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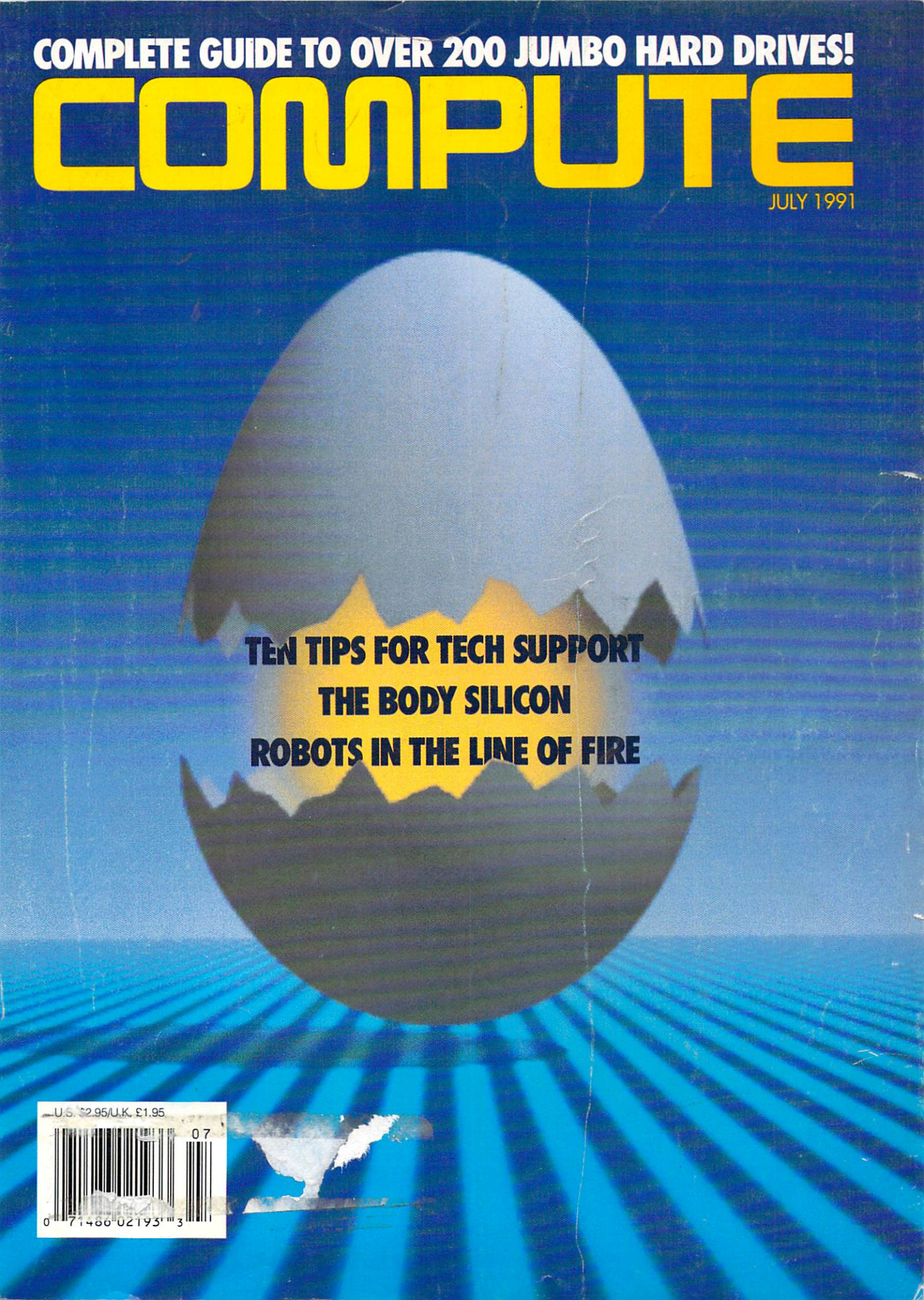
COMPUTE

JULY 1991



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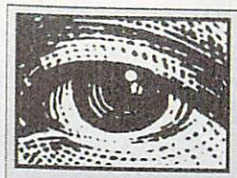

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PC Computing

[GeoWorks] has produced a GUI capable of making the PC a more friendly and powerful creature to the millions of people Windows and OS/2 have left behind...
FIRST LOOKS, PC Magazine

[PC/GEOS] thrives in a 640K 286, and even performs respectably on an 8088. On a run-of-the-mill 386, [PC/GEOS] peforms crisply in a way that Windows only dreams of...
PC Magazine

GeoWorks PC/GEOS: What Windows 3.0 Should Have Been.
INFO WORLD

The Geos environment sports a simplified (but sharper-looking) Windows-like interface with many of the same features, comes with Ensemble (a bigger and more capable suite of applications), and runs lickety-split on 80286s and XTs.
PC WORLD

The Small Office REPORT
SPRING/SUMMER 1991

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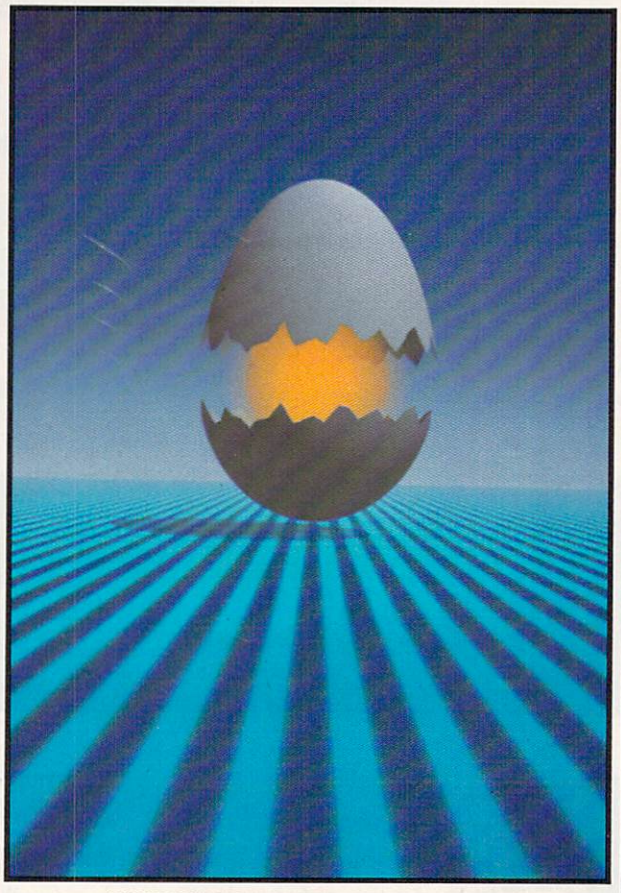

HIROMASMA SUGIURA/WESTLIGHT INTERNATIONAL

ON THE COVER

Hiromasma Sugiura employed ray-tracing techniques on an NEC computer to develop the art featured on our July cover.

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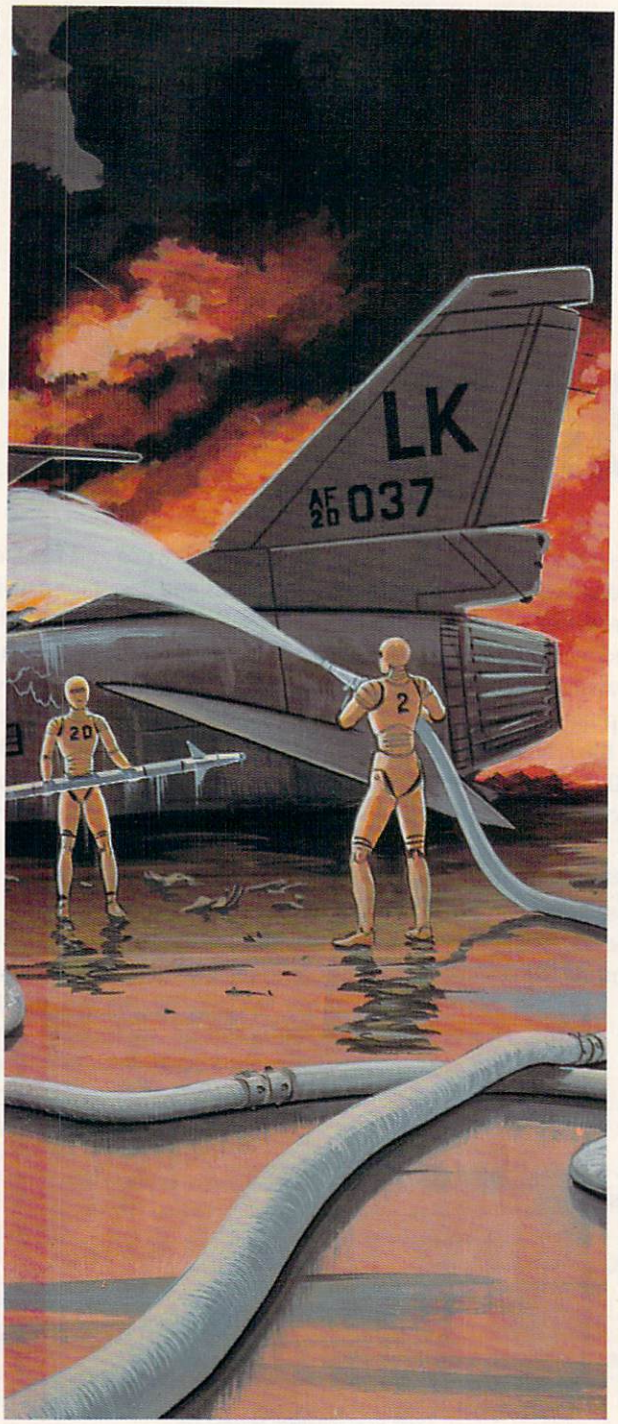

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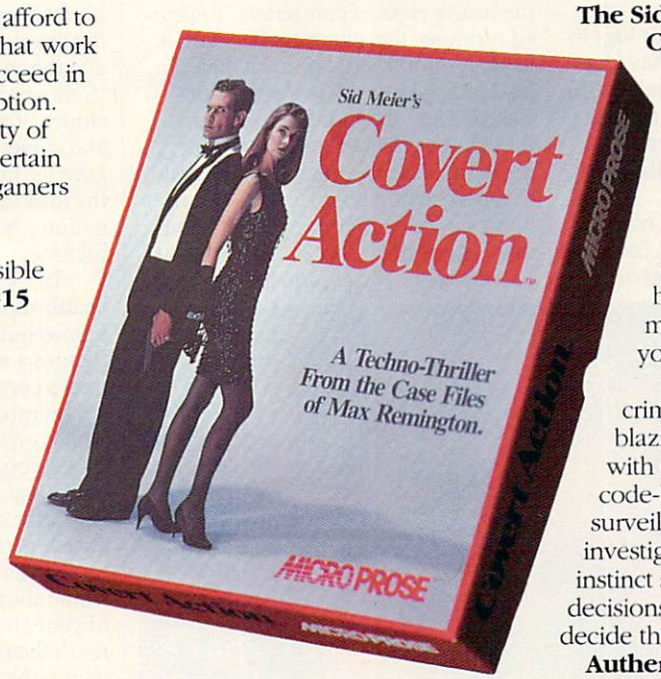
COMPUTE is looking for exceptional computer-generated art for use on future covers and with feature articles. If you're a computer artist interested in national exposure, send us examples of your work in either color slide or transparency format. Include a brief note listing the title of the work and the hardware and software used in its creation. Please address your samples to Art Director, COMPUTE Publications International Limited, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

Sid Meier's Latest Game Is Just Like All His Others... Terrific!

Most game designers can't afford to repeat themselves. Formulas that work so well in one game rarely succeed in the next. Sid Meier is an exception. His games, despite the diversity of subject matter, always share certain qualities, qualities computer gamers have grown to love — and demand.

Now, the designer responsible for the award-winning hits **F-15 Strike Eagle, Pirates!, Red Storm Rising, F-19 Stealth Fighter** and 1990's Best Strategy Game*, **Railroad Tycoon**, presents the high-tech, dangerous world of international espionage. Once again the subject is unique; but Sid's "magic touch" remains.



The Sid Meier Checklist For Fun:

Challenge. Crimes are being perpetrated, plots are being hatched. As super-spy Max Remington, you must piece together ambiguous clues leading to a ruthless criminal mastermind. Weeks, even months of intrigue-filled gaming time can be spent finding just one mastermind. *Covert Action* gives you 26 of them to foil.

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Authenticity. Use the weapons *real* agents use and follow their procedures. Face the same, real dangers. *Covert Action* is international espionage as it really is.

"It is no exaggeration to say that MicroProse has released the richest treatment of espionage ever put in a computer game. Only the real thing could be more rigorous, and one imagines that it wouldn't be nearly so much fun."
Computer Gaming World • May, 1990

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* Software Publishers Association

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PETER SCISCO

Good health is a lot like the weather: Everybody talks about it, but nobody does anything about it. Despite Madison Avenue's efforts to convince us we should be stair-stepping, bicycling, and jumping for our lives, most people are just too busy to do more than rush home and grab a sack of chips in time to catch a flick on HBO.

Around the winter holidays, our thoughts turn to dieting, but we always wait for the New Year so we can make a resolution out of all this good-health business. Another broken promise. Another guilty conscience. Another raid on the fridge.

And then technology comes along to save us. From CAT scans to electronic microscopy, from jogger logs to nutrition guides, computers have had an amazing impact on our health over the last 20 years. Take a look around your doctor's office. Everything is automated, from insurance filings to blood analyzers.

There's no question that computer technology has brought the possibility of better health management, if not better health, to all of us, computer users and Luddites alike. Computers are good at counting numbers, at presenting facts we can compare and analyze, at turning raw data into charts and graphs we can pore over to our hearts' content. They can bring us to surprising conclusions in startling and innovative ways. That's the strength of technology and, in many ways, the basic pattern of healthy living—taking stock, analyzing, drawing conclusions, programming a solid nutritional base, establishing an effective exercise program.

This is all on the bright side, but there's a dark side as well—a venerable library of fact and folklore about the health risks of computers. Repeated motions, like entering data with a keyboard for several hours a day, can lead to Repetitive Stress Injury or Carpal Tunnel Syndrome. And although the effect of radiation from monitors, laser printers, and the rest of the electronic gear stashed in our homes is still a matter of debate, the discussions have become more agitated, much like the arguments about the greenhouse effect. Only this time we aren't talking about global warming that might affect the earth in 30 years; we're talking about microwaving our bodies to an early grave.

Fortunately, some manufacturers are concerned about health and computers, and they've answered with, for example, radiation screens and glare screens, extremely-low-frequency monitors, recycled toner cartridges, and recycled paper for packaging. Government and labor are taking a hard look at the situation as well—witness San Francisco's recent ordinance that sets health guidelines for computer operators.

I grew up with stories about how NASA's space program contributed to the development of pacemakers and about how the miniaturization of electronics contributed to the wonder machines of microscopic investigation and surgery. I also heard that NASA gave us Tang and it probably spawned the idea for pâté in a tube, an abomination I hope not to see twice in one lifetime.

In the future we'll have complete health-monitoring systems for our homes built around computer chips. Picture a small kitchen computer that tracks personal nutrition data for every member of the family. All of your data is encoded on a small data card, which you slip into the system like a bank card at an ATM. From the refrigerator comes a suggestion for a balanced, personalized lunch.

If you're low on staples, an electronic shopper zips to the food market of your choice and places your order for delivery. The money is debited to your bank account. Your microwave sets itself for optimal cooking time. Calorie and nutrient information is stored in your personal database for future reference, and your data card is updated for the next meal.

If this all sounds too George Jetson for you, pull your nose out of the funny papers. Many successful businesses have shown how computers can help to manage projects. And what better project than your health? ⊡

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IBM Screens Pictured.

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CASTLES

NEWS & NOTES

PC Paper

Computers have moved their users away from pen and paper. Now it appears that users are moving back. For certain applications, keyboard input isn't always best. Sometimes—especially when creating computer-aided art and design—it's better to be able to work with a pen in hand. It was this need, coupled with the growth of the field of Computer-Aided Design (CAD), that led to the birth of computer graphics tablets. These wonderful devices let you actually draw onscreen by tracing outlines with a pen on a flat pad that loosely resembles a sheet of paper. Slowly, other applications have adopted the graphics tablet philosophy, now commonly referred to as pen-based computing. One computer manufacturer has even based its entire operating system on pen-based computing.

Summagraphics, long a leader in graphics tablet manufacturing, wants to see widespread use of pen-based computing. Toward this goal, the company is now planning to bundle its graphics tablets with *Microsoft Pen Windows.* The offer is designed to allow owners of desktop computers to upgrade their systems to take advantage of pen-based computing. *Microsoft Pen Windows* combines the established *Windows* graphic user interface with handwriting and gesture recognition, making the creation of a fully pen-based system much easier. The combination of *Microsoft Pen Windows* and pen-based computing with handwriting recognition presents virtually endless possibilities for distinct new markets for graphics tablets. These new markets will encompass general and new pen-based applications. The greatest area of interest is in editing and manipulating figures (as in spreadsheets), but more will certainly appear. For more information about graphics tablets, contact Summagraphics, 777 State Street Extension, Fairfield, Connecticut 06430.

Three Reasons Why

According to a new survey by COMTEC Market Analysis Services of the Gartner Group, the work-at-home industry has been most affected by personal computers, cellular telephones, and facsimile machines.

The survey tabulated information for approximately 45,000 households, representing a reasonable sample of the almost 90 million U.S. households as counted by the U.S. Bureau of the Census. According to the report, 52 percent of all households still don't use any of the three information technologies—even at work—and only 3 percent make use of all three. PCs are now used in 42 percent of households surveyed, however, while only 7 percent use cellular telephones. The survey also found that 14 percent of homes using PCs own and use cellular telephones. Clearly, this indicates that households that adopt one technology are more likely to adopt others.

An ongoing service since 1982, COMTEC Market Analysis Services studies the installed base of information industry equipment and services—telecommunications, computers, and office equipment. For more information, contact COMTEC Market Analysis Services, P.O. Box 10212, Stamford, Connecticut 06904.

The Electric Chair

Surely you have a favorite chair. Almost everyone does. One that just seems to fit you. It takes time to break in a favorite chair, molding it slowly, through hours of sitting and shifting in it, getting it to fit your exact shape like a glove. Fortunately, a new microprocessor-based interactive chair might make all that sitting and shifting and waiting for comfort obsolete. The new chair invented by Biomechanics Corporation of America (BCA) actually responds to each occupant's body by making hundreds of pressure-sensitive adjustments on its own, automatically providing a new level of seating comfort.

Computer technology enables the new Intelligent Seat to learn about its occupant, measure load distribution, rate the occupant's comfort, decide which adjustments to make, automatically make those adjustments, and optimize seat comfort. Soon, every chair in the house might provide that coveted perfect fit. For additional information, contact Biomechanics, 1800 Walt Whitman Road, Melville, New York 11747; (800) 248-3746 or (516) 752-3550.

Speed *and* Capacity

Not to be outdone by Intel's recent achievements, IBM scientists have managed to build what they refer to as the world's fastest high-capacity memory chip. The experimental chip can send or receive eight billion bits of information per second. The record breaker is a Static Random Access Memory (SRAM) chip that holds 512 kilobits (524,288 bits) of information.

The chip can read individual bits of information in four-billionths of a second, a benchmark known as *access time.* And it can read and write successive bits of information—a measure known as *cycle time*—in just two-billionths of a second. The lightning chip holds the world speed records for both cycle and access time for memory chips with more than 64K (65,536) bits of information storage. ▷

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0.10 GigaHertz

If you can imagine the current race for faster computers as resembling the Indianapolis 500, Intel has just unveiled the Maserati of microprocessors. The new chip is a fully functional 486 microprocessor that operates at a truly blinding 100 MHz, delivering approximately twice as many instructions per second as any microprocessor currently on the market.

This new microchip contains 1.2 million transistors and uses a process technology called CMOS (complementary metal oxide semiconductor) that minimizes the chip's electrical power consumption. Intel's new 100-MHz microprocessor features submicron line widths and three metal layers. One micron equals approximately 0.01 times the thickness of a human hair. Submicrons, of course, are much smaller.

Intel says it has no immediate plans to offer this 100-MHz device as a commercial product—but why else was it designed? Buckle your seat belts!

Power to the People

The VW of IBM PC word processors has just been souped up. *Volkswriter 4,* the midrange product in Volkswriter's complete line of low-cost word processing packages, has been upgraded, adding more features and ease of use than ever before.

The new release of *Volkswriter 4* offers full integration of Reference Software's *Grammatik IV,* a 310,000-word thesaurus, a 170,000-word spelling checker, footnotes, endnotes, page preview, macros, and autorecognition for five common file formats. Optional add-ons include multilingual thesauruses and dictionaries for spelling and autohyphenation, specialized dictionaries, LAN installation, and Volkswriter's file-conversion package, *Volks Word for Word. Volkswriter 4* release 2.0 retails for $249.

The complete Volkswriter line offers increasingly sophisticated products, from the entry-level *Volkswriter 2* program to the *Volkswriter 6* package with advanced publishing capabilities. The company's unique upgrade policy offers an easy and economical way to move between packages for considerably less than the cost of a new program. High-power, lower cost apps represent a new trend. For more information, contact Volkswriter, One Lower Ragsdale Drive, Building 2, Suite 100, Monterey, California 93940; (408) 648-3000.

Superpriced *SuperCalc*

Computer Associates has slashed a whopping 70 percent off the suggested retail price of *SuperCalc5,* the company's popular spreadsheet program. It doesn't take a spreadsheet to see this represents a major cost savings for consumers. The result is that *SuperCalc5*'s original suggested retail price of $495 is now $149.

Sanjay Kumar, CA's senior vice president of planning, said, "We are a client- and market-driven company. Users tell us they want the latest spreadsheet technology, but they need it at a price they can afford and in an application that will run on all of their MS-DOS based PCs. That's exactly what we're giving them."

SuperCalc5 provides advanced spreadsheet technology, including *Lotus 1-2-3* compatibility, spreadsheet linking, three-dimensional spreadsheet capabilities, presentation-quality graphics and output, and network support. The company also claims *SuperCalc5* is the only spreadsheet offering this level of functionality that can run across the complete range of PCs, from 8086 to 80486 machines. For more information, contact Computer Associates, 1240 McKay Drive, San Jose, California 95131.

Enormous Plot!

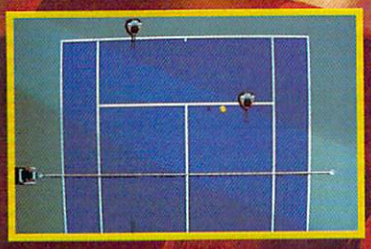
For those who think regular tabletop or freestanding plotters are just too darned small, Data Mate has released the Michelangelo Paint Jet System. With it, you can decorate the side of a van, a wall, or a giant canvas (up to 5.38 feet square). The source can be any graphic scanned into a computer with a Sharp JX-300 or compatible scanner. As you might imagine, the equipment doesn't come cheap. To begin with, you will need to have an IBM PS/2 computer, a color scanner, and an air compressor (Michelangelo is sort of a robotized airbrush artist). Once you have assembled this basic support equipment, Michelangelo itself costs $60,000 f.o.b. Japan (or $53,000 each for two or more). The paint (you will need to have yellow, magenta, and cyan installed) costs $15 per bottle, and you will use about a bottle of paint for each painting. Still, Data Mate insists that Michelangelo quickly pays for itself if you create four paintings a day at a charge of $600 per painting (each painting takes Michelangelo about four hours). The net cost per day is around $60, so you would make a net profit of around $2,340 per day (that's $70,200 per month). Or so they say.

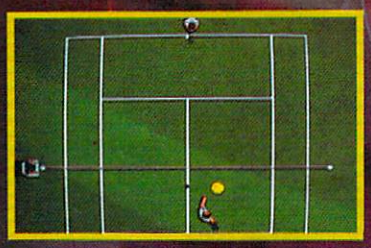
The literature states that Michelangelo can paint on paper, glass, plastic, cloth, wood, or enamel (as used on automotive bodies). The unit looks like a vertical version of a flatbed plotter, about six feet high and a little wider than it is tall. The painter runs on a track mounted on a horizontal bar which is elevated on twin vertical bars. It breaks down into separate sections and weighs only 287 pounds (plus 40 pounds for the controller), making it easy to transport from one job to the next. It uses acrylic paint that is odorless and nontoxic but weathers well.

Although the price of the equipment may seem high at first glance, it compares well with the cost of silk screens. Silk screens are many times more expensive than Michelangelo, and they are not as flexible.

For more information, contact Data Mate, New Taro Building, 2-2-12, Fujimi, Chiyoda-ku, Tokyo, Japan. ▷

tie break





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Available for: IBM PC, PS-2, PS-1, 100% compatibles and Tandy computers. Also for AMIGA, C-64/128 and Atari ST. IBM: For VGA (256 colors), EGA, CGA, MCGA, Tandy (16 colors) and HERCULES. Supports Ad-Lib, Soundblaster, and Covox soundcards.

Retail price: $39.95. Visit your local software retailer or call **1-800- 783-8023** to order.

DigiTek Software

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Circle Reader Service Number 208

Windowed *PageMaker*

PageMaker just opened up for *Windows. PageMaker* version 4.0 for *Microsoft Windows* 3.0 now boasts more than 75 new features, including a built-in word processor, extensive support for long documents, sophisticated text handling, and professional typographic controls. Capabilities previously available only in *PageMaker* 4.0 for the Macintosh have been included in this PC powerhouse, including memory management, networking options, and color capabilities. All the program's features have now been designed to take specific advantage of the *Windows* 3.0 environment.

With this new version, users can turn layout and text windows into easily accessible icons. Dynamic data exchange (DDE) links with *Microsoft Excel* 3.0 are also provided. The program's new high-speed Story Editor and built-in word processor allow you to do most of your work without leaving *PageMaker.* Advanced features such as search-and-replace for text and style attributes and add-on spelling checkers for 12 languages, as well as for legal, medical, and scientific terminology, make it easy to use the new *PageMaker*'s built-in word processor for virtually any document you might want to create.

For a limited time only, *Aldus PageMaker* 4.0 also includes a free copy of *Adobe Type Manager,* a $99 value (not available in 360K media). *Aldus PageMaker* 4.0 for *Windows* is available in the U.S. for a retail price of $795. For more information, contact Aldus, Customer Relations, 411 First Avenue South, Seattle, Washington 98104.

Two Batteries, No Waiting

Laptops are definitely *the* computers of the future. All sales figures indicate these little wonders are outselling their desktop competitors and there appears to be no end to their accelerating sales. But laptops aren't worth a whole lot without their batteries. That's why Epson's new 386SX notebook PC, the NB3s, comes equipped with not one but *two* 8-ounce ni-cad batteries, each with an estimated life of 1 to 1.5 hours per charge under typical usage conditions.

Even better, the 16-MHz machine weighs just 5.8 pounds (with battery) and comes with a slip case that accommodates the unit and the extra battery. It's just about everything you need in a high-powered portable PC, for a suggested retail price of $3,999. For additional information, contact Epson America, 2780 Lomita Boulevard, Torrance, California 90505; (800) 922-8911.

Expensive Software

The Software Publishers Association (SPA) has revealed that a settlement of $300,000, the largest ever reached in such a case, has been obtained in a software copyright infringement suit against Davy McKee Corporation, a Chicago-based construction engineering firm.

Using information supplied by a former Davy McKee employee, SPA filed a lawsuit on November 16, 1990, alleging that software copyrighted by Lotus, Software Publishing, and WordPerfect was routinely copied by the company in violation of the Copyright Act. After a surprise visit and an SPA-supervised audit of the software in use on all personal computers located at the firm, the company agreed to a settlement which, in addition to the cash, includes annual software audits for the next two years.

The company apparently thought it was saving money by using unauthorized copies of popular software on its computers. Of course, the cost was eventually much higher than was most likely anticipated at the time. Software piracy takes all forms, and SPA has been a dedicated force in education and enforcement geared to bringing it to a halt.

Affordable 486?

Headed into the fast lane, Intel has just created a new, less expensive version of the 486 microprocessor. Called the 486SX, the new chip will sell to computer manufacturers for roughly half the cost of a full-blown 80486. The new 486SX runs at a speed of 20 MHz, which is about 20 percent slower than Intel's slowest 80486 CPU and about 35 percent faster than Intel's fastest 80386 chip combined with cache memory chips.

According to a report pubished in the *Wall Street Journal,* the 486SX is basically the same as the standard 486 chip, but Intel has disabled circuits in the floating-point chip unit. The floating-point chip unit normally speeds up math calculations.

Intel says that for an additional $800 it will offer manufacturers another plug-in chip that will restore the coprocessor capability and will increase the speed of the 486SX to that of a standard 486 chip. The main advantage of a 486SX over Intel's 386 chip is the 486's built-in cache memory.

IBM has already begun shipping several new systems that use Intel's 486SX microprocessor. The new systems come standard with 4MB of memory, expandable to 64MB on the system board. All systems include a 32-bit SCSI busmaster that includes 512K cache for data input and output.

The desktop models are configured with either an 80MB SCSI hard disk (Model 90 XP 486 SX-0G5) or a 160MB SCSI hard disk (Model 90 XP 486 SX-0G9) and with 80-, 160-, 320-, and 400MB SCSI hard disks as options. Suggested retail prices range from $8,345 to $8,945.

Also available (in July) are two new Model 95s featuring the same amount of memory as the Model 90s, a 160MB or 400MB hard disk (with the same list of optional hard disks as the Model 90s), price ranging from $9,995 to $12,695. In addition to the difference in hard disk size, the Model 90 machines are desktop units, while the Model 95s are designed to stand on the floor beside a desk.

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

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IBM VGA DISPLAY

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Based on an enhanced version of the award-winning game system used in *Pool of Radiance*, *Curse of the Azure Bonds* and *Secret of the Silver Blades*, *Gateway to the Savage Frontier* gives you the freedom to make the story happen the way you want it to! Plus, an all-new wilderness style adds new exploration and excitement to all of your outdoor adventure!

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The Savage Frontier awaits!

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SHAREPAK

RICHARD C. LEINECKER

Since summer months are the biggest travel months, we've collected three terrific programs targeted to the laptop audience. If you don't have a laptop, though, don't worry. The same principles that apply to laptop-specific software usually apply to desktop systems as well.

You may be running a floppy-only system, or your available hard drive space may be in short supply. If you're in either situation, hang on; these programs are for you, too.

First, there's *SimplyWrite,* a text editor for writing letters, outlines, and documents. *PROspector* is a prospect tracker for salespeople who need to stay organized. And when you get back to the office, *Filesync* will copy over and update only the files you've worked on while you were away.

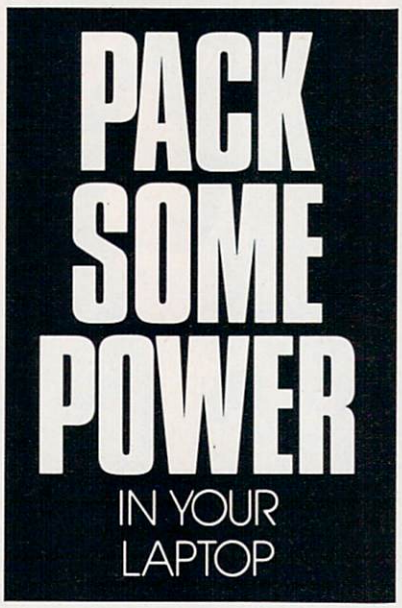
Why should you order our *SharePak* disks? Because they're always packed with the best programs, hand-picked from hundreds of submissions. The cost of downloading these programs from an online service alone is worth many times the cost of the disk. And we spend many hours screening them to select the very best programs so you don't have to. There's one more important incentive: We guarantee our *SharePak.* If for any reason you're not happy, just send it back with your reason, and we'll refund your money. A subscription can save you even more money. You can get 12 disks for $59.95, a 37-percent savings over individual disk purchases.

SimplyWrite

This ASCII text editor does more than just edit ASCII text. It has the full list of features you would expect: search and replace; insert and overwrite toggle; block operations like cut, copy, and paste; keystroke macros; word-wrap and autoindent; margin and tab operations; complete print-formatting commands like bold, italic, compressed, and letter quality; and much more.

There are some surprises, too. You can edit the cursor size, set the keyboard speed, edit documents with up to 1000 columns, and use a built-in pop-up calculator and calendar. These features aren't even found in many commercial word processors.

The keypresses I needed were easy to learn—thanks mainly to the great online help that's merely a keystroke away. *SimplyWrite* was easier to learn than most text editors I've used, and the best part is that the required disk space was 273K—small enough to put on a single floppy and have plenty of room for documents.



For laptop owners, *SimplyWrite* is the answer to the fight for programs small enough to fit on a single floppy. If you need to economize on disk space, this program is also for you. Not only is it a quality piece of software, it's small and won't hog your system's resources.

PROspector

You're on the road or in the air, and you need to refresh your memory. Instead of fumbling through legal pads, take out your laptop computer and run *PROspector* 1.0. It'll give you a complete picture so you can mentally prepare for upcoming events.

PROspector is pretty easy to use; if you're familiar with similar programs, you shouldn't have any trouble learning how to use it. Entering data is simple. The program gives you a box, and all you have to do is type in the information and press Enter. It does all the worrying about updating your disk files and keeping track of them.

You can sort the entries just about any way you want, and you can set the search criteria for a wide range of uses. The search routines can find entries in any of the fields. That way you can search for all references to *Bill,* for example, and then turn around and find all the phone numbers with a 919 area code.

For such a powerful program, you won't have to give up much disk space. The directory I put *PROspector* in contained a total of 359K of files, including several test-data files. That leaves plenty of room on a 3½-inch disk for your files.

If you want to keep track of appointments, clients, and contacts, this program is a must. It will give you a needed edge in your business, and it won't tax your computer's resources too heavily.

Filesync

Once you're back in the office, you'll want to copy your files back to your desktop system, but it isn't always a good idea to copy everything. That's why *Filesync* is so handy. It compares the dates and times of files and makes sure you're left with the latest updates.

The program is simple to use. Just type in the source and destination directories, and let it go to work. This handy utility can save you time and aggravation, and possibly prevent mistakes that will wipe out your latest file changes.

When using a laptop, you have to find ways to get the most computing power out of the least amount of disk space and memory. These programs do that *and* provide some of the most useful tools to use on the road—and they're useful for desktop systems, too. ⊡

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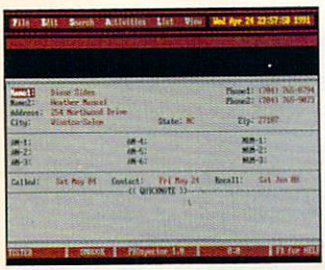
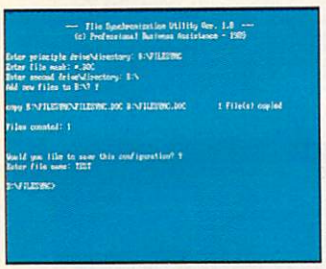


PROspector

SimplyWrite



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FEEDBACK

LETTERS FROM OUR READERS

The IDEs *Démarche*

You could help your readers avert a fatal mistake by running another paragraph about low-level formats ("IntroDOS," April 1991).

Before you do anything to your hard drive, you should find out what kind it is. IDE drives are low-level formatted at the factory and should not be low-level formatted again.

S. M. RUSSELL
W. PEABODY, MA

Reader Russell makes an excellent point, and his letter goes on to quote his user manual's warning against low-level formatting of IDE (Integrated Drive Electronics) drives.

April's "IntroDOS" column failed to note the differences between IDE and other drive types. During the factory low-level format, certain information is written to IDE drives, and subsequent low-level formatting could destroy that information, rendering the drive inoperable.

The column's intended message was that you should not be afraid to use low-level formatting utilities if appropriate for your drive. If such utilities came packaged with your drive, you can be pretty sure you won't harm your drive through their use.

No hardware procedure, however, should be attempted without checking the user manual for information about how that procedure might affect your specific computer system.

Missing Link

I read with interest the telecommunications-related articles in your February 1991 issue but was dismayed to observe the almost total lack of recognition of and discussion about American People/Link (Plink). It has been online since December 1984 and has tens of thousands of satisfied users. Plink offers a wide variety of services to its subscribers, not the least of which are its Amiga support clubs, which I run. To ignore People/Link is a disservice to your readers.

HARV LASER
TORRANCE, CA

People interested in learning more about People/Link can call (800) 524-0100 (voice) or (800) 826-8855 (modem) or write to American People/Link, 165 North Canal Street, Suite 950, Chicago, Illinois 60605.

Worth More Than 1000 Words

I understand that a scanner can transfer images from a printed page to a computer for desktop publishing applications, but why is it necessary to use another device to accomplish the same for printed words? What's the difference to the computer between an illustrated page and one filled with text?

HSIN TU
N. HOLLYWOOD, CA

To start with your second question, computers store text as a series of discrete characters. Each character occupies one byte of storage space. Programs that display these characters—word processors, for example—have a series of rules to follow in displaying this text so that it appears organized when displayed.

With a graphic, the entire illustration is considered one element. The image is stored using a code that describes how the pixels (picture elements) on the screen are to be lighted when the graphic is displayed.

When an image is scanned, the scanner bounces its light off of the image, measures the reflection, and records the information about the lightness and darkness of the image. To a scanner, a page of text is no different from a picture of a sailboat—both represent varying amounts of reflected light.

A scanned image fits nicely into a paint program, which is essentially a pixel-manipulation program.

To turn scanned text into editable text, additional software is needed. This software, called OCR *or* Optical Character Recognition software, *examines the scanned image (a graphic) for character patterns that it can match with patterns in its character li-*

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brary. When it finds a match, it stores the matched character in a file as a discrete letter.

*Optical Character Recognition presents many challenges that are slowly being overcome. One problem is that the same letter—*a, *for example—can take different forms depending on the typeface. We've trained our brains to recognize and adjust for these differences, but programming such nuances into OCR software is a mammoth task that requires great amounts of memory.*

Newspapers were among the first businesses to use OCR software regularly. As recently as ten years ago, an OCR scanner was larger than today's full-featured office copier. Writers typed their stories on special paper using special type balls on their IBM Selectric typewriters. Their letters had to line up properly and fall within certain margins.

