in the desired patterns. The difference is in the way the image is electronically etched on the printer drum.

BY **W**iLlIam **H**ARREL



Copiers generally feed the image of the page being copied to the printer drum through simple optics. Laser printers use a laser beam to transmit a page in computer memory to the drum.

A big difference between laser printers and other printing devices is that the entire page is programmed, or *rasterized*, in memory before the paper begins its journey through the printer. Dot-matrix and impact printers, on the other hand, program as they print, printing a little of the page at a time.

The benefits of laser printers are many, one of the most important being speed. In draft mode, a good 24-pin dot-matrix will print at somewhere between 300 and 400 characters per second (cps), and considerably slower if it's in NLQ mode. Laser printer speed is measured, instead, by pages per minute (ppm). Many of today's laser printers will churn out eight ppm, and a few will do ten. Soon we'll see these desktop laser printer speeds double. On a basis of 300 words per page averaging five characters per word at eight ppm, a laser printer will approach 200 cps—about the speed of a dot-matrix printer—and all of it letter quality.

Another advantage of laser technology is sound—or, rather, the lack of it. Dot-matrix and impact printers are annoyingly noisy. If you have several printers going at once, conversation is almost impossible, to say nothing of phone calls. All you hear from a laser printer is its fan and, when printing, the low hum of the printer engine as it carries the paper through.

The most significant difference between laser and other printers is the resolution of the output. The higher the resolution, the cleaner the output. Most of today's laser printers print at 300 dpi, though there are several higher-resolution devices on the market, some of them printing as high as 1000 dpi. Most dot-matrix printers produce somewhere around 75 dpi. Laser printers have allowed computer output to move into the realm of typesetting.

Better resolution means better text and graphics—much better text and graphics. Depending on the instructions from the software driving the printer, graphic lines are smooth, gray shading is evenly dispersed, and text (especially in larger fonts) doesn't have that blocky, stairstep appearance associated with computer output.

A Question of Character

It's difficult to talk about laser printers without using some fairly technical typesetting terms like *typeface*, *point size*, and so on. Let's pause here a moment for a few definitions.

A typeface, such as Courier, is a family of fonts. Typefaces usually include four fonts: normal, italic, bold, and bold italic. Fonts come in point sizes (abbreviated as pts—there are 72 points per inch) from 2 points on up. Therefore, you would be able to visualize a 12-point italic Courier as being like the output from a standard typewriter, 1/6-inch high, and slightly oblique.

Another pair of terms used in defining fonts are *proportional* and *fixed spacing* (or *monospacing*). Fixed-space fonts—if you are currently using a dot-matrix or impact printer—are probably what you're used to. Courier is a fixed-space font. The individual characters in Courier occupy the same amount of space on a line. An *I* is given the same amount of space as a *G*, for example.

Proportional fonts apportion line space to each character according to its width, and pairs of characters are kerned, which means that they're spaced in relationship to each other to give them a more pleasing appearance. For example, a capital *T* and a lowercase *o* can be squeezed closer together than their individual widths because the *o* can be moved slightly underneath the crossbar of the *T*.

Inside Story

Not only laser printers, but all printers, including typewriters, come with fonts built in. These are called *resident fonts*. Typewriters and impact printers have wheels or balls you can snap in and out to change type styles. An advantage of laser printers is their ability to accept hundreds of different fonts in all kinds of point sizes.

There are a number of methods to get fonts into a laser printer; the two most common ways are by using soft fonts and cartridges.

Soft fonts are software that is sent to the printer from your computer through a process called *downloading*, which is a common term for sending data from one device to another. Fonts can be downloaded into a printer's memory as needed for a specific print job (called *temporary soft fonts*), or they can be downloaded and kept in the printer's memory until the printer is shut off (called *permanent soft fonts*).

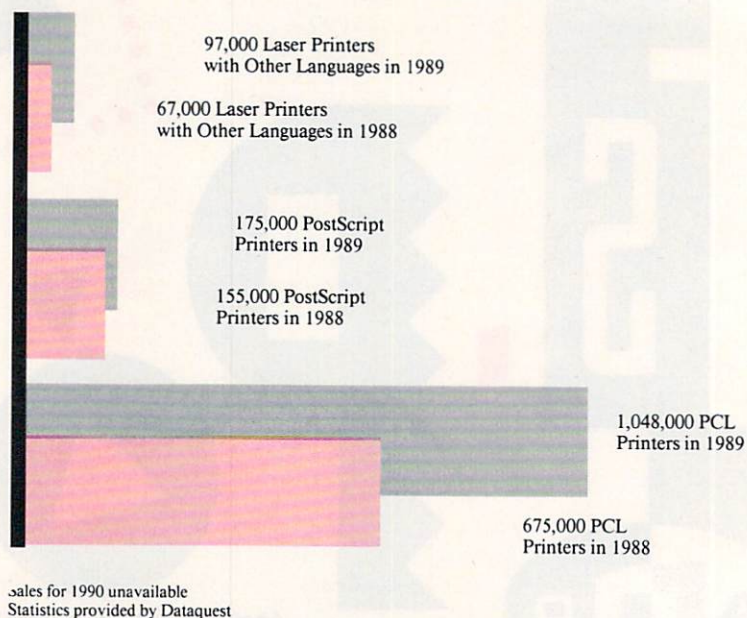
Although there are two different downloading techniques, that doesn't mean that you need two different kinds of fonts. All soft fonts are capable of being either temporary or permanent. The downloading technique is usually determined by the word processor or desktop publishing software.

Cartridge fonts come in cartridges that plug into special slots in the laser printer. Once the cartridge is plugged in and activated, the fonts in the cartridge become resident. There are literally hundreds of different font cartridges available, with a multitude of font combinations. The major drawback to most of them is that, unlike soft fonts, you are usually locked into a limited selection of fonts and point sizes. But cartridges are much easier to install and use than soft fonts.



High-resolution output like this is standard with 1250-dpi typesetters. The same graphic could be printed on a laser printer, with significant degradation in smoothness. (Graphic used with permission from Dynamic Graphics, Peoria, Illinois.)

PCL Has the Lion's Share of Laser Printer Sales



The Great Language Debate

A laser printer uses a page-description language (PDL) to determine where to put toner on paper. Although there are several PDLs out there, two are at the forefront: Adobe Systems' PostScript and Hewlett-Packard's Printer Control Language (PCL). Which language is better? The best answer is that it depends on your application.

Among other major differences between the two types of printers is price. A PostScript printer can cost thousands more than a PCL printer; however, the prices of both kinds of printers have dropped considerably over the past year, making the decision to go with PostScript less onerous.

PostScript printers are the devices of choice for most high-end desktop publishers. The reasons are many. In several ways, PostScript is a more flexible language than PCL.

PCL printers use a convention for printing fonts called *bitmap*. Bitmap fonts are produced as patterns of dots that are fixed in position like the elements of a rubber stamp. Every character must have its own bitmap.

PostScript fonts, on the other hand, are drawn based on instructions that reside in memory or are downloaded from your computer. Fonts created from instructions rather than from bitmaps are called *outline fonts*. Since each character is drawn separately, it's easy to manipulate, stretch, or treat text with any number of other special effects, such as reversing (mirroring), skewing, outlining, and so on.

PostScript fonts can be rotated to any degree or printed with different fills. The only limitation is your imagination.

Another font advantage of PostScript is that most devices using this language come with 35 scalable fonts, meaning that all 35 can be sized in increments of 0.5 points, from 2 points to more than 700 points (depending primarily on your software). Any outline soft font downloaded to a PostScript printer can also be scaled accordingly.

Although the latest PCL version (Version V, used in the LaserJet Series III) does contain some limited font scaling and a few other font special effects capabilities, most PCL printers must have a separate font in the printer for each font attribute and point size. In other words, to use Times 10 point in normal, bold, italic, and bold italic, you must download four files to the printer. If you also want to use these four Times fonts in a 12-point size, you must download four more files.

Font files must be stored either on your hard disk or on floppies. They take up an enormous amount of disk space (to store three typefaces in various point sizes ranging from 6 point to 36 point in all four fonts can take ten megabytes or more).

Also, soft fonts require huge amounts of printer memory. This drastically limits the number of fonts and the size of graphics you can use per document page. Another PCL disadvantage is that, depending on the speed of your computer, it can take a



This graphic was created in a large size at low resolution and then reduced in size to increase the number of dots per inch. (Graphic used with permission from Dynamic Graphics, Peoria, Illinois.)

long time to download fonts. Larger point sizes can take several minutes.

Even though PCL font cartridges follow the same convention—fonts must be present in specific attributes and point sizes—they can eliminate some of the inconvenience. As mentioned, most cartridges are limited. However, a number of megafont cartridges have recently become available. Computer Peripherals, for example, makes a cartridge called SuperSet+ that contains over 400 fonts. And several companies make PostScript emulation cartridges that give certain PCL printers all the font features of PostScript. PostScript printers, in contrast, have no need for cartridges. Their outline fonts use significantly less disk or printer storage.

Another PostScript advantage is greater graphics control. Since PostScript *draws* its lines and arches (rather than bitmapping them), the smoothness of graphic elements isn't dependent on the quality of the information sent from the computer (as it would be with a bitmapped language like PCL). Instead, it's dependent on the highest resolution of the printer. Any PostScript printer will provide output at the limits of its resolution, whether that is the standard 300 dpi of desktop laser printers or the far higher resolution of typesetting machines. PostScript printers are capable of printing Encapsulated PostScript (EPS) graphics, which can contain in-

tricate patterns and fills unavailable in PCL.

Desktop publishers utilize PostScript laser 300-dpi output to create drafts of documents that require higher resolution typesetting. After all the revisions have been made, the document is then played out on Allied Linotype's Linotronic typesetters at 1270 dpi or higher for excellent quality. All you have to do is take your disk to the local graphics service bureau.

The question of whether you need PostScript or PCL is not the only consideration.

PCL will drive a few typesetting machines, but so far this type of output hasn't caught on. You could be hard-pressed to find a service bureau that can typeset from PCL files.

PostScript is not without its disadvantages. As mentioned, the price of PostScript printers has always been significantly higher than that of PCL printers. Laser printer prices have dropped dramatically over the past year or so. However, while the price of low-end PostScript printers has come down by 40 percent (to around \$3,000), the price of the least-expensive PCL printers has dropped by 50

percent (to less than \$1,000). The gap narrows almost to insignificance, however, with the introduction of a \$995 PostScript printer called the JetScript by the Printer Works (3482 Arden Road, Hayward, California 94545; 415-887-6116). One reason for this printer's low cost is that it uses a refurbished printer engine. Watch for a review of this machine in an upcoming issue of *COMPUTE*.

PostScript is also notoriously slow. Waiting for intricate or bitmapped graphics to print on a PostScript device can be excruciating. However, relatively new technology has sped PostScript by as much as a factor of 5. Most documents will print with little or no delay.

Before You Buy

The question of whether you need PostScript or PCL is not the only consideration in buying a laser printer. Some printers don't use either language, which means you could have trouble using them with some of your software. Canon, for example, makes several printers that use a language called Canon Printer System Language (CaPSL). These printers have nine scalable fonts and can be upgraded to almost the same standards as PostScript. However, at present not all software programs support Canon printers. There are also printers, such as several NEC lasers, that support both PCL and PostScript.

There are many, many laser printer manufacturers and distributors out there today, and you'll find printers with all kinds of configurations and a wide range of prices. Printer RAM, for example, is an important feature. Many printers are shipped with only 512K of RAM, which is barely enough to download a couple of fonts or to print about half of a page of graphics. PostScript printers with two or three megabytes of RAM can store additional data while printing a page, freeing up your computer to start the next page sooner.

Printer RAM can almost always be upgraded, but at a cost somewhat higher than upgrading your computer's RAM.

PCL printers handle memory a little differently from PostScript printers, but a good rule of thumb is that you'll need a 1MB minimum for full-page graphics and more than 1MB if you want to use many soft fonts and intricate graphics on the same page. Printer RAM of 3MB is almost impossible to overload, unless you're doing high-end desktop publishing.

Laser printers also come with different font configurations. Some, such as the HP LaserJet Series IIP, come with only a few fixed-space fonts, and

a few PostScript printers have well over the standard 35 fonts resident. Not all PostScript printers use true Adobe PostScript, which could mean that Adobe Type 1 (the one used by typesetters) downloadable fonts are not supported.

Paper-handling options are also important. Some printers cannot handle paper sizes smaller than 8½ × 11 inches, and many will not print envelopes. Some have paper trays that hold only 100 sheets of paper, while others have more than one 250-sheet paper tray, and many printers can be

equipped with much larger paper trays. Still other printers, such as the HP LaserJet Series IID, support duplex printing—printing on both sides of the paper.

These configuration questions should all be considered before you go shopping for a laser printer. Sometimes one or two hundred dollars can make a world of difference in the printer you finally set on your desk. There are many good laser printers available and some that are not so good. A safe plan would be to purchase a product that can be upgraded

later; you never know where your computer application might take you.

PostScript Alternatives

Buying a PCL printer for under \$1,000 is for many computer users the only economically feasible means for obtaining a laser printer. Many PCL users find themselves wishing later they had the power of PostScript. To-

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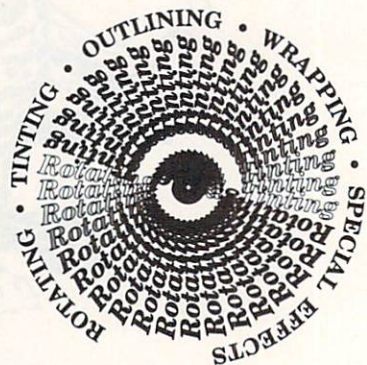
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FILLS

Rotating, tinting, wrapping, and blending—all seen in this example—are only a sample of the typographic tricks you can play with PostScript. (Graphic used with permission from The WRITE Desktop Publisher, Ventura, California.)

day there are a number of PostScript alternatives for most PCL printers—everything from low-cost software, like GoScript and Freedom of Press, to expensive boards and other not-so-expensive hardware.

Probably the most convenient and practical solution is a PostScript emulation cartridge. PostScript cartridges work the same as font cartridges: Just plug them in and tell your software to use PostScript. These cartridges endow PCL printers with all 35 scalable fonts and all other PostScript functions at a fraction of the cost. There are several available, and they range from \$300 to \$700. Vendors include Computer Peripherals, Adobe Systems, Pacific Data, and Hewlett-Packard.

The main thing to remember when buying a PostScript cartridge is that they all require more than the 512K of RAM that comes standard with some PCL printers. Currently, most require a minimum of 2.5MB of RAM, but Computer Peripheral's Jet-Page requires a mere 1.5MB. □



ONLINE

G E O R G E C A M P B E L L

Health is a key issue for all of us. Regular checkups and careful living are essential to maintain ourselves. Sometimes, however, we have questions about health issues and need answers. Where can we turn?

Books are one solution, but popular medical guides often don't offer enough information, and they aren't interactive. For PC users with modems, there's a better way to get answers about health. A wealth of online resources are available on any health issue.

More and more users are signing up to take advantage of GENie's flat-rate Star Services. Among those services is GENie's Medical Roundtable. At no extra charge, you can use the bulletin board area of this roundtable to get the answers you need.

To access this area, just type *medical* at any GENie prompt. Once you're in the roundtable, choose the Medical Bulletin Board option on the menu. The bulletin board is divided into 15 categories, ranging from Clinical Consulting and AIDS to Medical Ethics and Ask the Doctor. Within each of these categories, you'll find hundreds of topics of discussion. You can read messages or ask your own questions.

While you can't expect to use this service as a substitute for regular medical care, it's a terrific place to go for any medical questions you might have. If you ask a question in one of the bulletin board areas, you can be sure of a quick and accurate response, usually from a physician or other health professional.

Just browsing through the topic list is fascinating. You'll find discussions on topics ranging from cancer and chiropractors to x-ray safety and even mundane topics like foot odor.

Getting all of that information costs no more than using any GENie Star Service. However, you can also access the Medical Roundtable's file library at GENie's normal hourly rates. Here you'll find files ranging from collections of medical papers to

medicine-related programs for your PC.

If you're a GENie user, take a few minutes the next time you're online to explore the Medical Roundtable. You'll be glad you did.

GENie offers other medical services, most at an additional cost. To get a list of them, give the INDEX command at any GENie prompt; then use *medicine* as a search keyword.

ANSWERS TO QUESTIONS ABOUT MEDICINE AND HEALTH

While CompuServe doesn't offer the low-cost flat-rate service that makes GENie so popular, its medical forums are extensive. CompuServe users seeking health information should enter the command GO GOODHEALTH at any CompuServe prompt to reach the Health and Fitness forum.

This forum offers a message area where you can ask questions or read discussions on almost any health-related issue. There's a special section for teenagers, a section for drug and alcohol abuse questions, and sections on mental health, nutrition, and many other specialized areas.

As with GENie, hundreds of files and programs are also available for downloading in the software library.

Ranging from transcripts of online conferences to a guide for selecting a therapist, these files are just one more reason to get online.

CompuServe also offers other medicine-related services. There's a forum for diabetics (enter the command GO DIABETES), collections of articles on AIDS (GO AIDSNEWS), a cancer forum (GO CANCER), a forum for people with disabilities (GO DISABILITIES), and a forum on human sexuality (GO HUMAN). Each forum offers the same mix of BBS-like messages, a library of files, and real-time conferences.

Finally, at an extra cost, you can access several databases to search for articles and other information from medical journals. These services, however, are designed for medical professionals, and the costs are prohibitively high.

For a list of forums and health-related areas, give the command GO INDEX at any CompuServe prompt; then search for topics using the word *medicine* as a keyword.

If you don't use commercial online services, you still have plenty of options for online medical information. You'll find that hundreds of BBSs across the country specialize in medical issues. Wherever you live, there's likely to be a medically oriented BBS nearby.

Edward Del Grosso, M.D., operates a BBS that acts as a clearinghouse for the medical BBS community. His BBS, the Black Bag (302-731-1998), is a rich source of information on other online systems as well as being an excellent health-oriented BBS itself. Read Bulletin H, which lists hundreds of active health-oriented systems nationwide—most charge nothing for the service, and many of these are run by physicians.

As you explore the world of online medical information, remember that although these BBSs are a source of information to help you participate in your own health care, none can substitute for the care and advice of your personal physician. □



HARDWARE CLINIC

M A R K M I N A S I

Buying a new PC or upgrading an old one? Want some good advice? Don't buy speed. For the past three years, big corporate buyers and the PC trade rags have been beating the drum about the great new PCs: 25- and 33-MHz 386 and 486 systems have become de rigueur. In fact, one large magazine recently said that 25-MHz 386s were the new entry level system.

Phooey on that, I say. Your best bet is to buy a 16- or 20-MHz 386 or SX, save a pile of money over the "faster" models, and plow that money into faster video and disks. The result will be a faster and cheaper system than that 33-MHz pile driver you wish you could afford. Here's why.

Your computer's speed is mainly determined by four things: the CPU's speed, its memory subsystem, its disk subsystem, and its video subsystem. Making just one of these parts superfast is of no value, since the relative pokiness of the other parts holds back the whole system. In essence, the system is no faster than its slowest part.

Let's look first at the CPU. You definitely want a 386 or 386SX. There's little price difference over a 286, and the 386 family can do so much more than the 286. Don't worry about losing in the long run by buying an SX; software-wise, it works just like a full 386 (a full 386 is officially called a DX). You don't buy 386-family PCs for the speed; you buy for the capabilities, like *Windows* 386-enhanced mode.

What do megahertz cost? Comparing the prices of a few representative bare-bones motherboards, you'll find that a 16-MHz SX motherboard costs \$325 and a 25-MHz DX motherboard costs \$900. How do they compare when doing real work? My advice is to try it. You won't be able to tell the difference for most real-world applications. Why is a 16-MHz SX so similar in apparent speed to a 25-MHz DX? It has to do with the video and the disk. You see, the video is controlled by a video board, which plugs into the PC's bus. The disk is

similarly controlled by the disk controller board, which also plugs into the PC's bus. And there's the rub.

Virtually all PC systems today run their buses at 8 MHz. Spend a zillion dollars on a 33-MHz DX, and it's really only the CPU that runs at 33 MHz. All the expansion boards run at a mere 8 MHz. Every time that 33-MHz computer talks to the video board, the whole system slows down to 8 MHz—ditto for every disk access. Even worse, it probably doesn't run at a full 8 MHz, since the video or disk board may well be running slower than 8 MHz.

BUY A 386SX AND
**SAVE
A
BUNDLE**

That's why it's silly to pour money into fast CPUs while hobbling them with slow peripherals. By spending less on the CPU and more on drives and video, you balance your system. Here's how.

First, get a fast disk. Disk speeds are called access time or seek time, and they are measured in milliseconds (ms), thousandths of seconds. With access time, the smaller, the better. There is no reason why you should get stuck with a disk with an access time slower than 28ms, yet I see clonemeisters *still* dumping 65ms drives on the public! Insist on 28ms or faster.

Get a fast disk controller. Disk controllers are rated by their interleave factor. Most 286 and 386 systems nowadays contain a 1:2 disk controller, a \$90 item. For \$20 more, you can purchase a 1:1 disk controller. Such a controller can read the data off your disk at twice the speed of a 1:2. Why does anyone ship 1:2 systems, when 1:1 costs only a bit more? Until recently, 1:1 controllers were four times the price of 1:2 controllers. As a result, 1:2 controllers became a standard, and old habits die slowly, I guess.

Get a fast video board. Ensure that you have a 16-bit VGA board, rather than the slower 8-bit VGA board. Once, 8-bit boards were half the price of 16-bit boards, but no more. Good 16-bit VGA boards can be had for around \$80.

Your PC's memory subsystem also affects both your PC's upgradability and its speed. You've probably heard the terms *memory cache*, *interleaved memory*, and *wait states*. They all refer to methods of interfacing the CPU to its memory. There's not enough room here to explain all of them—memory would provide enough fodder for several articles. Basically, though, no one today makes inexpensive memory that is fast enough to keep up with today's CPU speeds of 16 MHz and up. So manufacturers hook up fast CPUs with slow memory and build tricks into the system to minimize the effects of this mismatch. Wait states are the worst way to handle the speed mismatch, interleave is a much better way, and cache is the best of all. Cache, unfortunately, also *costs* more—perhaps too much. Don't settle for wait states, however; you want a no wait-state, interleaved-memory system.

So you see that buying the 33-MHz screamer with the 8-bit video, 1:2 interleave, and 48ms hard disk isn't such a good idea after all. I recently bought a 16-MHz SX with 16-bit video, 1:1 interleave, and a 120MB hard drive (28ms access time). Lots of folks think it's a 25-MHz, and heck, who am I to dispel their illusion? □

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INTRODOS

T O N Y R O B E R T S

Redirection, pipes, and filters are tools that let DOS users accomplish seemingly impossible tasks. First, we need a few definitions. Your keyboard is the standard input device, and your monitor is the standard output device. Together, the keyboard and monitor are known as *CON*, or the *console device*. Most DOS input comes from the keyboard, and most DOS output is displayed on the monitor.

Redirection allows DOS to accept input from a source other than the keyboard and to direct output to a destination other than the screen. The greater- and less-than symbols are used to accomplish the redirection, and these symbols point out the direction of the information flow.

For example, `DIR > DIRFILE` redirects the output of the `DIR` command (which displays a directory listing) to a file called `DIRFILE`. That file can then be edited, printed, or treated like any other file.

If `DIRFILE` had already existed, the command would've erased the existing file and created a new one. Redirected information can be appended to the end of an existing file by using two greater-than signs: `DIR >> DIRFILE`. Redirection also can be used to fetch information from a source other than the keyboard. To do this, use a less-than symbol to reverse the direction of the data flow, as in `SORT < INPUT.TXT`. This command sorts the information in the `INPUT.TXT` file and displays it, in alphabetical order, on the screen.

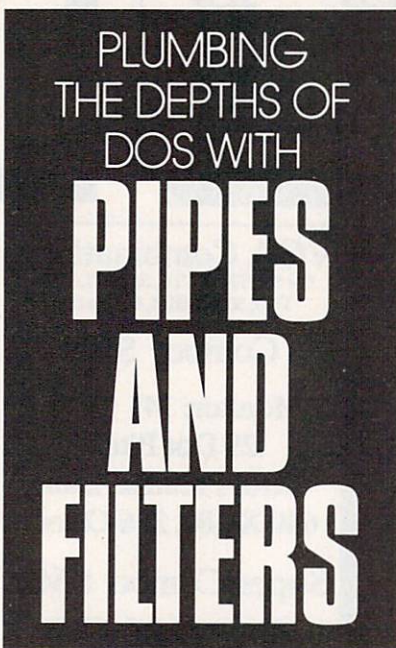
Piping is similar to redirection, but it allows the output of one program to be used as the input for another program. The vertical bar is used as the pipe symbol.

Many computer users steer clear of redirection and piping because the results seem unpredictable. The key to setting up successful commands lies in knowing the distinction between redirection and piping. Redirection links a program with a device or a file; piping connects two programs.

Filters, which modify streams of

data, are often used in conjunction with redirection or piping. DOS comes equipped with three filters—`MORE.COM`, `FIND.EXE`, and `SORT.EXE`. To use these filters, the program files must be on your system's default disk or path.

`MORE` is a filter commonly used to display text files. It displays a file one screenful at a time and pauses until the user presses a key. `MORE` can



be used with redirection or with piping, depending on the situation. For example, `TYPE SAMPLE.TXT | MORE` uses piping because two programs (`TYPE` and `MORE`) are involved. The output of the `TYPE` command is piped through the `MORE` filter. The command `MORE < SAMPLE.TXT` accomplishes the same thing, but it does so using redirection. The `MORE` command gets its input from the `SAMPLE.TXT` file.

`SORT` can be used with redirection as indicated above, but if you want a sorted directory listing, you must use piping because `SORT` and `DIR` are both commands. `DIR | SORT` pipes the output of the `DIR`

command through the `SORT` filter.

There are several options you can use with the `SORT` command. You can sort a directory listing by file extension, for example, using the command `DIR | SORT /+10`. The `/+10` specifies that the sorting should be based on the tenth character in each line, the file extension. It also is possible to reverse the direction of the sort by including the `/R` switch. This would order entries from *Z* to *A*, then from 9 to 0.

Both `SORT` and `MORE` create temporary files on the default disk while they work, so be certain the disk is neither full nor write protected, or you'll get an error.

The `FIND` filter locates specific text strings in text files. The syntax for this filter is `FIND switch "text string" filename`. For example, `FIND "Fred" NAMES.TXT` displays all the lines containing the name *Fred* in a file called `NAMES.TXT`. `FIND` looks for an exact match, so if you're looking for *Fred*, you can't spell it *FRED*.

You can specify more than one filename for `FIND` to scan, but wildcards are not allowed. The switches that are used with the `FIND` filter are `/N`, which supplies a line number for each line it displays; `/C`, which simply counts the number of occurrences of the text string; and `/V`, which displays all the lines not containing the text string. Here are two examples of how to combine filters, piping, and redirection.

`CHKDSK /V | FIND ".BAT"` runs `CHKDSK` with the `/V` (verbose) switch, creating a list of all files on the disk. That list is then piped into the `FIND` filter, which searches for the string `.BAT`, the batch-file extension. What you see onscreen is a catalog of all the batch files on your disk. This command can locate a group of files or a single file. Just be sure to type the filename in all uppercase letters.

`SORT < NAMES.TXT > NAMES.SRT` uses `SORT` to alphabetize the names in the `NAMES.TXT` file. The sorted output will be placed in a file called `NAMES.SRT`. □



ARTS & LETTERS

R O B E R T B I X B Y

Everyone agrees that there needs to be a friendly, smoothly operating graphical interface for the PC. The bare command line interface of traditional DOS-based computers is frightening to newcomers and beloved by only a small minority of the computing public.

Most of us cope with it as best we can. This coping has generated a hungry market for shells, macros, and task switchers.

Most computer users also agree that the PC's graphical interface isn't necessary for everything. Spreadsheets, databases, and word processors generally operate more quickly when text based because the text screen can be updated more quickly than the graphics screen.

The graphical interface is best for layout and drawing programs that help you visualize an eventual print-out. There's no argument about whether artists need a graphical interface, only whether *Windows* is the graphical interface we need and whether *Windows 3.0* is a step in the right direction.

With its slightly friendlier interface, *Windows* has helped computer-phobes by reducing some of the anxiety associated with an empty screen. Almost no one cringes when the opening *Windows* screen appears.

Furthermore, *Windows* has established an operational standard. Even without a good manual, you can usually figure out how a *Windows* product works.

As you move from one *Windows* program to another, menus work the same way, dialog boxes work pretty much the same way, toolboxes work a little bit the same way, and so on. This similarity among programs allows you to master programs more rapidly.

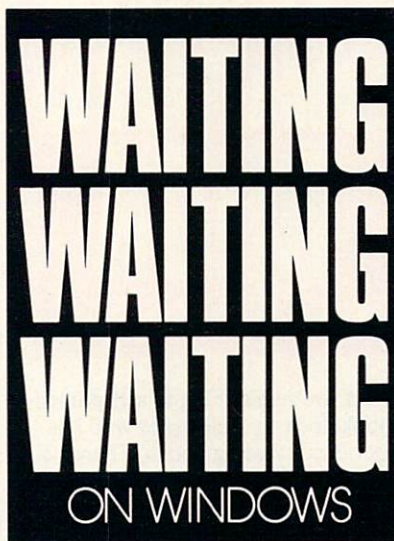
But despite these advantages, there are problems. The major problem with *Windows* (and I am not the first to point this out) is that it's slow. It's ponderous. Sometimes it's glacial.

Artists of all kinds live on feedback. If you are working with crayons or oils, you can see your graphic even

as it is being made. The line of motion through the center of the canvas or a shadow remains visible.

Compare this to working with a graphics program running under *Windows*. If you've just begun your drawing, you'll see rapid refreshes of the screen. The more complex the drawing, the longer it will take before you'll be able to see it displayed in full.

Based on my experience with *Windows* graphics programs, my drawings must be out on the fringe in terms of complexity, because I'm al-



ways crashing programs or causing them to beg for mercy because there are too many objects on the screen.

Sometimes (and particularly when the project includes extensive text, each letter of which is treated as an individual graphic element), the text literally crawls onto the preview screen letter by letter.

Programs that take maximum advantage of *Windows*' multitasking are particularly bad in this regard, indicating to me that the problem is with *Windows* or the hardware rather than the application.

I'm not the only person who has trouble operating *Windows*. At a re-

cent *Windows* seminar, the embarrassed presenter had to do some fast clicking and dragging to make his applications operate. A warning box kept appearing telling him that too many applications were running and asking him to close some windows. (Here's the punch line: Nothing was running on his multimegabyte 386 but the Program Manager.)

Maybe *Windows* isn't the panacea we've been led to believe it is. Take as an example Ventura Software's port to *Windows* of *Ventura Publisher*. It's an excellent program (no less so than the GEM version), which in a single step was upgraded to the professional level and took on an alien environment.

Unfortunately, this advance was not without some pitfalls. New releases may be better, but the version I received crashes semiregularly.

Save early and often, the standard advice with all software, applies doubly to complex software like *Ventura Publisher*, but despite similar warnings in my book on GEM *Ventura*, I have never seen *Ventura Publisher* version 2.0 crash. From that standpoint, you might say that the *Windows* port represents one great leap forward and half a great leap back.

Fortunately, Ventura has elected to continue supporting the GEM operating system version, which it has had two years to debug. I hope Ventura will remain loyal to the original interface for a long time to come.

What choices do you have if you want to work with graphics but you're driven to distraction by the inadequacies and delays that seem to be built into *Windows*?

There are a few options open, including graphics programs that operate under other shells and programs that dispense with a shell entirely and go it alone against DOS, providing their own collections of menus, dialog boxes, macros, and so forth.

We'll talk about a grab bag of graphics packages that provide an alternative to *Windows* programs in the next "Arts & Letters" column. □

WORKPLACE

D A N I E L J A N A L

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I had always wanted to write a book, ever since the second grade. I went to a top journalism school, worked at a great American newspaper chain for eight years, won awards, and rose through the editorial ranks. Then I went into public relations and handled big-name computer accounts for four years. When I started my own agency five years ago, I learned tactics that I realized would help people run their companies better. So I decided to write a book called *How to Publicize High-Tech Products and Services*.

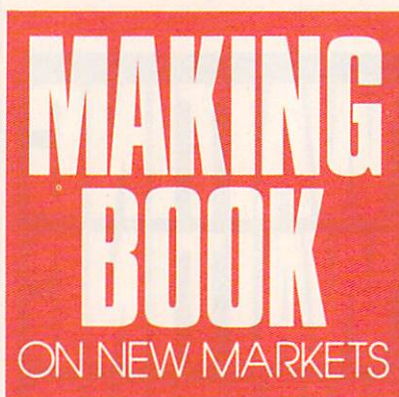
I wrote 80 percent of the book between Christmas and New Year's 1989 while everyone else was partying. I showed the book to friends, who suggested changes and additions. I sent the manuscript to a big-time editor. He liked it but told me he could not publish it because the topic was narrow. "You'll sell 10,000 copies," he said. "But you'll sell them. We can't."

Ironically, an industry guru also said I'd sell 10,000 copies. I decided to publish it under the 10K Press imprint (10,000 copies, 10K—get it?), figuring the name sounded computerish and also active (like a 10K race). Also, because people don't value "vanity press" publications, I didn't use my name in the publishing imprint.

I tried to design the book with my desktop publishing software. However, there are so many design issues—margins, leading, borders, cover art, marrying text and graphics—that the best design I did looked amateurish. I decided to spend real money and get the

job done correctly. I asked friends to recommend designers.

Each designer works and charges differently. One designer quoted me two prices: one if he entered all the codes on his computer and a second, lower price if I did the coding on my computer based on his design. Prices ranged from \$25 to \$75 an hour. I settled on a designer who offered a fixed price for designing the cover, text, and brochure—about \$3,000 plus expenses.



If you're planning to self-publish a book, look for a designer who has experience creating books. There's a world of difference between designing a book and designing a brochure. An experienced designer will save you time, money, and credibility.

After the book was designed, I called for printing bids. Through referrals, I found a company that prints only books. I gave that bid to a friend in the business, and he matched it. I was able to get 3,000 copies for about \$5,000.

Next came the marketing. I put the book, still in its *WordPerfect* format, into a three-ring binder and rented a booth at a trade show for people in the high-tech industry—the very people I thought my book would help.

At that show, an important thing happened. I created new markets. My book targets small companies that do their own publicity because they can't or won't hire a public relations agen-

cy. But when a PR agency representative walked by, I told him it would be a great training tool for newly-hired employees. He agreed. One woman wanted to use the book as an incentive to get people to sign up for her seminars. Another woman who operates a convention hall wanted to give books to exhibitors. A major magazine bought 200 copies to turn their advertisers into better marketers. The Software Publishers Association bought 150 copies to give to new members. This wasn't just a book; it was a premium incentive as well. I received enough orders to pay almost all my expenses.

To make selling easier, I arranged to take VISA and MasterCard orders. Since banks don't like giving cards to home-based companies or mail-order firms, I had to convince the banker I was more than just your average home office worker. I sent him a two-page backgrounder and copies of articles about my business that had appeared in *USA Today*, *Success*, and several other periodicals. I also told him I sold the book at conventions and seminars. When he asked about mail order, I repeated my assertion. I never lied. He didn't pursue the question, and I didn't volunteer information.

If you want to turn yourself into an expert, then write and publish a book. Just keep in mind these essential steps:

- Write a book that appeals to a lot of people.
- Find an experienced and economical designer.
- Shop around for a printer.
- Find companies that might buy multiple copies.
- Create new markets.
- Sell. Sell. Sell.

The beauty of this marketing strategy is that even if you don't sell the book, you can give it to prospects. They'll think you're smart because you wrote a book. And if they hire you for a project, you just might earn back your publishing costs. □

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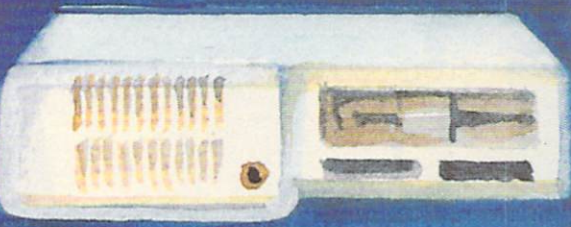
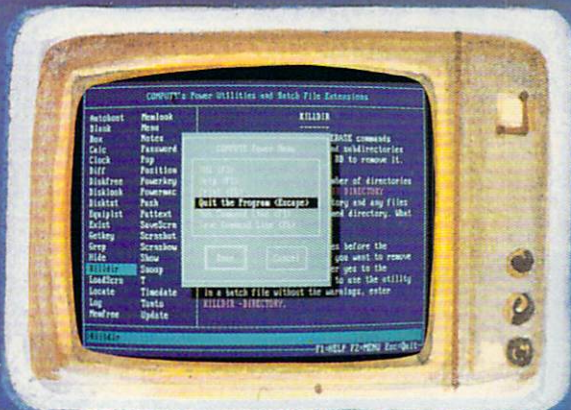
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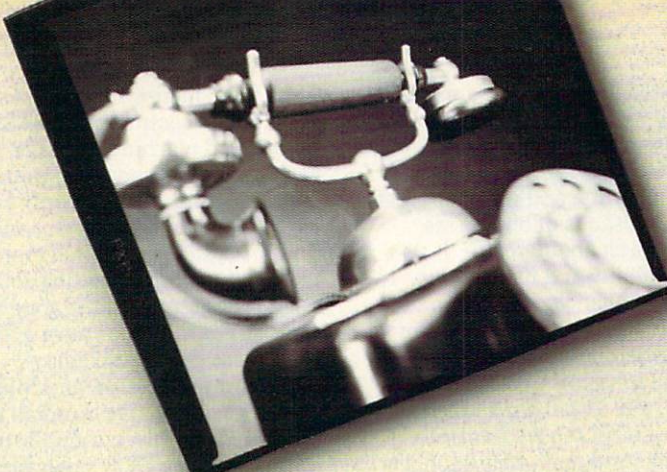
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Tony Roberts

I operate a public relations and desktop publishing business out of my home. I spend most of my energies writing, laying out pages, and compiling databases of contacts at newspapers and radio stations.

Interface. *Windows* made a run at earning my vote for best interface, but it still falls short. I like *Windows* 3.0, but it can be slow and cumbersome even with a 386 and many megs of memory. Since I need several *Windows*-based applications, I use it often, but I keep dropping to DOS, specifically *4DOS*, when I need more than a program launcher. *4DOS* is a command processor that replaces *COMMAND.COM*. It adds new power to most DOS commands and soups up the batch processor. *4DOS*, which is what DOS ought to have been, is distributed as shareware. Try it.▶

CONTRIBUTING EDITORS

Word processor. I doubt that any word-processing program will ever top *XyWrite* in my mind. *XyWrite* is fast, versatile, and best of all, text-based. I string together a lot of words in the course of a day; when I write, I want to concentrate on the words, not on how they look in different fonts and sizes. The makers of *XyWrite* support their product well, constantly updating it to make sure it's not left behind as new equipment, such as laser printers, and new platforms, such as *Windows*, change the way we work.

Utilities/desk accessories. I'm not a fan of pop-up calendars, calculators, or card files. For me, a hand-held calculator works far better than any pop-up, and it never creates a memory conflict no matter what software I'm using. I can get along fine using my traditional desktop calendar and Rolodex. A file finder, though, makes a great utility. There are dozens available, and they go by names like *Whereis*, *Locate*, and *File Find*. File finders often come as part of larger packages. A good file finder will save you hours a week tracking down misplaced and forgotten documents and programs.

Disk management. I've relied on *PC Tools Deluxe* for years for backing up and optimizing hard disks, deleting files, and sector editing. The software is easy to use and, best of all, effective. I've had no problems restoring backups when necessary, and the disk optimizations are fast and effective. *PC Tools* includes a DOS shell to help with file-management chores, but I use it rarely. Because I've had such good luck with this program, I've had little reason to look elsewhere for disk-backup software.

Telecommunications. *Telix*, a shareware program, meets my needs as an easy-to-use telecommunication program that does it all. *Telix* covers the gamut of file-exchange protocols and can handle nearly any configuration. The software's script-generating language allows you to create extremely

sophisticated programs to handle telecommunications chores automatically.

Database/file management.

Ashton-Tate's *dBASE III Plus* is a heck of a program, and it's done great work for thousands of businesses. What I like best about *dBASE* is its programmability and its flexibility. It may be more than you need to track your videotape library, but if you're dealing with hundreds of inventory items and thousands of customers, it can do the job. Because *dBASE* is so ubiquitous, most other software—spreadsheets and mail-merge applications, for example—makes some provision for importing *dBASE* data. So far I've stayed clear of problem-plagued *dBASE IV*, but it may be time to look into it, as the latest release appears to have resolved most of the difficulties.

Personal information manager.

Info Select, a recent enhancement of the long-popular *Tornado*, handles information management on my system. This program is speedy and effective. Answer the phone, and before the small talk has finished, you can locate and display acres of pertinent information having to do with your caller. This program, more than anything else, has helped me organize client lists, project information, deadlines, and siblings' birthdays.

Spreadsheet/financial. *Quicken* is clearly the best financial program for the general public. For a household and/or a small service-based business, it's all you need to handle the checkbooks, budgeting, accounting, and reporting. For a decade, people have talked about using computers to balance their checkbooks. With *Quicken*, this notion finally makes sense. Intuit has announced a new version of the program, *Quicken 4.0*. I haven't seen it yet, but I ordered the upgrade right away. In the spreadsheet arena, don't overlook *Quattro Pro*, soon to be upgraded to *Quattro Pro 2.0*. This is a major-league spreadsheet with a major-league list price, but Borland's Philippe Kahn has sent me at least 15 letters in the last year offering me a \$99 special. If you're on any high-tech mailing list, you've received one, too. If you need a high-end spreadsheet, find a way to qualify for Kahn's offer.

Graphics/DTP. When desktop publishing for clients, I use both *Aldus PageMaker* and *Ventura Publisher*, depending on the client and the job. If a client owns one of the programs, I'm usually asked to work in that format. Of the two, I lean toward *PageMaker*, maybe because I learned it first. Also, I prefer *PageMaker's Windows* environment to *Ventura's GEM* environment. (*Ventura Publisher* has a new *Windows* version, but I haven't tried it yet.)

Programming language. Over the years I've programmed in BASIC, Pascal, and machine language. In the early days of personal computing, programming was often the only way to get software tailored to your needs. Today's systems are much more complex, and my programming abilities haven't kept up. Besides, good software can be found for most applications these days. I still enjoy programming, though, and I find I can be most effective on small projects—writing telecommunications scripts, creating DOS batch files, and inventing useful macros for my word processor and spreadsheet.

George Campbell

As a computer journalist and shareware author, I spend long days at home in front of my computer. Top-quality software is essential to my work. Many times shareware programs fill my needs for a low cost.

Interface. Since I started using IBM-compatible computers in 1983, I've always been a command line fanatic. That's beginning to change now, with the introduction of *Microsoft Windows 3.0*. While I still prefer the classic DOS prompt for many jobs, the multitasking tools in *Windows*, along with *Windows* applications like *Ami Pro* from Lotus, have begun to lead me astray.

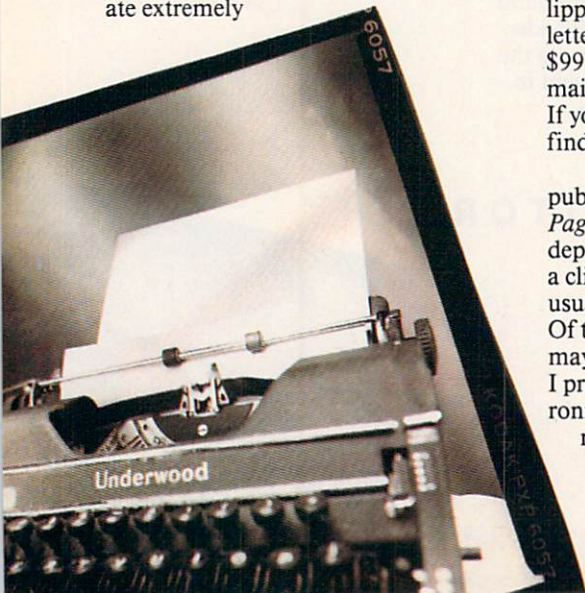
These days, I spend about half my computing time in the *Windows* environment. Still, for file operations and many of the programs I use, the command line makes the most sense.

Word processor. I make my living with words, so my word processor is very important to me. When I'm working with pure text, I use *Microsoft Word 5.0*. I like its logical interface, fast editing tools, and powerful macro language. By the time you read this, *Word 5.5* will be available. Its new *Windows*-like interface makes it even easier to use, so I'm planning to switch as soon as I can.

When I need to add graphics, charts, or complicated layouts to my documents, I fire up *Windows* and run *Ami Pro*. With its ease of use, WYSIWYG display, desktop publishing features, and powerful graphics tools, it's a great program.

Utilities/desk accessories. I use several utility programs regularly, but two stand out above the others: Vernon Bueg's *List* and Phil Katz's *PKZIP*. For reading ASCII text files, there just isn't a better program than *List*. With its scrolling, searching, and file-selection tools, it makes dealing with text files a breeze.

PKZIP takes care of all my file-archiving needs. It has become every-



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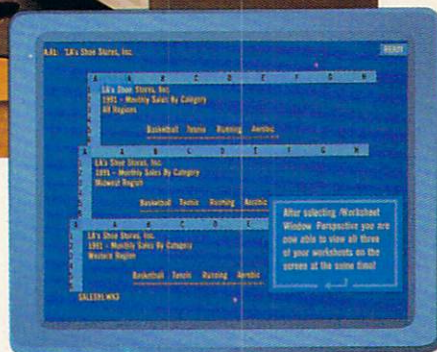
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one's standard file-compression utility. Since I spend a lot of time online, downloading files, I use this program dozens of times each day.

Disk management. To keep my hard disk organized and running smoothly, I use *PC Tools Deluxe*. However, I only installed parts of the program on my disk. I use its PC Shell to move files around quickly and to maintain the structure of my 80MB hard disk. The Compress program is the only other part of *PC Tools* I use. This disk-optimizing program quickly takes care of fragmented files and helps keep my busy hard disk clean and efficient.

Telecommunications. Since I spend several hours a day online with my modem, I need a powerful communications program. *ProComm Plus* is my choice for this job. It offers the power I need along with an easy-to-use interface and a powerful script language that automates my online sessions.

I also run a busy BBS. I looked at several BBS programs before choosing *Wildcat!* from Mustang Software. It's easy for callers to use and needs a minimum of maintenance by the sysop. And, since it can support multiple phone lines, it will let me expand the BBS.

Database/file management. Jim Button's *PC-File 6.0* is the database that fills all my needs. I started using *PC-File* years ago and have upgraded the program with each new version. Its low cost, *dBASE* compatibility, and powerful features make it perfect for maintaining customer lists, address books, and even a database of my video collection.

Best of all, it's available in a shareware version, which lets you try the program out to make sure it fits your needs. While it probably couldn't handle the database needs of a Fortune 500 company, it sure works for me.

Personal information manager. I've looked at a few personal information management programs but just haven't found any need for them. I keep my address book in a *PC-File* database, use *Microsoft Word* for note taking, and write my appointments and deadlines by hand on a wall calendar. Call me old-fashioned.

Spreadsheet/financial. My finances are pretty simple. I use the shoebox method of accounting and manage pretty well. I find that it takes more time to enter my limited financial records in a financial package than it does to add everything up at tax time.

I do use a spreadsheet program, however, to create charts and gridlike comparison sheets of products I re-

view. For this simple chore, I chose a shareware spreadsheet, *TurboCalc*, from P & M Software. It has all the power I need and can export files in DIF format for use by other spreadsheets. *COMPUTE!'s PC* included *TurboCalc* on its January 1990 disk.

Graphics/DTP. Since I switched to *Windows* for my graphical interface needs, I've found that the *Paintbrush* program included with *Windows 3.0* satisfies the artist in me. The PCX files it creates are compatible with every application I use, and I never have to leave *Windows*.

I occasionally produce a flier or a small newsletter for a user group. I once used *Ventura Publisher* for these chores, but now I've switched to *Ami Pro*. It can easily handle a ten-page newsletter, and it's far easier to use than *Ventura Publisher*.

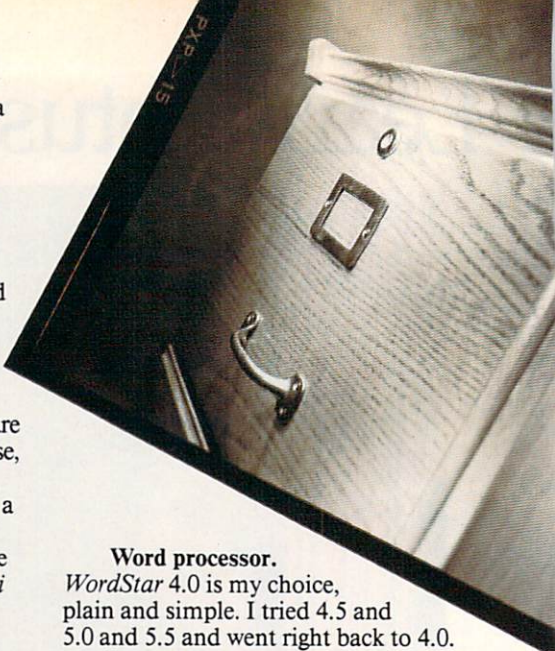
Programming language. Like most PC users, I began to learn programming with the GW-BASIC interpreter included with my copy of MS-DOS. These days, I produce shareware software, so I need a compiled language. Fortunately, I didn't have to give up BASIC. I use *QuickBASIC 4.5*.

Its use of a structured programming style, along with easy access to BIOS functions, lets me write state-of-the-art software quickly. Best of all, programs written in *QuickBASIC* are easy to maintain, since BASIC is more like English than most of the widely used programming languages.

Alan R. Bechtold

I have enslaved several personal computers to help edit *Info-Mat Magazine*, an electronically distributed news weekly published by BBS Press Service. I edit the magazine and write many of the news and feature items. I also freelance, writing and editing newsletters and other publications, including *Online Digital Music Review*. I can't remember what it was like to type on a typewriter.

Interface. I'm still attached to the DOS command line, probably because I'm always finding something I want to do in DOS that one shell or another won't let me do easily, if at all. The command line *always* lets me do it. It's this trust in the command line that makes *The Norton Commander* a favorite. At first, I dressed up my system with *Commander's* wonderful windowed point-and-shoot menus. It wasn't long, however, before my command line addiction took over and I found myself trying to get back to the basics, aborting out of the menus I'd designed. Without the menu interface, *Norton Commander* is basically a disk-management system that allows constant access to the DOS command line. I can always live with that.



Word processor.

WordStar 4.0 is my choice, plain and simple. I tried 4.5 and 5.0 and 5.5 and went right back to 4.0. My first word processor was *WordStar 2.3* for CP/M and 4.0 on DOS. It's what I'm used to. I've tried others that claim to emulate *WordStar*. Many do a good job, but they're not good enough to keep me using them.

Wordstar 4.0 maintains the purest feel of the *WordStar* I know and love and offers advanced features, such as the built-in spelling checker and thesaurus, that make it far more useful than the earlier versions.

Utilities/desk accessories. The utilities I use most often are PKWare's *PKZIP* and *PKUNZIP* (both available as one product) and System Enhancement Associate's *ARC+PLUS* program. These programs let me squeeze one or more files into smaller single files to make the many file transfers I do every day faster and less expensive. Otherwise, I don't even use an onscreen calculator. *WordStar 4.0's* math function usually serves all my addition, subtraction, multiplication, and division needs.

Disk management. *The Norton Commander* handles any disk management tasks that I don't care to handle at the DOS level. I use it most often to move files from one nested subdirectory to another and to clean up my hard disk. When your directory tree has many branches, just typing out those long paths is a chore. *Norton Commander* reduces this to a simple point-and-shoot operation. The program's split-screen layout provides a clear view of two different directories at once. Even an old command line addict like me can see the benefits of vastly reduced keystrokes.