The finished pages were then fed into the scanner, which took several minutes to digest a typical story. The machine beeped constantly, asking for help when it couldn't quite make out a character.

Today's OCR software is improving, but it still isn't perfect, and even 99-percent accuracy isn't good enough. Imagine trying to scan this magazine page, which holds approximately 6000 characters, using OCR software. Even if your software correctly identifies 99 percent of the characters, it's still going to stop and ask you for help 60 times.

Troubling Memories

I recently expanded the memory in my system from 512K to 1MB. My first use for the memory was to install a RAM disk for use with my *Money Counts* files, but I'd also like to use the extra memory when I run *Quattro Pro.* How can I delete the RAM disk when I'm through with it?

ROBERT M. MERRITT
BLUE SPRINGS, MO

Little in computing causes as much frustration as the extended memory between 640K and 1MB. It's a crime to let that memory go unused, but it's difficult to use it effectively.

Any device you install through your CONFIG.SYS, such as RAMDISK.SYS or VDISK.SYS, is with you until you rewrite CONFIG.SYS and reboot. Switching a standard DOS-supplied RAM disk on and off isn't possible. However, you can buy commercial RAM-disk programs that can be temporarily disabled or permanently removed.

Although a RAM disk can be extremely valuable on a floppy-disk-based system with no hard disk, it tends to be a bother when you have a hard disk. You do save a little time reading and writing files with a RAM disk, but you also have to spend time copying the files from the hard disk to the RAM disk and back again. In addition, you run the risk of losing updated data if the power fails before your RAM disk files are saved on the hard disk.

Perhaps the extra memory could be better used by installing a disk cache or by using it as a swap area for certain resident programs.

A cache speeds disk access by keeping frequently read disk sectors in memory and by trying to anticipate which sector you'll need next. When the cache is successful, data is fetched directly from memory rather than from the disk drive, resulting in a faster data transfer.

Swapping is a technique used by many resident utilities to minimize their footprint when not in use. A small portion of the utility stays in memory at all times. When you press that program's hot key, the resident portion loads the "swapfile." If the swapfile is on disk, this process takes a few seconds, but if the swapfile is in extended memory, it's almost instantaneous.

Memory prices are currently as low as they've been in years. Why not add three or four more megabytes? Then you'll face some really tough decisions about how to use your memory.

Playing the Slots

All the slots in my system are full, but I don't want to buy a larger unit at this time. Is there any way to add an expansion box with more slots?

LEE COTE
FOLSOM, CA

A computing truism seems to be that expansion slots fill faster than gullies in a thundershower. Look at computing's recent history, and you'll see expansion everywhere.

My first computer, for example, held 64K of memory. Friends who used systems of 16K and 32K thought I was nuts. Today, I can't run the software I want with 3 megabytes of RAM. As software and hardware advance to new levels, there are many more cards I can plug into my system—modems, mice, scanners, MIDI.

As time passes, demand on your system's resources will only increase. When you shop for a computer, buy as much expansion capability as you can afford; then spend the next year or two filling it up.

Many corporations have come to accept the inevitability of this cycle and are now budgeting to replace their computer systems every three years in order to stay abreast of technology.

If you've run out of slots, you may be able to consolidate the expansion boards you have to gain some room, but there doesn't seem to be any practical external expansion system for today's PCs.

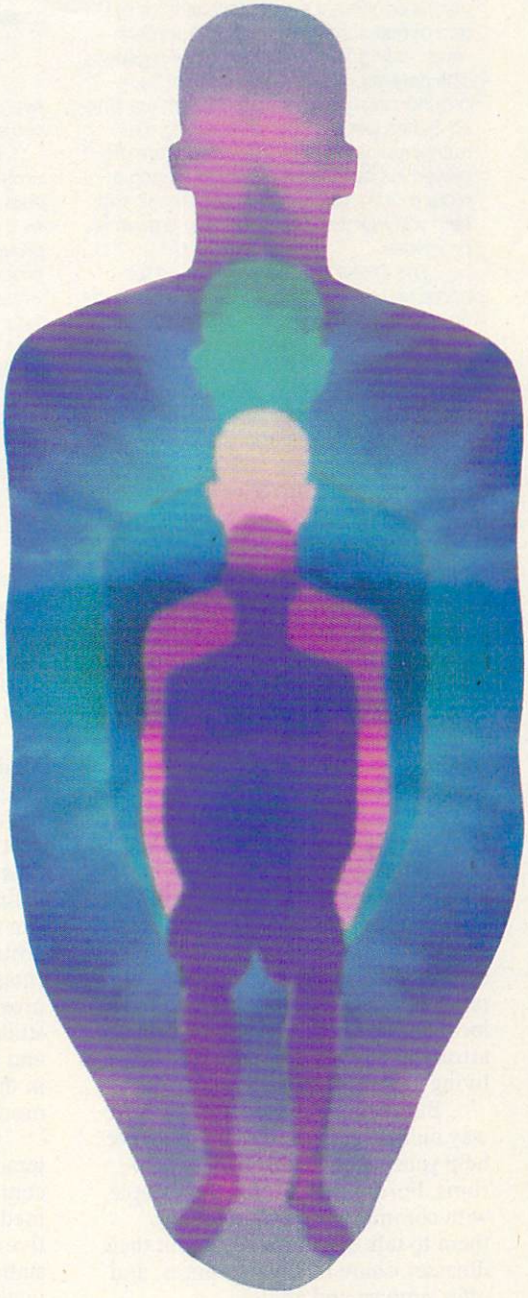
Consolidation can be achieved by using multifunction boards to replace dedicated cards. Many memory boards, for example, can accommodate serial and parallel ports in addition to RAM chips.

If you have an unused serial port, you could free a slot by switching from an internal to an external modem or by trading a bus mouse for a serial mouse.

If consolidation is impossible and you need more power, it's time to shop for a system you can live with for another two or three years. If you have no need for two computers, you may be able to sell the old system through a classified ad in a community newspaper. Or consider giving the less powerful computer to a son or daughter for schoolwork. Then you can start thinking about setting up a household LAN—but there goes one more precious expansion slot. ⊡

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. ⊡

HEALTH & COMPUTERS



Is a computer your best friend and personal trainer? Or is it a potentially dangerous appliance? Can the PC help the disabled lead more normal lives? Or is it a powerful tool in the hands of medical professionals? The answers are *Yes, Yes, Yes,* and *Yes.*

A personal computer much like the machine sitting on your desk can be everything from a coach to a diagnostician. And it helps enable the disabled.

On the downside, your computer's monitor showers you with extremely low frequency (ELF) and very low frequency (VLF) radiation every minute you use it. And, unless your workspace is ergonomically designed, your keyboard may be dooming you to chronic, painful repetitive strain injury.

Your PC has its own health to worry about, too. Viruses can strike at a PC's heart and soul—its hard disk drive—and cripple the machine as effectively as a flu virus lays you low.

As they say, if you have your health, you have everything. The PC, *the* household tool of the 1990s, can help to ensure that you keep your health—your everything.

GREGG KEIZER

Eat Right, Lose Weight, Stay Fit

Your PC can't do it alone. Before it can help you get a grip on your diet, before it can tell you how healthy (or unhealthy) certain foods are, and before it can motivate you to exercise, you have to give it the right software.

Several comprehensive nutrition and diet programs let you record what you've eaten and see exactly what nutrients make up each food. They'll even note your physical activities. Most are flexible enough to let you enter new foods and play what-if games with your diet and exercise. Noteworthy software in that category ranges from the graphical *DINE Windows* to the more traditional *Food Processor II.* Some products treat your diet as the key to good health, monitoring not entirely for the sake of weight loss, but for nutritional content. Parsons Technology's *Diet Analyst* checks your food intake for deficiencies in vitamins and other nutrients. *Diet Analyst* can also help you track caloric intake, but its principal claim is health maintenance rather than weight loss. If your diet is intended to maintain weight or is a reduced-sodium, -sugar, or -cholesterol diet, *Diet Wise/Energy Wise* from Nutritional Data Re-

sources not only assists you via your computer but also provides toll-free access to a registered dietitian.

Your computer can't nag you to get up in the morning for your daily run or swim, but it can motivate you by tracking your progress. A small amount of software is available to help you develop daily exercise plans, while logging your workouts. *Fitness Profile,* an expensive package, scores your current fitness from several tests, many of which you can do at home or at the local club. *Personal Fitness Planner* designs a daily activity and eating plan and then lets you record activities to show how you're doing.

Software can also turn your PC into a rudimentary self-diagnostic tool. Packages like *Family Medical Adviser* and *Home Doctor* consider symptoms, ask questions, and let you narrow down the possibilities for personal and family illnesses. They can't replace a doctor's expertise, of course (expert system software isn't at that stage yet), but they can help answer questions about simple ailments.

If you go to the trouble to look for it, you can find specialized software on almost any health topic imaginable. Want information about AIDS? *Understanding AIDS* takes you through an interactive lesson on the disease, from its history to its symptoms and prevention. *Birds 'N Bees for 7–12 Year Olds* explains sex and reproduction in a clear and simple fashion to youngsters, and it even lets you customize the content as well as direct it for your child's age and sex.

The Doctor Is Always In

Transform your PC into a fascinating medical- and health-information terminal with a phone line, a modem, and access to one of the online services. Connect to CompuServe, for instance, and you can peruse medical journals, order prescription drugs, and even chat with others about anything from exercise to cancer treatments.

Although other online services offer health information, none of them match CompuServe. If you call on Health Database Plus, for instance, you can retrieve complete articles from general-interest publications like *American Health, Hippocrates, Runner's World,* and *Psychology Today.* If you want to keep up with breaking medical news, you can pull down short summaries of articles from prestigious journals such as the *New England Journal of Medicine,* the *British Medical Journal,* and the *American Journal of Medicine.*

Want specific information about the medication your family doctor has prescribed? Then go to HealthNet, an online medical reference library. You can consult it at any hour of any day to learn about symptoms, diseases and disorders, home health care, drugs, and more. If your child's doctor prescribes Amoxil to fight an infection, for instance, you can quickly find out how it works, what it's best used for, its side effects, and even its wholesale cost.

CompuServe also includes Court Pharmacy, an online drugstore that fills prescriptions. The doctor's prescription must be mailed to the pharmacy, so it's best for maintenance medications, not drugs you need immediately. Court is an interesting and price-competitive alternative to your local pharmacy and may be especially attractive to the homebound or those living in remote rural areas.

But perhaps the most impressive way online services like CompuServe help your health is through their forums. Forums gather together people with common interests, allowing them to talk electronically about their illnesses, share their experiences, and offer support and advice.

Your PC is no replacement for an intelligent, caring medical professional, but it can certainly put a wealth of information at your fingertips.

PCs for the Pros

Personal computers do more for health care than just make out the bills and keep track of a doctor's schedule. Although they may be ever present in the office, handling the same sorts of chores as in any business, PCs may actually be making a bigger and better contribution to medicine long before an M.D. goes into practice.

At the Louisiana State University Medical Center in Shreveport, Louisiana, PCs are a prominent part of the library. Linked in networks, they connect to any number of online medical databases, including the publication listing of MedLine. Medical students can scan recent journals, pulling down abstracts of articles from the screen. Interlibrary and interregional loan programs ensure that hardcopy gets to students quickly. Teaching faculty and physicians link up from the PCs in their offices via the network or modems.

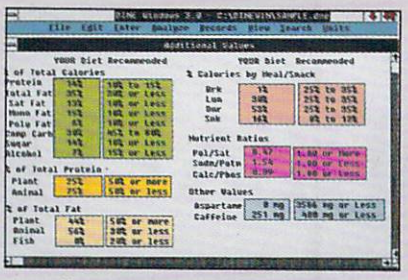
Off to the side, PCs drive an interactive videodisc lab. IBM PS/2s control laser disc players to simulate medical emergencies and put prospective doctors under pressure. At one station, the videodisc shows a shotgun victim arriving at a hospital's ER. By pressing a touchscreen on the PC's monitor, users call for examinations, order medications and fluids for the patient, and review vital statistics like blood pressure, respiration, and heartbeat. Choices determine the wounded man's condition. A wrong diagnosis at the PC can kill the patient; a moment of hesitation can waste what little time the victim has left. ▷

The Dieter's Edge

Nobody likes counting calories, yet keeping track of your food intake is an integral part of any sound personal health plan. It's easy to lose sight of the fact that a diet isn't a quick means for taking off unwanted weight. A good diet balances fitness and nutrition into a pattern you can maintain for life.

That's where a program like *The Dieter's Edge* comes in. This isn't just a simple calorie counter; it's a comprehensive system of measuring personal metabolism rates, eating habits, and exercise regimens. The data you enter is cast against background information compiled from the United States Department of Agriculture's nutritional databases. The results are displayed in graphs and charts that bring a picture of your health into clear focus and help you maintain weight-loss and exercise programs.

The Dieter's Edge is designed for home use, and its sophisticated techniques are particularly suited for those people working with a physician, coach, or dietitian. The program tracks the protein, fat, carbohydrate, mineral, and vitamin levels of the foods you eat daily. It also tracks your energy expenditures from such common exercises as bicycling, walking, running, swimming, and tennis. More than that, however, you can define home recipes and special exercises with customizing options.



How does your diet stack up?

It's difficult to gain mastery over the program's complex and comprehensive data because the interface isn't as intuitive as it needs to be. Fortunately, the manual provides a clear guide through the basic processes, and the program itself comes with some sample data you can experiment with. Mastering *The Dieter's Edge* takes time. But if you're serious about your nutrition and you need some help staying with your program, this software turns your computer into a personal health coach. Best of all, you never have to listen to Richard Simmons.

—PETER SCISCO

If I Only Had a Brain

"Dr. Bodine! Dr. Bodine to the operating room!"

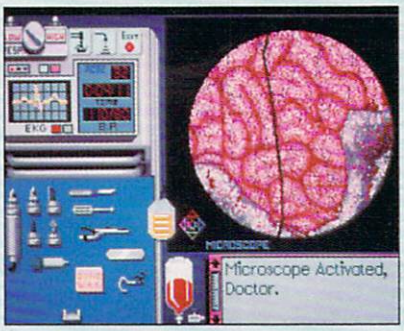
"Beverly Hillbillies" folk hero Jethro Bodine swore he was going to be a brain surgeon. If only he'd had *Life & Death II: The Brain.*

Though it's a long way from a simulation, *Life & Death II* carries a certain realistic feel, enough to make the squeamish squirm when the scalpel is in their hands and the EKG monitor is beeping in the background.

You play doctor as you diagnose patients with a variety of neurological ailments. After a quick examination, you can request CAT, MRI, x-ray, or angiogram tests to pinpoint the problem. Then it gets interesting. You hit the operating room, instruments at your fingertips, with no idea of what to do. The hospital classroom is available, but the text lessons are in big chunks, they're hard to remember, and they don't include any visual aids.

Sounds and sights on a VGA-equipped PC with an Ad Lib or Sound Blaster board are impressive. You see the blood well up as you make an incision, hear the whine of the drill as you bore a hole in the skull looking to relieve a subdural hematoma. If you don't follow correct procedures, or heaven forbid, you make a wrong diagnosis, you'll get yanked from the OR and sent back to class with calls of *Quack!* echoing down the hospital halls.

Life & Death II is, believe it or not, great fun—even for someone like me who early



on decided that the fame and glory of medicine weren't worth passing out over. It may be no simulation, but it's the closest to a sharp knife any of us deserve to be. Move over, Jethro!

—GREGG KEIZER

"Hospitals are leery of letting students practice on people," says Bonnie Sellig, the library's assistant director. Instead, computer-assisted instruction lets rookie doctors try treatments and immediately see the outcome, just as a student pilot uses a simulator before climbing into the cockpit. "Computer technology is the very beginning level of medical training," Sellig says.

But medicine holds even more hope for the PC. Sellig spells out a not-too-distant future in which doctors use an integrated system to pull up all the records of a patient; see the treatments, diagnoses, and medications given; and then review current literature to ensure that everything possible has been done. "Doctors are going to have to be knowledgeable about computers," Sellig asserts. "[Computers are] going to be part of their life from now on."

Linked with other commonplace technologies—the facsimile machine and the CD-ROM drive—PCs already send copies of crucial medical articles to doctors in rural areas and provide entire textbooks on disk. In the years ahead lie simpler point-and-click software and even voice-activated computers. "It's just a matter of keeping up," says Sellig. "And computers are what's doing it for us."

Talk It Up

The PC may play surrogate physician or help diagnose common illnesses, but these contributions pale nearly to insignificance in comparison with its impact on the handicapped. Computers, including heavily modified laptops, are providing the power and freedom of communication to people who can't speak.

Sitting in a wheelchair, a quadriplegic man watches the laptop's LCD screen. Using specialized software, he writes, not by pressing keys, but by almost imperceptibly moving an eyelid. A flat sensor attached to his muscles reads the movement, and as a bright cursor scans across a graphic of the keyboard, it stops momentarily to enter a letter. Tedious? Not really, since the word processor leaps to conclusions and offers a list of words it thinks should come next. A single flick of the eyelid, and the word pops up on the screen. The program can even be trained to remember the user's most-used words.

Laptop speech add-ons like DecTalk put natural-sounding voices on chips inside the PC, letting the computer speak—even sing—for those who can't. Quick-response software like *Talking Screen* and *E-Z Keys* from Words+ let the disabled "talk" much faster and more normally. Drawing programs provide a creative outlet and can be manipulated on the portable computer when switches are pressed, sipped, or squeezed.

All this technology doesn't come cheap—customized laptops run $5,000 and up. But they're portable, they have legible screens, and they can carry on conversations for as long as two hours between battery changes.

Advanced technologies like voice recognition and virtual reality combine to show the future of computerized aides for the handicapped. At Pacific Gas & Electric, Bill Yee, a senior programming analyst, works with a robotic assistant. Yee, a quadriplegic, talks, and the robotic arm responds, bringing reams of computer printouts to his side, turning pages on command, and tearing sheets off the

Feel the Burn

Using a computer for extended periods can cause eyestrain for many people. But coupled with a program like *Vision Aerobics*, your computer can actually be used to strengthen the eyes. What's more, the 3-D glasses that come with this health-oriented software will let you play the role of Dr. Jacoby at your neighbor's next "Twin Peaks" party.

Vision Aerobics combines three separate exercises into an interactive exercise program for your eyes. The Eyes in Motion exercise resembles an arcade game and is designed to improve your ability to make rapid and accurate eye motions. Letters flash onto your computer screen at different points, and you must press the key that corresponds to that letter.

The Images exercise is aimed at promoting the muscles that align your eyes in order to improve your depth perception. It consists of a set of convergence and divergence exercises, during which you try to keep a set of images combined into one image as long as possible. To do this requires the 3-D glasses (not required in all exercises) and opening your eyes as wide as possible. You can really feel yourself work during this exercise, and it's easy to see where the program got the *aerobics* in its title.

The last exercise, Relaxation, is a kind of electronic visual mantra, during which images float across the screen and tend toward the background while you think pleasant thoughts and try to relax your shoulder muscles.

Taking a break from long periods of computer use is a good idea whether you own this program or not. You should look away from your screen and focus on something across the room or outside the window for at least five minutes every hour. *Vision Aerobics* claims to be able to strengthen your eyes with continued use. If your physician thinks you can benefit from this kind of exercise, it's worth looking into.

—PETER SCISCO

Repetitive Strain Injuries

ELF and VLF electromagnetic radiation is certainly not the only hazard associated with lengthy sessions at the computer. The very act of typing could be crippling you, causing repetitive strain injuries, known as *RSIs*. How? The answer is both simple and complex.

For generations, piano teachers have urged students to play with their hands suspended above the keyboard. Unfortunately, typing instructors seem to care more about accuracy and speed than proper placement of the hands, so most of us never learn the correct way to use a keyboard. Our modern office environments have conspired against us, too. It's much faster and easier to send a message from one networked terminal to another than it is to handwrite a note or actually deliver the message in person. All this typing might only be a pain in the fingertips if it weren't for our posture and the placement of our hands.

Many people type with the heels of their hands on the desktop and their hands angled upward to raise their fingers above the keys. This results in a constriction in the carpal tunnel, which is a conduit for the tendons that actuate the fingers. Constant movement through this tunnel has the same effect as rubbing your skin against the edge of a tabletop. Heat is generated, and the tendons become sore. This is the most common—and painful—form of RSI, but any motion you perform constantly can cause this kind of injury. Even the way you sit in your chair could lead to backache and other muscle pains and strains.

If you can't (or don't care to) lift the heels of your hands from the desktop while typing, pads are available that will elevate your hands slightly, or you could make your own pad with a square of cardboard and some foam rubber. Also think about the way you sit at your desk. Would your grade-school teacher have given you satisfactory posture marks for the way you sit? Consider the possibility that your chair or desk may be too low (many are) or that the placement of your computer equipment causes you to sit in an unnatural or uncomfortable position. Don't be afraid to experiment to find the right way to sit.

Finally, take a break. Go and look out a window every so often. If you're fascinated by your work and don't really want to stop, set a timer on your watch or alarm clock to go off every hour or so. Just getting up and stretching your legs, looking at distant objects, and conversing with friends can keep you fresh and alert and inoculate you against the stresses associated with being sedentary.

—ROBERT BIXBY

printer as he programs and debugs software. It performs the functions of a human assistant but does it more economically. The robot will pay for itself in less than two years.

Virtual reality—creating artificial environments inside the PC that can be experienced like a sketchy version of the real world—also promises much for the handicapped. Connected to a powerful PC in the not-too-distant future, people bound to wheelchairs will be able to "walk" through computer-made worlds, "run" for an imaginary touchdown, or simply free themselves from the constraints of their afflictions.

Hey, Coach!

Imagine how motivated you'd be to eat right and keep fit if it meant your job. Think how you'd watch what you eat if, when you arrived at the office each day, you were paid by how quickly you charged through the halls or by how many chairs you could knock out of the way.

San Francisco 49er football players, like everyone else in professional sports, are constantly judged on how well they perform, how often they win. It's no surprise, then, that Jerry Attaway, the 49ers strength and conditioning coach, uses PCs to help players manage their diets and calculate their conditioning.

Attaway has calibrated the ergometers on the exercise bicycles and combined them with a custom PC program that tells his charges how long they've got to pump the pedals to consume a set number of calories. "It really hits home that way," Attaway says, "about how much work is involved to burn off the calories in a food."

But it's in nutrition that he excels. Using a program called *Nutritional Analysis,* Attaway tries to get professional athletes to change their eating habits. He's really trying to change their lifestyles. "There's only one or two guys on the team with a weight problem," he says. "I'm trying to get everyone to eat for their performance. I sit down and explain some physiological principles and, with the computer, show them what they normally eat, then do what-ifs on the bottom line—the calories. They go, 'Oh, yeah, I can do that,' or 'Coach, what if I do this?' The computer gives us all sorts of options."

Calculating a nutritional plan used to take Attaway half a day, and then it wouldn't be quite correct. Now it takes only ten minutes. "I make them do it," he says. "They see the numbers, and it's a way of teaching them how to enhance their performance or reduce the risk of heart disease or even certain kinds of cancer."

The 49ers also use PCs to log injuries and treatments, whether that means ice on an ankle or a session in

More Miscarriages: Are VDTs Responsible?

Pregnant women who work in front of VDTs for more than 20 hours a week run an 80-percent higher risk of miscarriage. That was the conclusion reached by researchers at the Northern California Kaiser Permanente Medical Care Program in Oakland, California, after studying 1583 pregnant women who attended Kaiser Permanente obstetrics and gynecology clinics during the years 1981 and 1982 (*American Journal of Industrial Medicine,* June 1988).

In the study, researchers compared the miscarriage rates of VDT users with those of women who performed the same type of work at their jobs but without VDTs.

Video display terminals (VDTs) are known to emit very low frequency (VLF) and extremely low frequency (ELF) electromagnetic fields (EMFs)—that much has been proven. The question is whether EMFs at those frequencies are harmful to humans, and more specifically, to the unborn.

While the evidence so far seems to weigh against VDTs, a recent study from the National Institute for Occupational Safety and Health reached a completely different conclusion (*New England Journal of Medicine*, March 14, 1991). Of the 730 women included in the NIOSH study, 307 were directory-assistance operators who used VDTs, and the other 430 were general operators who performed similar work using both LED (Light-Emitting Diode) and NGT (Neon Globe Tube) monitors, which emit no EMFs.

Both VDT and non-VDT workstations were measured directly for VLF and ELF emissions, as were background areas away from the workers.

In their detailed study, researchers concluded that VDT use did not, in fact, increase the risk of miscarriage: "The rate of spontaneous abortion for women with more than 25 hours of VDT use per week was similar to that for women with no hours of use per week. . . . The use of VDTs and exposure to the accompanying electromagnetic fields were not associated with an increased risk of spontaneous abortion in this study."

The study did confirm several other factors already known to be associated with an increased risk of miscarriage: previous miscarriage, the use of alcohol, the use of cigarettes, and the presence of a thyroid disorder.

Until more studies are conducted comparing VDT use and miscarriages, the jury will remain out on this one. Whatever the findings of the next study, however, one thing is for certain: Enough studies have been conducted that we can say with fair certainty that exposure to EMFs is harmful. That fact alone may render any future correlation between VDT use and the risk of miscarriage purely academic.

—JILL CHAMPION

the whirlpool. Everything goes into a player's file at the end of the season—missed practices, missed games due to injuries—and is reviewed by the organization. That PC use probably makes some players nervous. "Pro football players don't like to keep records," laughs Attaway. "You can't let the paranoia take over. If you don't win, they're going to fire all of us anyway. You just do the best you can."

Warning: Computer in Use

Your PC may pose a potential threat to your health. Surprised?

Monitors are the prime suspect. They emit electromagnetic radiation at VLF and ELF levels. Although studies are far from conclusive, many researchers warn of possible health risks associated with high electromagnetic radiation levels, including miscarriages and cancer. San Francisco, the first American city to regulate working conditions at computer monitors and terminals, has even established a Video Display Terminal Advisory Committee to report on, among other things, electromagnetic fields.

You can reduce the risk simply and inexpensively. Don't crowd your screen: Radiation levels drop sharply two to four feet from the monitor. Turn off any monitor you're not using, as well as laser printers and copiers, because they also throw out large electromagnetic fields. And if you have several computers in your home office, position them so that the monitors' sides and backs don't face your work space: Radiation levels are typically weakest from the front.

More costly solutions range from antiradiation screens to low-radiation monitors. For $139 you can buy NoRad's screen, which, according to the company, stops 99 percent of the electric radiation at VLF and ELF levels. Low-radiation monitors are pricey but available from major manufacturers like NEC, Sigma, and Qume. They block electromagnetic radiation, but only at VLF levels. Or you may want to switch to an LCD monitor, like those on laptops. LCD screens emit negligible radiation. Safe Computing makes desktop-sized LCD screens, but the cost—$2,495 for a backlit VGA model—is prohibitive to all but the wealthiest home computer users.

The catalog of less threatening, but still harmful, effects includes everything from headaches and eyestrain to backaches and carpal tunnel syndrome, a persistent pain in the wrist. Tired muscles and eyes can be relieved by wrist support pads at the keyboard, an adjustable chair, and properly positioned lighting to reduce glare on the screen. Headaches can be combated by taking breaks from the computer.

Heal Your PC

Unaccountable system crashes. Extraordinarily long times to load programs. Corrupted (and crucial) files. Sound familiar? If so, your PC may be the sickest thing in your house.

A PC can succumb to illnesses, too. Some ailments come from care-

Food for Thought

Have you ever wondered exactly what's in that pizza you've been gnawing on during a late-night session with *King's Quest*? Or those potato chips you clogged your keyboard with while chatting on CompuServe? Now your computer can tell you. *Santé* (pronounced *santay*, which is French for *health*) is a new computer program designed to help you eat better by providing computerized meal and recipe analyses.

Created under the strict supervision of a registered dietitian, *Santé* first asks you a few short questions about yourself and then lets you select your foods from 3000 possible choices, supplying you with a full analysis of your meals and full day's intake. Detailed reports cover calories, cholesterol, fat, and essential vitamins and minerals—29 nutrients in all. How you measure up to the government's Recommended Dietary Allowances is computed automatically. It even takes into account your age, sex, and other information. The software comes with a dozen dietitian-tested recipes and a coupon good for hundreds of additional free recipes.

—ALAN BECHTOLD

Product List

Birds 'N Bees for 7–12 Year Olds
$14.95
IntraCorp
14202 SW 136th St.
Miami, FL 33186
(800) 468-7226
(305) 252-9040

Clean-Up
$35.00
Scan
$25.00
McAfee Associates
4423 Cheeney St.
Santa Clara, CA 95054
(408) 988-3832

CompuServe
5000 Arlington Centre Blvd.
Columbus, OH 43220
(800) 848-8199

The Dieter's Edge
$49.95
Training Table Systems
17624 Golfview
Livonia, MI 48152
(800) 336-6644

Diet Wise/Energy Wise
$159.00
Nutritional Data Resources
P.O. Box 540
Willoughby, OH 44094
(800) 637-3438
(216) 951-6593 (in Ohio)

DINE Windows
$295.00
DINE Systems
586 N. French Rd., Ste. 2
Amherst, NY 14228
(716) 688-2492

E-Z Keys/Talking Screen
$1,195.00
Words+
44421 10th St. W. #L
Lancaster, CA 93534
(800) 869-8521
(805) 949-8331

Fitness Profile
$395.00
Wellsource
15431 SE 82nd Dr., Ste. D
Clackamas, OR 97015
(800) 533-9355
(503) 656-7446

Food Processor II
$295.00
ESHA Research
P.O. Box 13028
Salem, OR 97309
(503) 585-6242

Home Doctor
$39.95
Dynacomp
Dynacomp Office Bldg.
178 Phillips Rd.
Webster, NY 14580
(716) 671-6160

Life & Death II: The Brain
$49.95
Software Toolworks
60 Leveroni Ct.
Novato, CA 94949
(415) 883-3000

Lifecycle Aerobic Trainer
$1,598.00
LifeFitness
9601 Jeronimo Rd.
Irvine, CA 92718
(800) 735-3867
(714) 859-1011

NEC 3DS Low-Emissions Monitor
$1,049.00
NEC
1255 Michael Dr.
Wood Dale, IL 60191
(708) 860-9500

Norton AntiVirus
$129.95
Symantec/Peter Norton Computing
10201 Torre Ave.
Cupertino, CA 95014
(800) 343-4714
(408) 253-9600

PageView, L* View, SilverView Reduced-Emissions Monitors
$1,299.00–$2,495.00
Sigma Designs
46501 Landing Pkwy.
Fremont, CA 94538
(415) 770-0100

QM835VLF Super VGA Monitor
$699.00
Qume
500 Yosemite Dr.
Milpitas, CA 95035
(800) 457-4447
(408) 942-4000

Santé
$149.00
Hopkins Technology
421 Hazel Ln.
Hopkins, MN 55343-7117
(612) 931-9376

Understanding AIDS
$49.95
SAE Software
P.O. Box 13738
Edwardsville, KS 66113
(800) 748-7734
(913) 441-1868

Virex-PC
$129.95
Microcom
P.O. Box 51489
Durham, NC 27717
(919) 490-1277

ViruCide
$49.00
Diet Analyst
$59.00
Parsons Technology
375 Collins Rd. NE
P.O. Box 3120
Cedar Rapids, IA 52406
(800) 223-6925

Vision Aerobics
$129.00
Vision Aerobics
10 Mechanic St., Ste. G
Red Bank, NJ 07701
(201) 219-1916

lessness or unforeseen events, like using out-of-date printer drivers or electrical blackouts. Others are harder to diagnose and treat, like incompatible software or a damaged hard disk drive. But nothing comes close to a computer virus for sheer terror.

Viruses, those small bits of computer code maliciously placed inside innocent software carriers, can rob you of valuable data or make your PC virtually unusable. Where you pick up a virus—from public domain software, from a program you eagerly "borrowed," or in some limited cases, even from commercial software—is almost beside the point. Once your PC has a virus, once your PC starts acting strangely and unpredictably, it may already be too late. Fortunately, several good detection programs can spot and eliminate viruses before they have a chance to lay your PC low.

One capable package is *Virex-PC.* This three-program combination scans your disk, checking each file for 137 different virus strains. It also constantly watches over your computer and alerts you when potential viral activity is detected. And it eradicates some (though not all) of the viruses it finds. You pay a price for this protection—*Virex-PC* consumes 31K of precious RAM.

Norton AntiVirus is a slightly more expensive virus-protection package. *AntiVirus* identifies 142 strains and uses three methods to detect viruses: It watches each disk read, scans memory for viruses, and scans disks for suspicious strings of characters that may mark a virus. Once *AntiVirus* spots a virus, it tries to destroy it and repair the damage done.

Actually, viruses are rare. That's why you may want to use *Scan* and save yourself the RAM used by programs like *Virex* and *AntiVirus. Scan* and its companion, *Clean-Up,* don't constantly watch for viruses. Instead, you run *Scan* if you suspect your PC has caught a bug and then run *Clean-Up* to mend any faulty files. The combination takes care of most viral infections and damage, but if you don't remember to regularly check your PC, it could become irreversibly infected before you notice.

Another option is *ViruCide* from Parsons Technology. It should be run regularly for file maintenance, like *Scan.* It removes viruses and repairs files wherever possible. As a premium, Parsons provides a book about computer viruses so you will know what you are up against.

Prevention is the key to computer health.

Only the Beginning

Crude. That's the current state of health computing. In ten years, or even in five, what you'll be able to do with your household PC will make today's possibilities seem laughable.

As the information revolution continues to hit home, you'll be able to contact your family doctor electronically to book appointments and ask simple questions. You'll be able to keep up with groundbreaking medical research by going online and reading clips your computer has collected for you from professional journals and consumer magazines. Your doctor will send prescriptions to the pharmacy via computer, and you'll file claims to your medical insurance company the same way. The PC will monitor your wellness, reminding you of immunizations for the kids and watching your blood pressure and cholesterol through the add-on diagnostic tools you'll connect to it. It will become an invaluable adjunct to your health.

Your home PC is a good health tool now. Someday it'll be great. ⊡

Dr. Future

Modern medicine consumes technology. From CAT scans to computerized diagnostic databases, medicine pushes the technological envelope harder than almost any other profession. Its appetite for high-tech solutions is voracious. On the whole we accept that appetite, since we believe the end—saving lives—justifies almost any means. But where is high-tech, particularly computer technology, taking medicine? We asked two editors at *Omni, COMPUTE*'s sister magazine that specializes in science, to dream a bit about Dr. Future.

"In the well-equipped middle-class household [of 2010], your bathroom will be an adjunct to your doctor's office, with monitors, sensing devices, and other high-tech paraphernalia," says Keith Ferrell, editor of *Omni* magazine. "You'll go to the doctor, for instance, to have bones set, but certainly blood pressure, blood, urine, feces, and semen can all be examined at home and the data transmitted electronically to your doctor. More important, though, the computer will replace the experimental animal. The computer will act as a virtual guinea pig," says Ferrell, outlining how computer simulations will test new drugs and procedures, all without the necessity of animal or human testing.

Mary Glucksman, *Omni*'s medical editor, suggests other home health care technologies. "There will certainly be very detailed prenatal care [software]," she says. "This will help women maximize their nutritional intake as well as help them avoid harmful foods." And women will use software for both contraception *and* conception. "Programs will analyze temperature fluctuations on a daily basis, then chart and compare [them] to the norm" as women track their menstrual cycles to either boost the chance of conception or as a form of chemical- and device-free birth control.

And technology-intensive developments of today foreshadow what health care may be like in 20 years. Micromachines with metallic gears a couple of hairwidths wide will be used to "Roto-Rooter" clogged arteries or for superprecise surgery beyond the abilities of the steadiest surgeon. Computer-controlled x-ray equipment will put the inside of your body on a video screen in realtime, letting doctors watch the inner workings of the human body without lifting a scalpel. Robotic assistants will grind sockets for a perfect fit of replacement joints in the hip and knee.

It's all in the hands of Dr. Future.

—GREGG KEIZER

Biking Rough Terrain—at Home

You hope your muscles won't give out before finishing the last leg of this vigorous bike ride through rough terrain. That's easier said than done: A 3K hill looms before you. You begin the ascent, pedaling harder and harder—and then the telephone rings. Pressing Pause on the display console, you hop off your bike and race to the next room to answer the phone.

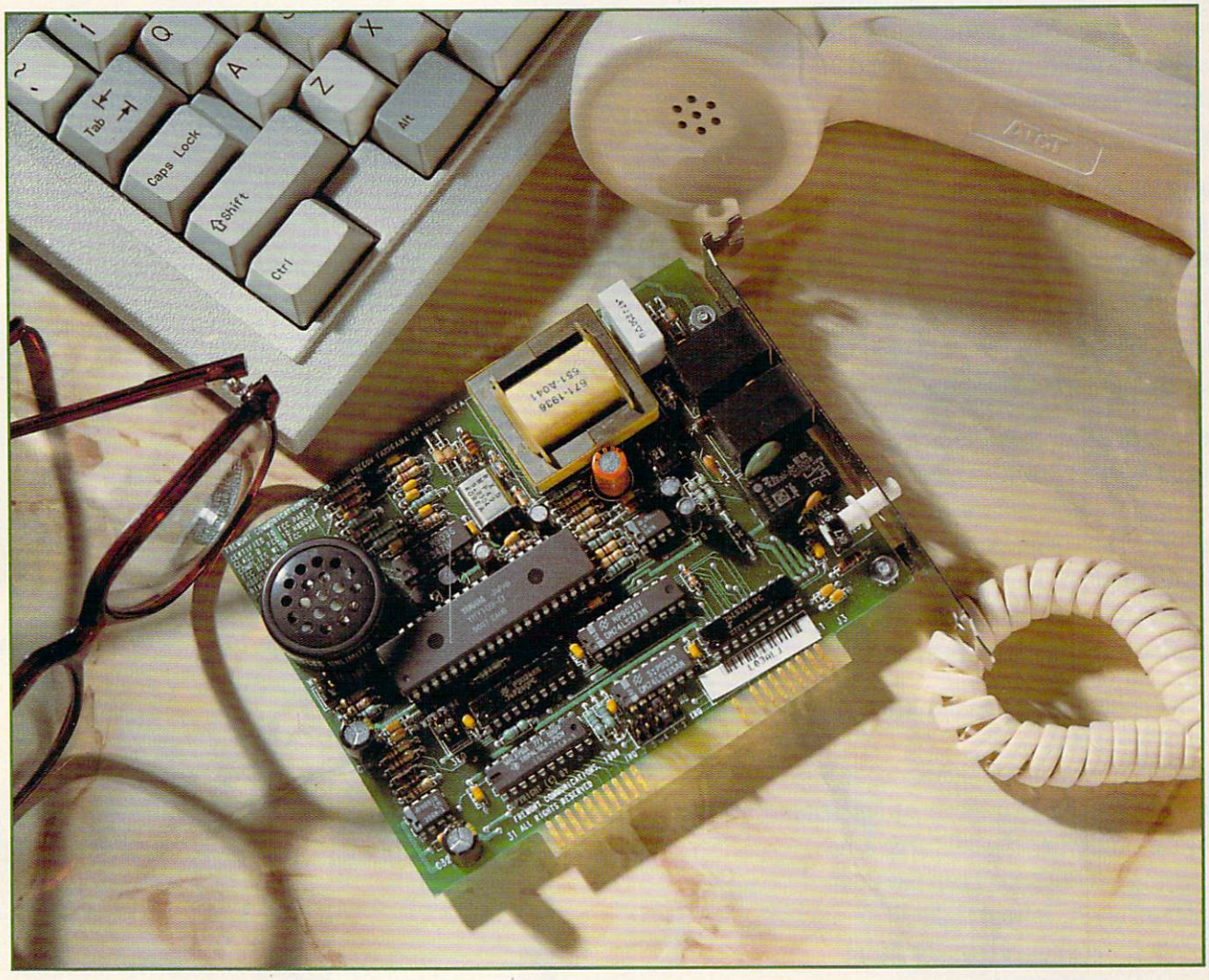
Come again? A *pause* button? Weren't we just in the throes of pre-Olympic bike training? The answer is *Yes*—sort of. Actually we were about to finish the last leg of one of the numerous exercise programs on the Lifecycle. While you weren't actually riding over rough terrain, the hills were very real where it counts—in your legs, heart, and lungs.

The Lifecycle is a stationary bike computerized to simulate actual outdoor bike riding, and, indeed, you'll feel as though you've been on an outdoor trek if you can make it through a full 12-minute program.

Unlike other stationary bikes, the Lifecycle is programmed for "interval training with progressive overload." In plain English, that means your pedaling will change periodically—becoming sometimes more difficult, sometimes easier—as the program emulates the various ups and downs you'd encounter on a real outdoor ride. Both hills and valleys are visualized on the bike's display console as red and yellow lights that move up and down as pedaling difficulty increases and decreases. As for the 3K hill, you may have to use your imagination to see the real thing, but you'll feel as though you were there.

One of the best things about training with the Lifecycle, besides the fact that neither wind, nor rain, nor dark of night will keep you from taking a ride anytime you want, is that beginners as well as conditioned athletes will find complete pedaling programs compatible with their abilities. The different levels of programs vary in hill intensity and duration, allowing you to graduate to higher levels as your conditioning progresses. Among other things, you can test your heart rate and maximum oxygen uptake (MOU) and watch the number of calories expended per hour and miles pedaled. Now, if they only could add a few trees and a nice breeze. . . .

—JILL CHAMPION



MARK WAGONER © 1991

This month *COMPUTE*'s Test Lab focuses on modems, fax boards, and fax/modems. With these technological marvels, you can use your computer to order airline tickets, send and receive important documents, do your banking, communicate with people who have similar interests, and tap into a world of information. *COMPUTE*'s expert reviews will help you decide what you want and need, as our reviewers examine installation, software, hardware requirements, and special capabilities in clear, unintimidating language. You'll get the facts and the figures, the sidebars and the statistics you need to understand these devices and make the right buying decision.

Brooktrout Fax-Mail 96
The Complete FAX/Portable
Fremont Frecom Fax96
GVC Mini-FaxModem FMM-4824
Hayes JT Fax 4800 Portable
Hayes JT Fax 9600B
Intel SatisFAXtion
Okidata Okitel 2400B Plus PC Modem
Tandy FaxMate
Touchbase WorldPort 2400 Modem
Zoom/Modem HC2400S SendFax

"It expanded my horizons, without exceeding my budget."

"With PRODIGY,® there's a panorama of information, services, advice, and entertainment at my command. Hundreds of exciting features, and all for just $12.95 a month, with no online time charges. That means I can use PRODIGY without worrying that the meter is running.

"The great graphics and friendly interface are real attention-getters. And the menus and cross-referencing features make it so easy, my whole family's involved.

"There's so much to tell you about PRODIGY, I hardly know where to start.

"We talk to other members. We all love the PRODIGY clubs where we exchange information about things we enjoy. The computer club is great because it keeps me up on the latest PC technology. My wife's favorite is the food club where she shares recipes and tips.

"I do more shopping and banking in a lot less time. I go window-shopping for ideas on PRODIGY and make purchases by keyboard instead of by car. And when the bills arrive, no problem. With PRODIGY I can pay them right from my PC. It would take all day to tell you about all the exciting things I do on PRODIGY.

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The PRODIGY service, connected to your home computer and phone line, has games, sports information, an encyclopedia, and much, much more. And, it's just $12.95 a month, including 30 personal messages.*

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Circle Reader Service Number 143

*Additional messages will be billed at only 25 cents each. Bank fees may apply. PRODIGY is a registered service mark and trademark of Prodigy Services Company. IBM is a registered trademark of IBM Corporation. Macintosh is a registered trademark of Apple Computer, Inc. © Copyright 1991 Prodigy Services Company.

BROOKTROUT FAX-MAIL 96

I hold the record for fax-document jams. That's why I was thrilled to get something other than the standard manual-feed fax machine. The Brooktrout Fax-Mail board met and exceeded all of my hopes, and I've gotten over my fax phobia at long last.

Fax-board installations can stump even expansion-card installation veterans. That's because they often conflict with other devices and software already installed. This was no exception to that rule. But the manual was complete and walked me through troubleshooting steps that anyone could've followed.

The software that comes with the system is menu driven and easy to use. I had no trouble adjusting the configuration and preferences for my needs. The configuration and system software passed the No Manual Needed test. They were so easy to use that, until I was ready for the advanced features, the manual wasn't necessary. And my AUTOEXEC.BAT file was automatically updated, saving me from having to manually edit it.

Sending faxes from text files is simple. Select the file, enter the destination phone number, and tell it to start. The Fax-Mail system does the rest—converting it to the correct format, dialing the phone, sending the fax, error checking, and terminating the call. On the other end the faxes arrive looking just as if I'd sent them through one of the old-fashioned faxes (probably better since I would've had at least one document jam). Sending graphics files in PCX format is just as easy. The software takes care of all the conversion details for you.

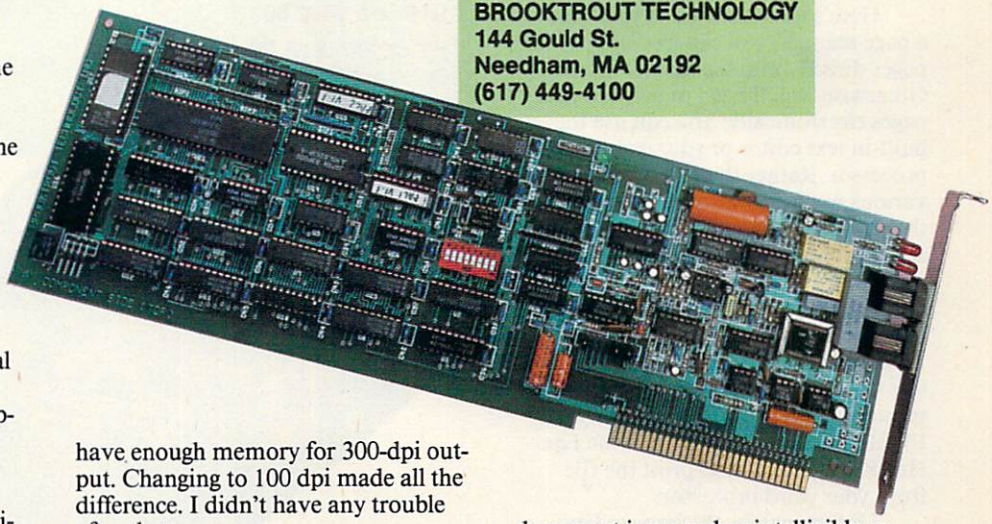
Receiving was almost as easy. The documents are saved to a disk file and can be viewed on the screen or sent to your printer. My Panasonic KX-P4420 laser printer's RAM filled up and generated an error message occasionally. Then I read the documentation and found out that I didn't have enough memory for 300-dpi output. Changing to 100 dpi made all the difference. I didn't have any trouble after that.

If you fear or loathe fax machines, the Brooktrout Fax-Mail 96 is your ticket. With it, you can forget document jams and unintelligible errors—and enjoy smooth sailing into a better-working office or business. ▷

RICHARD C. LEINECKER

Installation: internal
Slot/Bus Required: 8-bit
Fax Group Supported: 3
Other Requirements: n/a
List Price: $499.00

BROOKTROUT TECHNOLOGY
144 Gould St.
Needham, MA 02192
(617) 449-4100



Xerox Fax Firsts

First with LDX (Long Distance Xerography)—1964
First to introduce desktop fax—Telecopier I—1966
First to use automatic document handler—Telecopier 410—1973
First in plain paper laser fax—Telecopier 200—1975
First to use an automatic dialer—Telecopier 200—1976
First to use white line skipping—Telecopier 485—1980
First to enhance fax multifunctionality—FaxMaster software—1984
First to introduce plain paper use—Telecopier 7020—1986
First to develop a fax terminal capable of communicating with computers—Telecopier 7021—1987

—DAVID DAY

Facsimile Facts & Figures, 1990/91, International Facsimile Association

THE COMPLETE FAX/PORTABLE

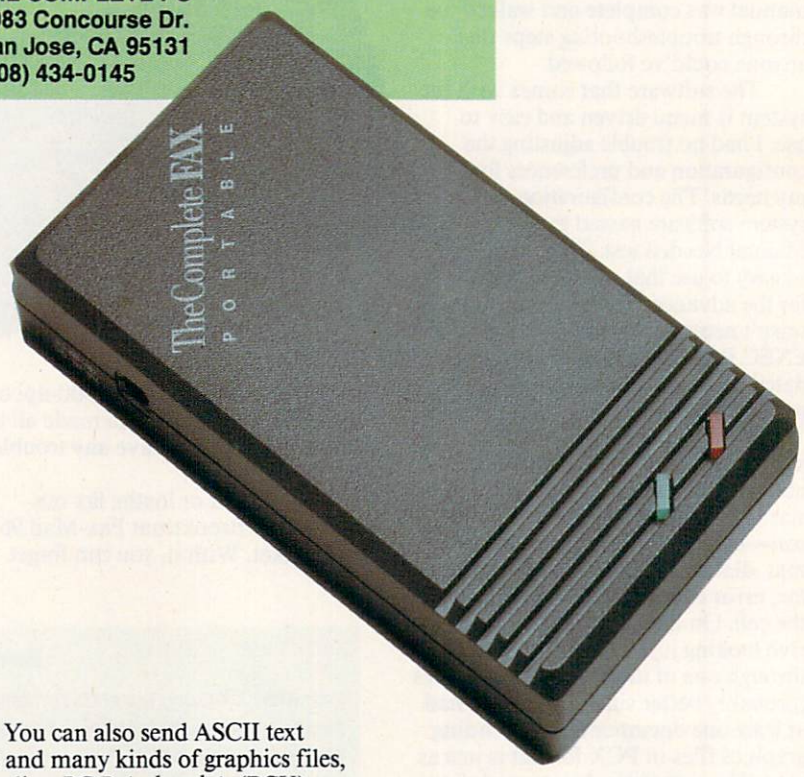
Talk about small. Who would've thought you'd be able to buy a fax machine that's only 5½ inches long and 2½ inches wide? Before you rush out to buy one, let me explain. This fax machine doesn't come with a printer, and you can't put paper in it—but when hooked to a computer, it can do just about everything a conventional fax machine can do and more.

Here's how it works. If you have a page scanner, you can feed your pages directly into the fax machine. Otherwise, you'll need to prepare your pages electronically. You can use the built-in text editor or your own word processor. Rather than convert the various word processor file formats, the Complete FAX/Portable includes a memory-resident program that captures your word processor's printer output and automatically sends it out as a fax. You simply configure your word processor for an Epson printer (it's OK if you have another kind of printer), press the hot key (usually Alt-F), fill out the information in the Fax Hot-Key window, and print the file from your word processor.

Unfortunately, the pop-up Fax Hot-Key window won't work from some programs, including *Microsoft Windows, DESQview,* and any application that operates in the Hercules graphics mode. There are workarounds for most of these programs. With *Windows,* for example, although you can't use the hot key, you can print files from *Windows* to the fax board as long as you've installed the fax program before going into *Windows.* There are two drawbacks. First, any printing from *Windows* at that point will be faxed and you won't be able to print to your printer. Second, to regain printing control in *Windows,* you'll need to exit *Windows* and deactivate the fax program. This would be a strong argument for not starting the fax program from your AUTOEXEC.BAT file.

Installation: external
Slot/Bus Required: n/a
Fax Group Supported: 3
Other Requirements: 640K RAM, graphics adapter, hard disk with at least 3MB available, serial port
List Price: $499.00

THE COMPLETE PC
1983 Concourse Dr.
San Jose, CA 95131
(408) 434-0145



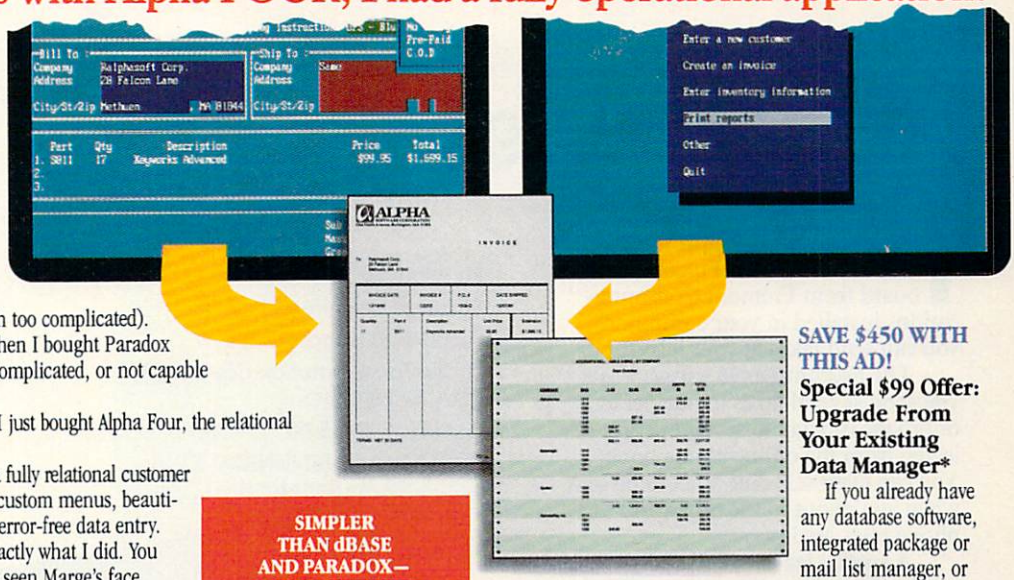
You can also send ASCII text files and many kinds of graphics files, including *PC Paintbrush+* (PCX), *Microsoft Windows Paint* (MSP), Tagged Image File Format (TIFF class B), and *Dr. HALO II* and *III* (CUT) files.

While the software could've been easier to use (especially with *Windows*), I had no trouble sending or receiving faxes. It's a bit pricey, so you'd be better off buying a less-expensive fax card for your desktop computer. On the other hand, the unit's small size makes it a good choice for laptops, especially if you already have a modem. ▷

DAVID ENGLISH

After I bombed with dBase, I almost gave up automating our office...

...but after a few hours with Alpha FOUR,® I had a fully operational application!



At our Monday morning staff meeting, I announced I was going to automate our sales tracking and invoicing system later that day.

Skepticism ran high. "Paul, you promised me an application like that two years ago," said Marge. "You couldn't do it, and neither could that dBASE programmer you hired. It'll never happen!"

I'd already tried three times before to program a database: first with dBASE (much too complicated). Then I tried Q&A (not powerful enough). Then I bought Paradox (just like dBASE). They were all either too complicated, or not capable enough for our needs.

This time, I was confident. Why? Because I just bought Alpha Four, the relational database for non-programmers like me.

I knew within hours, I'd be able to build a fully relational customer tracking and billing system, complete with custom menus, beautiful screens and extensive help messages for error-free data entry.

SIMPLER THAN dBASE AND PARADOX— MORE POWERFUL THAN Q&A

And that's exactly what I did. You should have seen Marge's face when the first, perfectly formatted invoice came off the printer.

I DEVELOPED MY APPLICATION & REPORTS IN MINUTES

With the "application outliner," I automatically set up a system of menus, sub-menus, and procedures based on the outline I laid out.

Alpha Four's report writer was even more impressive. I "painted" reports and invoices on-screen. They looked exactly like I wanted them to—much better than our old paper forms. I always ran out of power with other simple-to-use databases; they weren't relational. With Alpha Four, I created different databases for customers, invoices and inventory and then related them into a "set," just by drawing on-screen, a diagram of the links between the databases.

I'LL NEVER KEY IN DATA TWICE AGAIN

Now, we never have to enter the same information more than once. New invoices can be generated for existing customers without having to re-enter their information—we just "look it up" in our customer database.

And I was delighted that Alpha Four is totally compatible with dBASE .dbf files. Our mailing list went right into the new application without even having to convert the files!

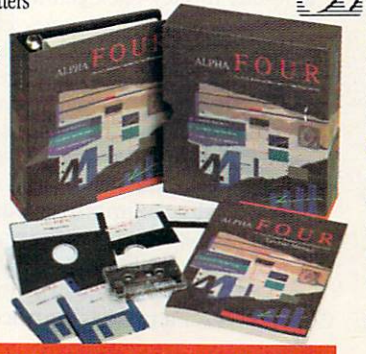
FASTER, MORE ACCURATE DATA ENTRY

When you enter data, you can automatically change the case of letters from lower to upper. You can display data entry templates for formatted fields like phone numbers, or skip over fields when certain conditions are met. Of course, all calculations are performed automatically.

Look-ups are super flexible. You can display information from a look-up database in a multi-column window anywhere on the screen. Select from the window and Alpha Four automatically fills in the related information.

*Qualifying packages include: programming databases (dBASE® II, III, and IV, Paradox, Clipper,® Foxbase® Fox Pro,® Revelation, etc.), flat-file databases (Q&A,® PFS:Professional File,® Rapid File,® etc.), integrated packages (Microsoft Works,® PFS:First Choice,® Lotus Works,® etc.), and mailing list managers (Fastpack Mail, etc.) or spreadsheets with databases (Lotus 1-2-3,® Quattro Pro®).

All trademarks are registered with the appropriate companies.



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If you already have any database software, integrated package or mail list manager, or if you are currently using your spreadsheet to manage data, you can upgrade to Alpha Four for just $99.

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For Fastest Service Call: 1-800-852-5750, Ext. 117 Orders Only Hotline: 1-800-336-6644 Or Fax the order form to: 1-617-272-4876. Or mail to: Alpha Software Corporation, One North Avenue, Burlington, MA 01803.

In Canada Call: 1-800-451-1018, Ext. 177. Or fax your order to: 1-416-365-1024. Or mail coupon to: Alpha Software Corp. 626 King Street, Suite 301, Toronto, Ontario M5V 1M7.

Alpha FOUR $99 Upgrade Offer

(Suggested Retail Price $549)

ALPHA SOFTWARE CORPORATION
One North Ave., Burlington, MA 10803
1-800-852-5750, Ext. 117
Orders Only Hotline: 1-800-336-6644

Yes! Please send me the Alpha Four relational database for non-programmers for just $99 (SRP: $549), plus $8.50 shipping and handling. I understand it is fully guaranteed and I may return it within 60 days for a full refund. I have enclosed the cover page of my existing qualifying product* manual (or original diskette).

Method of Payment (MA. residents, add 5% sales tax)
☐ Check Enclosed ☐ Charge my: ☐ MC ☐ Visa ☐ AMEX

Card # _____ Exp. _____
Name _____
Address _____
City, State, Zip _____
Daytime Phone _____
(in case we have questions about your order)

Diskette Size Select one: ☐ 3-1/2" ☐ 5-1/4"

Offer subject to change without notification

TAN

"RUNS RINGS 'ROUND dBASE" PC Computing
"BEST BUY" PC WORLD
"EXCELLENT VALUE" INFO WORLD
"RATED # 1" PC WEEK

Circle Reader Service Number 162

FRECOM FAX96

The fax has come of age! No longer must you wait in line at the fax machine. With the Frecom Fax96 board from Fremont Communications installed in your computer, you can send faxes at your leisure.

The Frecom Fax96 software lets you send several faxes to one person or broadcast a fax to several people selected from the online phone book. You can even schedule a fax to be sent when you're out of the office and the phone rates are lower.

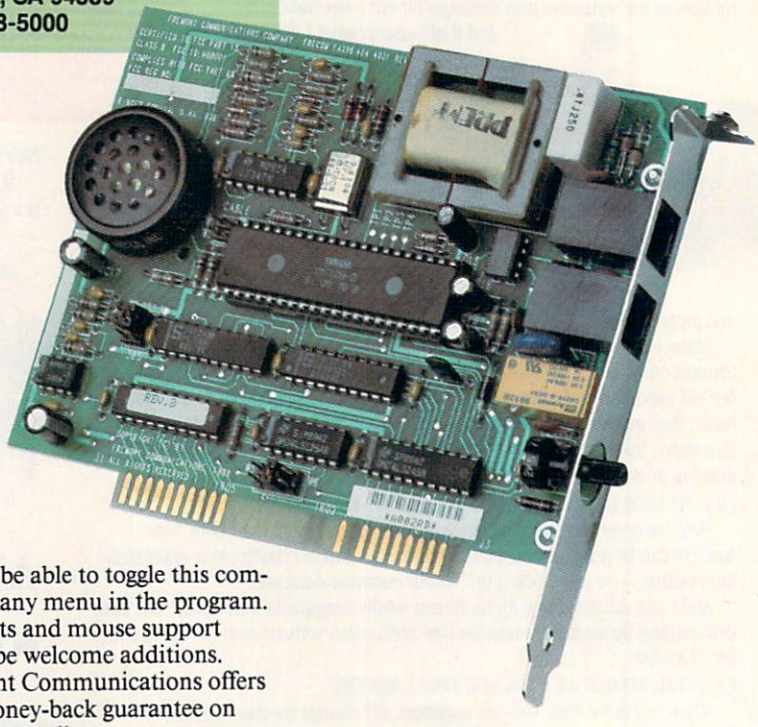
A special feature included with the Fax96 is the ability to send TIFF or PCX file formats, or if you use a scanner, you can send images directly from the scanner as well as scanned disk files. Another handy feature is the log that automatically records the faxes you send. The quality of the graphics faxes I received could compete with graphics from any fax machine I've ever used. The printout of the PCX file (640 × 350 resolution) transmitted almost to the dot resolution of the original.

Demo and tutorial modes take you through procedures step by step. There's also online help available, but you won't need these aids if you've used a fax machine. The control panel buttons make it easy to use the program even with limited exposure to the manual.

The documentation is relatively easy to follow as far as the installation of the board and the software goes. The manual is straightforward and easy to read, but some topics aren't easily found because some of the new features are not in the orginal operator's manual. An addendum describes the new features.

The positive features of the Frecom Fax96 move this board to the top of my list of favorite peripherals, but there are several options that I would like to see added in the next software update. The background receive option is accessible either from the command line or from the Exit menu.

Installation: internal
Slot/Bus Required: 8-bit
Fax Group Supported: 3
Other Requirements: CGA, EGA, VGA, or Hercules
List Price: $195.00
FREMONT COMMUNICATIONS
46309 Warm Springs Blvd.
Fremont, CA 94539
(415) 438-5000



You should be able to toggle this command from any menu in the program. Custom fonts and mouse support would also be welcome additions.

Fremont Communications offers a 30-day money-back guarantee on the product as well as a one-year warranty. If one year isn't adequate, you can add a second year for 10 percent of the current price. As a convenience, you send your warranty through the fax board to test its installation.

If you're constantly sending faxes and you'd like to improve your productivity, a fax board is the way to go. The Frecom Fax96 provides this convenient, timesaving way to transmit faxes for a reasonable price. ▷

JOYCE SIDES

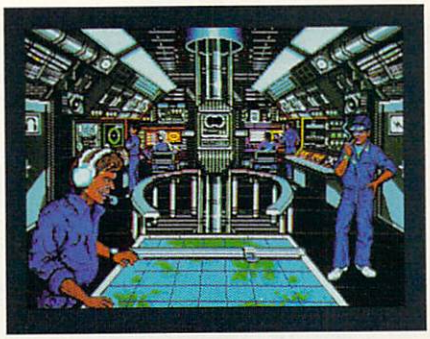
Fax Groupies

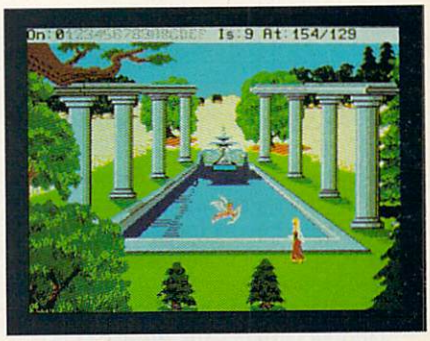
Group 1. Speed of six minutes per page. Introduced in 1974.
Group 2. Speed increased to three minutes per page. Introduced in 1976.
Group 3. Speed increased to one minute or less. Introduced in 1980.
Group 4. Speeds as fast as 3 seconds per page. Introduced in 1984.

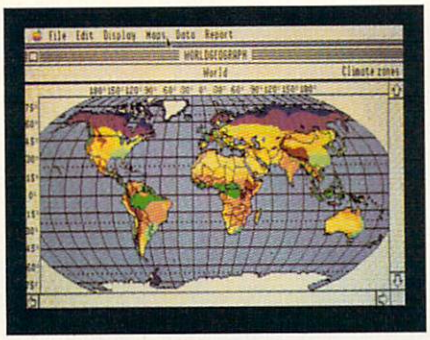
—DAVID DAY

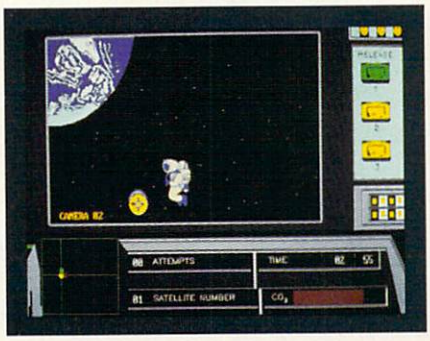
Facsimile Facts & Figures, 1990/91
International Facsimile Association

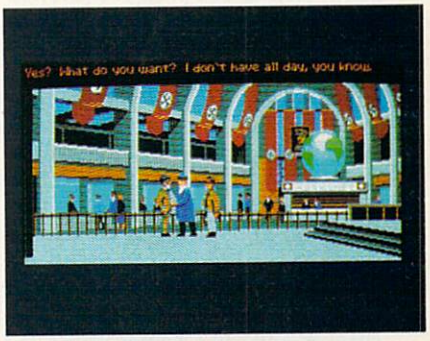
See The World











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CONSUMER SOFTWARE SECTION

GVC MINI-FAXMODEM FMM-4824

Be careful with this fax machine; it's easy to misplace. When you realize that two of them can hide under a business-sized envelope, you'll have some indication of just how small GVC's Mini-FaxModem FMM-4824 is.

Weighing in at 6.5 ounces (including battery), the Mini-Fax is about the size of a pack of cigarettes, but it works like a full-sized machine. It sends fax files at 4800 or 2400 bps and doubles as a conventional modem at speeds up to 2400 bps.

The Mini-Fax won't tie up any of your PC's internal slots. It plugs directly into a 25-pin RS-232 port. If your PC's serial port has 9 pins, the Mini-Fax connects easily with an optional 25-pin to 9-pin converter.

The Mini-Fax is 100-percent Hayes compatible, has a built-in speaker, and can schedule transmissions to take advantage of lower night rates. It will also send faxes to multiple destinations that you select from its dialing directory, and it can operate in a background mode while your computer performs other chores.

This mighty midget handles graphics as well as text files. With its *Quick Link II Fax* software, you can send text, *PC Paintbrush* (PCX), *MacPaint* (MAC), or Tagged Image File Format (TIF) graphic files from your desktop or laptop PC. It includes a text editor and a function for merging text and graphic files. It also generates cover sheets and can include your logo graphic, if desired.

The Mini-FaxModem FMM-4824 comes with software on 3½- and 5¼-inch disks, an AC adapter, a telephone cable, a modem holder, and a carrying pouch. Whether you use it at home, in the office, or on the road, you'll find the Mini-Fax compact, easy to set up, and simple to operate. ▷

TOM NETSEL

Installation: external
Slot/Bus Required: n/a
Fax Group Supported: 3
Other Requirements: 128K RAM
List Price: $219.00

GVC TECHNOLOGIES
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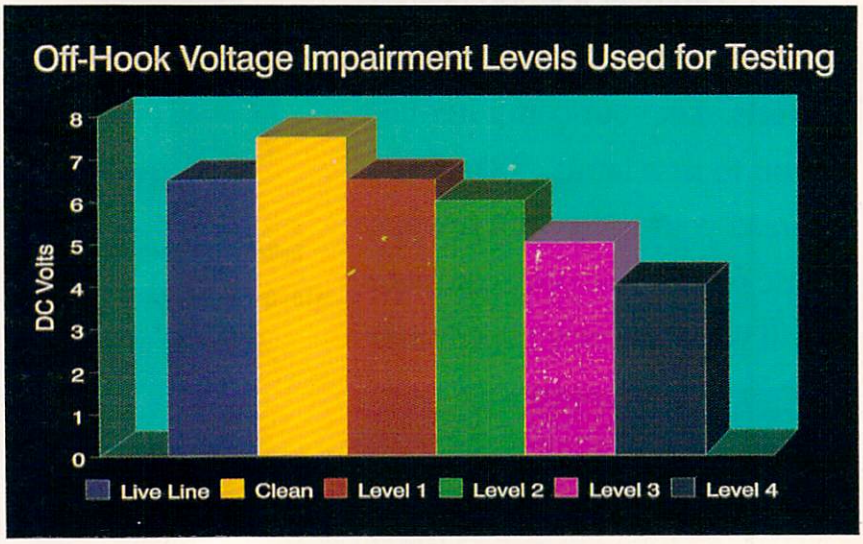

How to Talk to Your Modem

You may not realize it, but you can talk directly to your modem in its own language. Give it the right commands, and it will dial your phone, answer incoming calls, and do just about everything else in between.

Human-to-modem communication is simplified by the fact that almost all PC modems speak the same language (with minor variations), a lingo based on commands originated by modem manufacturer Hayes. This language is appropriately called the *Hayes command set*.

As you might suspect, your modem has to know the difference between when you're talking to it and when you're talking to a computer at the other end of the line. To keep these two situations straight, all Hayes-compatible modems have two operating modes: command, in which you can issue commands to the modem, and data, in which the modem simply sends what you type over the phone line.

The best way to get your feet wet with modem talk is to run your telecommunications program and enter its terminal mode. In this mode, as long as you're not connected to another computer, you'll be in command mode, and whatever you type will go directly to the modem.

Although the Hayes manual lists nearly 15 pages of commands, there are really just 10 essentials. Master these, and you're on your way to being a modem expert.

AT Type AT to grab your modem's attention. You precede almost every Hayes command with an AT. Type it now, followed by Enter. (You follow all AT commands with Enter, just the way you do DOS commands.) Your modem should respond with the message *OK*. It's worth mentioning that some modems require that you enter commands in uppercase; others aren't so choosy.

A Sets the modem to answer mode. If you're talking with a friend and you want to switch to computer communication, one of you types ATA, the other types ATD, and your PCs will take over. Before this magic can happen, however, you need to make sure that both communciations programs are set with the same parameters and that the modems for both computers are connected through the phones.

DT This is the main touch-tone dialing command. To call 123-4567, you'd type ATDT1234567. If you don't have a touch-tone phone, use DP, for Dial Pulse.

, The comma pauses for the number of seconds specified in register S8 (see below). This command is handy if you're dialing from a switchboard system, like those found in hotels, that can't handle numbers as fast as your modem rolls them out.

H Hang up. If you've had it, ATH is the command to use.

L*n* This is the speaker's loudness. Values for *n* are 0, 1 (low), 2 (medium), and 3 (high). If you want your modem to annoy as many people as possible at the office, use ATL3.

M*n* Controls your modem's speaker, with values for *n* of 0 (off), 1 (on when dialing), 2 (always on), and 3 (on after carrier detected). To turn your speaker off, for example, type ATM0.

+++ When you're connected to another computer, you're in data mode, and the characters you type go directly to the other computer; they aren't considered commands by your modem. If you type AT in data mode, for example, your computer will simply send the characters *A* and *T* to the other end of the line. To get your modem's attention back again, type +++, without a preceding AT and without pressing Enter. Your modem will respond with *OK*. Now you can enter any commands you wish. To return to data mode and talk to the other computer again, type ATO.

S*n* S stands for Store and denotes one of the Hayes registers. There are 16 of these, and although each is interesting in its own way, you'll probably use only two: S8 and S11. The value in S8 tells the modem the number of seconds to pause for a comma. ATS8=3 pauses for three seconds at every comma. S11 is a real sleeper. It controls dialing speed (in milliseconds). To make your modem dial like a demon, try ATS11=55 (smaller numbers make for faster dialing).

Z Resets the registers to their default values. If your modem starts misbehaving, ATZ is a gentle slap in its face.

After you've tried a few of these commands, you may want to look at your terminal program's configuration options. Most programs let you send a command string to the modem. Take advantage of this to make your modem louder or silent or to dial in a blur of speed.

You can also configure your modem by issuing commands directly from the DOS prompt or from a batch file. First, open a COM port with the MODE command; then send the commands to your modem with an ECHO statement. Here's a short batch file that tells your modem to dial the phone at warp factor 5.

```
MODE COM1:1200,n,8,1
ECHO ATS11=55 >COM1:
```

That's it. Modem power in a nutshell.

—CLIFTON KARNES

HAYES JT FAX 4800 PORTABLE

Hayes, the standard-bearer for PC modem products, brings its considerable expertise to bear on the JT Fax 4800 Portable. I've evaluated several PC fax products over the last year, and the JT Portable is, without a doubt, the easiest to set up, configure, and operate. What's more, its portability lets you take your fax capability on the road.

Installing the JT Portable is simplicity itself. Connect the box to an open COM port using the standard serial cable, plug in your telephone line as directed, and plug the power supply into the wall. That takes care of the hardware. To install the software, insert the Program/Utility disk (one disk for 3½-inch drives, two disks for 5¼-inch drives) and type *Install.* The self-running installation and configuration program will have you ready to send your first fax (your warranty registration) within 15 minutes.

The JT Portable works best with ASCII text files; however, you can fax documents straight from your word processor using the JT's Application Capture option. If you configure your word processor to send its document to an Epson MX–compatible printer, the JT will capture the print job and route it to a receiving fax machine. You'll almost always be better off using Application Capture for sending a fax. The JT won't send graphics from any application, but it will convert its fax files from and to *PC Paintbrush* files (PCX) so that you can transmit and receive letterhead and signatures, for example.

As a receiver, the JT works extremely well. Faxes are captured and stored automatically and can be printed on plain paper (a great advantage over stand-alone machines using thermal paper). I experienced no problems printing a one-page fax on an HP LaserJet–compatible printer.

Installation: external
Slot/Bus Required: n/a
Fax Group Supported: 3
Other Requirements: 640K RAM
List Price: $199.00

HAYES MICROCOMPUTER PRODUCTS
5835 Peachtree Corners E
Norcross, GA 30092
(404) 449-8791

While the JT Portable has a lot to recommend it, there are a few disadvantages. One, the software is memory resident. You'll have to check for possible conflict with other TSRs. This also precludes the use of the JT Portable with such memory-manipulative software as *Windows.* Also, if you run into trouble (a bad connection, for example), it's difficult to regain control of your system for an exit or reboot. Finally, the JT is a fax system only—it doesn't double as a modem.

On the whole, the JT Portable offers flexibility as a trade for full stand-alone fax machine functionality. But it's a trade worth considering if you're in the market for a PC fax device. ▷

PETER SCISCO

Fax Facts

The sidebars "Fax Groupies," "The First Fax Machine," and "Xerox Fax Firsts" are from David Day's *Facsimile Facts & Figures, 1990/91.* The book is available for $69.95 plus $9.00 shipping and handling from the International Facsimile Association, 4023 Lakeview Drive, Lake Havasu City, Arizona 86403; (602) 453-5330.