Telecommunications. *ProComm Plus* is my telecommunications package of choice. There are a lot of good communications programs, and I've tried most, but I always go back to *ProComm Plus* because it offers a wide variety of file-transfer protocols and the most efficient and persistent

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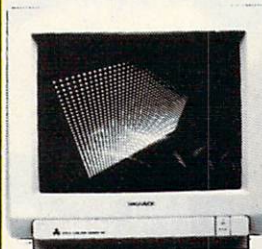
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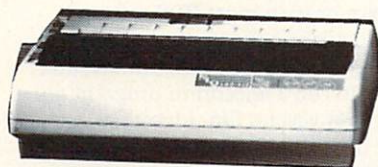
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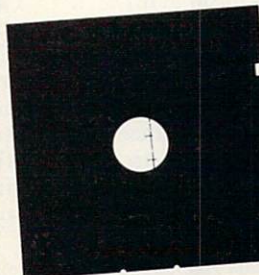


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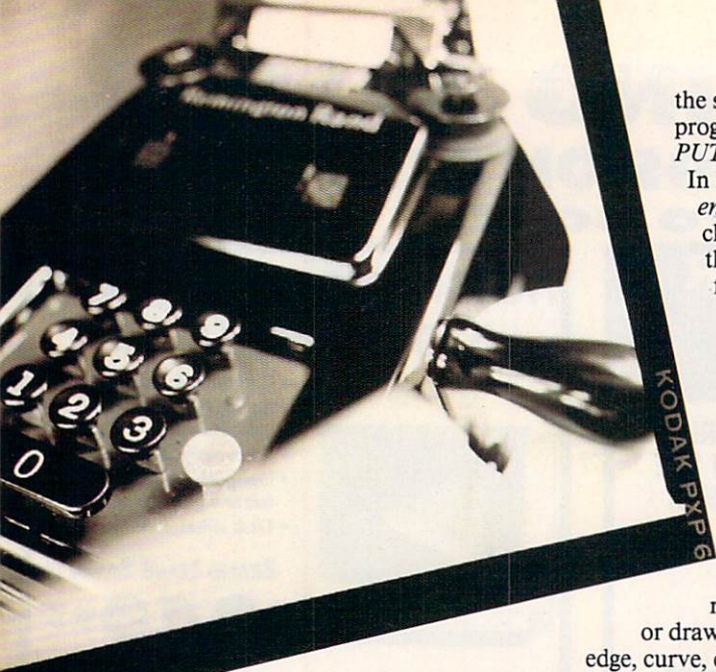
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utilization of each protocol it offers. This variety and reliability, combined with the program's easy menu-driven operation, huge automatic dialing directory, and extensive macro language for use when creating your own automated communications sessions, make it a hands-down choice for me. I've also run a bulletin board system, for client and general public access, for over five years, and *TBBS* is the choice there. The program's ability to handle up to 32 incoming telephone lines on a single AT is simply uncanny.

Database/file management.

dBASE is my favorite database management program. As with *WordStar*, I started out running *dBASE II* on a CP/M computer, so it's a program I've long been familiar with. I tried *dBASE IV* and went back to *dBASE III Plus*. *dBASE IV* was too bulky, required too much hard disk space, and didn't run with the speed and agility of *dBASE III Plus*, which handles all the data-management tasks I throw at it.

Personal information manager.

This was a completely new software category barely a year ago. Because I spend almost every working day manipulating information, I immediately fell in love with the category itself. I also fell in love with *Lotus Agenda*, one of the most flexible, powerful, and imaginative products to come along in years. I like the way *Agenda* lets me enter my data free-form and then arrange it any way I please after the fact. That's the way information really happens, after all. *Agenda 1.0* created this category, and 2.0 is keeping it on the leading edge.

Spreadsheet/financial. Unfortunately, I've never manipulated as much cash as I do information, so I've never had the need for a spreadsheet program. For home use, I run *CheX*,

the shareware checkbook program I got from *COMPUTE!'s PC* (March 1990).

In my office, I use *Quick-en*, which maintains the checkbook approach that *CheX* uses but offers the kind of report-generation, billing, and check-printing capabilities that are necessary for running a small business.

Graphics/DTP.

I draw with *PC Paintbrush*. It's a full-featured, powerful drawing program that allows

me to sketch freehand or draw with all the straight-

edge, curve, circle, and square drawing aids I need. I love the variety of shading and pen styles. *PC Paintbrush* drawings can also be easily incorporated into page designs created with my favorite desktop publisher, *Time-works' Publish It!* I prefer *Publish It!* over others because it's reasonably small and will run on a standard 8088-based laptop PC without too much trouble or the need for a hard disk.

Programming language. I'm still stuck on BASIC for general programming purposes, but I also write some programs in *dBASE III Plus*. BASIC is just that—basic. It's simple and straightforward. But most important, it's the one I've learned to use—and I haven't had the time it takes to learn another language. *dBASE III Plus* was simple to learn because so much of it is based on straightforward English. It's a language I can put to work on all my database operations.

Tom Campbell

I'm a columnist for *COMPUTE!* and chief developer of *Builder* for Hyperkinetix. My memorable first exposure to programming was using a Commodore VIC-20 and devouring every word of *COMPUTE!* magazine starting with the September 1983 issue. My writing style was strongly influenced by the writing of Jim Butterfield. I use computers for writing and programming at home and at work.

Interface. My favorite interface on a PC is the DOS command line. I'd gladly trade it for the Macintosh MultiFinder but never *Windows*, OS/2 Presentation Manager, or any other replacement currently available on the PC. The command line is lean, logical, and universal. The others only supplement it, and none can replace it completely.

Word processor. *Microsoft Word* by a mile. *Word* isn't for everyone, but here's why it's the standard at my

company. First of all, its style sheets mean that with a small amount of training anyone can produce attractive, richly formatted documents that all look as if they came from the same company (you'd be surprised at how few organizations of any size can say this). Style sheets also make maintenance a breeze: Change the style sheet for business letters, and everyone's letters will inherit the change with no individual effort. Second, its ability to generate indexes and tables makes *Word* the only game in town. We routinely produce manuals over 300 pages long, and in this business, you can't do an index by hand every time a manual changes. Programmers here use *QEdit*. It's flexible, reconfigurable, easy to learn; and it loads quickly.

Utilities/desk accessories. *The Norton Utilities' Quick Undelete* is worth the price all by itself, and *SYS-INFO* also gets frequent workouts. We bought *PC Tools Deluxe* for backup, and it became the company's standard database manager and appointment maker as well. Except for Borland's languages, there's no better value on the market.

Disk management. My company's own *HYPE* utilities are my choice for disk management. They're absolutely free (we don't sell them; we only give them away). *HYPE* is available on BBSs everywhere. I use the file finder, the disk statistics, and the memory statistics utilities every day.

Telecommunications. I'm not thrilled with any telecommunications program. The ones I use are *Pro-Comm Plus* (95 percent of the time) and *PC Tools Deluxe* (the other 5 percent). I have never yet felt comfortable with a telecommunications program or with most BBS software. I'm a regular on CompuServe, but learning to use it was a nightmare, and having to run a telecomm program on top of that was no fun. I look forward to the telecomm program that's so easy even I can like it.

Database/file management. For DBF files, I normally use *PC Tools Deluxe*. I'm irritated by its 5000-record limitation, but otherwise it's a godsend. But nothing beats *HyperPad* for putting together small or free-form database systems. It has the ideal combination of a language and applications generator for someone like me. I need to create small databases quickly every month or so, then distribute them throughout the company. The new version lets me include the *HyperPad Browser* (\$99.95 to registered *HyperPad* users) with any application I want to send out.

HyperPad gives me tremendous turnaround time and just the right set of features. It even imports DBF files. >

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Personal information manager. I must admit that normally I use *QEdit* and view or update a to-do list about a dozen times a day. Throughout my company, *PC Tools Deluxe* is the preferred program. I use it when I absolutely must remember an appointment and need to be beeped. Otherwise *QEdit* and my Mickey Mouse wall clock make do—a hardware/software combination that cost about \$100 total.

Spreadsheet/financial. *Quattro Pro* is my spreadsheet. I much prefer *Wingz*, but I don't run *Windows* enough to justify it, and I need to exchange Lotus-compatible work sheets with my co-workers, who are 1-2-3 jocks. *Quattro* is quite fast, comes with the font and mouse support that I need, and has the simple graphics I want.

Graphics/DTP. *Microsoft Word* is my desktop publishing program. I need strong font control and moderately complex formatting. The formatting must be automated because long stretches of the manual must use the same layout, and only *Word* and *Ventura Publisher* give me what I need. Since *Word* is also a word processor, I use it and have completely dropped dedicated desktop publishing packages. It also costs a few hundred dollars less, but I've been upgrading *Word* since 1985, so that's not of direct concern to me.

Programming language. Programming languages are my livelihood, so my preferences are clear and wide-ranging. For systems utilities on the PC, nothing can match *Turbo Pascal Professional 6.0*, with the fastest compiler of all time and a great integrated environment. For programs that need to run in non-PC-compatible environments, ANSI C is the only way to go. I prefer the Borland environments, so I use its *C++ Pro* system. Both ANSI C and *C++* come with an excellent assembler, good documentation, and one of the best debuggers that ever walked the planet.

For fun, it's a tie between *QuickBASIC* and *Turbo Pascal*. *QuickBASIC* lacks dynamic memory allocation and strong type checking, but its integrated environment is a joy. It also has extensible online help and a no-wait compiler for the integrated environment, both of which are features that ought to be mandatory in all compilers. While I generally lean toward *Turbo Pascal* for short utilities, *QuickBASIC* steps into the fray as often as not.

When a program has to be in assembly language, I edit with *QEdit* and assemble using Borland's *TASM*, which is part of *Turbo Debugger and Tools*, but *QuickAssembler's* online help is slowly becoming a permanent and welcome part of my life. □

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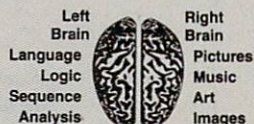
			
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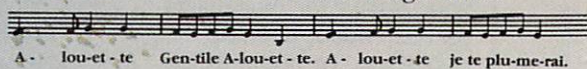


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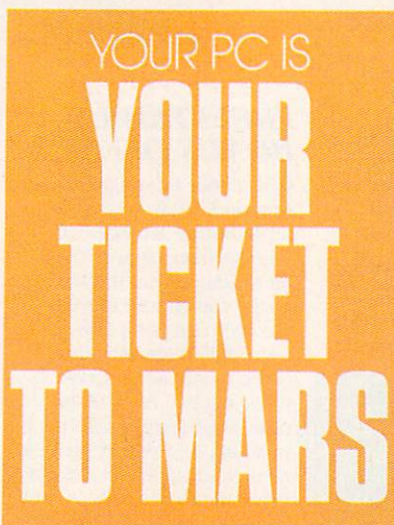
S T E V E N A N Z O V I N

Mars, the red planet, looms ahead. Flying at spacecraft speed above the orange and umber terrain, you swoop past awesome Martian landmarks. Ahead is the vast canyon of the Valles Marineris, 3000 miles long and more than 3000 feet deep. Towering above the Martian plains is Olympus Mons, the tallest volcano in the solar system. Its base is the size of Nebraska; its peak nearly juts out of the thin Martian atmosphere. Beyond are endless seas of red dust, alien fields of stone, dustings of carbon dioxide frost that evaporate at the first touch of the cold sun.

No, this isn't a scene from the 1950s science fiction film *The Angry Red Planet*. It's *Mars: The Movie*, an amazingly accurate virtual reality simulation of the Martian landscape created by NASA's Jet Propulsion Laboratory. The JPL used actual electronic images from the Viking Mars probes to create a two-minute simulated journey across a U.S.-sized area of the red planet, re-creating scenery that no one has ever actually seen. The concept of virtual reality simulation is not that difficult to understand in principle. The process turns dimensionless numerical data—for example, radar readings of elevations taken at set intervals on the surface of a planet—into an accurate 3-D representation. You could do pretty much the same thing by using a topographic map as a guide for modeling a mountain range out of clay, though a computer can do it faster and more accurately. The wizardry lies in making the simulation look real.

Lighting, shadows, colors, and the reflectivity of different kinds of surfaces—impact craters, soil, vegetation, bodies of water—have to be convincing. In *Mars: The Movie*, JPL used image enhancement techniques to bring out small details, smooth the edges of landscape features, and seamlessly stitch together the edges of adjoining maps. All this makes *Mars: The Movie* and its JPL siblings, including *Miranda: The Movie* (*Miranda* is a moon of Uranus) and *Earth:*

The Movie, too real not to believe. And believability is the true test of any simulation. (You can get a video copy of these and other simulations for \$19.95 from Video Publishing Group, 5055 NW 159th Street, Miami, Florida 33014; 305-621-7283).



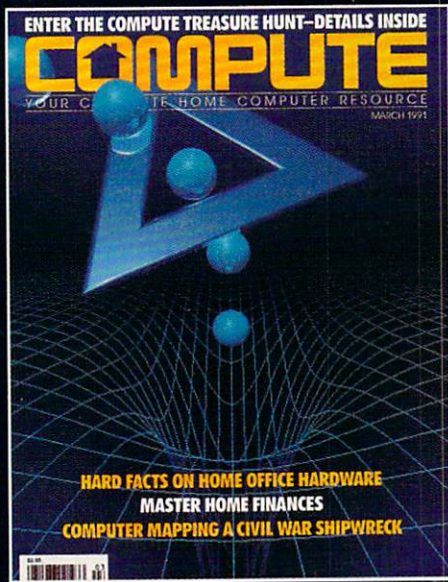
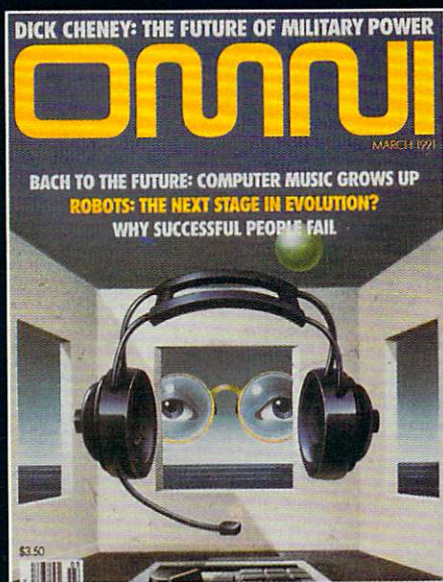
While virtual reality landscape simulations can be art in their own right, they are also useful for line-of-sight surveys, previews of large-scale civil and architectural engineering projects, environmental impact forecasting, exploration of exotic environments, and other applications involving sites too hazardous, difficult, or costly to visit in person. But suppose you simply wanted to make *My Town: The Movie*. Interestingly, you don't need a JPL supercomputer to do the job. In fact, all that's required is an Amiga 500 (one of the lowest-cost home computers around) and a program called *Vista*, from Virtual Reality Laboratories (2341 Gaudor Court, San Luis Obispo, California 93401; 805-545-8515; \$99.95). Like the big-time 3-D landscape simulation software, *Vista* can take 2-D elevation and contour data and convert it into a 3-D virtual reality that can be viewed from any angle. To make a fly-by movie, you move the viewpoint along a path and save pic-

tures at set intervals to an animation program or VCR.

Vista can generate 4 billion fractal landscapes, but most people are using the program to simulate real places. *Vista* accepts the United States Geologic Survey's Digital Elevation Mapping (DEM) files, which currently cover about 40 percent of the country. A DEM file contains essentially the same information found in a USGS paper contour map, but in database form. Getting DEM data into *Vista* is not a task for the faint of heart. Once you've called the USGS to find out whether the area you're interested in has been digitally mapped, the Survey will send you (for a fee) an MS-DOS-formatted tape with the relevant DEM file. (How many of you have a tape drive at home?) Then you've got to convert it to an Amiga-readable format, which requires programming skills in C. If you take the time to master the file format, you don't have to limit yourself to USGS data—you can enter any topographic values you like. So, for example, you could create a 3-D map of your backyard, assuming you want to go out and measure all the bumps in the lawn. It doesn't have to be a landscape—one user has adapted *Vista* for molecular modeling. For nonprogrammers, Virtual Reality Labs is trying to make things easier by offering data disks with the most-requested DEM files, plus other goodies like 3-D projections of the latest Magellan probe maps of Venus.

Reality simulation in your own home—is it a more practical use of your time than balancing your checkbook? According to Susan Woeltjen, one of the developers of *Vista*, the U.S. military thinks it's practical. Apparently, the Department of Defense has been looking into *Vista* as an engine for cheap, fast simulations of Iraqi terrain. It's interesting to contemplate that the success of a multi-billion dollar military operation in the Middle East might just depend on the virtual reality created with a \$600 computer and a \$99 software package. □

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RAD CAD

CAD HAS HELPED BUILD OUR BRIDGES AND FLY US TO THE MOON.
WHAT DOES IT OFFER THE NEXT GENERATION?

CAD? In the schools? Educators who have enjoyed success with innovative computer simulations like *Voyage of Mimi*, *Balance of Power*, or *The Oregon Trail* shouldn't be surprised to hear that computer-aided design (CAD) is moving into the schools, starting in kindergarten.

CAD was once the exclusive province of engineers and architects. But the aerospace, machining, and electronics industries now share this versatile technology with such diverse fields as clothing and interior design. Even archaeologists have found a use for this tool in the reconstruction of ancient ruins.

Since CAD use is so widespread in the working world, its use is coming to be seen as a basic skill, as important to conceptualizing as English is to communicating.

Kids are discovering that design work can be as competitive and fun as videogames. Teachers are finding all kinds of new ways to put CAD to work in helping students conceptualize, organize, manipulate, and learn.

Canned CAD

What kind of CAD program is right for young people? Since the introduction of the CAD concept begins early, a "canned" CAD program such as *Stickybear Townbuilder* (Optimum Resources) is used. This program lets a child as young as five construct his or her own town. When the town is completed, the student can drive around in a simulated car to get the feel of the layout.

Slightly older children get into design with *Car Builder* (Optimum Resources). It's organized similarly to *Stickybear Townbuilder*. *Car Builder* challenges students to select components from a database until they have assembled a simulated car. Then the car can be modified and tested for wind drag and overall performance.

Junior high and high schoolers are crazy about *Sim-*

City (Maxis Software). Just about everybody seems to like it. This award-winning software has been a bestseller for months. Based on the American Urban Architecture model, *SimCity* allows students to construct a city in an area ten miles on a side. In their simulated cities, students can bulldoze land and place roads, parks, airports, police and fire stations, stadiums, factories, and residential areas.

Once the city has been constructed, the user must act as mayor and deal with all the classic problems of a growing city, including not only predictable urban headaches such as tax flight and pollution, but also disasters like earthquakes and fires and even a marauding sea monster.

Learning to Love Design

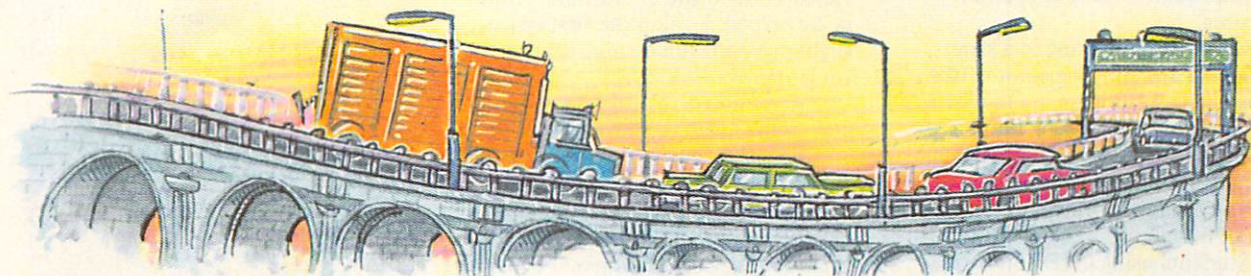
But how do the kids react to these simulations? Do they approach the software as something challenging and fun, or as just one more boring school activity?

The best person to ask is a teacher. David Ellison is a long-time user of introductory CAD programs as a computer coordinator and classroom teacher at Barnard-White Middle School in Union City, California.

"Initially, many of the students balk at the CAD programs when they discover that more thought is required than is needed with most videogames," he comments. "Once they get into it, however, they start to appreciate the value of the computer as a design tool. We even have contests to see what team can design the fastest car or the most efficient city."

Employing a more open-ended format, Lockart Middle School (grades 6-8) in Orlando, Florida, has students use a CAD program called *AutoSketch* (Autodesk) to design monorail trains and then build physical models based on their CAD designs.

AutoSketch allows them to create perfectly symmetrical drawings that can be moved, stretched, copied, mir- >



MICHAEL C. PERKINS AND KELLY RIVERS

rored, scaled, or rotated as needed in a two-dimensional format. Using CAD, the Lockart students' drawings are cleaner and more accurate than hand renderings. As a result, they develop more successful physical prototypes of their trains.

Eighth graders at San Jose Middle School in Novato, California, will be using the same kind of CAD software to learn drafting. The plan, however, is to extend these skills into subjects beyond drafting. Principal Nancy Cooley says, "Our goal for the 1990-1991 school year is to develop a more interdisciplinary approach in which, for example, a social studies class studying ancient civilizations could use CAD software to draft up a working model of a Sumerian city and its various structures."

On a high school level, two schools in Ohio—Perry High School in Massillon and the Libby Skill Center in Toledo—have been using a more complex design program, *AutoCAD* (Autodesk).

At Perry, students learn the CAD software by copying shop documents; then they practice creating architectural, electrical, and other types of drawings. The second year of CAD involves real-world drafting assignments that include three-dimensional drawings, shading, and isometric views.

At Libby, students work with flow charts and assembly drawings to develop work-cell models for use in industrial automation.

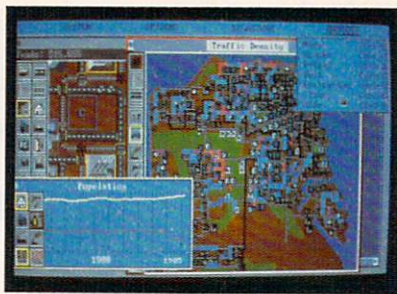
Students at both schools are assisted in getting summer jobs and internships where they can put their CAD skills to use.

Synergy

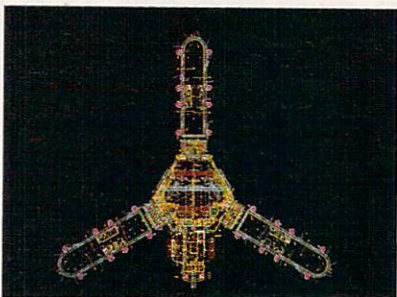
Taking a different approach, tenth graders at Sir Francis Drake High School in San Anselmo, California, like their counterparts at San Jose Middle School in Novato, will be exploring the virtues of computer-aided design through an innovative new program. The program, the Marin Education Collaborative (MEC), was organized by Autodesk, whose company headquarters is in Sausalito, California.

Rather than working in a strict engineering and drafting context like the high school students in Ohio, students in the program at Sir Francis Drake work with data from their biology, math, and English studies.

One proposed project involves a study of the evolution of costume design. Students using CAD software would learn how to create costumes in much the same way modern clothing designers use computers to construct and generate garment patterns.



SimCity is a delight for all ages.



AutoCAD is professional designware.

Students then study changes in costume and fashion in various historical periods and cultures in the light of physical environmental factors (for example, colder weather in Northern Europe or desert climates in the Near East). Once the study has been completed, students will draw upon their English skills to write a report on the project and make an oral presentation.

Another proposed project involves a study of water conservation at Sir Francis Drake High School and in the San Anselmo community at large. Students will use CAD software to re-create and study the current layout of water pipes. They'll use animation software to study the flow. The students seek to discover how much water is being used, whether the water is being used in the most economical way, and how the use of water can be improved.

Ron Fortunato will be serving as a consultant to the MEC program. Currently he's a technology consultant with the Glenbrook High School District in Glenview, Illinois. As coordinator of the NORSTAR Student Research Institute in Norfolk, Virginia, he helped develop the first space-flight program run by high school students.

According to Fortunato, the main goal of the MEC programs is "to create an educational environment in which students are using technology—including CAD—to generate new data that can ultimately be used to solve real-world problems."

Fortunato will also be assisting the MEC programs to develop ties to NASA's Ames Research Center in Mountain View, California, and the

Christa McAuliffe Center at Stanford University.

Barbara Granicher, principal at Sir Francis Drake, characterizes the program's multisubject, interdisciplinary approach as an experiment in thematic problem solving, rather than a strict computer program limited solely to drafting projects. Other CAD-related ideas include projects focused on urban development, transportation, and pollution control.

The project instructors hope to bring in other computer applications such as database, word-processing, and desktop-publishing software in order to store the data generated by the projects, to produce the reports, and to serve as graphic aids in the presentation of the results.

In the Material World

Ultimately, the use of CAD by kids can achieve a number of practical goals. It helps all students better understand the use of computers in the everyday working world, and it helps them discover aptitudes in their own use of the computer as an instrument of design.

Student designers should learn CAD for the same reasons budding journalists must learn word-processing skills and future financial analysts must learn the power of the spreadsheet. As students decide to become architects, engineers, molecular chemists, city planners, cartographers, and designers of all kinds, they must learn to use the appropriate CAD program.

Though school computing was once looked down upon as the exclusive province of nerds and dweebs, it is now becoming a basic necessity for all students to have computer skills. □

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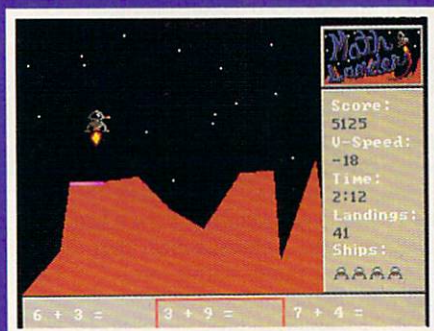
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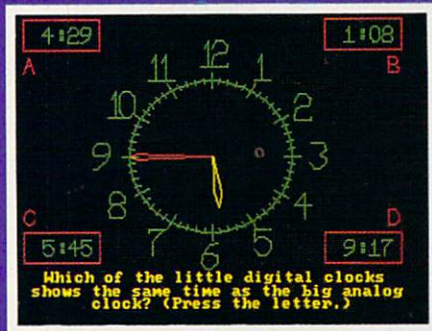
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GAMEPLAY

O R S O N S C O T T C A R D

Try as they might, gamewrights *don't* have complete control over the way you experience their games. As more and more games rely on nonstandard devices—something besides the keyboard, the screen, and the hard disk—your enjoyment depends more and more on the right tools.

But where to turn for guidance? Where can you find the right tool that will bring life to the game, without interfering with the quality of the play? Ask another game player—like me. Here's my guide for the game player's indispensable toolkit.

Sticks. I've used a lot of joysticks over the years, and for a long time I thought there was no such thing as a good PC joystick. Once you've played with that tough old bird, the original Atari joystick, with its firm resistance and delicious tactile feedback, those wimpy little toothpick joysticks you're forced to use on IBM-related machines are faintly disgusting.

Does *any* game actually use the IBM-joystick's capability of registering how far you've moved the stick? I don't think so. They only register the same things that the Atari stick reported so cleanly and simply—up, down, left, right, or center. So we put up with all that wimpiness just so the IBM stick can report information that no game ever uses.

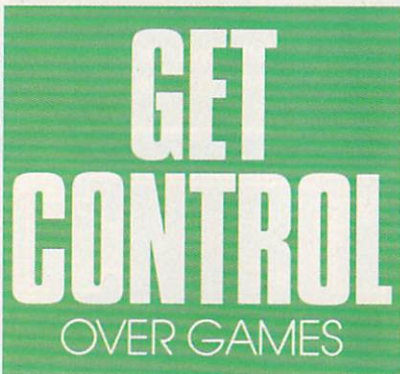
Despite my dislike of the whole idea of the IBM joystick, I'm glad to report that somebody actually makes a good one. Epyx's hand-held joystick, the 500XJ, is the most comfortable, responsive joystick in the IBM world—and it's the only one that belongs in the same league as the Atari stick.

Balls. What the IBM joystick's designers didn't anticipate was the little box with the ball in it—the mouse and the trackball. When we want subtle information about *how far* and *how fast*, that's what we use.

I've tried a lot of mice, and for the sheer feel of it, there's no comparison to the Microsoft mouse. It cradles in the palm of your hand, it responds

beautifully to natural and easy wrist movements, and when it gets dirty and binds up, you just pop off the collar, drop out the ball, and blow the box clean.

There is something better, but I don't think it's made its way to the PC world yet. On my Amiga I use the optical Boing Mouse from GfxBase (408-262-1469). It doesn't give quite the tactile feedback of the Microsoft mouse, but it has the advantage of never getting dirty and binding up like a shopping cart wheel.



On my upstairs machine, the portable that I use for my writing, I need a mouse for a few jobs. (Well, all right, for a few monochrome *games*.) But the way I use my desk doesn't work well with a mouse. I surround myself with the piles of books and notes that I'm using for current projects; I can't afford to keep a mouse pad's worth of space free and clear.

So I decided to buy a trackball. I first tried the most traditional design—big ball in the middle, buttons above it. It was awful. What was I supposed to do, move the ball with my palm?

My next try was a nice hefty pool-ball-sized item with big buttons framing the ball on either side. It was much better, but my fingers just aren't dexterous enough to move the ball with speed and assurance.

Then I bought Logitech's Trackman, and I'm happy. This is the trackball that has you move the ball with

your thumb, while your fingers rest on the buttons off to the side. Logitech's promos aren't hype; they're true: The thumb really is more dexterous than the fingers. With the ballistics feature turned on, I can move all over the screen with simple, quick, intuitive movements. It still isn't as comfortable and easy as a mouse, but where a mouse won't do, the Trackman will.

Sounds. I always figured that when I wanted good sound, I'd use the Amiga. But then it became clear that too many good games with good sound were being put out for PCs only, and I wanted to hear them. So I sprang for the bucks to buy the Roland MT-32. The only trouble is its memory conflict with the Racet laser drive (a rewritable optical disk drive) I use for backup. When faced with that choice—well, backup comes before play.

When I got my 486, I moved the MT-32 into it and fell in love. It sounds great. In the meantime, I bought an Ad Lib board for my 386 machine, and it had no conflicts with the laser drive. While it isn't quite as lush-sounding as the MT-32, it still sounds great—and many games make good use of both sound boards, either for sound effects or for background music. (Both boards require you to buy a simple amplifier and a pair of speakers.)

There are some peculiarities, at least on my systems. When I'm playing *Railroad Tycoon*, there are times when the Ad Lib board doesn't get the message to turn off a particular sound effect, so I have to spend several minutes listening to a whine or a hiss before I can get the thing to shut down. Very unpleasant.

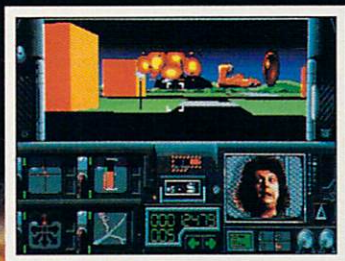
The MT-32, on the other hand, is consistent: Every time it's first used, no matter where I have the volume set, it turns on at full blast and calms down only after I've fiddled with the knob.

But hey, once you've played with either sound board installed, playing without it feels like watching a movie with the soundtrack turned off. □

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RICHARD SHEFFIELD

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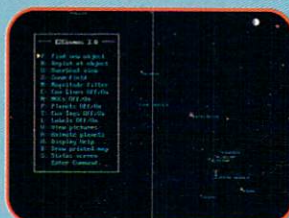


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Circle Reader Service Number 111

The ability to make up your own scenarios finally frees the game player from the designer's view of how the game should be played. Canned scenarios are nice, but once you've played them once or twice, the game starts to lose some of its zip. When you can make up new scenarios and rewrite history, a game can remain interesting almost indefinitely.

With *WolfPack* and *Action Stations*, you can cover both ends of the spectrum when it comes to scenario building. The Mission Construction Set in *WolfPack* is mouse driven, highly graphic, and easy to use; but it's also rather shallow in detail. The Scenario Builder with *Action Stations*, however, is complex and highly detailed, but it's more difficult to use.

Though the Germans' plan was to destroy PQ-17 with a surface force, they also had 11 U-boats (code-named the Ice Devil pack) in the area to track the convoy. What if the Germans had decided to attack the convoy early with Ice Devil instead of tracking? You can easily set up and play this scenario with *WolfPack*. The only problem is the size of the forces and convoy. *WolfPack* tends to slow down when a large number of ships are used. Fortunately, this is easily countered by reducing the forces on both sides by half.

Actually building the scenario is very easy. Using a point-and-click operation, you just pick a patch of ocean and populate it with ships. The convoy of 20 ships is set up to follow one ship as a leader, so you only need to plot the course for that one ship. Around the convoy are placed seven destroyers, either in repeating patrol routes, which move with the convoy, or in advance positions on their own. Then it's just a matter of placing the six U-boats and picking their captains. This feature lets you choose how the U-boats will function when you're not controlling them. Some captains are

It seemed that no one was very keen on the Iceland-to-Russia convoys, from the British Admiralty, who called the operation "unsound," to Seaman James Atkins, who would write, "We were loaded with . . . 450 tons of high explosive, loaded fore, aft, and amidships: they were not taking any chances on our getting through to Russia."

But Roosevelt, who provided most of the material and ships, and Stalin, who needed that material to stop the German advance along the Russian front, put enormous pressure on Churchill to get the convoy moving, though they had intelligence that the German navy was cooking up

something special for PQ-17.

It was probably too much good intelligence that led the British to believe that the convoy was in imminent danger of attack by a strong surface force. Believing they were out-gunned, the British gave the disastrous order to withdraw the covering warships and disperse the convoy.

Starting Over

But what if things had been different? Two new simulation games let you set up PQ-17 and see how it plays out. In fact, *WolfPack* from Brøderbund and *Action Stations* from Conflict Analytics let you set up just about any scenario, real or imagined.

ANATOMY OF A BLUNDER

If you're interested in learning more about Convoy PQ-17, here are two excellent books on the subject:

The Destruction of Convoy PQ-17, by David Irving (St. Martin's, New York, 1989). This heavily researched book was initially banned by the British Admiralty, since it explained their blunders in great detail. A superb operational history.

A Cold Corner of Hell: The Story of the Murmansk Convoys 1941-1945, by Robert Carse (Doubleday, New York, 1969). The complete story of the Iceland-to-Russia convoys, from inception to completion, with a large section on PQ-17.



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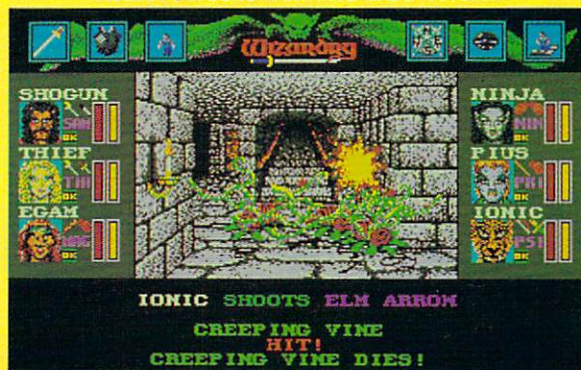
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WolfPack lets you re-create realistic sub battles.

relentless attackers, and others won't attack at all.

Put the U-boats on an intercept course with the convoy and start the action. Once engaged, you can take control of any U-boat in your group

or watch them operate on their own.

Though the setup is easy, there isn't a lot of detail that can affect the outcome. *WolfPack* makes no provision for setting the level of visibility or sea state. And the convoy

doesn't change course or disperse once the attack starts.

Call to Action

Action Stations, on the other hand, presents a much more balanced surface battle—which the Germans had code-named The Knight's Move. Actually, convoy PQ-17 is one of the scenarios that comes with the game. This turns out to be a good thing, since building the battle from scratch is quite a lengthy and complicated process. Very little is overlooked in the building process. The details include sea state, wind direction and speed, sea direction and speed, day and night visibility, time of day, and optional storms and squalls. And that's before you ever plot your first ship.

There are also quite a few details to fill in for each ship you include, but the most complicated process is placing the ships on the map. Instead of pointing to where you want the ship to be on the map, you provide x,y coordinates without even seeing the map. It's best to follow the manual's advice and first plot the whole thing out on graph paper.

Because PQ-17 is one of the 30 scenarios included with *Action Stations*, it's much easier to use the Edit function to change a few things in the way the scenario is set up. The scenario comes set up with two German battle groups placed together, attacking the convoy from the south. Set up this way, the British must hold off the Germans until the covering cruiser force can arrive from the north. Playing this way, I got an even battle with heavy losses on both sides.

But when I play *what if* and use an alternate German plan of an enveloping attack, things shift a little to the Germans. In this setup, the German force that's positioned around the battleship *Tirpitz* comes in from the north. Before it can attack the convoy, it engages the British covering force. By staying at long range, the *Tirpitz* can keep this force occupied while the Second Battle Group, consisting of the "pocket battleships" *Lutzow* and *Admiral Scheer*, attacks the convoy and destroyers with 11-inch guns.

You can't add or remove ships with the Edit program, but a program on the optional *Utilities* disk will let you do this. Using the Swap-Add program, you can really start to play what if. What if the *Bismark* wasn't sunk in 1941 and was available for The Knight's Move? What if the convoy had twice as many torpedo-carrying destroyers or a King George V-class battleship? The possibilities and replay value of the game are endless.

Scenario builders are becoming so popular that they're almost a must

Das Boot

Richard Sheffield

Das Boot puts you in command of a German Type VII U-boat, the scourge of the Atlantic during World War II. Type VII boats were responsible for sinking millions of tons of Allied shipping. Had they been used properly and in greater numbers, they might have affected the outcome of the war.

The name *Das Boot* comes as a promotional tie-in with the book (provided free with the game) and movie of the same name. But it should be made clear that there is no attempt made in the game to re-create the action in either.

Learning a game like this is usually very difficult, what with all the various stations and moving around in the boat. But *Das Boot* has an excellent training mode that lets you operate each battle station in an arcadelike combat sequence with plenty of targets. In the training mode, you can use the anti-aircraft gun against Allied planes, shoot the deck gun, make surface and submerged torpedo attacks, maneuver through minefields, and practice sub-versus-sub warfare. The practice sessions are scored to let you know how well you did.


After a little practice you are ready for your command and one of the five missions. From the Arctic to Gibraltar to the North Atlantic to Norway to the Bay of Biscay, you'll find no shortage of enemy contacts. Allied bombers are a constant threat. There are three levels of difficulty, and the introductory level is definitely recommended for new players. You can further fine-tune the difficulty using the Historical Accuracy selections. Torpedo performance, on-board repairs, and new-

equipment introduction can be tailored to make your mission easier or more difficult.

The game fully supports 256-color VGA and does present some interesting graphics. But they fail to take full advantage of this high-powered video adapter by using digitized images of enemy ships as do some of the other sub simulations. Sound-board support includes both Ad Lib and SoundBlaster and is well used. The mouse interface also works well. Gameplay was satisfactory, but I had several system lockups and a recurring bug: The bottom portion of my screen would not paint until I moved the mouse back and forth over it.

Actually, the biggest problem with this game is what is left out. What's there works pretty well but seems incomplete. My biggest complaint is the lack of a Save Game feature. With the ability to call for a *Milch cow* resupply sub, some of these missions can go on for hours. Asking the player to complete them in one sitting is just not realistic, and forcing him or her to scuttle the sub to quit in the middle is downright mean. Also missing is a campaign/career mode along with promotions or medals. It would have been great to see how victories at sea affect the ground war as you sever the Allied supply lines. The manual could use some work as well.

The work completed on *Das Boot* is well done, but she seems to have been launched a bit prematurely. Until a few more hatch doors are installed, I'm afraid that she will leak rather badly when compared to other World War II sub simulations.



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Product List

Here are the products used by Richard Sheffield, and some other submarine combat products you might enjoy.

Action Stations

Conflict Analytics
395 Del Monte Center, Ste. 189
Monterey, CA 93940
IBM PC and compatibles, 640K RAM, CGA;
mouse optional—\$49.95
Utilities disk—\$12.95

Ancient Art of War at Sea

Bröderbund Software
17 Paul Dr.
San Rafael, CA 94903
(415) 492-3200
IBM PC and compatibles, 256K RAM,
graphics adapter; mouse or joystick optional—\$44.95
Apple II version—\$44.95
Macintosh version—\$44.95

Das Boot

Three-Sixty
2402 Broadmoor
Bldg. B, Ste. 201
Bryan, TX 77802
(409) 776-2187
IBM PC and compatibles, 640K RAM, CGA
(10-MHz 286 or better with VGA recommended); Microsoft mouse supported but not necessary—\$49.95

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(919) 275-9809
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Bryan, TX 77802
(409) 776-2187
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(286 or 386 with EGA or higher recommended); Microsoft mouse recommended—\$59.95
Amiga version—\$59.95
Macintosh version—\$59.95

Hunt for Red October

Software Toolworks
60 Leveroni Ct.
Novato, CA 94949
(415) 883-3000
IBM PC and compatibles, 512K RAM, CGA or EGA; mouse supported—\$29.95
Amiga version—\$29.95
Apple II version—\$29.95
Atari ST version—\$29.95
Commodore 64 version—\$29.95
Macintosh version—\$29.95

Pirates!

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(301) 771-1151
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Amiga version—\$44.95
Apple II version—\$44.95
Atari ST version—\$44.95
Commodore 64 version—\$44.95
Macintosh version—\$59.95

Silent Service II

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180 Lakefront Dr.
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(301) 771-1151
IBM PC and compatibles, 640K RAM, CGA, EGA, VGA, and Tandy 16-color; supports Ad Lib, SoundBlaster, and Roland sound cards—\$59.95

WolfPack

Bröderbund Software
17 Paul Dr.
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(415) 492-3200
IBM PC and compatibles, 512K RAM,
graphics adapter; mouse or joystick optional—\$54.95
Amiga version—\$54.95

for new military sims of this type. But if the idea is to play what if, I'd like to see the publishers go a step further. They could let you set up a battle, sit back, and watch the computer play both sides. You might even be able to watch the action from a number of vantage points, as in *M1 Tank Platoon*.

Courting Disaster

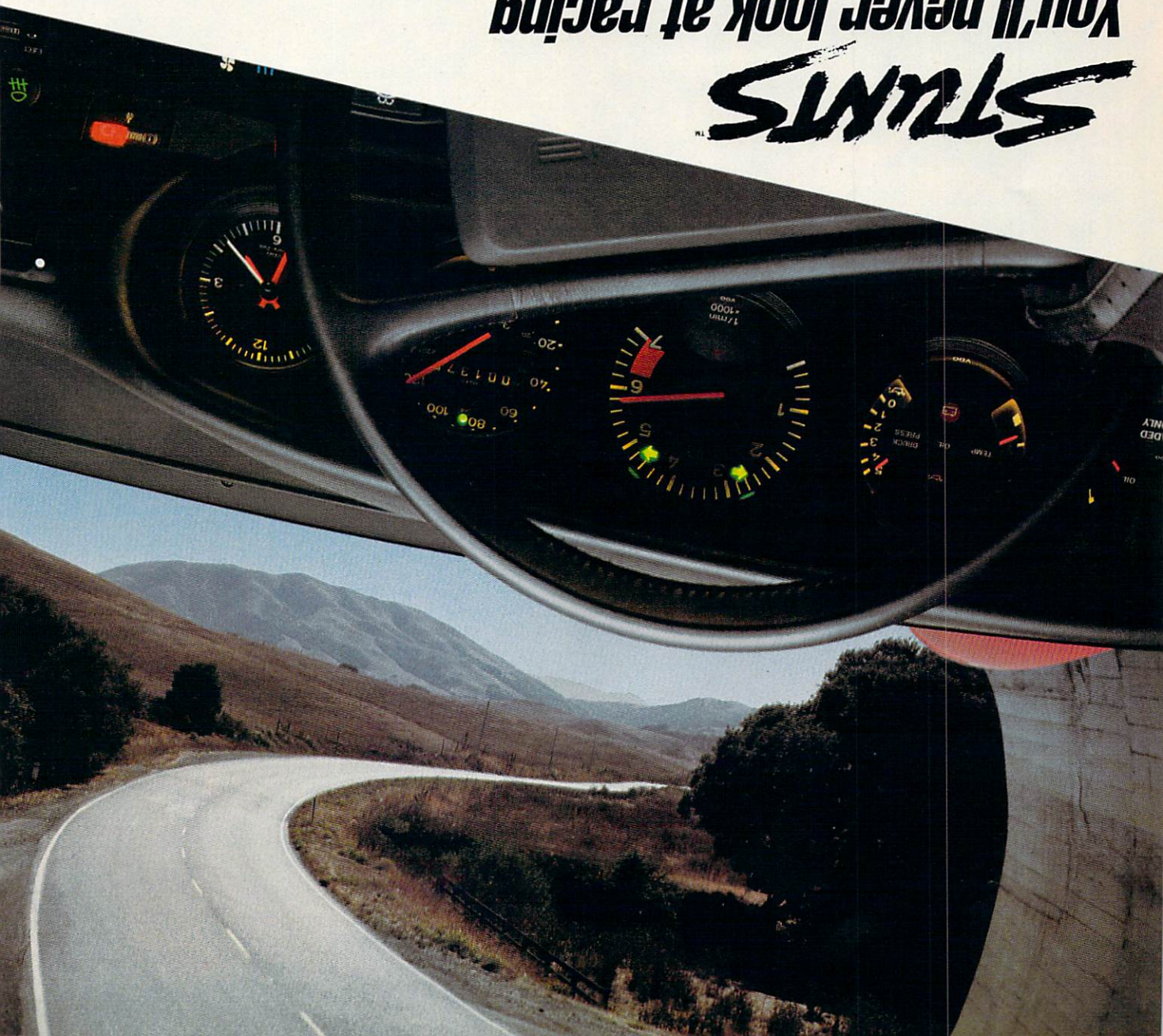
So what finally happened to the real-life PQ-17? After the order to disperse the convoy, things got bad in a hurry. Without destroyer cover, many ships were taken individually by U-boats and bombers. A few seaworthy ships were beached and abandoned by their crews on the first patch of dry land they found. In all, 24 ships and 153 Allied seamen were lost.

The SS *Carlton* was torpedoed the day after the convoy scattered, and most of her crew members were taken prisoner. The crew's bad luck continued when their transport ship hit a mine and sank. Having been through this before, the crew of the *Carlton* distinguished themselves by calmly handing out life preservers to the panicked German ground soldiers on board and organizing the rescue. They were later thanked by the ship's captain for saving the lives of hundreds of men. □

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Circle Reader Service Number 135



64/128 VIEW

T O M N E T S E L

First of all, I'd like to remind all user groups to get in contact with us if you want to be included in this year's listing. We've sent forms to all the groups on our worldwide list, but you'll be excluded if we don't hear from you. If you haven't received a form by this time, send us a card or letter with your group's name, address, and any BBS information.

Now I'd like to thank all of you who've responded to our Gazette Readership Survey. This is the fourth year we've run such a survey, and your feedback provides us with a good idea of how we're doing. We appreciate your taking the time to mail them in. Incoming survey forms have slowed to a trickle now, so let's take a look at what you've told us.

It comes as no surprise that the majority of you own and use a 64 (77 percent); 42 percent of you own a 128. Of those responding, 3 percent own an Amiga, 2 percent own a Macintosh, and 6 percent own an IBM or compatible. Of course, many of you own more than one computer and have an interest in more than one brand. More than one of you indicated that you own all the brands mentioned in the survey.

Of those who use a computer at work, 57 percent use a PC, 23 percent use a 64, 9 percent use a 128, 8 percent use a Macintosh, and 3 percent use an Amiga.

We were curious about how many of you are computer novices and how many are veterans. It seems 5 percent of you bought your 64 within the past year, and twice that figure have two years' experience. The survey indicates that 3 percent of you bought a 64 the first year it came out. The average length of ownership is 4.7 years. Interestingly enough, ten readers said they bought a 64 the year *before* it was introduced. Maybe they were thinking of the VIC-20.

We also found that you spend quite a few hours each week at your keyboards. The average is 11.5 hours, but a few superusers spend 50 or more hours at their computers. One reader

in Ontario, Canada, spends 20-50 hours keeping church and election records on his 64 and 128, teaching children how to program, and working with handicapped people. Another 50-hour user does everything from playing games to controlling his home's lighting system. Others in the 50-60 hour category say they keep their computers busy doing real estate appraisals, keeping tax records, operating ham radio stations, drawing, writing newsletters, and helping in the classroom.

The champion heavyweight user, who reportedly spends 60-80 hours each week at his 64, says he gets his copy of *COMPUTE* from his father, plans to buy another 64 this year, buys "a lot" of mail-order software, doesn't use Gazette's programs, but might if there were more business programs offered.

While most of you are satisfied with your computers, 18 percent of you plan to buy a new one within the next year. The PC market will get the biggest share, with 28 percent of you moving to an IBM or clone. Brand loyalty is reflected by the 45 percent who say they'll stick with Commodore. Of those planning to buy a new computer, 16 percent say they'll get another 64, and 17 percent plan to upgrade to an Amiga. An interesting note is that 12.5 percent plan to buy a 128. Since Commodore no longer makes the 128, people interested in this gone-but-not-forgotten computer will have to turn to the used-equipment market to buy the computer they want. (Montgomery-Grant advertises that it still has 128s in stock, but that's the only 128 ad I've seen recently.) With this much interest in an orphaned machine, count on Gazette to continue its 128 support. Now's a good time to remind programmers that we actively solicit 128-specific programs.

Next month, we'll take a look at some of the other information provided by the survey, including what you want to see in Gazette in the future and how you feel about our new format. □

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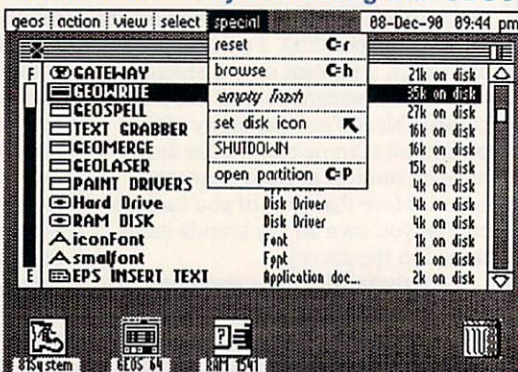
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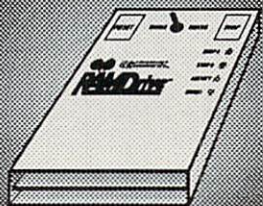
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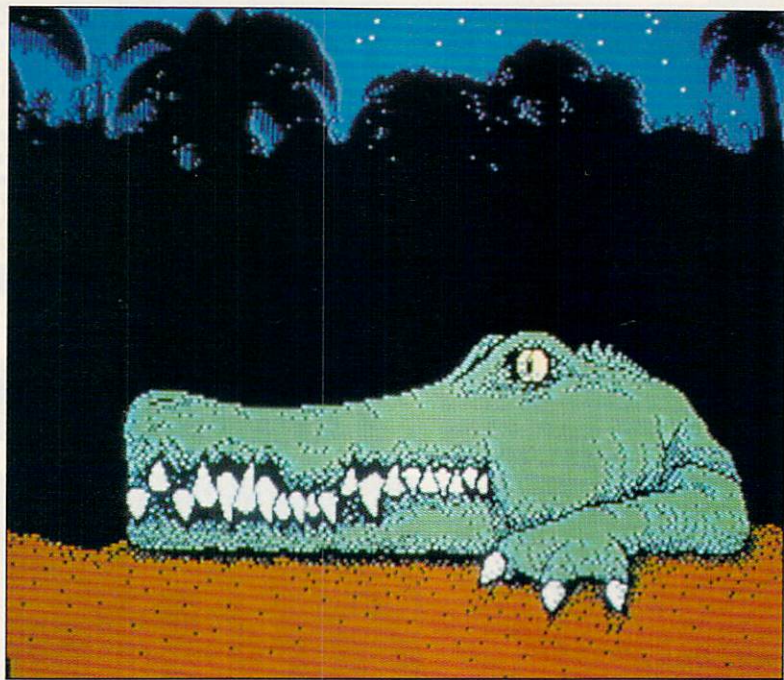


NEWS & NOTES

Ultimately Bad

Origin (110 Wild Basin, Suite 230, Austin, Texas 78746) announces the release of two new titles for the 64: Lord British's *Ultima VI* (\$69.95) and Chris Roberts's *Bad Blood* (\$49.95). Uncover the mystery of the gargoyles in the sixth episode of the Ultima saga. As Avatar, you and your trusty band of friends venture forth from the shores of Britannia to the dark reaches of the underworld.

In *Bad Blood* you must save the mutant survivors of a nuclear holocaust from the hatred of their human foes. The new leader of the pureblood humans seeks to enslave, and eventually destroy, the entire race of mutants. You have been sent from your tribal village to scour the bombed-out cities in search of a way to overcome centuries of bad blood. Just be sure to arm yourself to the teeth for battles against gun-toting slavers and airborne buzzards.



Croc

Croc by Vincent D. Zahnle of Martinez, Georgia, is this disk's Picture of the Month.

Welcome to "Gazette Gallery." Each month *Gazette Disk* features a collection of the best 64/128 artwork submitted by our readers. We pay \$50 for each piece of art we accept and an extra \$50 for the one selected as Picture of the Month. Send original art to Gazette Gallery, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

Fast Hat Trick

Hatronics (145 Lincoln Street, Montclair, New Jersey 07042) announces its HART (Hatronics Asynchronous Receiver/Transmitter) interface for the 64 and 128. This high-speed RS-232 interface is capable of sustaining interrupt-driven serial-to-parallel and parallel-to-serial data conversions at speeds in excess of 19.2K baud.

HART connects via the computer's cartridge port and is fully programmable in BASIC, 6502 and 8502 assembler, and other languages. Although still under development, HART will be provided with programming information, terminal software, and file-transfer programs for use with most modems and IBM PCs.

Great Balls of Fire

A multitude of colored balls are falling from the sky, and it's your job to make them disappear. That's the aim of *Pick 'n Pile* (\$29.95), a new release this spring from the French company Ubisoft and distributed by Electronic Arts (1820 Gateway Drive, San Mateo, California 94404).

To make the balls disappear, you must stack columns of identical balls. The column must be surrounded by others in order to make it vanish. Once a column has been completed, it disappears. If you are skillful enough to clear the screen of the balls, you're off to the next level. This exciting and frustrating game is designed for one or two players. Joysticks required. □

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FEEDBACK

E D I T O R S A N D R E A D E R S

Pope Gregory Did It

I realize *Module 64* (January 1991) is not primarily a calendar program, but rather a demonstration of how the program can load routines from a disk and link them together. I take issue, however, with the statement that *Module 64* will print any month between the years 0 and 2300. The years 1700, 1800, 1900, 2100, and 2200 are not leap years, as the demo indicates. Also, I see no notice of the fact that in the year 1582, ten days were omitted from the calendar when we switched from the Julian to the Gregorian calendar. In 1582, the day following October 4 was October 15. The *Module 64* calendar is correct only from March 1900 to January 2100.

RUSSELL E. HOLT
CANDIA, NH

You're right, Russell. While time may flow in a continuous stream (if we discount what some science fiction writers may say), trying to track it with calendars introduces a few holes and gaps. Pope Gregory made calendars more accurate when he devised his calendar with a leap year adjustment, but he unwittingly made it tough for computer programmers. Several readers pointed out these and other problems. See the following letter.

A shortcoming with the *Module 64* calendar is that the program allows for years prior to 1582 to be selected. For the Gregorian calendar, these years didn't exist. Also, for use in the United States and Canada, the program should limit the dates prior to 1752—September 14 to be exact. This was the date that the Gregorian calendar came into use in the British colonies.

ROBERT C. MARCUS
ST. THOMAS, ON
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*That's an interesting historical point you don't see mentioned with most perpetual calendars. We're glad to know that *Module 64* works, even if the demonstration's accu-*

cy is questionable. For those readers who may need to know the day of the week for any date on the Gregorian calendar, including those pesky end-of-century, nonleap years whose numbers end in 00 but are not evenly divisible by 400, COMPUTE programmer Bruce Bowden offers this simple program. By the way, Romania didn't accept the Gregorian calendar until 1917.

```
MJ 5 REM GREGORIAN DAY OF THE
      {SPACE}WEEK - BRUCE BOWDEN
MH 10 D$="MM/DD/YYYY"
RB 20 PRINT"ENTER THE DATE AS
      {SPACE}";D$:INPUT RS
QJ 30 IF LEN(R$)<>LEN(D$) THEN
      20
CC 40 M=VAL(LEFT$(R$,2)):D=VAL
      (MID$(R$,4,2)):Y=VAL(RIG
      HT$(R$,4))
BJ 50 F=365*Y+D+31*(M-1)
FS 60 IF M<3 THEN F = F+INT((Y
      -1)/4)-INT(.75*(INT((Y-
      1)/100)+1))
GB 70 IF M>2 THEN F = F-INT(.4
      *M+2.3)+INT(Y/4)-INT(.75
      *(INT(Y/100)+1))
PM 80 DY = F-INT(F/7)*7
KC 90 PRINT"WITH SATURDAY=0, T
      HE DAY IS";DY
```

A Different Calendar Lament

Can you help me with *Monthly Calendar* (March 1989)? Various lines in the calendar printout don't line up. I have a 128D, a Star SG-10 printer, and a G-Whiz interface.

R. H. LENTZ
JOSHUA TREE, CA

I have a fix for *Monthly Calendar*. The program won't work with the setup that I have. I have a Star NP-10 printer and a G-Whiz interface. I had to change the following two lines to make it come out right.

```
1030 PRINT#4,CHR$(18);"(2 SPACES)
      SUNDAY(6 SPACES)MONDAY(5
      SPACES)TUESDAY(3 SPACES)
      WEDNESDAY(2 SPACES)";
1040 PRINT#4,CHR$(18);"THURSDAY
      (4 SPACES)FRIDAY(4 SPACES)
      SATURDAY(3 SPACES)";GMS
```

I hope this helps some people who may have had trouble with the printouts.

RICHARD BUTTERFIELD
ATASCADERO, CA

Thanks, Richard. That seems to be just the fix that Mr. Lentz needs. When readers with certain hardware configurations have problems getting programs to run, it's difficult for us to offer solutions when we don't have the same hardware on hand. That's why we encourage readers to send in tips or Bug-Swat- ters that can help others with similar problems.

Best CAD

What are the best CAD programs for the 64 and the 128, and who makes them?

BRIAN TREASE
ERIE, MI

It's tough to say which of any kind of program is best, and we would hesitate to try. Since there aren't too many CAD programs available for the 64 or 128, however, we can mention a few titles. Chances are we'll leave one or two out—and I'm sure we'll hear about the ones we do—but the following programs are still readily available.

CADPak 64 (\$39.95) and CADPak 128 (\$59.95) from *Abacus Software* (5370 52nd Street SE, Grand Rapids, Michigan 49512) are fine programs that have been around for some time. CAD-3D (\$53.95) from *IHT Software* (2269 Chestnut Street, Suite 162, San Francisco, California 94123) is another.

For more specialized programs, there's *Home Designer 128* (\$39.95) from *Free Spirit Software* (58 Noble Street, Kutztown, Pennsylvania 19530). If you want to design printed circuit boards, check out *Printed Circuit Board 64* (\$75.00) from *Microsentinel Systems* (P.O. Box 4135, San Pedro, California 90731-4135). □

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If you're an artist who wants to express your creative talents, your 64 can be an exciting medium. Let's take a look at the wonderful world of Commodore graphics. To begin with, there are benefits and advantages of creating art on a computer over using more traditional methods. Unlike using tools such as brush, pen, pencil, charcoal, or pastels, which wear out and have to be cleaned, drawing on a computer's digital canvas isn't messy, and the medium is renewable. Also, there's no additional expense for new supplies.

You can create unlimited patterns and textures with different brush tips and nibs that you can save and use many times. The ability to experiment and change your mind as you work is open to you. By generating art on your computer, you can save the stages of your work in progress to disk for later retrieval. If you make a mistake, you can easily undo the last action. If you "spill" color somewhere, you don't have to grab a cloth and worry that your painting is ruined. You have the freedom to let your creativity flow, to make decisions as you work, and not to feel locked into a particular route.

If you decide that an earlier course was a better one, call up the last image and start with a fresh new approach, rather than starting from scratch. Also, by saving in stages, you'll have a visual record of sequences from sketch to finished artwork and learn from past efforts.

Cut-and-Paste Artist

The ability to duplicate portions of your image by cutting and pasting sections saves you from the tedious task of re-drawing multiple objects by hand. Because you are working on an exact replica of the original, you can share your images with fellow computer users. So it is very easy to duplicate your electronic images and share originals by swapping disks or uploading to a BBS.

Tools of the Trade

As with traditional artists, choosing the right tools is important to a computer graphic artist. As a traditional artist chooses the right brushes and nibs, you'll have to decide which is the best input device to suit your needs. Then you'll have to decide on a paint program.

A joystick is fine for arcade and maze games in which up, down, left, right, and diagonal movements are required, but it is not well designed as a drawing implement. A trackball might be more useful for drawing smooth free-hand curves, but it is very slow and unstable for doing straight lines.

Using a touch tablet and stylus that emulate pen and paper might seem more natural to some; unfortunately, they are not very accurate and are rather jittery. The KoalaPad touch tablet is popular but no longer made, but the pad that comes with *Animation Station* is a good replacement.

Using a lightpen is very close to drawing with an air-brush or paintbrush, but be careful of static when touching the monitor screen. Also, your hand and arm may become cramped by holding the lightpen in the air without support. The lightpen pointer, or cursor, may get lost in dark or red areas of the image, and you will be unable to move it. Many lightpens are cheaply made and are not precise. An exception of high quality is the Flexidraw Inkwell Lightpen.

The input device that provides the most accurate responsiveness and best follows the movements of your hand is a true-proportional 1351 mouse. Many computer artists find this to be the optimal input device.

Two Graphic Modes

The 64 has two graphic resolution modes. Multicolor, sometimes referred to as medium resolution, is the most



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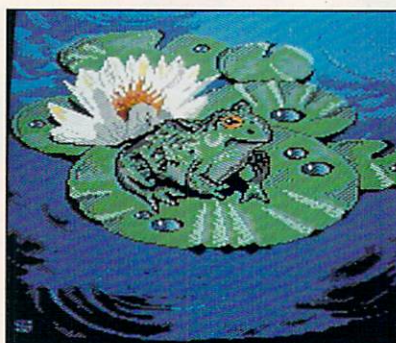
popular format and is often used for game title screens and graphics. It has a 160 × 200 pixel display and allows more colors to be used closer together.

High-resolution mode is composed of a bitmap image of 320 × 200 pixels. This mode allows for more pixel detail but limits placing colors in close proximity. Hi-res mode is used mostly for printer output rather than for screen displays. Koala is the standard format for multicolor, and *Doodle* is the popular format for high-resolution graphics. These programs were the first to exploit the graphics capabilities of the 64. (See "Bitmap Graphics on the Commodore 64.")

Many of the graphics packages that have followed *Koala* and *Doodle* have advanced to the point that they include many state-of-the-art drawing tools that would have been found only on programs for more expensive graphic computers. Each of the programs mentioned includes the basic drawing tools of freehand, line, box, circle, zoom, copy and paste, and undo. But they also have their own unique features that set them apart.

Graphics Galore

Because the 64 is a powerful yet inexpensive computer for creating graphics, a plethora of paint programs quickly sprang up, but only a handful



Excellent examples of a 64's black-and-white and color graphics are these pictures of a cabin, by Perry Miller, and a frog, by T. Preston Chesser.

of them have endured the test of time. In the past if you wanted to draw in both multicolor and high-resolution modes, you had to buy two separate packages. *Advanced Art Studio* is an easy-to-use menu-driven, multicolor program that supports multiple input devices. This British import also comes with *Advanced OCP Art Studio*, which is basically the same program, but in high-resolution mode.

Advanced Art Studio is unique because of its pull-down menu system. It offers three levels of magnification in zoom mode (2×, 4×, 8×), as well as scaling, mirroring, and rotating sections of the screen and saving them for later access. It includes a spray-paint feature and built-in editors for defining custom pens, brushes, patterns, and fonts. It includes a grayscale printer dump option.

Digital Artist is an all-purpose, state-of-the-art, full-featured, high-resolution graphic design program that supports a 1351 mouse or joystick and RAM expansion units and allows for editing on a virtual page larger than the viewing screen. Many features set this program apart from its competitors. These include a unique graphical user interface, digital parameter display of coordinates for precise alignment, rotation of selected object at any arbitrary angle, turbo-

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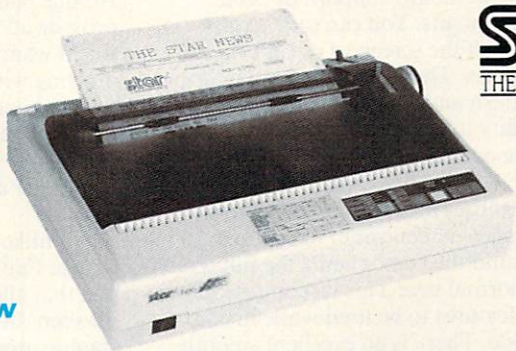
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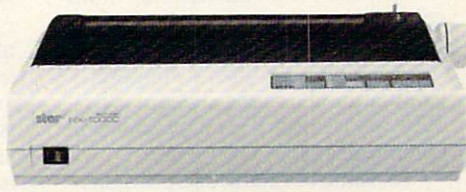
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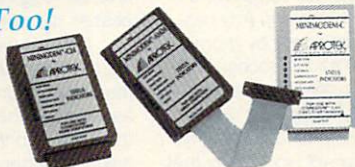
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Graphics from Overseas

Many of the more powerful paint programs are imports from Europe. *Mastertierpiece*, also known as *64 Image System*, is imported from Europe by Scorpion Software. It supports both high-resolution and multicolor modes. Some of its unique features are its ability to twist, bend, rotate, stretch, and distort objects for strange and unusual special effects.

Artist 64 is an outstanding multicolor paint program from England that has many features found only on Amiga paint programs. It supports joysticks and a mouse. There is a 1351 mouse driver for it available on QuantumLink.

It features multisided polygons from three to ten sides, the ability to draw with a cycle or rainbow of selected colors at a specified rate of speed, and protection and priority for colors to weave over and under each other (for those who decide to add a tree after drawing a brick wall and want to place it in the background). Other unusual drawing commands include remember cursor position (RCP) for drawing concentric circles, use last option for repeating an action, grab a section of the screen with or without colors to use much as you might a cookie cutter or rubber stamp, repeat paste, draw continuously, and draw text with a pattern.

Artist 64 also has an editor for unlimited brush tips and textures for shading. The most amazing feature of *Artist 64* is that its 13 commands can each be affected by one or more of 21 other options, for a total of more than 250,000 possible effect combinations.

AMICA Paint (Advanced Multicolor Computer Aided Paint) is an impressive and innovative graphics package from Germany, which I hope will be imported into the U.S. It pulls Amiga-like performance out of the 64.

It loads and saves standard Koala files, as well as its own compressed picture format. Its unique pop-up, multilevel menus can be accessed by function keys or hot keys.

AMICA Paint also has color protection and priority for selectively stenciling and masking certain colors, a repeat option, and a macro mode to load and save frequently used mouse movements and command sequences. It supports many hollow and filled shapes such as polygons, rays, ellipses, arcs, and cutout pie shapes. You can

adjust the size and power of the spray command. The block option allows you to mirror, rotate, enlarge, reduce, scale, stretch, bend, slant, skew, tip, or tilt into perspective any section of the screen for 3-D effects.

Other advanced features let you extrude, add a drop shadow, contour, thicken or smooth, create random gradient fills, mix, blend, or smear an area of the screen. You can load and save custom configurations such as cursor speed, movement and acceleration, keyboard support, or pixel movements. You can save to disk parts of the screen to use as custom brushes. There's an excellent built-in pattern and line editor, and it has the ability to rub through a second work area onto the current workscreen.

An excellent zoom mode either magnifies the full screen or shows a small 1/4-screen zoom of the area around the cursor while the full screen is normal size. This last option allows all features to be used while in zoom mode. There is an excellent smooth-scrolling slideshow feature built in. A true-color cycling animation feature

allows volcanoes to erupt and spheres to rotate. If that is not enough, there is the ability to load in animation, printer, and expansion modules.

Both *Artist 64* and *AMICA Paint* are truly extraordinary graphics packages for experienced 64 computer-graphics artists who are serious about their work and want many Amiga-like features. Too bad these European programs are hard to find in the U.S.

Graphics Conversions

No one paint program can possibly provide all the features and tools you might want. So the ability to create a drawing with one paint package and then enhance the picture with features found in another program is to your advantage. Moving from one format to another can present problems, however.

Unlike the Amiga IFF (Interchange File Format) standard file format that allows exchanging of images between different programs, each 64 graphic program has a different file format. You can't simply load one image into another program and edit it.

Bitmap Graphics on the Commodore 64

How does your 64 translate data in memory to pictures on screen? The answer is *bit-mapping*. This term means that no translation takes place—the data *is* the image.

Memory on the 64 is composed of 65,536 cells, called *registers*. As a group, these registers constitute the computer's RAM (Random Access Memory). Any register can be accessed randomly by merely giving its address to the microprocessor. The register, which we refer to in the abstract as a byte, is the fundamental unit of computer memory. Does this mean that no smaller memory units exist? No, simply that no smaller unit can be individually addressed. In fact, there is a smaller unit of prime concern to graphics programming.

Each byte carries with it eight digits. Each digit can have a value of either 0 or 1, similar to the off or on state of a light switch. These digits are called *bits*.

When a bitmap is used to make a computer picture, the bits affect what is seen. On the 64, there are two kinds of bitmaps. One sees each bit as a screen dot that will be placed on the screen (high-resolution mode). These dots, or picture elements, are called pixels. The other kind of bitmap uses two bits side by side to represent a pixel (multicolor mode). The difference has to do with the way the 64 handles color.

When each bit corresponds to a pixel, the bit is either off or on. Hence, there are two possible colors, a foreground color for the pixel whose bit has a value of 1 (on) and a background color where the pixel bit is 0 (off). But if there are two bits to every pixel, then there are four color possibilities. The first two bits correspond to 10 in binary; that is, the first bit is on, and the second is off. The second pair is 01, the third is 11, and the fourth is 00.

The 64's microprocessor, the VIC (Video Interface Chip), is specially designed for doing bitmapped graphics, but it has some peculiarities. The major one is the way it maps those bits to the screen. Remember that the bits are packaged eight to a byte and, although the VIC displays in bits, it accesses memory in byte groupings.

It starts with the pixel image at the top left of the screen as the 1st byte of the memory region to be mapped. Instead of assembling the byte images straight across the screen to the end and continuing on the next line, it deposits subsequent bytes below the 1st until there are 8 in the stack. The 9th is then placed next to the 1st and starts a new stack; then the 17th is placed next to the 9th, and so on.

When the end of the current row of 8-high stacks is reached, a new line is built in similar fashion below it, starting with the 321st byte. There are 25 of these 320-byte lines on a screen, resulting in 8000 bytes per bitmap. Since there are 8 bits per byte, that makes a total of 64,000 bits, or pixels—320 across by 200 down. It isn't by chance that this stacking arrangement, 8 bits across by 8 bytes deep, has the same dimensions as a character.

So far, we have a monochrome image. The 8 × 8 character blocks are also the fundamental units for color assignment. Whether an image is 2-color or 4-color, the colors are decided within the 8-byte character block grouping. Once a new character block is reached, a new set of colors may apply. That's why all 16 colors can be seen on the screen at once but there are only 2 colors within a character-sized region in *Doodle* art and 4 colors within the same region in *Koala* art.
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There are approximately 50 known graphic file formats for the 64. Without a conversion program that supports these different file formats, you could be lost. The best is *Auto-graph* by David DeSimone, known as Fuzzy Fox on QuantumLink. This graphics management utility may be downloaded from QuantumLink's Graphic Support Group Libraries. It will automatically display, convert, copy, scratch, and rename many of the popular high-resolution and multicolor picture formats.

The other program is *Pixelmaster* by Steve Emsley, Q-Link graphics formats expert, which is available from Silvasoft. It's a truly comprehensive graphic-translation, image-manipulation, and processing program for the 64. It supports over 40 graphic formats so you can easily exchange graphics between your favorite paint programs.

Create Video Titles

Because this is the video age, you can create video-creating cards or video titles for your home videos with packages like *Video Title Shop* and *Home Video Producer* by recording the 64 composite video output onto a video cassette recorder. You can also use any paint package with large fonts from GEOS or *Print Shop* to caption your home videotapes.

Graphics Support and Information

After you've created your masterpieces, how can you share them with others? Where do you go for graphic utilities? Where do you get to chat with fellow artists, share ideas, and get questions answered and problems solved? The best place to get all of these things is the QuantumLink Graphic Support Group on QuantumLink. Hook up your modem, and you can tap into this graphics resource and electronically transmit your picture just about anywhere in the United States. You can also chat with the masters of 64/128 graphics and other

graphic programmers who host the Starving Artists Cafe chat room each night on QuantumLink from 10 p.m. to 1 a.m.

Another outlet for your artwork is "Gazette Gallery," a feature found each month on *COMPUTE's Gazette Disk*. Accepted submissions earn \$50, and the artwork selected as the Picture of the Month earns \$100. Artists retain the rights to their creations. □

Paul Hughes and his twin brother, Peter, are the editors of *Geoworld* magazine. Paul is also one of the sysops (SYSOP PH) of QuantumLink's Graphic Support Group.

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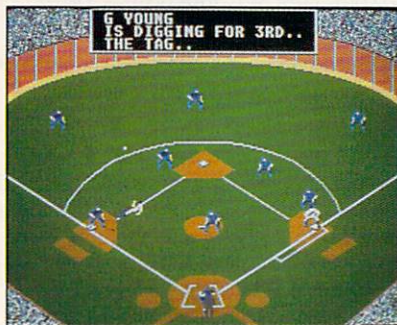
Yes, baseball fans, you, too, can become a part of a time-honored and elite fraternity. They are the few, the proud, the loud. Here's your chance to assume the role of the sometimes not-so-polite gentlemen who frequently explode from the dug-out, sprint across the baseball diamond, and accost the kindly, slightly nearsighted umpires, yelling just inches from their faces and kicking dirt on their shoes. Ah, the life of a major league manager!

Before you position your favorite baseball cap backward on your pate and ready yourself for a full-fledged rhubarb, there are other demands of America's favorite pastime that a good baseball manager must master. Can your starting pitcher last the remaining innings, or should you bring in a relief from the bullpen? Should you send the runner at first base to steal second? Do you signal the batter on deck to hit away or sacrifice bunt? These are but a few of the management skills featured in the new *Micro League Baseball II Enhanced* by Micro League Sports.

As in the original *Micro League Baseball* version, the object of the simulation is to manage a baseball team of your choice. Whether you win or lose depends on the managerial moves you make. The new and improved version, written especially for the 64, features improved ballpark graphics, pop-up screens for easy mid-game substitutions, stealing and base-running ratings, pitching/hitting stats vs. lefty or righty, a Quickplay option, and many other extras.

Micro League Baseball II Enhanced is absolutely great, and noth-

ing I've seen comes closer to the real thing. If you've always wondered what it would be like to manage the power hitters of the 1927 Yankees or how they would fare against the speed and athletic ability of the 1988 Dodgers, this is your vehicle. The simulation comes with a listing of 26 legendary teams of the past that you may pair as the home and visiting teams. Choose the stadium, the length of the series, and the rosters of your choice; and then play ball.



Two managers may guide their respective teams to victory, or one manager can challenge the management skills of the computer. If you like, both teams can be managed by the computer while you sit back (beer and hot dog in hand) and watch as the game unfolds before you.

Each manager is given the opportunity to choose his or her offensive and defensive moves. When your team is at bat, you tell the batter to bunt, to swing away, or to hit and run—and whether to take the extra bases or not. Engineering a squeeze play or having a runner steal a base depends on your individual player's athletic ability, the throwing-arm capabilities of the opposing team, and, of course, luck.

On defense, you size up the ability of the batter in the box. You decide whether you should instruct your pitcher to pitch an aggressive fastball, pitch out in anticipation of a stolen

base, or intentionally walk the dude at the plate. You position the outfield shallow or deep, and you shift the infielders to guard the line or to play in at the corners.

How deeply you will want to delve into this miniverse is up to you. *Micro League Baseball II Enhanced* lets you keep and compile stats on players, teams, leagues—you name it. You can trade players, create new rookies, and manufacture farm teams.

STEVE HEDRICK

Playability	4
Documentation	4
Originality	4
Graphics	4

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PRO TENNIS TOUR

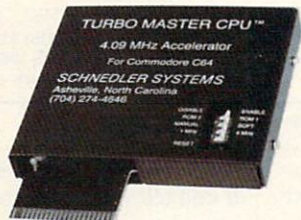
In the makeup of *Pro Tennis Tour*, it almost seems as if the player has been forgotten. Yet, in spite of that lapse, the game is a faithful representation of the sport it strives to simulate.

Based on the Grand Tour of professional tennis, which includes Wimbledon, the French Open, the U.S. Open, and the Australian Open, *Pro Tennis Tour* lets you play matches at some of the world's most famous courts and to play in several modes of difficulty.

For me, the primary difficulty came in mastering the joystick moves. To serve, you must click the fire button, position a black cursor to where you want the ball to land in your opponent's court, and then release the button (in Advanced and Professional modes, you click again) to hit the ball.

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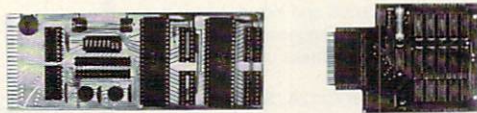
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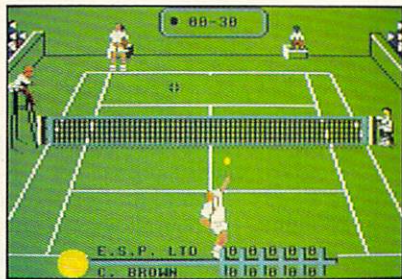
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Easy enough? Almost. But to return a ball, you must press the joystick button to swing the racket back and then release to hit the ball. The problem here is that your player stops



moving once you cock your racket arm. An added complication is choosing the desired return. For a lob, you move the joystick back; for a smash, you move it forward.

Moves of this type are not uncommon in computer games, and I've found they work well in slower games such as golfing simulations. Here, if you want the fast action associated with tennis, you'll have to put in so many hours of practice that you'll probably feel like Jimmy Connors.

Once you've passed this obstacle, however, the game can be enjoyable. You can practice your returns against

an automatic serving machine, practice serving, and play against the computer or a friend; but best of all, you can play the various world courts without having to play at championship levels.

Graphics and animation are very good, and care was taken to emulate the different playing surfaces found on the tour. The sound is so-so.

In addition to documentation that is adequate without being ostentatious, the game's booklet contains a section on tennis techniques, complete with diagrams. There's also a brief history of the game.

Had it not taken me several hours of practice to achieve a mediocre rating, I probably would've enjoyed the game more. But it's a game, not an avocation, and I usually find myself feeling no more than lukewarm toward any game that demands I put in it more than I'll get out of it.

If the user interface (in this case, the joystick moves) can be made as simple as a fast-action game demands, *Pro Tennis Tour* could be one of the great ones. As it stands, it's an average exercise that demands almost as much practice and skill to master as the real game of tennis.

ERVIN BOBO

Playability	3
Documentation	4
Originality	3
Graphics	4

Commodore 64 or 128; joystick—\$29.95

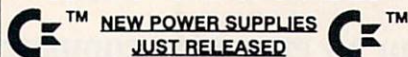
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MEGA PACK

I have this recurring nightmare. I'm being pursued by a loose stack of quarters, skittering after me in a Slinky-like motion. They're coming at me, shouting obscenities, trying to mow me down and bury me beneath their silver-and-copper sandwiched selves. They're angry with me, for now they'll never know the numismatic ecstasy of sliding down the roller-coaster innards of an arcade game money box. I've got *Mega Pack*.

Mega Pack from Virgin Games is a two-disk package of ten different arcade games for the 64/128. It leads off the first disk with *Rebounder*, a game

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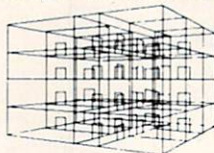
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in which you are a tennis ball bouncing across a scrolling landscape. Next is Jack the Nipper II, the adventures of a diaper-sporting brat (according to the manual—my game would not run). Monty on the Run is the third—a game a la *Goonies*, in which Monty the Bear tries to escape to freedom. Bulldog is your basic flying space jet trying to outmaneuver and outblast alien space stations. Krakout is next, a fancy pong game with a kick and a twist: You try to obliterate blocks and aliens with your ball and bat. Be the hero in Future Knight and try to save your maiden fair.

The second disk brings you Cosmic Causeway, a rolling marble game; Trailblazer, a sort of Cosmic Causeway for two; and Northstar, where you're responsible for resuming control of space station Northstar, which has been overrun by aliens. Finally, taking up all of side 2 of the second disk is Thing Bounces Back—a rather indescribable game of mazes and slides, pipes and surprises, in which Thing (as apt a description of this springy gremlin as any) needs to collect parts of a computer program.

Of the nine I could play, I found Monty, Krakout, Cosmic Causeway, and Thing to be the most fun, with Future Knight, Northstar, and Trailblazer next. Rebounder and Bulldog were OK, too (they bear a close resemblance to games designed with *Shoot 'Em Up Construction Kit*). Music and graphics on all the games, though differing in content and styles, were excellent.

Krakout provides the most adjustable variables, including options for screen color changes in time to the music's beat, scrolling, and bat speeds. It also boasts 100 screens. Monty on the Run is cute but challenging. I'm sure it can be done, but to be honest, I didn't make it past the second screen. Cosmic Causeway is real arcade fun and masterable enough to be satisfying rather than frustrating. Thing Bounces Back is incredible. It's fun and playable, and it's charismatic along the lines of *Tower Toppler*.

The manual to *Mega Pack* is brief but gives a pretty good rundown

of each game—better than having a friend tell you how to play them. And hey—how often do you get on-the-spot instructions to arcade games anyway?

Mega Pack provides a good cross section of games, something for everybody. It saves quarters, it saves wear and tear on the family car, and it keeps arcade addicts available for emergencies, like dinner and work, or school. It's a good value—and a lot of fun.

ROBIN MINNICK

Playability	4
Documentation	3
Originality	4
Graphics	4
Sound	5

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An enemy bunker in the jungle returns fire, and the plane is hit. Its oil pressure drops, and the pilot struggles in vain to keep the plane's nose up. There's no chance of making it back to the carrier, and the Hellcat plows into the jungle floor. Smoke engulfs the plane, and its ammunition explodes.

One plane down, two to go. The action is hotter than the Hellcat's six machine guns in *Wings of Fury*, Broderbund's new World War II action game for the 64.

The time is 1944, and you are a Navy pilot aboard the USS *Wasp*, somewhere in the Pacific. After the game loads, cycle through seven naval ranks to select your mission. Midshipmen have it the easiest with but one enemy-held island to attack. Move up in rank, and you go against enemy ships and fighter planes, plus numerous well-defended islands.

Before takeoff, arm your Hellcat with bombs, rockets, or torpedoes. Bombs and rockets are good against the machine guns, but you'll need a torpedo to have any chance of sinking an enemy ship. Don't worry if you run out of ammunition before you complete your mission; you can always return to the carrier and reload. You can land on a carrier, can't you?

Carrier landings are tough. I've crashed into my ship more frequently than enemy bombs have. Taking off is a snap. Just give the plane full throttle and hope you have enough speed to stay in the air once you leave the flight deck. Everything is controlled with your joystick.

You don't fly this game from the cockpit. Instead, you observe and control the action from the side as your plane scrolls left and right. It's almost like watching a war movie.

The graphics in *Wings of Fury* are pretty good. Your plane dips and dives over palm-covered islands as you try to eliminate enemy machine-gun bunkers that are firing at you. You have 30 bombs and plenty of bullets. The falling bombs, explosions, and plane crashes are detailed and entertaining.

The game's sound effects don't come close to taxing the 64, however. Engine noises, enemy fire, and explosions are fine, but your machine guns are almost silent. Most of the innovative sound work comes from plane crashes and ditchings at sea, but your Hellcat's six machine guns sound much too puny.

A panel at the bottom of the screen keeps track of your fuel, oil

pressure, and number of bombs remaining. It also keeps track of your score and the number of enemy planes you've shot down. There's also a small, forward-looking view that helps you with landing.

Landings are the toughest part of this arcade game, but they don't detract from its overall appeal. You will have to hone your timing and reflexes, however, if you expect to bomb anything other than palm trees.

The Hellcat is easy to fly, the action is fast paced, the missions range from easy to impossible, and the game restarts very quickly. I just wish I could stop playing kamikaze with my own carrier every time I try to land.

TOM NETSEL

Playability	4
Documentation	3
Originality	4
Graphics	3

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MACHINE LANGUAGE

J I M B U T T E R F I E L D

Let's set aside serious study for the moment and have a little fun with a simple race game. Four horses will race across the screen, and the winner will be selected at random.

One of the best ways to learn programming techniques is with a game, because once you have finished entering the bare-bones listing, you'll certainly come up with ideas to make the game more elaborate.

The BASIC loader will set up the program. The computer will wait for the jiffy clock to tick. The A register will contain the value of the low-order byte of this clock. We'll wait in a tight loop until the clock changes.

033C CMP \$A2
033E BEQ \$033C

Now the time has come to move a horse. Which horse? Pick it randomly by tapping the noise oscillator.

The noise oscillator will give a random value from 0 to 255. That's too large a range, since we have only four horses. The obvious thing to do would be AND #03, which would zero out unwanted bits and leave a random value from 0 to 3. For reasons that will become clear soon, it's better to start with an even number (0, 2, 4, or 6). You can AND #06 to get an even number in the right range.

0340 LDA \$D41B
0343 AND #06

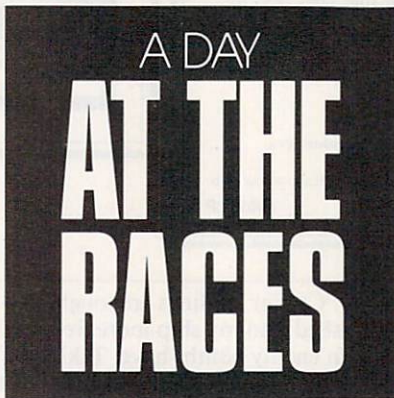
The x position of the sprites may be found at \$D000 and successive even addresses. Can you see how the even-number gimmick works? That's right; you slip the horse number into the X register and bump its position with an INC. After it's moved, you'll copy its position into Y.

0345 TAX
0346 INC \$D000,X
0349 LDY \$D000,X

Divide the random horse number by 2 with a Logical Shift Right (LSR) to reduce it to a number from 0 to 3.

Your objective is to change the sprite drawing to make the legs appear to move.

The drawing for each sprite is set in the video matrix (screen memory). The standard address for sprite 0 is \$07F8 or 2040 decimal. For the horse in question, the picture number will switch. The EOR instruction is ideal for this kind of flip operation.



034C LSR
034D TAX
034E LDA \$07F8,X
0351 EOR #01
0353 STA \$07F8,X

The selected horse has moved a pixel, and its legs have been adjusted. The horse's position is in register Y. If the value has reached \$FF, the horse has reached the finish line, and you can stop the race. You'll note that x position \$FF is not the right-hand edge of the screen, by the way. The race could go further if you would write the routines necessary to adjust the x-position high bit. But, in the interests of program simplicity, that project is left to you. To test Y, increment it, and if it becomes 0, you'll know that the horse has run the course.

0356 INY
0357 BEQ \$035E

Assuming we have not branched ahead to end the race, we need to go back to the start and wait for the next

jiffy (1/60 second). Load the jiffy clock into the A register and hop back to the beginning.

0359 LDA \$A2
035B CLC
035C BCC \$033C

If the race is over, return to BASIC, where the program will pause.

035E RTS

```
100 DATA 197,162,240,252,173
110 DATA 27,212,41,6,170,254
120 DATA 0,208,188,0,208,74
130 DATA 170,189,248,7,73,1
140 DATA 157,248,7,200,240,5
150 DATA 165,162,24,144,222
160 DATA 96
170 FOR J=828 TO 862:READ X
180 T=T+X:POKE J,X:NEXT J
190 IF T<>4770 THEN STOP
200 DATA 0,2,0,63,255,255,63
210 DATA 247,63,243,63,240,56
220 DATA 48,24,48,12,96,6,192
230 FOR J=0 TO 18 STEP 3
240 READ X,Y
250 POKE 896+J,X:POKE
897+J,Y:POKE 898+J,0
260 POKE 960+J,X:POKE
961+J,Y:POKE 962+J,0
270 NEXT J
280 FOR J=21 TO 27 STEP 3
290 READ X,Y
300 POKE 896+J,X:POKE
897+J,Y:POKE 898+J,0
310 POKE 961+J,X:POKE
960+J,Y:POKE 962+J,0
320 NEXT J
330 FOR J=30 TO 60 STEP 3
340 POKE 896+J,0:POKE
897+J,0:POKE 898+J,0
350 POKE 960+J,0:POKE
961+J,0:POKE 962+J,0
360 NEXT J
370 FOR J=0 TO 3
380 POKE 53248+J*2,25
390 POKE 53249+J*2,J*30+80
400 POKE 53287+J,1
410 POKE 2040+J,15
420 NEXT J
430 POKE 54287,55
440 POKE 54290,129
450 POKE 54296,128
460 POKE 53269,15
470 PRINT CHR$(147)
480 FOR J=1 TO 20:PRINT
TAB(31);CHR$(165):NEXT J
490 SYS 828
500 FOR J=1 TO 5000:NEXT J
510 POKE 53269,0
```



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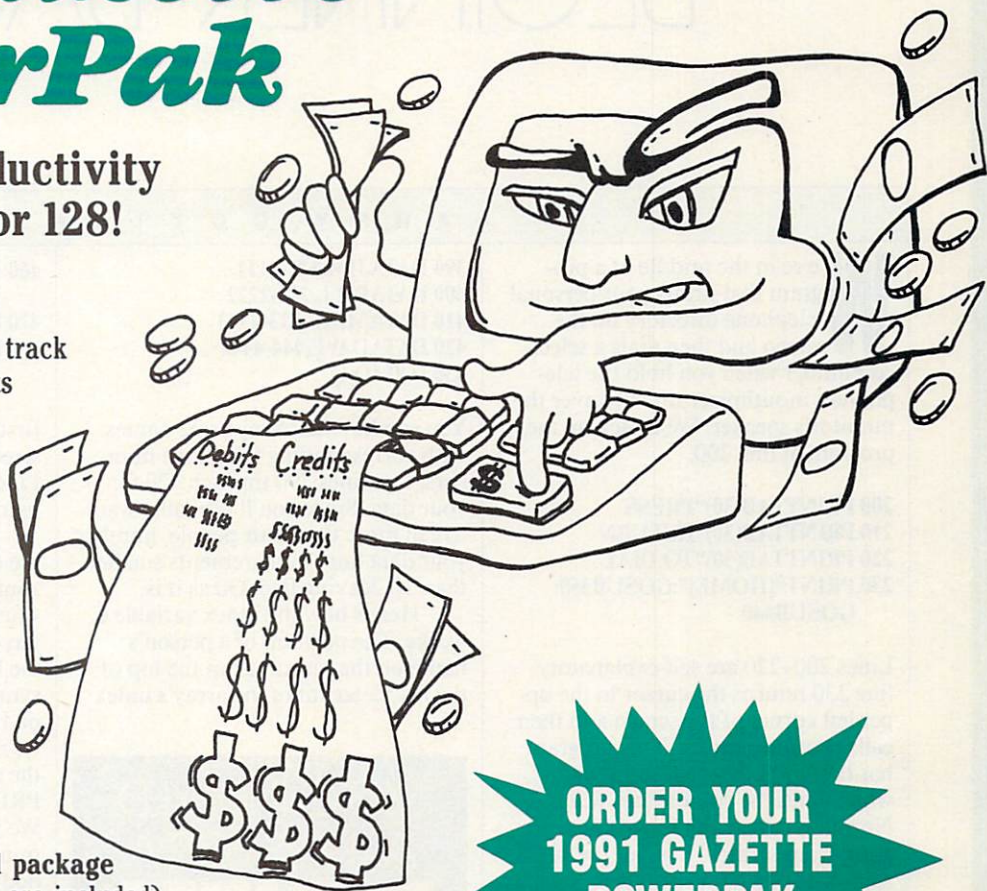
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BEGINNER BASIC

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```
200 PRINTTAB(30)"PRESS
210 PRINTTAB(30)"RETURN
220 PRINTTAB(30)"TO DIAL
230 PRINT"[HOME]":GOSUB350:
    GOSUB440
```

Lines 200-220 are self-explanatory; line 230 returns the cursor to the upper left corner of the screen and then calls two subroutines. This program has been renumbered, so I know which lines the subroutines will use. Normally, when you're writing a program from scratch, just put the subroutines at high line numbers, such as 1000 or 5000; you can then renumber the program later if you wish. Here's the first subroutine.

```
350 READN$,NU$(C):IFN$="Q"THEN
    RETURN
360 PRINTSPC(3)N$TAB(18)NU$(C)
370 C=C+1:IFC>22THENPRINT"NO
    MORE THAN 22 NAMES AND
    NUMBERS!":END
380 GOTO350
```

This is a four-line loop that reads and prints on the screen the names and numbers from lines of DATA while incrementing counter C. N\$ is the person's name; NU\$(C) becomes his or her corresponding telephone number. For each READ, an IF-THEN checks for a Q, which is an out-of-data signal. If a Q is read, the subroutine returns to line 230. Another IF-THEN in line 370 checks for more than 22 names and numbers.

We are filling what's called an *indexed array*, NU\$(C), with telephone numbers; C is the index to that array. We'll discuss that in more detail in a moment. Now let's add some fake data to read, which you should replace with real names and numbers.

```
390 DATAJIM,111-1111
400 DATABILL,222-2222
410 DATAMIKE,333-3333
420 DATADAVE,444-4444
430 DATAQ
```

You can have as many as 22 names with corresponding telephone numbers. Use lines 390 through 429 for your data. Since you'll probably want to call more than four people, number your data lines in increments smaller than 10, leaving line 430 as it is.

Here's how the index variable C works. The position of a person's name on the screen, from the top of the list, determines the array's index

MORE INDEXED ARRAYS FOR A DIGITAL DIALER

number, beginning with 0. In our ersatz example, Jim's name, N\$(0), will be printed on the first line from the top of the screen (line 0); his phone number, NU\$(0) is 111-1111. Likewise, Mike's name, N\$(2), will be printed on the third line from the top of the screen; his phone number is 333-3333, NU\$(2). We'll use the those critical line numbers later to generate the telephone dialing tones. Here's the second subroutine, which controls a symbol (*) that points to the names.

```
440 POKE214,Y:PRINT:POKE211,2:
    PRINT"[SPC]"
450 IFAS$="[UP]"THENY=Y-1:IFY
    <0THENY=0
```

```
460 IFAS$="[DOWN]"THENY=Y+1:
    IFY>C-1THENY=C-1
470 POKE214,Y:PRINT:POKE211,2:
    PRINT"*":RETURN
```

We want the symbol to appear first in the upper left corner of the screen, so we use this subroutine now. Lines 440 and 470 are the only ones used the first time through.

Memory registers 214 and 211 on the 64 control the vertical and horizontal positions, respectively, of where something is printed on the screen. In the subroutine above, Y is the line number that the pointing symbol * is on. If Y=0, the * will be on the first screen line. (Remember, we're counting from 0.) POKE211,2 is the same as PRINTTAB(2). PRINT"[SPC]" erases the asterisk. We'll get to lines 450 and 460 in a minute after we return to the main body of the program.

240 Z=50

Z is the length of time each pair of tones will sound when dialing and is used later in a simple time-killing FOR-NEXT loop. Remember, the screen has been printed (subroutine 350-380), and the * is pointing to the first name on the screen (subroutine lines 440-470). We now want to look at the keyboard, specifically the cursor-up and -down and Return keys.

```
250 GETAS$:IFAS$<>="[UP]"THENIFAS$
    <>="[DOWN]"THENIFAS$<>
    CHR$(13)THEN250
```

The cursor must move if the up- or down-cursor key has been pressed, so we use the subroutine at 440 again.

```
260 IFAS$="[UP]"ORAS$="[DOWN]"
    THENGOSUB440:GOTO250
```

Now lines 450 and 460 in that subroutine decrease or increase Y by 1, which effectively moves the * up or down. Once the * has been positioned next to the desired name, Y has a particular value corresponding

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to the vertical position of the *, the screen line number.

If the Return key has been pressed, control falls to line 270.

270 N\$=NU\$(Y)

Remember that in line 350 we filled an NU\$() array. Here's where we use Y to index the array. If, say, the * is on line 7 (the eighth line printed), N\$ will become NU\$(7)—the telephone number on line 7.

The next seven lines contain three nested FOR-NEXT loops. Basically, we want to scan the telephone number and have the computer play two tones for each digit scanned.

280 FORN=1TOLEN(NS):D\$(N)=MID\$(NS,N,1)

290 IFD\$(N)="*"THENNEXT

300 FORT=1TO4:POKEF(T),W(T,(VAL(D\$(N)))):NEXT

310 POKEG,VN:POKEH,VN

320 FORT=1TOZ:NEXT

330 POKEG,VF:POKEH,VF

340 NEXT:GOTO250

In line 280, the outermost FOR-NEXT loop uses its variable N and MID\$ to scan N\$ (the phone number)

one digit at a time. In the number 638-3990, D\$(3) will be 8. Line 290 causes hyphens to be ignored.

Using a nested FOR-NEXT loop and the VAL function, line 300 pokes two pairs of frequencies into the frequency control registers for voices 1 and 2. Line 310 turns on voices 1 and 2 with waveform 64, line 320 causes them to sound briefly, and line 330 turns them off. Line 340 closes the outermost FOR-NEXT loop, which is scanning the digits.

To use the program, carefully enter your DATA lines from 390 to 429. You'll probably want to use more than four people, so number your lines in increments smaller than 10. Run the program. A screen of names and numbers should appear, with an asterisk (*) to the left of the first one. Select a name with the up/down cursor key. Turn up the volume of your TV or monitor and press Return. You should hear touch-tone dialing tones.

Now pick up the handset of a nearby phone, place the mouthpiece directly over your TV or monitor's speaker, and press Return again. If the volume is adjusted properly, the computer should dial the telephone. If not, adjust the volume and try again. ☐

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PROGRAMMER'S PAGE

R A N D Y T H O M P S O N

What happened to the adage bigger is better? Unless you're discussing RAM, the old Texan logic is lost on computer technology. Smaller circuits, smaller disks, and smaller pixels are the mainstay of today's modern computer systems.

Let's have some fun this month and shift the wheels of micro-progress into reverse. The next time some 128 or IBM PC owners boasts of their 80-column display, ask them to show you something really impressive—say, 10-column text.

The BASIC listing shown below creates a machine language routine for the 64 that prints characters four times their normal size. Use *The Automatic Proofreader*, found elsewhere in this section, to help eliminate typing errors.

```

HD 100 REM BIG TEXT
CX 110 GOSUB 10000
FC 120 SYS49152," BIG TEXT ACT
      IVATED!"
SR 130 END
KJ 10000 FOR I=49152 TO 49484:
      READ D:POKE I,D:NEXT
AR 10010 RETURN
MH 10020 DATA 032,253,174,032,
      158,173,036,013
KA 10030 DATA 048,006,032,221,
      189,032,135,180
KR 10040 DATA 032,166,182,133,
      252,169,255,133
FA 10050 DATA 251,230,251,164,
      251,196,252,208
HM 10060 DATA 024,032,121,000,
      240,011,201,059
BQ 10070 DATA 208,217,032,115,
      000,208,212,240
XH 10080 DATA 007,169,017,032,
      008,193,134,211
JX 10090 DATA 096,177,034,201,
      032,144,031,201
FG 10100 DATA 064,144,042,201,
      096,176,005,041
CE 10110 DATA 191,076,109,192,
      201,128,176,004
EG 10120 DATA 041,223,208,025,
      201,160,144,006
GH 10130 DATA 041,127,009,064,
      208,015,201,029
RK 10140 DATA 208,005,032,017,
      193,240,178,032
JR 10150 DATA 210,255,076,025,
      192,133,253,173
FJ 10160 DATA 024,208,041,002,
      240,002,169,008

```

```

DS 10170 DATA 009,208,133,254,
      169,000,006,253
DS 10180 DATA 042,006,253,042,
      006,253,042,024
XS 10190 DATA 101,254,133,254,
      032,048,193,201
AR 10200 DATA 037,144,003,032,
      021,193,160,000
FK 10210 DATA 173,014,220,041,
      254,141,014,220
JA 10220 DATA 165,001,041,251,
      133,001,177,253
XF 10230 DATA 133,249,200,177,
      253,133,250,200

```

```

      210,255,032,210
HP 10390 DATA 255,032,210,255,
      202,208,232,096
BA 10400 DATA 165,211,201,040,
      144,003,056,233
SG 10410 DATA 040,201,000,096,
      160,172,187,162
KM 10420 DATA 188,033,063,062,
      190,191,161,060
ER 10430 DATA 034,059,044,032,
      000

```

Using this routine—appropriately titled *Big Text*—is very much like using a PRINT statement. After you've run the BASIC loader above, simply type **SYS 49152**, followed by the item, or items, that you want to print in quotation marks. Note that you must use a comma to separate the SYS command and the item(s) being printed. For example, to print the name of your favorite magazine, enter the following line:

SYS 49152,"COMPUTE"

Numbers can be printed just as easily. For example, the following command prints the result of a simple mathematical formula.

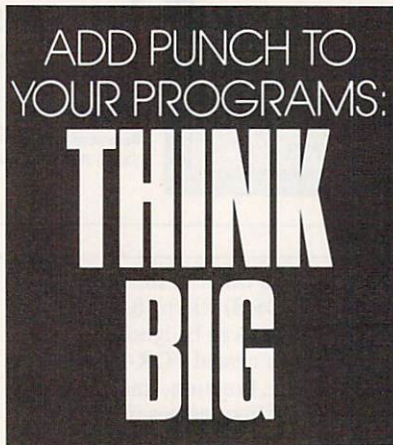
SYS 49152,"2 + 2 =";2 + 2

As with the PRINT command, you can use a semicolon to combine items being printed or to suppress the carriage return that is usually output at the end of each line. Because this program increases characters' size four times, carriage returns move the cursor down four lines instead of one.

Special control characters, such as Crsr Up or Ctrl-6, can be printed by *Big Text* and often produce impressive results. *Big Text* can't use the TAB() and SPC() functions, however. Using commas outside of a string to advance the cursor doesn't work.

Killer Birds

To show off *Big Text*'s capabilities, I've written *Flap Attack*, a simple arcade game in which large, hostile birds are attacking earth and must be shot down. Ten points are awarded for each bird hit.



```

SF 10240 DATA 165,001,009,004,
      133,001,173,014
QQ 10250 DATA 220,009,001,141,
      014,220,162,004
EB 10260 DATA 134,002,165,199,
      072,169,000,006
JR 10270 DATA 249,042,006,249,
      042,006,250,042
JS 10280 DATA 006,250,042,170,
      189,060,193,048
BQ 10290 DATA 012,009,128,162,
      000,228,199,208
QC 10300 DATA 002,162,018,134,
      199,032,210,255
JX 10310 DATA 104,133,199,198,
      002,208,211,169
AF 10320 DATA 157,032,008,193,
      169,017,032,210
QR 10330 DATA 255,192,008,208,
      155,032,021,193
QM 10340 DATA 169,145,032,008,
      193,076,025,192
BH 10350 DATA 162,004,032,210,
      255,202,208,250
KB 10360 DATA 096,162,001,208,
      002,162,004,169
CA 10370 DATA 029,032,210,255,
      032,048,193,208
JM 10380 DATA 011,169,017,032,

```




PROGRAMMER'S PAGE

The score, the cannon, and the flying invaders are all created by using enlarged characters.

The *Flap Attack* program is listed below. You must load and run *Big Text* before running this program.