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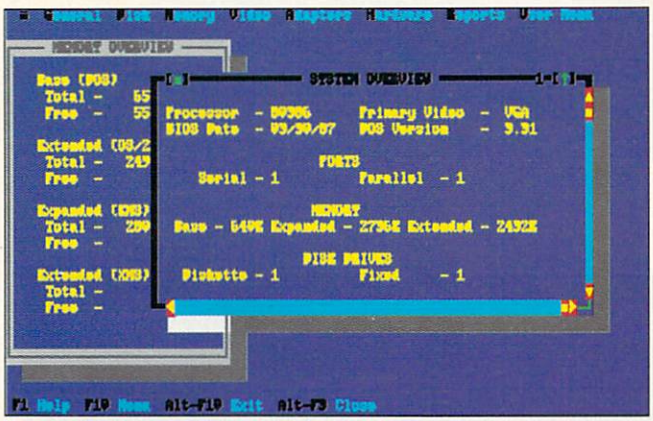

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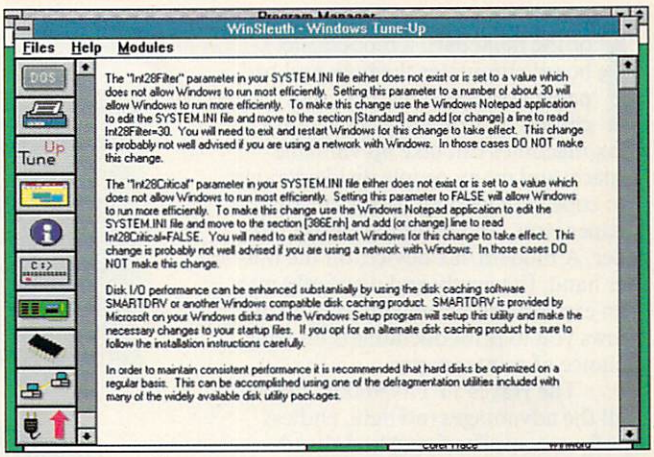
Paul Bonner, PC Computing, January, 1991



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HAYES JT FAX 9600B

For the most part, a modem/fax board eliminates the bulk and bad paper associated with fax machines. As wonderful as they are, fax machines can take up valuable space; and many people dislike having to cope with loading paper, clearing paper jams, and handling flimsy paper. A modem/fax device, on the other hand, fits neatly and discreetly into an expansion slot on your PC and allows you to print documents on your choice of printer paper.

The Hayes JT Fax 9600B covers all the advantages (no bulk, endless software applications) and disadvantages (you have to buy a scanner to transmit copies of physical documents).

Essentially techno-shy, I found the Hayes JT Fax 9600B mercifully easy to install. Just uncover the expansion slots, press it in, and plug in a couple of phone wires. The only disadvantage that I discovered was the size of the modem attached to the fax board. On my IBM XT compatible, I found it necessary to leave the expansion slot open next to it to make room for its bulk.

The software included in the package made sending and receiving fax transmissions as easy as selecting from a series of clear options. It would've been nice to have seen a menu appear when the program came up rather than having to press a hot key, though offering a menu might nullify the advantage of leaving the program in the background for use at any time. Displaying and printing received faxes was no problem, and enlargements were amazingly crisp. The user's guide provided clear illustrations and instructions, though I found it skimpily indexed.

The Hayes JT Fax 9600B may not be quite as convenient in some respects as an actual fax machine, but it makes up for the minor inconveniences with its size and flexibility. ▷

EDDIE HUFFMAN

Installation: internal
Slot/Bus Required: 8-bit
Fax Group Supported: 3
Other Requirements: 640K RAM
List Price: $499.00

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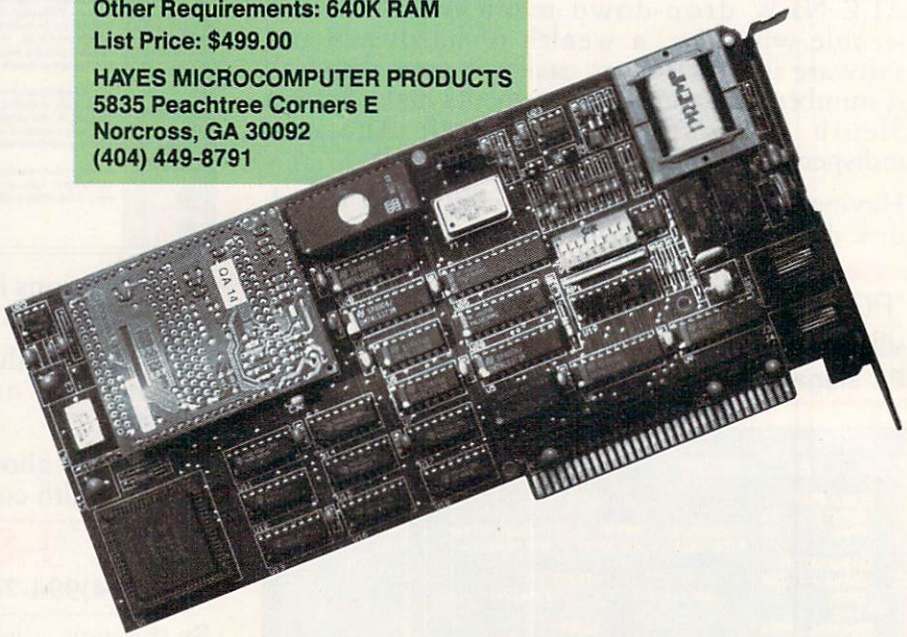

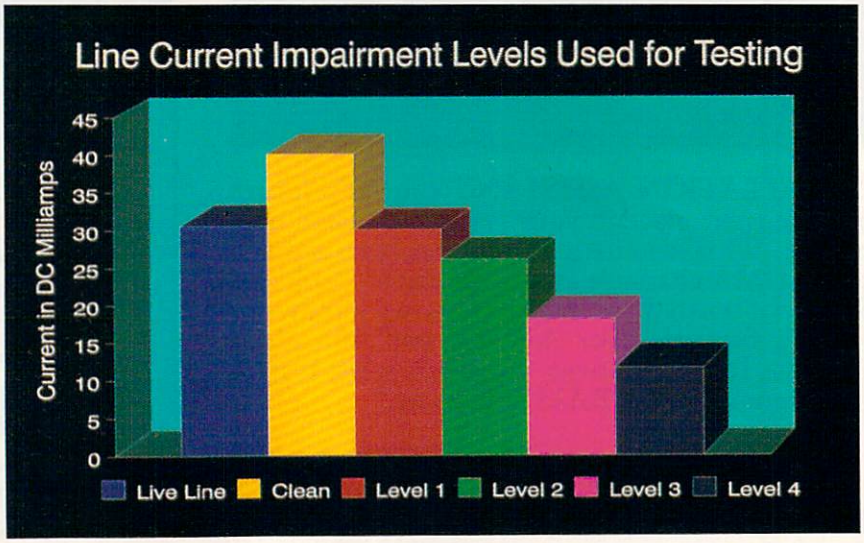

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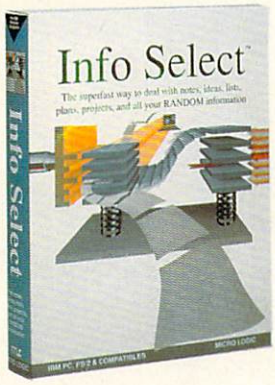

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SATISFAXTION

For a friendly fax that won't take up room on your desk and for receiving faxes as images that can be stored and manipulated by your computer, you'd be hard-pressed to find something simpler to install or easier to use than SatisFAXtion.

The full-length 16-bit board is installed in a couple of minutes (although it's a 16-bit board, it will work in an 8-bit slot). It has no jumpers or switches to set. Once it's in, the only thing left to think about is the software.

You can send faxes from either *Windows* or DOS. For *Windows*-based transmission, the program supports *Faxit* (which isn't included, although you get a coupon for a free copy). There are two options for sending faxes from DOS. You can create a text file and then use the command COPY TEXTFILE LPT3 to send the fax (it invokes a pop-up program called *FaxPop*), or you can print the file from within the program (any program) to LPT3. LPT3 is the fax board; you can easily change the port to LPT1 for programs that can't print to alternative printer ports. LPT3, incidentally, emulates an Epson dot-matrix printer.

Keep up to 1000 fax numbers on file in your online telephone book for automatic dialing from the pop-up program. By using a feature called *grouping* in the telephone book and a special fax process called *polling*, you can automatically send up to 100 faxes, one to each of the numbers in a group. If your word processor allows you to change your printer setting from within the program, you could also print directly from your word processor to the fax line.

At first, the board fought with my mouse for dominance of the serial port, but by telling the installation program that I had no mouse (I lied), I was able to get the data-modem part of the board to cooperate.

The card is equipped with an input for an optional hand scanner that would enable you to fax directly from gray-scale images. Unfortunately, it has a proprietary connection, so only the Intel scanner can be plugged into it.

OCR software is also available. Neither of these were provided with the review unit. Clearly, this fax board from Intel has much to offer, including an abundance of useful features, superior ease of use and installation, and a very good manual.▷

ROBERT BIXBY

Installation: internal
Slot/Bus Required: 8-bit or 16-bit
Fax Group Supported: 3
Other Requirements: 640K RAM; MDA, CGA, EGA, VGA, or Hercules; hard disk; mouse recommended if used with *Windows*
List Price: $499.00 ($549.00 for microchannel)

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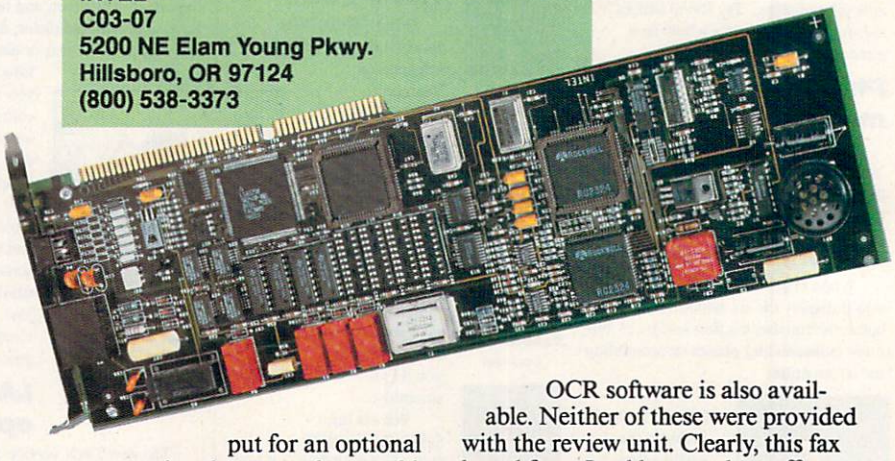

Fetch That Fax

It used to be easy to have Rover fetch your morning paper. Nowadays, he may have to learn to use a fax machine first. Fax devices have become so commonplace they're beginning to replace more conventional distribution channels.

An excellent example of this is *FAX TRACK Computers*, a computer news daily distributed by fax.

FAX TRACK works like this: Each day's computer news is condensed into one page of executive summaries covering hardware, software, company earnings, and other related topics and faxed to subscribers by 6:00 a.m. For more information on any topic, you can call a toll-free number and have a detailed story faxed back to you.

If you're traveling, give the company your hotel's fax number and receive *FAX TRACK* at your destination.

FAX TRACK Computers is available for $47.90 per month or $527.00 per year from Inlex, 4099 McEwen Road, Suite 350, Dallas, Texas 75244; (800) 800-3994. If you'd like to give *FAX TRACK* a try, a special five-day free trial is available.

—CLIFTON KARNES

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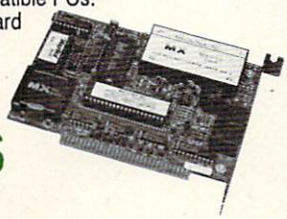

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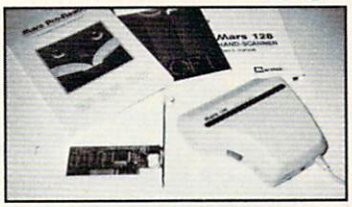

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- Adapter for DB9 and DB25 serial ports
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- Custom Pen Holder

$58.00

APPOINT

Memory Products

IBM PS/2 MEMORY

CAT. #	DESCRIPTION	NSI
30F5348	512KB Upgrade PS/2 30 286	44.00
30F5360	2MB Upgrade PS/2 30 286	128.00
6450372	2MB Memory Adapter 6450367	395.00
6450603	1MB SIMM PS/2 70-E61; 121	68.00
6450604	2MB SIMM PS/2 50Z-70	108.00
6450608	2MB SIMM PS/2 70 - A21	128.00
34F2933	4MB SIMM PS/2 55SX; 65SX	279.00
6450375	1MB Mem. BD PS/2 80-041	96.00
6450379	2MB Mem. BD PS/2 80 111-321	158.00

CAT. #	DESCRIPT.	NSI
6451060	4MB Mem.BD PS/2 80-A21;A31	298.00
6450605	2-8MB Xpand Mem. PS/2 70&80 w/2MB	348.00
34F3077	2-14MB Xpand BD. PS/2 70&80 w/2MB	388.00
6450609	2-14MB Xpand BD. PS/2 50-65SX w/2MB	388.00

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SIMM MODULES

	150	120	100	80	70	60
256x8	15.00	17.00	19.00	22.00		
256x9	17.00	19.00	21.00	24.00		
1MBx8			45.50	46.00	55.00	65.00
1MBx9			46.50	47.95	58.00	68.00
4MBx8				259.00	279.00	309.00
4MBx9				279.00	269.00	299.00

DRAM CHIPS

	150	120	100	80	70	60
64x1	.90	1.20	1.50			
64x4		2.00	2.15			
256x1	1.25	1.40	1.60	1.85		
256x4		5.00	5.25	5.60	6.25	7.50
1MBx1		4.75	5.00	5.35	6.00	7.00

COMPAQ MEMORY

CAT. #	DESCRIPTION	NSI
107331-001	512KB Upgrade Portable III	38.00
107332-001	2MB Upgrade Portable III	118.00
107651-001	1MB Module Portable 386	218.00
107653-001	4MB Xpand Mem. Portable 386	630.00
107654-001	4MB Mem. Xtension Portable 386	630.00
108069-001	1MB Xpand Memory DP386-16	288.00
108070-001	4MB Xpand Memory DP386-16	630.00
108071-001	1MB Memory Upgrade DP386-16	108.00
108072-001	4MB Memory Upgrade DP386-16	438.00
110235-001	1MB Memory BD Slt 286	162.00
110237-001	4MB Memory BD Slt 286	630.00
112534-001	4MB Module DP386S-16	298.00
113131-001	1MB Module DP386286E, 386 20-25E	96.00
113132-001	4MB Module DP2886E, 386 20-25E	228.00
113633-001	1MB Xpand Mem. DP386S-16	148.00

CAT. #	DESCRIPTION	NSI
113634-001	4MB Xpand Mem. DP386S-16	358.00
113644-001	1MB Xpand Mem. DP386 20E, 25E	148.00
113645-001	4MB Xpand Mem. DP386 20E, 25E	358.00
113646-001	1MB Module DP386S-16	110.00
115144-001	1MB Module DP386-33, 486-25, Syspro	158.00
116561-001	8MB Module 486-25, Syspro	899.00
116568-001	32MB Module DP486-25, Syspro	4,990.00
117077-001	512KB Mem. BD Portable LTE	119.00
117081-001	1MB Mem. BD Portable LTE 286	99.00
117081-002	2MB Memory BD Portable LTE 286	158.00
118688-001	1MB Module DP286N, 386N	90.00
118689-001	2MB Module DP386N, 386S-20	168.00
118690-001	4MB Module DP286N, 386N,	396.00

LASER PRINTER MEMORY

Cat. #		WORKS WITH	NSI
H33474B	1MB	HPLaser Jet IIP,III, IIID	99.95
H33475B	2MB	HPLaser Jet IIP,III, IIID	139.95
H33477B	4MB	HPLaser Jet IIP,III, IIID	214.95
H33443B	1MB	HPLaser Jet II & IID	99.95
H33444B	2MB	HPLaser Jet II & IID	139.95
H33445B	4MB	HPLaser Jet II & IID	214.95
1039136	1MB	IBM Laser 4019	139.00
1039137	2MB	IBM Laser 4019	185.00

Cat. #		WORKS WITH	NSI
1038675	3.5MB	IBM Laser 4019	229.00
M6005	1MB	Apple LaserWriter II/NTX	85.00
M6006	4MB	Apple LaserWriter II/NTX	319.00
S63-1300	1MB	Canon LBP-8II	119.00
S63-1880	2MB	Canon LBP-8II	189.00
N/A	4MB	Canon LBP-8II	269.00

TOSHIBA MEMORY

CAT. #	DESCRIPTION	NSI
PC10-PA8304U	2MB Memory Card Portable T5200 Toshiba Destop T8500	168.00
PC12-PA8307U	2MB Memory Card Portable T3200SX	168.00
PC13-PA8306U	2MB Memory Card Portable T1200XE	168.00
PC14-PA8311U	1MB Memory Card Portable T1000SE-XE	218.00
PC15-PA8308U	2MB Memory Card Portable T3100SX	162.00

CAT. #	DESCRIPTION	NSI
PC15-PA8310U	4MB Memory Card Portable T3100SX	378.00
PC6-PA7137U	3MB Memory Card Portable T3200	228.00
PC7-PA8301U	2MB Memory Card Portable T5100	168.00
PC9-PA8340U	512K Memory Card Portable T3100E	120.00
PC9-PA8341U	2MB Memory Card Portable T3100E	168.00

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NSI Computer Products

OKITEL 2400B PLUS PC MODEM

There are three questions I ask when I'm shopping for a modem card. Will it be easy to install, does it have all of the features I need, and will it perform over a reasonable period of time without failure? After putting this Okitel 2400B Plus through some paces, I can answer all three questions with a most definite *Yes.*

This modem occupies a full-sized expansion card. That tells me several things. Most important, it indicates that the design engineers didn't cut any corners to save money on production costs. It also means that the components won't overheat since there's plenty of space between them. And if repairs are ever necessary, a technician will have an easier time finding problems. Considering the quality engineering, I figure this modem will outlast most of the others that I've seen and used.

Installing a modem card can be frustrating, but the Okitel's documentation is clear and well illustrated. Knowing precisely where to look and what to do helped immensely because I had to change some jumpers on the modem card so that it wouldn't conflict with my other serial devices.

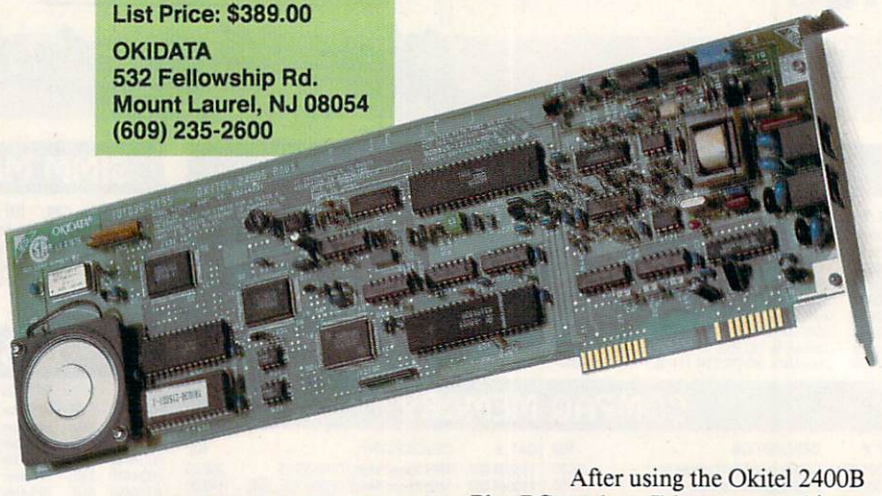
The default settings of my terminal program, *ProComm Plus,* didn't work. Here again, fixing these types of problems can be a hassle. But it wasn't. I read through the documentation, easily found the information that I needed, and set the *ProComm Plus* modem specifications. From then on, my telecommunicatons went smoothly.

And last but not least, this modem, being Hayes compatible, has all of the features I need. Not only did *ProComm* work fine, but so did other programs that I use, such as *Telix* and *Windows Terminal.*

The folks at Okidata were kind enough to provide telecommunications software. It's good enough to get started with, but you'll want to find something else if you want a full-featured program.

Installation: internal
Slot/Bus Required: 8-bit
Other Requirements: n/a
List Price: $389.00

OKIDATA
532 Fellowship Rd.
Mount Laurel, NJ 08054
(609) 235-2600



After using the Okitel 2400B Plus PC modem, I'd recommend it to anyone. It's a quality modem card that has excellent documentation and carries all of the features you need. ▷

RICHARD C. LEINECKER

The First Fax Machine

The first primitive facsimile machine was invented by Dr. Alexander Bain, a Scottish physicist, in 1842. This may come as a surprise to the many people who had only heard of facsimile during the fax explosion of the past five years.

Dr. Bain's early effort was developed even before the invention of the telephone by Alexander Graham Bell in 1876. It had a pendulum which created a brown stain as it swung across chemically treated paper.

It is interesting to note that both of these pioneers were of Scottish origin. Bell's U.S. Patent became the most valuable ever—and held by a foreigner! However, he did become an American citizen in 1882. Although Bell's life work, even apart from the telephone, is well documented up to his death in 1922, Alexander Bain's contribution to facsimile is little known. It is the author's sincere hope, that as the facsimile industry continues its meteorical rise, the work of its inventor, Dr. Alexander Bain, will not be forgotten.

Dr. Bain's device was called the Electromechanical Recording Telegraph, and although today it may not be considered to have been a commercial success, little or no attempts were made to market the device at that time.

—DAVID DAY

Facsimile Facts & Figures, 1990/91
International Facsimile Association

TANDY FAXMATE

Fax communication is a fast and efficient variation on conventional information exchange. Trading the slow pace of mail or express delivery services for instantaneous worldwide communication, it offers good speed but poor-quality paper, few machine language barriers but some document-form limitations.

The Tandy FaxMate is an appropriately fast and efficient fax board that lets you send and receive facsimiles from your PC. Offering few frills, easy use, and mediocre onscreen reproduction, it simply gets the job done.

The FaxMate is easy to install: Remove your PC's cover, snap the fax board into a slot, and plug in a couple of phone cords. Its software is similarly easy to install and use, providing clear instructions and, for the most part, easily followed paths to any field, whether sending a fax or altering the current setup (I was caught off guard, though, when its automatic receive function kicked in unexpectedly).

With automatic setup of files for received faxes and steps that walk you through setting up a cover sheet and sending a document, the FaxMate does most of the hard work for you. It automatically redials if it gets a busy signal when sending, and it allows for automatic transmission to different machines during low-rate times.

Though designed to operate with the *DeskMate* software program, the fax board and accompanying software work fine on their own. The only substantial complaint I had was with onscreen reproduction of received documents. When the documents show up onscreen, they're illegibly reduced. And for all the software's zooming and half-sizing capabilities, making a document readable onscreen takes a lot of doing. However, the FaxMate readily prints clear, full-sized fax documents. And you enjoy the speed and convenience of working from your computer. ▷

EDDIE HUFFMAN

Installation: internal
Slot/Bus Required: 8-bit
Fax Group Supported: 3
Other Requirements: 640K RAM; hard disk with at least 3MB available; 3½- or 5¼-inch floppy disk drive; 80-column monitor with CGA, EGA, VGA, Tandy 16-color, Hercules, or compatible graphics; MS-DOS version 3.1 or higher
List Price: $249.95

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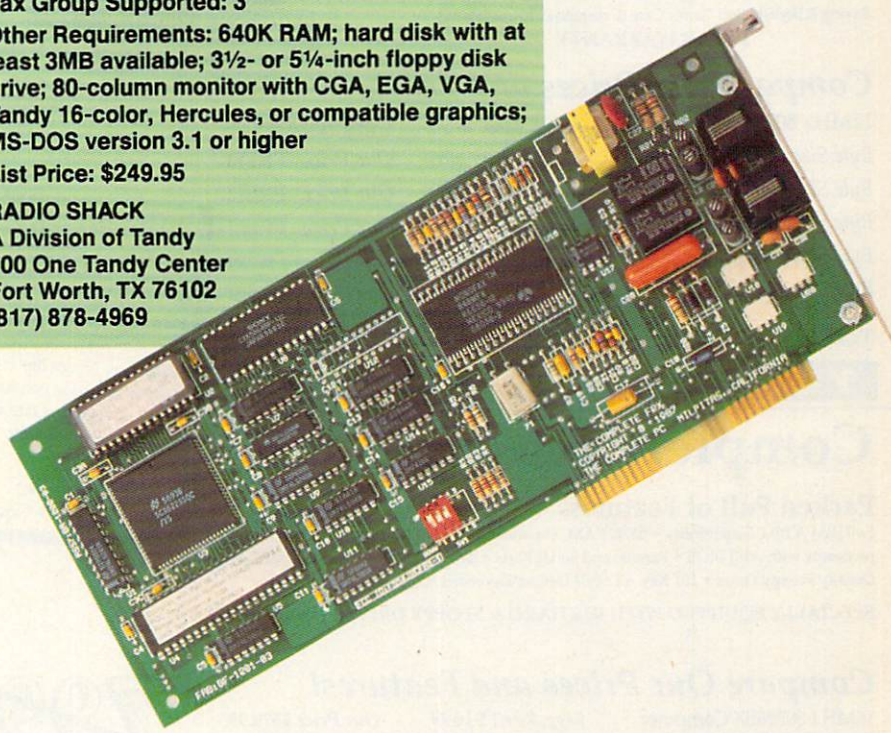

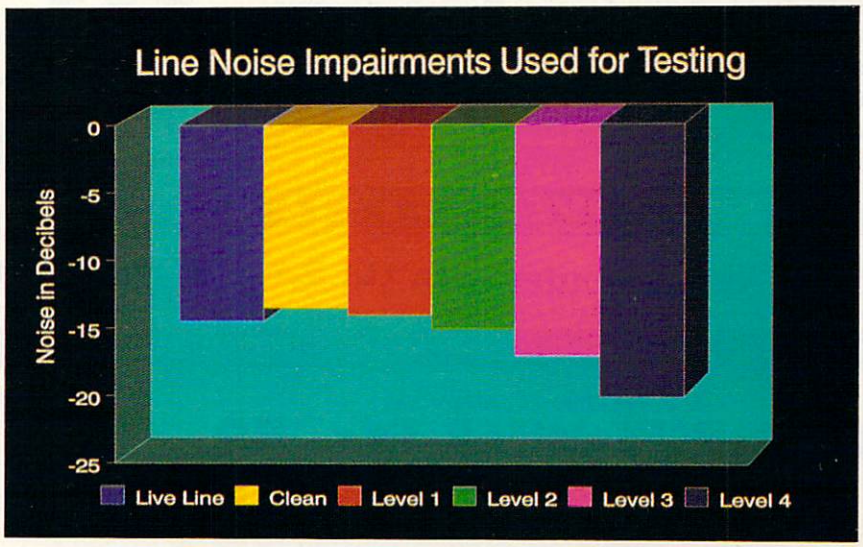

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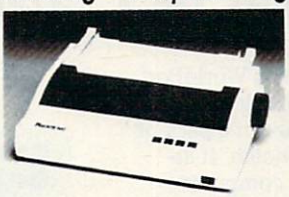

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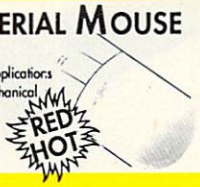

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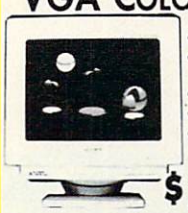

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COMPUTER DIRECT, INC.
22292 N. Pepper Road
Barrington, IL 60010
'We Love Our Customers'

Circle Reader Service Number 114

WORLDPORT 2400 MODEM

The Touchbase Systems WorldPort Hayes-compatible modem is small—about the size of a pack of cigarettes—but topnotch. It attaches externally to the computer through the serial port and can be powered by a standard nine-volt battery, an AC adapter, or the computer itself. It connects to the phone line either through its modular phone jack or by means of an acoustic coupler.

The WorldPort cannot connect directly with some computers because it requires a 25-pin serial port. But an appropriate adapter cable, such as the DB9–DB25, will take care of that.

The modem gets its power directly from some computers, but not all. Using an alkaline battery as an alternative will maintain power for about six hours of continuous use. The unit also comes with an AC adapter. You switch the modem on and off using your communications software.

A phone jack on the modem's side connects directly to the telephone line running from your wall. There's only one jack on the modem, so to use your phone along with the modem, make sure the modem is either at the end of a daisychain or plugged into a Y-connector at the wall jack. An alternative to directly connecting the modem to the phone line is plugging it into an acoustic coupler using an adapter cable provided in the package.

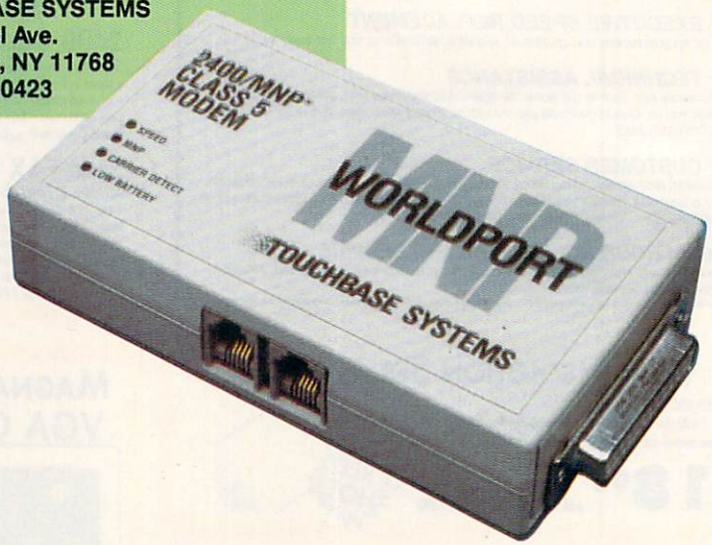
The WorldPort worked well with each commercial or public-domain telecommunications program I tried at the modem's three speeds of 300, 1200, and 2400 bits per second. And, in case you lack such software, the unit comes with a powerful communications package—*Carbon Copy.*

The WorldPort is a very nice piece of equipment—easy to use, reliable, and well documented. The only thing preventing me from rushing out to buy one for myself is the whopping $359 price tag. Of course, you can expect the street price to be lower. ▷

BRUCE M. BOWDEN

Installation: external
Slot/Bus Required: n/a
Other Requirements: Any computer with an RS-232 port and the ability to accept the Hayes AT command set
List Price: $359.00

TOUCHBASE SYSTEMS
160 Laurel Ave.
Northport, NY 11768
(516) 261-0423



Bits, Baud, and CPS

Bits Per Second (bps). The number of data bits the modem is capable of transmitting each second.

Data Bits. The number of bits transmitted for each byte of data. Seven-bit characters usually represent the 128 standard ASCII characters; 8-bit characters can represent control characters and special token or graphics characters.

Baud Rate. The number of times per second a signal in a communications channel varies or changes states. This doesn't necessarily translate to bps.

Multiple-State Modulation. This method allows multiple bits to be sent with each baud.

Characters Per Second (cps). The number of characters transmitted by a modem in a second.

Medium- and high-speed modems use baud rates lower than their bps rates by employing multiple-state modulation. For example, 1200-bps modems that conform to the Bell 212A standard (which includes most 1200-bps modems used in the U.S.) operate at 300 baud and use a modulation technique called *phase modulation* that transmits four bits per baud.

—MICHAEL A. BANKS

What We Tested

First of all, we tested the specific features and capabilities of this month's communications devices. While this kind of information routinely appears in advertisements and manuals, our tests allowed us to thoroughly check out these features and capabilities.

In addition, we ran a series of pass/fail tests to determine that each device did in fact function as the manufacturer indicated it would. Testing modems and fax units presents some interesting challenges. Because communications devices must, to a large extent, conform to industry standards in order to do what they do, a comparison of numerical benchmark results would not yield statistically significant information. Therefore, a pass/fail system was adopted, and each of the communications devices passed our rigorous tests.

Modem Testing

To test this month's modems, the lab used a 2400-baud Hayes-compatible external modem connected via the serial port to an IBM AT (6MHz). Using *ProComm Plus* communications software (parameters: 2400, N, 8, 1) and the SuperKermit file-transfer protocol, the lab sent and received the following test files:

File Name	*File Description*	*File Name*	*File Description*
SPALOGO. IMG	bitmap graphics	BUSY.EXE	executable program
SOFTWARE.TEX	ASCII text file	CAN.TIF	TIFF scanned-image file
WATERFAL.PCX	*PC Paintbrush* file	PRINTER.DOC	ASCII extended characters
MEMCHK.COM	command program	SAY.EXE	executable sound program
QT.COM	command program	VOICE.V3S	digital sound file
4000AS.TXT	ASCII alignment text file	WINDLOGO.GEM	GEM vector graphics file

The lab installed the test modem either externally or internally on an 80386 SX (16MHz). Additional hardware consisted of a TLS-3 line simulator, an FTS-80 modem/fax test set, and a proprietary multilevel line noise/signal impairment generator unit. All off-hook meter readings and test levels were calibrated and confirmed using a standard AT & T 2500 Touch-Tone telephone set. Test files were sent and received using "clean" simulator conditions, as well as impairment levels 1 through 4. These impairment levels mimic problematic line conditions you might encounter in your everyday electronic communications. The lab ran executable and program files at the end of each test cycle and compared file sizes. To confirm the integrity of the file transfer, the lab displayed text and graphics files.

Fax Testing

The lab used the manufacturer's proprietary software for all testing. For all fax-transmission testing, the lab used several test files (supported by the hardware/software):

File Name	*File Description*	*File Name*	*File Description*
SPALOGO.IMG	bitmap graphics	4000AS.TXT	ASCII alignment text file
SOFTWARE.TEX	ASCII text file	CAN.TIF	TIFF scanned-image file
WATERFAL.PCX	*PC Paintbrush* file	PRINTER.DOC	ASCII extended characters

Test files were sent and received using clean simulator conditions, as well as impairment levels 1 through 4—again, reflecting adverse line conditions you might encounter. Documents received from the tested fax devices were compared with laser-output samples of the original document files to judge quality of the transmission and visually confirm the integrity of the file transfer. The lab used the highest available baud rate for sending files from the test unit to the receiving fax unit, which supports 9600 baud in standard Group 3 mode.

For testing fax device units that can receive files, the lab used a nine-page set of laser-output samples with a cover sheet; both clean and impaired line conditions were used. The lab viewed received fax files on the video display between test cycles and generated laser-output specimens of the received files using the fax software's file-printing utilities and a 300-dpi HP-compatible laser printer.

—TOM BENFORD

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Lynn Frantz

Here are special tips and shortcuts to simplify your work with *PC Tools*. Includes ready-to-use macros and design charts. Of special interest are the numerous charts and tables that make using *PC Tools* a snap. 512 pages.
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ZOOM/MODEM HC2400S SENDFAX

If you find yourself hemming and hawing every time someone says, "Just fax it to me," the Zoom/Modem HC2400S SendFax may be just the ticket. For a mere $169, you'll get a 2400-bps modem and a 9600-bps Group 3 send-only fax, both in one internal board. Also included with the package is *ProComm,* probably the most popular telecommunications program around today, and *BitFax,* software that works with the Zoom board.

Installation: internal
Slot/Bus Required: 8-bit
Fax Group Supported: 3
Other Requirements: n/a
List Price: $169.00

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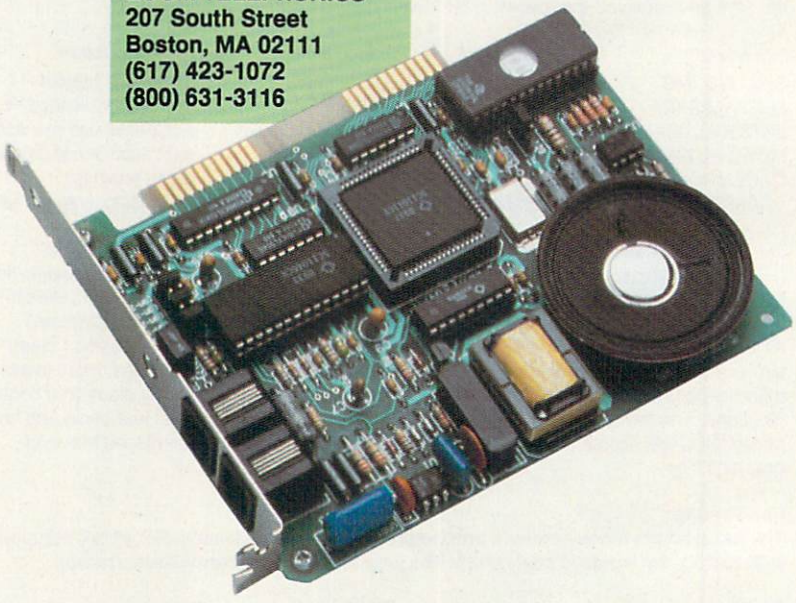
207 South Street
Boston, MA 02111
(617) 423-1072
(800) 631-3116



To install the Zoom SendFax, all you have to do is decide which COM port it's going to use and set a jumper on the board. Then just slip it in any 8-bit expansion slot, and you're ready to go. (A slightly more expensive external version of the Zoom is also available.)

You'll be able to use the modem for two-way communication and the fax for sending faxes (but you won't be able to receive faxes with this Zoom board).

The modem portion of the Zoom/Modem HC2400S SendFax works flawlessly. It has full Hayes AT-command set compatibility (including support for all the standard Hayes registers), and it boasts a speaker with a tone that you'll find clearer than most.

For telecommunicating, you can either settle in with the *ProComm* communications software or use *ProComm* to download an even nicer communications program such as *Telix.*

For sending faxes, you can get your feet wet with the bundled *BitFax,* but it's no fun to use, and although you can combine graphics and text in your faxes, you may find the process cumbersome. You won't get many "oohs" and "ahs" for your documents' design at the other end of the telephone line.