```

HX 100 REM FLAP ATTACK
RS 110 CR$="{32 RIGHT}":CD$="{
  21 DOWN}"
GG 120 POKE 53280,0:POKE 53281
  ,0:BD$(0)="{UI}":BD$(1)="{
  JK}":
FR 130 SYS 49152,"{CLR}{BLU}SC
  ORE:"SC:SYS 49152,LEFT$(
  CD$,16)" {WHT}
  {3 SPACES}{A}{S}{YEL}"P
MB 140 PRINT "{BLU}{5 SPACES}P
  RESS THE SPACE BAR TO F
  IRE{YEL}";
XA 150 FR=0:Y=(RND(.)*8)+5:FOR
  X=0 TO 32
RK 160 IF PEEK(197)=60 AND NOT
  FR THEN FR=-1:G=18+X
JC 170 SYS 49152,"{HOME}"LEFT$(
  CD$,Y)LEFT$(CR$,X)BD$(
  XAND1)
RX 180 IF NOT FR THEN FOR P=0
  {SPACE}TO 30:NEXT:GOTO2
  40
XF 190 IF G-X<4 THEN FR=0
GP 200 PRINT "{HOME}"TAB(17)LE
  FT$(CD$,G-X)"<>{DOWN}
  {2 LEFT}{2 SPACES}":IF
  {SPACE}G-X<>INT(Y)+2 TH
  EN240
CG 210 IF X<13 OR X>15 THEN240
QJ 220 FOR I=7 TO 23:POKE 646,
  I:SYS 49152,"{HOME}"LEF
  T$(CD$,Y)LEFT$(CR$,X)"*
  *":NEXT
PJ 230 X=32:SC=SC+10
QB 240 NEXT:AT=AT+1:IF SC<>100
  THEN130
EX 250 PRINT "{CLR}{WHT}AFTER"
  AT"ATTACKS..."
DP 260 SYS49152,"{4 DOWN} Y
  {DOWN}O{DOWN}U H{DOWN}A
  {DOWN}V{DOWN}E":SYS4915
  2,"{3 SPACES}W{DOWN}O
  {DOWN}N"

```

How Big Text Works

Without the 64's extensive number of graphics characters, *Big Text* would not have been possible. To produce enlarged characters, this program uses graphics characters, instead of pixels, to draw a character's shape. The bit pattern of each character is retrieved from character ROM, located in memory at \$D000-\$DFFFF. Next, the bit pattern is evaluated, and each 2 x 2 block of pixels is converted into a single Commodore graphics character. Any 2 x 2 block can be represented by one of 16 graphics characters.

To speed up this pixel-to-character conversion, *Big Text* uses a lookup table consisting of the 16 possible

characters. Each 2 x 2 pixel pattern is converted into a number and used as an index to retrieve and print the corresponding graphics character. The accompanying figure shows the 16 graphics characters used and the order in which they appear in the program's conversion table. Not only does this conversion table increase the program's speed, it also decreases the program size by reducing the amount of code required to locate the appropriate graphics character. And as we all know, when it comes to program size, bigger isn't always better.

32	172	187	162
188	182	191R	198R
190	191	182R	188R
162R	187R	172R	32R

These 16 graphics characters can represent any 2 x 2 bit pattern. Below each character is the character's Commodore ASCII value. ASCII values followed by the letter R are displayed in reverse video. These characters are shown in the order in which they appear in the pixel-to-character conversion table.

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D'IVERSIONS

F R E D D ' I G N A Z I O

Recently, I was watching my 11-year-old son, Eric, sitting on the floor operating his Nintendo Game Boy. Suddenly Eric looked up and said, "Dad! I beat it! I finally beat *Super Mario Land!*"

I went over and sat down beside Eric. It took a while for my 40-year-old eyeballs to adjust to the miniature display screen on the Game Boy, but eventually the screen came into focus.

I was stunned. For months Eric had been playing the Game Boy, and I had imagined that its display was only a slightly more sophisticated version of the little hand-held games you see at drugstores and electronics outlets. I was wrong. The action figures on Eric's display screen, though in black-and-white, were incredibly detailed. The game action was complex and nonstop, and the little tune was catchy, if a bit repetitive.

The Game Boy is more than a toy. It's a full-scale computer!

The battle over Nintendo has been raging across the U.S. for years, ever since Nintendo America came along and revived a near-dead electronic-game industry. Educators, almost without exception, are allied against Nintendo and against kids' playing Nintendo. Educators say that Nintendo keeps kids from doing their homework, warps their minds, turns them into couch potatoes, and discourages them from reading.

All this may be true!

On the other hand, educators' epithets have done nothing to stem the Nintendo tide. Almost every kid in America has played Nintendo, and most households now have a Nintendo or a Nintendo look-alike tucked away in some kid's bedroom.

How many adults play Nintendo? Quite a few, judging by Nintendo's recent efforts to create adult-oriented games. However, whenever I speak at a national conference, I ask the crowd of 50-500 adults, "How many of you dare to come out of the closet and admit publicly that you like to play Nintendo and feel confident that you could whip a kid at it?"

The unbelievable thing is that I've *never* had a single adult raise his or her hand when I ask this question. This indicates to me that Nintendo is very much a generational issue. Nintendo game playing, the fascination with Nintendo, and the growth of its market are all related to who our kids are and who we are not. Nintendo offers kids something powerful that we aren't offering them, something powerful they aren't getting elsewhere.

What could that something be? Here are my guesses.

Power. The first is power: power to enter a simulated world where they are the top dog, where their decisions

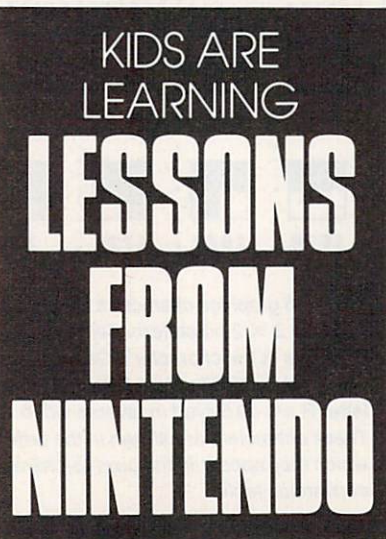
they're going to get there. They follow this character through a simulated three-dimensional landscape full of milestones and markers that tell them how much progress they've made toward their goals. They are on a quest, and this quest has meaning.

Control. Adults who think children play Nintendo for fun haven't spent enough time watching their children play Nintendo. Children take their Nintendos very seriously. Often while Eric is playing, I hear cries, grunts, cheers, and groans, depending on how a game is going. Eric measures his overt success by how long he can stay alive and how far toward an ultimate level he can travel. His deeper, more sustained quest in all Nintendo games is toward mastery, competence, and control over the reality of the Nintendo game world.

Mystery. Mystery is what makes Nintendo fun. The environment must be unpredictable to be challenging. If it's a good game, no one really knows every step through it. At any point, the next step may be successful—or it may be your last.

It is critical that some adult has not been there before you and now waits (like a teacher in the front of the room) for you to struggle to catch up. The world is a mystery, full of invisible buttons and dangers that leap out from all sides, and you have to master a game world by mapping it out. The only way to map it out is, through an endless series of game voyages into the wilderness, to be struck down again and again. Each time you go back, make it a little farther through the world before the game "you" is sacrificed on the altar of discovery.

It's my opinion that the Nintendo system is far more important than most of the adult world realizes. I believe computer games could form the basis for a new schooling experience for kids and maybe for us adults as well. It represents a new architecture of knowledge—a new way to map knowledge for the learner and a new way for the learner to navigate through knowledge. □



count, where the world's very existence is dependent on them.

Complexity. Simulated experiences that are so complex and so demanding that they challenge today's TV babies to give their undivided attention and to call upon every nook and cranny of their intelligence—or die (at least for a few seconds).

Context. Unlike their school days, children's Nintendo experiences are rich in context. Kids sees themselves acting in the role of one of the game characters. They know roughly what the game's goal is and how



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M A R K N E R I

Mordred, an evil wizard, has stolen the Great Cup of Castalia, plunging all the land into darkness. You have learned that the cup is hidden in a great underground castle. To recover the cup, you must make your way through many caves and caverns leading to the castle. The journey will be difficult; the caves are filled with goblins and traps. Can you return the cup and restore order to the world?

That is the story behind *Castalia*, an excellent arcade/strategy/adventure game. *Castalia* combines fast play, colorful graphics, and many levels to create a great game.

Getting Started

To enter *Castalia*, you'll need to use *MLX*, our machine language entry program; see "Typing Aids" elsewhere in this section. When *MLX* prompts you, respond with the values given below.

Starting address: 1C01
Ending address: 3478

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

Although *Castalia* is written in machine language, it loads and runs like a BASIC program. After you've loaded and run the game, the first level will appear with your character in the lower left corner of the screen. Move it using a joystick in port 2.

Goblin Cheese

The caves you must traverse are made of different building materials. It will take some time for you to become familiar with them and to know what you can and cannot do. The purple blocks are cave walls, which you cannot go through. The red bricks are impenetrable unless you have superstrength (see below).

It's possible to move through brown dirt, and gray boulders can be pushed to one side, providing there is space available. White doors are magic. You can pass through one unless you're carrying a boulder. The green

material that looks like dirt is goblin cheese. You cannot go through it, but goblins can eat a passage through.

Can You Spare a Spell?

Many types of treasure found in the caverns will help you on your journey. Yellow coins are the most abundant. Watch for white coins; each of them is worth ten of the yellow ones. You may also find white healing potions marked with an *L*. These restore one unit of your character's life force. The red superstrength potion allows you to

CASTALIA
EVADE THE GOBLINS
IN THIS EXCITING,
FAST-PACED ARCADE
ADVENTURE FOR THE
64. JOYSTICK
REQUIRED.

break any red bricks that get in your way. Collect an orange fireball spell, and you can shoot five deadly fireballs at goblins. Look for a light blue helmet and armor; each will limit the amount of damage goblins and their fireballs can inflict.

Goblins are the blue creatures that patrol the caverns. They are dangerous and will cause you to lose three units of life force unless you have the blue helmet or armor. You can kill goblins by shooting them with fireballs. If you trap a goblin so it can no longer move, it will turn into a white coin.

Magical Moments

In some caves, you'll find magical statues that shoot fireballs. These fireballs will take three units of your life force unless you have the helmet or

armor. If you stand directly in front of a statue, its fireballs won't be able to hit you.

Other magical items include teleporters. They are cyan, purple, blue, or green and resemble doors. Teleporters will take you to various places throughout the caves. Sometimes, these teleporters will be blocked by locked doors. To open these doors, you must find the key of the same color.

There are two types of toll booths between you and many treasures. The white booths cost 100 yellow coins to pass through; the yellow ones cost 10.

Your status appears across the top of the screen. At the left is the amount of time you have left with superstrength, followed by the number of superstrength potions you're carrying. The number by the fireball potion is the number of fireballs you have. Next, the healing potion shows the amount of life force you have remaining. Any keys or armor you have will be displayed next, followed by the number of coins you have collected.

Tips on Playing

Pressing the space bar during play pauses the game. While it's paused, you can push the joystick left or right to select a fire-button function. A gray border means you can press the fire button to carry a boulder and release it to drop the boulder, an orange border means you'll shoot a fireball when you press the fire button, and a red border means that if you press the button, you'll drink a superstrength potion. The screen will flash while you have superstrength. Press the fire button to restart the game. Press *Q* while the game is paused to start over.

If your life force drops to 0, your character dies. Press the fire button to restart the game, or press *Run/Stop-Restore* to leave the program. When you restart, you lose all of your coins and potions, but you retain your keys and armor.

Helpful Hints

Castalia is a challenging game, but it



PROGRAMS

can be solved if you take it bit by bit. Since you don't lose your keys or armor when you die, they are valuable. Once you've found a key, you can teleport past caves blocked by locked doors.

In many caves, goblin cheese will block your way. Move boulders so that the goblins will eat the cheese for you. Be careful if you teleport out of a cave when a goblin is about to get you. It will be waiting for you if you return.

Whenever possible, dispose of the goblins by trapping them with boulders so that you can get the white coins. Use fireballs only when necessary. When dealing with goblins in tight spaces, study their movements and try to find a safe place to stand so you can shoot them.

Use your superstrength potion sparingly. There are many places to use it, but not much potion.

Castalia is a fairly long game to type in, but its numerous features will keep dedicated game players busy for hours. It's filled with many little tricks that you'll learn after you've played the game a few times. Good luck.

CASTALIA

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1C01:0B 1C 70 17 9E 32 34 30 9B
1C09:37 00 00 00 20 20 20 BE
1C11:20 20 20 20 20 A0 C4 B9 2E
1C19:3C 08 99 F8 00 B9 FD 08 1F
1C21:99 33 03 88 D0 F1 A0 09 74
1C29:B9 0C 08 99 FF 03 88 D0 C9
1C31:F7 A9 13 85 2D A9 27 85 6E
1C39:2E 4C 00 01 19 A0 02 13 0E
1C41:27 EF 1E B9 6E 09 99 8E 1C
1C49:07 C8 D0 F7 EE 02 01 EE 41
1C51:05 01 C6 F9 D0 ED A2 03 4B
1C59:20 34 03 F0 33 C9 07 D0 BD
1C61:16 A2 01 20 34 03 D0 0A C8
1C69:A2 04 20 34 03 18 69 07 8D
1C71:10 05 A2 0A 20 34 03 85 45
1C79:A8 A5 A7 85 A9 A5 FE 85 24
1C81:F7 A5 FF 85 F8 20 6C 03 9B
1C89:A5 F8 85 FF A5 F7 85 FE 9A
1C91:E8 20 34 03 D0 1E A2 08 49
1C99:20 34 03 A0 02 84 A8 85 52
1CA1:A6 18 A5 FC 65 A6 85 F7 80
1CA9:A5 FD 65 A7 85 F8 20 6C 18
1CB1:03 4C 13 01 E8 20 34 03 24
1CB9:D0 1C A0 03 84 A8 E8 20 5E
1CC1:34 03 F0 08 A2 08 20 34 1D
1CC9:03 4C 5C 01 A2 0B 20 34 E7
1CD1:03 E6 A7 4C 5C 01 E8 20 D7
1CD9:34 03 D0 0A E8 20 34 03 DA
1CE1:18 69 04 A8 D0 D6 E8 20 5F
1CE9:34 03 D0 0A A2 02 20 34 49
1CF1:03 18 69 06 D0 ED A2 08 CA
1CF9:20 34 03 D0 E6 A9 00 85 20
1D01:A7 A4 FB F0 0C 06 FA 2A 5F
1D09:26 A7 C6 FB CA D0 F2 A8 01
1D11:60 48 B1 FE 85 FA A9 08 27
1D19:85 FB 68 A4 FE D0 02 C6 72
1D21:FF C6 FE C0 E7 D0 DE A4 DD

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1D29:FF C0 07 D0 D8 A9 37 85 E2
1D31:01 58 4C 0D 08 A4 A8 F0 71
1D39:22 A5 F7 38 E5 A8 B0 03 A6
1D41:C6 F8 38 85 F7 A5 FC E5 B2
1D49:A8 B0 02 C6 FD 85 FC B1 62
1D51:F7 88 91 FC 98 D0 F8 C4 6A
1D59:A9 F0 0A B1 F7 C6 FD C6 9E
1D61:F8 C6 A9 10 EC 60 78 E6 C0
1D69:01 4C 16 08 60 00 0B 08 9B
1D71:0A 00 9E 32 30 36 31 E3 48
1D79:0E 78 A9 02 E7 4A A2 F0 4B
1D81:BD 31 11 54 27 9D FF 2B 29
1D89:BD 21 12 00 B8 28 9D EF BE
1D91:2C 00 2A EB A2 51 BD 7F 3B
1D99:D1 9D 7F 29 10 BF F7 90 A6
1DA1:0B 85 01 1A 9E A9 1A 8D E1
1DA9:1E 1F 2C A2 06 9D 98 CA 0D
1DB1:D0 FA A9 06 8A EA 3C 34 55
1DB9:02 3D 22 00 EC 70 39 62 95
1DC1:A4 44 6A 91 5B 62 52 84 53
1DC9:AA 8D 98 2C 18 2D DC A9 6B
1DD1:0C 43 C5 91 C8 28 D6 44 8D
1DD9:0C 0F 20 62 0F 20 46 17 A4
1DE1:B2 45 38 04 7F 02 07 42 62
1DE9:9C A9 3A 71 C3 F8 0D 31 88
1DF1:1D 0C DF C0 4D 93 6A 4C 9F
1DF9:79 7E A1 4C 48 38 18 D0 AD
1E01:15 F0 1D 07 03 CD 4B 8F 8D
1E09:02 D5 08 58 62 5C A5 4F 61
1E11:85 5D 65 65 43 04 E6 4E B0
1E19:E6 4C D0 04 E6 4D 35 FC 0A
1E21:57 44 B1 CA A9 C3 F0 72 AD
1E29:C4 A5 5C C5 AD A5 5D D0 A8
1E31:0A 7C 09 43 30 16 C9 0A 5E
1E39:F0 12 AD 52 83 23 41 03 7B
1E41:A9 50 38 ED B0 8D 4C 00 A0
1E49:71 9D 08 10 3F 89 BD 62 A5
1E51:C7 4C 8C AD 71 F2 43 2C 19
1E59:05 E3 04 46 0C A3 9A 44 5E
1E61:18 00 FE 09 96 0E 24 00 4F
1E69:5E 75 0E 13 D4 84 28 71 9F
1E71:53 09 AB 54 59 03 D0 1A E6
1E79:33 17 A0 8D 43 1A A0 E3 E8
1E81:D0 08 AD 5A CE 40 90 69 85
1E89:89 A3 27 03 10 C4 05 E9 10
1E91:0E 81 F0 0A A1 9A 0C A6 2A
1E99:26 99 AF 07 06 B4 36 BC 43 DF
1EA1:87 16 FC 81 80 8D 69 60 4C
1EA9:C0 AF 8C 11 01 DE AA 29 D6
1EB1:7C 29 10 B1 67 45 02 80 90
1EB9:06 C0 0D 75 4B F4 09 8A C4
1EC1:86 1E C9 15 F0 1A AC 5F FB
1EC9:67 C8 98 10 04 CC 51 A8 9E
1ED1:97 AC 09 A9 14 CC CA C0 EA
1ED9:FB 09 AD 4E D9 80 2D 06 22
1EE1:C5 79 46 64 E4 00 DC 8D DC
1EE9:9B 29 10 AA 4D 40 01 8E E6
1EF1:42 E2 CC 3B 0E 22 1D 43 CB
1EF9:03 49 FF 29 0F 36 AE 10 5B
1F01:0B 79 81 F8 1F 86 01 00 F7
1F09:0D C8 9E 94 4E 8D 50 6B 62
1F11:7F C9 08 B0 65 E2 06 69 B9
1F19:3F B3 08 26 76 B9 57 44 D4
1F21:56 B9 58 0A 80 FA D2 F2 2D
1F29:0B 0C 0C 5C 42 0C 27 C0 D3
1F31:1F D1 82 D8 26 A1 68 89 63
1F39:BD 0B AB 1D 0B 30 C4 06 09
1F41:32 02 0B 55 0B 6C 20 23 3D
1F49:E5 0A 9F 0A 07 0B 12 0B 25
1F51:A7 80 F8 40 46 0A F6 0A F8
1F59:80 0D 64 04 C0 59 E1 54 6B
1F61:47 EB 1C 92 90 83 12 AD 4F
1F69:4C 70 F9 89 D0 04 86 64 C9
1F71:4D 03 09 84 9C 0A A5 D2 AB
1F79:07 51 1D 09 91 50 CA 04 2B
1F81:52 91 4E 52 05 06 C4 C6 CC
1F89:99 86 38 80 C9 1C A8 29 7E
1F91:72 55 DB 60 65 A0 6C 28 8E

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1F99:53 34 0A 73 84 83 54 03 E4
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1FA9:24 17 1E 0C C9 0A B0 05 21
1FB1:E8 F0 16 50 01 66 84 01 14
1FB9:E0 E9 3C 80 1B 85 C5 41 2E
1FC1:40 0E 97 82 0C AD F0 96 4E
1FC9:8D 52 03 0A 0A B4 38 44 3C
1FD1:CC 5A 74 EA 04 85 59 A2 D5
1FD9:00 A0 28 B1 58 45 71 85 A0
1FE1:29 FC C9 04 D0 36 20 4C 59
1FE9:A4 82 21 2B 81 5A E6 58 8D
1FF1:CC BE E3 E6 59 E6 5B A5 F3
1FF9:59 C9 08 D0 D9 AD 4A D1 51
2001:7C 48 18 A8 8C 4B A4 40 3A
2009:03 0E 35 18 6D 40 06 A8 97
2011:B9 F2 10 8D 41 6C 89 08 9C
2019:4F 69 0A F1 A4 A5 78 D0 39
2021:04 63 26 A3 26 1A 19 48 4F
2029:4D C6 85 47 01 64 05 C8 53
2031:7B 90 05 B0 0A 46 C4 BC AE
2039:17 12 71 F4 07 43 23 A3 36
2041:3F 18 70 D1 38 AE 10 6B 5A
2049:F0 5E D2 F8 68 D2 8B ED 17
2051:8D 66 1C D0 69 9B 63 18 1B
2059:D8 A9 02 B7 A6 78 0C A5 01
2061:4E 60 A2 28 85 50 85 54 84
2069:A5 4F E9 00 85 51 22 27 6A
2071:0F 55 0E D6 C4 B1 50 16 61
2079:5B 13 A9 8B 91 50 A9 0C 47
2081:91 54 4E 38 2E 00 28 85 34
2089:44 4C 82 0C A9 20 74 0F D5
2091:A0 21 90 0C A0 28 73 21 EA
2099:8E 90 C8 51 14 84 AC 4C CB
20A1:BC A2 60 C0 83 E6 39 02 2D
20A9:B6 4F A9 C0 C5 4E D0 09 84
20B1:A9 07 C5 4F 60 DE 10 B7 8C
20B9:0C 4C 25 09 A0 FB A2 7F 02
20C1:8A 1B 80 99 FF 03 80 19 DD
20C9:80 99 F9 04 80 19 80 99 33
20D1:F3 05 8A 39 80 0A 99 ED 7F
20D9:06 58 E1 4C DD AA 79 C1 82
20E1:F0 1A AA AD 04 12 49 02 4E
20E9:50 45 8A F8 85 0F D8 A6 45
20F1:22 44 22 08 05 4C 04 7A F4
20F9:00 8D 21 D0 8D 3E 62 21 1A
2101:38 80 39 01 99 8D 59 A6 13
2109:55 12 21 3C 97 03 25 39 AE
2111:C8 3D 39 23 90 83 3F 9C 0E
2119:03 01 39 28 1E A0 08 41 8B
2121:1D 04 E4 20 83 38 A0 0C DB
2129:A8 A2 20 26 0E BB 41 8D 3E
2131:89 53 68 22 21 72 08 20 3F
2139:22 0F 27 22 AD 67 A2 0D B4
2141:A9 22 23 04 A9 20 39 C0 86
2149:CE 90 5A 0A 04 B9 54 94 EF
2151:0F 98 0A AA A9 1C 63 03 B4
2159:04 98 7A 04 9D 11 D8 88 BE
2161:D0 E9 4C 87 0D 20 9F FF B0
2169:20 E4 FF 95 BE 00 07 C9 1C
2171:51 D0 69 96 B1 AD 39 D0 AE
2179:61 A7 AC 5A 78 8C A8 9A 73
2181:A8 4B 26 04 D0 0C CE 02 4A
2189:0D 10 1C A2 02 D0 A2 4C E8
2191:D2 0D 98 29 08 D0 0F EE B6
2199:E2 58 03 CD A0 0C 40 0A 60
21A1:B0 41 08 C0 CA 1C 07 AD 1C
21A9:C2 00 53 CD 42 F0 BF 40 2A
21B1:55 20 36 8A 85 0C C9 0C 12
21B9:F0 B0 4C EB 0D 1C 0E 06 E3
21C1:AC 79 78 B9 0A 0E 8D D0 7E
21C9:4C 1D 09 0C 08 02 98 A9 7E
21D1:C1 38 ED 49 03 8D 40 0B 2F
21D9:D8 90 05 AD 48 94 05 68 2F
21E1:68 4C 51 0F 60 04 F8 13 9E
21E9:34 10 00 04 B2 9C 40 90 A3
21F1:30 99 01 04 06 2A 47 0A 57
21F9:53 09 37 D0 13 B9 52 48 88
2201:56 B9 53 0E 85 57 6C 56 E2

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2209:00	69 0E B2 0E FD 0E AD C6	2479:1C	1C 1C 0C AC 3F F0 70 CF	26E9:4D	08 06 72 56 D2 45 50 9F
2211:20	7D F0 33 98 BC 05 4C 24	2481:07	1C 18 10 80 41 80 28 EA	26F1:A4	2D 61 68 5B 67 23 67 B4
2219:F5	0E C9 02 40 63 6D 0B AA	2489:BD	24 24 66 C7 26 18 00 AB	26F9:67	40 32 42 D8 6C 31 76 C5
2221:F8	98 14 A8 1B 26 05 1A AA	2491:54	08 18 3A BD A1 B9 30 C4	2701:75	76 76 E3 09 A8 6C 28 A0
2229:98	20 34 26 A9 01 15 59 7F	2499:1A	78 9D 69 CC 85 B8 FF 45	2709:95	34 0B 19 2A E0 05 5A 5B
2231:1C	31 17 F0 3E C4 70 00 A7	24A1:EA	AA 8E 75 F3 B7 FF F7 AA	2711:06	44 23 E5 8E 04 C5 14 5A
2239:81	C5 57 F1 40 24 74 0B 40	24A9:9C	87 9F 3A 06 FD 00 DF C1	2719:81	42 2D 50 5C 88 27 10 C6
2241:22	53 08 AD 35 29 90 5D 14	24B1:F2	2E E1 B5 81 1E 9F A1 FB	2721:42	35 46 3A DC 12 6D 45 99
2249:08	15 28 20 B4 C1 30 B1 9C	24B9:E6	3C 7A 6E 5A 14 1B 20 34	2729:08	55 62 D5 04 A6 DF 55 4A
2251:4E	C9 20 D0 23 AC 07 37 51	24C1:00	0E 37 EB DF 35 0E 01 24	2731:07	26 C6 7D 41 C4 83 2A 8B
2259:B9	AA 10 A8 AD 4D 03 00 5A	24C9:78	18 2C 34 5A 76 5E 3C C2	2739:84	A8 48 58 58 5E EE 1E A2
2261:CE	90 25 1A 85 21 88 13 4C	24D1:00	70 AC FB D7 EC 70 84 63	2741:68	B4 96 B0 8F 86 03 30 9B
2269:28	80 93 46 9C 93 00 E6 D2	24D9:73	B0 02 14 7A 20 AB DD 13	2749:EA	84 23 88 B6 40 00 82 54
2271:A4	88 29 48 45 9A 83 8C FB	24E1:6B	BC 6B B6 EB 5D 4B F8 4C	2751:75	5C 17 D0 10 2F 8F 85 43
2279:86	00 26 15 0A 9A 99 8D 03	24E9:41	F1 8D 8D 40 07 A1 A1 DC	2759:81	8C 0D 23 28 8E DB 12 A4
2281:3F	03 F8 AD 84 78 38 E9 80	24F1:A1	9D 95 9D FC 10 E2 71 5E	2761:AE	C1 10 80 6D F0 99 C3 A7
2289:01	8D 47 03 D8 A9 04 20 60	24F9:50	C7 0D 08 15 3C FF CD E5	2769:01	02 A4 84 A4 8C F7 C2 9F
2291:6D	10 81 F2 27 8D 44 03 EA	2501:43	88 C7 41 3C 24 5D 58 A1	2771:47	47 34 C3 A3 B0 05 29 0B
2299:A9	10 8D 42 E0 6C 9F 0C 90	2509:38	18 38 DD 40 46 00 00 75	2779:52	94 D7 0C B3 0C 46 1F 4B
22A1:9E	76 03 42 8C 60 2C A5 B4	2511:00	1D 80 00 1C 81 EC 18 8B	2781:B3	39 4E 20 69 06 E7 2A 21
22A9:4E	85 52 A5 4F 18 69 D4 9D	2519:BD	A5 A5 D8 99 A5 C3 C3 9C	2789:06	23 0B 1F 49 54 EA 55 BD
22B1:85	53 90 37 29 7F A8 B9 65	2521:A5	99 01 3F 8A 7B 1C D4 CB	2791:F1	25 50 C0 D5 1F 04 2B 9E
22B9:BE	10 D4 07 91 52 AD 4F EC	2529:31	BD DB 40 0A DB BD FF 36	2799:03	BE 50 DC 14 0C 28 41 53
22C1:03	AC 50 05 F7 60 16 83 FD	2531:36	91 3C 7E 45 C0 E0 F0 4A	27A1:F4	2C 5A 26 50 B0 64 C4 F5
22C9:D0	F9 AD 00 DC 29 10 F0 47	2539:60	04 F0 E0 C0 A6 7E 3C BA	27A9:F7	41 FC 91 0E 11 95 A2 7F
22D1:F9	4C 4E 08 A9 92 7D 9E A1	2541:40	01 18 18 03 07 0F FF C2	27B1:95	35 87 50 9C 98 34 31 EE
22D9:12	D3 E4 40 CA 46 5B 8C 6F	2549:FF	0F 07 03 C6 41 A8 65 5A	27B9:1C	65 A2 15 E2 08 F0 45 73
22E1:C4	80 AA 8D 04 4A 4A D0 85	2551:24	6F 42 56 1B 52 37 56 1E	27C1:E2	44 64 23 5A 2F 95 88 94
22E9:C1	8A 29 0F 1E 5E A5 5B D8	2559:62	A5 AC 63 04 32 5C D4 80	27C9:21	1E EA 00 02 2B 43 63 38
22F1:C9	B0 F0 03 4C 74 F0 5D 45	2561:16	0B 30 C0 C2 26 43 F2 68	27D1:82	A1 0E 9B 10 6E 23 18 DD
22F9:FC	A0 5A A9 30 85 5B E5 FE	2569:00	24 83 0A C4 4F 8C 40 8A	27D9:E6	C8 51 F5 72 65 40 CD CE
2301:58	A9 70 85 59 6D B5 A2 D2	2571:D2	44 74 76 60 82 55 84 68	27E1:10	B3 C0 00 9B E4 1F 2A 16
2309:00	49 A1 30 C9 00 21 87 F0	2579:52	50 C2 46 6F 55 6B 70 D5	27E9:26	56 78 83 84 54 72 1F A1
2311:10	C6 A1 C2 01 D0 0B A2 75	2581:04	88 40 18 56 76 58 2E E4	27F1:AA	88 24 B7 1F 06 48 45 9E
2319:20	8E 9B 03 76 AB 0F C9 01	2589:3C	C4 82 36 88 8D 1E E4 6E	27F9:44	04 56 A0 A8 04 48 84 AA
2321:02	D0 25 B2 13 F0 31 8D B8	2591:04	35 48 56 56 04 29 7A 29	2801:04	F7 38 51 F2 65 1F 25 FD
2329:F6	1E E0 A4 B1 58 AA A8 C5	2599:24	93 1A 02 A1 54 82 34 D5	2809:C3	1D B0 50 20 D1 8E 2C 2F
2331:AE	5C 03 4F 62 63 F8 4C 1A	25A1:73	29 24 63 26 20 D0 23 21	2811:12	18 14 23 C6 65 9B 4D 75
2339:01	10 0C F9 5B 03 AA BD 1F	25A9:A6	42 80 0E 42 78 D9 1F 8F	2819:05	D2 B4 41 25 20 AF 24 78
2341:16	10 91 5A 20 0F 8C 93 58	25B1:A1	7C 80 DF 30 C2 55 48 79	2821:6A	2E 35 42 BC A8 44 70 7E
2349:08	10 4C A4 0F A9 58 81 BC	25B9:41	82 42 42 0C 83 86 84 B2	2829:40	EC 08 86 78 41 94 55 85
2351:18	59 60 E6 5A D0 02 E6 75	25C1:CC	51 45 98 17 48 0C 51 3C	2831:06	C5 A8 F0 35 40 E4 28 B6
2359:5B	60 54 FC 21 0E 20 0A 4B	25C9:1C	02 0B 46 CC 25 96 2C BC	2839:84	23 AE C8 10 2C 90 70 BC
2361:CF	15 14 D0 16 17 08 09 4E	25D1:24	CA 59 C6 A0 29 47 23 D3	2841:11	2A 75 80 07 8A F4 25 C9
2369:1F	F8 42 01 02 03 28 29 6B	25D9:F1	04 66 46 47 76 64 B4 E0	2849:38	F1 F4 24 41 75 18 19 20
2371:2A	2B 18 19 1A 1B 34 F9 CB	25E1:3F	43 B9 30 2A EA 80 81 56	2851:13	85 1A 88 0E 8A 91 85 9B
2379:3E	1C 1D 1E 1F 24 25 26 65	25E9:46	62 94 67 2E 0C 75 20 78	2859:63	42 8A 44 E0 11 D1 E2 9B
2381:27	21 22 0F 23 A2 29 A9 78	25F1:0C	72 54 64 5D 03 84 98 48	2861:5D	1E 25 D5 1F 54 27 52 D4
2389:20	9D FF 03 A9 0F 9D 00 3C	25F9:42	65 82 03 88 78 87 84 F8	2869:84	A2 F4 30 3F 03 21 65 F3
2391:D8	30 06 6F A9 04 85 4F BF	2601:2A	EB 58 22 D1 23 52 94 DE	2871:2C	12 4D B0 41 40 55 40 65
2399:A9	00 85 4E A2 04 BD E9 D4	2609:1F	1F B8 E8 C2 E0 75 97 6E	2879:B8	20 70 75 26 45 4A F2 03
23A1:10	A8 BD ED 10 20 27 0F 0F	2611:0E	D8 16 45 52 76 51 F5 B6	2881:00	04 9B ED 26 50 74 05 85
23A9:CA	D0 F3 60 8D D1 0C 9E 78	2619:1B	BA 81 07 82 2E 46 8F 2B	2889:BC	AA 95 87 0A 8F 8D 62 98
23B1:0A	18 6D 4F 03 A0 0F 8C EA	2621:24	E6 98 1A 77 44 12 3E 1D	2891:64	94 71 0D A7 F0 50 28 02
23B9:18	80 38 10 8C 01 51 A0 DF	2629:66	0B 23 56 42 96 20 40 22	2899:1E	89 71 5F 22 BB 18 11 C0
23C1:00	8C 00 D4 8C 06 D4 A8 47	2631:32	D2 54 E2 64 B4 23 64 A4	28A1:40	40 27 0E 20 13 07 75 B8
23C9:B9	9B 20 2F 01 90 02 9C B5	2639:84	66 84 E3 56 46 67 D1 9C	28A9:B2	05 19 42 35 4B C5 29 67
23D1:29	04 D4 B9 9D 10 8D 05 31	2641:84	97 42 36 29 88 38 68 A5	28B1:F1	18 01 05 CE 26 26 52 1F
23D9:D4	60 64 81 69 14 21 09 2E	2649:62	75 74 4D B9 04 66 82 B4	28B9:35	09 8C 83 04 65 AE 7C 40
23E1:32	21 19 06 81 04 28 11 8A	2651:1C	86 58 2A 0F 23 62 65 39	28C1:86	94 54 28 54 0C 57 26 2F
23E9:2F	00 29 50 27 04 D0 C1 9E	2659:07	7E 45 0F 80 37 C4 91 5E	28C9:D8	E8 72 35 07 37 4F 95 AB
23F1:1B	04 C9 08 08 00 11 08 EA	2661:40	40 C2 BA 2A 84 C0 64 2C	28D1:0B	02 88 EC 0D 46 6C 2C 7E
23F9:04	04 04 74 01 06 06 14 4B	2669:F5	E4 C8 50 D4 11 82 B4 AB	28D9:2A	40 E2 F5 3C B1 20 80 84
2401:01	20 07 02 09 0C 07 02 5B	2671:04	CD 14 FA 97 A3 A1 23 17	28E1:A4	29 52 34 72 F5 54 EE 5F
2409:04	01 C0 03 08 08 C8 01 CE	2679:84	2C 82 0C 83 D1 B2 F1 DA	28E9:26	85 45 41 79 2A 74 08 D0
2411:07	03 04 01 03 0E 20 63 6D	2681:01	F4 24 E2 7B 82 F6 1A 2C	28F1:C8	82 75 42 88 2B 0E 05 2C
2419:0E	01 05 06 07 08 9B 03 3C	2689:B9	20 05 27 57 6A 10 60 B2	28F9:88	75 F1 51 08 08 26 54 40
2421:0B	0B 03 07 0B 22 09 08 7D	2691:50	B8 85 04 89 87 79 88 0B	2901:09	60 8C 34 6A 84 64 25 18
2429:0F	0C 01 0E 94 17 00 88 86	2699:10	35 74 15 63 C2 F7 18 49	2909:54	1E 08 25 52 B4 02 F8 C2
2431:41	03 01 04 57 00 05 05 05	26A1:62	23 F8 52 35 48 2F 51 A6	2911:43	1D 03 84 08 15 10 AC 56
2439:FF	02 FF 04 07 06 03 D0 69	26A9:F5	40 F5 84 27 40 46 61 30	2919:1B	E3 01 48 40 82 35 48 55
2441:F1	06 05 07 0A 05 08 06 8F	26B1:65	1F 44 62 45 98 81 E1 98	2921:48	08 2F AE F0 B9 10 18 89
2449:09	E0 05 FF 08 84 FF 07 48	26B9:E8	89 8A A7 00 52 65 0D C9	2929:26	40 4F B4 86 44 29 74 DF
2451:40	10 0C 42 E0 D0 30 0A 81	26C1:F1	86 D0 26 92 75 B2 AC 14	2931:80	85 54 74 D0 67 F0 2C 29
2459:0C	54 64 06 00 09 0B FF E3	26C9:60	10 24 54 24 77 28 B0 14	2939:4C	87 04 45 52 C7 03 05 25
2461:0D	A0 91 00 E4 61 1C 3C AB	26D1:00	F1 50 50 67 5C 21 8C 25	2941:49	40 85 49 49 49 F5 F2 DB
2469:30	38 38 38 30 0E 3E 05 9D	26D9:08	80 99 0C 0C 72 E5 77 AB	2949:F5	2A AD 41 41 21 08 20 A9
2471:46	7E 7E 66 66 E7 EA 0C 67	26E1:CB	28 34 67 25 28 EB 44 01	2951:C2	40 62 A6 41 02 C8 40 AF



PROGRAMS

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2959:84	50	54	80	58	F5	66	44	40	2BC9:45	E4	48	5E	5E	54	24	86	FD	2E39:05	01	77	07	02	54	1D	42	95
2961:0A	2B	42	18	01	2A	2B	50	A4	2BD1:64	80	07	08	99	37	18	85	3B	2E41:0F	B0	23	02	02	04	65	24	E4
2969:B2	65	46	55	05	2E	72	F8	4B	2BD9:93	38	E5	E5	1E	42	85	8D	B5	2E49:C8	61	F6	1F	1E	1E	CC	50	86
2971:54	0A	27	94	65	23	34	19	D7	2BE1:54	40	85	54	55	26	E5	7C	F3	2E51:B5	47	78	52	F1	01	1E	52	B0
2979:27	F1	3C	8B	68	28	D2	52	F7	2BE9:52	74	62	1D	A1	E4	40	84	4A	2E59:74	54	7B	02	5A	5A	5A	54	D9
2981:C5	89	A3	F8	85	68	45	71	E6	2BF1:24	50	B6	A9	1F	26	62	85	BB	2E61:45	25	65	61	EA	65	65	42	66
2989:2F	44	A0	43	10	08	B5	45	1E	2BF9:49	D6	12	65	34	64	04	0A	88	2E69:95	0B	C2	B4	1F	44	5D	DF	9B
2991:A0	EE	45	46	26	BA	1E	A5	FA	2C01:B7	24	B2	F4	73	30	F2	52	78	2E71:56	A1	E6	56	54	08	29	42	FA
2999:69	C8	C4	69	98	C3	23	E3	FF	2C09:1A	D5	1F	2F	85	4E	25	85	EF	2E79:65	04	24	57	94	40	46	06	BB
29A1:49	1A	9A	05	85	05	28	56	A9	2C11:1F	86	97	C1	A6	B4	98	C4	A7	2E81:28	65	60	64	D0	0E	75	22	69
29A9:44	50	95	04	70	45	78	0A	B8	2C19:38	74	C4	04	F8	A1	1F	52	E1	2E89:17	D4	56	25	16	00	A9	65	2D
29B1:41	F2	34	54	62	F4	44	64	01	2C21:D6	D3	99	56	1A	EB	02	23	1A	2E91:45	4A	4A	4A	9A	D5	44	52	18
29B9:45	30	DE	72	08	E6	AA	70	5F	2C29:38	23	2A	64	A4	08	87	70	B6	2E99:C6	8E	E1	05	52	C4	11	55	A6
29C1:75	46	2A	50	52	65	E0	FC	91	2C31:45	23	45	66	F4	54	62	24	E5	2EA1:26	89	12	07	18	75	29	51	60
29C9:56	C6	08	51	F5	51	F2	46	30	2C39:46	C1	A4	54	48	00	04	58	A1	2EA9:F2	D5	2F	15	0A	2B	42	3A	E7
29D1:27	8F	F2	88	64	40	C2	74	A0	2C41:C8	D8	08	20	58	06	DA	82	4A	2EB1:27	B4	0E	FD	56	20	11	19	DE
29D9:08	09	BA	D1	30	84	03	B4	35	2C49:17	64	56	45	AA	1F	55	82	64	2EB9:28	3E	9E	23	54	64	E6	1B	DC
29E1:0F	18	29	71	BE	21	52	76	93	2C51:FA	23	50	B2	B2	EE	4A	26	31	2EC1:8C	44	60	50	81	4A	D1	05	64
29E9:71	F5	1F	5C	12	4E	40	84	EA	2C59:0D	36	4C	34	96	F0	6D	9C	82	2EC9:A4	1F	E9	8C	46	84	60	23	6E
29F1:F8	8A	BA	25	50	E4	1F	46	C5	2C61:8D	4A	23	46	26	AC	2A	A5	B9	2ED1:A2	B4	25	5A	F0	69	C0	49	EE
29F9:56	65	62	84	38	7E	42	45	EA	2C69:F3	00	3F	35	42	49	27	64	E0	2ED9:9C	E4	82	C1	50	62	A8	15	9C
2A01:4A	52	85	19	05	51	40	CE	22	2C71:66	42	B5	44	55	0B	44	81	69	2EE1:40	C9	80	3C	63	B0	A4	04	CF
2A09:6E	A2	66	4F	17	51	EC	04	C6	2C79:F4	02	9A	46	64	25	99	3D	AC	2EE9:06	74	0E	54	24	F4	B0	40	04
2A11:A3	2E	83	A7	04	D2	4E	98	4E	2C81:A8	C3	63	24	48	60	EA	E8	50	2EF1:52	35	06	4A	AB	9E	4C	48	88
2A19:06	AA	25	AA	1D	86	4F	C6	D2	2C89:85	91	07	42	46	42	36	4C	02	2EF9:84	09	2F	54	4B	45	06	25	A6
2A21:24	5A	E2	35	06	4A	2A	F5	59	2C91:55	A2	35	44	2C	8B	B5	42	65	2F01:C7	F3	4C	4C	41	68	4B	07	D7
2A29:9F	C8	00	06	47	74	52	64	F4	2C99:95	46	62	44	66	81	0F	14	4A	2F09:E5	74	4B	E3	02	47	54	C4	B9
2A31:1F	2A	41	F4	C1	39	32	84	F2	2CAL:01	80	F2	3A	50	B4	EA	08	CF	2F11:48	40	92	D5	77	40	D5	1F	DA
2A39:0A	6E	23	91	F2	55	FC	54	B6	2CA9:1C	28	64	58	55	85	58	F8	96	2F19:07	68	72	15	50	21	89	93	62
2A41:47	27	B4	87	62	E6	14	FC	E5	2CBL:5B	35	0B	88	54	29	54	24	03	2F21:70	92	95	23	72	54	1F	87	EB
2A49:84	85	46	24	50	44	04	53	3B	2CB9:65	23	64	2B	24	5F	45	0B	01	2F29:40	24	A7	0A	70	24	A4	AA	4E
2A51:95	27	54	25	84	32	05	50	5E	2CC1:A5	87	75	46	25	41	CC	94	3E	2F31:45	1F	77	2E	56	65	1F	50	A2
2A59:85	AA	83	11	86	50	A5	A3	01	2CC9:1F	24	AD	11	44	DF	08	71	A4	2F39:D4	57	57	04	1E	44	72	F5	6F
2A61:6C	62	C4	64	2C	52	38	87	06	2CD1:61	38	90	26	71	14	61	62	5E	2F41:AA	0C	10	85	E2	A2	98	50	75
2A69:AA	46	9C	1F	88	44	1D	28	E1	2CD9:22	2E	C0	E0	15	71	55	D3	E1	2F49:44	0A	33	8B	8D	11	40	44	E0
2A71:85	85	F4	06	B6	47	0D	7D	53	2CEL:54	04	54	41	E1	64	52	38	81	2F51:AA	20	91	1F	9C	24	F9	94	2C
2A79:65	56	85	52	E0	88	85	82	A2	2CE9:88	59	E0	98	1A	45	06	75	E9	2F59:57	70	0A	B0	09	87	02	F8	2F
2A81:34	4B	29	92	21	B4	56	55	EE	2CF1:12	41	EA	A2	48	27	53	42	F2	2F61:08	24	4A	62	3B	04	24	54	C2
2A89:64	09	24	5A	23	84	58	58	B0	2CF9:74	1C	A5	5A	47	95	45	40	49	2F69:BA	2B	28	01	0B	43	92	41	D0
2A91:45	1E	64	E6	FE	57	60	4C	6D	2D01:10	AA	25	37	61	02	AC	34	C6	2F71:E4	95	06	11	45	F7	C8	61	76
2A99:4B	04	50	46	10	45	A8	84	6E	2D09:54	06	F4	D0	48	A4	BC	64	6D	2F79:E4	58	EC	11	6C	04	48	48	5B
2AA1:08	80	88	40	F4	1F	25	F1	8F	2D11:4A	25	85	97	45	47	24	AE	42	2F81:48	58	E2	46	60	92	1E	3E	9E
2AA9:89	45	52	F4	28	CD	F7	10	26	2D19:34	1F	C4	85	1F	56	55	0E	51	2F89:89	5C	72	55	4C	13	C4	16	B5
2AB1:14	10	1F	52	96	D4	29	54	CB	2D21:48	0B	E2	F8	00	94	0E	28	E4	2F91:87	2B	50	72	3C	15	60	12	B8
2AB9:54	0A	74	A8	28	46	A2	4C	BF	2D29:51	F5	BD	16	1F	2F	55	44	67	2F99:3E	AD	5A	E2	04	41	55	40	0C
2AC1:26	74	68	9B	0B	8C	62	44	A0	2D31:62	84	DB	15	73	2C	42	86	02	2FA1:44	34	88	C2	44	5A	D0	67	01
2AC9:92	93	39	97	E4	52	84	6B	D1	2D39:45	19	35	08	16	33	72	94	9A	2FA9:64	A3	55	05	29	B3	00	20	56
2AD1:88	45	09	52	C8	1E	1F	61	60	2D41:64	5A	23	45	52	34	A5	C4	90	2FB1:A0	54	42	20	32	2A	30	11	6B
2AD9:F0	46	E8	78	90	42	8A	A8	28	2D49:85	27	9B	0D	90	83	39	55	CE	2FB9:48	55	44	25	57	25	DB	0F	82
2AE1:3E	11	B4	64	41	E2	68	1E	FA	2D51:30	A7	54	72	42	65	74	45	35	2FC1:C5	25	28	02	4D	1D	10	1F	87
2AE9:09	A5	99	42	65	AA	46	0D	F2	2D59:24	AF	C3	A2	34	55	23	4A	DB	2FC9:26	59	11	40	4D	04	90	14	67
2AF1:CC	0E	94	08	2C	42	1B	03	E6	2D61:54	2F	57	60	B8	02	30	80	51	2FD1:87	78	D8	04	42	BA	0B	31	B1
2AF9:2F	B2	4B	9E	1A	31	D0	82	9F	2D69:46	42	C5	63	08	90	8B	46	46	2FD9:B2	58	44	2B	47	54	02	44	77
2B01:91	44	09	2C	6A	1B	19	BD	C4	2D71:27	41	F2	4C	0A	10	0A	41	B8	2FE1:D1	39	C3	44	46	44	92	34	D0
2B09:20	19	2A	45	47	1E	23	82	CA	2D79:54	29	64	23	A5	4C	2E	59	1B	2FE9:C4	C2	34	94	1E	70	16	50	5A
2B11:B9	2B	80	81	92	C5	0B	54	4D	2D81:1D	F0	8A	45	2F	44	1F	2E	9D	2FF1:EA	0C	0E	63	45	50	64	41	31
2B19:71	E2	38	08	BC	3E	43	FB	C9	2D89:B6	47	48	84	55	42	95	25	66	2FF9:EA	A4	C4	C4	AA	1E	40	02	2C
2B21:0A	48	52	A4	98	13	25	DC	5B	2D91:60	44	0C	EF	C5	10	0C	88	BC	3001:F9	52	84	06	90	31	55	23	63
2B29:8A	FB	A5	54	85	3C	0E	70	67	2D99:61	29	54	C4	30	01	08	CA	26	3009:41	F4	45	24	84	24	35	DC	2E
2B31:00	43	13	DA	0A	A2	48	54	68	2DA1:66	41	64	10	11	94	94	74	85	3011:09	04	F0	42	1B	15	14	47	D5
2B39:2F	6D	97	40	A5	73	35	A5	84	2DA9:04	40	45	17														



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30A9:81 66 20 85 22 18 E6 58 58
 30B1:80 B5 20 39 10 66 45 99 95
 30B9:46 98 18 78 28 62 C2 65 A3
 30C1:68 24 63 50 47 24 C0 49 66
 30C9:84 07 54 24 59 1E 92 04 67
 30D1:A3 55 40 98 64 94 94 94 1E
 30D9:24 54 64 F1 16 92 75 50 43
 30E1:0B 26 C2 A4 A4 A4 25 54 4A
 30E9:42 E5 07 1C 63 46 80 B2 6F
 30F1:64 93 21 23 A9 66 48 51 88
 30F9:F2 3C 2F 52 65 3E CE 21 D0
 3101:1E AA 09 4E 23 85 1F 92 23
 3109:F5 26 54 00 F8 54 F1 74 EB
 3111:08 40 D5 00 F7 2F 72 47 EC
 3119:40 F2 50 93 81 94 52 66 05
 3121:2F 55 52 36 40 A0 A6 96 86
 3129:96 91 F5 23 45 25 47 2E A7
 3131:49 23 46 EF 18 20 01 21 2D
 3139:50 55 D5 4A A5 05 8B 69 3A
 3141:78 48 47 69 69 4A 5E 54 F6
 3149:91 AA 26 71 78 46 64 56 F6
 3151:69 64 4A 0E 23 52 F4 44 3C
 3159:1E 1E 42 36 C2 03 07 56 84
 3161:94 A4 48 24 58 47 29 89 3E
 3169:0B 41 E1 E4 64 61 43 75 D0
 3171:56 4A 29 41 F2 84 24 62 1F
 3179:44 23 C9 13 E6 C8 2B 64 46
 3181:23 57 40 66 78 06 47 2B 4F
 3189:40 44 66 46 6A 66 24 30 B3
 3191:EE 00 89 4A 22 54 66 42 B2
 3199:86 42 85 4A 2E 2F 5C 4A 56
 31A1:A4 24 64 66 47 4B 80 84 3F
 31A9:A4 BB 76 A4 23 B6 CB 52 44
 31B1:D4 21 0A 44 59 B8 91 A0 BD
 31B9:62 06 45 CC 1F 23 50 52 BC
 31C1:35 67 1F 25 52 3C 1F 05 56
 31C9:B9 4A 97 E8 BB 4A 90 23 68
 31D1:8A 30 64 E5 08 0A 40 A4 FD
 31D9:0A 1F B4 D4 42 3B 44 A4 19
 31E1:54 04 61 01 42 55 45 26 C3
 31E9:0A 50 A5 52 34 BB 23 4B 61
 31F1:D0 F0 18 20 C8 80 28 3A D0
 31F9:72 55 44 6C 02 22 BB 25 6F
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 3209:72 45 44 29 B4 B4 49 44 62
 3211:E2 10 45 52 57 23 54 4B F3
 3219:26 4B B4 BB 41 F4 55 42 80
 3221:FB 7C 35 A2 54 1F 27 4B 2C
 3229:41 E2 6B 74 51 F5 1F 05 41
 3231:45 5A 54 23 5A A4 26 50 8D
 3239:72 35 44 B2 84 1F 1A 07 B3
 3241:9F 34 52 84 54 42 5B E1 59
 3249:EF 45 24 82 45 04 24 52 78
 3251:48 1F 57 AA 1E 1E AA 75 6B
 3259:0C 01 83 CF CE F0 2F 42 4C
 3261:A4 53 88 F9 67 89 40 72 F1
 3269:37 12 0A 2D 50 92 64 A0 38
 3271:85 42 F9 25 F8 2E 20 AC 28
 3279:70 00 05 20 C8 24 69 44 A6
 3281:99 24 88 39 CC 80 A0 4B 55
 3289:B2 44 BB 24 42 4B E0 0F 22
 3291:21 1E 07 75 44 14 24 2F 30
 3299:B2 FB 96 40 C5 40 1E 26 BE
 32A1:8D C2 02 4D 5D 14 23 1E 32
 32A9:03 45 42 CB 42 39 44 66 CB
 32B1:94 0D 1F 24 54 2C B4 40 C6
 32B9:84 69 2E 41 24 B2 E4 DA 25
 32C1:46 42 04 C0 A1 38 23 62 FC
 32C9:D9 25 40 03 99 44 3A 24 13
 32D1:62 F9 23 94 49 92 F6 66 7C
 32D9:20 3E 49 44 2F 92 F9 2B 2B
 32E1:92 00 1C 12 74 1C 42 2B F7
 32E9:87 60 83 CC FC CF C0 9E AE
 32F1:24 C1 68 7C 16 80 42 33 18
 32F9:42 52 A4 AA 01 D0 3D 1E 37
 3301:23 C1 C4 5D D2 4C 15 45 0F
 3309:C7 03 4E 24 14 8C E2 A8 61
 3311:01 76 98 D8 00 C9 D8 1E 2D

3319:D4 A0 50 68 C1 12 00 60 59
 3321:54 C0 62 42 3D 5D 39 D0 F4
 3329:03 11 75 E0 66 EC C4 D1 54
 3331:4D D7 D4 66 34 6D 1E 54 1D
 3339:58 86 39 1A D6 D2 5A E8 D5
 3341:CC 2A E3 64 21 4C 26 D1 B3
 3349:55 28 78 40 88 0B E4 CC 7E
 3351:26 64 77 0B DE 3B 01 20 89
 3359:0F 79 20 22 1E DD 2A 08 90
 3361:E8 42 75 44 5C C1 89 94 51
 3369:52 4D ED 1E 45 27 4C 1D 68
 3371:DE 4E 44 45 63 23 DE DD FA
 3379:9D 52 52 76 95 08 3F 45 85
 3381:45 DD 27 45 24 83 96 C0 58
 3389:74 94 0D 45 14 10 F0 12 1A
 3391:6E 45 28 89 0B 10 E6 61 E5
 3399:40 15 4E 39 06 41 E1 64 20
 33A1:91 45 23 D1 ED D1 9B E2 74
 33A9:56 E4 45 4D 4D 23 00 BC A5
 33B1:A2 10 28 1C 52 84 54 3A BB
 33B9:96 3B 2A EE E4 59 EE 90 69
 33C1:2F 36 E2 36 44 54 1E 41 FD
 33C9:A8 12 A0 22 63 A1 E1 E4 89
 33D1:54 0B 1E 66 1E B0 1D 48 85
 33D9:C4 55 C4 E8 06 D4 55 D4 22
 33E1:D4 C4 45 2A 80 0B 41 41 23
 33E9:21 75 1F C2 85 2A 40 D2 76
 33F1:94 C0 28 40 E2 94 0F E0 17
 33F9:9C B7 0E 53 44 61 28 5C E7
 3401:45 64 B5 26 39 1C F1 C0 1D
 3409:BB 43 A2 30 00 89 0E 95 4F
 3411:88 2D 3F 09 85 91 29 68 AE
 3419:24 DA 88 28 4C 22 A5 C7 DB
 3421:03 24 95 44 A2 2A 91 BA A6
 3429:10 03 90 C8 B5 88 29 A8 C3
 3431:82 A5 86 2C 58 82 7A 88 22
 3439:2B A8 1D D5 29 82 C5 32 73
 3441:1D 2E F5 25 82 E5 3C 1D 16
 3449:58 2E B6 1C C5 2B 82 B5 97
 3451:32 1D 54 04 F5 24 54 54 22
 3459:45 41 19 45 45 44 52 32 3E
 3461:1F 64 54 42 F5 2F 52 85 B7
 3469:0A 3E 64 0D 40 02 85 F4 CD
 3471:2F 42 84 00 80 00 00 00 96

ONLY ON DISK

In addition to the type-in programs found in each issue of the magazine, *Gazette Disk* offers bonus programs and original 64 and 128 artwork. Here are this month's bonuses.

Head On

Grant R. Young
Christchurch, New Zealand

The object of this outstanding two-player arcade game is simple: Try to find your opponent and annihilate him. Two players are placed in a maze that's filled with bullets, missiles, guns, and teleporters. Check out the excellent split-screen technique, and design your own mazes with the editor program that's included.

ON DISPLAY IN "GAZETTE GALLERY"

Picture of the Month:
CROC

Vincent D. Zahnle
Martinez, GA

NOMAD

Brian Kissinger
Evansville, IN

WINTER PINES

Robert Woodall
Rural Hall, NC

MOUNTAIN

Danny English
Moreno Valley, CA

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

Gazette Submissions Reviewer
COMPUTE Publications
324 W. Wendover Ave.
Ste. 200
Greensboro, NC 27408

Please enclose an SASE if you wish to have the materials returned.



PROGRAMS

J E S U S M E N D O Z A E S C A L O N A

If you need a useful utility program for reading, renaming, and scratching files, try *Multi-Reader*. It can handle one or more files at a time for extra speed and convenience, and it provides other useful file information as well.

This disk-management program displays the parameters of any file or program on disk. It provides a file's size in blocks, its type (program, sequential, or user), its starting and ending addresses, and whether or not the file is locked.

Typing It In

Multi-Reader is written entirely in machine language, but it loads and runs like a BASIC file. To enter it, use *MLX*, our machine language entry program; see "Typing Aids" elsewhere in this section. When *MLX* prompts you, respond with the values given below.

Starting address: 0801

Ending address: 1720

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

Remove any cartridges you may have plugged into your computer. They may interfere with *Multi-Reader* and cause it not to work.

When the main screen appears, you'll see a menu with all the program options. The first letter in certain words will be flashing. These are hot keys that will activate the *Multi-Reader* commands. The A, B, and Home keys are also active, although they do not appear on the menu screen. Their functions are covered later.

Using the Program

To use *Multi-Reader*, insert a disk in your drive and call up a directory. Use the appropriate hot keys to make your selections.

D Press D after you've inserted a disk, and its directory will appear onscreen. *Multi-Reader* will display all the files, even those that have been deleted (* del) and would not

normally appear on a directory listing. The current track and sector are displayed on the bottom left of the screen for your convenience.

S This option allows you to scratch or delete selected files. Select a file by pressing the space bar. This will highlight its name in the directory. You can delete as many files as you like at one time by simply highlight-

MULTI-READER

READ, RENAME, OR
SCRATCH FILES EASILY
WITH THIS UTILITY
FOR THE 64

ing each name. Before any files are deleted, you'll be asked if you are sure. Press Y to continue or N to cancel. After a file has been deleted, its file type changes to * del. If a read or write error occurs, it's displayed at the bottom of the screen, and the program stops until you press the space bar to continue.

R Press this key when you want to rename all the files selected. To rename a file, enter the new name on the bottom line of the screen and press Return. Use the Inst/Del key to correct typing errors. Press the Run/Stop key to exit. Any errors are handled as explained above.

G Press G to get or read all selected files. The contents will be displayed in ASCII characters. The current track and sector are displayed at the bottom of the screen. Press the

space bar to pause the information; press it again to continue. Press the Run/Stop key to stop and return to the main screen. When you've reached the end of the file, the program stops and waits for you to press the space bar so that you can continue reading the next selected file.

I This key provides file parameters: name, type, lock key, size in bytes, size in blocks, starting address, and ending address. The track and sector where the program is saved are displayed at the bottom left of the screen. To stop and return to the main screen, press the Run/Stop key.

Run/Stop To stop an operation during its execution, press this key. Press it at the menu screen to exit to BASIC. You'll be prompted to press Y to exit or N to cancel.

Cursor keys Use these keys to scroll up and down the filenames in the main screen.

Space bar Use the space bar to select a filename. Press it again if you should change your mind about a selected file. In the Get or Read mode, it's used as a toggle key to pause or resume the scrolling text.

B Press this key to scroll to the last file in the list.

Home Press this key to move to the first filename in the directory.

A This option toggles all the filenames between highlighted and not highlighted.

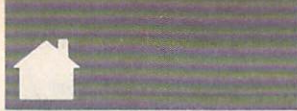
MULTI-READER

```
0801:0C 08 0A 00 9E 20 32 30 64
0809:36 32 00 00 00 A9 00 85 EC
0811:45 A9 A0 85 46 A0 00 A2 F1
0819:1F B1 45 91 45 C8 D0 F9 CF
0821:E6 46 CA 10 F4 20 06 11 D5
0829:20 28 11 20 49 11 A2 00 4B
0831:86 03 86 05 E8 86 02 86 52
0839:04 78 A9 6C 8D 14 03 A9 D1
0841:0E 8D 15 03 58 20 E4 FF 9B
0849:F0 FB A2 0A DD 1C 16 F0 42
0851:0E CA 10 F8 20 E1 FF D0 06
0859:EC 20 CB 11 B0 E7 00 8A 22
0861:0A AA BD 06 16 8D 70 08 09
0869:BD 07 16 8D 71 08 20 00 A1
0871:00 4C 46 08 A9 30 8D 32 39
0879:16 8D 33 16 A9 31 A0 38 4B
0881:8D 2F 16 8C 30 16 A2 FF CE
```




PROGRAMS

0889:86	09	E8	86	0A	A9	00	85	21	0AF9:A0	05	20	BD	0F	B0	26	A2	A9	0D69:18	A5	FB	69	20	85	FB	90	AE
0891:02	A9	00	85	43	8D	18	0F	F4	0B01:00	A0	05	BD	1B	17	C9	A0	25	0D71:02	E6	FC	E6	0A	68	85	02	53
0899:A9	8C	85	44	8D	19	0F	A2	28	0B09:F0	06	91	FD	C8	E8	D0	F3	AA	0D79:60	20	72	11	4C	57	0D	A5	AA
08A1:15	A0	00	98	91	43	C8	D0	E9	0B11:E0	10	F0	06	91	FD	C8	E8	19	0D81:05	F0	04	A5	0A	D0	01	60	2B
08A9:FB	E6	44	CA	10	F6	20	CC	10	0B19:D0	F6	20	14	0E	20	E1	FF	4F	0D89:A5	02	48	A9	00	85	02	A9	5E
08B1:0E	20	DD	0E	20	F2	0E	AD	04	0B21:F0	06	4C	65	0A	20	C2	11	78	0D91:17	8D	F7	E8	A9	03	8D	04	A0
08B9:18	0F	85	41	AD	19	0F	85	D3	0B29:4C	4E	0A	A5	05	F0	04	A5	2E	0D99:E9	A9	F0	8D	05	E9	A9	CA	F7
08C1:42	A0	00	B1	41	F0	0C	20	3C	0B31:0B	D0	03	E6	02	60	A9	00	B4	0DA1:8D	FF	E8	A9	EF	8D	08	E9	E9
08C9:7D	0F	20	53	0F	EE	19	0F	0B	0B39:85	02	20	42	0E	A9	00	85	57	0DA9:A9	D8	8D	0D	E9	A0	00	B1	D4
08D1:4C	B5	08	20	BE	0E	20	7B	62	0B41:41	8D	18	0F	A9	8C	85	42	1C	0DB1:FB	F0	5A	38	A5	FB	E9	20	E5
08D9:11	A9	00	85	43	A9	8D	85	96	0B49:8D	19	0F	A0	04	B1	FD	C9	05	0DB9:85	FB	B0	02	C6	FC	B1	FB	55
08E1:44	A0	02	B1	43	D0	07	C8	CB	0B51:12	F0	09	20	EA	0C	A5	0B	AD	0DC1:F0	4B	20	72	11	18	A2	03	83
08E9:B1	43	F0	61	A9	00	48	48	FD	0B59:D0	F1	F0	D7	20	67	10	20	CE	0DC9:A0	01	20	F0	FF	A0	1E	B1	F7
08F1:29	0F	C9	04	90	04	F0	02	4C	0B61:28	11	EE	08	ED	A9	17	8D	FF	0DD1:FB	AA	C8	B1	FB	20	CD	BD	82
08F9:A9	05	85	08	0A	0A	0A	38	16	0B69:04	E9	20	CC	0E	20	DD	0E	87	0DD9:18	A2	03	A0	06	20	F0	FF	A5
0901:E5	08	AA	A0	15	BD	35	16	87	0B71:A0	01	B1	FD	8D	01	8C	88	40	0DE1:A5	FB	18	69	04	A4	FC	20	34
0909:F0	06	91	43	E8	C8	D0	F5	7D	0B79:B1	FD	8D	00	8C	88	84	49	72	0DE9:1E	AB	38	A5	0F	E9	20	85	BC
0911:68	29	F0	D0	06	A0	16	A9	55	0B81:20	7D	0F	20	53	0F	20	F2	F4	0DF1:FD	B0	02	C6	FE	AD	72	07	7E
0919:2A	91	43	68	29	40	F0	06	62	0B89:0E	A0	00	B1	41	D0	13	C8	26	0DF9:C9	20	F0	B0	38	A5	3F	E9	90
0921:A9	3C	A0	1A	91	43	A0	03	AA	0B91:B1	41	38	E9	02	20	EF	0F	F5	0E01:20	85	3F	B0	02	C6	40	C6	F3
0929:B1	43	F0	21	48	C8	B1	43	21	0B99:B0	99	20	9B	11	20	41	10	C7	0E09:0A	68	85	02	60	20	72	11	8E
0931:48	A9	92	91	43	A0	01	68	44	0BA1:B0	B4	20	ED	0F	90	D9	4C	DA	0E11:4C	EB	00	A0	04	B1	FD	C9	A6
0939:91	43	68	88	91	43	E6	09	EA	0BA9:34	0B	A5	05	0F	04	A5	0B	8F	0E19:92	F0	06	C6	B0	A9	92	D0	DC
0941:18	A5	43	69	20	85	43	90	F5	0BB1:D0	03	E6	02	60	A9	00	85	1D	0E21:04	A9	12	E6	0B	91	FD	18	0D
0949:9E	E6	44	D0	94	A9	9A	8D	05	0BB9:02	20	42	0E	A9	00	85	41	9B	0E29:A2	0C	A0	06	20	F0	FF	18	EA
0951:8E	8C	A9	12	8D	8F	8C	A9	91	0BC1:8D	18	0F	A9	8C	85	42	8D	AD	0E31:A5	FD	69	04	A4	FE	20	1E	8C
0959:92	8D	A7	8C	A9	9B	8D	A8	55	0BC9:19	0F	A9	00	85	45	85	46	F7	0E39:AB	20	EA	0C	60	A5	05	F0	E5
0961:8C	A9	00	8D	A9	8C	18	A2	4F	0BD1:85	49	85	4A	A0	04	B1	FD	C8	0E41:07	20	80	0D	A5	0A	D0	F9	BA
0969:A0	A0	04	20	F0	FF	A9	8E	10	0BD9:C9	12	F0	09	20	EA	0C	A5	72	0E49:60	A5	05	F0	0F	20	42	0E	3A
0971:A0	8C	20	1E	AB	A2	1A	86	7F	0BE1:0B	D0	E7	F0	CD	20	67	10	8B	0E51:20	14	0E	A5	0A	C5	09	D0	E8
0979:05	8A	48	20	EA	E8	68	AA	32	0BE9:A9	89	A0	16	20	1E	AB	18	95	0E59:F7	20	14	0E	60	A5	05	F0	71
0981:CA	10	F6	A9	E0	85	3F	A9	BB	0BF1:A2	03	A0	10	20	F0	FF	A0	94	0E61:09	20	EA	0C	A5	0A	C5	09	12
0989:8C	85	40	A9	01	8D	E0	8C	72	0BF9:05	B1	FD	C9	A0	F0	08	20	54	0E69:D0	F7	60	A5	02	D0	03	4C	F7
0991:A5	09	48	C9	FF	F0	15	C9	16	0C01:D2	FF	C8	0C	16	D0	F2	18	99	0E71:31	EA	C6	04	D0	F9	A2	07	B4
0999:0B	B0	04	A9	0B	85	09	AD	A6	0C09:A2	05	A0	10	20	F0	FF	A5	33	0E79:86	04	A5	03	F0	04	A0	0B	A2
09A1:E2	05	C9	20	D0	06	20	EA	6B	0C11:FD	18	69	16	A4	FE	20	1E	3C	0E81:D0	02	A0	0C	49	01	85	03	B7
09A9:0C	4C	A0	09	68	85	09	E6	CB	0C19:AB	18	A2	07	A0	10	20	F0	48	0E89:98	D0	6E	D8	8D	BE	D8	8D	57
09B1:02	A9	E0	85	FB	A9	8C	85	C8	0C21:FF	A0	1A	B1	FD	C9	3C	D0	20	0E91:0E	D9	8D	5E	D9	8D	AE	D9	FE
09B9:FC	A9	00	85	0A	85	0B	A8	32	0C29:07	A9	04	A0	17	18	90	04	F7	0E99:A2	07	9D	4E	DA	9D	C6	DA	17
09C1:91	FE	A9	00	85	FD	A9	8D	D5	0C31:A9	08	A0	17	20	1E	AB	18	8E	0EA1:9D	3E	DB	CA	10	F4	20	B5	8E
09C9:85	FE	60	A5	05	F0	07	A5	64	0C39:A2	09	A0	10	20	F0	FF	A0	5F	0EA9:0E	AC	27	9D	C0	DB	CA	10	4F
09D1:8B	D0	06	20	7B	11	E6	02	50	0C41:1E	B1	FD	AA	C8	B1	FD	20	68	0EB1:FA	4C	31	EA	A2	1A	9D	E1	CD
09D9:60	20	CB	11	B0	F5	A9	00	5F	0C49:CD	BD	20	CC	0E	20	DD	0E	43	0EB9:D9	CA	10	FA	60	A9	0F	20	0F
09E1:85	02	20	42	0E	20	7B	11	58	0C51:A0	00	B1	FD	8D	00	8C	C8	1E	0EC1:C3	FF	A9	05	20	C3	FF	20	75
09E9:A0	04	B1	FD	C9	12	F0	09	E4	0C59:B1	FD	8D	01	8C	20	7D	0F	7A	0EC9:CC	FF	60	A0	0F	A2	08	98	0E
09F1:20	EA	0C	A5	0B	D0	EE	F0	15	0C61:20	53	F0	20	F2	0E	18	A2	E4	0ED1:20	BA	FF	A9	00	20	BD	FF	43
09F9:DA	18	A2	18	A0	01	20	F0	8F	0C69:0D	A0	10	20	F0	FF	A0	02	FE	0ED9:20	C0	FF	60	A0	05	A2	08	A2
0A01:FF	A9	73	A0	16	20	1E	AB	11	0C71:B1	41	AA	C8	B1	41	86	45	79	0EE1:98	20	BA	FF	A9	01	A2	27	67
0A09:20	CC	0E	A9	0F	AA	A0	00	21	0C79:85	46	20	CD	BD	A0	00	B1	E8	0EE9:A0	16	20	BD	FF	20	C0	FF	BD
0A11:20	C9	FF	A9	53	20	D2	FF	03	0C81:41	F0	08	A9	FB	20	86	11	90	0EF1:60	A9	0F	AA	A0	00	20	C9	44
0A19:A9	3A	A0	05	20	BD	0F	B0	BB	0C89:4C	CE	0C	C8	B1	41	20	86	E2	0EF9:FF	A2	00	BD	28	16	20	D2	47
0A21:1E	A0	1A	A2	05	BD	35	16	79	0C91:11	18	A2	0F	A0	10	20	F0	F3	0F01:FF	E8	E0	0D	D0	F5	20	CC	B1
0A29:91	FD	88	CA	10	F7	C8	C8	FD	0C99:FF	A6	45	A6	20	CD	BD	6A	BC	0F09:FF	A9	05	AA	A0	00	20	C6	E8
0A31:A9	2A	91	FD	20	14	0E	20	44	0CA1:18	A2	0B	A0	10	20	F0	FF	BC	0F11:FF	A2	00	20	E4	FF	9D	00	3C
0A39:E1	FF	D0	B7	4C	D4	09	20	BB	0CA9:A6	49	A5	4A	20	CD	BD	20	94	0F19:8C	E8	D0	F7	20	CC	FF	60	E5
0A41:C2	11	4C	D4	09	A5	05	F0	AB	0CB1:9E	11	20	BA	10	A9	00	8D	C1	0F21:18	A2	18	A0	01	20	F0	FF	6B
0A49:07	A5	0B	D0	06	20	7B	11	71	0CB9:E0	8C	20	14	0E	A9	FB	8D	47	0F29:A9	00	20	BD	FF	A9	08	AA	5D
0A51:E6	02	60	20	42	C9	20	7B	6D	0CC1:85	0C	20	E1	FF	D0	03	4C	57	0F31:A0	0F	20	BA	FF	20	C0	FF	15
0A59:11	A0	04	B1	FD	C9	12	F0	E5	0CC9:B3	0B	4C	0E	0B	A9	FE	8D	A0	0F39:A2	08	20	C6	FF	20	A5	FF	E6
0A61:09	20	EA	0C	A5	0B	D0	EE	0A	0CD1:85	0C	20	7D	0F	20	53	0F	3A	0F41:C9	0D	F0	05	20	D2	FF	D0	13
0A69:F0	E3	18	A2	18	A0	01	20	81	0CD9:20	F2	E0	20	E1	FF	D0	06	39	0F49:F4	A9	08	20	C3	FF	20	CC	7A
0A71:F0	FF	A9	7F	A0	16	20	1E	86	0CE1:20	BE	0E	4C	B3	0C	4C	7E	25	0F51:FF	60	A9	04	8D	AE	0F	A0	E2
0A79:AB	A2	FF	86	08	20	E1	FF	F8	0																	



PROGRAMS

0FD9:21	0F AD C2 07 C9 30 D0 BE	1249:9B	C2 20 20 20 20 20 D3	14B9:20	20 20 20 C2 20 20 20 F6
0FE1:09	AD C3 07 C9 30 D0 02 8B	1251:20	20 20 20 C2 AB C3 C3 A3	14C1:20	20 20 20 20 20 20 C2 8C
0FE9:18	60 38 60 A9 FD 85 45 CE	1259:C3	C3 C3 C3 C3 C3 C3 7D	14C9:C2	20 20 20 20 20 20 20 43
0FF1:20	CC FF A4 43 A6 44 18 F2	1261:C3	C3 C3 C3 C3 C3 C3 85	14D1:20	20 20 20 20 20 20 20 F9
0FF9:20	F0 FF A0 02 84 46 A5 C2	1269:C3	C3 C3 C3 C3 C3 C3 8D	14D9:20	20 20 20 20 20 20 20 02
1001:49	10 0F A9 26 85 49 20 40	1271:C3	B3 20 12 97 44 92 9B 18	14E1:20	20 20 20 C2 20 12 97 7A
1009:EA	E8 18 A2 17 A0 00 20 61	1279:49	52 45 43 54 4F 52 59 91	14E9:43	52 53 52 20 55 2F 44 D0
1011:F0	FF A5 45 C9 FF F0 3F 22	1281:C2	C2 20 20 41 20 3D 20 E2	14F1:92	20 9B C2 C2 20 20 20 02
1019:A5	49 30 E7 A4 46 B1 41 C5	1289:54	4F 47 47 4C 45 20 41 02	14F9:20	20 20 20 20 20 20 20 22
1021:C6	45 C6 49 E6 46 C9 0D 54	1291:4C	4C 20 46 49 4C 45 4E AB	1501:20	20 20 20 20 20 20 20 2B
1029:F0	D9 29 7F C9 20 B0 02 87	1299:41	4D 45 53 20 C2 20 20 FB	1509:20	20 20 20 20 20 20 20 33
1031:A9	2E 20 D2 FF 20 F2 11 5A	12A1:20	20 20 20 20 20 20 C5	1511:C2	20 20 4D 4F 56 45 20 FB
1039:20	B4 11 90 D5 20 BE 0E 7C	12A9:C2	C2 20 20 20 20 20 C7	1519:20	20 20 C2 C2 20 20 20 82
1041:20	BA 10 20 28 11 20 49 33	12B1:49	4E 20 54 48 45 20 4C 3B	1521:20	20 20 20 20 20 20 20 4B
1049:11	A9 00 8D E0 8C 85 D4 4E	12B9:49	53 54 20 20 20 20 20 C5	1529:20	20 20 20 20 20 20 20 53
1051:85	C6 20 14 0E 38 60 A5 E2	12C1:20	20 20 20 20 C2 20 12 62	1531:20	20 20 20 20 20 20 20 5B
1059:D3	85 43 A5 D6 85 44 A2 7F	12C9:97	53 92 9B 43 52 41 54 D4	1539:C2	20 20 20 20 20 20 20 B4
1061:05	20 C6 FF 18 60 A2 04 70	12D1:43	48 9B 20 20 C2 C2 20 D0	1541:20	20 20 C2 C2 20 20 20 AA
1069:A0	00 B9 00 04 99 00 A0 38	12D9:20	20 20 20 20 20 20 20 FD	1549:20	20 20 20 20 20 20 20 73
1071:B9	00 05 99 00 A1 B9 00 A2	12E1:20	20 20 20 20 20 20 20 06	1551:20	20 20 20 20 20 20 20 7B
1079:06	99 00 A2 B9 00 07 99 A2	12E9:20	20 20 20 20 20 20 20 0E	1559:20	20 20 20 20 20 20 20 83
1081:00	A3 B9 00 D8 99 00 A4 93	12F1:20	20 C2 20 20 20 C2 20 6A	1561:C2	20 12 97 20 53 50 41 E0
1089:B9	00 D9 99 00 A5 B9 00 65	12F9:20	20 20 20 20 C2 C2 20 ED	1569:43	45 20 20 92 20 9B C2 9B
1091:DA	99 00 A6 B9 00 DB 99 0F	1301:20	42 20 3D 20 47 4F 20 7C	1571:C2	20 20 20 20 20 20 20 EC
1099:00	A7 C8 D0 CD CA 10 CA 4E	1309:54	4F 20 54 48 45 20 4C 5A	1579:20	20 20 20 20 20 20 20 A3
10A1:A0	1E B9 DA 00 99 00 A9 8E	1311:41	53 54 20 20 20 20 20 1B	1581:20	20 20 20 20 20 20 20 AB
10A9:88	10 F7 A9 37 85 01 A9 27	1319:20	C2 20 12 97 52 92 D7	1589:20	20 20 20 C2 20 20 53 FB
10B1:93	20 D2 FF A9 35 85 01 2C	1321:9B	45 4E 41 4D 45 9B 20 1B	1591:45	4C 45 43 54 20 20 C2 74
10B9:60	A9 36 85 01 A2 04 A0 CE	1329:20	20 C2 C2 20 20 20 20 C2	1599:C2	20 20 20 20 20 20 20 15
10C1:00	B9 00 A0 99 00 04 B9 E8	1331:20	20 46 49 4C 45 4E 41 2D	15A1:20	20 20 20 20 20 20 20 CB
10C9:00	A1 99 00 05 B9 00 A2 37	1339:4D	45 20 20 20 20 20 20 3F	15A9:20	20 20 20 20 20 20 20 D3
10D1:99	00 06 B9 00 A3 99 00 DC	1341:20	20 20 20 20 20 20 C2 0A	15B1:20	20 20 20 C2 20 20 20 F0
10D9:07	B9 00 A4 99 00 D8 B9 6E	1349:20	20 20 20 20 20 20 20 0F	15B9:20	20 20 20 20 20 20 C2 86
10E1:00	A5 99 00 D9 B9 00 A6 FA	1351:20	20 C2 C2 20 20 20 20 F5	15C1:CA	C3 C3 C3 C3 C3 C3 6F
10E9:99	00 DA B9 00 A7 99 00 9F	1359:20	20 20 20 20 20 20 20 7F	15C9:C3	C3 C3 C3 C3 C3 C3 C3 F3
10F1:DB	C8 D0 CD CA 10 CA A0 F5	1361:20	20 20 20 20 20 20 20 87	15D1:C3	C3 C3 C3 C3 C3 C3 C3 FB
10F9:1E	B9 00 A9 99 DA 00 88 F2	1369:20	20 20 20 20 20 C2 32	15D9:C3	C3 C3 C3 B1 C3 C3 C3 73
1101:10	F7 C6 01 60 A9 00 8D 49	1371:20	12 97 47 92 9B 45 54 75	15E1:C3	C3 C3 C3 C3 C3 C3 CB 14
1109:20	D0 8D 21 D0 A9 FD A0 FC	1379:28	52 45 41 44 29 9B C2 C5	15E9:20	20 42 59 3A 4A 45 53 E2
1111:11	85 41 84 42 A0 00 B1 D3	1381:C2	20 20 48 4F 4D 45 20 F3	15F1:55	53 20 4D 45 4E 44 4F AF
1119:41	F0 0B 20 D2 FF C8 D0 74	1389:3D	20 47 4F 20 54 4F 20 45	15F9:5A	41 20 45 53 43 41 4C 70
1121:F6	E6 42 4C 18 11 60 A9 F4	1391:54	48 45 20 46 49 52 53 ED	1601:4F	4E 41 13 00 75 08 CC 74
1129:37	85 01 A0 00 A2 1F A9 54	1399:54	20 20 20 C2 20 20 20 EE	1609:09	46 0A 2C 0B AB 0E EA 57
1131:00	85 45 A9 E0 85 46 B1 E3	13A1:20	20 20 20 20 20 C2 6A	1611:0C	80 0D 14 0E 3E 0E 4A 16
1139:45	91 45 C8 D0 F9 E6 46 1A	13A9:C2	20 20 20 20 20 20 20 21	1619:0E	5E 0E 44 53 52 47 49 A5
1141:CA	10 F4 A9 35 85 01 60 28	13B1:20	20 46 49 4C 45 4E 41 A2	1621:91	11 20 13 41 42 23 55 3E
1149:A9	37 85 01 A2 18 BD F0 B0	13B9:4D	45 20 20 20 20 20 20 BF	1629:31	3A 35 20 30 20 30 33 BA
1151:EC	18 69 01 9D F0 EC CA 82	13C1:20	20 20 20 C2 20 12 97 58	1631:20	31 34 0D 92 20 44 45 F3
1159:10	F4 A9 02 8D F7 E8 A9 DD	13C9:49	92 9B 4E 46 4F 20 46 87	1639:4C	20 00 92 20 53 45 51 E6
1161:16	8D 04 E9 A9 1A 8D D3 B5	13D1:49	4C 45 C2 AD 20 20 20 D2	1641:20	00 92 20 50 52 47 20 4C
1169:E9	8D 00 EA A9 35 85 01 C0	13D9:20	20 20 20 20 20 20 20 FF	1649:00	92 20 55 53 52 20 00 97
1171:60	A9 0F 20 B5 0E 20 EA 23	13E1:20	20 20 20 20 20 20 20 08	1651:92	20 52 45 4C 20 00 92 E2
1179:E8	60 A9 20 A2 27 9D C0 0D	13E9:20	20 20 20 20 20 20 20 10	1659:20	3F 3F 3F 20 00 41 52 17
1181:07	CA 10 FA 60 48 18 65 45	13F1:BD	20 20 20 20 20 20 20 E6	1661:45	20 59 4F 55 20 53 55 7F
1189:45	85 45 90 02 E6 46 68 02	13F9:20	20 C2 AB 20 20 20 A6	1669:52	45 20 28 59 2F 4E 29 E3
1191:18	65 49 85 49 90 02 E6 12	1401:49	4E 53 45 52 54 20 41 85	1671:3F	00 44 45 4C 45 54 49 83
1199:4A	60 20 EA E8 20 BE 0E FE	1409:20	44 49 53 4B 20 49 4E 6C	1679:4E	47 2E 2E 2E 00 4E 45 9A
11A1:18	A2 17 A0 0C 20 F0 FF 28	1411:20	44 52 49 56 45 20 20 61	1681:57	20 4E 41 4D 45 3A 00 33
11A9:A9	0B A0 17 20 1E AB 20 D9	1419:B3	20 20 20 20 20 20 20 0B	1689:93	0D 0D 0D 20 20 50 52 A9
11B1:C2	11 60 20 E1 FF D0 02 3A	1421:20	20 20 C2 B0 20 20 20 F7	1691:4F	47 52 41 4D 20 4E 41 5E
11B9:38	60 20 E4 FF C9 20 D0 9A	1429:20	20 20 20 20 20 20 20 51	1699:4D	45 3A 0D 0D 20 20 20 1F
11C1:07	20 E4 FF C9 20 D0 F9 76	1431:20	20 20 20 20 20 20 20 59	16A1:20	20 20 20 20 20 20 54 02
11C9:18	60 20 7B 11 18 A2 18 12	1439:20	20 20 20 20 20 20 20 61	16A9:59	50 45 3A 0D 0D 20 20 DF
11D1:A0	01 20 F0 FF A9 5F A0 9D	1441:AE	20 20 20 20 20 20 20 B0	16B1:20	20 20 20 4C 4F 43 4B 6D
11D9:16	20 1E AB 20 E4 FF F0 13	1449:20	20 20 C2 C2 20 20 20 B0	16B9:20	4B 45 59 3A 0D 0D 53 7A
11E1:FB	C9 4E F0 07 C9 59 D0 30	1451:20	20 20 20 20 20 20 20 79	16C1:49	5A 45 20 49 4E 20 42 D9
11E9:F3	18 90 01 3E 20 7B 11 78	1459:20	20 20 20 20 20 20 20 81	16C9:4C	4F 43 4B 53 3A 0D 0D B7
11F1:60	A0 7E A2 7E CA 10 FD A3	1461:20	20 20 20 20 20 20 20 89	16D1:20	53 49 5A 45 20 49 4E 3D
11F9:88	10 FA 60 93 8E 08 9B 4C	1469:C2	20 12 97 52 55 4E 2F 6A	16D9:20	42 59 54 45 53 3A 0D 10
1201:D5	C3 C3 C3 C3 C3 C3 C3 2E	1471:53	54 4F 50 92 9B 20 C2 4D	16E1:0D	20 53 54 41 52 54 20 68
1209:C3	C3 C3 C3 C3 C3 C3 C3 2D	1479:C2	20 20 50 52 45 53 53 B5	16E9:41	44 44 52 45 53 53 3A CD
1211:C3	C3 C3 C3 C3 C3 C3 C3 35	1481:20	2D 53 50 41 43 45 20 36	16F1:0D	0D 20 20 20 55 4E 44 E4
1219:C3	C3 C3 C3 B2 C3 C3 C3 B4	1489:42	41 52 2D 20 41 46 54 27	16F9:20	41 44 44 52 45 53 53 F4
1221:C3	C3 C3 C3 C3 C3 C3 C3 4B	1491:45	52 20 20 C2 20 20 45 13	1701:3A	0D 00 59 45 53 00 4E EA
1229:9B	C2 12 9A 44 53 4B 3A F7	1499:58	49 54 20 20 20 20 C2 51	1709:4F	00 50 52 45 53 53 20 4C
1231:20	20 20 20 20 20 20 20 55	14A1:C2	20 20 20 20 20 41 4E 8B	1711:53	50 41 43 45 20 42 41 C9
1239:20	20 20 20 20 20 20 20 5D	14A9:20	45 52 52 4F 52 20 4F F5	1719:52	00 00 00 00 00 00 00 70
1241:20	20 20 20 20 20 20 92 D7	14B1:43	55 52 52 53 2E 20 20 F3		



PROGRAMS

R O B E R T T R A V A I N I

This is a fast-paced dogfight program for two players flying radon-ium-powered spaceships. Each player tries to destroy the other ship and its cache of fuel containers while avoiding enemy fire.

The ship in the upper left corner of the screen is controlled by a joystick in port 2; the other, by a stick in port 1. So after you've typed the game in, invite your best friend over for a friendly space duel.

Radonium consists of two programs. The first is a short BASIC boot program that loads and runs the main machine language program. The boot program is only a few lines long, but to avoid typing errors, you may want to use *The Automatic Proofreader* to enter it; see "Typing Aids" elsewhere in this section.

You'll need *MLX*, our machine language entry program, to enter the main program; see "Typing Aids" elsewhere in this section. When *MLX* prompts you, respond with the values given below.

Starting address: C000

Ending address: CFFF

Be sure to save a copy of the program as RADONIUM/ML. before exiting *MLX*. This is the name the boot program loads and runs.

Playing the Game

When the title screen appears, set your game parameters. The levels of play are selected by the function keys. Level 3 is the most difficult. The plus and minus keys select the number of rounds you wish to play. You can set it anywhere between 10 and 90; the default number of rounds is 20. A round continues until a ship has been destroyed.

The main screen also provides scoring information, presenting both scores from the previous game and the game's high score. The high score will be in the color of the ship that scored it.

When you press a function key, the game begins. The object is to de-

stroy your opponent's ship and radon-ium supplies before he or she can destroy yours.

Learning to maneuver your craft may take some practice. Press the joystick to the left to rotate to the left; move it to the right to rotate right. Press the joystick forward to accelerate in the direction your ship is facing; pull it back to stop. Press the fire button to fire a neutron pulse.

RADONIUM

SPACESHIPS DUEL IN
THIS TWO-PLAYER,
ARCADE-STYLE
GAME FOR THE 64.
JOYSTICKS REQUIRED.

Do not touch your opponent's radon-ium supply depot until you've destroyed all the canisters stored there. Fifty points are awarded for every radon-ium canister you destroy, but the points go only to the winner of each round. The round ends whenever your ship or your opponent's ship has been destroyed. Your ship is very strong, however; it can bounce off walls and your own fuel area without harm.

Information windows in the center of the screen keep track of the scores for the current round, the over-all totals, and the number of the current round. Pressing the up-arrow key during a round will terminate that game and return you to the title screen. Any points accrued in the terminated round will not be added to the total scores.

Since each player has 24 canisters of radon-ium in his or her supply depot, you can build up your score by destroying as many of them as you

can. Remember, each one is worth 50 points. Getting to the canisters that are stored against the walls can be tricky, however, due to the shape of your vessel and the fact that your guns are located in the ship's nose. You'll have to attack from several angles.

RADONIUM (PROGRAM 1)

```
KH 0 REM COPYRIGHT 1991 COMPUT
E PUBLICATIONS INTL LTD -
ALL RIGHTS RESERVED
SR 10 IFFL=0THENFL=1:LOAD"RADO
NIUM/ML.",8,1
SQ 20 SYS49152
```

RADONIUM/ML.