There is other send-fax software, however, and the Zoom will work with any program that supports the Sierra chip set. If you're using *Microsoft Windows,* one excellent program is *WinFax* (Delrina Technology, 1945 Leslie Street, Toronto, Ontario, Canada M3B 2M3; 416-441-3676; $69). With it, you can send beautiful faxes, and doing so is about as easy as printing.

Do I recommend the Zoom SendFax? You bet I do. It has performed flawlessly, and even though I'm not enamored with the bundled software, you just can't beat the Zoom's price. ▷

CLIFTON KARNES

All Benchmark/Performance Testing is conducted by Computer Product Testing Services, Inc. (CPTS), an independent testing and evaluation laboratory based in Manasquan, New Jersey. Every effort has been made to ensure the accuracy and completeness of this data as of the date of testing. Performance may vary among samples.

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❑ **Invoice-It (1664)** Keep track of invoices, merchandise, vendors and customers at the point of sale. HD

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❑ **PC-Areacode (1665)** Helps you find the areacode for any city in the U.S. or Canada quickly and easily.

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❑ **Computer Tutor (1235)** Become a more effective computer user.

❑ **School Mom (1251)** Teaches kids 2-14 the basics of art, music, spelling, English and math. FANTASTIC!!! CGA

❑ **World (1221)** A computer encyclopedia of global information. CGA

❑ **Total Recall (1245)** This program helps you quickly memorize words and information on any subject.

❑ **Algebrax (1233)** A great program that teaches algebra. CGA, DOS 3.0

❑ **Pre-Calculus (1218)** Excellent pre-calc tutor. Reviews algebra and trig.

❑ **Play n' Learn (1236)** A collection of learning games for children. CGA

❑ **KinderMath (1262)** An excellent math tutor for children. Three levels of difficulty. Very entertaining. CGA

❑ **WordWhiz (1252)** A challenging word game that tests your vocabulary.

❑ **Word Gallery (1256)** Teaches kids to link written words with objects. CGA

❑ **Wunder Book (1269)** A collection of 5 colorful and fun games in English, Spanish, French, and German for children 3 to 10 years old. EGA or VGA

❑ **Animated Shapes (1264)** Teaches shapes and colors to pre-schoolers using animated graphics. 640K, EGA

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

❑ **InstaCalc (1812,1813)** A high-power, stand-alone spreadsheet which may also be run as a TSR (pop-up) spreadsheet. (2 disks)

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.

❑ **Paint Shop (1488)** An excellent graphics tool for desktop publishing. Supports BMP, GIF, IMG, MAC, PCX, and RLE formats.

❑ **Active Life (1472)** A powerful system for managing your active business and personal life.

❑ **Icondraw (1478)** Create your own icons to use with Windows.

❑ **XVTDraw (1489)** A great drawing program that is in many ways better than the Windows Paintbrush program.

❑ **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.

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.

❑ **Calendar Mate (1344)** A full-featured program designed to create personalized calendars.

❑ **Lotto! (1313)** Win the lottery with the help of your computer!

❑ **Bowl 101 (1346)** A user-friendly bowling league management program.

❑ **The Electric Almanac (1341)** A source for lots of useful information.

GRAPHICS

❑ **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

❑ **Cooper PM Graphics (1516,1517)** Approx. 800 clip-art images to be used with PrintMaster. (2 disks)

❑ **Cooper PS Graphics (1518,1519)** Approx. 800 clip-art images to be used with PrintShop. (2 disks)

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.

❑ **Will Kit (1343)** Create your own will valid in all 50 states.

❑ **Cash Control (1127)** Manage your bank accounts the fast and easy way with this great program. 320K

UTILITIES

❑ **Auto Menu (1409)** A professional hard disk menu system. Run any of your programs from a customized menu. HD

❑ **ViruScan (1440)** Make sure your computer is virus-free with this valuable utility. Highly recommended!

❑ **Tree View (1418)** A superior DOS command shell with pull-down menus.

❑ **Telix (1422)** The best telecommunications program available. HD

❑ **VGA Fonts (1442)** A collection of fun and interesting fonts to spice up your VGA screen display. VGA

❑ **Virus Central (1441)** A program that simplifies the use of ViruScan by providing a menu oriented environment. Requires ViruScan. 512K, CGA, HD

❑ **PC Pro (1443)** Combines a user menu, a file manager, an enhanced DOS prompt, and many new features into one environment. 384K, HD

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!

❑ **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

❑ **Arctic Adventure (1982)** Contains 80 new levels of mind bending, finger twitching, arcade action. 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 Columns (1997)** Beyond is like Tetris with a twist. 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

❑ **Double Link (1983)** A great Tetris style game that is sure to keep you challenged. EGA

IMPORTANT

CGA = Requires Color Computer
EGA = Requires EGA or VGA
HD = Requires Hard Drive
512K = Requires 512K RAM
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Max Speed	9600	9600	9600	4800	4800	9600	9600	2400	4800	2400	4800
Min Fallback	2400	2400	2400	2400	300	300	300	300	2400	300	2400
Data Modem	O	O	O	●	O	●	●	●	O	●	●
Auto Fax/Modem Select	n/a	n/a	n/a	●	n/a	●	●	n/a	n/a	n/a	●
Fax Transmit	●	●	●	●	●	●	●	O	●	O	●
Fax Receive	●	●	●	O	●	●	●	O	●	O	O
Dithered/Gray Scale	O	●	O	O	●	●	●	n/a	●	n/a	●
Compressed Fonts	●	●	O	O	●	●	●	n/a	●	n/a	O
Max Modem Data Speed	n/a	n/a	n/a	2400	n/a	2400	4800	2400	n/a	2400	2400
AT Command Set	n/a	n/a	n/a	●	n/a	●	●	●	n/a	●	●
Background Operation Mode	●	●	●	●	O	●	●	O	●	O	●
Min Memory Requirement	62K	640K	41K	128K	640K	640K	640K	128K	384K	none	320K
Capture PrintScreen Output	●	O	O	●	●	●	●	n/a	●	n/a	O
Capture Screen to File	●	O	O	O	●	●	●	n/a	O	n/a	●
Capture Text Sent to Printer	●	●	●	●	●	●	●	n/a	●	n/a	●
Capture Graphics Sent to Printer	●	●	●	●	●	●	●	n/a	●	n/a	●
Direct Scanner Transmit	●	●	●	O	●	●	●	n/a	O	n/a	O
Direct Printer Text-File Transmit	●	●	●	●	●	●	●	n/a	O	n/a	●
Direct Printer Graphics-File Transmit	●	●	●	●	●	●	●	n/a	O	n/a	●
Max Pages Transmit/Receive	no limit	no limit	no limit	255	no limit	no limit	999	n/a	25	n/a	no limit
Adds Document Headers	●	●	O	●	●	●	●	n/a	●	n/a	●
Generates Letterhead	●	●	O	●	●	●	●	n/a	O	n/a	●
Generates Cover Sheet	O	●	●	●	●	●	●	n/a	●	n/a	●
Auto Answering	●	●	●	●	●	●	●	●	●	●	●
Auto Dialing	●	●	●	●	●	●	●	●	●	●	●
Auto Printing	●	●	O	n/a	●	●	●	n/a	●	n/a	n/a
Auto Speed/Rate	●	●	●	●	●	●	●	O	●	●	●
Performs Polling	●	●	O	n/a	O	O	●	n/a	●	n/a	O
Audible Speaker	O	O	●	●	●	●	●	●	O	●	●
Volume Control	n/a	n/a	●	●	O	●	O	●	n/a	●	●
Custom Fonts	●	O	●	●	O	O	●	n/a	O	n/a	O
File Conversions	ASCII, PCX, EPC	ASCII, PCX, TIF, CUT, MSP, Epson FX, Complete FAX	ASCII, PCX, TIF, FAX	ASCII, PCX, TIF, MAC	ASCII, PCX, FAX	ASCII, PCX, FAX	ASCII, PCX, DCX, Epson	n/a	ASCII, PCX, TIF, CUT, MSP, Epson FX	n/a	ASCII, PCX, TIF, IMG, PIX, *WordStar*, *WordPerfect*
Second Jack	●	●	●	●	●	●	●	●	●	O	●

●=yes O=no

Interpreting the Grid Information

The grid information has been supplied by *COMPUTE*'s independent testing laboratory (Computer Product Testing Services) and should help you sort out the various capabilities of our Test Lab evaluation units.

Because much of the technology is new and unfamiliar, we have defined selected terms for you.

Max Speed. The maximum tested fax speed (in the case of fax units) or modem speed (in the case of modem-only units). The **Max Modem Data Speed** is the fastest modem speed for those devices with modem capabilities. This and all other speed listings are in bits per second (bps).

Min Fallback. The minimum speed to which a modem or fax will fall back—that is, slow down—to match speeds with another machine or to perform extra error correction in order to check and ensure data integrity.

Dithered/Gray Scale. A fax unit's ability to employ a technology called *dithering* to produce grays, not just black and white.

Compressed Fonts. A fax unit's own fonts, which allow it to create output more closely resembling the original document. These onboard fonts can also enhance the readability of a document.

Capture PrintScreen Output. A fax unit's ability to translate printer output into a transmittable image file. It simply dumps the screen to a file.

Direct Scanner Transmit. A fax unit's ability to send a scanned image directly, without creating a disk file.

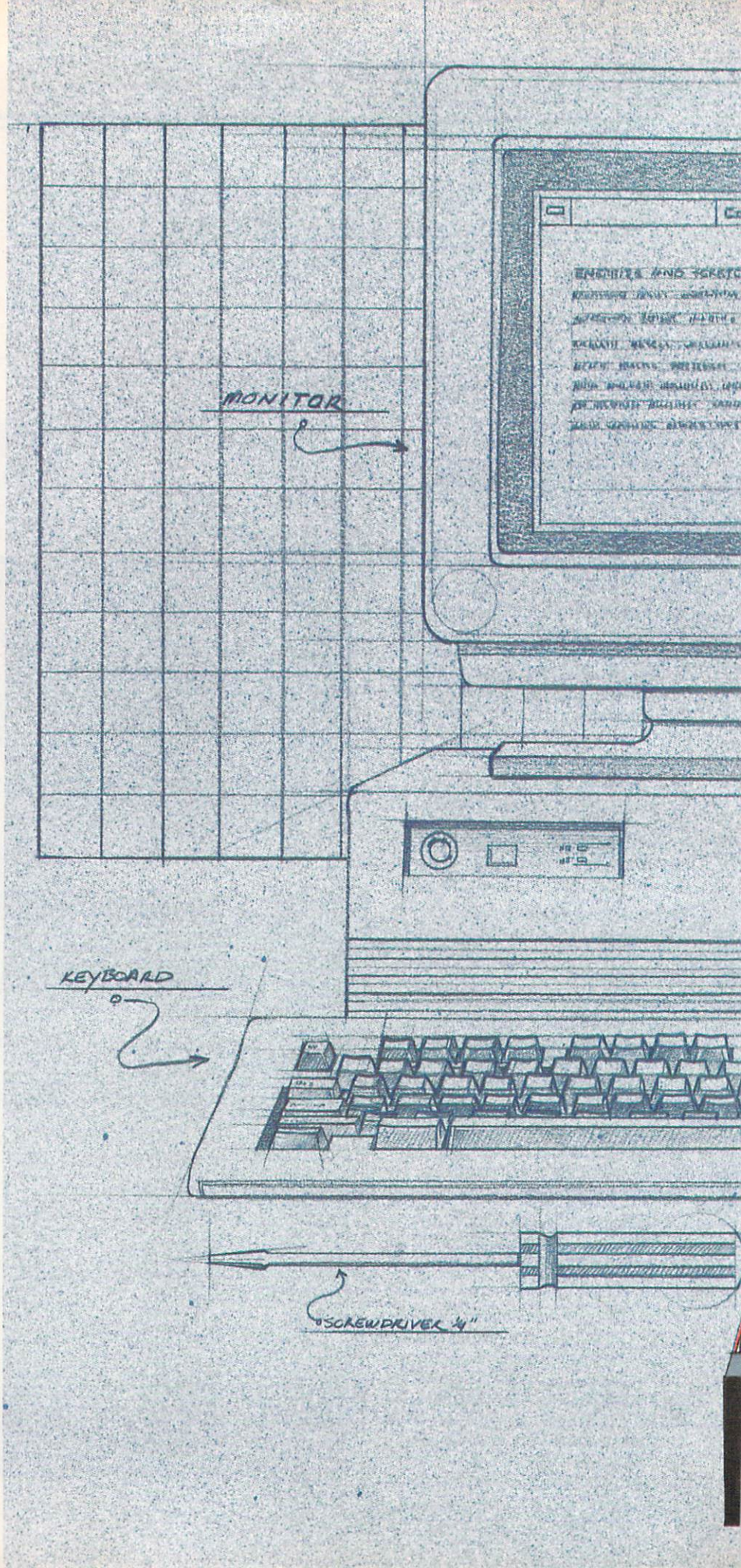
Direct Printer Transmit. The capability to "print" directly to a fax board.

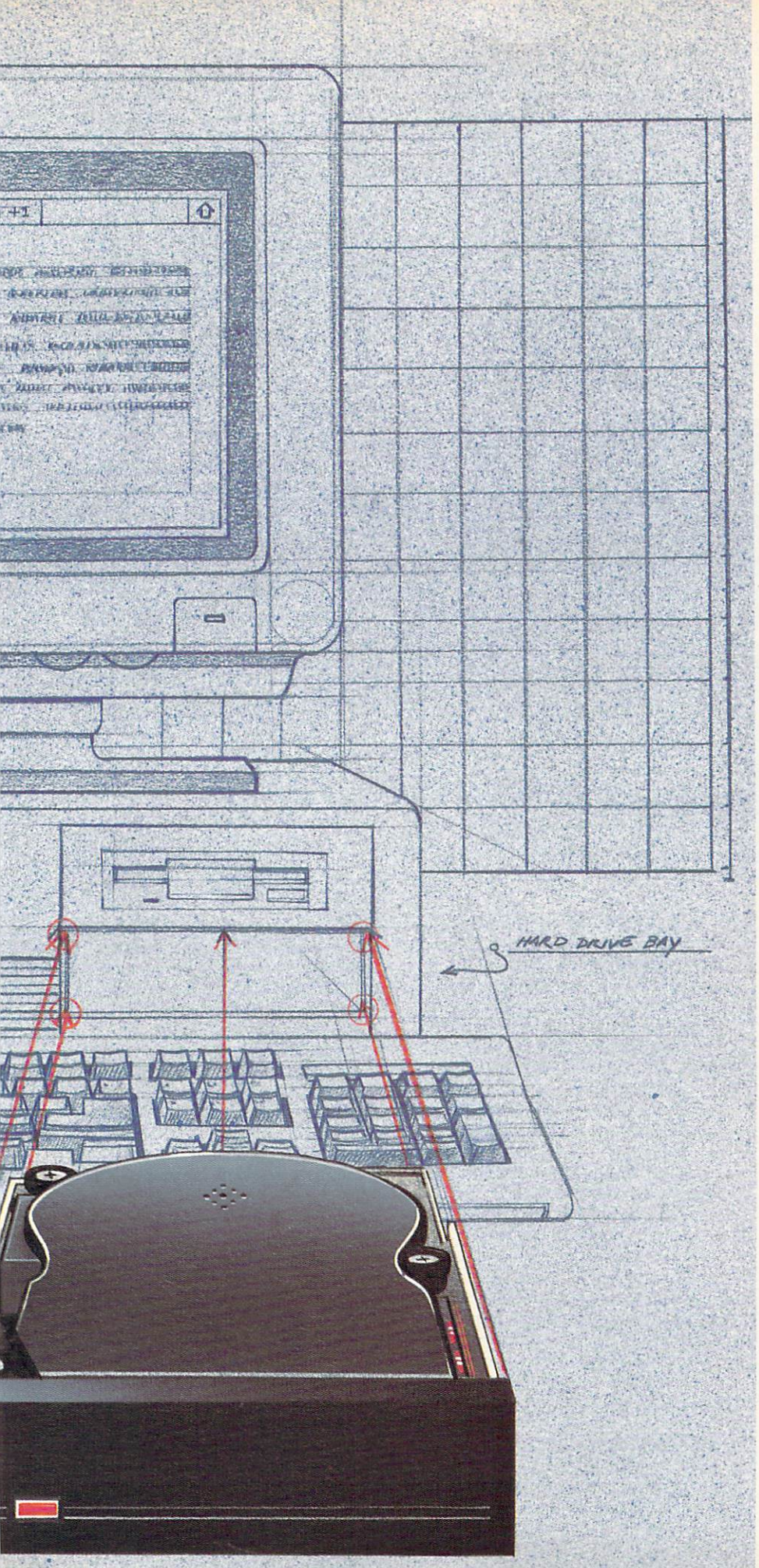
Polling. Unattended, automatic fax transmission and reception. A fax unit's ability, at a deferred time, to send out form letters to a predetermined set of fax numbers. It also allows you to leave documents in your transmit queue and have them transmitted in response to a faxed request. ⊡

Circle Reader Service Number 202

HOW TO INSTALL A HARD DRIVE

MARK MINASI





MICHAEL HILL

FOUR STEPS TO HARD DISK POWER

A couple of years ago, 20 megs seemed like a lot of storage. But nowadays *everything* burns up disk space at a furious rate. *Windows* 3.0 takes up 5 or more megabytes, *Lotus* several more—heck, even *Wing Commander*, a game with unbelievable graphics, can only manage those graphics by taking up 5 megs on your disk.

So it's time for an upgrade. You buy a larger disk and don't want to pay to have it installed. Here's how to put in your first hard drive or add a second hard drive. ▷

One caveat before we go further. There is a wide variety of controllers, drives, and interfaces, so one article can't cover them all. What follows will tell you how to install *most* hard drives. Here are the basic steps to the process:

- Gather the information you'll need before you start.
- Configure the hard drive.
- Install the hard drive.
- Install the drive controller.

I'll also assume that you know that a drive system needs a hard drive, a circuit board called a *hard drive controller,* and cables. The controller has to be compatible with the hard drive, or this whole operation isn't going to work.

If you're not clear on how to buy a controller and drive, take a look at "How to Choose a Hard Disk" in the May 1991 issue.

Getting Ready

There are a few things you'll need to know about your drive later on, so let's get this information together before we go any further.

Find whatever documentation came with the drive, controller, and PC. You want to know the heads, cylinders, sectors per track, and write precompensation cylinder for your drive because the controller needs to know that data in order to support your drive. So get this from your vendor and write it down somewhere—you'll probably have use for it even after the drive is installed.

Most drives have a paper label pasted on them with a bad track table or error map. It describes exactly where the disk's surface has some kind of defect. I'm looking currently at a Seagate ST251-1, a popular 42MB drive. It has a white paper label atop it marked *Error Map.* The label looks like this:

Error Map 251/Serial # 26956413

Cyl	Hd	BFI
137	3	2463
140	3	2463
141	3	2463
442	5	3722

The three columns are labeled *Cyl* (Cylinder), *Hd* (Head), and *BFI* (Bytes From Index). As the disk spins, there is an arbitrary starting point that is the index—*BFI* is the distance from this index. (Note an oddity of the table: It sees an error on head 3 for tracks 137, 140, and 141 at the same BFI. It seems highly likely that an error exists also on tracks 138 and 139. Personally, I'd treat head 3, BFI 2463 as bad for cylinders 138 and 139.)

The last suggestion for this installation phase is to collect documentation. There's no sense in tearing the computer apart only to realize that you never got the information on configuring the controller and that you won't get any further until you beg the company to send you that information. And besides, even if you convince the company to send it, you'll look strange lurking around the mailbox waiting for the mail carrier. (Actually, most controller vendors have 24-hour-a-day BBSs from which you can download your controller documentation and other information.)

Opening the Computer

There's a good chance you'll have to get into your computer before going much further, since most AT-class machines (286-, 386SX-, 386-, and 486-based PCs) have their hard disk controller and hard disk cables already in the machine. Here are some tips on getting inside the machine with a minimum of trouble. Take your time, and write everything down.

Make a bootable DOS disk. If you don't have a bootable DOS floppy, make one now with everything on it that you'll need to boot the system. If you're replacing a hard disk, you probably always boot from the hard disk and don't have a bootable floppy handy. Make one, and make sure that it has the things you'll need for software preparation: SETUP if it's an AT machine, whatever low-level format program you'll be using, FDISK, and FORMAT.

Park your drive's heads. If you're removing an old hard disk, park it first. You should have a head-parking program around somewhere.

Turn the computer off, and remove the cover. Leave the PC plugged in, however, but be sure to provide antistatic protection, as I'll explain in a minute.

Be especially careful when removing the cover that you don't rip any ribbon cables on the edge of the cover. The ribbon cables for the floppies and hard drive often pop up as the cover is removed, making them easy prey for any sharp edges on the inside of the case.

Also, find an egg carton and use it to help you organize the screws that you take out of the computer. You can use the compartments in the carton to keep the different screws separated. You'll probably find two or three sizes of screws in your PC: large ones that secure the cover, small ones that secure the hard drive, and medium-sized ones that fasten everything else.

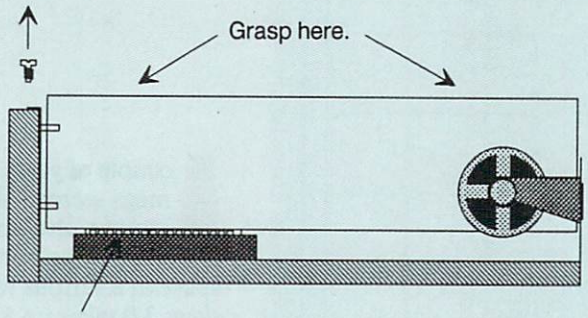
Ground yourself. Before you touch anything in the computer, touch the case of the power supply. (Don't know which is the power supply? It's the silver box with the fan in it and the power switch on the side. It's also got a label on it that says—sometimes in several languages—"If you open me, I'll kill you.")

Touching the power supply case drains away any static electricity that you might have built up. This only works if the power supply is plugged in.

Heed this warning: In 1989, I lived in The Condo from Hell for three months. It had the most static-attracting carpet I've ever seen in my life. I was working on a computer and absent-mindedly shuffled my feet on the carpet while trying to work out a problem. I reached over to remove a memory board from the system, and *zap!* A blue spark leapt about a centi-

Removing Circuit Boards

1. Remove any connectors (diagramming them first).
2. Remove the board's mounting screw.
3. Grasp the board along its top edge and rock it GENTLY up and out.
4. Avoid touching the edge connector once the board is out of its slot.



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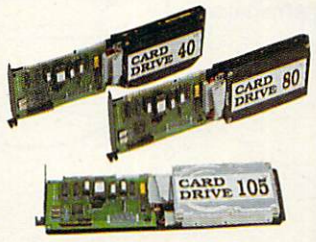

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meter from my hand to the board. Killed two memory chips and probably weakened others.

Get in the habit of touching the power supply case. (No, you won't get electrocuted by touching the case of the power supply. Just don't open it up—*that* can kill you.)

Remove the hard drive. If you already have a hard drive, remove it and the controller. You can find the controller easily—just follow the ribbon cables from the back of the hard disk to a circuit board. That circuit board is the controller. It'll probably look like a pincushion, as it usually sports a 34-pin connector and two 20-pin connectors.

Before you do any of this, however, *please make good diagrams* so you can put things back the way you found them!

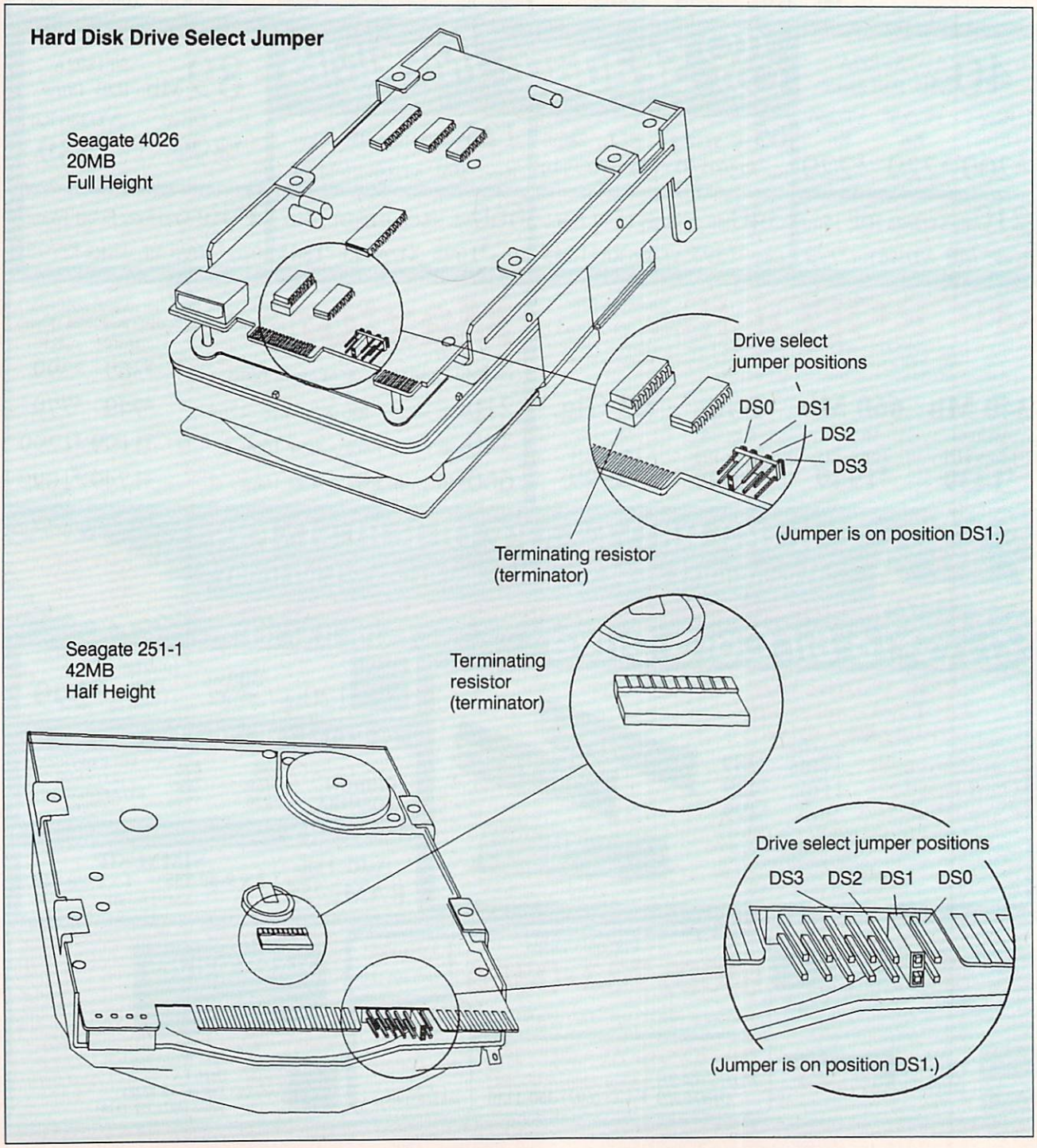
Circuit boards are held into the system with a single screw near the back of the PC. Remove the screw, and the board will come out. Rock the board gently back and forth to remove it from the system board. See the figure "Removing Circuit Boards."

Drives in XT-class systems are generally held in place with screws that bolt the drives right into the chassis. AT-class systems typically have rails fastened to the sides of the hard drives; the drives slide right into the AT chassis like drawers into desks. Metal tabs hold the drives in place.

If you ordered a hard drive with an installation kit for AT-class machines, the installation kit probably consisted of the plastic drive rails and screws to mount them on the drive.

Configuring the Drive

Next, you'll need to adjust two things on your hard drive: the terminator and the drive select jumper. If the drive is the only hard drive (floppies



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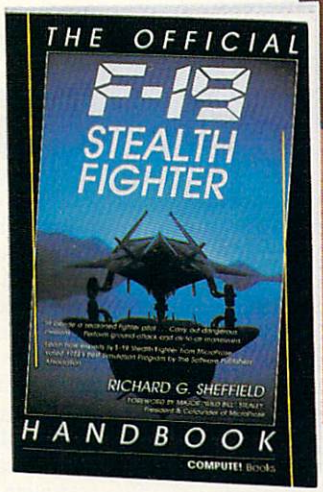

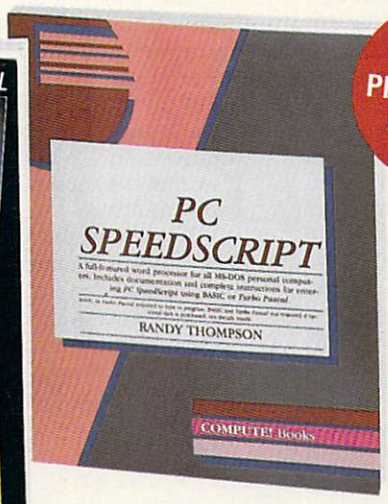

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don't count), you don't need to mess with the terminator.

The drive select jumper gives a drive an address as far as the controller is concerned: either address 0 or address 1. Ordinarily, your first hard drive (let's call it drive C) is addressed 0, and the second, if present, is addressed 1.

Let's call the second hard drive D, and ignore for the present that it's possible for a single drive to own more than one drive letter.

The drive is addressed by placing a jumper—a tiny plastic box (usually black, but I've seen white and blue) over two metal pins.

Drives generally have pins for drive addresses 0 through 5, but we only use addresses 0 and 1 in the PC business. There are a set of pins to jumper for address 0, another set for address 1, and so on.

The address your drive responds to is determined by where you put the jumper. There are two examples of drive select jumpers (and terminators, which we'll discuss presently) on "Hard Disk Drive Select Jumper." Just remember that the drive select jumper only goes on one address.

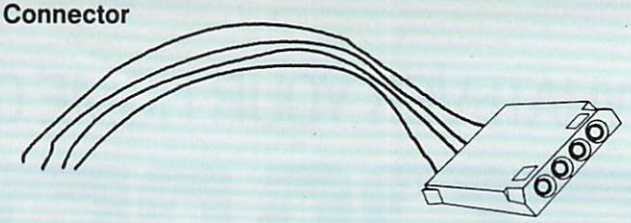
So we've said that the drive can have address 0 or 1. But which should it use? It depends on whether or not there's a twist in the cable. Your system probably uses two cables to connect the hard disk to the hard disk controller—a wider 34-wire cable and a skinnier 20-wire cable. The 34-wire cable carries the control signals; the 20-wire cable the data signals.

Take a look at the 34-wire cable. It should have a 34-wire connection on one side that attaches to the controller and a 34-wire connection on the other side that attaches to the drive. Is there *also* another 34-wire connection in the middle of the cable? If so, that is intended to support a second hard drive.

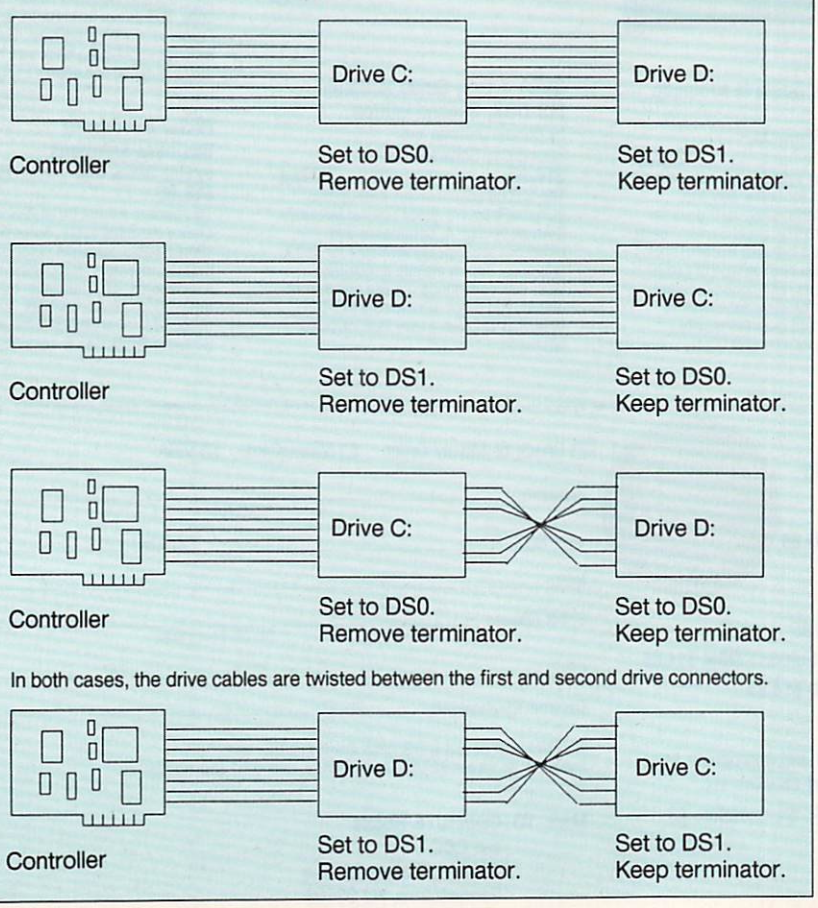
If you have the middle connector, look between the middle connector and the hard drive connector on the end. Is there a twist in the cable? Some cables are cut, twisted, and reconnected between lines 24 and 29 on the 34-wire hard disk cables. Knowing whether your cable is twisted or not determines how you set the drive select jumper.

If your cable isn't twisted, you set the drive select jumpers as I've already explained: Drive C is drive select 0, and D is drive select 1. On the other hand, if the cable has a cut and a twist, you set *both* drives to either drive select 0 or drive select 1, as you see in "Hard Disk Cabling."

Power Connector



Hard Disk Cabling



The Terminator

The last adjustment on the drive is the terminating resistor chip, or terminator.

You only need to mess with this if you're installing a second drive. The terminator is a group of resistors packaged in a chiplike housing. It will look like either a chip or half of a chip, and it can be any color, though it is generally *not* black so it will stand out from the rest of the board.

Limited space prevents a complete explanation of the terminator, but basically it's a resistor needed to complete a bus circuit. Drives connected to a controller are on a bus much like the bus that your PC has—the slots on the PC motherboard. Something's got to hold up one end of the bus (termed an *open collector bus*), and that's a resistor called the *pull-up* or *terminating resistor.*

The problem arises when the controller sees *two* drives with terminators—the circuit then ends up with *half* the resistance that it's designed for, and twice as much current runs through the controller and drive electronics. Result? You slowly cook the drive and controller.

So remove the terminator from the drive attached to the connector in the middle of the cable. Again, the arrangement is pictured in "Hard Disk Cabling." Look back to the figure "Hard Disk Drive Select Jumper," and you can see two examples of common hard drive terminators.

Installing the Drive

Now the drive's configured. Let's physically install it in the chassis.

The easiest way to install a drive is to insert it partway into the chassis and then attach the ribbon cables.

Stop at this point; don't get overanxious to screw in the drive. The dif-

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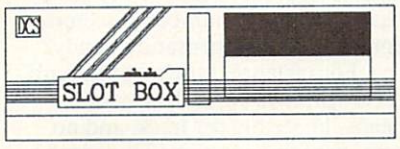

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Circle Reader Service Number 120

ference between a good installation and a bad installation (as students in my PC troubleshooting classes hear over and over again) is how the cables are routed.

Now that the cables are attached to the drive, take a minute and figure out where to put them. They go from the drive to the controller, but there's nearly always some slack. Sloppy installers just stuff the cables into the case and then slap the cover on. This is a time bomb. The next time you take the cover off the PC, you'll end up catching the cables on something sharp, and you'll rip them. So take a minute and see if you can tuck them down out of the way.

Don't forget to provide power to the drive with the power connector. That's the white plastic connector with four wires running back to the power supply. You'll see several of these four-wire power connectors. They're pretty universal, and they'll connect to a floppy drive, hard disk, or tape drive. It doesn't matter which one you connect to the drive—they're all equal. There isn't a special one for A and one for C, or anything like that, so use whatever power connector is handy. If they're all in use, you'll need a Y splitter to convert one of the power connectors into two power connectors. Contact your hard disk dealer to buy a Y connector, if necessary.

Now secure the drive. As we saw before, with most systems you either bolt the drive directly to the chassis or secure it with metal tabs that keep it from sliding out of the box. See "Securing Hard Drives" for details.

Install the Hard Disk Controller

If the controller isn't already installed, put it in now. Installing the board is just the reverse of removing it; push the board's edge connector down into an expansion bus slot on the PC motherboard and then secure it with a screw on the board's back bracket.

A common question at this point is *My PC has five (or eight or three) expansion slots. Does it matter which slot I put the board in?* The answer is *Basically, no.* Some boards are 8-bit boards. They're identifiable because they have a single edge connector.

Other boards are 16-bit boards. They have two edge connectors. A 16-bit board should go in a 16-bit slot, but an 8-bit board can go in either an 8- or a 16-bit slot.

Now hook up the cables from the hard drive. If you've got an AT system, the controller will probably be a combination floppy and hard disk controller, so be sure to hook up the cable for the floppy drives, too.

Introduce the Controller and the Drive

Seems only polite, hmmm?

The controller needs to know what kind of drive it's dealing with. On XT-style systems you give it that information during the first part of the software installation—a step called *low-level format,* so we won't worry about that here.

On AT systems, the system BIOS has a table of drive types built into it. Most clones know of 47 different hard drives. Why 47? Who knows? The earliest IBM ATs only knew of 14 drive types, and later ones knew 25. The last batch had 47 drive types. Cloners just copied IBM from that point on.

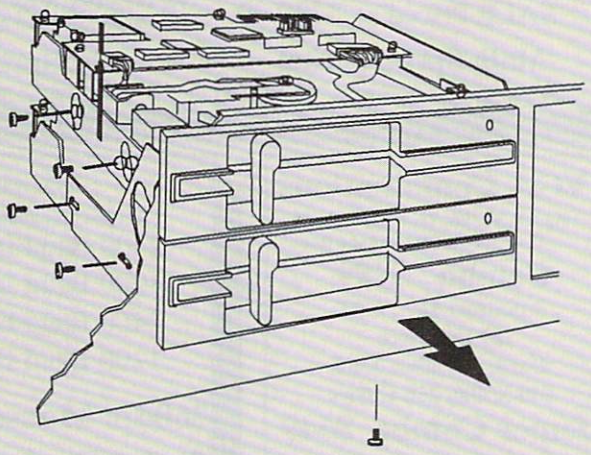
You just figure out which drive type most closely describes your hard disk—remember I told you to have heads, cylinders, number of sectors, and write precompensation handy?

For instance, I use a 60MB hard drive with 1024 cylinders, seven heads, 17 sectors per track, and no write precompensation. There isn't a drive type in my clone's ROM that matches that, but there's one that's close—977 cylinders, seven heads, 17 sectors per track, and no write precomp. That's drive type 18.

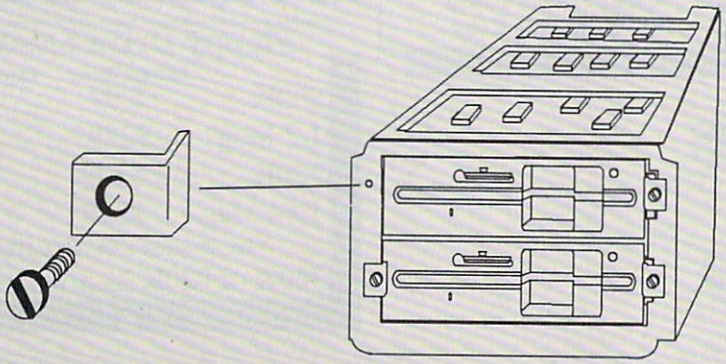
Once I figured that out, I ran my clone's SETUP program and told the system that I had drive type 18, and then I was ready to format the disk. I lost a little space, as I'm only using 977 of my 1024 cylinders, but that's not a big deal.

Well, that's how to do a hardware installation of most PC hard disks. Again, not every drive installation works as I've described, but this is the procedure for installing drives in most XT- and AT-class systems these days. Good luck and have fun—it's a great feeling to do a hard drive installation by yourself!

Securing Hard Drives



XT drives—both floppy and hard—are secured to the XT chassis directly.



In AT-style systems rails are placed on the drives so they can slide in and out of the chassis like drawers in a desk. Metal tabs keep the drives in place.

Mark Minasi is an owner of Moulton, Minasi, & Company, an Arlington, Virginia–based firm specializing in training technical and nontechnical users how to support, upgrade, and repair their PCs. He is also the author of COMPUTE's recently published *Maintaining, Upgrading, and Troubleshooting IBM PCs, Compatibles, and PS/2 Personal Computers*. Some of the illustrations used in this feature were done by Terry Keaton, an associate with Moulton, Minasi, & Company. ⊡

ONLINE

DENNY ATKIN

Most of us have stories of brushes with the famous and infamous—you may have shared an elevator with Jimmy Stewart or met Lewis Grizzard at a cocktail party, or perhaps your mother-in-law was Richard Nixon's nurse.

However, even if some of us have had the good fortune to meet admired celebrities once or twice in our lives, only a few of us will ever have the opportunity to hold a prolonged discussion with our favorite authors or chat about world events with well-known TV personalities.

Who are those lucky few who can join the in-crowd? If you own a modem, you're only a phone call away from schmoozing with the famous.

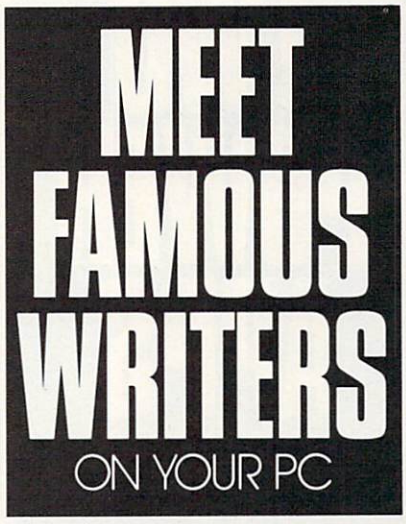
The global village prophesied by Marshall McLuhan is in its formative stages on the online networks. You can log on to CompuServe and send ultraconservative radio–talk show host Rush Limbaugh a letter about his latest show. Or log on to BIX and ask science fiction author Jerry Pournelle about his latest novel. During the Persian Gulf War, you could see military analyst Jim Dunnigan on network television explaining Saddam's latest moves. If you were online with GEnie, though, you could have asked him to elaborate on his short TV talk by posting a notice in the message base.

Of course, not everyone is hooked into the networks. Still, you're a lot more likely to be able to engage your favorite authors in a conversation if you run into them online than if you try to call them at home.

While you'll find an interesting assortment of famous (and perhaps infamous) personalities on the online networks, not everyone has moved into the global village yet. If you're into science fiction, though, you'll find that many people associated with that genre are available online. Perhaps because the field is intimately associated with high technology, the personalities associated with it aren't intimidated by online networks.

Whatever the reason, science fiction fans will find the online networks a paradise of information, tidbits, and gossip. The most active area I've encountered online is GEnie's Science Fiction RoundTable (SFRT). Pop into the message base (which is covered under GEnie's $4.95/month Star*Services flat fee), and you'll find an incredible wealth of messages from well-known writers, editors, reviewers, directors, special-effects experts, and occasionally even actors.

The SFRT is divided into 19 different categories, each concentrating on a specific aspect of the genre. Topics include novels, authors, films, science fiction TV shows, comics, conventions, fandom, science fact, writers' workshops, and an entire category devoted to Star Trek.



The Trek category, often the most active of the SFRT's topics, is a dream come true for fans of "Star Trek: The Next Generation." It's a great place for Trekkies to get together and discuss the show with each other, of course. However, they can also talk about the latest episodes with people like Mike Okuda and Ron Moore, who work on the show's computer displays and special effects. Or Chip Chalmers, who has directed a few episodes of the series. Or Brad Ferguson, Carmen Carter, Peter David, John Vornholt, Vonda McIntyre, and other Star Trek novelists. Even Wil (Wesley Crusher) Wheaton has been known to participate in the SFRT, although he's been absent lately due to the unfortunate death of his Macintosh.

Discussions range from the serious to the silly. In one topic, Brad Ferguson was discussing how unhappy he was with the major edits done to his most recent Star Trek novel and how he hopes people will be able to read his original version through the fan press. Reading on, I encountered a topic called *Carrot Juice, Earl Grey, Hot,* where a number of SFRT readers were writing a story about various Looney Tunes characters loose on the *Enterprise.* It features characters like Elmer Fudd as Wocutus of Borg. ("Wooney Tunes are iwwewevant. Pwepare to be assimuwated.")

Even if you're not a Trek fan, there's something here for you. You'll also find mainstream SF authors such as Lawrence Watt-Evans, Michael P. Kube-McDowell, Jerry Pournelle, Damon Knight, Mike Resnick, and David Bischoff online. Some folks, in the presence of such well-known names, will remain lurkers and read, but not join in, the discussions. Once you join in, you'll have a great time. These may be famous writers, but they're also regular folks.

There's also the infamous CAT 24, the Anything Goes category. Even if you're a devoted SF fan who reads fanzines (fan magazines) and attends conventions, you probably don't know what your favorite author thinks about subjects ranging from nuclear power and Operation Desert Storm to reincarnation and the opposite sex. In CAT 24, you'll find out.

This is just a taste of what you'll find in the SFRT. You'll find similar areas on BIX (SF), CompuServe (Science Fiction and Fantasy Forum), and People/Link (SF & F Club). So log on, beam up, and say hi.

Send comments and suggestions to DENNYA on BIX and GEnie, DENNY on Plink, or 75500,3602 on CIS. ⊡

POINT & CLICK

CLIFTON KARNES

TWO POWER APPS THAT WON'T BREAK THE BANK

When most people think of *Windows,* they think of applications with superhigh price tags. It's certainly true that *Windows* has its share of $500-and-up programs, but there are many excellent software packages available for under $100. Here are two essential utilities, each priced below $100.

First, there's *Intermission* (ICOM Simulations, 648 South Wheeling Road, Wheeling, Illinois 60090; 708-520-4440; $49.95), a superb screen blanker you can set for a predetermined period or activate on demand by moving the mouse pointer to one of the screen's four corners (you choose which corner).

That's usually it for a screen blanker, but with *Intermission,* the fun is just beginning. While your screen is blanked, *Intermission* offers 34 animated displays, which the program can select at random.

These animated displays include Marine Screen (with multicolored fish that occasionally turn to look at you and also eat each other), Clock (an analog clock that slowly bounces around your screen), Dissolve (a pixel-by-pixel fade to black), Fireworks (with beautiful multicolored rockets), Flashlight (which illuminates a slowly moving circle), Kaleidoscope (just like the kid's toy), Puzzle (which turns your screen into an animated shuffle puzzle), Spaceflight (which moves you through space at warp factor 5), Mosaic (a quilt of elegant symmetrical designs), and Intermission (which is a lively display of pop bottles, popcorn, and candy).

Installing *Intermission* is simple. Just run the setup program and follow directions. You'll find the files INTERMISSION.EXE, SAVERDLL.DLL, and ANTSW.INI in your WINDOWS subdirectory, and the IMX animation files in a directory called SAVER. One additional file, ANTHOOK.386 may go in your SYSTEM subdirectory.

To configure *Intermission,* click on its icon, and get ready for the show.

The other essential *Windows* utility is *StraightLine* (First Genesis Software, 1000 Shelard Parkway, Suite 270, Minneapolis, Minnesota 55427; 612-544-4445; $99), a menu program and task manager. At $99, *StraightLine* may seem a little pricey, but it's worth every penny. It's unquestionably the fastest way to get from point A to point B in *Windows.*

StraightLine allows you to install *Windows* and DOS applications on a pop-up menu. From the menu, you can launch programs, switch to active programs, run programs not on the menu, or add new programs to the menu.

To set up *StraightLine,* simply run the program and choose Launch from the menu bar and Setup from the pull-down menu.

From Setup, you can browse through your files and install any EXE, COM, or BAT file. If there are documents associated with an executable file, you can attach these to it.

After installing your programs, click on Done to put *StraightLine* to work. To call *StraightLine,* press a special hot key or mouse click. The program provides several to choose from, or you can supply your own.

I've found that the right mouse button makes an excellent hot key, or more appropriately, hot *button.* Then you're only two clicks and a short mouse movement away from running any program on your system.

If you find a conflict with the right mouse button—*Paintbrush, Word for Windows, ToolBook, Turbo Pascal for Windows,* and several other programs use the right button—you can change it.

After you've installed *StraightLine,* simply press your hot key or button to call up the menu. You'll see a tiny window with a title bar and a menu bar that has just two selections on it: Launch and Active. If you chose a hot button, the window will appear right under your mouse pointer with the pointer directly over the Launch menu selection.

If you want to run a program, simply click your left button, drag to the *Windows* or DOS application you want to run, and then release the mouse button.

If you've associated documents with a program, you'll see a cascading menu with each installed document's name when you select the program from *StraightLine's* menu. Click on a document, and the associated program runs and loads the doc file.

From *StraightLine's* Active menu, you can switch to any active application much as you can from *Windows'* Task Manager, but *StraightLine* has some important enhancements.

For starters, there's a menu selection that allows you to minimize all your active programs. This is great if you have a large number of windows open and you need to get organized.

You can also press Control and click on any *Windows* application (including *Program Manager*) to close it.

Pressing Shift while clicking on a program will minimize it to an icon.

In short, *StraightLine* provides amazing control over your *Windows* environment. It's undoubtedly the most useful utility on my desktop. ⊡

HARD DISK BUYER'S GUIDE

If you want to upgrade your PC, the first thing to consider is a faster, larger hard disk. To make shopping for your dream disk easier, we've compiled a list of more than 150 hard disks of 100MB or more, complete with their specifications and the address and telephone number of each manufacturer.

Use this list as a starting point to find the disks with the specs you want in the price range you can afford. While some of these drives aren't yet widely available to consumers, they do exist; shop around. The prices listed here are mail-order prices, and they may have dropped since press time.

How to Read the Chart

The drives in this chart are listed in alphabetical order by manufacturer (you'll find addresses and telephone numbers at the end of the chart). Each manufacturer's drives are then listed by capacity—the most important specification for most people.

Following capacity, you'll find the model number, the form factor (which is the diameter of the drive's disks), the exterior dimensions of the drive (so you can make sure it fits in the space you have), and the number of heads.

Next is the most important column in the chart after capacity: seek time. Seek time is a measure of a hard disk's speed, with smaller numbers meaning a faster disk. Just two years ago, 65 milliseconds was standard, but just look at the seek times for these drives. Most are less than 25ms, and some are *considerably* less than that.

The next column lists interface, which determines many of the drive's qualities (especially its speed and capacity) and the way the drive connects to your PC. Here's a brief explanation of each interface type.

AT (Advanced Technology) is the bus used in the IBM AT and compatibles. Drives designated with an *AT* by the manufacturer usually employ an IDE interface.

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 one gigabyte in size.

IDE (Integrated Drive Electronics), like SCSI (see below), is an interface design that puts the controller on the drive itself. IDE, however, offers lower performance.

MCA (MicroChannel Architecture) drives require a PS/2–style bus connection.

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 seven additional devices to be daisychained. SCSI-2 is faster than SCSI but is fully compatible with the earlier standard.

The next column, Encoding, refers to the way data is stored on a disk. Almost all of the high-capacity drives listed here use RLL, for Run Length Limited, a system borrowed from the mainframe world that increases storage by 50–100 percent over previous encoding methods.

Under MTBF (Mean Time Between Failures), the numbers represent the hours of service you can expect from your drive. For most of these drives, the MTBF is 50,000 hours or more, which means that if you left your drive on 24 hours a day, it would last nearly six years. Most of us will be looking at 100-*gigabyte* drives by that time.

The last column lists price, and as mentioned above, these are mail-order prices, which may have dropped since press time.

Any column with *n/a* indicates that the information was not available at press time. ⊡

DAVID SEARS

Manufacturer	Capacity in Megabytes	Model Name	Form Factor	Dimensions in Inches	Number of Heads	Seek Time in Milliseconds	Interface	Encoding	MTBF in Hours	Price
Conner	104.9	CP3100	3.5	1.625×4×5.75	8	25	SCSI	RLL	50,000	$469
	104.9	CP3104	3.5	1.625×4×5.75	8	25	AT	RLL	50,000	$449
	120	CP30104	3.5	1×5.75×4	4	19	AT	RLL	40,000	$569
	120	CP30100	3.5	1×5.75×4	4	19	SCSI	RLL	40,000	n/a
	120	CP30109	3.5	1×5.75×4	4	19	MCA	RLL	40,000	n/a
	212.6	CP3200F	3.5	1.625×4×5.75	8	16	SCSI	RLL	50,000	$779
	212.6	CP3204F	3.5	1.625×4×5.75	8	16	AT	RLL	50,000	$785
	212.6	CP3209F	3.5	1.625×4×5.75	8	16	MCA	RLL	50,000	n/a
	510	CP500	3.5	1.625×4×5.75	12	12	SCSI	RLL	100,000	n/a
	510	CP504	3.5	1.625×4×5.75	12	12	AT	RLL	100,000	n/a
Fujitsu	105	M616SA	3.5	1×4×5.75	4	20	SCSI	RLL	50,000	n/a
	105	M616T	3.5	1×4×5.75	2	20	PC/AT	RLL	50,000	n/a
	135.2	M2613T	3.5	1.625×4×5.75	6	20	AT	RLL	50,000	$515
	136.6	M2613SA	3.5	1.625×4×5.75	6	20	SCSI	RLL	50,000	$515
	180.3	M2614T	3.5	1.625×4×5.75	8	20	AT	RLL	50,000	n/a
	182.4	M2614SA	3,5	1.625×4×5.75	8	20	SCSI	RLL	50,000	$649
	235.2	M2621S	3.5	1.625×4×5.75	5	12	SCSI	RLL	50,000	n/a
	330.1	M2622S	3.5	1.625×4×5.75	7	12	SCSI	RLL	50,000	n/a
	366	M2261	5.25	3.3×5.7×8	8	16	ESDI/SCSI	RLL	200,000	$1,429
	425.1	M2623S	3.5	1.625×4×5.75	9	12	SCSI	RLL	200,000	n/a
	520.1	M2624S	3.5	1.625×4×5.75	11	12	SCSI	RLL	200,000	n/a
	688	M2263	5.25	3.3×5.7×8	15	14.5	ESDI/SCSI	RLL	200,000	$1,699
	1079	M2266	5.25	3.3×5.7×8	15	14.5	ESDI/SCSI	RLL	200,000	n/a
Kalok	105	KL3100	3.5	1.625×4×5.75	6	25	AT/IDE	RLL	50,000	n/a
Maxtor	130.4	7120	3.5	1×4×5.75	2	15	SCSI	RLL	150,000	n/a
	157.4	XT4170S	5.25	3.25×5.75×8.2	7	14	SCSI	RLL	150,000	$859
	157.93	XT4170E	5.25	3.25×5.75×8.2	7	14	ESDI	RLL	150,000	$849
	203.04	XT4230E	5.25	3.25×5.75×8.2	9	16	ESDI	RLL	150,000	$899
	213	LXT213	3.5	1.625×4×5.75	7	15	SCSI	RLL	150,000	$720
	337.58	XT4380S	5.25	3.25×5.75×8.2	15	16	SCSI	RLL	150,000	$1,249
	338.4	XT4380E	5.25	3.25×5.75×8.2	15	15	ESDI	RLL	150,000	$1,269
	340	LXT340	3.5	1.625×4×5.75	7	13	SCSI	RLL	150,000	$1,469
	360.31	XT8380S	5.25	3.25×5.75×8.2	8	14.5	SCSI	RLL	150,000	n/a
	360.97	XT8380E	5.25	3.25×5.75×8.2	8	14.5	ESDI	RLL	150,000	$1,249
	437	LXT437	3.5	1.625×4×5.75	9	12	SCSI	RLL	150,000	n/a
	535	LXT535	3.5	1.625×4×5.75	11	12	SCSI	RLL	150,000	n/a
	541.4	XT8610E	5.25	3.25×5.75×8.2	12	15.5	ESDI	RLL	150,000	n/a
	616.69	XT8702S	5.25	3.25×5.75×8.2	15	16.5	SCSI	RLL	150,000	$1,699
	675.58	XT8760S	5.25	3.25×5.75×8.2	15	16.5	SCSI	RLL	150,000	$1,895
	676.82	XT8760E	5.25	3.25×5.75×8.2	15	16.5	ESDI	RLL	150,000	$1,895
	694.7	XT8800E	5.25	3.25×5.75×8.2	15	16.5	ESDI	RLL	150,000	n/a
	696	P108E	5.25	3.25×5.75×8.2	15	13	ESDI	RLL	100,000	n/a
	696	P108S	5.25	3.25×5.75×8.2	9	12.5	SCSI-2	RLL	100,000	n/a
	1005	P112S	5.25	3.25×5.75×8.2	19	10.5	SCSI-2	RLL	100,000	n/a
	1027.7	P012S	5.25	3.25×5.75×8.2	15	13	SCSI-2	RLL	100,000	n/a

Manufacturer	Capacity in Megabytes	Model Name	Form Factor	Dimensions in Inches	Number of Heads	Seek Time in Milliseconds	Interface	Encoding	MTBF in Hours	Price
Maxtor	1051	P112E	5.25	3.25×5.75×8.2	15	13	ESDI	RLL	100,000	n/a
	1051	P116E	5.25	3.25×5.75×8.2	15	13	ESDI	RLL	100,000	n/a
	1160	P113E	5.25	3.25×5.75×8.2	15	13	ESDI	RLL	100,000	n/a
	1470	P117E	5.25	3.25×5.75×8.2	19	13	ESDI	RLL	100,000	n/a
	1470	P117S	5.25	3.25×5.75×8.2	19	13	SCSI-2	RLL	100,000	n/a
Micropolis	158	1674	5.25	3.25×5.75×8	7	16	SCSI	RLL	150,000	$959
	158	1674HS	5.25	3.25×5.75×8	7	3.9	SCSI	RLL	150,000	$959
	161	1654	5.25	3.25×5.75×8	7	16	ESDI	RLL	150,000	$899
	331	1578	5.25	3.25×5.75×8	15	16	SCSI	RLL	150,000	$1,445
	331	1578HS	5.25	3.25×5.75×8	15	3.9	SCSI	RLL	150,000	$1,445
	338	1558	5.25	3.25×5.75×8	15	19	ESDI	RLL	150,000	$1,249
	340	1684	5.25	3.25×5.75×8	7	15	SCSI	RLL	150,000	$1,395
	340	1684HS	5.25	3.25×5.75×8	7	3.9	SCSI	RLL	150,000	$1,395
	345	1664	5.25	3.25×5.75×8	7	15	ESDI	RLL	150,000	$1,295
	676	1568	5.25	3.25×5.75×8	15	16	ESDI	RLL	150,000	$1,829
	668	1588	5.25	3.25×5.75×8	15	16	SCSI-2	RLL	150,000	$1,895
	668	1588HS	5.25	3.25×5.75×8	15	3.9	SCSI	RLL	150,000	$1,819
	871	1538	5.25	3.25×5.75×8	15	14.5	ESDI	RLL	150,000	n/a
	1034	1598	5.25	3.25×5.75×8	15	14.5	SCSI-2	RLL	150,000	$2,689
	1034	1598HS	5.25	3.25×5.75×8	15	3.9	SCSI-2	RLL	150,000	$2,689
	1346	1518	5.25	3.25×5.75×8	15	14.5	ESDI	RLL	150,000	n/a
	1346	1528	5.25	3.25×5.75×8	15	14.5	SCSI-2	RLL	150,000	n/a
	1748	1548	5.25	3.25×5.75×8	15	14	SCSI-2	MZR	150,000	n/a
Microscience	107.3	7100	3.5	1.625×4×5.75	7	18	AT/IDE	RLL	60,000	n/a
	110.3	5100	3.5	1.625×4×5.75	7	18	ESDI	RLL	60,000	n/a
	120.4	710020	3.5	1.625×4×5.75	7	18	AT/IDE	RLL	60,000	n/a
	123.86	5100-20	3.5	1.625×4×5.75	7	18	ESDI	RLL	60,000	n/a
	201.38	7200	3.5	1.625×4×5.75	7	18	AT/IDE	RLL	60,000	n/a
	366	FH2414	3.5	3.25×5.75×8	8	14	ESDI	RLL	100,000	n/a
	366	FH3414	3.5	3.25×5.75×8	8	14	SCSI	RLL	100,000	n/a
	787.6	FH2777	3.5	3.25×5.75×8	15	14	ESDI	RLL	100,000	n/a
	787.6	FH3777	3.5	3.25×5.75×8	15	14	SCSI	RLL	100,000	n/a
	1062.2	FH21200	3.5	3.25×5.75×8	15	14	ESDI	RLL	100,000	n/a
	1062.2	FH31200	3.5	3.25×5.75×8	15	14	SCSI	RLL	100,000	n/a
Quantum	105	105S	3.5	1.625×4×5.75	6	19	SCSI	RLL	50,000	$539
	120	120S	3.5	1.625×4×5.75	3	15	SCSI	RLL	50,000	$689
	120	120AT	3.5	1.625×4×5.75	3	15	AT	RLL	50,000	n/a
	168	170S	3.5	1.625×4×5.75	4	15	SCSI	RLL	50,000	n/a
	168	170AT	3.5	1.625×4×5.75	4	15	AT	RLL	50,000	n/a
	210	210S	3.5	1.625×4×5.75	4	15	SCSI	RLL	50,000	n/a
	210	210AT	3.5	1.625×4×5.75	4	15	AT	RLL	50,000	n/a
	331	330AT	3.5	1.625×4×5.75	7	13	AT	RLL	75,000	n/a
	331	330S	3.5	1.625×4×5.75	7	13	SCSI	RLL	75,000	n/a
	425	425AT	3.5	1.625×4×5.75	9	13	AT-BUS	RLL	75,000	n/a
	425	425S	3.5	1.625×4×5.75	9	13	SCSI	RLL	75,000	n/a

Manufacturer	Capacity in Megabytes	Model Name	Form Factor	Dimensions in Inches	Number of Heads	Seek Time in Milliseconds	Interface	Encoding	MTBF in Hours	Price
Quantum	105	LPS105AT	3.5	1×4×5.75	4	17	AT-BUS	RLL	60,000	n/a
	105	LPS105S	3.5	1×4×5.75	4	17	SCSI	RLL	60,000	n/a
Rodime	112.5	3139AP	3.5	1.625×4×5.75	5	18	AT	RLL	100,000	$499
	112.5	3139S	3.5	1.625×4×5.75	5	17.5	SCSI	RLL	100,000	n/a
	121.99	3151A	3.5	1×4×5.75	4	18	AT	RLL	50,000	$599
	210	3259S	3.5	1.625×4×5.75	9	17.5	SCSI	RLL	100,000	n/a
	213	3259AP	3.5	1.625×4×5.75	9	18	AT	RLL	100,000	$799
	331	3331S	3.5	1.625×4×5.75	7	12	SCSI	RLL	100,000	n/a
	426	3426S	3.5	1.625×4×5.75	9	12	SCSI	RLL	100,000	n/a
	540	3540S	3.5	n/a	9	12	SCSI	RLL	100,000	n/a
Seagate	106.9	ST3120A	3.5	1×4.02×5.77	3	16	AT	RLL/ZBR	150,000	n/a
	107	ST2125AV	5.25	1.625×5.75×8	2	18	SCSI	ZBR	100,000	n/a
	107	ST2125N	5.25	1.625×5.75×8	2	18	SCSI	ZBR	100,000	$735
	107	ST2125NM	5.25	1.625×5.75×8	2	18	SCSI	ZBR	100,000	n/a
	113.4	ST1133N	3.5	1.625×4×5.75	5	15	SCSI	RLL	150,000	n/a
	126	ST3144N	3.5	1×4.02×5.77	3	16	SCSI	RLL/ZBR	150,000	n/a
	128.4	ST1150R	3.5	1.625×4×5.75	9	15	ST506	RLL	150,000	n/a
	130	ST3144A	3.5	1×4.02×5.77	3	16	AT	RLL/ZBR	150,000	n/a
	130.7	ST1144A	3.5	1.63×4.02×5.77	7	19	AT	ZBR	150,000	$439
	155	ST4182N	5.25	3.25×5.75×8	9	16.5	SCSI	RLL	100,000	$799
	155	ST4182NM	5.25	3.25×5.75×8	9	16.5	SCSI	RLL	100,000	n/a
	158.8	ST1186N	3.5	1.625×4×5.75	7	15	SCSI	RLL	150,000	n/a
	160	ST2182E	5.25	1.625×5.75×8	3	16	ESDI	RLL	100,000	$929
	160	ST4182E	5.25	3.25×5.75×8	9	16.5	ESDI	RLL	100,000	$799
	163.8	ST1186A	3.5	1.625×4×5.75	7	15	AT	RLL	150,000	n/a
	171.9	ST1201N	3.5	1.625×4×5.75	9	15	SCSI	RLL	150,000	n/a
	177.5	ST1201A	3.5	1.625×4×5.75	9	15	AT	RLL	150,000	$699
	177.8	ST1201E	3.5	1.625×4×5.75	9	15	ESDI	RLL	150,000	$899
	183	ST2209N	5.25	1.625×5.75×8	3	18	SCSI	ZBR	100,000	$939
	183	ST2209NM	5.25	1.625×5.75×8	3	18	SCSI	ZBR	100,000	n/a
	183	ST2209NV	5.25	1.625×5.75×8	3	18	SCSI	ZBR	100,000	n/a
	204.2	ST1239N	3.5	1.625×4×5.75	9	15	SCSI	RLL	150,000	$775
	210.7	ST1239A	3.5	1.625×4×5.75	9	15	AT	RLL	150,000	$859
	241	ST2774A	5.25	1.625×5.75×8	5	16	AT	RLL	100,000	n/a
	307	ST4350N	5.25	3.25×5.75×8	9	16.5	SCSI	ZBR	100,000	$1,249
	307	ST4350NM	5.25	3.25×5.75×8	9	17.5	SCSI	ZBR	100,000	n/a
	337	ST2383N	5.25	1.625×5.75×8	7	14	SCSI	ZBR	100,000	$1,289
	337	ST2383NM	5.25	1.625×5.75×8	7	14	SCSI	ZBR	100,000	n/a
	338	ST2383A	5.25	1.625×5.75×8	7	16	AT	RLL	100,000	$1,295
	338	ST2383E	5.25	1.625×5.75×8	7	16	ESDI	RLL	100,000	$1,289
	338	ST4383E	5.25	3.25×5.75×8	13	18	ESDI	RLL	100,000	$1,295
	338	ST4384E	5.25	3.25×5.75×8	15	14.5	ESDI	RLL	100,000	$1,359
	357	ST4385N	5.25	3.25×5.75×8	15	10.7	SCSI	ZBR	100,000	$1,499
	357	ST4385NM	5.25	3.25×5.75×8	15	10.7	SCSI	ZBR	100,000	n/a
	357	ST4385NV	5.25	3.25×5.75×8	15	10.7	SCSI	ZBR	100,000	n/a

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HTDK8

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Seagate	380	ST4442E	5.25	3.25×5.75×8	15	16.5	ESDI	RLL	100,000	$1,469
	442	ST2502N	5.25	1.625×5.75×8	7	16	SCSI	ZBR	100,000	$1,749
	442	ST2502NM	5.25	1.625×5.75×8	7	16	SCSI	ZBR	100,000	n/a
	442	ST2502NV	5.25	1.625×5.75×8	7	16	SCSI	ZBR	100,000	n/a
	462	ST1480A	3.5	1.625×4×5.75	9	14	AT	ZBR	150,000	n/a
	613	ST4702N	5.25	3.25×5.75×8	15	16.5	SCSI	ZBR	100,000	$1,795
	613	ST4702NM	5.25	3.25×5.75×8	15	16.5	SCSI	ZBR	100,000	n/a
	676	ST4766E	5.25	3.25×5.75×8	15	15.5	ESDI	RLL	150,000	$1,895
	676	ST4766N	5.25	3.25×5.75×8	15	15.5	SCSI	RLL	150,000	$1,995
	676	ST4766NM	5.25	3.25×5.75×8	15	15.5	SCSI	RLL	150,000	$1,995
	676	ST4766NV	5.25	3.25×5.75×8	15	15.5	SCSI	RLL	150,000	n/a
	676	ST4767E	5.25	3.25×5.75×8	15	11.9	ESDI	RLL	150,000	n/a
	676	ST4767N	5.25	3.25×5.75×8	15	11.9	SCSI-2	RLL	150,000	$2,179
	676	ST4767NM	5.25	3.25×5.75×8	15	11.9	SCSI-2	RLL	150,000	n/a
	676	ST4767NV	5.25	3.25×5.75×8	15	11.9	SCSI-2	RLL	150,000	n/a
	691	ST4769E	5.25	3.25×5.75×8	15	12.9	ESDI	RLL	150,000	n/a
	1050	ST41200N	5.25	3.25×5.75×8	15	15	SCSI	ZBR	150,000	$2,695
	1050	ST41200NM	5.25	3.25×5.75×8	15	15	SCSI	ZBR	150,000	n/a
	1050	ST41200NV	5.25	3.25×5.75×8	15	15	SCSI	ZBR	150,000	n/a
	1352	ST41520N	5.25	3.25×5.75×9.9	1	11.5	SCSI-2	ZBR	150,000	n/a
	1352	ST41600N	5.25	3.25×5.75×8	1	11.5	SCSI-2	ZBR	150,000	n/a
	1420	ST41650N	5.25	3.25×5.75×8	15	15	SCSI-2	ZBR	150,000	n/a
	1420	ST41650ND	5.25	3.25×5.75×8	15	15	SCSI-2	ZBR	150,000	n/a
	2100	ST42400N	5.25	3.25×5.75×8	1	11	SCSI-2	ZBR	150,000	n/a
Teac America	105.02	SD-3105	3.5	1×4×5.75	4	19	AT/SCSI	RLL	30,000	n/a
Toshiba	106	MK234FB	3.5	1.625×4×5.75	7	25	SCSI	RLL	30,000	n/a
	107	MK234FC	3.5	1.625×4×5.75	n/a	16	AT	RLL	30,000	$479
	107	MK1034FC	3.5	1×4×5.75	4	16	AT	RLL	40,000	n/a
	675	MK350FB	5.25	3.25×5.75×8	15	16	ESDI/SCSI	RLL	30,000	n/a
	765	MK350FA	5.25	3.25×5.75×8	15	16	ESDI	RLL	30,000	n/a
Western Digital	209.8	WDSP4200	3.5	1.625×4×5.75	8	16	SCSI	RLL	86,587	n/a
	212	WDAP4200	3.5	1.625×4×5.75	8	16	AT/SCSI	RLL	50,000	$775
	320	WDSC8320	3.5	1.625×4×5.75	15	12.5	SCSI	RLL	150,000	n/a
	400	WDSC8400	3.5	1.625×4×5.75	14	11.5	SCSI	RLL	150,000	n/a

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PROGRAMMING POWER

TOM CAMPBELL

I've seen so much hype the last few years that I've been skeptical of some innovations that were actually worthwhile. If you're the same way, you might be wondering whether you should learn C++.

This month I'll try to illustrate why C++ lives up to all its publicity. I think it's well worth your time to learn, and I'll show you some of its new features. I'll finish by explaining when you *shouldn't* use C++.

What's New?

C++ is a highly compatible superset of ANSI C. In fact, many of ANSI C's features came from C++, which itself is now the subject of an ANSI standardization effort. Void, const, and function prototypes are three such examples.

Void lets you create generic pointers, a cleaner and semantically more acceptable solution than using char *, and it lets you create functions that don't return a value—just like a procedure in Pascal.

Const tags variables so that optimizers won't remove them improperly. Function prototypes, like the FORWARD of Pascal or the DECLARE of *QuickBASIC*, assure that functions use the correct type and number of parameters. Optional in C, they're required in C++.

Object Lessons

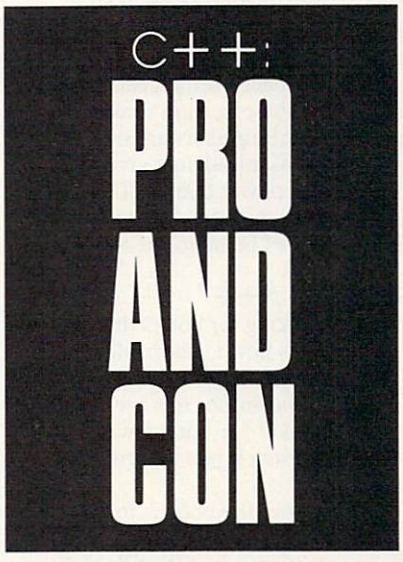
The most important additions to standard C are object orientation and operator overloading. Objects are like structures that can include functions; more important, their traits can be inherited by other objects.

Objects are difficult to design and can't be hacked quickly (because bad object design can ruin a program long before you know it), but they make program maintenance an order of magnitude easier.

I don't believe, as many do, that objects alone speed development time, although I believe that a beginner taught correct C++ would make far fewer mistakes than a beginner taught C.

But objects do speed maintenance time, because you can combine them with operator overloading to make your code conform more closely to what it's actually doing.

Operator overloading means that most operators, such as +, >>, and ==, can be redefined to operate on user-defined data types. For example, FORTRAN can deal with complex numbers, but C can't.



In C, you'd create a structure called *complex* and a number of functions to operate on them—multiply, divide, and so on. To add two complex numbers, you'd create a function called add( ), and invoke it like this:

```
complex c1, c2;
...
add(c1, c2);
```

In C++, you can add complex numbers to the repetoire of + and do this:

```
complex c1, c2;
...
// The plus operator now works on
   complex numbers.
// Note that single-line comments can
   start with "//"
// and don't need to be terminated.
c1 = c1 + c2;
```

The cout class, which works much more like BASIC's PRINT than C's printf( ), uses the << operator. Objects plus operator overloading mean that you can create, say, a records-and-fields object called *Datum*, and then inherit its qualities in a CustomerRecord object, overload the << operator for displaying records, and wind up with this code:

```
CustomerRecord NewRecord;
...
cout << "New customer: \n" <<
   CustomerRecord;
```

If this is hard to understand, translate it to C. Imagine being able to do this in C:

```
CustomerRecord NewRecord;
...
printf("New customer: \n %z",
   CustomerRecord);
```

where %z is an imaginary print specification for values of type CustomerRecord, which could contain numeric, text, or binary values.

Avoiding the Routine

One of my favorite additions to C is call by reference—like Pascal's VAR or QuickBASIC's parenthesized SUB parameters. It makes program maintenance a zillion times easier by eliminating the need for those pesky indirection operators.

Here's a trivial example that squares a number. Note that it changes the value of *a* without making you call the routine with &a and without requiring tons of *a indirections within the function. This single-handedly removes one of C's most difficult-to-learn and worst-conceived traits.

```
#include <iostream.h>
// The & gives C call by reference.
void Square(int &Value)
{
  // Just square it. The "&" lets this
```

```
  look more natural.
  Value = Value * Value;
}

void main( )
{
  // Request a number.
  cout << "Enter an integer. ";
  // Allocate a variable for it.
  int a;
  // Get it from the keyboard.
  cin >> a;
  // Square it. Notice no "&".
  Square(a);
  // Display its value.
  cout << "Squared, it's " << a;
}
```

I/O in the Stream

If you're a C programmer, you probably use the line *#include <stdio.h>* routinely, not even thinking twice. When you program in C++, you have to think twice.

Stdio.h has been superseded by iostream.h, which supplements the concepts of standard input and standard output considerably, refining greatly the concept of streams that began with C. (Note here that you can easily distinguish current from outdated texts by their use of stream.h, the predecessor to iostream used in C++ before version 2.)

Iostream.h is as great an improvement on stdio.h as C's elegant file I/O was on everything that preceded it. In fact, some of it is actually as powerful as . . . BASIC.