```
C000:A9 0B 8D 11 D0 A9 08 85 9E
C008:FC A0 00 98 84 FB A2 38 4B
C010:91 FB C8 D0 FB E6 FC CA BF
C018:D0 F6 A0 2D B9 9E CC 99 22
C020:0A 08 B9 CC CC 99 4A 08 16
C028:B9 66 CD 99 89 08 B9 FA 4E
C030:CC 99 CA 08 B9 28 CD 99 FB
C038:09 09 B9 94 CD 99 49 09 71
C040:B9 C2 CD 99 88 09 B9 F3 72
C048:CD 99 C9 09 88 10 CD A0 A1
C050:20 B9 55 CF 99 1E 0F B9 15
C058:76 CF 99 5E 0F B9 97 CF 80
C060:99 9E 0F B9 B8 CF 99 DE EA
C068:0F A9 FF 99 80 03 99 A0 59
C070:03 88 10 DD A2 21 BD 71 FB
C078:CE 9D 4D 0C CA 10 F7 A0 5A
C080:18 8C 1F 0C 8C 22 0C A9 84
C088:00 99 A7 02 99 E7 02 B9 AF
C090:AE CE 99 00 D4 88 10 EF 29
C098:A9 19 85 02 A9 00 85 FB 5A
C0A0:A9 20 85 FC A2 28 A5 FB 7C
C0A8:85 FD A5 FC 85 FE A0 00 5A
C0B0:B9 0D CF 91 FD C8 C0 08 02
C0B8:D0 F6 A5 FD 18 69 08 85 F0
C0C0:FD 90 02 B6 FE CA D0 E6 BF
C0C8:E6 FC A5 FB 18 69 40 85 DD
C0D0:FB 90 02 E6 FC C6 02 D0 FA
C0D8:CB A9 68 85 FB A9 2A 85 70
C0E0:FC A9 09 85 FE A0 00 A9 E8
C0E8:0E 85 02 A2 00 BD 56 CD AE
C0F0:91 FB C8 E8 E0 08 D0 F5 A0
C0F8:C6 02 D0 EF 18 A5 FB 69 30
C100:40 85 FB 90 02 E6 FC E6 1A
C108:FC C6 FE D0 D8 A9 0F 8D C1
C110:F6 02 A9 14 8D 13 03 A9 6E
C118:32 8D F4 CE 20 44 E5 A9 2B
C120:00 8D 21 D0 8D 20 D0 A9 70
C128:F8 8D 10 D0 A0 04 B9 A7 CA
C130:02 18 69 B0 99 94 05 B9 D5
C138:AC 02 69 B0 99 AF 05 A9 0A
C140:0F 99 94 D9 99 AF D9 88 A9
C148:10 E4 A0 02 B9 E7 CF 99 E7
C150:4F 05 A9 0F 99 4F D9 88 29
C158:10 F2 C8 B9 A7 02 D9 AC FA
C160:02 D0 07 C8 C0 05 D0 F3 36
C168:F0 15 B9 A7 02 38 F9 AC EC
```



PROGRAMS

G A Z E T T E COMMODORE 64/128

C170:02	90 06 A9 0A A2 00 F0 40	C3E0:03	A9 00 8D FD 03 F0 03 0E	C650:4C	DC C6 AD 10 D0 39 98 BD
C178:0A	A9 0E A2 05 D0 04 A9 74	C3E8:EE	FD 03 A9 D8 85 FB A9 E0	C658:CC	F0 0A BD 04 D0 18 C9 03
C180:0F	A2 00 48 8A 40 A0 00 6F	C3F0:2B	85 FC A2 00 86 FE A9 FA	C660:42	B0 5E D0 59 BD 04 D0 AE
C188:B9	F0 02 DD A7 02 D0 0A 34	C3F8:08	85 02 BD FC 03 0A 14	C668:18	C9 15 90 03 4C 18 C7 61
C190:C8	E8 C0 05 D0 F2 68 4C 8A	C400:0A	A8 84 FD A4 FD B9 21 DA	C670:B9	D4 02 C9 25 D0 04 A9 0B
C198:B3	C1 B9 F0 02 38 FD A7 41	C408:CE	A4 FE 91 FB E6 FD E6 79	C678:23	D0 40 C9 26 D0 04 A9 96
C1A0:02	B0 14 68 AA A0 00 BD EF	C410:FE	C6 02 D0 EF E8 E0 02 FE	C680:22	D0 38 C9 27 F0 02 D0 C8
C1A8:A7	A0 99 F0 02 E8 C8 C0 C8	C418:00	DD A9 03 8D B1 02 A9 C7	C688:35	A9 21 D0 2E B9 D4 02 50
C1B0:05	D0 F4 68 8D F6 02 A0 FC	C420:00	85 FB A9 20 85 FC A9 DF	C690:C9	20 D0 04 A9 24 D0 23 08
C1B8:04	B9 F0 02 18 69 B0 99 4C	C428:80	85 FD A9 3C 85 FE A0 44	C698:C9	21 D0 04 A9 23 D0 1B 44
C1C0:52	05 AD F6 02 99 52 D9 C8	C430:00	A9 08 85 02 A2 00 BD D5	C6A0:C9	27 D0 04 A9 25 D0 13 CD
C1C8:88	10 EE A9 00 8D D1 02 E8	C438:5E	CD 91 FB 91 FD C8 E8 55	C6A8:C9	26 D0 04 A9 22 D0 06 7C
C1D0:8D	FE 03 8D FC 03 8D FD 21	C440:0E	08 D0 F3 C6 02 D0 ED 63	C6B0:C9	22 D0 0A A9 26 20 77 04
C1D8:03	A9 B8 85 FB A9 D9 85 77	C448:18	A5 FB 69 40 85 FB 90 FD	C6B8:CC	90 03 4C 46 C7 4C 62 42
C1E0:FC	A2 02 A0 00 A9 07 91 1C	C450:03	E6 FC 18 A5 FD 69 40 6E	C6C0:C7	B9 D4 02 C9 21 D0 04 D3
C1E8:FB	C8 D0 FB E6 FC CA D0 08	C458:85	FD 90 02 E6 FE E6 FC 54	C6C8:A9	27 D0 7A C9 22 D0 04 33
C1F0:F6	A0 0D B0 C7 CE 99 C5 C7	C460:E6	FE CE B1 02 D0 C8 A0 97	C6D0:A9	26 D0 72 C9 23 D0 E6 61
C1F8:05	B9 D5 CE 99 3D 06 B9 9C	C468:8E	A9 00 99 B1 02 88 10 CB	C6D8:A9	25 D0 6A B9 D4 02 C9 34
C200:E3	CE 99 B5 06 B9 F1 CE 83	C470:FA	A2 0F 8E C9 02 8E CA 29	C6E0:23	D0 04 A9 21 D0 5F C9 24
C208:99	2D 07 B9 FF CE 99 A5 36	C478:02	8E C7 02 8E C8 02 E8 44	C6E8:24	D0 04 A9 20 D0 57 C9 94
C210:07	88 10 DF A9 0D 8D D2 AA	C480:8E	C3 02 8E C4 02 A2 00 DE	C6F0:25	D0 04 A9 27 D0 4F C9 45
C218:02	A2 11 BD 43 CF 9D C0 9A	C488:A9	F0 85 FB A9 31 85 FC AD	C6F8:26	D0 04 A9 22 D0 06 C9 13
C220:0D	CA 10 F7 A0 07 B9 D9 CE	C490:20	64 CB A2 05 A9 28 85 8B	C700:22	D0 5F A9 26 20 77 CC C8
C228:CF	99 F8 07 B9 3B CF 99 7F	C498:FB	E6 FC 20 64 CB A2 0A 1D	C708:90	58 B0 3A 4C DC C6 4C 5F
C230:27	D0 88 10 F1 A0 0F B9 79	C4A0:A9	30 85 FB A9 2E 85 FC 89	C710:8D	C6 4C 70 C6 4C C1 C6 5A
C238:2B	CF 99 00 D0 88 10 F7 3B	C4A8:20	64 CB A2 0E A9 70 85 7C	C718:18	C9 6C 90 0F C9 EF B0 5C
C240:A9	F3 8D 17 D0 8D 1D D0 82	C4B0:FB	E6 FC 20 64 CB AD FD 02 8D 80	C720:0B	BD 05 D0 C9 60 F0 E4 E8
C248:A9	FF 8D 15 D0 A9 1B 8D 96	C4B8:E0	02 8D E1 02 A9 00 A8 62	C728:C9	B9 F0 E3 BD 05 D0 18 23
C250:11	D0 EE 3E 03 D0 45 A9 E3	C4C0:AA	B9 A2 CE 99 04 D0 C8 96	C730:C9	60 90 2E C9 BA B0 2A 76
C258:00	A8 AA DE 08 D0 BD 08 52	C4C8:C0	04 D0 F5 BD A6 CE 9D F0	C738:BD	04 D0 C9 6C F0 D6 C9 FC
C260:D0	C9 FF D0 0B B9 9A CC 0F	C4D0:F8	07 BD E1 CF 9D 27 D0 82	C740:EE	D0 1F 4C 12 C7 99 D4 D4
C268:49	FF 2D 10 D0 8D 10 D0 E6	C4D8:E8	E0 08 D0 EF 8E 21 D0 E9	C748:02	A9 00 99 C0 03 99 C2 E4
C270:AD	10 D0 39 9A CC D0 15 3D	C4E0:8E	20 D0 A9 28 8D 10 D0 D6	C750:03	98 AA B9 C1 02 C9 01 23
C278:BD	08 D0 C9 01 D0 0E B9 B6	C4E8:A9	3C 8D 15 D0 EE 34 03 07	C758:D0	03 20 A2 CB 20 A2 CB 2F
C280:9A	CC 0D 10 D0 8D 10 D0 D6	C4F0:EE	35 03 A9 BB 8D 11 D0 41	C760:A6	02 B9 C7 02 D0 2B B9 DA
C288:A9	FE 9D 08 D0 C8 E8 E8 3B	C4F8:A0	00 A2 00 86 02 8C D1 4E	C768:D4	02 E8 E8 E8 E8 20 06 BF
C290:C0	04 D0 C7 A2 03 FE 2B 58	C500:02	98 AA B9 E4 02 F0 18 CC	C770:CB	CA CA CA CA BD 04 D0 C4
C298:D0	CA 10 FA A5 C5 C9 28 EA	C508:FE	2D D0 FE E2 02 D0 10 39	C778:F0	0F C9 FF D0 14 B9 98 60
C2A0:F0	04 C9 2B D0 38 EE D1 A2	C510:A9	00 99 E4 02 B9 9C CC EE	C780:CC	49 FF 2D 10 D0 4C 8F 87
C2A8:02	D0 57 CE D2 02 D0 52 CD	C518:49	FF 2D 15 D0 8D 15 D0 F6	C788:C7	B9 98 CC 0D 10 D0 8D 22
C2B0:A0	0D 8C D2 02 C9 28 D0 E0	C520:B9	00 DC 48 29 10 99 C3 29	C790:10	D0 AD 10 D0 39 98 CC 7C
C2B8:12	AD 13 03 18 69 0A C9 89	C528:02	68 29 0F 85 FB A9 0F 63	C798:F0	15 BD 04 D0 38 F9 34 6D
C2C0:64	F0 3F EE 30 07 EE F4 FB	C530:38	E5 FB 99 C1 02 D0 08 2A	C7A0:03	9D 08 D0 90 13 B9 9A A6
C2C8:CE	D0 0E AD 13 03 38 E9 85	C538:99	C0 03 99 C2 03 F0 55 14	C7A8:CC	0D 10 D0 4C C1 C7 BD A7
C2D0:0A	F0 2F CE 30 07 CE F4 9A	C540:C9	01 F0 54 FE C5 02 BD 25	C7B0:04	D0 38 F9 34 03 9D 08 0E
C2D8:CE	8D 13 03 D0 24 C9 05 6B	C548:C5	02 C9 5A D0 47 A9 00 0D	C7B8:D0	B9 9A CC 49 FF 2D 10 F3
C2E0:D0	04 A2 04 D0 0E C9 06 BC	C550:9D	C5 02 B9 C1 02 C9 02 A3	C7C0:D0	8D 10 D0 BD 05 D0 38 07
C2E8:D0	04 A2 09 D0 06 C9 03 F1	C558:D0	0A A9 0F 99 C7 02 99 7E	C7C8:F9	34 03 9D 09 0D B9 D6 72
C2F0:D0	10 A2 0E A0 04 BD 93 3C	C560:C9	02 D0 31 C9 04 D0 11 8F	C7D0:02	F0 03 4C DF C9 B9 D8 35
C2F8:CE	99 FB 02 CA 88 10 F6 7B	C568:20	A2 CB DE FA 07 B9 FA 76	C7D8:02	F0 02 D0 FE B9 CF 02 33
C300:30	03 4C 52 C2 A9 2B 8D AF	C570:07	C9 1F D0 1A A9 27 D0 79	C7E0:D0	4D B9 C3 02 F0 03 4C C5
C308:11	D0 A9 1D 8D 18 D0 A9 6B	C578:13	C9 08 D0 18 20 A2 CB 60	C7E8:CA	C8 A9 01 99 CF 02 A9 10
C310:D8	8D 16 D0 A0 00 8C 1D 72	C580:FE	FA 07 B9 FA 07 C9 28 76	C7F0:40	8D 12 D4 A9 41 8D 12 13
C318:D0	8C 17 D0 84 FB 84 FD 36	C588:D0	05 A9 20 99 FA 07 B9 75	C7F8:D4	B9 FA 07 99 D2 02 BD 0B
C320:A9	04 85 FC A9 D8 85 FE B8	C590:FA	07 99 FC 07 4C 11 C6 B0	C800:04	D0 9D 00 D0 BD 05 D0 D3
C328:A2	03 A9 CF 91 FB A9 0B CE	C598:A9	80 8D 04 D4 A9 81 8D E8	C808:9D	01 D0 AD 10 D0 39 98 6C
C330:91	FD C8 D0 F5 E6 FC 06 52	C5A0:04	D4 FE CD 02 B9 CD 02 B4	C810:CC	F0 08 AD 10 D0 19 96 AC
C338:FE	CA D0 EE A9 CF 91 FB A6	C5A8:CD	FF 02 D0 64 A9 00 99 CB	C818:CC	D0 08 B9 96 CC 49 FF 5B
C340:A9	0B 91 FD C8 C0 E8 D0 5D	C5B0:CD	02 B9 C7 02 D0 3B B9 DA	C820:2D	10 D0 8D 10 D0 AD 15 73
C348:F3	A9 00 85 FD A9 04 85 B0	C5B8:C0	03 D0 3B B9 C2 03 D0 E2	C828:00	19 96 CC 8D 15 D0 98 03
C350:FE	A9 90 85 FB A2 03 A0 3D	C5C0:24	A9 05 85 FE B9 D4 02 4C	C830:AA	B9 27 D0 F0 0F FE 38 71
C358:07	A9 2F 91 FD A9 6F 91 D3	C5C8:38	E9 20 AA BD F2 CF D9 CC	C838:03	BD 38 03 C9 0A E0 05 0F
C360:FB	88 10 F5 18 A5 FB 69 22	C5D0:FA	07 F0 0C E8 C6 FE D0 AB	C840:A9	00 99 27 D0 DE E0 02 12
C368:28	85 FB 90 03 E6 FC 18 B3	C5D8:F3	98 AA FE C0 03 D0 17 94	C848:D0	0E AD FD 02 99 E0 02 95
C370:A9	28 65 FD 85 FD 90 02 AA	C5E0:98	AA FE C2 03 20 A2 CB 19	C850:A6	02 B9 D0 02 02 06 CB 82
C378:E6	FE CA D0 DA A0 00 A9 B6	C5E8:B9	C9 02 C9 0F 20 22 FE 9F	C858:A6	02 BD 00 D0 F0 0F C9 A7
C380:BB	99 24 05 88 10 FA A9 45	C5F0:C0	03 A9 00 99 C7 02 B9 7C	C860:FF	D0 14 B9 96 CC 49 FF BE
C388:4C	85 FB A9 05 85 FC A0 8A	C5F8:FA	07 99 D4 DE D2 C9 02 65	C868:2D	10 D0 4C 74 C8 AD 10 A5
C390:00	A2 0B A9 BB 91 FB A5 1E	C600:0B	C9 02 CD FB 02 00 06 89	C870:D0	19 96 CC 8D 10 D0 BD 5C
C398:FB	18 69 28 85 FB 90 02 13	C608:AD	FC 02 99 C9 02 20 B4 D0	C878:01	D0 C9 27 F0 49 C9 FE 9B
C3A0:E6	FC CA D0 EE BD 1D CF B9	C610:CB	FE CB 02 B9 C7 02 F0 BE	C880:F0	45 AD 10 D0 39 96 CC F7
C3A8:9D	90 29 BD 24 CF 9D 60 20	C618:19	FE 36 03 BD 36 03 C9 7F	C888:D0	09 BD 00 D0 C9 0C F0 33
C3B0:34	E8 E0 07 D0 EF 98 A2 33	C620:6E	D0 0F A9 00 9D 36 03 7B	C890:36	D0 09 BD 00 D0 C9 4B 90
C3B8:09	9D A7 02 CA 10 FA A9 77	C628:BD	34 03 C9 01 F0 03 DE 4F	C898:F0	2D D0 2E 18 C9 75 90 4E
C3C0:00	A8 99 34 03 C8 C0 07 AC	C630:34	03 A6 02 B9 CB 02 18 A6	C8A0:0F	C9 E3 B0 0B BD 01 D0 D5
C3C8:D0	F8 EE FE 03 AD FE 03 94	C638:D9	C9 02 10 03 4C CE C7 15	C8A8:C9	67 F0 1B C9 AE F0 17 CA
C3D0:A0	01 38 E9 0A F0 07 C8 79	C640:A9	00 99 CB 02 BD 05 D0 74	C8B0:BD	01 D0 18 C9 68 90 12 20
C3D8:C0	0A D0 F6 F0 0A 8C FC 92	C648:C9	30 F0 41 C9 E6 D0 03 87	C8B8:C9	AF B0 0E BD 00 D0 C9 6B



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C8C0:75 F0 04 C9 E2 D0 03 20 E6	CB30:CB FE 00 D0 FE 01 D0 60 78	CDA0:05 F0 00 09 E0 00 01 F0 85
C8C8:44 CB A9 00 85 FC BD 01 41	CB38:C9 22 D0 04 FE 00 D0 60 91	CDA8:00 01 FB 20 01 FF E0 01 D0
C8D0:D0 38 E9 28 4A 4A 4A A2 4B	CB40:DE 00 D0 60 B9 29 D0 99 15	CDB0:FF E0 03 FF E0 07 F9 E0 DC
C8D8:05 18 06 FC 0A 90 02 E6 01	CB48:27 D0 B9 96 CC 49 FF 2D 01	CDB8:07 81 00 0F 02 00 0C 04 55
C8E0:FC E0 03 D0 06 A4 FC 84 D7	CB50:15 D0 8D 15 D0 A9 00 99 70	CDC0:00 00 C0 00 1F E0 00 03 F3
C8E8:FE 85 FD CA D0 EB 18 65 93	CB58:D8 02 99 38 03 99 CF 02 B3	CDC8:F0 00 03 F0 00 0F C0 00 0A
C8F0:FD 85 FE 90 03 E6 FC 18 31	CB60:99 D6 02 60 A9 00 8D EA 14	CDD0:3F C0 01 FF 00 0F FF 00 98
C8F8:A5 FC 65 FE 85 FC A6 02 A8	CB68:02 A9 08 8D E8 02 BD A7 B7	CDD8:0F FF 00 01 FF 00 00 3F 4B
C900:BD 00 D0 38 E9 0B 08 4A E5	CB70:02 0A 0A 0A A8 8C E9 02 BA	CDE0:C0 00 0F C0 00 03 F0 00 B8
C908:4A 4A 28 90 13 48 AC D1 46	CB78:AC E9 02 B9 21 CE AC EA 45	CDE8:03 F0 00 1F C0 00 00 E0 1B
C910:02 AD 10 D0 39 96 CC F0 CD	CB80:02 91 FB EE E9 02 EE EA 0C	CDF0:00 00 C0 0C 04 00 0F 02 A5
C918:06 68 18 69 20 D0 01 68 11	CB88:02 CE E8 02 D0 EA E8 E0 F6	CDF8:00 07 81 00 07 F9 E0 03 6B
C920:16 65 FB 90 02 E6 FC 85 CC	CB90:05 F0 0E E0 0A F0 0A E0 BF	CE00:FF E0 01 FF E0 01 FF E0 E1
C928:FB A2 03 18 06 FB 26 FC AD	CB98:0E F0 06 E0 12 F0 02 D0 6B	CE08:01 FB 20 01 F0 00 09 E0 B3
C930:CA D0 F8 A5 FC 18 69 20 12	CBA0:C8 60 FE C9 02 B9 C9 02 BD	CE10:00 05 F0 00 03 F0 00 01 E9
C938:85 FC AE D1 02 FE E6 02 9C	CBA8:C9 10 D0 03 DE C9 02 B9 4F	CE18:E0 00 01 E0 00 01 F0 00 3A
C940:BD E6 02 CD FE 02 D0 0D 38	CBB0:C7 02 D0 0E B9 C9 02 4A EA	CE20:00 AA 8A 22 22 22 22 DB
C948:A9 00 9D E6 02 A0 04 B1 1F	CBB8:AA BD EA CF 99 34 03 AE C1	CE28:8A AA 8A 0A 8A 8A 8A C5
C950:FB C9 C2 F0 03 AC D7 C9 7E	CBC0:D1 02 60 B9 3C 8D 15 D0 7B	CE30:8A AA 8A 22 8A 2A D0 D6
C958:AC D1 02 B9 CF 02 F0 F5 F0	CBC8:A9 80 8D 0B D4 A9 81 8D 95	CE38:02 AA 8A 22 A2 8A A2 22 9B
C960:C0 00 D0 20 A2 02 18 AD 6B	CBD0:0B D4 A9 31 99 FA 07 99 CB	CE40:8A AA 2A 2A 2A 2A 22 02 F5
C968:01 D0 C9 D1 B0 02 E6 00 67 1D	CBD8:FC 07 C0 E0 0A F0 06 20 23 CB	CE48:8A AA 02 2A 0A 22 A2 22 F8
C970:A0 07 B9 15 CF 91 FB 88 E3	CBE0:CC 4C E7 CB 20 4E CC A9 29	CE50:8A AA 8A 2A 2A 0A 22 22 B1
C978:10 F8 AC D1 02 A9 01 99 57	CBE8:07 8D CD 02 E8 D0 FD EA 53	CE58:8A AA 02 A2 A2 8A 8A 2F
C980:D6 02 D0 0C AD 03 D0 A2 98	CBF0:D1 02 98 30 04 A9 0A D0 B8	CE60:8A AA 8A 22 22 8A 22 03
C988:06 18 C9 48 B0 49 90 E0 8F	CBF8:02 A9 07 9D 29 D0 C8 D0 A5	CE68:8A AA 8A 22 22 82 A2 8A 54
C990:18 BD B1 02 69 05 9D B1 42	CC00:EB CE CD 02 D0 E6 AD FE 7B	CE70:8A DA 00 02 B2 80 05 4D 19
C998:02 C9 0A D0 19 A9 00 9D FA	CC08:03 CD 13 03 F0 03 4C BF 15	CE78:40 0A B3 60 0B 4A A0 19 11
C9A0:B1 02 CA FE B1 02 BD B1 99	CC10:C3 A9 0B 8D 11 D0 A9 15 64	CE80:55 50 15 4A 90 0A B5 60 9C
C9A8:02 C9 0A D0 09 A9 00 9D 8A	CC18:8D 18 D0 A9 C8 8D 16 D0 AC	CE88:09 4D 50 06 B5 20 01 53 EB
C9B0:B1 02 CA FE B1 02 AC D1 A7	CC20:4C LC C1 A2 02 BD B1 02 B5	CE90:40 00 54 04 05 03 12 5A CB
C9B8:02 D0 10 A2 0A A9 30 85 8A	CC28:F0 1E 18 7D A8 02 9D A8 CD	CE98:03 04 02 0C 3C 02 03 01 AA
C9C0:FB A9 2E 85 FC 20 64 CB D7	CC30:02 18 C9 0A 90 12 38 E9 D1	CEA0:06 1E 3E 4E 1E C8 30 30 1A
C9C8:4C D7 C9 A2 0E A9 70 85 59	CC38:0A 9D A8 02 CA 10 05 EE 03	CEA8:23 27 23 27 31 31 00 FF 06
C9D0:FB A9 2E 85 FC D0 EE AC A0	CC40:A7 02 D0 03 FE A8 02 E8 FF	CEB0:00 00 00 77 07 00 05 00 08
C9D8:D1 02 A6 02 4C 27 CA BD 1D	CC48:CA 10 DA A6 02 60 A2 02 E9	CEB8:00 00 0C 07 00 05 00 01 5D
C9E0:00 D0 9D 0C D0 A9 00 9D E3	CC50:BD B5 02 F0 1E 18 7D AD 7F	CEC0:00 09 00 00 5A F6 1F 7B 09
C9E8:E2 02 BD 01 D0 9D 0D D0 1E	CC58:02 9D AD 02 18 C9 0A 90 BC	CEC8:20 86 B3 20 0C 05 16 05 36
C9F0:AD 10 D0 39 96 CC D0 0B A1	CC60:12 38 E9 0A 9D AD 02 CA 61	CED0:0C 20 31 20 6C 7B 20 86 BC
C9F8:B9 9C CC 49 FF 2D 10 D0 64	CC68:10 05 EE AC 02 D0 03 FE 4C	CED8:B5 20 0C 05 16 05 0C 20 28
CA00:4C 09 CA AD 10 D0 19 9C C4	CC70:AD 02 E8 CA 10 DA 60 48 2D	CEE0:32 20 6C 7B 20 86 B7 20 8F
CA08:CC 8D 10 D0 AD 15 D0 19 F2	CC78:AD 10 D0 39 98 CC D0 09 3D	CEE8:0C 05 16 05 0C 20 33 20 48
CA10:9C CC 8D 15 D0 A9 01 99 F2	CC80:BD 04 D0 C9 14 F0 0C D0 FD	CEF0:6C 7B 20 AD 32 30 AB 20 4C
CA18:E4 02 A9 80 8D 0B D4 A9 C9	CC88:07 BD 04 D0 C9 42 F0 03 DE	CEF8:20 12 0E 04 13 20 6C 7B 9A
CA20:81 8D 0B D4 20 44 CB C0 F2	CC90:18 90 01 38 68 60 01 02 C6	CF00:20 9E 20 20 12 05 13 14 3C
CA28:00 D0 1A AD 05 D0 38 C9 B5	CC98:04 08 10 20 40 80 18 00 6E	CF08:01 12 14 20 6C 88 88 88 50
CA30:D2 90 4D AD 10 D0 39 98 A6	CCA0:00 18 00 00 18 00 00 3C 3D	CF10:00 22 22 22 00 88 BE BE FC
CA38:CC F0 45 AD 04 D0 18 C9 51	CCA8:00 00 3C 00 00 3C 00 00 BA	CF18:BC BE FE BC EE C8 C8 C8 66
CA40:03 90 3D B0 18 AD 07 D0 84	CCB0:7E 00 04 7E 20 04 FF 20 23	CF20:00 32 32 32 8C 8C 8C 00 65
CA48:18 C9 46 B0 33 AD 10 D0 71	CCB8:04 FF 20 07 FF E0 0F C3 2E	CF28:23 23 23 00 32 A0 57 40 89
CA50:39 98 CC D0 2B 18 AD 06 6A	CCC0:F0 0F C3 F0 07 00 E0 03 1B	CF30:8D 19 8D 06 1F 9E 1F CE F5
CA58:0D C9 56 B0 23 C0 00 D0 8B	CCC8:00 C0 00 00 40 60 00 81 97	CF38:1F FE 1F 00 08 0A E0 00 8F
CA60:0E AD B1 02 F0 17 AD B2 B0	CCD0:E0 01 03 C0 0F 3F C0 0F 8D	CF40:00 00 00 00 1F 77 EA 1B A7
CA68:02 C9 02 D0 10 F0 11 AD D2	CCD8:FF 80 0F FF 00 0F FF 00 B0	CF48:57 AA 0B 42 EE 0E 72 A4 FC
CA70:B5 02 F0 09 AD B6 02 C9 26	CCE0:09 BF 00 00 1F 00 00 0F F6	CF50:1B 00 E6 1B FF 7F C3 FC 8E
CA78:02 D0 02 F0 03 4C C3 CB 2F	CCE8:20 00 1F 40 00 1F 80 00 F7	CF58:7F E7 FE 7E 7E FE 00 E7 AC
CA80:C0 00 D0 36 AD 15 D0 29 80	CCF0:0F 00 0F 00 00 1F 00 41	CF60:0E 70 C7 0E 7E 7E 7E 7E 16
CA88:02 F0 65 AD 10 D0 29 06 FE	CCF8:00 00 1F 00 00 0F 00 00 B2	CF68:E7 FE 70 E7 0E 70 E7 0E 58
CA90:F0 06 C9 06 F0 02 D0 58 43	CD00:0F 00 00 1F 80 00 1F 40 97	CF70:70 E7 FE 70 E7 0E 7F C3 45
CA98:AD 04 D0 38 ED 02 D0 18 D4	CD08:00 0F 20 00 1F 00 09 BF 36	CF78:FC 7E 07 FE 7E 7E 7E 00 FC
CAA0:C9 09 90 04 C9 F7 90 48 47	CD10:00 0F FF 00 0F FF 00 0F F6	CF80:E7 0E 70 E7 0E 70 E7 0E 34
CAA8:AD 05 D0 38 ED 03 D0 18 29	CD18:FF 80 0F 3F C0 01 03 C0 7A	CF88:70 E7 0E 70 E7 0E 7E 7E 81
CAB0:C9 09 90 C9 C9 F7 90 38 A3	CD20:00 81 E0 00 40 60 00 00 BB	CF90:FE 7E 07 FE 7E 7E C3 FC 70 F1
CAB8:B0 C3 AD 15 D0 29 01 F0 BC	CD28:03 00 C0 07 00 E0 0F C3 33	CF98:E3 F8 78 E3 F8 7C E3 F8 30
CAC0:2F AD 10 D0 29 09 F0 06 BD	CD30:F0 0F C3 F0 07 FF E0 04 8D	CFA0:7E E0 E0 7E E0 00 7F E0 36
CAC8:C9 09 F0 02 D0 22 AD 06 34	CD38:FF 20 04 FF 20 04 7E 20 8A	CFA8:E0 77 E0 E0 73 E0 E0 71 13
CAD0:D0 38 ED 00 D0 18 C9 09 1E	CD40:00 7E 00 00 3C 00 00 3C 99	CFB0:E3 F8 70 E3 F8 70 E3 F8 17
CAD8:90 04 C9 F7 90 12 AD 07 9F	CD48:00 00 3C 00 00 18 00 00 CB	CFB8:E1 CE 0E E1 CF 1E E1 CF 67
CAE0:D0 38 ED 01 D0 18 C9 09 3E	CD50:18 00 00 18 00 00 55 D6 FA	CFC0:1E E1 CF BE E1 CF FE E1 FB
CAE8:90 93 C9 F7 90 02 B0 8D DF	CD58:F6 FA FA F6 D6 55 FE D6 DD	CFC8:CF FE E1 CE 4E E1 CE 0E DE
CAF0:A5 C5 C9 36 D0 03 4C 11 A3	CD60:C2 D6 C2 D6 82 AA 03 00 9D	CFD0:FF CE 0E FF CE 0E 7F 8E 22
CAF8:CC C8 E8 E8 C0 02 F0 03 C5	CD68:00 07 F8 00 0F C0 00 0F 6F	CFD8:0E 0E 3E 25 3C 3D 3E EE
CB00:4C FC C4 4C F8 C4 C9 20 E8	CD70:C0 00 03 F0 00 03 FC 00 E1	CFE0:3F 02 06 02 06 00 00 88 3A
CB08:F0 11 C9 21 F0 0A C9 27 12	CD78:00 FF 80 00 FF F0 00 FF E7	CFE8:89 A0 08 07 06 05 04 03 36
CB10:DE 0D DE 00 D0 4C 1B CB E8	CD80:F0 00 FF 80 03 FC 00 03 AB	CFF0:02 02 22 23 24 25 26 27 B1
CB18:FE 00 D0 DE 01 D0 60 C9 0D	CD88:F0 00 0F C0 00 0F C0 00 48	CFF8:20 21 22 23 24 25 00 00 1D
CB20:24 F0 11 C9 23 F0 0A C9 7F	CD90:07 F8 00 03 01 F0 00 01 EA	
CB28:B5 D0 0D DE 00 D0 4C 34 26	CD98:E0 00 01 E0 00 03 F0 00 C0	



PROGRAMS

J O E R Y K O W S K I

This handy little routine transfers a block of data from one location in 128 memory to another. It sounds simple, but simple can mean powerful, as in the case of this short machine language routine.

Xtrax transfers data between Bank 0 and Bank 1. This can be important if you're writing a program that uses a lot of hi-res graphics screens, sprites, or text. Just set aside enough memory in Bank 1 for your program, and with this routine Bank 1 becomes a buffer for that data. *Xtrax* also provides an overlay option, making it easy to display multiple screens.

Getting Started

Xtrax consists of two parts, the program itself and a demonstration.

Xtrax is written entirely in machine language, so use *MLX*, our machine language entry program, to type it in; see "Typing Aids" elsewhere in this section. When *MLX* prompts you, respond with the values below.

Starting address: 1B74

Ending address: 1C03

Be sure to save the program before you exit *MLX*.

The demonstration program is written in BASIC. Use *The Automatic Proofreader*, found elsewhere in this section, to type it in.

The demo will call *Xtrax*, so be sure *Xtrax* is on the same disk and has been saved with that name. The demonstration will draw a circle in the center of the screen. *Xtrax* will then copy the circle to Bank 1.

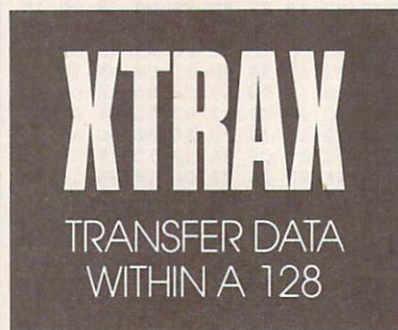
After this, the screen clears and two intersecting lines are drawn. Then the data in Bank 1 is overlaid on the top and bottom portions of the screen that contains the intersecting lines. There are now two circles on the hi-res screen with the intersecting lines. The data in Bank 1 was copied to two different screen locations.

Using the Program

Xtrax is a subroutine used from within another program. To load and run

it, type BLOAD "XTRAX",B0,P7028. To transfer data, determine the low- and high-byte values of the source and target addresses.

The demo program does this at line number 160. This is where the data to be transferred is being passed from the address range 28160-32319 to the destination address 8192. In the hexadecimal number system, these addresses are \$6E00-\$7E3F and \$2000, respectively.



The 128 works with addresses as two-byte values, with each byte holding two digits of the hexadecimal address. Thus, for the first address above, the byte values are \$6E and \$00. The former is the high byte; the latter, the low byte. Converting back to decimal, these values become 110 and 0. The decimal pair for the end-of-source require a 1 be added to each, with the result being 126 and 64. For the target address, the byte values are 32 and 0. The part of the demo program that instructs *Xtrax* to make the transfer reads as follows:

```
170 POKE 249,0: POKE 250,110
180 POKE 251,64:POKE 252,126
190 SYS 7028,0,32,6
```

Generally, the format for a transfer is as follows:

```
POKE 249, source starting value (low
byte): POKE 250, source starting val-
ue (high byte): POKE 251, source end-
ing value + 1 (low byte): POKE 252,
source ending value + 1 (high byte)
```

This is followed by SYS 7028, destination value (low byte), destination value (high byte), type of transfer.

The demo type value of 6 refers to an overlay from Bank 1 to Bank 0. Additional transfer and overlay types are listed in the following table.

Type	Action
0	Transfer (Bank 0 only)
1	Transfer from Bank 0 to Bank 1
2	Transfer from Bank 1 to Bank 0
3	Transfer (Bank 1 only)
4	Overlay (Bank 0 only)
5	Overlay Bank 0 on Bank 1
6	Overlay Bank 1 on Bank 0
7	Overlay (Bank 1 only)

XTRAX

```
1B74:85 FD 86 FE 8C FE 1B A0 E4
1B7C:04 A9 00 99 F9 1B 88 D0 D6
1B84:FA A9 FD 8D B9 02 A0 01 53
1B8C:AD FE 1B 29 01 F0 03 8C AD
1B94:FB 1B AD FE 1B 29 02 F0 A7
1B9C:03 8C FA 1B AD FE 1B 29 51
1BA4:04 F0 03 8C FD 1B A0 00 DF
1BAC:AE FA 1B A9 F9 20 74 FF 30
1BB4:AC FD 1B C0 01 D0 10 8D 29
1BBC:FC 1B A0 00 AE FB 1B A9 91
1BC4:FD 20 74 FF 4D FC 1B AE D3
1BCC:FB 1B A0 00 20 77 FF E6 A1
1BD4:F9 A5 F9 C9 00 D0 02 E6 7B
1BDC:FA A5 FA C5 FC D0 09 A5 98
1BE4:F9 C5 FB D0 03 4C F9 1B 6E
1BEC:E6 FD A5 FD C9 00 D0 02 9C
1BF4:E6 FE 4C AA 1B 60 00 00 EC
1BFC:00 00 00 00 00 00 00 33
```

DEMO

```
AB 10 BLOAD "XTRAX",B0,P7028
XJ 20 GRAPHIC 1,1
SH 30 REM DRAW CIRCLE
RQ 40 CIRCLE 1,160,100,51
SJ 50 PAINT 1,160,100
JF 55 REM CIRCLE TO BANK 1
BH 60 POKE 249,128:POKE 250,39
RP 70 POKE 251,192:POKE 252,55
EQ 80 SYS 7028,0,110,1
MH 85 REM CLEAR SCREEN
JX 90 GRAPHIC 1,1
HF 95 REM DRAW LINES
FE 100 DRAW 1,0,0 TO 319,199
QJ 110 DRAW 1,319,0 TO 0,199
HS 115 REM OVERLAY CIRCLES
KG 120 POKE249,00:POKE 250,110
DH 130 POKE251,64:POKE 252,126
BD 140 SYS 7028,0,32,6
RA 150 POKE249,00:POKE 250,110
HB 160 POKE251,64:POKE 252,126
SM 170 SYS 7028,0,47,6
```



PROGRAMS

M A T T H E W S P I N K S

I've always been annoyed by programs that require a SYS command to activate them. For starters, I can never remember all the SYS numbers used by my various programs.

Another problem occurs when I need information to operate a machine language program. It's never available directly from the program itself, so I'm forced to search through all my back issues of magazines for the relevant article.

One way around this problem is to use a separate BASIC loader that activates the program and includes any necessary documentation. This is not always the best solution, however. Loaders are time-consuming to set up, they clutter up disk directories, and they are clumsy to use.

Loader-Maker is a short machine language utility designed to rectify these problems. It allows the user to set up a BASIC program containing REM statements (or anything else) to which a SYS command to activate the program is automatically added.

The program can then be saved as a single BASIC file. Gone is the need to remember SYS numbers or provide separate BASIC loaders for each program.

Getting Started

Loader-Maker is written entirely in machine language. To type it in, use *MLX*, our machine language entry program; see "Typing Aids" elsewhere in this section. When *MLX* prompts you, respond with the values given below.

Starting address: 5000
Ending address: 5137

After you've finished typing in the program, be sure to save a copy of *Loader-Maker* before exiting *MLX*.

Using Loader-Maker

After you've produced a working copy of *Loader-Maker*, using it is simple. Simply load *Loader-Maker*, type NEW, and then load the machine language file to be converted. Set up your

basic program with any documentation you might want to include, and then type SYS 20480,sa,ea,ep.

After the SYS command, *sa* and *ea* are the starting and ending addresses of the machine language file, respectively, and *ep* is the program's entry point—that is, the SYS number you would normally use to activate the program.

LOADER-MAKER

ADD SYS
COMMANDS TO
MACHINE
LANGUAGE
PROGRAMS TO
ACTIVATE THEM
AUTOMATICALLY

After a short pause, the READY prompt should appear. If you list the program, you'll see your BASIC program, plus a new line 63999, containing a SYS command. Don't worry that the SYS number in this line is different from the one you provided. This SYS number calls a small program that moves the actual machine language file into its proper place and activates the program. Now, save the program as you would a normal BASIC file, using the format SAVE "filename",8,1.

For example, to convert *Loader-Maker* itself into a single BASIC file, load *Loader-Maker* and type NEW. Type in some comments, for example,

10 REM ACTIVATE WITH SYS 20480,SA,EA,EP

Then in immediate mode, type the command SYS 20480,20480,20787,42100 (this extra number will be explained later).

List the program to verify that line 63999 exists. Then save *Loader-Maker* using the format SAVE "Loader-Maker",8,1. That's all there is to it.

How It Works

Loader-Maker works by searching until it finds the end of your BASIC program. It then calculates the SYS command needed to activate the program and appends it as line 63999. If a line 63999 already exists, it will be overwritten. A small machine language routine then moves the program back to its correct position on reloading. The machine code program is then added to the end of the BASIC program, and CLR is performed to reset any altered pointers.

Things to Watch For

Loader-Maker won't be able to convert machine language files that already exist as a one-line basic SYS statement, such as *SpeedScript's* 10 SYS 2061. These programs already are in their optimal form. Nor will it cope with programs that begin between 2048 (\$0800) and 2061 (\$080E), as these 14 bytes are needed to contain the BASIC SYS command. Plus, *Loader-Maker* will not run programs with entry points beneath BASIC or Kernal ROM (40960-49159 and 57344-65535, respectively). Also, *Loader-Maker* will not work with programs residing between 20480 and 20787 (\$5000-\$5133), as *Loader-Maker* itself resides in this block.

Loader-Maker will convert files that lie under BASIC or Kernal ROM, as long as their entry points exist in free memory. It will also convert programs that would overlap the BASIC file, owing to the use of a downward machine language mover. The small restrictions placed on using *Loader-Maker* are not as harsh as they seem,

PROGRAMS

as most machine language programs reside either in the 4K block beginning at 49152 (\$C000) or at the top of memory. Of the dozens of stand-alone machine language programs I own, not one has been unable to be converted with *Loader-Maker*.

Finally, *Loader-Maker* can be used with utilities that require parameters that need to be supplied with the BASIC SYS command, such as those used with *Loader-Maker* itself.

Simply supply the value 42100 (\$A474) as the entry point when you use *Loader-Maker*, rather than the proper entry point. This will send the computer straight back to BASIC, rather than to the start of the actual program itself, which would generate an error because the required parameters would be missing. The proper syntax can then be given.

Thus, as shown previously, to convert *Loader-Maker* into a BASIC file, type SYS 20480,20480,20787,42100. Once the BASIC loader has been run, simply use *Loader-Maker* as you normally would.

LOADER-MAKER

```
5000:20 25 51 8D 33 51 8C 34 29
5008:51 20 25 51 8D 35 51 8C 83
5010:36 51 20 25 51 8D 37 51 F6
5018:8C 38 51 A9 FF 85 14 A9 B9
5020:F9 85 15 20 13 A6 A5 5F A1
5028:85 FB A5 60 85 FC 20 59 FE
5030:A6 20 33 A5 18 A5 FB 69 A5
5038:0D 48 A5 FC 69 00 85 62 AE
5040:85 FE 68 85 63 85 FD A2 98
5048:90 38 20 49 BC 20 DF BD BB
5050:A0 0C B9 F0 50 91 FB 88 D3
5058:10 F8 A0 05 A2 00 BD 00 34
5060:01 F0 07 91 FB C8 E8 4C D8
5068:5E 50 A0 27 B9 FD 50 91 CA
5070:FD 88 10 F8 AD 36 51 A0 4D
5078:01 91 FD AD 33 51 A0 05 BD
5080:91 FD AD 36 51 38 ED 34 FD
5088:51 18 69 01 65 FE A0 09 86
5090:91 FD AD 34 51 38 E9 01 B2
5098:A0 22 91 FD AD 37 51 A0 B1
50A0:26 91 FD AD 38 51 A0 27 C2
50A8:91 FD E6 FE A9 00 85 FD B4
50B0:EE 36 51 AD 33 51 85 FB 41
50B8:AD 34 51 85 FC 78 A5 01 D5
50C0:29 FC 85 01 A0 00 B1 FB 5A
50C8:91 FD C8 D0 F9 E6 FC E6 24
50D0:FE A5 FC CD 36 51 D0 EE 5E
50D8:A5 01 09 03 85 01 58 A5 64
50E0:FD 85 2D A4 FE 84 2E 20 58
50E8:59 A6 20 33 A5 4C 74 A4 03
50F0:FF FF FF FF 00 00 00 26
50F8:00 00 00 00 00 A9 00 85 C5
5100:FE A9 00 85 FD A9 00 85 01
5108:FC A9 00 85 FB A0 FF B1 FF
5110:FB 91 FD 88 C0 FF D0 F7 FC
5118:C6 FC C6 FE A5 FE C9 00 E2
5120:D0 ED 4C 00 00 20 FD AE 5B
5128:20 8A AD 20 F7 B7 A5 14 33
5130:A4 15 60 00 00 00 00 76
```

THE AUTOMATIC PROOFREADER

PHILIP I. NELSON

The Automatic Proofreader helps you type in program listings for the 128 and 64 and prevents nearly every kind of typing mistake.

Type in the *Proofreader* exactly as listed. Because the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unusual commands. After you've finished, save a copy before running it.

Next, type RUN and press RETURN. After the program displays the message "Proofreader Active," you're ready to type in a BASIC program.

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

The *Proofreader* ignores spaces not enclosed in quotation marks, so you can omit or add spaces between keywords and still see a matching checksum. However, spaces inside quotes are almost always significant, so the program pays attention to them.

The *Proofreader* does not accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTING it, moving the cursor back to the line, and pressing RETURN.

Though the *Proofreader* doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program.

```
0 CLR
10 VE=PEEK(772)+256*PEEK(77
3):LO=43:HI=44:PRINT
{CLR}{WHT}AUTOMATIC PROO
FREADER FOR ";
20 IF VE=42364 THEN PRINT "
64"
```