I've often complained that C, with the advantage of a decade's hindsight, made you jump through hoops just to print common values. C++ goes BASIC one better by offering all the flexibility of PRINT and PRINT USING with the ability to customize their behavior completely.

Here's an example. The user is prompted for an integer. After it's been entered at the keyboard, the value is displayed in both decimal and hex, embedded in a message.

```
#include <iostream.h>
void main( )
{
  cout << "Please enter an integer. ";
  // Note declaration occurring after
    executable code.
  int Num;
  // Accept the number from the
    keyboard.
  cin >> Num;
  // Display it in decimal and hex.
  cout << "That number is " << Num
    << " decimal, and " << hex <<
    Num << " hex.";
}
```

Notice how Num is declared right where it's needed, whereas C requires declarations to appear before executable code. More interesting is hex, which is called a *manipulator.*

Manipulators affect the behavior of a stream. In this case, the default appearance of numbers in decimal form is neatly overidden, and the numbers are displayed as hex values instead.

Built-in manipulators include dec and oct; setw, which sets a default width for output values; fill, which lets you set the fill character (which is normally a space); setprecision, which determines the precision to which floating-point numbers are displayed; and others. Manipulators give you even greater power than PRINT USING with the bonus that you can alter the preset behavior of streams.

Getting an A++

If you're looking for books that teach C++, here's how to shop effectively. Try to get some sense from the book jacket that the author has been programming in C++ for a few years and didn't learn it just to write the book.

Make sure the book is for version 2.0 or 2.1 and not for earlier versions. Make sure it covers at least the following topics: operator overloading, function overloading, memory management (including new, delete, _new_ handler, and set_new_handler), the this pointer, references, inheritance and multiple inheritance, and the iostream class. All of these are medium- or advanced-level topics, but they form a kernel of knowledge no C++ programmer should be without.

I can vouch for a couple of entries in this already-crowded market.

Teach Yourself . . . C++ by Al Stevens (MIS Press, P.O. Box 30135, Salt Lake City, Utah 84139; 800-247-3912; $29.95) is well written, fairly free of typos, and obviously written by a C++ stud.

Another surprisingly good treatise is the Borland C++ tutorial (*Borland C++*, Borland International, 1800 Green Hills Road, Scotts Valley, California 95066-0001; 408-438-8400; $495), a near book-length introduction that does an excellent job of covering the fundamentals. Both come with the example code on disk, and both require that you be reasonably familiar with C before starting.

When to Avoid C++

Now it's time to gaze at the dark side of the force—when to avoid C++. First, plan for your next several projects to take much longer to code than they would in C.

Designing maintainable, extensible classes takes a very long time. So does learning *when* to apply new programming paradigms. Just knowing the features of C++ doesn't mean you know when to put them to work. However, maintaining your code will be a lot easier.

Second, bear in mind that moving your code to non-PC systems may be impossible. C++ has not been in widespread use for long. That means you may end up paying to beta test for the next implementation you use—without volunteering.

It's difficult enough to find ANSI C implementations on some systems; many administrators don't even know what C++ is.

Third and last, note that C++ isn't as standardized as ANSI C. While the ANSI C standard library must be included for an implementation to call itself ANSI, C++ is too new for that.

Each implementation of C++ tends to come with a library that includes linked lists, bags, queues, collections, and trees. But none of these is required, so plan to do a lot of wheel-inventing for the time being.

While I've tried to get across some of the best features of C++, I've barely scratched the surface.

If you want to find a good job programming in C, or if you have a big project coming up and are deciding on an implementation language, you should use C++.

It makes software easier to maintain (if the maintainer knows C++!), makes your code look more like your algorithms (finally—your code can match a line of pseudocode like "Print value," where value isn't a scalar type), and knowing it makes you a more desirable employment prospect. ⊡

HINTS AND TIPS FROM OUR READERS

In the February issue of *COMPUTE,* Caroline Hanlon stressed the importance of saving your system setup in case of later problems. She suggested writing the system setup information on a 3 × 5 card. This is fine, but there is a better method of saving your system setup information.

Below are two BASIC programs that save and restore the system setup information. To run the save program, type BASIC or GWBASIC SAVECMOS. When you run SAVE CMOS.BAS, the system setup information is saved to a file called CMOS.RAM. Since you won't be able to boot from your hard drive if the system setup is trashed, you should copy the programs, the CMOS.RAM file, and BASIC to a floppy disk formatted with the /s option to make the disk bootable. To restore the system information, boot from the floppy, and enter BASIC or GWBASIC RESTCMOS.

SAVECMOS.BAS

```
10 DEFINT A-Z:DIM CMOS(63)
20 FOR I=1 TO 63:OUT 112,I
30 CMOS(I) = NP(113):NEXT I
40 OPEN "CMOS.RAM" FOR
   OUTPUT AS #1
50 FOR I = 1 TO 63:WRITE #1,
   CMOS(I)
60 NEXT I
70 CLOSE #1:SYSTEM
```

RESTCMOS.BAS

```
10 DEFINT A-Z:DIM CMOS(63)
20 OPEN "CMOS.RAM" FOR INPUT
   AS #1
30 FOR I=1 TO 63:INPUT #1, CMOS(I)
40 NEXT I:CLOSE #1
50 FOR I = 1 TO 63:OUT 112, I
60 OUT 113, CMOS(I):NEXT I
70 SYSTEM
```

You'll need to enter your setup to correct the date and time information, but all the other information should be correct. If you use DOS 3.3 or higher, use the DATE and TIME commands instead of running setup. These commands change the date and time in CMOS for you.

Vincent O'Connor
Babbitt, MN

Cheap Format

I've recently discovered a way to low-level format my hard drive without buying an expensive low-level formatting program. Owners of IBM PS/2s can use this undocumented tool.

Make a backup of your hard drive. Insert the IBM Personal System/2 Reference disk in drive A and turn on the computer. When the menu appears, press Ctrl-A. You'll see the undocumented advanced menu. Here you can either run an advanced and more rigorous check of your computer or low-level format the hard drive.

Jason Shultz
Harrison, AR

Windows 3.0 Swapfile

Windows 3.0 running in 386 enhanced mode can make use of virtual memory, a process whereby *Windows* can handle a *memory full* condition by swapping data temporarily out to disk. If you want to run 3MB worth of programs but only have 2.5MB of RAM free, no problem. *Windows* in the 386 enhanced mode can send .5MB to disk temporarily, using the disk as if it were memory. This is a good bargain because disk space is less expensive than RAM, but its Achilles heel is speed. It can be quite slow.

One way to speed up virtual memory is to preallocate space on disk as a permanent file for this swapping process. That way, you save the file setup and breakdown time, and the file can be contiguous, making access faster.

That's what the *Windows* program SWAPFILE does; it sizes and allocates a permanent swapfile. It's discussed in the back of the *Windows* manual, so most people have never created a swapfile, even if they're running *Windows* on a 386.

SWAPFILE.EXE is located in the C:\WINDOWS\SYSTEM subdirectory. You'll only run the program once, in order to create the file. When you do run SWAPFILE, it must be run under *Windows* in real mode, so run it from the command line.

```
WIN /r C:\WINDOWS\SYSTEM
   \SWAPFILE.EXE
```

Follow the prompts. It's worth taking the few minutes to create a swap file. You'll see the improvement in performance when running memory-hungry programs.

Mark Minasi
Arlington, VA

Dump *dBase IV* Logo

For *dBase IV* developers and users, if you are sick of seeing the *dBase IV* logo every time you run the program, add the /T toggle switch to the command line. DBA /T will eliminate the *dBase* logo.

Jim Reece
Tucson, AZ

Shrinking a BASIC EXE

Here are some notes on how to trim down and speed up your compiled BASIC programs. These are all brute-force but often highly effective techniques that don't require a huge amount of brainpower.

Avoid ON statements and background music. Any ON statement slows down the program significantly because its condition must be checked after each statement executes. On the other hand, ON statements provide unparalleled ease of use and predate event-driven languages by a decade.

Use DEFINT and integer variables. By default, BASIC uses real numbers for its variables—numbers with an exponent and decimal point. If you can keep your calculations to integer values, they'll speed up immensely. This really shows up in games, where moving objects around the screen and figuring out their locations represent a huge investment of computer time.

Use *PowerBASIC*'s smart linking. *PowerBASIC* lets you trim out great chunks of your program with its smart

linking. This lets you jettison the parts of the runtime library your program doesn't use, giving you the option to remove things like communications code, screen drivers for graphics, and so on. This can cut a 50K program in half.

Some speed-up tricks that work with GW-BASIC won't work at all in the compiled versions. Taking out REMs won't help because they never make it into the compiled version anyway, but they do cost in interpreted BASIC. Putting often-used GOTO labels at the top of the program will speed up a GW-BASIC program because any GOTO causes the interpreter to rewind the program and search line numbers starting from the very first one. On the other hand, any GOTO, regardless of its location, compiles to a single machine instruction in compiled BASIC, and the target location doesn't matter. Finally, reducing the lengths of variable names—a useful and speed-improving trick in GW-BASIC—means nothing in compiled BASIC because the variable names are converted to addresses and thrown out at compile time. Like REM statements, they cease to be an issue when compiled.

Tom Campbell
Irvine, CA

Large File Copy

Have you ever come across a file too large to fit on a single floppy disk? Sometimes even compressing a file doesn't help, especially database files. There's a way to split a file and place the parts on separate floppies. Later the file can be restored to the original file. DOS provides this easy solution if you don't have a program that's specifically written to handle the problem. You can use the DOS BACKUP command by entering the following:

BACKUP *source drive: \path \ filename destination drive: \path*

Follow the instructions displayed on the screen. When you're ready to reassemble your file, use the DOS RESTORE command.

RESTORE *destination drive: source drive:*

Both BACKUP and RESTORE are external DOS commands. This means that the files BACKUP.EXE and RESTORE.EXE must be available to the system at execution time. The files must be located in the current directory, in a directory listed in your PATH statement in your AUTOEXEC.BAT file, or on a disk in the current drive. Be careful using this method between different computers, though. Some files that have been backed up with one version of DOS refuse to be restored under another version of DOS. Try it out with an unimportant file first.

Andy Lin
West Hills, CA

Batch Shortcut

I've created a batch file that allows me to change to any directory on my hard drive with a minimum of keystrokes. I also included the DIR command so that when I change to a directory, a directory listing of specified files is displayed. This command line parameter is optional. The batch filename is G.BAT, and the syntax for its use is as follows:

G *directory abbreviation* [*file spec*]

```
ECHO OFF
IF " " == "%1" GOTO HELP
IF L == %1 GOTO LOTUS
IF l == %1 GOTO LOTUS
IF W == %1 GOTO WP
IF w == %1 GOTO WP
IF D == %1 GOTO DBASE
IF d == %1 GOTO DBASE
:HELP
ECHO You must enter a directory abbreviation.
ECHO Syntax: G directory abbreviation [file spec]
GOTO END
:LOTUS
C:
CD \LOTUS
GOTO DIRECTORY
:WP
C:
CD \WORD
GOTO DIRECTORY
:DBASE
C:
CD \DBASE
:DIRECTORY
IF " " == "%2" GOTO END
DIR /P %2
:END
```

You should change the batch file to match the directories on your hard drive. Using a batch file such as this one can save lots of environment space, especially if your hard drive is filled with a lot of directories. You don't have to list the directories in this file in your PATH statement.

John Norris
Pasadena, TX

Mouse Hot Seat

If your optical mouse doesn't work properly sometimes and your computer is located in a sunny room, the problem may be direct sunlight falling on the mouse.

Optical mice keep track of movement by shining an LED at a receptor through a notched disk that moves when the mouse is moved. Other sources of light can confuse the sensor into thinking that the mouse isn't moving at all because the light isn't interrupted, a condition which the mouse interprets as movement.

In ambient light, the mouse's cover is usually enough to prevent unwanted light from reaching the sensor, but direct sunlight can be strong enough to shine through the case, particularly if it's white plastic. (I have experienced this problem with a mouse manufactured by Kraft, which has been perfect otherwise.)

The obvious solution is to move your mouse out of the sun or hold the mouse so your hand completely covers it. If you like your computer where it is and like the way you hold your mouse, it's a simple matter to remove the mouse cover and either cover the inside with electrical tape or paint the inside black. It shouldn't be necessary to completely cover the inside with tape or paint—just a little darkening over the ball should do the trick.

It may be something to try if you have a mouse which seems to work perfectly at night but poorly during the brightest parts of the day.

Michael Stowe
Yellow Springs, OH

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 PC Hot Tips, 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. ⊡

PC DISK UPDATE

JOYCE SIDES

For those of you who couldn't read the documentation file for *ASIC* (February 1991) from *CMOS*, install *ASIC* and then use *TurboTYPE* (located on the April disk as T.EXE) to read the documentation file. Enter T *drive:\path*ASIC .DOC at the DOS prompt to read the file. Make sure T.EXE is on the disk in the current drive or directory when you run the program.

CMOS Windows?

We've been tossing around the idea here at *COMPUTE* of enhancing *CMOS (COMPUTE's Menu Operating System)*. We'd like to know what you think about a *Windows* 3.0 version.

The program would still work on nongraphics systems, but there would be a version that would have the look and feel of *Windows* graphics with buttons and scroll bars. Drop us a line to let us know what you think.

Off Track

If you get the error message *Advanced feature unavailable in line no line in module DSKTRK 45 at address 0654:44DC* when you run *DISKTRAK* (December 1990), you probably have an early version of DOS that's incompatible with the program. *DISKTRAK* works with DOS versions 3.0 or higher. If you get this message, you'll want to check the DOS version you're using. To do this, enter VER command at the DOS prompt.

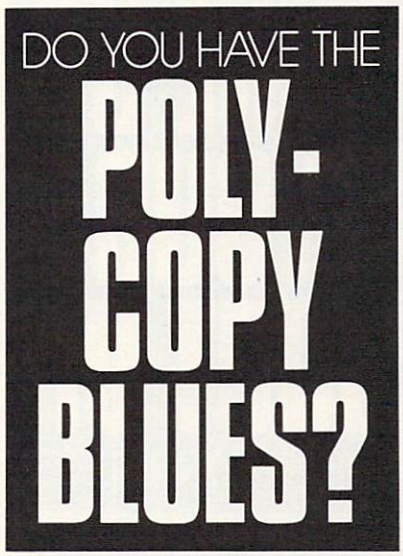
On Track

The author of *DISKTRAK*, Birk Binnard, has a new version of the program. The version published on the December 1990 *COMPUTE's PC Disk* was version 4.50. The new version is 5.10 and can be downloaded from CompuServe in area 6 of the IBM Utilities forum. The filename is DSKTRK51.ZIP.

If you don't have a CompuServe account, send a formatted disk plus $0.50 for postage in a reusable disk mailer, and Mr. Binnard will send you a shareware copy of the new version.

If you've already registered the program, send $5 to cover the cost of the disk, disk mailer, and postage. If you haven't registered but would like to, send $15 to register the program and receive the new version. Send your order to Peninsula Software, 28510 Blythewood Drive, Palos Verdes, California 90274.

The new version of *DISKTRAK* includes PATH support, a Restore function, enhanced comment editing, new printer controls, increased window size for Delete and Restore functions, and bug corrections.



Poly-no-*Copy*

After I received phone calls from several readers about a problem with *PolyCopy* (February 1991), I called Joseph Albanese, the author of the program. Some users complained of getting the message *Drive A not supported* when they ran the program.

Mr. Albanese said that he was aware of problems with *PolyCopy* running on the PS/2 Model 50z, the PS/2 Model 70/25 MHz, and also DTK machines.

He's working on the solution. If you've had trouble with the program, please contact Mr. Albanese and give him any pertinent information about your computer system such as the type and brand of computer, the version of DOS, and BIOS. Send inquiries to Joseph M. Albanese, P.O. Box 1157, Bassett, Virginia 24055. You can also contact him through his BBS at (703) 666-9535.

Mis-*CALC*-ulation

COMPUTECalc (February 1991) may not work on some Tandy computers. The program works in DOS 3.0 or higher, not on DOS 2.1 or higher as stated in the magazine and in *CMOS*.

The program may also not work with any mouse that is not 100-percent Microsoft compatible, such as a Genius mouse. However, you can still use the keyboard with the calculator, or you can install the mouse in Microsoft-compatible mode by pressing both mouse buttons when the computer boots. A Microsoft message should appear when the mouse driver loads.

Unfortunately, the Genius mouse isn't completely Microsoft compatible, so even this trick may not work, but it's certainly worth a try.

Sweet Memory

Sometimes the Run option is offered in *CMOS* for a program, but when you run it, you get a beep and an error message that says *Out of Memory*.

If this happens to you, exit the menu to DOS and rerun *CMOS*. Some programs don't release memory after they've run, so when the program returns to *CMOS* and you try to run another program, the memory isn't available.

You can install the program and run it from DOS without problems.

PATHs to Ponder

Make sure that you change the PATH to the correct directory when you run *AC Hunter* (February 1991). The PATH option is displayed on the opening menu when you first run the program. If you run it from drive A, enter A:\ when the program prompts you for the correct PATH. ⊡

TUNE UP YOUR BOOT UP WITH CONFIG.SYS

TONY ROBERTS

A properly tuned CONFIG.SYS helps your system run smoothly. With CONFIG.SYS out of balance, however, you'll waste memory in the best case, or have trouble running some programs in the worst case.

Many users avoid CONFIG.SYS except when directed by software installation procedures to make some change, usually to the BUFFERS or FILES commands. These suggestions are designed to ensure that the new software works properly under the heaviest imaginable load. If you don't push your software to its absolute limit, you may be able to scale back these settings.

Although the memory you can save by judiciously refining CONFIG .SYS commands amounts to only a few thousand bytes, this is sometimes enough to allow the coexistence of memory-resident utilities and programs that otherwise seem incompatible.

The FILES command specifies the maximum number of files that can be open at any one time. Although it may appear that very few files are open, there's more going on than meets the eye. If you start your word processing program with a batch file, for example, the batch file is open, the word processing program is open, the file you are editing is open, and other auxiliary files such as printer drivers or spelling dictionaries may be open.

DOS uses 64 bytes of memory to track the status of each open file. It sets aside this block of memory based on the FILES statement in CONFIG .SYS. If you specify FILES=20, DOS reserves 1280 bytes regardless of how many files are actually open.

If the FILES allocation is too small, DOS alerts you with a *Too many files open* message when it runs out of slots in which to track files.

To find the optimum setting for FILES, gradually reduce the number of files specified in CONFIG.SYS and then run your usual software until you encounter errors. Then raise the FILES setting a little so you can operate error free.

BUFFERS, at 512 bytes each, are much more memory-hungry than FILES. A buffer is a block of memory used in the exchange of information between programs and disks.

When data is needed from the disk, a disk sector is read, and the information is placed in a buffer where the program can access it. Although the program often requires fewer bytes than the entire 512 bytes the sector holds, the extra information is kept in the buffer in case the program asks for it later.

When the application makes its next request for disk access, the buffers are checked to see if the appropriate data is there. If so, the data can be accessed immediately without requiring a slow disk-read operation.

The most recently read disk data is kept in the buffers, and once all buffers are full, the oldest data is discarded to make way for new information.

When too few buffers are specified in CONFIG.SYS, the system will be slowed by extra disk accesses. If too many buffers are allocated, the system loses time churning through them before going to the disk.

Finding the proper number of BUFFERS is largely a matter of feel. With too few buffers open, your machine will perform sluggishly, but you may not need as many buffers as some software instructions suggest. This is especially true if you use disk caching.

A disk cache is a more sophisticated buffering system that manages a much larger amount of memory, often extended or expanded memory. Some disk caches work in conventional memory.

In addition to storing sectors already requested by the application program, caches commonly perform look-ahead buffering. In this scheme, the cache reads the requested sector plus the next few sectors on the assumption that those sectors will be sought soon.

Caching programs also make intelligent decisions about what data to keep in memory. A well-executed cache not only keeps the most recently accessed information but also the most frequently used.

One other bit of tuning that helps speed up disk access is the FASTOPEN command that came into being with DOS 3.3.

FASTOPEN creates a directory cache that speeds up DOS's file-opening operations. The command, which is usually executed in the AUTOEXEC.BAT file, has a slightly different syntax in DOS 3.3 and DOS 4.01.

In DOS 3.3, FASTOPEN C:=100 sets up a 100-entry directory cache for disk drive C. In DOS 4.01, FASTOPEN C:=(100,) accomplishes the same result. FASTOPEN only works with hard disks.

Whenever a file opening is requested, DOS searches the directory path until it locates that file. If FASTOPEN is running, the file's location on the disk is recorded in the FASTOPEN cache. If a subsequent request for that file is made, DOS can quickly look up its location in the FASTOPEN cache rather than having to read through all the files in all the directories on the directory path. ⊡

HARDWARE CLINIC

MARK MINASI

WHAT TO DO WHEN THE LIGHTS GO OUT

Last month, I talked about power protection and some lower-cost power-protection devices. This month, I'll finish the topic with a discussion of battery-backup devices.

In addition to protection from short power irregularities, you may need backup power. I've lived in a number of places in the northeastern United States where summer lightning storms will kill the power for just a second—enough to erase your memory and make the digital clocks blink. Unlike the devices I discussed last month, no transformer or MOV (Metal Oxide Varistor) can help you here. You need something that has a built-in battery, something with enough power to carry you through until the juice comes back on, or at least with enough power to allow you to gracefully exit your applications and shut off your computer. To that end, there are two kinds of devices in this category: SPSs (Standby Power Supplies) and UPSs (Uninterruptible Power Supplies). Both use batteries, but there's a fundamental difference between the ways they use them.

Not to Worry?

"Hang on a minute," I hear you cry. "Who needs a UPS? Isn't that overkill?" Actually, I'd say *No.*

Here's the bad news: Electrical power is getting worse in the United States. Nobody wants a power plant in his or her backyard, coal-burning plants cause acid rain, nukes scare just about everybody, and wind/tide/geothermal/you-name-it alternative sources of energy aren't really going anywhere. We're not building new sources of electricity, but we're continuing to create new drains on the country's power network. Power demand continues to grow, while electrical generation capacity grows much more slowly. The net result is that we're going to see more brownouts, blackouts, spikes, and surges throughout the 1990s.

The good news? Uh . . . there isn't any. The world is changing. Expect power in our country to take on a distinctly Third World look. (How do I know? I was a senior economist with a national laboratory working for the United States Department of Energy for several years in the early 1980s.) From your PC's point of view, electrical power is like air—it soon dies without it, and dirty power makes it sick. That could mean permanent hardware damage, data loss, or momentary misreads.

This all seems strange and counterintuitive because power in the 1980s was fairly clean and reliable, leading to the common wisdom that you just plug your PC into the wall and it'll go. Also, most household appliances are fairly robust about the kind of power they'll accept: Plug a toaster in just about anywhere, and it works fine. A new consensus will develop by the mid 1990s that everyone needs power protection.

UPS and Downs

Your backup options are standby power supplies (SPSs) and uninterruptible power supplies (UPSs). They use fundamentally different approaches to solving power problems. SPSs charge the batteries while watching the current level. (See Figure 1.) While utility power is normal, the SPS is fairly irrelevant, letting spikes, surges, and low voltage pass right through to your PC. A few SPSs have MOVs—the kamikaze components in surge protectors that I discussed last month—but, in general, they do nothing except when the power disappears altogether.

If the power drops, the SPS activates itself and supplies power until its batteries run down. (See Figure 2.) Note well that a *fast* power switch must occur here, and it's important to find out what the switching time is. Four ms or under is fine. In my experience, 14 ms isn't fast enough.

A UPS constantly runs power from the line current to a battery, then from the battery to the PC. (See Figure 3.) This is superior to an SPS because there's no switching time involved. Also, this means that any surges affect the battery-charging mechanism, not the computer. A UPS is, then, a surge suppressor as well.

A UPS or SPS has to convert the battery's DC current to the AC current that your PC requires. AC is supposed to look like a sine wave. Cheaper UPS and SPS models produce square waves. (See Figure 4.) Square waves are bad because they include high-frequency noise which can hamper your computer's operation. Worse, some peripherals (printers in particular) can't handle square-wave AC; their power supplies burn up. So, when examining UPSs, ask whether they use square wave or sine wave.

A sine-wave UPS is the only way to really eliminate most power problems. The reason everyone doesn't have one is cost; a good one costs over $1,000, like the excellent Minuteman systems from Para Systems (sine-wave MM500/1 UPS—$1,399, AT300 SPS—$339; 1455 LeMay Drive, Carrollton, Texas 75007; 800-238-7272).

Plan B

A decent compromise can be found in a fast (4 ms) square-wave SPS. I know I said square waves are bad for your peripherals, but consider this: How often will the SPS actually be providing power? Not very often—remember that it only supplies power when the line voltage drops out, which is probably not a common occurrence. ▷

The brief minute or two each month of square-wave power that your peripherals end up getting won't kill them. And you'll save a pile of money over a UPS.

On the other hand, remember that a UPS is always online and so must produce sine-wave output, but UPSs have the benefit of providing surge protection by breaking down and reassembling the power. SPSs don't provide this protection; you still have to worry about surge protection when you buy an SPS, but not if you buy a UPS. So make the choice that your budget allows.

Or you might buy a unique product, called the InnerSource, from PC Power and Cooling Systems (31510 Mountain Way, Bonsall, California 92003; 619-723-9513). The InnerSource replaces your current power supply with a combination power supply and UPS. It's a nifty device—it takes no more space than the power supply that's already in your PC and provides 10 to 15 minutes of backup power. (It also includes a connector to power your monitor.) You get low-voltage protection, surge and spike protection, and blackout insurance—all for $395. This isn't a bad deal (as I said last month, a decent power conditioner would cost $200, and this does a lot more). And while this sounds like a unique idea, every single battery-powered laptop incorporates a similar system—so I suppose you could buy only laptops as a means of combatting power problems. To summarize:

- If it's an SPS, it must switch in 4 ms or less.
- If it's an SPS, square-wave output is acceptable.
- If it's a UPS, it *must* have sine-wave output.

Figure 1: SPS in charging mode

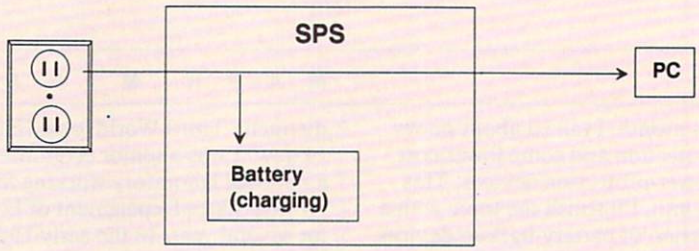


Figure 2: SPS in discharging mode

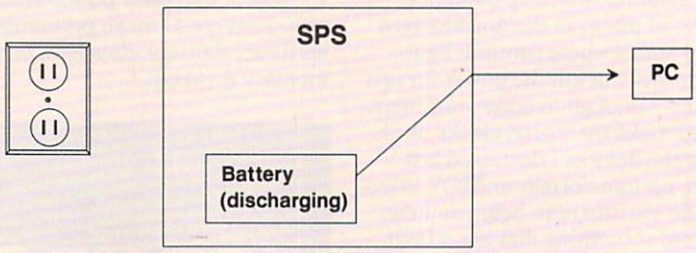


Figure 3: UPS operation

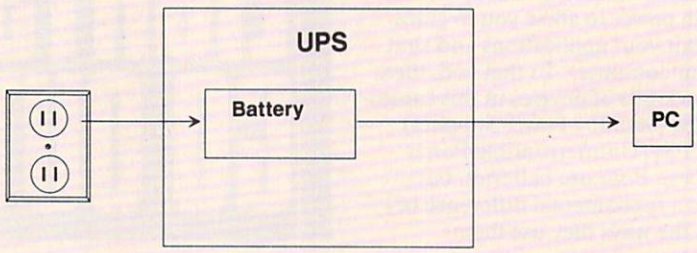
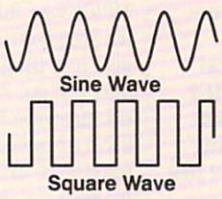


Figure 4: AC waveforms



Power of Misinformation

Shopping for a UPS can be a real education—not in power-protection devices, but in misinformation. You'd think Saddam Hussein's public-relations minister wrote some of the UPS brochures I've seen. One story in particular really highlights what I mean.

A few years ago, a power-protection company—I won't mention any names—ran some full-page ads claiming to have *the* answer to low-cost power protection: a $200–$300 UPS. Wow, I thought, and called them up to find out more. I was directed to a regional distributor, who took my call and did his best to answer my questions.

"This sounds like a terrific deal on a UPS," I said. "Does it produce sine-wave output or square-wave output?"

"I'm afraid the information I have doesn't include the answer to your question," the distributor's technical manager replied. He didn't have the answers to a lot of other questions, so I started smelling a rat.

So I ventured, "How about the switching time? What's the switching time?"

He perked up, pleased to have the answer to a question. "Four milliseconds," he proudly answered. I replied that he wasn't selling a UPS, but an SPS. His answer? "Oh, you mean it's not an online UPS. Yeah, that's true. It's not an online UPS." I've heard similar dodges from vendors since that conversation, so be careful when examining power-backup products. ⊡

ROBERT BIXBY

STALKING THE PERFECT WINDOWS CAPTURE PROGRAM

If you want to write a how-to guide for using a *Windows* program or if you're creating a presentation based on a *Windows* program, you'll need to make screen captures of *Windows* 3.0 screens. There are several ways to capture text and graphics on your PC, but *Windows* 3.0 presents a bit of a challenge. It's different enough from earlier versions that the *Windows* capture program you used in the past probably won't work with 3.0.

Microsoft was generous enough to provide a built-in capture system to suit your needs some of the time. This method is similar to the Shift–Command–3 combination on the Macintosh, which saves the current screen as a *MacPaint* file—although the *Windows* version isn't nearly as convenient as the Mac's.

Pressing PrintScreen while *Windows* is running saves the entire screen to the Clipboard. (To capture only the currently active window, press Alt–PrintScreen.) You can then paste the graphic into *Paintbrush* and save it as a BMP or PCX file.

This means that each time you capture a screen, you'll have to call up *Paintbrush* to deal with it, which isn't a very efficient process and will tire you out if you're making more than two or three screen dumps. Furthermore, the *Paintbrush* canvas is slightly short. It isn't tall enough to paste the entire *Windows* 3.0 screen, and you'll always end up chopping about a quarter of an inch off the bottom.

In my search for the perfect *Windows* screen capture, I discovered *Hijaak* (Inset Systems, 71 Commerce Drive, Brookfield, Connecticut 06804-3405; 800-828-8088; $199) and *Collage Plus* (Inner Media, 60 Plain Road, Hollis, New Hampshire 03049; 800-962-2949; $129), both recently released with *Windows* 3.0–friendly capture programs. *Hijaak* is primarily a graphics conversion program that's just what you need for converting Macintosh and Amiga graphics to PC format or for transferring images among PC programs. It includes a simple program for capturing screens.

I got my start capturing *Windows* screens while editing a book on *Adobe Illustrator* for the PC. The program I used then was *HotShot Graphics* (SymSoft, 924 Incline Way, Call Box 5, Incline Village, Nevada 89450; 702-832-4300; $249). To signal the *Windows* portion of the program to capture a screen, I pressed two keys. The graphic was then captured and saved to disk in the *HotShot* native format, HSG, which could then be converted to TIF or PCX. *HotShot* would even autoincrement the filename, so I'd wind up with a list of easily managed files like GRAB001.HSG, GRAB002.HSG, and so forth.

One problem I had with *HotShot* was that when it converted its native format to TIF, it was incompatible with most other programs. In order to use its output with most other programs, I had to convert it to either PCX or IMG format.

Hijaak follows a similar convention, grabbing the file at a keypress and saving it in a native format, IGF, which can then be converted to PCX or another format at the end of the session. Not only is the screen capture a convenient feature of the program, but *Hijaak* is also the best solution if you find yourself converting files frequently. It offers both a conversion environment and a quick and easy command line converter. Unfortunately, *Hijaak* lacks an autoincrementing feature. It pauses in the screen-capture process to give you the chance to enter a filename before the screen is saved to disk.

I was even more impressed with *Collage Plus.* Rather than simply hiding in the background, this program's *Windows* 3.0 capture program features an onscreen window that disappears momentarily as the screen is captured. *Collage Plus* also offers a series of options for the capture file, including color, monochrome, and dithered grays. If you choose grays, you're given the option of a fine, medium, or coarse dither, and a slide bar for indicating whether you want a lighter or darker picture. These options won my heart.

Collage Plus even provides a chart in the manual to help you decide which screen-capture format should work best for your particular application (certain dithering schemes work better for scaling operations than others).

But the best news about *Collage Plus* is that it provides a countdown. The countdown feature means you can set it to snap a picture up to 99 seconds after the command is given. Usually only five to ten seconds are required to call up the dialog box you want to illustrate, but the long pause adds immeasurably to the program's flexibility.

Collage Plus will even capture in the format you prefer, whether it's PCX, TIF, or the BMP format used by *Windows* itself, which eliminates the extra step of converting files to the format you want. *Collage Plus* also autoincrements for you, so there's virtually nothing to do with the screen capture once you've requested it.

The screen-capture utility also lets you "flip" the image or reverse colors. There's an option that will let you capture the active window rather than the whole screen, and it can display an indicator that will show you how much of the screen has been captured. ⊡

FAST FORWARD

DAVID ENGLISH

I recently attended a seminar on the future of computing at a software conference, and no one on the panel was willing to define the term *multimedia.* As with other squishy phrases *(user-friendly, ergonomically designed, all natural),* most of us have a general idea of what we're talking about when we use the terms—but don't ask us to be too precise. When the phrase *desktop publishing* was introduced in 1984, it was squishy. But as actual products flooded the market, we were able to separate the practical uses from the industry hype.

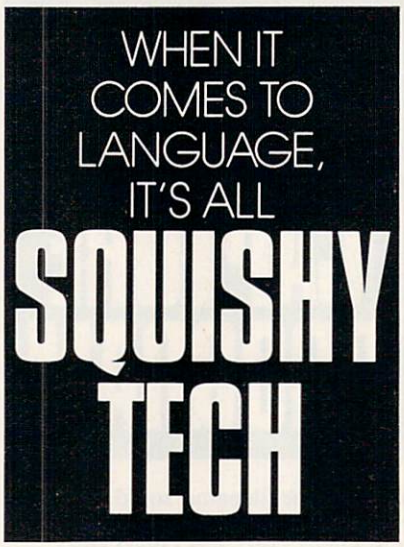
In the case of multimedia, the confusion is compounded by the fact that it isn't a market or a single application, but a group of six related technologies that have become affordable at the same time.

Three of these six technologies are extensions of past PC advances—high-resolution graphics (VGA or better), an affordable device for realistic sound (the Sound Blaster and similar sound cards), and a standard graphical user interface (*Windows* 3.0). The three other technologies are relatively new to the PC world—faster and less expensive CD-ROM players, full-motion video, and sophisticated, yet easy-to-use, authoring systems for multimedia applications.

Joined together, these six technologies form the foundation for what we know as multimedia. You don't even need all six to qualify—just about any combination of three or more will do. Let's take a brief look at these technologies and see how each has evolved.

Over the last few years, VGA has become the de facto video-card standard, especially its two high-resolution modes—320 × 200 with 256 colors, and 640 × 480 with 16 colors. In addition, *Windows* makes it easy for software companies to support even higher-resolution modes. A card manufacturer can write a single driver that will work with any present or future *Windows* program. This allows multimedia developers to use photographic-quality images in their applications and maintain a high degree of compatibility over the various high-resolution modes. We've come a long way on our journey from four-color CGA to the 16.7 million colors of the new 24-bit cards.

Sound has undergone an equally dramatic transformation. While many programs still rely on simple PC beeps, Microsoft has established a sound-card standard with *Multimedia Windows,* which allows any *Windows* application to play real sounds through your PC. As with video cards, sound-card manufacturers need to write only one driver in order to support all *Windows* programs, and software developers only have to deal with a single sound-card standard.



All of these high-resolution images and real sounds take up a lot of disk space—too much even for a hard drive. Enter CD-ROM, which can store as much as 650 megabytes on a disc. While the current crop of CD-ROM players are faster than ever, Microsoft has set an even higher standard (150K per second) for *Multimedia Windows.* These units are able to maintain their higher speeds by using a buffer to hold frequently read information. A year ago, CD-ROM players were $800–$1,000. Today, you can buy them for as little as $400.

The main reason Microsoft insisted that CD-ROM players be so fast is full-motion video. With a speedy CD-ROM player, a PC can spool images off of a CD-ROM disc fast enough to display a video sequence in a small window without any flicker (or a video in a full-screen window with only a little flicker). A multimedia program could display a person in a small window explaining the action in another window. As long as the windows aren't too large, a 150K per second CD-ROM player can handle them. All-talking, all-moving pictures (and animation) may soon be appearing on a PC near you.

Multimedia applications are only as good as the development tools that create them. Fortunately, we're seeing a bumper crop of reasonably priced authoring systems (most under *Windows*) that are both powerful and easy to use. The majority of these programs use the *HyperCard* model, allowing you to associate visual objects with programming code and literally move those objects into place with your mouse.

At this time, it looks as though the common platform for all of these technologies will be *Multimedia Windows.* With *Multimedia Windows,* you can link various applications together. For example, you could have one program grab an animation from a CD-ROM disc so that a second program could use it in a multimedia presentation. At the same time, a third program could grab the CD-ROM's MIDI data so that a fourth program (in this case, a MIDI sequencer program) could feed the musical data to a sound card and a MIDI synthesizer.

Because *Multimedia Windows* has the necessary programming hooks and standards for these technologies, it will ultimately be the means for making multimedia less squishy. Look for a steady stream of products over the next twelve months that will define what multimedia is and what it will become in the future. ⊡

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WORKPLACE

DANIEL JANAL

Do your clients know what you do and how long it takes? If they don't, they might think that you're ripping them off. And that's a message you certainly don't want to send.