```
30 IF VE=17165 THEN LO=45:HI
I=46:WAIT CLR:PRINT"128"
40 SA=(PEEK(LO)+256*PEEK(HI
))+6:FOR J=SA TO SA+166:
READ B:POKE J,B:CH=CH+B:
NEXT
50 IF CH<>20570 THEN PRINT
{SPACE}"*ERROR* CHECK TY
PING IN DATA STATEMENTS"
:END
60 FOR J=1 TO 5:READ RF,LF,
HF:RS=SA+RF:HB=INT(RS/25
6):LB=RS-(256*HB)
70 CH=CH+RF+LF+HF:POKE SA+L
F,LF:POKE SA+HF,HB:NEXT
80 IF CH<>22054 THEN PRINT
{SPACE}"*ERROR* RELOAD P
ROGRAM AND CHECK FINAL L
INE":END
90 IF VE=17165 THEN POKE SA
+14,22:POKE SA+18,23:POK
ESA+29,224:POKESA+139,224
100 POKE SA+149,PEEK(772):P
OKE SA+150,PEEK(773):PR
INT"{CLR}PROOFREADER AC
TIVE"
110 SYS SA:POKE HI,PEEK(HI
)+1:POKE (PEEK(LO)+256*P
EEK(HI))-1,0:NEW
120 DATA120,169,73,141,4,3,
169,3,141,5,3,88,96,165
,20,133,167
130 DATA165,21,133,168,169,
0,141,0,255,162,31,181,
199,157,227
140 DATA3,202,16,248,169,19
,32,210,255,169,18,32,2
10,255,160
150 DATA0,132,180,132,176,1
36,230,180,200,185,0,2,
240,46,201
160 DATA34,208,8,72,165,176
,73,255,133,176,104,72,
201,32,208
170 DATA7,165,176,208,3,104
,208,226,104,166,180,24
,165,167
180 DATA121,0,2,133,167,165
,168,105,0,133,168,202,
208,239,240
190 DATA202,165,167,69,168,
72,41,15,168,185,211,3,
32,210,255
200 DATA104,74,74,74,74,168
,185,211,3,32,210,255,1
62,31,189
210 DATA227,3,149,199,202,1
6,248,169,146,32,210,25
5,76,86,137
220 DATA65,66,67,68,69,70,7
1,72,74,75,77,80,81,82,
83,88
230 DATA 13,2,7,167,31,32,1
51,116,117,151,128,129,
167,136,137
```


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How to Type In COMPUTE's Gazette Programs

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

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

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

Special Characters

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

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

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

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

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

The Quote Mode

You can move the cursor around the screen with the Crsr keys, but you may want to move it under program control, as in examples like {LEFT} and {HOME} in the listings. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote key, you're in quote mode, which can be confusing if you mistype a character and cursor left to change it. You'll see a graphics symbol for cursor left. Use the delete key to back up and edit the line. Type another quotation mark to get out of quote mode. If things get too confusing, exit quote mode by pressing Return; then cursor up to the mistyped line and fix it. If the mistake involves cursor movement, you must press the quote key to reenter quote mode. □

When You Read:	Press:	See:	When You Read:	Press:	See:	When You Read:	Press:	See:
{CLR}	SHIFT CLR/HOME		{PUR}	CTRL 5		←	←	
{HOME}	CLR/HOME		{GRN}	CTRL 6		↑	SHIFT ↑	
{UP}	SHIFT ↑ CRSR ↓		{BLU}	CTRL 7				
{DOWN}	↑ CRSR ↓		{YEL}	CTRL 8				
{LEFT}	SHIFT ← CRSR →		{F1}	f1				
{RIGHT}	← CRSR →		{F2}	SHIFT f1				
{RVS}	CTRL 9		{F3}	f3				
{OFF}	CTRL 0		{F4}	SHIFT f3				
{BLK}	CTRL 1		{F5}	f5				
{WHT}	CTRL 2		{F6}	SHIFT f5				
{RED}	CTRL 3		{F7}	f7				
{CYN}	CTRL 4		{F8}	SHIFT f7				

For Commodore 64 Only		
[1]	COMMODORE 1	
[2]	COMMODORE 2	
[3]	COMMODORE 3	
[4]	COMMODORE 4	
[5]	COMMODORE 5	
[6]	COMMODORE 6	
[7]	COMMODORE 7	
[8]	COMMODORE 8	



REVIEWS

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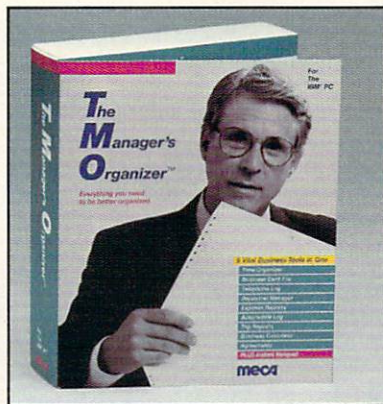
If you manage people, there's finally a Personal Information Manager (PIM) for you. PIMs have been a hot item lately because they help organize people, projects, and ideas in one convenient, free-form program. Because PIMs are so free-form, however, unless you're a computer wizard, you may have trouble harnessing their power.

The Manager's Organizer from MECA is different. Managers don't need to be computer jockeys or organizational geniuses to use this \$199.95 program. With *TMO's* five modules, you can organize time, calculations, personnel, travel expenses, and agreements.

The Desk Menu is a comprehensive time organizer that lists daily appointments, reminders, phone calls, and follow-ups in an easy-to-read report format. *TMO* lets you build a business-card file, telephone contacts with its auto-dialer, and write voluminous notes with its Spartan word processor. You can export files to ASCII, from which they can be imported to any word processor. *TMO* can't read or write directly to a *WordPerfect* file, an inconsiderate flaw. The card file allows you to print onto labels and provides sorting. It won't import your current records or export them to a database, however.

The Calculator can do some nifty numerical gymnastics. You can easily figure compound interest, loans and annuities, bond yields, yield versus interest, profits, cash flow, buy/lease/

rent options, and loan amortization. I liked using the days-between-dates calculator to figure out when a project was due. The profit calculator finally ended my frustration of figuring out what to divide by what.



With the Travel menu you can report expenses, trips, and auto mileage. The Agreement menu lists company contracts, such as insurance, rentals, leases, and maintenance, with such information as vendor, price, terms, date, and notes. While you can do this with a word processor, *TMO's* advantage is that it adds the figures for you and provides a total. This helps managers control budgets.

While many PIMs offer the features mentioned so far, *TMO* shines when you explore its special tools for managers.

The personnel menu keeps track of employees' days off, job descriptions, and office policies. For every manager who dreads giving performance reviews, *TMO* gives you the flexibility to become the perfect one-minute manager. You can catch people doing something right and note it in the file. When it is time to do the review, you'll have all the documentation to perform an effective critique. *TMO* provides fields for the employee's goals and accomplishments as well.

The compensation menu helps managers determine raises. You list each employee's salary and bonus. You can change these figures quickly by either percentage or money. The program adds all employees' salaries so you can see how much the department is paid—an effective tool for budget planning.

One wonders why *TMO* lacks a project manager. With the program's hefty \$199.95 list price, this feature should've been included.

TMO can be used as a stand-alone program or a TSR. However, it takes a deadening 18 seconds to load as a TSR on a 386-class machine.

The documentation is well organized and easy to read, and it even includes hints that can help any manager get more organized.

DANIEL JANAL

IBM PC and compatibles, 512K, two disk drives; hard disk recommended—
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DESIGNER

Micrografx's *Designer* version 3.0 makes the most of the new *Windows* operating environment and should be a significant contender in the high-end designware market that also includes *Arts & Letters Graphic Editor* and *Corel Draw*. Much has been made of the relative merits of these packages, along with *DrawPerfect*, *GEM Artline*, and a handful of other products. Generally, the argument boils down to what features are more important to the individual.

Designer's installation is much more user-directed than most, pausing at each turn to ask whether certain features should be added and giving



REVIEWS

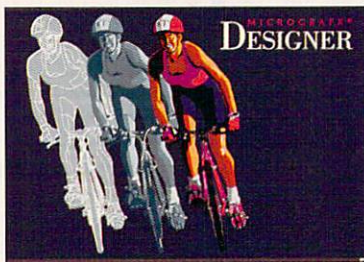
an estimate of the amount of disk space they will occupy—along with the amount of hard disk space remaining.

Graphic artists who work with scanned art will enjoy *Designer's* autotrace feature. While *Arts & Letters* can only trace a single contour in a monochrome graphic and *Corel Draw* uses an external program to automatically trace an entire graphic, *Designer* combines these features. It will trace an imported file with gray scales or multiple colors, recognizing the contours automatically and coloring the tracings to match the traced areas to which they correspond, right inside the main program.

Designer isn't very graceful when it uses all available memory in a too-complex autotrace. First a dialog box repeats several times, complaining that it has run out of memory, and then it continues to try to create the last trace until the user presses Esc. To *Designer's* credit, however, the pro-

gram doesn't crash, and you can back out of most actions with Esc.

Despite the fact that I had 4205K available to me, *Designer* refused to print when the figure onscreen was



***Designer* is a high-end drawing program that makes the most of Windows 3.0.**

highly complex. The solution offered by the technical support personnel was to make the trace less complex. I would suggest that future releases should make use of available memory

for temporary storage of the graphic specifications. I like complex traces, and I'd like to be able to print them out as well.

The people at technical support are patient and knowledgeable (they knew I was a reviewer). Their hours are from 7:00 a.m. to 7:00 p.m. CST, Monday through Friday. As a purchaser, you would be entitled to unlimited free technical support, but the registration card gives you the option of a year's "extended" technical support. This actually means that, for \$150, you will receive *Designer* upgrades for a year.

Designer comes with a program called *Telegrafx*, which allows you to download your *Designer* charts and graphics to a slide service, which can create physical manifestations of your graphics for sales presentations and other kinds of shows. This has become a standard feature of design software and is widely available.

Although *Designer* isn't equipped



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REVIEWS

to do "tweening" (creating intermediate shapes between two different drawings, as between a bat and a vampire) as *Arts & Letters Graphic Editor* is, it can make multiple copies of a single figure, distorting it and moving it a set amount for each copy. It substitutes gradient fill for blending—a poor bargain, in my opinion.

You can manipulate nodes (move control and set points for curves and lines in a drawing) through combinations of mouse buttons and the Ctrl, Alt, and Shift keys on the keyboard, which is harder to learn than the competing interfaces' styles. (*Corel Draw* uses a pop-up menu when you double-click on a point, and *Arts & Letters* uses selections from an existing toolbox and menu.) However, once you've learned *Designer's* node-manipulation technique, it's faster and less troublesome, representing a slight tradeoff of friendliness for efficiency.

In all, *Designer* is a capable piece

of software representing the state of the art in many areas, but it distinguishes itself in its autotrace capabilities. Its interface is slightly harder to learn but more efficiently laid out than that of the competition.

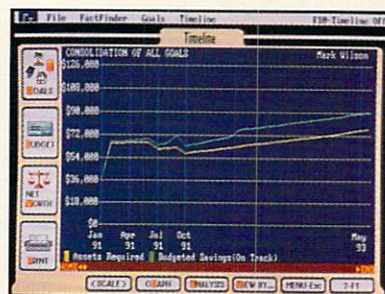
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WEALTH STARTER

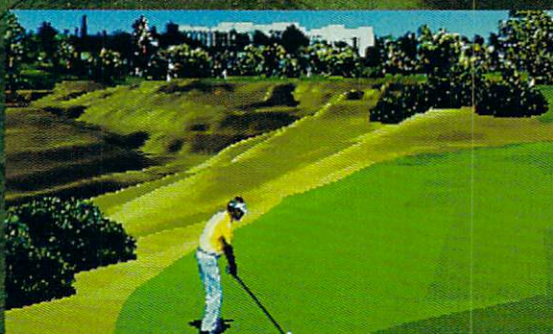
If you're like most people, you want to successfully provide for your family, put your children through college without taking out hefty loans, and have plenty of retirement



Keep your financial goals in sight by plotting them on a time-line graph.

money when the time comes. *Wealth Starter* is the personal financial planning system designed to help an individual or family control spending habits and set such financial goals. In addition to its other capabilities, *Wealth Starter* makes financial projections using tax rates, inflation rates, and expected investment returns to help project what steps you should

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take to achieve your goals; it even lets you see how you compare to the rest of the country.

Wealth Starter bases its financial model on the sound premise that you should have a cash reserve of three to six months' worth of expenses. From that, *Wealth Starter* enables you to set up a budget designed to help you reach your financial goals. After you've defined the parameters for yourself or your family (the program comes with several predefined goals such as debt reduction, retirement, education, and so on), *Wealth Starter* compiles four graphs (goals, monthly budget, projected cumulative budget, and net worth) and gives you such reports as a financial report card, budget tips, projected budget, and net worth.

Wealth Starter even lets you easily see if your goals are attainable. To do this, simply change certain parameters to view how these changes could affect your goals or your budget. If you use *Quicken* 3.0 or 4.0, you can import your budget data from *Quicken*, saving yourself double entry every month.

Here's one of the best features of the budget program: *Wealth Starter* will automatically reduce your liability amounts every month when you enter your payments. However, make sure you enter only the principal-and-interest part of the payment. Some monthly payments are loaded with things like taxes and credit life and health insurance. This loan balance information is valuable—use it at the end of the year to compare notes with your lending institution to prevent costly miscalculation.

There are some other nice loan-utility programs in *Wealth Starter* as well. The loan comparer is a good way to find the best loan when you shop for home mortgages. *Wealth Starter* will compare the variables from different institutions to let you know which rate is the most economical. There is also a loan calculator—a must when you're shopping for an item like a new car and are going to finance the purchase. Make sure your numbers compare to the seller's; this is a sure way to find out if any unwanted items like credit life or health insurance are added to your purchase price. There's even a loan-balance program to help you analyze hypothetical loans you may be considering.

Wealth Starter's only obvious disadvantage is its cumbersome submenus. They can be confusing, but with some practice you'll have no problem navigating through them. And don't forget the user's guide—it's less than 100 pages and should be read before beginning *Wealth Starter*.

To get ahead financially, you should have a picture of where you're going and how you plan to get there. *Wealth Starter* can help provide you with the road map to your financial success. And while you're at it, you can even find out if planning a trip to Europe is in your future.

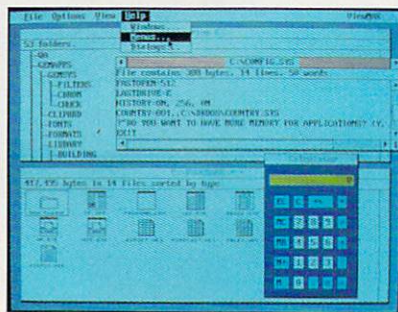
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DR DOS

This product is a giant step toward what a disk operating system ought to be. On the surface, DR DOS handles like any old DOS you're used to, but if you want more power, or more features, DR DOS provides options galore.



DR DOS 5.0 features ViewMax, an attractive icon-based graphical user interface.

The functional equivalent of MS-DOS 3.3, DR DOS lets you use all the normal DOS commands you'd expect without learning anything new. Or you can use command extensions like XDEL, which allows deletion of files in multiple subdirectories and removal of empty subdirectories, or XDIR, which adds a handful of options to the normal DIR command.

DR DOS outshines the current competing DOS versions in its memory-management abilities. It can install itself, device drivers, and certain applications into unused areas of high memory. Imagine having nearly 600K of memory free for programs after DOS loads.

Deciding how to set up your memory is made much easier by installation and setup programs that write and modify your AUTOEXEC.BAT and CONFIG.SYS files. Just answer questions about how you want your system set up, and the proper commands will be saved for you.

This feature is perfect for those who dread tampering with AUTOEXEC.BAT and CONFIG.SYS and is pleasantly palatable for untrusting souls like me who normally won't let any installation program near my system startup files. DR DOS is considerate, making its AUTOEXEC.BAT modifications in a restricted area so that your personal setup is never affected.

DR DOS also improves on MS-DOS by providing online help for all external commands and by keeping a command history, so recently used commands can be repeated or edited and reused without retyping. A full-screen text editor, which replaces the difficult-to-use EDLIN line editor, uses control commands similar to those of *WordStar*.

DR DOS also includes a disk-cache program, a password command that allows you to password-protect files and subdirectories, and a file-link program that can be used in unattended file transfers between computers.

One really exciting feature of DR DOS is its ability to accept user input during execution of the CONFIG.SYS file. Just place a question mark before any normal CONFIG.SYS command, and on boot-up, DR DOS will ask you whether you want that command executed.

For anyone who desperately wants a graphical user interface but has neither the megahertz nor the megabytes to support it, DR DOS provides ViewMAX, which allows you to use mouse clicks to launch applications and handle some rudimentary file-management chores. For more complex operations, however, it requires you to drop out to a DOS command line. Despite these short-

J. R. R. Tolkien's

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Vol. I

Experience the Excitement and Wonder of Tolkien's Middle Earth!

"Interplay's newest role-player tackles the Tolkien trilogy with top-flight graphics, sound and a new play system that should make adventuring in Middle Earth more realistic than ever before."

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IBM screens pictured.

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The program is published with the cooperation of the Tolkien Estate and their publishers, George Allen & Unwin (publishers) Ltd. The plot of The Lord of the Rings, the characters of the hobbits, and the other characters from The Lord of the Rings are © George Allen & Unwin Publishers Ltd. 1966-1974-1979-1981. © 1990 Interplay Productions. All rights reserved. MS-DOS is a trademark of Microsoft Corporation.



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comings, ViewMAX, which resembles GEM (also a product from Digital Research), may be all the GUI a lot of computers and users need.

The operating system comes packaged with a thorough manual of nearly 500 pages. In addition to the normal sections on DOS commands, there's a range of information for all users including introductory material and glossaries for the uninitiated and chapters on memory-management theory and troubleshooting for old hands.

Microsoft's impending MS-DOS 5.0 is expected to have some of the same memory-management features as DR DOS 5.0. There's no need to wait. Digital Research has a good program here with a lot of extras that can help wring every drop of power out of your machine.

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CAREER DESIGN

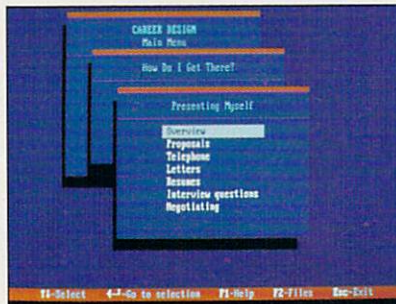
Anyone considering a midlife career change might be interested in a product like *Career Design*. It contains 50 activity modules that encourage you to explore your feelings about work. Almost every module contains an interactive exercise to help you gain a clearer picture of your career interests.

Career Design teaches how to write seven types of résumés (including chronological, functional, portfolio, and curriculum vitae), organize research, prepare proposals, and make presentations. And it provides tips on proper conduct during interviews, important interview questions to consider, and how to negotiate a more favorable contract.

Career Design is easy to use. It features a tutorial, help screens, and prompts that eliminate the need for memorizing tedious keyboard commands. Its mandatory password protection keeps your personal information confidential.

You can explore the *Career De-*

sign modules in any order, but the publisher recommends an exploration sequence in its printed *Flowchart of Modules*.



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If you follow the recommended sequence, *Career Design* begins by focusing on your interests, skills, likes, and dislikes. The objective is to give you a clear idea of what you do well and what you enjoy doing *before* you hunt for a job.

The files you type with the built-in word processor (your interests, goals, letters, and work preferences) are made more accessible through the use of markers in the text that let you return to them instantly.

The manual provides detailed program instructions plus a general-reference resource guide. You'll find information about business organizations and directories, U.S. nonprofit organizations, corporate news, how to locate the best places in the country to live, and much more. *Career Design* also includes a wall-size plan-of-action chart on which you can jot down summaries of your goals, interests, and preferences for work conditions so they'll be visible when you're talking to prospective employers on the phone.

Career Design offers practical advice for anyone interested in planning and implementing a successful career strategy. However, many individuals in search of new and exciting employment could probably do just as well by consulting career-planning guide books. The software doesn't use your answers to suggest possible job options. It merely poses questions that help you uncover your interests and abilities. All interpretation is left up to you.

One advantage *Career Design* has over conventional career-planning

textbooks is that your personal data files are always instantly available. You can use the word processor to copy information from the modules to the letters that you write. This feature is a valuable timesaver if you plan to write letters with boilerplate text. In addition, data files are always instantly available. You can call them up with a few simple keystrokes if you need to complete a job application or access personal information during a phone conversation with a potential employer.

The product is worth its \$99 price tag if you're the kind of person who prefers computers to pens. If you already have a word processor, you might learn as much by visiting the local library. However, the open-ended format may be freeing to some, and may lead to personal insights.

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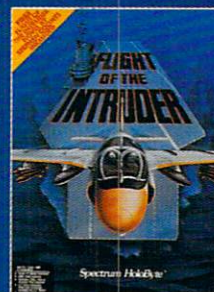
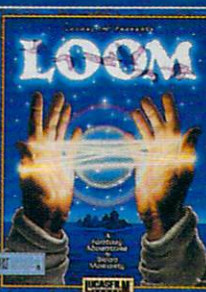
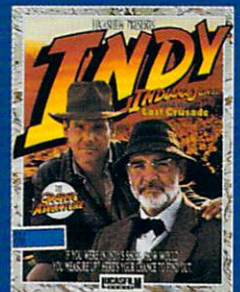
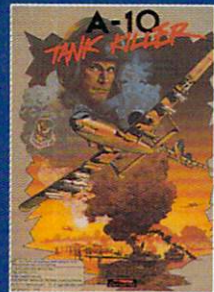
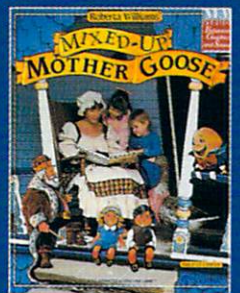
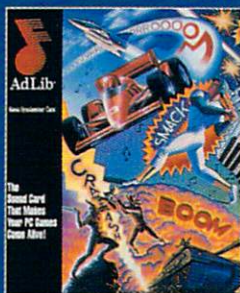
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TAKIN' CARE OF BUSINESS

Managing a business is tough, and half the battle is keeping records. *Takin' Care of Business* may be the answer. It's an integrated accounting package designed to help small- to medium-sized businesses manage their financial information. The package comes with six modules: General Ledger, Accounts Receivable, Accounts Payable, Account Reconciliation, Payroll, and Financial Utilities. Two additional modules—Inventory and Point of Sale/Invoicing—should be available by the time you read this. The program comes with a separate manual for each of the modules, as well as an introductory manual called *Getting Started*.

Installing the program's eight 5¼-inch floppies onto a hard drive is easy with the included Install program. Once up and running, the program can be configured with your preferences for screen colors, printing options, menu types, sound, and so on. You can also specify two levels of passwords for each of the modules. A first-level password allows access to all functions of a module except viewing or printing reports, while a second-level password allows unrestricted access to all functions. The configuration menu also includes a data-file backup utility. For large files, however, you're probably better off using a backup utility that also compresses the files.

Although *Takin' Care of Business* is designed for use by nonaccountants, a knowledge of basic accounting principles will help you to understand how the program works. The General Ledger module, for example, is a double-entry bookkeeping system in which debits must equal credits and assets are the sum of your liabilities and equity. These accounting principles are described briefly in the User's Manual, but it's also recommended that you consult an accounting or bookkeeping text for a more detailed explanation. Fortunately, the program comes with several sample files and sample accounts already created so you can experiment with various types of transactions to see how they

affect both sides of the ledger.

Up to 2000 accounts can be maintained in the General Ledger, and the number of transactions you may enter in any given year is limited only by your disk space. Recurring transactions can be specified as monthly, semimonthly, biweekly and weekly. A wide variety of financial reports can be generated and output to the screen, printer, or disk. Account balances can be compared using pie, bar, or line graphs.

The Accounts Receivable module lets you keep track of up to 2000 customers. Using this module, you can produce invoices and easily generate receivable aging reports that will list those customers with delinquent bills. The program will even print the address labels so you can send reminders to those with accounts past due.

On the other side of the coin, the Accounts Payable module will help you keep track of your vendor payables to ensure that your company's bills get paid on time. Again, this module is feature-packed, allowing an unlimited number of transactions, computer generation of either continuous- or laser-form checks, and several types of reports. *Takin' Care of Business* doesn't allow you to design report formats from scratch, but the existing formats are all thoughtfully designed and quite useful without modification.

The Payroll module can help you keep the paychecks rolling out for up to 1000 employees. The module includes income tax tables from most states and allows automatic tax deductions of both federal and state taxes. It also lets you easily track vacation, sick time, overtime, holidays, and two overtime categories for all of your employees. Again, mailing labels, and several types of reports (including W-2 and 1099 forms) can be generated from within this module.

It should be emphasized here that the Accounts Receivable, Accounts Payable, and Payroll modules are all fully integrated with the General Ledger so that transactions entered in any one module are automatically recorded where appropriate in others. The other modules—Financial Utilities and Account Reconciliation—aren't integrated in this same way, but both are easily accessible from the other modules.

The Financial Utilities module lets you analyze loans, investments such as annuities, and various types of depreciation (straight-line, declining balance, and so on), while the Account Reconciliation module serves to automate the balancing of your checkbook and helps you to monitor the balances of your credit cards. This module seems superfluous in a business package, and other programs such as *MoneyCounts* by Parson's Technology are better at handling personal finances.

Nevertheless, *Takin' Care of Business* is a reasonable accounting solution for any small business with a growing amount of financial data to get under control. Seeing all that *Takin' Care of Business* can do will make you wonder how any small company can get off the ground without such a program.

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An Install routine automatically installs the *BlueMAX* driver and configures *BlueMAX* to your system. Maximize then optimally configures available memory. On PS/2 systems, you can see gains of 80K or more. The result: more memory and faster system performance.

BlueMAX worked with a variety of applications on a PS/2 Model 70, although the manual warns of potential problems with programs using ROM BASIC or undocumented PS/2 features. The program supports LIM 4.0, EMS, XMS 3.0, VDS 1.0, and VCPI- and XMS-compatible protected-mode programs.

The program's documentation is comprehensive, and its operation is simplicity itself. Reconfiguring for new TSRs is easy, too. This is one memory manager you'll actually use.

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LEGACY

Times have changed. It used to be that if you wanted word processing, page layout, and graphics, you needed three separate programs. Today, however, more and more products are combining all three functions. *Legacy*, a new entry in this everything-you-ever-wanted-in-a-word-processor category, runs under *Windows 3.0* and brims with tools designed to make going from initial idea to finished document easy.

The nicest part of this software combination is having word processing features online during page layout. Search and replace, a spelling checker, and a thesaurus can really help get your document in shape before printing.

Legacy also boasts a table generator, which simplifies setting up and formatting tables and grids; mail merge; and Dynamic Data Exchange, which, for example, allows you to link a spreadsheet with a *Legacy* document so changes made in the spreadsheet will be automatically

reflected in the *Legacy* file.

The program's toolbox is jam-packed. Sadly though, some of the tools and the box itself appear to have been bent in order to make everything fit. The result is less than optimum performance.

To run *Legacy*, you need at least a 286 system with 640K RAM and *Windows 3.0*. *Legacy's* main program file is 1.3 megabytes large. With only 640K of RAM available, there's going to be a lot of disk swapping going on. Even with 3 megabytes of RAM on a 386SX, *Legacy's* menus and screen redrawing are sluggish.

Legacy is a frame-based system. You build your documents by placing frames on pages and filling the frames with text, graphics, or art. You create various styles for the text elements to define such things as fonts, sizes, positioning, and margins. Similarly, you create properties to manage the attributes of the various frames.

This program may be at its best when it's used to create and fill preset templates and generate fast, sharp output. Setting up templates for commonly used documents—letters, office memos, meeting agendas—assures quick, consistent results. For example, to type a letter, call up the letter template. Select the date style and type in the date. The date style includes positioning information so the date will be properly positioned below your letterhead.

Continue typing the letter, selecting various styles for such things as the recipient's address, salutation, body text, and closing. When you reach the letter's end, formatting is done. All that's left is to check the spelling and print.

Legacy provides several templates that can be used as is or modified. These include forms for letters, envelopes, memos, agendas, proposals, reports, press releases, projection overheads, and newsletters.

It's true that *Legacy* has much to offer, but it demands much of the machine and its operator. Even with a fast computer and plenty of memory, the going can be slow. When working with large amounts of text, it may be more expedient to enter the material into another word processing program and import the result into *Legacy*, which includes import filters for most major word processing programs.

Also, *Legacy's* spelling checker, while fine for checking a relatively clean document, leaves something to be desired for massive cleanup projects.

In one of my projects, I misspelled the word *scared* by typing an *x* rather than a *c*. *Legacy's* spelling checker dutifully stopped when it found *sxared*, but the replacement words it suggested left me cold. The top three replacement options were *sexier*, *sudsier*, and *saxifrage*.

Desktop publishers considering *Legacy* will want to note that the program has no apparent provision for distinguishing between opening and closing quotation marks. The documentation does not mention quotation marks, but the manuals exhibit the shortcoming by using inelegant inch marks throughout.

Legacy's documentation does a thorough job of guiding you through the program, and it's usually easy to locate needed information. The program's online tutorial is topnotch. The tutorial consists of 29 lessons on various aspects of the program. The lessons, which take from 5 to 15 minutes to complete, can be used in any order at any time.

These tutorials explain the material, then guide you through the menu selections needed to achieve the desired results. If you work through these lessons, you'll have a good basic understanding of *Legacy*.

But be forewarned: This program is complex, and with so many possibilities, it'll take time to master.

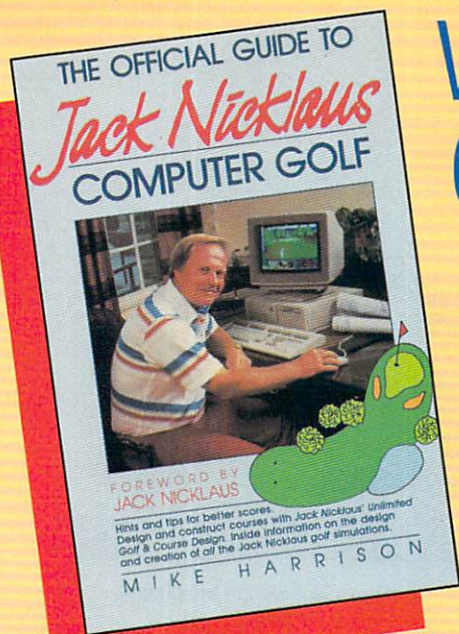
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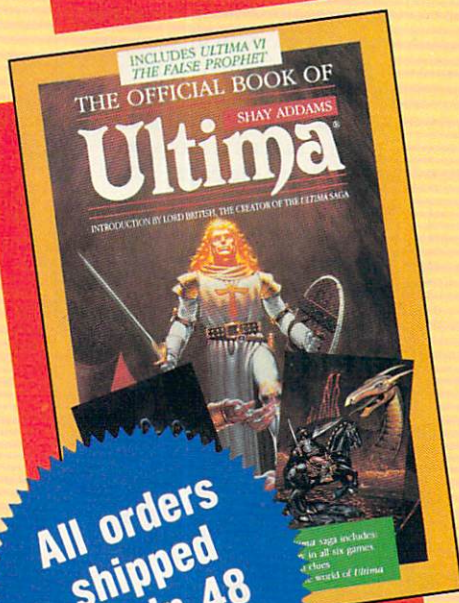
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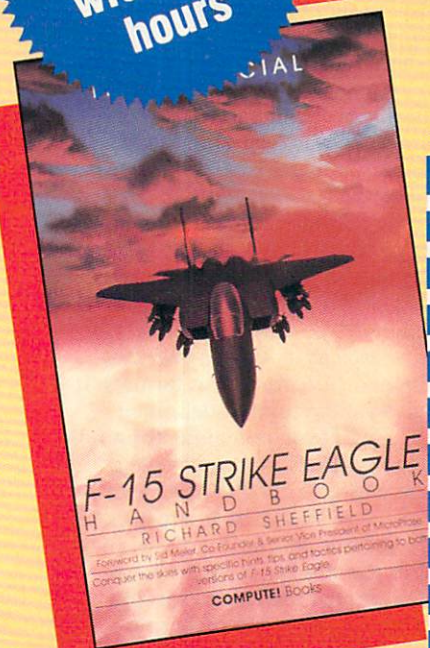
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for each number. Another usage record tracks calls and downloads (including drive, directory, and filename), and it provides a 32-character comment field. The program can up- or download in the background—and uses only 60K to do it. Script files, which store predetermined command sets and play them back on command, simplify repetitive tasks such as logging off commonly used boards. Other features, such as user-programmable wait-to-connect and wait-to-redial, allow easy customization. There's even a built-in text editor. These features, combined with *Eclin Connect's* solid documentation and unlimited technical support, make it one to consider.

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CROSSTALK COMMUNICATOR

A modem can be a lifeline. It links your PC to the outside world and lets you send and receive information, scan bulletin boards, and tap into time- and money-saving services where you do everything from researching the latest in panda metabolism to lining up an airline ticket. Standing between you and these exciting services, however, is communications software. Communications software tends to fall into two groups: programs that are easy to use and programs with a lot of features that are hard to use.

Crosstalk Communicator tries to be a happy medium. It's packed with enough features to handle a wide variety of telecommunications situations, necessarily making it somewhat complex; yet it's relatively easy to use. Entries are already programmed for popular services like CompuServe and the Official Airline Guide, and a feature dubbed EASYCALL makes

creating new entries for communication with bulletin boards or other computer systems a snap. *Crosstalk Communicator* asks a few simple questions to set up an entry and then dials automatically, if you want it to.

Making adjustments to *Crosstalk Communicator's* standard settings requires a bit more effort. Each entry hides a multilevel maze of options, allowing you to choose between several terminal emulations, XMODEM variants, and specific utilities. After initial setup, however, it's no problem to call a computer or system and interact. I'd like to see a more detailed menu after connection has been established, but once I got used to the system, I was able to work fairly quickly, executing commands and up- and downloading files online.

The program comes with a helpful reference card and a nicely detailed, thoroughly indexed user's guide. Its onscreen help system can be confusing at first, although with repeated use it proved perfectly adequate.

Crosstalk Communicator may provide more options and features than a casual telecommunicator needs, but it's basically easy to use, and it's a very powerful tool.

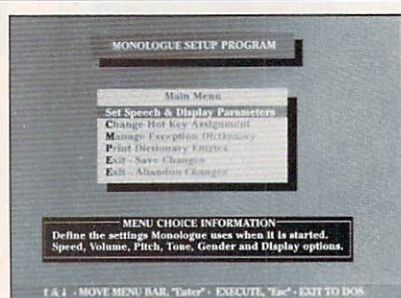
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MONOLOGUE

I had just mailed a column to my editor when the delivery man brought *Monologue 2.0*, a program that reads aloud any DOS text files including files created with word processors, databases, spreadsheets, as well as electronic mail. Even though I had run the column through *WordPerfect's* spelling checker, I was surprised to discover two missing words I hadn't noticed on paper. The voice sounded realistic and pleasant. You can change its volume, pitch, speed, and gender. The program uses your computer's internal speaker and sup-



Configure *Monologue* to suit you.

ports hardware sound accessories for better tones. People with limited eyesight can obviously benefit from a product like this, but *Monologue* will help any writer identify writing that "reads" poorly, though it looks perfectly acceptable on the page.

SCOTT DANIELS

IBM PC and compatibles; 512K free RAM; supports EMS and XMS memory, Sound Blaster sound card, and the Hearsay 1000, Covox Speech Thing, and Echo PC+ text-to-speech adapters; mouse and hard disk recommended—\$149

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LABELPRO

If you're running a small business from your home, *LabelPro* will give a sharp look to your mass mailings. In both its dot-matrix and laser versions, this program handles not only mailing labels but also shipping labels, disk and file-folder labels, and a variety of specialty labels. *LabelPro* lets you specify label size and format and gives you control over the type size and typefaces you use on your labels.

LabelPro will use address data stored in *dBASE* and *WordPerfect* formats, as well as in Avery's own *List&Mail* and *List&Mail Plus* formats. It can also handle comma-delimited ASCII files. If you're mailing from relatively small lists, you can create a database using *LabelPro* itself. Individual *LabelPro* databases are limited to 300 records per file, but there's no limit to the number of files you can create. Limited search and sort options are available, but there's no

automatic word-wrapping. That means that records can be truncated if they are too long for your specified format. Fortunately, the program can alert you to truncated records.

A home business that wants the look of custom labels for short mail runs will find *LabelPro* a real help.

STEVE HUDSON

IBM PC and compatibles, 512K RAM, hard disk; dot-matrix version requires graphics-capable printer; laser version supports LaserJet- and PostScript-compatible printers—\$99.95

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GAMES

C H O I C E

STELLAR 7

The word *stellar* refers to something outstanding. In this sense, *Stellar 7* is aptly named. This futuristic combat game from Dynamix features amazing action punctuated by enemy fire, eye-catching 256-color VGA graphics, and digital sound. *Stellar 7* almost feels like a game from the future.

Although the action is definitely arcade, *Stellar 7* has three-dimensional graphics that closely resemble those of the best flight and tank simulators. Looking out from the cockpit of your vehicle, you steer through fast arcade action that's set in the midst of excellent and realistic-feeling graphics. It's like a *Star Wars* battle on land with high-tech tanks.

The story is a classic plot from the pages of arcade literature (what an oxymoron!). It seems that some Darth Vader-esque character with a bad attitude and a voice like Arnold Schwarzenegger wants to take over the Earth. You are, of course, Earth's only hope and must fight off the invading forces (sound familiar?).

Your weapon is the Raven, which the documentation refers to as

"the ultimate fighting machine." It's a futuristic tank with an antigravity (agrav) generator that lets it hover two feet above any surface. The Raven's weapons include high-tech shields, cannons, radars, a cloaking device, and special thrusters.



Stellar 7 features eye-catching VGA graphics and fast arcade action.

You pilot your high-tech tank in any direction through a beehive of enemy vehicles and fire. Your tank has fixed turrets, so you must turn your entire vehicle to shoot at the enemy while avoiding its fire.

Unlike incompetent storm troopers who can't hit the side of a cargo ship, your enemy is dangerous, intelligent, and deadly. You have to move fast in order to shoot down the enemy planes, artillery, and tanks before they shoot you. Each time your tank takes a hit, you lose energy. When your power is gone, your shields drop. One more hit at this point, and the game is over.

The graphics exploit the 256-color VGA palette to the hilt. While the VGA graphics are incredible, the EGA graphics are still nice, and the CGA graphics are OK. The game is harder to play in EGA (even harder in CGA) because the objects on the radar are harder to differentiate.

The graphics are so well done that Dynamix features an actual screen shot on the package. How many times have you seen a game that even remotely resembles the picture on the box? *Stellar 7* doesn't let you down. Some of the screens were originally airbrushed and then digitized to produce graphics with a distinctive look.

If you have a sound board, you'll hear first-rate sound effects and a relentless, but rousing, musical score. You'll also hear the characters' voices during the interludes. It's easy to get

caught up in the action when you crank up the stereo sound. My insomnia-ridden neighbors probably heard me playing into the wee hours of the morning. The game is so addictive that I actually lost sleep playing it.

The documentation is brief and clearly written. The game is easy to install and a snap to learn—but with seven levels, it's a definite challenge. Overall, I preferred the joystick, but for certain shots that needed consistent accuracy, I preferred the keyboard.

If you want a break from computer games that bend your mind with puzzles or make you explore and map vast computer-generated worlds, treat yourself to *Stellar 7*. It's an excellent shoot-'em-up arcade game with riveting action and incredible graphics.

WAYNE N. KAWAMOTO

IBM PC and compatibles; CGA, EGA, VGA, or Tandy 16-color graphics adapter; joystick recommended; sound effects and musical support for Roland MT-32, LAPC-1, Ad Lib, and Sound Blaster sound cards; digital voice support for Tandy 1000TL, Tandy SL, and Sound Blaster; mouse optional—\$34.95

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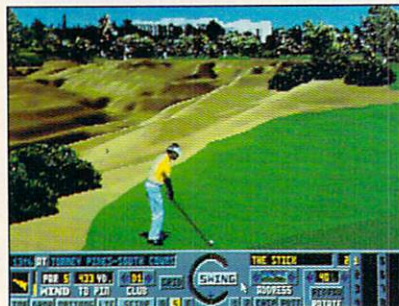
LINKS: THE CHALLENGE OF GOLF

Golf is a passion. To indulge in their favorite pastime, golfers endure rain, cold, even snow (using colored balls). You just can't keep avid golfers away from their game. When you can't play the real thing, a few rounds on the PC can calm the fever. Computer golf games are wildly popular; nearly every major game developer has one.

Access Software has taken computer golf a giant step forward with *Links*, a VGA-only, three-dimensional visual extravaganza that's the most fun and most realistic golf program I've tried.

Step onto the South Course at California's Torrey Pines, set atop pic-

turesque cliffs along the Pacific Ocean. At the first tee, your digitized golfer stands at the ready as you look over the fairway. The screens are digitized photos of Torrey Pines, showing contours, trees, golf cart paths, cliffs, ocean, background skyline, the clubhouse, and everything else you see on the actual course.



Links features VGA graphics.

As you admire the view, you may be surprised to hear birds singing—even through your plain-vanilla internal PC speaker. If you've played Access's earlier golf game (*World Class Leader Board*, also a standout game), you know about RealSound, Access Software's seemingly magical system that produces realistic sound without an add-on sound board. As you play your round, be ready for your companions to pipe up with such comments as "That'll play," "Nice par," or "I seem to have hit the tree, Jim."

You tee off using your mouse (there are keyboard alternatives, but a mouse is best). With fluid motion and true-to-life sound, the golfer hits the ball. The ball's flight is smooth and beautiful (unless you've hooked or sliced it), with its shadow following along the ground. The ball lands on the turf, bounces, and rolls in a way that's appropriate to the terrain.

As the ball rolls dead, a control panel pops up, offering instant replays of the shot, either from the tee or a reverse angle (a TV-like view that shows the ball coming toward you). You can see exactly what happens to your ball, including such interesting possibilities as seeing your ball roll down a long, steep hill to the cliff tops.

The control panel shows the distance of the shot, including the amount of ground roll, and offers two choices: Continue to the next shot or take a Mulligan. If you want to break

par consistently (if unfairly), hit the Mulligan button after every bad shot. It discards the stroke and lets you replay it.

Links is unequalled in its visual artistry. But its mouse-based system of control over the swing and aim of each shot makes the play just as pleasant. You can enjoy the game without ever fussing with the finer points of golf. Or, by clicking on the setup button, you can fine-tune the stance, ball placement, angle of the club face, and plane of the swing. Using these controls, you can design and execute an exquisite golf shot, one that quickly rises to clear a close tree and fades to the right to follow the curve of the fairway, for example.

Chip shots are a big part of the game. *Links* handles chip shots realistically by showing you the contours of the green so that you can place your shot just right. Club selection works properly, too. A 5-iron hit softly will run up the green, while a wedge shot landing in the same spot dies almost immediately. Chipping at the practice green with its challenging undulations is particularly addictive. I've hit a hundred consecutive balls from the same spot, trying for just the right combination of loft and strength to sink a 65-foot chip shot, including a curving downhill roll to the cup. I sank five of them.

There's a host of other features that add to the realism of this outstanding game. If you can't quite make out the slope of a green, for instance, you can overlay grid lines on it, making the contours clear.

One word of caution: All this video wizardry requires a powerful PC and takes up over two megabytes of hard disk.

From the spectacular 3-D course to the excellent play-control system, *Links* is a golfer's dream, a chance to play what feels like real golf without ever having to leave home.

RICHARD O. MANN

IBM PC and compatibles, 640K RAM, MCGA or VGA graphics adapter, hard drive; mouse strongly recommended; supports extended and expanded memory and most sound cards—\$59.95

ACCESS SOFTWARE
4910 W. Amelia Earhart Dr.
Salt Lake City, UT 84116
(800) 800-4880

BATTLE CHESS II: CHINESE CHESS

The original *Battle Chess* added a new twist to the game of chess by adding movement, sound, and a sense of humor to the game's medieval characters. Instead of simply sliding from square to square as in other computer chess games, the knights, bishops, rooks, and other pieces on the *Battle Chess* board actually walk to their new squares. Best of all, when one piece captures another, the square isn't surrendered peacefully but is reluctantly vacated after a mini-battle that can include anything from a sword fight to histrionic spell-casting.



The game pieces come to life in Battle Chess II: Chinese Chess.

Battle Chess II brings this same excitement to Chinese chess—a not-too-distant cousin of conventional chess that developed independently of its Western counterpart. Because Chinese chess features more playing pieces than conventional chess, *Battle Chess II* offers even more battle animations than the original. For instance, a cannon in Chinese chess fires cannonballs in high arcs over the other pieces in order to blow up the piece being captured. A counselor can do away with a pesky pawn by simply drawing an oversized mallet from beneath his robe and flattening the pawn with one bold stroke. Throughout the game, the battles are punctuated with the grunts of the combatants and the realistic clang of weapons and armor.

You can play *Battle Chess II* head to head, via modem, or against the computer on any of nine different skill levels. In addition to the colorful three-dimensional board where the



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The disk is designed to work with Accolade's *Mean 18*. The *Mean 18* program is sold separately.

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humorous battles occur, there's a two-dimensional board where you can play a conventional game of Chinese chess.

BOB GUERRA

IBM PC and compatibles; 512K (CGA or EGA) or 640K (MCGA or VGA) RAM; supports Ad Lib, Sound Blaster, Game Blaster, Covox, Innovation, Roland, and Tandy sound boards; hard drive and mouse optional—\$49.95

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THE SAVAGE EMPIRE

When the people at Origin Systems issued their new, much improved gaming engine in *Ultima VI*, they knew in advance that it would be a hit. Understandably, they didn't want to wait another year or *Ultima* episode until series producer Richard Garriott made use of it again, so the Worlds of *Ultima* spin-off line was created.

The Savage Empire, the first release, re-creates the steamy Grade B jungle epics of 1930s Hollywood films and pulp magazines. Once again you play the Avatar, good guy *extraordinaire*. Sent to a hidden jungle valley that's been cut off from the world for tens of thousands of years, you'll find a variety of oddly juxtaposed cultures and large, carnivorous reptiles. What begins as your party's attempt to rescue the kidnapped tribal princess Ayesha turns into a broader conflict against a deadly, well-organized foe.

Origin Systems' post-*Ultima V* products mark a radical departure from the standard role-playing interface of icons and stick figures. Conversing with NPCs (NonPlayer Characters) brings up images and short descriptions of each person. Cities are full-size, citizens work, fish gotta swim, and birds gotta fly. The price one pays for this detailed, animated reality is a good computer system; you really should have VGA, a sound card, and (above all) an 80386 microprocessor to sample Origin's universe-in-a-program.

Ultima's basic gaming compo-

nents remain unchanged, however. You're in charge of up to seven characters at once, who work, fight, and converse according to your whims. You, in turn, are at the mercy of Garriott's computerized world and a host of fictional people whose vividness tends to lurch at you through the screen.



Be the main course in *Savage Empire*.

Many people will prefer this game to *Ultima VI*. Character images are better drawn, and command response time is slightly faster. Its designers made *Savage Empire* a little more forgiving of errors of judgment and omission than their mainstream product. Should you pass up something important like a jar of sulfur, for instance, you'll find ways to acquire more in your surroundings. The quests are more varied, too, with shorter ones building confidence before you crash into the major efforts. *Savage Empire* is lengthy and involved, but not quite as complex as *Ultima VI*, and some moments of humor (involving a celebrated comedy team of the past) are better integrated with the plot.

In sum, it's an auspicious debut to a gaming series from an old and reliable source. Break out the pretzels, and keep plenty of mosquito repellent handy.

BARRY BRENESAL

THE SAVAGE EMPIRE

IBM PC and compatibles (10 MHz or faster recommended), 640K RAM (expanded RAM required for music), EGA, MCGA, VGA, or Tandy 16-color; mouse and hard drive recommended; supports Roland, Ad Lib, and Sound Blaster—\$59.95

ORIGIN SYSTEMS
P.O. Box 161750
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ALTERED DESTINY

At the start of *Altered Destiny*, Accolade's new graphic adventure, P. J. Barrett is sucked bodily through his television into a strange new world. Although not exactly the most subtle of plot devices, the opening sets the story line in motion and establishes the fanciful tone needed for the offbeat events to follow.

P. J. ends up on the bizarre planet of Daltere. Daltere is a dreamscape world that's part fantasy and part nightmare. If the environs are foreign, though, the goal of the game will be all too familiar to veteran adventurers. In yet another variation of the "Universe on the Brink of the Apocalypse" theme, *Altered Destiny* charges P. J. with the task of recovering a stolen jewel that's essential to the planet's stability and survival.

The most puzzling mystery in the game is why its designer has resurrected such a tired, old scenario.

You maneuver P. J. around the screen with the arrow keys or a mouse while giving him specific instructions through typed commands. The program is generally adept at understanding directions, although this seems more related to the kinds of actions P. J. must perform than the intrinsic sophistication of the game's parser. For the most part, you can get away with simple, declarative, Tarzan-like sentences. *Altered Destiny* isn't a very verbal game. Even the text descriptions that accompany the screen graphics tend to be terse. In short, the visual elements predominate.

Visually, the game is a rich collage of arresting, imaginatively drawn landscapes rendered in fluorescent colors. The limited animation (flower petals waft through the air, and odd creatures scurry across the ground) adds to the vividness of the screens. Like the program's varied and entertaining soundtrack (it even sounds good on the PC's internal speaker), the inventive imagery creates a mood and an impression that complement the adventure's far-out setting.

Altered Destiny is less linear than many games of its ilk. It allows you a fairly free range of movement on Daltere. Emblematic of the latitude you enjoy is the fact that P. J. starts his ex-

ploration of the planet's surface standing in the middle of a crossroads, with no clue as to which direction he should take. While certain tasks must be performed before others, the game doesn't force you to adhere to a rigid path.



Take a walk on the wild side.

On the other hand, although the puzzles and pitfalls you encounter in the course of P. J.'s quest are challenging, they don't always abide by the rules of logic—or even fairness. In more than one situation, the correct response to a problem must be found through trial and error. The manual warns you to save your position frequently. This is good advice, given the program's tendency to punish missteps with death. Experimentation is also recommended because *Altered Destiny* is a game in which inspiration—as much as calculation and deduction—will carry the day.

JEFF SEIKEN

IBM PC or compatibles (8-MHz or faster AT recommended); 640K RAM; DOS 2.1 or higher; hard drive; CGA, EGA, VGA, MCGA, or Tandy 16-color graphics adapter; supports Ad Lib, CMS, Tandy 3-voice, Roland MT-32 and LAPC-1, and Casio CT460 sound boards; supports MIDI instruments; mouse recommended—\$59.95

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STUNT DRIVER

After my daily commute on Southern California's congested freeways, a driving game should be the last thing I would want to play on my computer. But that was before I discovered *Stunt Driver*—

Spectrum HoloByte's terrific new car simulator.

This game goes beyond the typical car-racing simulation by offering tracks loaded with radical obstacles. Your car loops, jumps, corkscrews, and banks to the finish line. This roller-coaster race has more twists and turns than a contortionists' convention.

You drive a classic 1966 Shelby Mustang, a heavy-muscle car born to be driven. With *Stunt Driver's* five assorted tracks, three brutal opponents, and an editor to create your own courses, if you haven't driven a Ford lately, you'll have a formidable challenge ahead of you.

The first thing you'll notice about the game is the outstanding graphics. Representing the latest generation of graphics for home-computer games, *Stunt Driver* features a 256-color VGA mode that's stunning. The 16-color VGA and EGA are also well done. The background mountains look like mountains, not like a series of green triangles.

As you drive, you can try to take in the excellent scenery. You can choose backdrops that look like a forest, Tokyo (watch for Godzilla), London, San Francisco, and others. Even when you create your own tracks, the program automatically puts in the backdrops.

As in a flight simulator, you can watch your progress from a front, side, or back view. My favorite view is from an imaginary helicopter that follows the car.

You can replay your driving performance with a clever VCR mode. The best reviewer/camera I've seen in a game, it's literally like using a VCR. You can scan fast-forward through the race to reach the scenes you want to see, play back scenes frame by frame, and amazingly, switch between the views.

When I overshot a jump or fell off the loops, the car flew into the air and realistically tumbled bumper over bumper on the ground. Then I enjoyed reviewing my crashes—frame by frame—from the helicopter view.

Another nice touch is the ability to race another player head to head by modem. The program also supports the Ad Lib sound board for great audio effects.

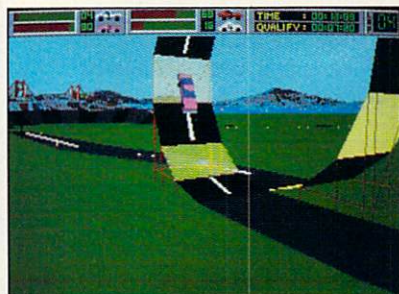
The driving is very challenging—in fact, this is the toughest driving

simulation I've played. It's easy to overshoot the turns, and it can be hard to get going in the right direction again. Fortunately, the game provides arrows to point you to the right path.

The package says that a joystick is optional. In fact, the game designers specifically recommend that you use the keyboard, and that's what I preferred.

The installation was straightforward, and the game was, overall, easy to learn. It's the driving skills that take some practice to master.

This was the most fun I've had with any driving simulator. The jumps and loops add an exciting twist to the racing-game genre. I'm just glad I didn't have to learn to drive on this challenging race course in real life. I can imagine my frazzled parents yelling at me, "Hey! Look out for that loop!"



Drive your car over incredible obstacles in *Stunt Driver*.

Stunt Driver is an exhilarating simulation that lets you forget about real driving issues, such as gas prices and car insurance premiums. Maybe it's the contrast to real driving that makes this game such a fun escape from reality. It's definitely not just another day at the races, and it's certainly not *Driving Miss Daisy*. I recommend *Stunt Driver*. It's is a rip-roaring, drive-by-the-seat-of-your-pants thrill ride.

WAYNE KAWAMOTO

IBM PC and compatibles; 640K RAM; CGA, EGA, VGA, or Tandy 16-color graphics adapter; 8-MHz 80286 and hard drive recommended; supports Ad Lib and Tandy sound boards—\$49.95

SPECTRUM HOLOBYTE
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TREASURE TRAP

In *Treasure Trap*, you control the movements of a diver searching the sunken HMS *Esmeralda* for a horde of lost gold. Local creatures have established squatter's rights since 1856, however, and don't take kindly to your interrupting their daily schedules. You have no map, no weapons, no keys, and a very limited supply of air. Additional air tanks are scattered throughout the ship's 100 rooms, but you don't know where, and the electric eels approaching you aren't about to tell you.

At first glance, *Treasure Trap* resembles a more sophisticated *Mario Brothers* with its jumping hero, points (gold) to collect, moving objects, and deadly creatures. But this game's graphics are far superior, with detailed ship hulls and bulkheads and shadowed highlights that provide good 3-D effects. The graphics suffer on a CGA-equipped machine, but the EGA and VGA versions are stunning.



Try this adventure in the briny deep.

The graphics get support from a plot right out of *Jaws*. Electric eels, stingrays, hammerhead sharks, and piranha all try to make an easy lunch out of you. Beyond the unfriendly marine life, there are also whirlpools that instantly transport you to unknown surroundings. Add to all of this the *Esmeralda's* secret cargo of some unknown substance, carried in leaking barrels and lethal upon contact.

One useful feature to this game is its optional key reconfiguration. Also included are abilities to toggle sound effects, remove shadowing (for speed), and the all-important pause control.

The original version of *Treasure Trap* used a key-disk copy-protection scheme that, in my use, did not operate as designed on one-third of the

computers I tested it on. To the company's credit, it has since released a version without copy protection. If you bought the first version and are having problems, you can exchange it for free by returning your original disks, along with a brief explanation of your problem, to the company's Baltimore offices (see address below).

Arcade addicts will be tempted by *Treasure Trap's* breathtaking visuals and playful brainteasers. And once they give in to that temptation, they can anticipate a lot of undersea fun.

BARRY BRENESAL

IBM PC and compatibles, 640K RAM, CGA, EGA, or VGA—\$39.95
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JAMES BOND: THE STEALTH AFFAIR

Santa Paragua may look like a sun-soaked South American vacation spot, but you only need to scratch the surface to find trouble in paradise. In *James Bond: The STEALTH Affair*, you step into the secret agent's well-polished shoes. On behalf of the American CIA, your job is to hunt for a stolen stealth fighter.

In this animated adventure game, Bond runs through a series of crises both trivial (getting change to buy a flower) and life-threatening (escaping a watery grave) in pursuit of the jet. Controlled by either keyboard or mouse, the Bond of *The STEALTH Affair* moves and acts in a manner like that of his namesake in latter-day 007 movies—that is, choppy and silly, trading the quiet sophistication of Ian Fleming's hero for a goofy nonchalance. He lapses into confused muttering at the first sign of a confrontation, trudges across open pavement at a sluggish pace, and freezes under smart-alecky insults at every wrong move.

While *The STEALTH Affair* os-

tensibly offers many options for action, each dilemma actually has only one correct resolution. Choosing the right option amounts to outguessing the whims of the game's creators. While some resolutions are challenging but logical—as they should be—others are almost impossibly obscure. If you're lucky, you'll suffer only smug putdowns for your mistakes. If you're not so lucky, you will watch Bond die or be thrown into prison, courtesy of Santa Paragua's system of summary justice.



Save the day with Bond, James Bond.

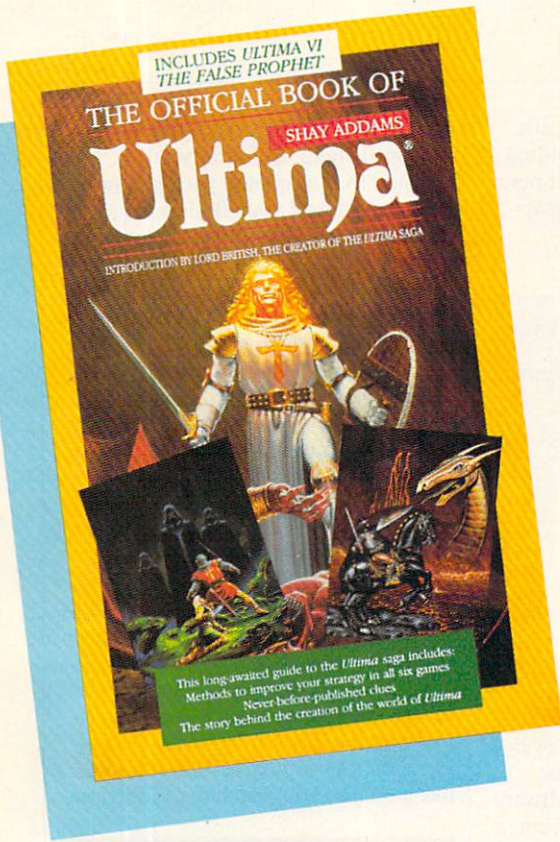
It's advisable to save your progress with every new scenario, since Bond succumbs so readily to so many different traps. Fortunately, Interplay offers American players a hint line to call if it becomes impossible to maneuver Bond out of a scenario. Unfortunately, it's a 900 number that costs \$1.25 for the first minute and \$0.75 for every additional minute. As a result, mistakes can punish your wallet almost as much as the animated James Bond figure.

The STEALTH Affair's graphics are colorful and varied, placing Bond in imaginatively created settings. There's a lovely park with a city skyline for a backdrop, a plush hotel cast in rich red tones, and an ominous-looking dictator's palace where the walls are peppered with bullet holes. Each scene sports interesting details, some of which are necessary for advancement while others are red herrings. Frenzied electronic music accompanies a handful of crucial scenes; it quickly became irritating, and I toggled it off. A detailed manual offers entertaining background material and crucial guidance.

Bond and the objects around him generally respond well to keyboard commands. The actions necessary to make things work are frustratingly in-

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consistent, however. In one early scene in an airport, where Bond is trying to figure out which luggage to take, the game is maddeningly unresponsive. And a few of the error messages contain annoying typographical errors.

Just as *The STEALTH Affair* obscures thieving military dictators and double-crossing secret agents behind sunny tropical locales, the game obscures some strict limitations on action behind an apparent wealth of options. When every dilemma has only one real solution, resolving predicaments can truly be an exercise in frustration.

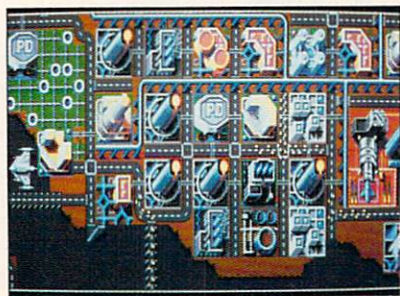
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IBM PC and compatibles; 512K RAM; CGA, EGA, MCGA, VGA, or 16-color Tandy; hard disk recommended; supports Microsoft mouse and Roland MC-32 and Ad Lib sound cards—\$54.95
Also available for the Amiga (\$54.95).

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SIMCITY GRAPHICS

Maxis has released two sets of alternative graphics for its wildly popular *SimCity* game. *Set 1* provides cities from Genghis Khan's Asia, the Wild West, and medieval times. *Set 2* offers futuristic cities in Europe, in the United States, and on the moon. It replaces aircraft with dragons (among other changes),



Build the European city of tomorrow.

and threatens cities of the past and future with different kinds of disasters. Electrical power and railroads are re-

placed with aqueducts and stone paths. Factories become windmills, rice paddies, or smithies, depending on the scenario. The game itself plays exactly the same, which may disappoint some.

ROBERT BIXBY

IBM PC and compatibles with 512K RAM (640K for EGA graphics)—\$34.95
Also available for the Amiga (\$34.95) and the Macintosh (\$34.95)
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MAXIS SOFTWARE
1042 Country Club Dr., Ste. C
Moraga, CA 94556
(415) 376-6434

STUNTS

Driving simulations have accelerated into the fast lane since the original *Test Drive*. This time, Distinctive Software, the developer of the *Test Drive* series, has teamed up with Brøderbund Software to bring us a racecar driver's dream, a game simply called *Stunts*.

As a stunt-car racer, you choose from an arsenal of 11 road rockets ranging from Indy-car racers to elegant sports roadsters to off-road puddle-jumpers. To get the feel of the controls and the inventive stunt tracks, I started with the Lamborghini LM-002, a \$120,000 four-wheel drive with a top speed of only 126 mph. When I switched to the Jaguar XJR9 IMSA, a \$325,000 Indy car with a top speed of 215 mph, it was like going from the cockpit of a twin-engine Cessna to that of an F-19. The feeling of power under the Jaguar's hood was exhilarating.

The stunt tracks include such challenges as steeply banked curves, open drawbridges (you'd better be doing at least 90 mph if you want to make it to the other side), loops, corkscrews, slaloms, and a devious pipe (a simple round tunnel with a nasty cement block in the middle). You have to drive up onto the wall of the pipe in order to miss the block, then be back on the level before you exit the pipe. There are also hills, elevated roadways, and spirals. If that's not enough, you can change the track to dirt or icy roads.

While all this sounds good, you have to see this game to have an in-

king of what it's all about. Driving, of course, you see the cockpit view out the windshield. But after you've crashed (or completed your lap, once you've polished your skills a little), you can run a videotaped replay of the race. A VCR-like control panel lets you run the tape forward and back, watch it frame by frame, and select your point of view. You can see it again from the driver's seat or select the TV-camera view, which shows your car approaching then receding from a series of remote cameras along the track.

The most fun is the helicopter view. You can zoom in and out, move the helicopter camera up and down, and change the angle of view through 360 degrees. As you move the point of view, the scenery, horizon, and race-track all change appropriately. Although the scenery and the cars are mostly polygons that are fairly jaggy-looking, the illusion works. It feels like a race as you drive, and it looks like a race as you watch the videotape.



Race over roads with corkscrew turns in *Stunts*.

Stunts has nice touches throughout, such as the choice of six opponents with varying degrees of skill. Helen Wheels and Skid Vicious are the best of the lot. In the evaluation panel that appears after each race, your adversary appears in a digitized animation to either rub your nose in your loss or pout about your superior abilities.

The developers have created painstakingly accurate simulations of the driving characteristics of these 11 cars; you'll come to recognize the feel and sound of each. They accelerate differently, they spin out at different speeds, and they even have individual characteristics when airborne.

In addition to the traditional cursor-key control system, you can

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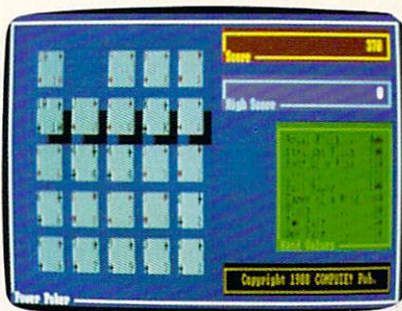
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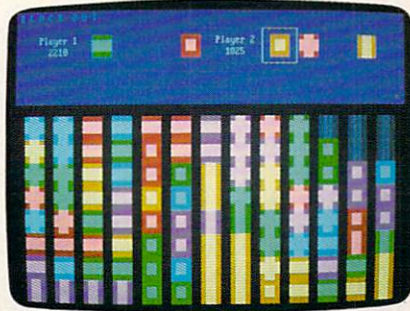
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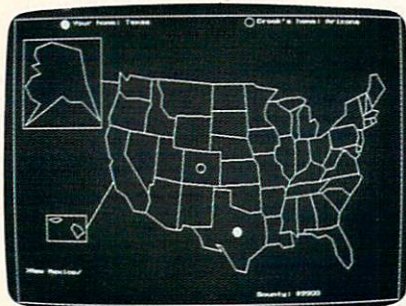
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drive these cars by mouse; left and right mouse movements turn the steering wheel. I found the mouse movements to be too hard to learn, so I soon drove exclusively by keyboard.

Once you've mastered the half-dozen increasingly complex tracks that come with the game, you can design your own tracks using the basic building blocks. You'll be able to create tracks formidable enough to keep you challenged, no matter how well honed your driving reflexes become.

Stunts' extensive graphics and complex simulation algorithms require a powerful computer; a 286 machine running at 8 MHz or better is recommended. The game also requires a tremendous amount of memory. If you have any TSRs running, you'll have to unload them in order to run *Stunts*. For me, this meant creating a separate boot disk just to run the game, which rankles a little.

If you have an unfulfilled desire to drive the hottest racing cars on the planet or if you fantasize about driving in an exciting TV-style car chase with jumps and other stunts, you can work off a lot of that energy with *Stunts*. The cars are satisfyingly realistic, the stunts are dramatically exciting, and you can create (and save) computerized videotapes of your exploits. In addition, the highway patrol will thank you for confining your stunt driving to your computer room.

RICHARD O. MANN

IBM PC and compatibles; 512K for CGA and Hercules, 640K for EGA, MCGA, VGA, or Tandy 16-color; 8-MHz 286 or faster processor recommended; mouse or joystick optional—\$49.95

BRØDERBUND SOFTWARE
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HOYLE'S OFFICIAL BOOK OF GAMES

Although Sierra is best known for its 3-D graphic adventures such as the Space Quest and Leisure Suit Larry series, *Hoyle's Official Book of Games, Volume 2* proves that the company also knows a thing or two about strategy games. *Hoyle's 2* is a feature-packed program that boasts

28 card games for the solitaire connoisseur. The collection includes everything from old standbys like *Pyramid* and *Klondike* to several lesser-known solitaire games such as *Scorpion*, *Fortress*, and *Penguin*. The program's designer, Warren Schwader, has even tossed in a couple of his own creations—*Bowling* and *Slide*.

No matter which game you select, the cards are neatly arranged on-screen and can be easily manipulated with your choice of control device—keyboard, joystick, or mouse. Mouse control is the easiest, but when no mouse is available, either of the other methods works just fine.

All of these solitaire games can be played at an easy or hard level of difficulty. But even with two difficulty levels, some games are much easier to win than others. Once you've selected a game and difficulty level, you may also choose the game's background color and the design of the deck you'll be using. While an unusual design won't improve your chances of winning, the option of choosing your own deck makes playing *Hoyle's 2* that much more enjoyable.

Other options let you toggle the sound on and off, adjust the cursor speed, and set the animation speed. This last option determines how fast cards are spun into place at the start of the game and how quickly they're flipped from the deck to the stockpile.

All in all, *Hoyle's 2* is a terrific way to pass some free time. Once you've installed it on your laptop, you'll never again be bored waiting at an airport terminal. If I had to find one fault with the program, it's that it doesn't allow you to save games in progress. Nevertheless, *Hoyle's Official Book of Games, Volume 2* will provide hours of solid entertainment for anyone who enjoys a good game of skill and chance.

BOB GUERRA

IBM PC and compatibles (8 MHz or faster recommended); joystick or mouse optional—\$34.95

Also available in a monochrome MS-DOS laptop version (\$19.95) and for the Amiga (\$34.95), Atari ST (\$34.95), and Macintosh (\$34.95)

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STAR CONTROL

This is not just another space game. While *Star Control* revives several classic game themes, it improves on them all and gives you plenty of options. Whether you decide to fight for the Alliance (good guys) or the Hierarchy (bad guys), you can choose one of 14 different craft to pilot, each with a truly distinct personality.



Choose among 14 ships, each with a distinct personality, in *Star Control*.

To help you out, stunning digitized graphics provide vital information about each ship. Pay attention here because knowing your ship helps you develop tactics to exploit enemy weaknesses.

Once battle has begun, you see your ship represented in deep space, with stars and planets floating by in different directions. The fine detail and multiple animations give the action a 3-D feel. As your ship and the enemy ship approach or dart away from each other, the screen zooms in and out. This ensures that both spacecraft appear on the screen at all times while providing the greatest possible detail.

The real virtues of *Star Control* emerge when you graduate to playing a full game. There are nine war game scenarios to choose from and an option to design your own. Generally, each places you in command of a handful of specific ships, pitted against an enemy who, one way or another, is as strong as you are. Taking turns, you and your opponent set out to explore planets. Ideally, you discover worlds where you can establish strategically important mines or colonies.

Don't think the strategy involved is an afterthought. In a full game, it's vital. Accolade wisely incorporated a

save-game feature into *Star Control*, as a well-fought scenario can last several hours.

Player options are extensive. A human or the computer can exercise exclusive control over each side. If you'd like, the computer can control either the strategic moves or the tactical fighting of a camp. Either player can navigate by keyboard or joystick. The keyboard seems to offer the best control, but ditch the key defaults. *Star Control* allows you to define your keys, and that really helps the playability.

CGA screens are adequate, EGA good, and VGA gorgeous. The supported game boards primarily provide different weapon sounds. While everything sounded perfect on my CMS board, you don't have to own a sound card to fully enjoy the program.

Star Control works just fine on a floppy-only system, but to run it on anything less than an AT-class machine requires stripping off a lot of the visual and audio features that you wouldn't want to miss. Documentation is very good. The off-disk copy protection is probably the least burdensome yet most effective I've seen.

Accolade deserves credit for taking the time to integrate the many diverse facets of *Star Control* into a cohesive package, paying obvious attention to minute detail in every aspect of this game. It may be another space game, but it's a space game with everything done right.

WARREN QUINLAN

IBM PC and compatibles; 512K RAM for CGA or EGA, 640K RAM for MCGA, VGA, or Tandy; 8-MHz or faster AT class recommended; supports Ad Lib, Tandy, CMS, and Roland MT-32—\$49.95

Also available for Amiga, 1 MEG—\$49.95

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WEIRD DREAMS

Watch the roses—they bite. Careful of the little girl—she's lethal. Flying fish are key to your survival. Is this a nightmare or another David Lynch movie? *Weird Dreams* is a little of both, a

game that traps you in a surreal environment from which you must escape, checkered pajamas and all. The only way out is to wake yourself up, but you won't be able to do that until you experience some of the strangest adventures ever seen on a computer screen.



Well hello, Dali, it's so good to have you back in dreams where you belong.

Like most action games of this kind, *Weird Dreams* deposits you in a series of potentially deadly situations that you must survive by using your wits and joystick skill. Make your way through all the screens, and you achieve the ultimate goal of the game (in this case, to reassemble your badly addled brain and make it through the surgery you seem to be undergoing). What's refreshing and different in this adventure is the game's unpredictable sense of humor and use of graphics that would give Salvador Dali pause.

The gameplay will be very familiar to sword-and-sorcery gamers, even if it does require a fish or soccer ball instead of a sword. Instead of dragons and trolls, there are more unusual adversaries. Watch out for seemingly innocent objects; unwary encounters with these are likely to result in sudden, gruesome (sometimes gruesomely funny) death. To survive, you've got to kill just about everything you meet and grab anything that you can pick up.

The package includes a useful hint book and a long-winded novella that sets the scene for the game itself but which won't help you much in playing it. (You'll need the novella to pass the game's copy protection.) A joystick is also highly recommended, although you can play from the keyboard. One irritating flaw is the lack of a save-game feature; after five deaths, you're back at the beginning.

While *Weird Dreams* is certainly something different in the all too predictable world of computer gaming, I found myself wishing it were even more different. A lot of the game depends on joystick reflexes. The game would've broken new ground if it had required players to figure out the kind of intensely personal symbolisms and puzzles that dreams really present. You get some of the flavor of a generic dream, without the emotional urgency that all real dreams have. Sometimes I wanted to talk with some of the characters I met, but to progress required more violence than voice. The nastier opponents tend to be female (the little girl, the ballerina, the queen bee); game programmers ought to be more sensitive to these issues.

Perhaps my wish is really a call for a radically different kind of computer game, one that *Weird Dreams* only hints at. All in all, the game was fun, an odd diversion from the usual without being a complete reverse of the familiar. All that's required to have a good time with *Weird Dreams* is a quirky sense of humor—and it helps if you aren't too squeamish.

STEVEN ANZOVIN

IBM PC and compatibles, 640K RAM, CGA, EGA, or VGA graphics; joystick recommended—\$39.95
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SPELLCASTING 101

With *Spellcasting 101*, game designer Steve Meretzky (*Zork Zero*) has taken a text-and-graphics interface and revamped it for gamers new to text adventures. The strong plot and Meretzky's irreverence give the game a unique flavor. You play the role of Ernie Eaglebeak, a nerd who lusts after the hand of Lola Tigerbelly and who aspires to be a famous sorcerer.

The game is separated into chapters, the first of which involves Ernie's escape from home in Port Gekko.

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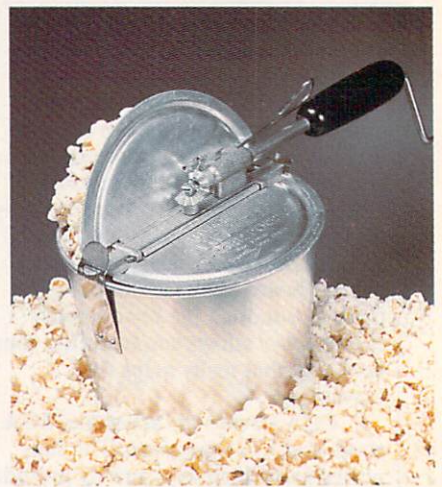
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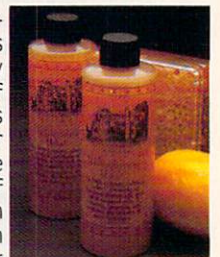
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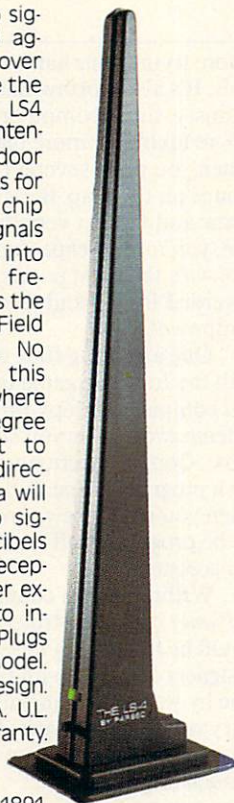
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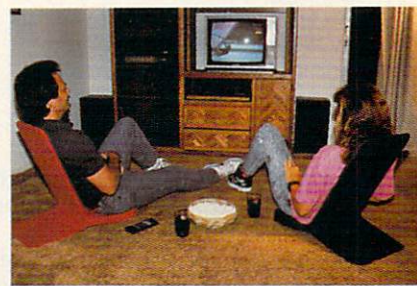
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Chapter 2 begins at Sorcerer University, where *Spellcasting 101* really gets started. An evil bunch of hooded ruffians ransack the school, and everybody disappears. Solving this mystery is the goal of the game, and it involves putting together the pieces of the Sorcerer's Appliance.



That ol' black magic will have you in its spell with its many surprises.

The interface for *Spellcasting 101* is one of the easiest I've ever seen for such a game. A window at the top of the screen can show a picture of your location, an overhead map, your inventory, your status, or a verbal description of your current location. You can toggle these options with the function keys. For those who have no desire or talent for typing, don't fear. Gameplay isn't hampered by the point-and-click interface.

Spellcasting 101 features outstanding graphics. Some of the pictures are a little risqué, but you can play the game in naughty or nice mode. (Frankly, I didn't see much difference.)

All of this ribaldry is easily installed on a hard drive. It supports most graphics modes and the Ad Lib and Roland sound boards. The game's puzzles are challenging but not so hard that they make you want to quit. As sophomoric fun without a trace of redeeming social value, *Spellcasting 101* appeals to the *Animal House* in all of us.

RUSS CECOLA

IBM PC and compatibles—\$59.95

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FULL METAL PLANET

This science-fiction strategy game is better than most but not quite as good as it could be. It takes its scenario from 1940s–50s industrial science fiction; you're in charge of an armed expedition to mine ore on an unstable planet. At your disposal are barges, tanks, cargo haulers, and attack boats. There's also a clever vehicle called the *Weather Hen*, which can not only manufacture replacement equipment but also forecast the planet's extraordinary tides. Yours isn't the only crew working the world. Your opponents possess the same tools and arms.

The planet itself has plenty of valuable ore, but the world's terrain makes extracting minerals difficult. Before each turn, a substantial tide alters the landscape. Dry ground can become swamp or even waterway, stranding your equipment or providing your enemies with access to your resources.



Be careful—this planet is all mine.

Full Metal Planet is a timed game with 25 turns. You have the option of setting the length of each turn on the opening menu. Up to four players, human or computer, can compete for the mineral resources. Several computer opponents are included, each offering a different strategic challenge.

The game all but requires a mouse, and its interface takes some getting used to. Use the cursor to guide your vehicles and to access various menus and commands. The game's manual doesn't explain these commands as clearly as it should, so I recommend watching a couple of completely computer-controlled turns

before trying your hand at the controls. It's also worthwhile to play against a single computer opponent before taking on more than one. When you place several rival mining groups on the map, things become hectic and violent very quickly. To win, you must escape the planet's surface with the most points, which are rewarded for ore and recovered equipment.

One annoying flaw interfered with my fun. The game insists that you complete its copy-protection scheme every time you start a new game. Copy protection upon executing a program is one thing; requiring it when you start a new game from within the program itself is altogether unnecessary.

Within its own context, *Full Metal Planet* is a solid strategy game. It would be interesting to see what its designers could do with the game's engine by way of offering different planetary surfaces and types. It certainly has potential for creating the basis for a much larger game.

KEITH FERRELL

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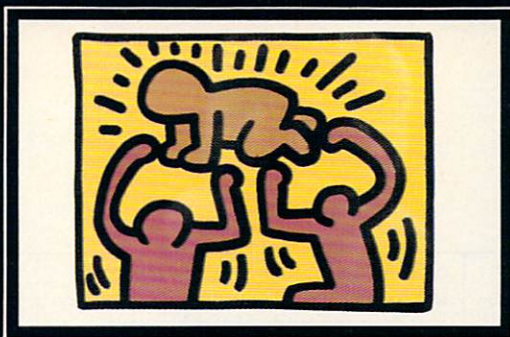
BILL ELLIOTT'S NASCAR CHALLENGE

Stock car racing has always been the romantic favorite on the pro racing circuit, the poor cousin to Grand Prix glamour and Indy 500 high-tech. With its roots in Prohibition-era moonshine running and its heroes self-effacing good old boys from down the pike, the NASCAR road-running track meets have all you need for spending a perfectly good Sunday afternoon engulfed in noise, steel, and the checkered flag.

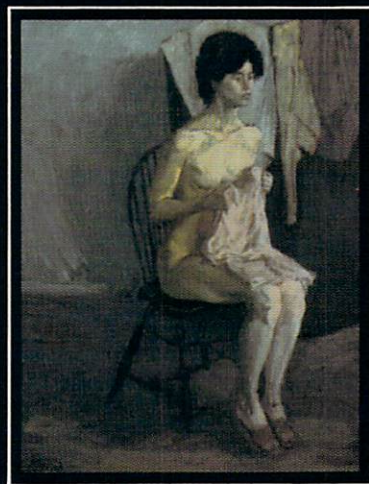
Bill Elliott's NASCAR Challenge brings those Sunday afternoons home, with a simulation that puts PC sports players in the driver's seat of one of



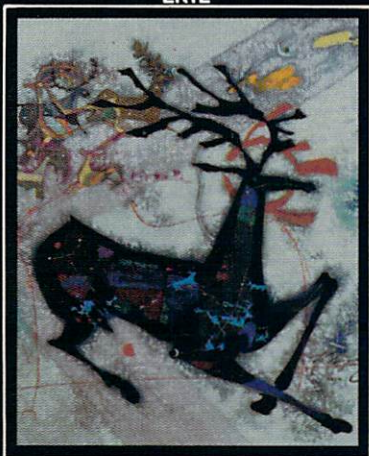
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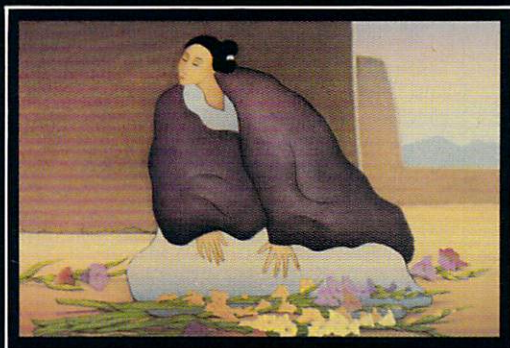
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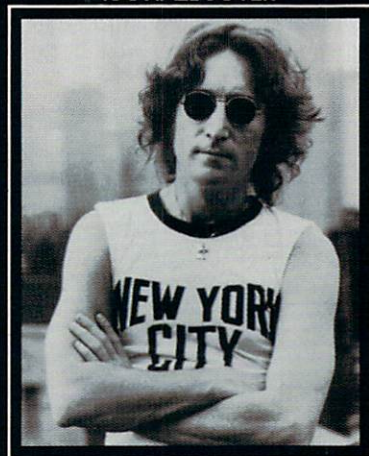
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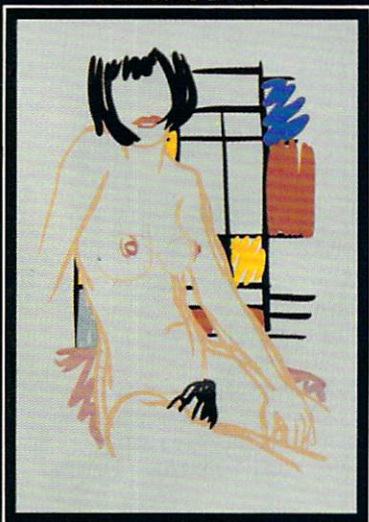
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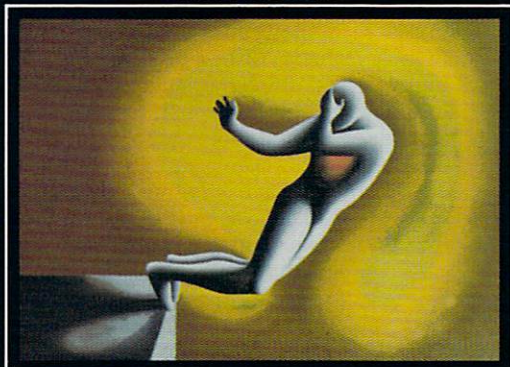
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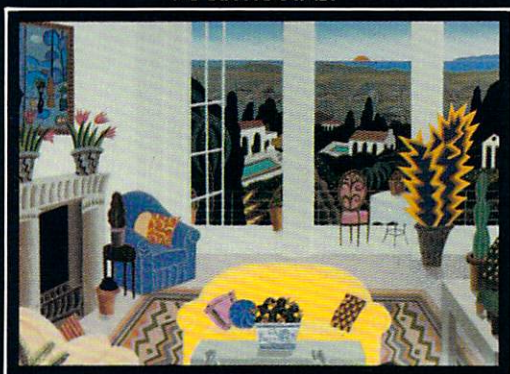
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three hot stock cars: a Ford Thunderbird, a Pontiac Grand Prix, or a Chevrolet Lumina. And even though the NASCAR rules are straightforward on what modifications you can make to your car, it's plain to see that these aren't your everyday showroom models. They may look like the cars you see on your dealer's lot, but when you get inside and put your sneakers through the floorboard, you'll have a whole new appreciation for the American automobile.



Gear it down and hit the straightaways with Bill Elliott's NASCAR Challenge.

Racing is more than cars, however. It's also the driver and the skills he or she can bring to bear when barreling down the asphalt. You'll need all the practice you can get before you take to the blacktop in this game, because the cars are tricky to control, even with manual shifting.

Races take place on any of eight topflight NASCAR speedways: Atlanta, Bristol (Tennessee, home of the first Winston Cup series race), Darlington, Daytona (a trioval course that begs for speed), Michigan, Sears Point, Talladega (claiming the fastest 500-mile stock car race), and Watkins Glen. If you're starting out, you can practice on any of these courses. If you're ready for racing, you can race a single race on any of the courses or go right to the championship season. A season of racing takes you through all eight tracks and awards points on your finishes. The top finisher walks away with the coveted championship trophy.

As with any racing game, realism boils down to how well the simulation controls the cars as they make their way around the track or down the street. With *Bill Elliott's NASCAR Challenge*, gear shifting is extremely accurate and realistic, while steering is a little less accurate and more diffi-

cult. And although you can't escape the feeling that you're in a race when you are surrounded by other cars, once you're alone on the track, it's difficult to see that you're on a racetrack.

This simulation blends bit-mapped graphics (for animated detail) and filled polygons (for fast graphic processing and a 3-D effect) in an attempt to capture the look and feel of NASCAR racing. The detail inside the cars is terrific, with finely drawn gauges and an animated gearshift that tracks your shift patterns. Outside your car, however, the filled polygons fail to deliver the same level of realism, though they enhance the feeling of speed.

Sound support is superb, with an upbeat theme song giving way to extremely realistic engine sounds. The noise of shifting and the squeal of tires in the curves add excitement to the simulation and promote the game's realistic sense.

While you have only three cars from which to choose, the game allows for several adjustments to your car's equipment so that you can modify it to suit your driving style and the track you're racing on. Everything from the engine (qualifying or racing) to tire stagger is adjustable. If, for example, you choose to qualify before every race (Auto-Qualify is also an option; you will start at the back of the pack), you can put a qualifying engine in your car which you will discard after you secure your starting position. If you like to gas it hard out of curves, you'll want to set the gear ratio higher. If the racetrack is an oval with banked curves, you'll want to adjust the tire stagger on your car. You can also adjust the angle of your spoiler, to help the car stabilize at high speeds. Modification is the soul of stock-car racing.

If that's what you want out of life is speed, thrills, crackups, and a kiss at the winner's circle, belt yourself into this racer. It's a rubber-burning treat for any racing fan.

PETER SCISCO

IBM PC and compatibles (AT-class), 640K RAM, EGA or VGA—\$49.95
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IVAN "IRONMAN" STEWART'S SUPER OFF ROAD

Bump your way to victory! Race three monster trucks across rough terrain; the first to complete four laps wins. Avoid obstacles—hitting them slows you down or makes you lose control. Graphics are only fair. Sometimes you can't tell which direction your truck's facing, even in VGA. On a 386, *Ivan "Ironman" Stewart's Super Off Road* plays almost too fast; it's easy to oversteer. The sensation of speed is lost on an XT—but it's easier to win.

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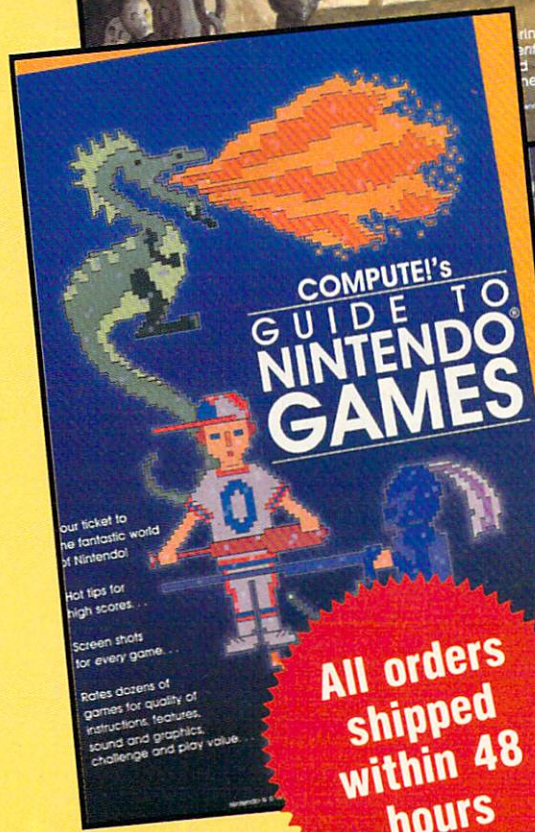
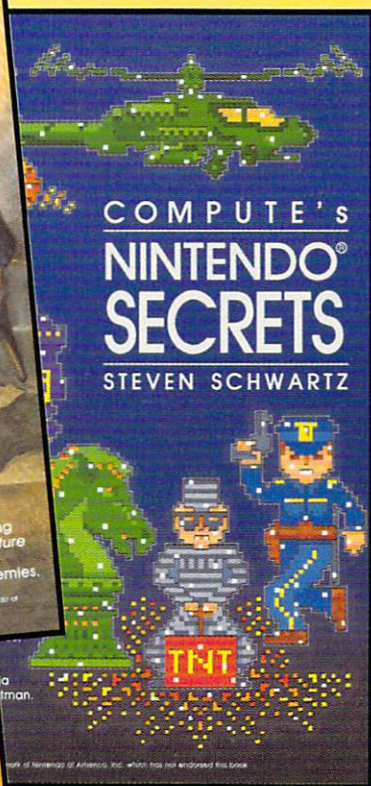
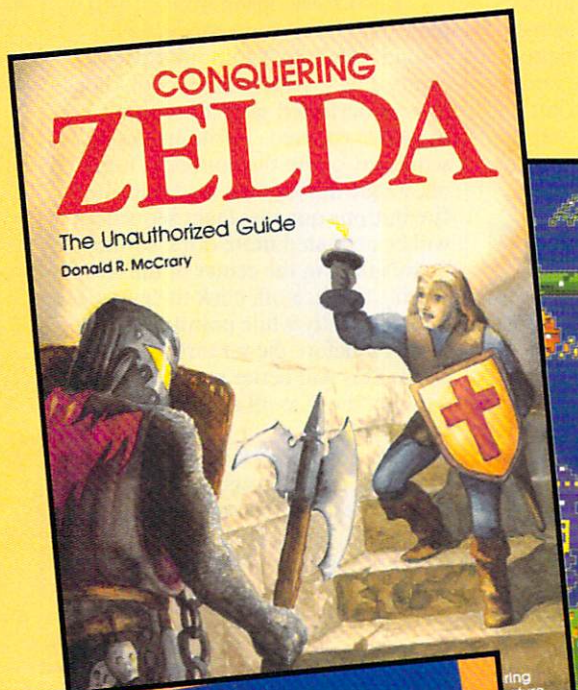
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and Louie climb mountains, explore caves, and make their way through the jungle. Watch your step—a multitude of dangers await you in your quest for gold and adventure. Disney Software deserves credit for its great sound and graphics. This game offers one of the best implementations of Tandy's 16-color graphics I've ever seen.

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BLADES OF STEEL

No doubt about it—this is the straight stuff for any arcade junkie with the hockey jones. As a straight port from its Nintendo videogame cousin, *Blades of Steel* is long on stick reflexes and short on strategy. It's skate, skate, slap shot, skate, skate.

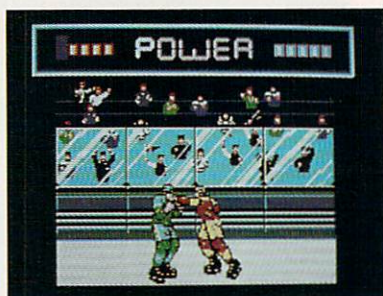
That's not all bad, if that's as far as you want to take computer hockey or if you want to experiment first before jumping into a full-blown simulation. There's plenty of five-on-five action here, and since you also control the goalie, you must think quickly and act faster to get points on the board and to keep your opponent from scoring.

Play against either the computer or a friend. The game will work with keyboard commands, but you're a sucker if you use anything but a joystick. Your control of the player follows whatever direction you move your joystick. Passing and shooting are fine arts; shooting is the most difficult because you must aim at a red mark that moves back and forth on the goal, awaiting the time that it gets into a clear position and you have a chance to get the puck past the goalie.

On defense, you can try to steal the puck by taking it away from the offensive player or by intercepting a pass. When the ball gets close to the goal, you must defend the net by moving the goalie back and forth. Blocking

one shot isn't usually too tough, but if your opponent gets two or three tries, you can just about mark it down.

Blades of Steel offers two modes of play, Exhibition and Tournament, and three skill levels. These options enhance the playability of the game but do not make it a true simulation. All players are equal in ability, and you have no coaching options. Still, if your idea of fun is a 100-mph slap shot across thirty feet of ice, this game has all you need.



Hockey action is yours in *Blades of Steel*.

Because of its arcade orientation, *Blades of Steel* sacrifices realism for action. However, fights and penalties do play a role, as they do in real hockey. If two players do get into a brawl, the game switches to a fight screen. You can actually control the fighting, throwing punches at your opponent. If the ref thinks things have gotten out of hand, he will award one of the teams a penalty shot—a one-on-one match-up between you and the goalie or, if you're on the short end of the stick, between you and the shooter.

Blades of Steel supports Hercules, CGA, EGA, and Tandy 16-color graphics but is unspectacular in any of these modes. The graphics are enough for you to enjoy the action but not so splendid as to interfere with your shooting.

Sound is limited to the internal PC speaker and includes a few digitized voiceovers that sound quite realistic.

Although you can't edit teams or compile stats on individual players, *Blades of Steel* does have one interesting feature not found in some of its competitors. If the referee awards one of the teams a penalty shot, you move to the penalty-shot screen. If you're on the receiving end, you must defend against a free shot by one of your opponent's best slap-shot artists. If the

penalty is against the other team, it's your turn to burn one into the net. The free shot does play a role in hockey, so it's good to see it incorporated here.

Keep these tips in mind as you play. In defensive pro mode, you should watch for a computer player camped near your goal. He will knock in your deflected save if you don't keep him covered. To initiate a fight sequence, bump the opponent head-on, wiggle the joystick, and press both fire buttons quickly. Fight sequences will be activated more often by the boards than in the center of the ice. During the face-off, click the passing button rapidly while pointing the joystick left before the ref throws out the puck. This will better your chances of winning the face-off and controlling the puck early.

Blades of Steel for the home computer was programmed as a conversion of the highly successful Nintendo version of the same name. The game is designed for the novice sports gamer.

PETER SCISCO

IBM PC and compatibles; 384K RAM for CGA or Hercules, 512K RAM for EGA, 640K RAM for Tandy 16-color; joystick recommended—\$19.95

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JOE MONTANA FOOTBALL

The 49ers might not have made it to the Super Bowl this year, but there's no stopping this game from scoring big at any PC sports gamer's house. This is without a doubt the best version of football to come to the PC, with superb graphics and animation, a well-designed and easily learned interface, a wealth of editing functions (including individual player stats as well as league functions), and an endorsement by one of the greatest quarterbacks ever to play the game.

Joe Montana Football is comprised of 28 teams, all from cities that boast an NFL franchise (no team names, just the cities). You can play

an exhibition match or an entire season while coaching a team, or you can let the computer call the plays while you watch. Taking a professional football team through a season on a march toward Super Sunday is captured here in all of its essence, with the setbacks, the celebrations, and the drama that make up the game of football.

Before you jump right into a game, however, you'd better familiarize yourself with the game's controls. You can do that with two practice modes, one for passing/running, the other for kicking field goals. The kicking game is the easiest to grasp. After the snap of the ball, you must press the fire button at the proper place along an accuracy meter that is displayed at the bottom of the screen. You can direct your kick against the wind, or you can angle it toward the sideline by moving your joystick handle forward or back (the keyboard works, too).

Running is also simple. All you have to do is take the snap from the quarterback and then direct your player toward the gaps in the defense.

You may find some running plays work well and then be frustrated when the defense seems to "get smart" to your plans. That's all a part of the game—and an engaging piece of realism.

Passing is the toughest part of the game to master. After you take the snap, you can cycle through the eligible receivers, then press a button to release the ball. You must learn to do this in a matter of seconds, or the defensive linemen will have you chewing turf.

Only by practicing can you gain the skills you need. And even then you'll want to play a few exhibition games to try out your new-found talents before engaging in a full-blown season.

Everything about this game, from its presentation to its sound effects,

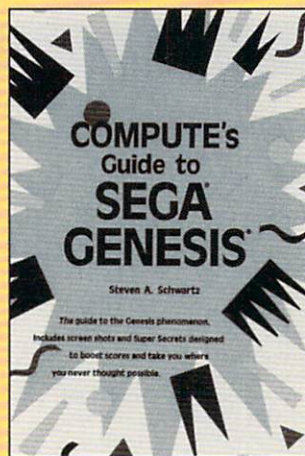
puts a premium on bringing the realism of football to the PC. The plays are professionally drawn (you can design your own) and realistically executed. The playing perspective during most of the game resembles what you would see on television; during field goals and extra points you have a view of the defensive line and the up-rights from behind the kicker—a view not many PC game players have experienced in real life.

Realistic animation, coupled with the grunts, pops, cracks, and thunder of 300-pound linemen crashing into one another, create an illusion of an interactive sporting event happening right on your small PC screen.

Also contributing to the effect are injuries, substitutions, and full player rosters. The weather doesn't really play a role, and penalties are limited to two: Pass Interference and Delay of Game. (The documentation lists three but includes Safety, which is, of course, a score, not a penalty). Fum-

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bles, interceptions, and lost opportunities round out the many pieces that go into creating an extremely realistic simulation.

With full color graphics support (from CGA to VGA), *Joe Montana Football* looks as good as it plays. The scrolling screen always keeps you in the middle of the action, whether you're covering a punt or throwing long on a post pattern. The onscreen characters are fun to watch even after the whistle is blown, when they continue to push and shove each other until called to the huddle. My only small quibble is that the team uniforms aren't a match for their real-life counterparts. (Chicago wearing Miami blue? Cincinnati in gold and black?)

The sound support for this game is also excellent, with full attention paid to the Sound Blaster, Game Blaster, and MT-32 sound cards. The music is a kind of never-ending trumpet fanfare that eventually grows tiresome, but the sound effects add a dimension to the game that shouldn't be missed.

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Aside from team editing and league play, *Joe Montana Football* brings its own method of instant replay to PC football. Each play is recorded as it happens; you have the option of seeing an instant replay from the field or of saving the replay on an option screen.

If you save from the option screen, you have the capability of splicing together several replays to create your own "game highlights" film.

Another special feature is what Sega calls its *Receiver Cam*. This feature allows you to check off your receivers during pass plays. Football games that incorporate action as part of their design have always had trouble dealing with the multiple receivers that pro quarterbacks routinely use; the Receiver Cam feature is a unique way of solving that problem, by presenting a small window in the corner of the screen that highlights each receiver as you toggle through the possibilities. You still have to keep an eye on the pass rush, but this method is less intrusive than those employed by most PC football games.

Don't drop the ball on this one. With its superb blending of action and strategy and its use of stats and reflexes, it's bound to go down as one of the best sports simulations ever to hit the field. And even if you never play as well as Joe Montana, this game will just about make you think you could.

PETER SCISCO

IBM PC and compatibles, 512K RAM (640K for optimal performance), CGA, EGA, MCGA, VGA, or Tandy 16-color; hard disk and joystick recommended—\$49.95

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GALLEONS OF GLORY

Magellan never completed his quest for glory, honor, and gold; he was killed by Philippine tribesmen while still thousands of miles from home. *Galleons of Glory* re-creates his sixteenth-century voyage from Spain to the coast of

South America and shows you what it was like to be an admiral setting sail for the unknown during the Age of Discovery.

Galleons also teaches managerial skills. To acquire gold and glory, you must equip and maintain your ship, keep your crew in line, weigh the opinions of your officers, deal with adverse weather and sea conditions, and explore unmapped coastline. As you gather information and issue orders to your captain, navigator, and other officers, you must keep track of provisions, maintain morale, and watch for signs of discontent. Lose touch with your crew, and a traitorous officer will organize a mutiny. Unless you can discover who is leading the rebellion, you'll be marooned on shore, falling to your knees in despair as your ship sails on without you. Mutinies are less likely if you locate treasure and extract it with minimum casualties from the natives you meet.

This game is more challenging than Brøderbund's Carmen Sandiego series, but it should appeal to much the same audience. The interface is very easy to master, and the graphics are well done, especially in VGA. A few things are slightly off about *Galleons of Glory*, though. Play can be repetitive. With such a small cast of characters, players will find themselves hopping frequently between cabin and galley, longing for a change of scene (much like real sailors, I suppose). Younger players will probably find it impossible to guess the leader of the mutineers, so their games will never progress very far.

Some of the less palatable aspects of Magellan's voyages are glossed over in *Galleons*. Mention is made of wormy biscuits, but you don't experience the extreme hardships that the crew suffered (at one point Magellan's men were reduced to eating boiled leather). The natives with whom you trade or fight are offensive stereotypical caricatures bearing little resemblance to the South American coastal peoples that Magellan and other explorers actually met—and often enslaved or killed.

Interestingly, conversion of the natives to Christianity is not one of the onshore menu options, although that was one of the main goals of Magellan's expedition and ultimately proved to be his undoing. Nor do you

get a sense of what drove Magellan personally—his religious zeal, the Spanish desire for world domination, the rivalry between the Portuguese Magellan and his Spanish captains.

Still, if you are intrigued by the exploits of "so noble a captain," as Magellan's chronicler Antonio Pigafetta called him, take the helm. *Galleons of Glory* proves to be quite a seaworthy simulation.

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BLACK GOLD

You're drilling for oil. Sound boring? Not if you're playing *Black Gold* from Rainbow Arts. This game challenges you to become an oil magnate and run successful oil recovery and processing plants all over the world. *Black Gold's* strong points include a logical interface and playable arcade sequences, but the game needs some work on graphics and sound. Most scenes, excluding the arcade sequences, are in drab colors, and sounds are almost nonexistent. Despite these complaints, the game's combination of action and strategy is engaging and kept me preoccupied even during a time of rising oil and gasoline prices.

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REVIEWS

COUNTDOWN

Anyone familiar with the PC adventure-game scene knows that every new entry is the most exciting, most appealing, most realistic game ever. Now, from Access Software, there's an adventure that may send you in search of new superlatives. It's called *Countdown*, and it's great!

Countdown starts with a mystery. You're Mason Powers, American agent, held in a Turkish prison hospital. There's something about a murder . . . somebody named Frank McBain . . . the CIA . . . the phrase *96 hours to save the world*. You really have no idea what's going on, thanks to a bad case of amnesia, but that's part of the fun. Mysteries are best unraveled alone.

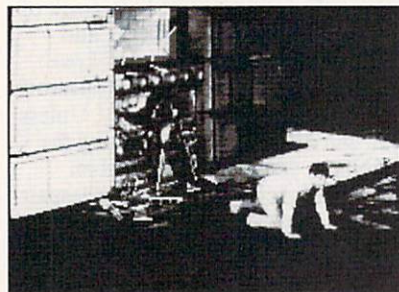
Countdown is billed as an interactive movie, and it definitely has impressive moves. Some you make yourself; some debut in automatic animated sequences. All of the plot develops on the game's fantastic 256-color VGA graphics screens, which are undeniably first-rate.

But there's more here than a lot of pretty pictures. *Countdown* has a strong interactive element, too. A key game component is searching—easy to do thanks to a straightforward interface. To check out an object, simply peg it with the crosshairs and click on the desired action (LOOK, OPEN, and so on). Now and then you'll pick up something that triggers an animated onscreen flashback. Pay careful attention. There may be valuable information in those tattered shreds of memory.

Next to careful searching, careful conversation is key. *Countdown's* characters are a chatty lot, but you've got to get them talking first. Some can be bluffed or hassled into helping you; others respond better if you're pleasant or sincere. You set the tone with the push of a button, choosing from an onscreen list of options. Choosing the right tone can determine whether you get much-needed information or a nasty insult and a door in your face. Oh, yes—an offer of cold, hard cash may help out, too.

If you keep at it, you'll eventually escape from your cell. After exploring lots of rooms and conducting lots of

conversations, you may even find your way out of the asylum. That's when you'll recover your handy-dandy CAD (spy talk for Computer Access Device). It slices, dices, and puts you in direct contact with the CIA computer at Langley, Virginia. This gives you vital access to background information and lets you do detective-style analysis, too. It even accepts E-mail, which other characters will send you from time to time.



Save the world from destruction and regain your memory in *Countdown*.

Make it this far, and soon you're on the road. New destinations (ranging from McBain's apartment to Cairo and Jerusalem) will become available as you discover them, and the travel screen lets you visit them by train or by air. Train trips are cheaper, but air is faster. Your choice will depend on your resources and on how much time is left.

Throughout *Countdown*, you'll appreciate the program's broad-based approach to sound. It features digitized sound effects, music, and speech and even offers synchronized voice and sound. It supports Ad Lib, CO-VOX, and PS/2 Sound Adapter cards, as well as the Sound Blaster. But even if you have no sound card, better-than-average sound is available (on machines running at a 6 MHz or more) thanks to *Countdown's* use of the RealSound system. This patented technology allows your MS-DOS machine to reproduce high-quality digitized sounds without any additional hardware. It works, too, although actual sound quality will be affected by the quality of your PC's speaker and to some extent by your clock speed. The results, while far from sound-card quality, are nonetheless a big improvement over what you'd get otherwise. *Countdown* also offers a no-

sound option, handy should you decide to go adventuring during those slack times at the office.

Countdown is a massive program, but hard disk installation is almost automatic. Be sure, though, that when you shop for a copy, you pick up the package with disks in your machine's format.

Challenging without being obscure, entertaining without being trite, and realistic without being tedious, *Countdown* is what every adventure game should be. There's even a number to call for help in case you reach what seems like a dead end. And with world-class graphics, *Countdown* may be the best reason yet to buy yourself a VGA board!

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C H O I C E

PROFESSOR DOS

Everyone needs help with DOS. If the simplest MS-DOS command befuddles you, or if you're an intermediate user out to achieve expert status, you'll find *Professor DOS* an instructive and efficient learning tool. In addition, the program's accompanying *SmartGuide for DOS* should prove an invaluable memory-resident DOS reference guide.

Featuring over 30 onscreen tutorials, *Professor DOS* covers a wide range of material. The first of seven sections includes lessons on the function and history of DOS and on how to use the *Professor DOS* program. Sections 2 through 7 cover commonly used commands, hard disks, the DOS 4.0 shell, batch files, advanced commands, and special tools.

Use your keyboard to access all tutorials, and take advantage of the

excellent onscreen index.

Each lesson begins with a statement of objectives and ends with a summary. The program presents information in a straightforward fashion, with prompts that provide continual assistance. Graphics enhance and clarify what you're being taught, and sound effects draw attention to specific concepts.

Constant interaction between you and *Professor DOS* assures that you'll understand what you need to understand. The program helps you assess your knowledge and understanding of the material in a variety of ways. Quizzes come in many forms, including true/false, fill in the blank, and matching columns.

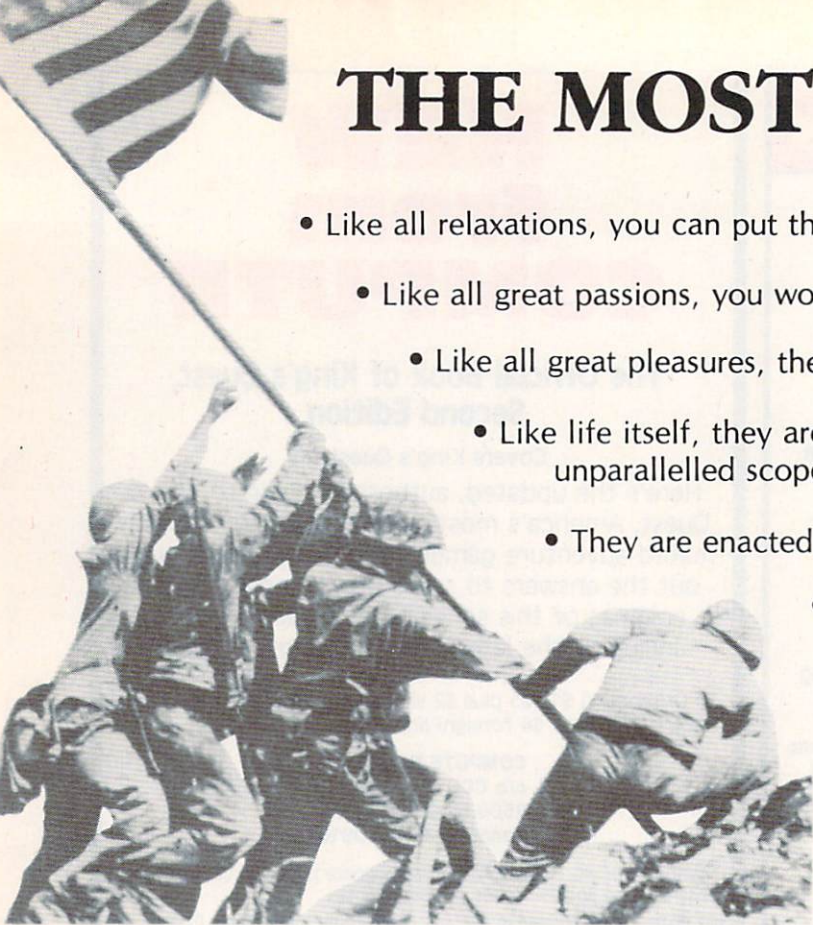
As valuable as this program is, it does present a few very minor difficulties. If you take too long to reply to questions or give incorrect responses, the program displays the correct answer. Unfortunately, the answers pop up so quickly that some users may not get a chance to reply before the system gives the answer.

Also, some information is phrased unclearly. Instead of indicating that a period precedes the extension of a DOS filename, the program suggests that the period is part of the

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The tapestry of these struggles was dark to its creators, its final outcome obscure and inevitably the result of a panoply of individual efforts. For example, the French were undone in Spain by *Napoleon's* inability to personally supervise the campaign.

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A French hussar and a dragoon talk with their sentries posted nearby.



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MUSKETS & MULES

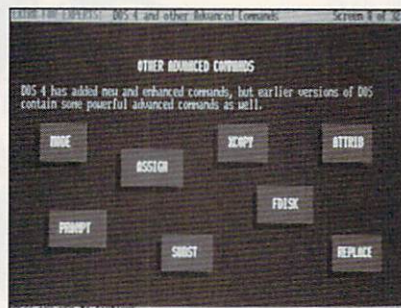
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- Austrian
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- Prussian

C-5

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extension: "The extension can be up to 3 characters long and includes the period."). It would've been better to refer to the period as a separator between the filename and the DOS extension, which can be associated with applications in later versions of the operating system.



Learn advanced DOS commands by taking the professor's class.

The *Professor's* worthy companion—*SmartGuide for DOS*—may operate solo or work inside another program. With the stroke of a key, *SmartGuide* provides useful information about numerous DOS commands. Facts pertaining to other DOS topics, tips for users, and special tables (ASCII codes, for example) are available as well.

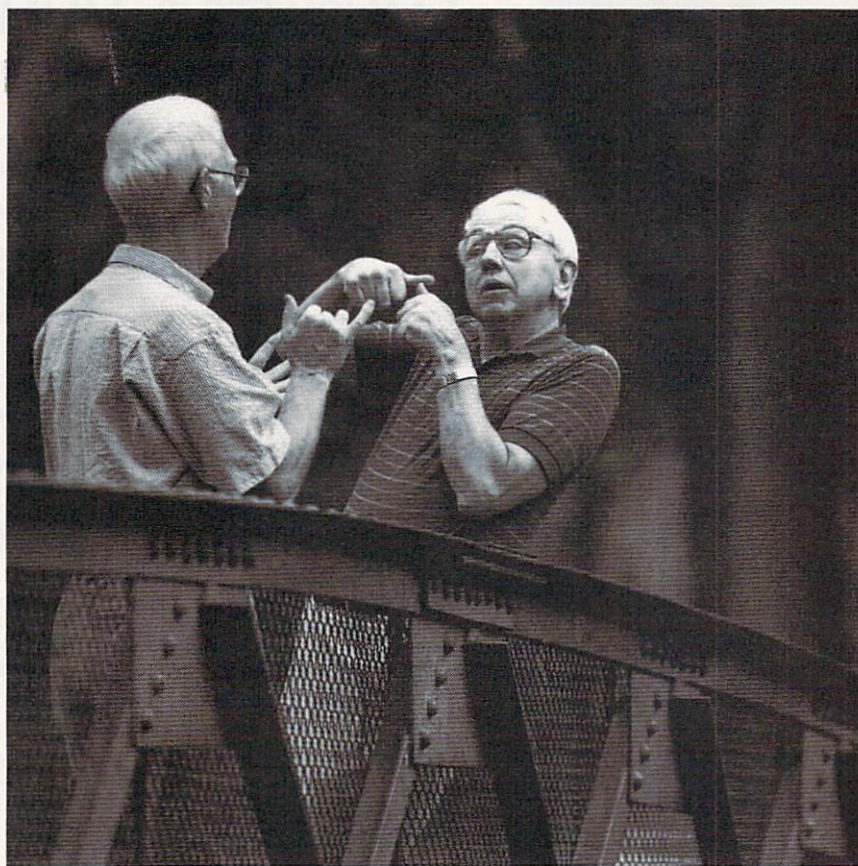
SmartGuide functions not only as a memory-resident reference tool but also as a timesaver. From the Utilities option, you may create a menu of your 15 most-used DOS commands. One keystroke will transport them to *SmartGuide's* line editor, and pressing Enter will send them to DOS to be executed.

Both programs are very easy to use, thanks to the expert design of the menus, the excellent tutorials, and the concise 31-page manual. Ease of use combined with solid educational and practical value make *Professor DOS* and *SmartGuide for DOS* musts for the perplexed beginner, the curious intermediate, and the would-be expert.

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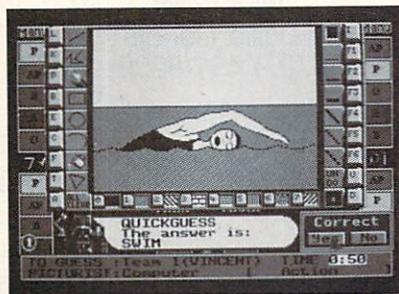
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PICTIONARY

The transition from the tabletop to the desktop isn't always a smooth one, but the PC version of *Pictionary* does a remarkable job of capturing the frenzied drawing, wild guessing, and leap-from-your-chair gymnastics that the board game inspires. Not only that, but it serves as an excellent introduction to computer draw and paint programs.

Pictionary for the PC can be played by two to four teams or by one to four individual players. The picturer (the person who does the drawing) is determined by the play format



Draw on your parlor game skills.

you select. If you have two or more people on a team, a member of each team draws the picture on the screen. A word card reference number appears on the screen, and the picturer uses it to look up the word to be drawn.

Drawings are created onscreen using your mouse or joystick and an array of drawing tools. If necessary, you can use the cursor keys, but I don't recommend it. An option for practicing your drawing skills will help before the serious competition begins.

Teams have one, two, or three minutes to guess the word that the picture represents. Dual onscreen clocks (one digital, one analog) keep track of remaining time. If you or your team guesses correctly, then a small die is rolled toward the center of the screen. The computer moves your piece forward the indicated number of spaces, and then it's time for the next turn.

Pictionary's biggest limits are the size of the teams and the size of the screen. There's a practical limit to the

number of people you can crowd around a computer monitor. For smaller gatherings, it might work; but for large groups, it will prove frustrating.

You can play the game with the computer drawing the pictures and with you and a friend trying to guess what the picture is. Unfortunately, you only get one guess, which eliminates a lot of the excitement found in the board version. A better design would have allowed you to type in answers as the picture drawing progresses, rather than halting the action and making a single guess.

Despite this limitation, the computer is a remarkably human artist. It's fun to watch it draw pictures of varying skill and sophistication. And while the game lacks some of the board version's sizzle, it's nonetheless an engaging diversion. Board game purists will find it an interesting addition to their game shelf.

STEVE HUDSON

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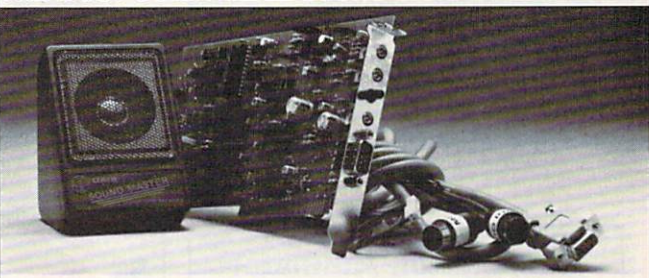
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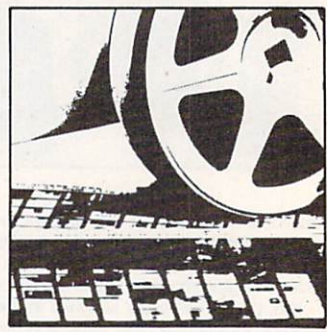


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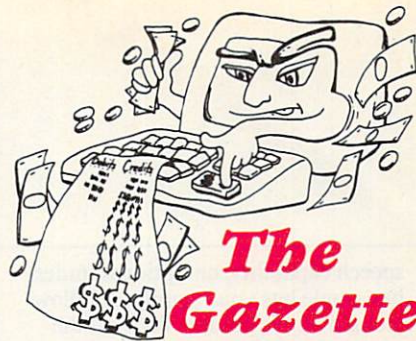
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For all of its drama, sound, and graphics, however, *Storyteller* also has some omissions. For example, there's no printer support. Also, despite the generally excellent quality of the digitized voice, the speech routine is much too fast for preschoolers, even when slowed down by 20 percent. Skipped words or slurred speech, designed to provide dramatic highlights, often confuse beginning readers who must read every word. On a more aca-

demical level, the program's linear design doesn't take full advantage of the PC's ability to create an interactive environment.



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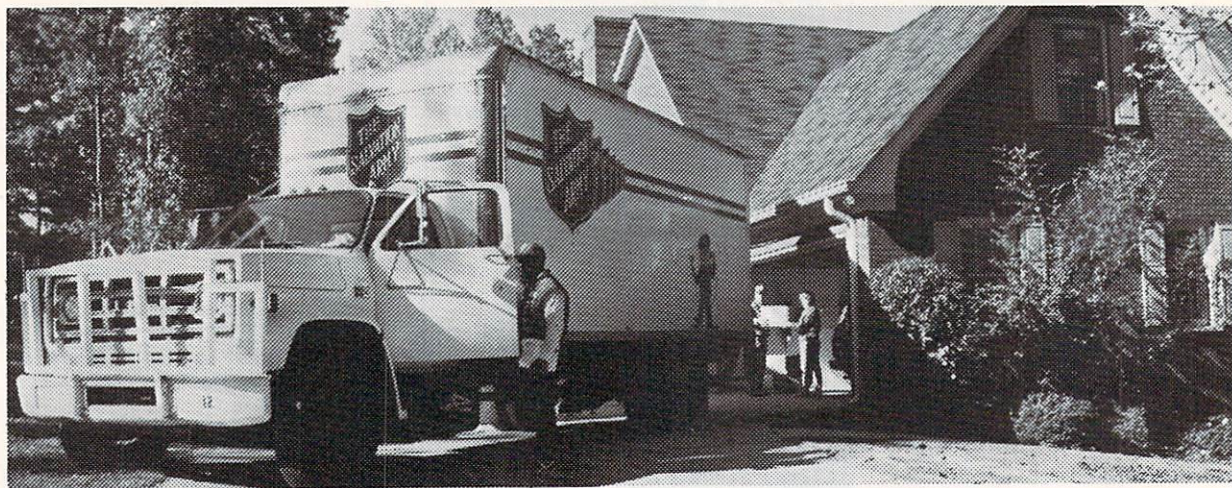
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SNEAK PEEKS

SPORTS SIMULATED BOXING

Filled polygons have, over the last few years, turned games like flight and driving simulations into fantastic experiences of motion and color. Polygons allow games makers to create 3-D worlds where scale, speed, and fluidity of motion combine to create more realistic animated sequences. Brøderbund has now brought that technology to sports simulations, creating the Mike Tyson of computer boxing games.

Sports Simulated Boxing captures almost every element of professional boxing for you to experience at your PC (except for the facial lacerations and brain swelling). The first thing you'll notice are the boxers themselves, shaped like some kind of weird cyborg fighters, not the smooth bitmapped figures adopted by most sport games. But once you see them in motion, all negative assumptions about the figures vanish. These guys move like real fighters, bobbing and weaving, attacking or retreating, throwing the jabs, uppercuts, rabbit punches, and roundhouses that wreak havoc on the head and body of the enemy.

The game looks best on a VGA-equipped machine, where the resolution enhances the look of the fighters and their crisp movements on the screen. Digitized photos and detailed backgrounds add an extra dimension to the Spartan ring. The polygons, though disconcerting at first, become the anchor to the game's movement and gracefulness.

Supporting the excellent and imaginative use of graphics is an excellent and stirring theme song. Even better are the sounds of the hits and the grunts of the fighters as the blows come raining down. This is the kind of sound support owners of PC sound

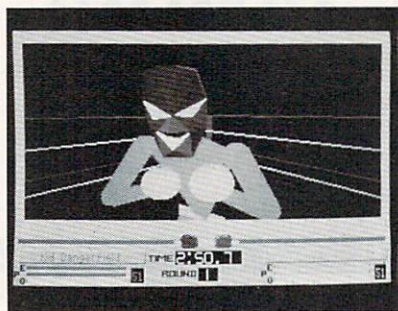
cards so rarely get in games.

Sports Simulated Boxing is no street brawl; it's truly an innovation. For fight fans, the science was never quite so sweet.

PETER SCISCO

Scheduled Release: August 1991
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Brøderbund Software
17 Paul Dr.
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Slug it out with your enemy face to face.

PUBLISHER'S PAINTBRUSH

The company that developed the first *Windows* paint program now brings you the most powerful *Windows* paint program: *Publisher's Paintbrush*. The word *publisher* gives a clue to ZSoft's aspirations. This program is for professionals, and it can do almost anything possible you could want to do with bitmaps.

Notable features include support for 256 colors, 256 gray scales, multiple windows, multiple palettes, a movable push-button toolbox (the first of its kind in any PC paint program), and the ability to load and save files in PCX (both monochrome and color), GIF, BMP (three flavors), Targa TGA, and TIFF formats.

Paintbrush boasts more than 40

painting tools, including everything you'd expect in a world-class paint program plus special tools for blending, brightening, and replacing colors; drawing Bezier curves; filling and painting with gradients; lassoing images; sharpening and smudging areas; and tinting.

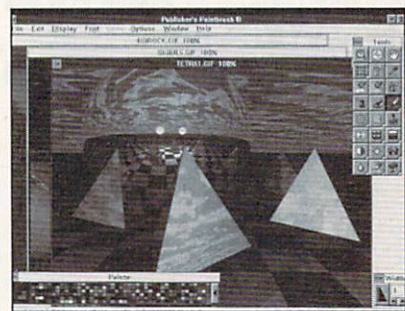
Two special retouching tools will be especially useful to artists. Cloning lets you replace one area of a picture with another using freehand strokes, and Eyedropper allows you to pick up colors from the picture itself so you can paint with them.

Take these features, blend them together in a beautifully designed *Windows* interface, throw in support for every major scanner, add excellent online help, and you have a package no serious computer artist should be without.

CLIFTON KARNES

Scheduled Release: March 1991
For IBM PC and compatibles—\$495.00

ZSoft
450 Franklin Road, Ste. 100
Marietta, GA 30067
(404) 428-0008



Publisher's Paintbrush lets you work with paintings in multiple windows.

What Are Sneak Peeks?

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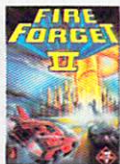
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Cosmic Forge

System Requirements: IBM® PC, XT, AT, 386, 486 or compatible with 256K RAM, DOS 2.0 or higher, CGA, EGA, VGA, MGA or IBM PS/2, and headset or external speaker.
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