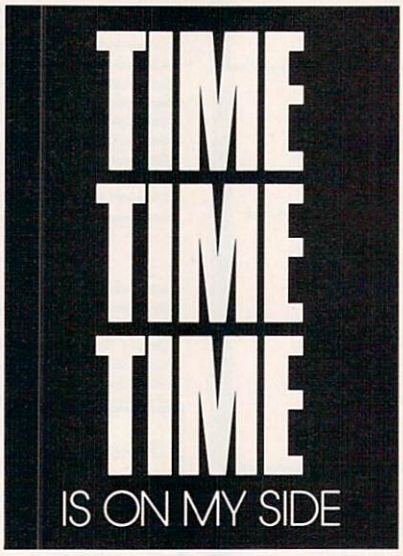
It's important for any business, at home or downtown, to keep accurate track of the time spent on projects. For me, that means looking at my watch at the beginning and end of each project and recording the time in my diary. However, when I forget to make entries (and this does happen), I must rely on estimates. Then, at the end of each month, I face another problem—adding the figures. If you've ever tried to add one hour and 25 minutes to three hours and 50 minutes, you know what I mean. Do that 20 times a month, and you'll be mired in a tedious process that can be fraught with errors.

Timeslips, a leading time-billing program, bolsters its attractiveness by claiming that 25 percent of the average person's time is not billed properly. I recently decided to take the program up on its challenge, figuring that if I won, my income would increase and my clients would get more detailed reports.

Timeslips is easy to set up. The program asks for standard logistical data, such as your name, billing rate, and activity (consulting, writing, phone calls) and your clients' names, addresses, and billing rates, among other items. This information is used to create time slips, invoices, and labels. Ten easy minutes later, I was ready to track time. My only complaint is that I wanted to use my current client number codes, which range from 30 to 60. *Timeslips* insists that all client codes be entered sequentially, beginning with 1. My solution was to enter *x* in the first 29 fields.

I began by creating a time slip for writing this article and then starting the stopwatch. The program displayed the time not only as seconds, but as dollars and cents. The effect of seeing money accumulate on the screen is mesmerizing. Time really is money. Then, to my dismay, I realized the first ten minutes of preparation time were not billed. But, because the *Timeslips* program lets you enter time from the keyboard, I was able to quickly remedy this problem. This feature comes in handy for services performed outside the office.

To create a time slip, type your name or employee number, client name or number, and activity. The *Timeslips* program automatically inserts the correct billing rates. You can type a description of the activity you're about to perform, such as *write article, proofread manuscript,* or *send*



invoice. Then select the billing options, such as Bill by Client or Charge a Flat Rate. Activate the stopwatch, and time is credited to your account.

Timeslips can operate as a TSR, which is great for client-based companies. For example, say you're working on a project for one client when a second client calls. With the TSR function, you can stop the time slip on the first client and create a new slip for the second client in just a few seconds. I used *Timeslips* with *WordPerfect* in a 640K environment with no problems, but that didn't leave room for any other TSRs. I also used it as a stand-alone program in order to free some memory and was pleased with its performance.

But while the billing process is simple and effective, I found the reporting process cumbersome. Fortunately, *Timeslips* gives you so many selections that you can create virtually any kind of report or invoice you need. The program uses onscreen prompts and help, but I still needed to refer to the manual quite often. Obviously, as with any other software program or hardware system, you should spend some time with the manual to get yourself acquainted with the product. That way, you'll have some idea of what to expect.

I called the technical support department (on my dime, as the company doesn't have toll-free support) and held the phone for eight minutes and 23 seconds, according to my *Timeslips* time slip, which displayed my lost productivity and earnings on the screen, second by second, dollar by dollar. (Those who live by the time slip die by the time slip.) On the plus side, the technician was friendly and answered my question with ease.

Another feature that I liked, and which saved me money, was the program's ability to track expenses. I sometimes forget to charge clients for postage and copying. Because this feature is so easy to use, there is no excuse for letting nickels and dimes fall through the cracks.

By keeping accurate track of your time, a time-tracking and billing program like *Timeslips* enables you to better serve your clients by allowing you to prepare detailed invoices that are both informative and accurate. For workers in an extended office setting—those telecommuters who are becoming an ever-increasing part of the modern American work force—*Timeslips* can offer the means to track work so that they can meet their employers' desire for accurate record-keeping.

Put time on your side. And take back all those hours that have been slipping through your fingers. You'll be surprised by how they add up. ⊡

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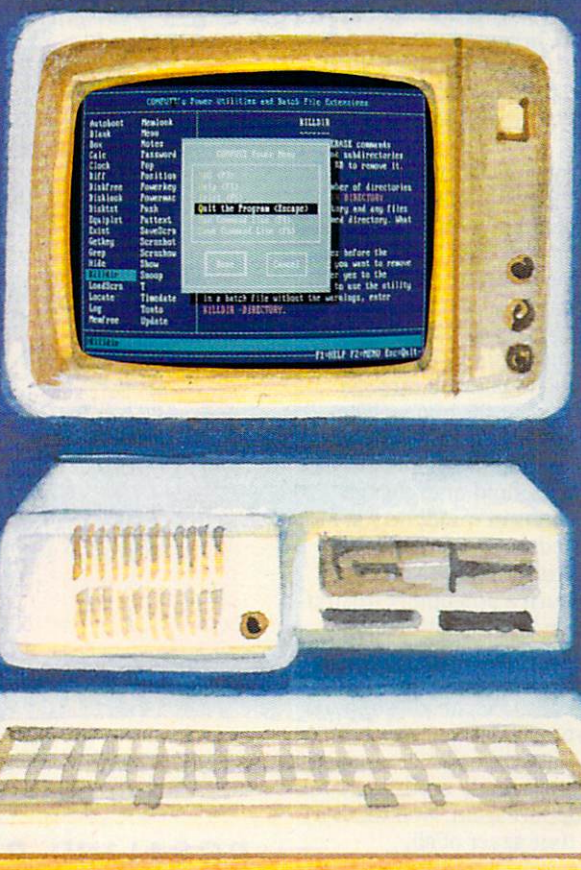

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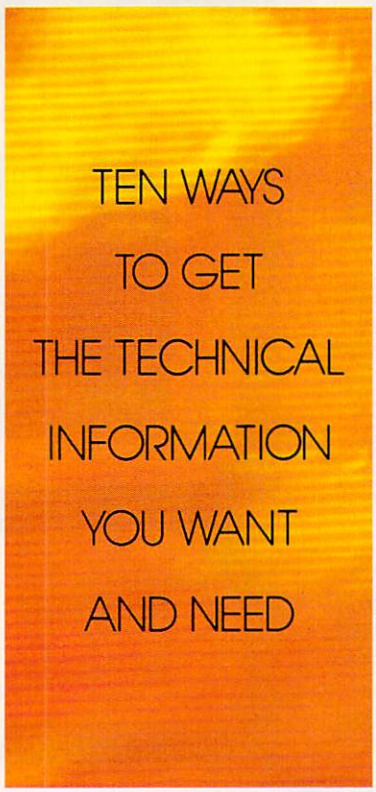

ROSALIND RESNICK
AND
SUSIE ARCHER

In business, time is money. For most business people who depend on computers for their livelihood, few things are more maddening than waiting on hold for a computer-company technician. Few things, that is, except having the technician come on the line talking in some weird computer lingo and offering "assistance" that is impossible to comprehend.

Getting technical support for your home office doesn't have to boost your blood pressure. Although few hardware or software warranties guarantee much beyond the right to return or repair a product if it turns out to be defective, computer companies value your business and are usually willing to talk you through your problem over the phone. The store where you made your purchase, on the other hand, rarely offers more than a limited refund or exchange.

Keeping this in mind, here are ten time-tested ways to help you get the technical information you require—and turn a potentially frustrating experience into a fruitful one. When you learn the language computer technicians talk, you'll get more out of your calls to technical support. And once you master the basics of troubleshooting your own computer problems, you'll rarely need to ask for technical support again. And that's the biggest time saver of all.

1 An Ounce of Prevention

When you buy a program or a piece of equipment, you enter a relationship with the manufacturer. Start your relationship off right by sending in the registration and warranty cards enclosed with your purchase. Telephone support is offered by almost every manufacturer, but the staffer fielding the call may ask you to identify yourself before directing your call to a technician. If you're not in the company's database as a registered user (or if you don't have your registration number readily available), you may get the cold shoulder. You'll also miss out on any notices, newsletters, or other product information designed to keep you abreast of changes.

You should also consider buying a one-year maintenance contract on your computer hardware—but only if it costs less than ten percent of the product's purchase price and you feel reasonably certain that the company will survive the life of the contract. On-site contracts normally don't cost much more than a standard contract; some companies throw them in free as part of a package deal. An on-site contract will let you stay at home by your phone during business hours while a technician comes to you. It can save taking a morning off to lug your machine to the computer store.

2 Read the Directions

No matter how user-friendly your computer claims to be and no matter how many pull-down menus your software possesses, it's still a good idea to read your user manual carefully before throwing in the towel and calling the company for help. If you have time or patience for nothing else, make sure that you study

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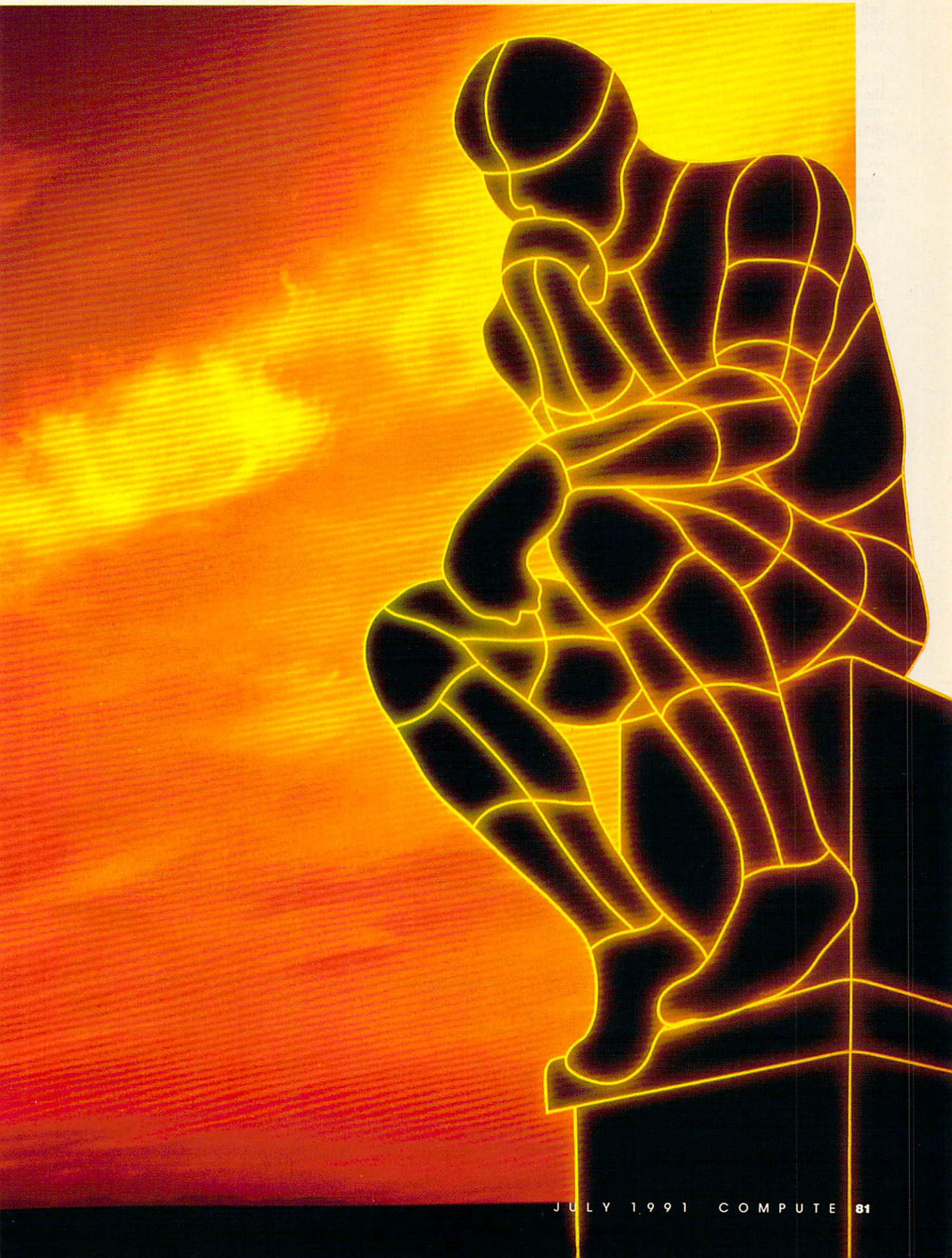

the chapter that tells you how to set up your computer and install your software. Make sure that you have followed directions to the letter and that you are using the equipment specified.

If a problem pops up, check the troubleshooting guide in the back of the manual for common problems and frequently asked questions (you may want to look in a local bookstore for the books listed in the tech books section). Remember that few technical support lines are toll-free, and, for most home computer users, Silicon Valley is a long-distance call.

3 Reach Out and Ask Someone

Unless you're a seasoned computer user, there's probably a limit to what you can do on your own. There comes a time when it's best to pick up the phone and call for help. Demand assistance right away if your computer won't start or your program freezes up on the screen and you have to reboot or exit your application unexpectedly.

Call, too, if you find yourself having to repeat a particular task or keystroke sequence again and again. It could be that a new device driver has been introduced that better supports your printer or modem or a software guru has come up with a keystroke-saving macro that will save you time and aggravation. Or your software may have been updated to correct a problem while the package you bought was sitting on the shelf.

A technician can let you know whether you have the latest version. Even if there isn't a fix for your problem, phone calls are what spur companies to make improvements.

4 Be a Do-It-Yourselfer

Ultimately, the best source of product support is you, the home user. If your manual provides more confusion than help, log on to an online database or bulletin board and look for answers there. Microsoft, Tandy, IBM, and other hardware and software manufacturers provide no-cost bulletin boards, called *forums* on CompuServe and *roundtables* on GEnie, where the company's technical staffers are assigned to read users' questions and leave detailed answers.

It's a good idea to browse through these forums before sending in your question; chances are your problem is not unique. Another nice thing about forums is that you can leave and receive messages at any time of day or night. Remember that though there is no extra charge for many of these forums, use of CompuServe itself is neither free nor inexpensive.

It also pays to know your limits. Whenever a problem occurs, it's wise to back up your data on a floppy disk using the DOS BACKUP command. Often a support technician can repair or restore a damaged file if you haven't tried to fix it yourself first. This backup file can also help the technician diagnose an obscure error. The smartest thing, of course, is to back up your system on a regular basis. That way, your programs and data can be salvaged in case of a hard disk crash—the home computer user's darkest nightmare.

5 Know the Lingo

Reaching out for help won't do you much good if you don't speak the same language as the technician on the other end. We're not suggesting you dash out and take a crash course in C, but knowing a little bit about the hardware can make your interaction with a technician much smoother.

Familiarize yourself with the following, and you'll be on your way:

- Memory-resident programs (also known as *terminate and stay resident* or *TSR programs*), the most popular being *Sidekick* and *PC-Tools'* PCSHELL, reside in your computer's random access memory, enabling your system to call up or enhance other applications. Some may even load automatically every time you turn on your machine. They make it possible for you to call up a program with a keypress or speed up your system in some way, but they may also be memory hogs and sometimes prevent other programs from running. If you have problems, a technician may suggest that you remove all TSRs from your AUTOEXEC.BAT and reboot.
- If your screen freezes up, you may have to warm boot your computer by holding down the Ctrl-Alt-Del keys or cold boot it by pressing reset or turning your computer off and and then on again.
- The CHKDSK command tells the technician how much disk and free memory space you have available.
- You'll also need to know the contents of your AUTOEXEC.BAT and CONFIG.SYS files. To view these files, type CD \ to enter the root directory; then enter TYPE AUTOEXEC .BAT. You can repeat these steps for the CONFIG.SYS file. If either file scrolls off the screen before you can read it, use Ctrl-S to pause and Ctrl-Q to resume the scrolling. You can also send a screenful of information to your printer by pressing the PRINTSCREEN key. The CONFIG.SYS file sometimes contains a command to load a memory manager. Often these managers have names like QEMM.SYS or EMM.SYS. These memory managers give access to RAM beyond the conventional 640K. Technical support people will need to know whether you have one of these memory managers running because they sometimes are the source of conflicts that prevent programs from operating properly. You might try deleting these commands or putting REM ahead of them and rebooting. If your memory manager is the problem, that could clear it up.
- The setup is a part of memory that contains important information on what peripherals are attached to your computer. PCs and XTs have this information coded by setting switches on the motherboard, but ATs and more advanced machines store this information in a CMOS RAM that is maintained by battery power. If your AT fails to boot properly, it could be because the CMOS battery has run down. Therefore, you should always know what is contained in your setup. Different machines use different methods to reach the setup, but the two most common ways are by pressing Ctrl-Alt-Esc or by pressing Del while the machine is booting. Don't change the settings except under the supervision of a technician, but you should take the time to write down all of the setup information and keep the record close to your computer. Then if your setup fails,

Tech Books

Here is a selection of favorite PC books packed with maintenance and troubleshooting information.

The Hardware Bible
Winn Rosch
ISBN 0-13-160979-3
500 pages
$29.95
Brady Books

Maintaining, Upgrading, and Troubleshooting IBM PCs, Compatibles, and PS/2 Personal Computers
Mark Minasi
ISBN 0-87455-230-3
384 pages
$18.95
COMPUTE Books

The PC Configuration Handbook, Second Edition
John Woram
ISBN 0-553-34947-3
672 pages
$26.95
Bantam Books

Upgrading and Repairing PCs
Scott Mueller
ISBN 0-88022-395-2
750 pages
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Que Books

you can reenter the information and be back to work in minutes.

- A technician may ask you to identify your DOS version, your BIOS type, and your graphics display. You can easily determine your DOS version simply by typing VER at the DOS prompt. The BIOS (Basic Input/Output System) type and display type (usually Hercules, CGA, EGA, or VGA) flash on your screen when you boot your computer. Some common BIOSs are AMI (American Megatrends) and Phoenix.

6 Work the System

It's easier and faster to get help if you know what it's like for the technicians on the other end. On any given day, the peak volume period for help-desk calls is from 9:00 a.m. to 2:00 p.m. EST (most software companies are on the West Coast and there is a three-hour time difference between the Eastern and Pacific time zones).

Many companies hold support staff meetings on Monday morning in order to compare notes on problems. Generally, you can get faster, more personal service if you avoid peak periods and call when the support staff is most likely to be available.

It's also important to know who will be answering your call. At a small company, the person on the other end of the line may be a programmer or software developer, while at a large organization, it may be a receptionist who will take the basic information and route your call to someone else. At a midsize company, you are likely to land a generalist with good people skills who has enough expertise to ask the key questions and diagnose your problem. A specialist may be called in, but it's usually the call-taker's job to get the answers you need.

Generally, computer technicians will record their discussion with you on a trouble ticket or problem report and assign it a level of priority. Priority Level 1, for example, will usually get you an answer in a couple of hours. Priority Level 2 will generate a response within a day. Be honest about your urgency. You don't want to earn a reputation for crying wolf.

7 Put It in Writing

It's a good idea to keep a detailed call-history journal in case you can't resolve your problem in one phone call and must explain your problem again to someone else. Your log should include the date and time of your call, the problem symptoms, the phone number and extension you called, the person who took the call, and the diagnosis and any trouble-shooting steps required.

8 Clean Out Your AUTOEXEC

A support technician will frequently fix your problem by giving you instructions on how to alter your system files or copy certain types of files or device drivers into certain subdirectories. That's why it's important to know how to access the AUTOEXEC.BAT file that automatically loads programs into your computer's memory at boot-up every time you turn on your machine. If too many memory-resident programs are being loaded in automatically, you may not have room to run other programs that require at least 512K of RAM. A support technician can help you edit your AUTOEXEC.BAT file using a text editor or the EDLIN program that edits ASCII files. Normally, RAM space can be freed up by inserting the letters REM in front of any command that loads in a driver or TSR.

9 ReCONFIGure Your SYStem

Common problems such as system freeze-ups and insufficient memory can often be solved by letting the technician edit your CONFIG.SYS file. This file usually contains the statements BUFFERS = X and FILES = X. The CONFIG.SYS file also lets you add device drivers to your system that can control a modem, a mouse, or an optical scanner.

The more buffers you tell DOS to use, the more data it can store in memory. The greater the number of files you set, the more tasks your system can perform simultaneously. To solve your immediate problems and help your computer run more efficiently, set the buffers statement somewhere between 10 and 25 and the files statement at no less than 20.

10 Take It to the Top

Captain Kangaroo notwithstanding, the three magic words are not *please, thank you,* and *you're welcome,* but *please, thank you,* and *may I speak to your supervisor.* If you can't get the help you need from the support technician, ask to speak with someone further up the chain of command. This person, typically called the support manager, will probably be able to steer you to a technician who can better help resolve your problem.

If a problem recurs, try to remember whether you've installed any additional hardware or software since your last call or if you've recently entered a large amount of data on your hard disk. Even if the answer is yes, don't be shy about calling back for more help. Don't assume that you'll get the same technician on the line. This is where your call-history journal can come in handy. In addition, problems labeled by a technician as chronic normally get higher priority.

If you're still not satisfied, it may be time to write a letter to the company's president or ask for a refund. After all, time is money, and you've got to know where to draw the line.

Tech Support Is Only Human

Above all, remember that the person at the other end of the line is a human being who must deal with dozens of dissatisfied users at all levels of expertise. If you are patient and cooperative—and if you've done your homework—he or she can be much more helpful to you. ⊡

How to Get Help Online

If you're on GEnie or CompuServe, you're only a phone call away from some of the best technical assistance available, directly from your software company. Here are the shortcut ways to contact some of the software heavy hitters. Some of the hardware roundtables and forums are not directly supported by the companies involved, but they are a way to contact fellow users of the equipment to obtain information.

Company	GEnie	CompuServe
Microsoft	MICROSOFT	GO MSOFT
Software Publishing		GO SPC
Lotus		GO LOTUS
WordPerfect	WP	GO WPSG
Ashton-Tate	ASHTONTATE	GO ASHFORUM
WordStar International		GO WORDSTAR
Symantec		GO SYMANTEC
Borland	BORLAND	GO BORLAND
Hayes	HAYES	GO HAYES
IBM	IBMPC	GO IBMNET
Macintosh	MAC	GO MAUG
Amiga	AMIGA	GO AMIGA
Commodore	COMMODORE	GO CBMNET

To see a complete listing of the software or hardware forums on CompuServe, type GO SOFTWARE or GO HARDWARE. A larger computer-related area containing all of the above forums and more can be reached by typing GO COMPUTERS.

STEVEN ANZOVIN

WHY PC CAN'T READ

Hal 9000 could do it. So could the Terminator, not to mention the Robot in *Lost in Space.* These Hollywood computers could read, use a phone book, and even read lips. In the real world, we also want our computers to understand what we write and say and to return enlightening responses. Unfortunately, they don't understand a word.

That's what computing newcomer Daniel Lombardo, curator of the Emily Dickinson Collection in the poet's hometown, Amherst, found out when he tried the popular grammar-checking program *Grammatik IV* (Reference Software International, 330 Townsend Street, Suite 123, San Francisco, California 94107; 800-872-9933, 415-541-0222). Danny was writing an article about Dickinson on his new PC, which he ran through *Grammatik's* battery of grammar, style, mechanics, and spelling analyzers.

Like other grammar and style checkers, *Grammatik* offers suggestions for improving text based on rules developed by academic writing experts. The program's internal rules couldn't cope with Dickinson's writing, however. About Dickinson's poem on a hummingbird—

A Route of Evanescence
With a revolving Wheel—
A Resonance of Emerald—
A Rush of Cochineal—
And every Blossom on the Bush
Adjusts its tumbled Head—
The mail from Tunis, probably,
An easy Morning's Ride—

Grammatik said, *This may be an incomplete sentence. Long sentences can be difficult to understand. Consider revising so that no more than one complete thought is expressed in each sentence.*

The use of *in case* in a line from one of Dickinson's letters, "I found abundance of candy in my stocking, which I do not think had the anticipated effect upon my disposition, in case it was to sweeten it," prompted this response: *Hackneyed, Cliche, or Trite . . . Avoid cliches, they distract the reader and weaken your message. Cliches are a symptom of lazy writing.*

As Danny remarked sarcastically, "After 30 years, the great critic Thomas Wentworth Higgins was still bewildered by Emily's writing. *Grammatik* got right to the point in a microsecond. She was lazy."

Grammatik is actually one of the better programs of its kind on the market and can be a real help to expository writers—not poets—trying to learn their craft. Reference Software doesn't claim *Grammatik* will make a computer "understand" your writing any more than a paint program can critique your artwork.

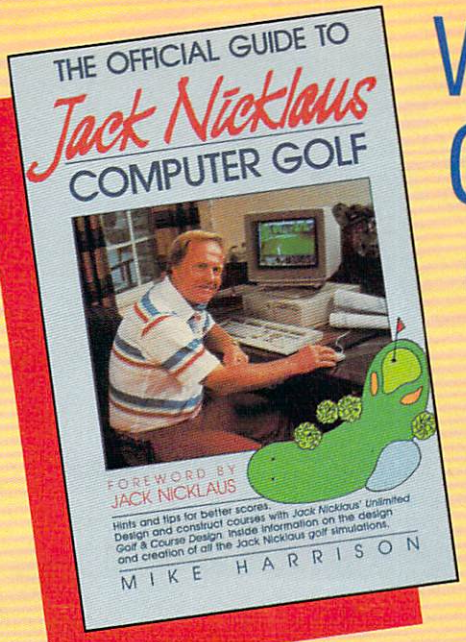
Danny's experience points to a more general problem in what's called *natural language processing,* the yet-to-be-achieved ability of computers to understand everyday language. Computers work by rules, called *algorithms,* and many theorists of artificial intelligence think the human brain works much the same way. In this view, the only important difference between brains and computers is in the brain's greater complexity and adaptability. Make computers more complex, faster, and better able to learn, and natural language processing should follow—you merely need to feed in the right language rules. The same rules *Grammatik* now uses to analyze a poem are the primitive precursors of a system that may someday allow computers to read natural human language.

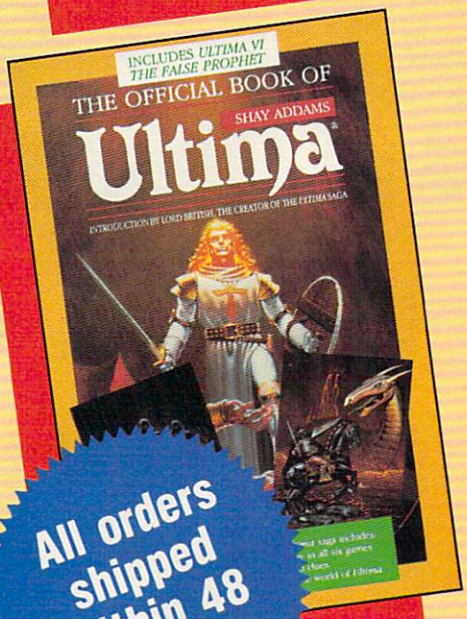
But research shows that reading isn't as simple as it appears; it requires a knowledge of how the world works, not just the rules of language. Some experts estimate that an ordinary, common-sense understanding of the world may actually require a knowledge base of as many as 10 million instantly accessible rules of thumb. But because language evolves over time and varies in usage with each writer and speaker, it may not be possible to define all the rules.

To get a sense of the difficulties involved in natural language processing, first remember what it was like to learn how to read in grammar school. Now imagine attempting the same complex task having lived your life in a featureless box with no speaking ability and having the innate language capabilities of a gnat. A daunting prospect.

Clever programming can yield software that gives the appearance of language understanding. MS-DOS seems to "know" what you mean when you type *dir,* and that's what misleads computing neophytes. Also, it doesn't help that movie robots all talk fluently, only occasionally stumbling over human colloquialisms. However, most researchers in the field of natural language processing are just beginning to admit that devising a real-world program capable of understanding text, including poetry, on a human level is probably decades away from happening.

So why can't PC read? Because we don't know how we do it ourselves, and until we know better, our computers will be unable, in Dickinson's words, to "expound the skies." ⊡





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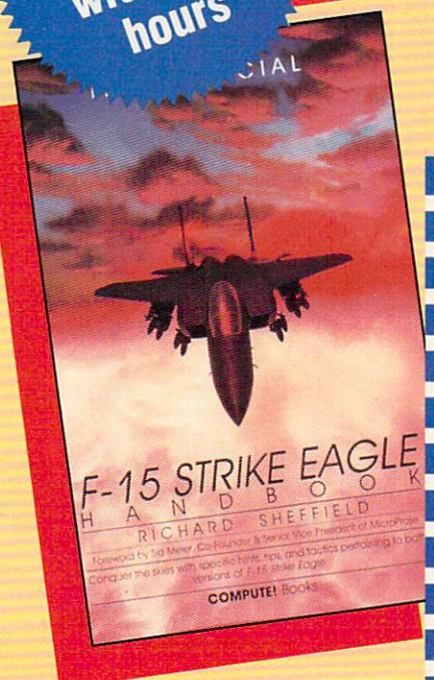

WHETHER IT'S GOLF, AIR COMBAT, OR ADVENTURE COMPUTE HAS THE OFFICIAL GUIDE

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by Mike Harrison
Foreword by Jack Nicklaus
$12.95 224 pages

Here's the inside story. Learn how professional course designers decide where to put bunkers, trees, and greens. Also includes tips for all the Jack Nicklaus golf games, including *Jack Nicklaus' Unlimited Golf & Course Design*. This is the only authorized guide to all the Jack Nicklaus computer simulations from Accolade.

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by Shay Addams
Introduction by Lord British
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Scientists call robots that do this kind of work *smart*. In this case the word *smart* has far less to do with common sense than with computerized intelligence used to make high-level decisions. Long the darling of science fiction writers and movie producers, robots have traditionally been portrayed as intelligent machines performing work too dangerous or too dull for humans. Despite these decades-old prophecies, however, totally independent robots still exist only in fiction and the minds of visionaries. ▷

One realist, Dr. Reinhold C. Mann, director of the Oak Ridge National Laboratory's Intelligent Systems Section, believes that continued advances toward creating autonomous robots require much more exploration of the ways a machine's mind is trained: "We have not yet solved the learning problem. We still need to achieve a more humanlike performance from robots." Mann believes one way to solve the learning problem is to find a way for an older generation of robots to teach the younger generation.

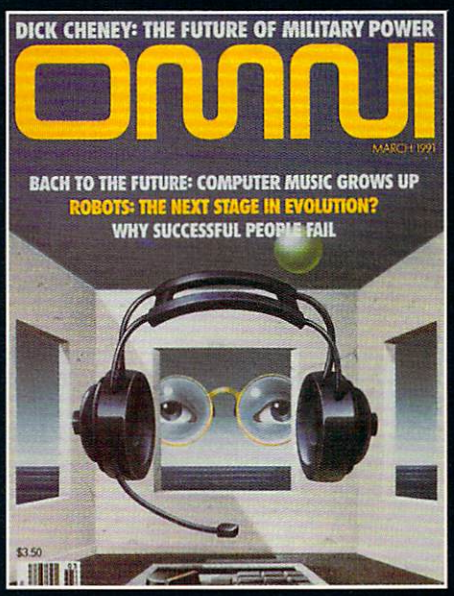
In addition to the formidable technical obstacles of creating a practical machine intelligence, emotional issues also impede progress. Many people hold to the once widely popular Hollywood concept that robots, in league with malevolent computers, could destroy the world, enslave humanity, or produce widespread unemployment as machines replace humans. Paul Klarer, robotics software engineer for Sandia Laboratory, disputes that concept. "We need to get the word out that robots are designed to help. They will not take away their jobs, but they will keep people out of the line of fire," says Klarer.

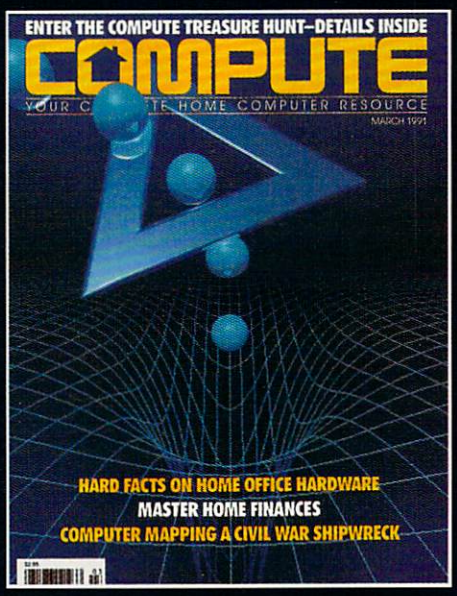
Since robots are, after all, merely expendable machines and will never possess a sense of self-preservation, they can be used to spare humans from performing society's dirtiest, most dangerous work. Each of the robots shown in the accompanying photographs exists for just that reason—to keep people out of harm's way.

▲ **Built on an All-Terrain Vehicle (ATV) chassis, Sandia's Fire Ant qualifies as a *smart assassin.* A human operator guides it to its assigned position by remote control. Parked and armed, it waits for an enemy vehicle to pass. The onboard Motorola 6805 8-bit processor analyzes incoming sensor data to detect the target and initiate the fire-control sequence. When locked onto the target, the Fire Ant launches its six-inch armor-piercing slug at 6600 feet per second.**

◀ **This is the result of the Fire Ant's attack. The Fire Ant's copper-jacketed slug devastated this M-47 tank. Because of such awesome firepower, some researchers resist allowing autonomous military robots the freedom to initiate a fire sequence. Supporters of robot technology claim that future armed robots incorporating built-in safeguards will provide strategic support for front-line troops with total dependability. Even under human control, robots already have a place on the battlefield. The U.S. Army requested more than 1000 Fire Ants for urgent delivery to Saudi Arabia at the start of Desert Storm (ironically, Sandia declined, saying it could not comply with the request on short notice).▷**

CHOOSE YOUR FUTURE





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▶ Primarily designed for military use, TMAPs (Tactical Multipurpose Automated Platforms) may see service as reconnaissance vehicles or as smart, mobile launchers of laser-guided Hellfire missiles. Like the Fire Ant, TMAPs remain under human guidance and use on-board computers and sensors for gathering and processing target-acquisition data. Grumman's version of the TMAP relies on Motorola's 6805 processors to control its propulsion system and process incoming sensor data. An Intel 80386 central processing unit provides high-level intelligence for path-planning and obstacle-avoidance sequences.

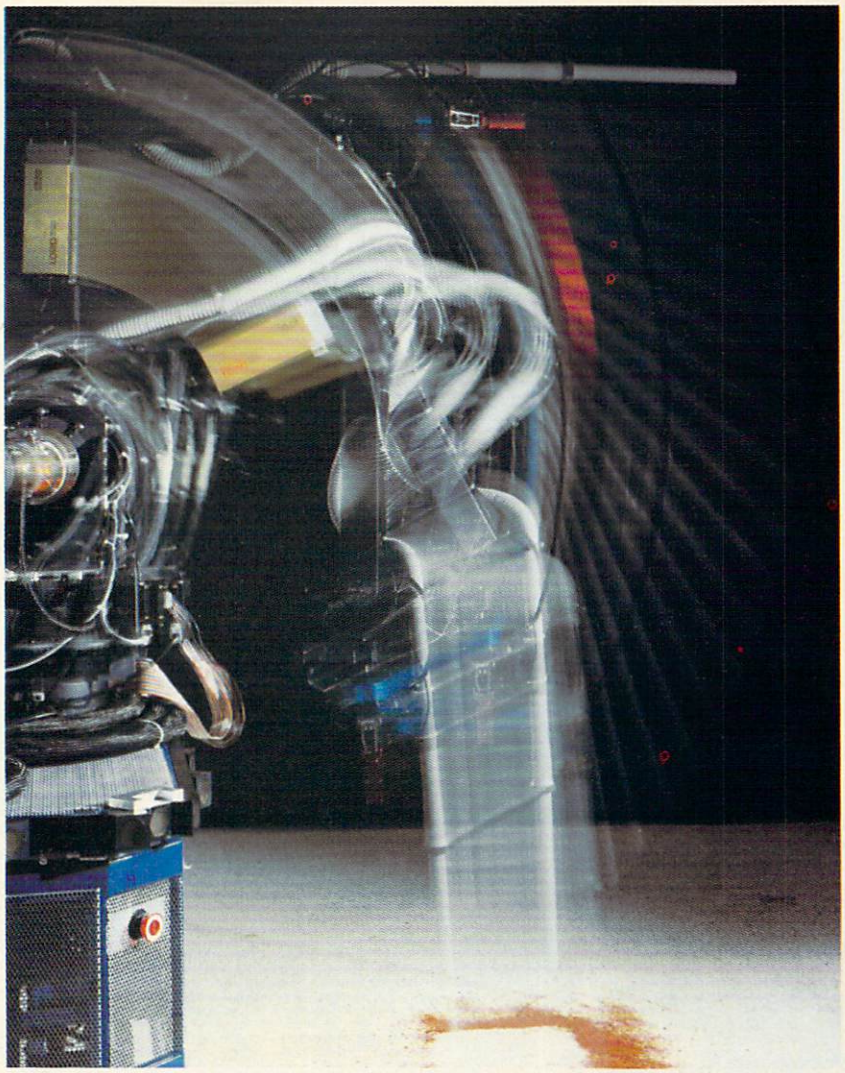
At the current development rate of machine intelligence, some cautious researchers predict that 20 years may pass before advanced TMAP hunter/killer robots can operate without human supervision. Even the development of fail-safe logic circuits may not convince some experts to grant armed robots battlefield independence. Why? Because there are thorny ethical questions about the fact that military robots lack compassion (and might even violate the Geneva Convention), not to mention the frightening possibility of the robot initiating friendly fire.

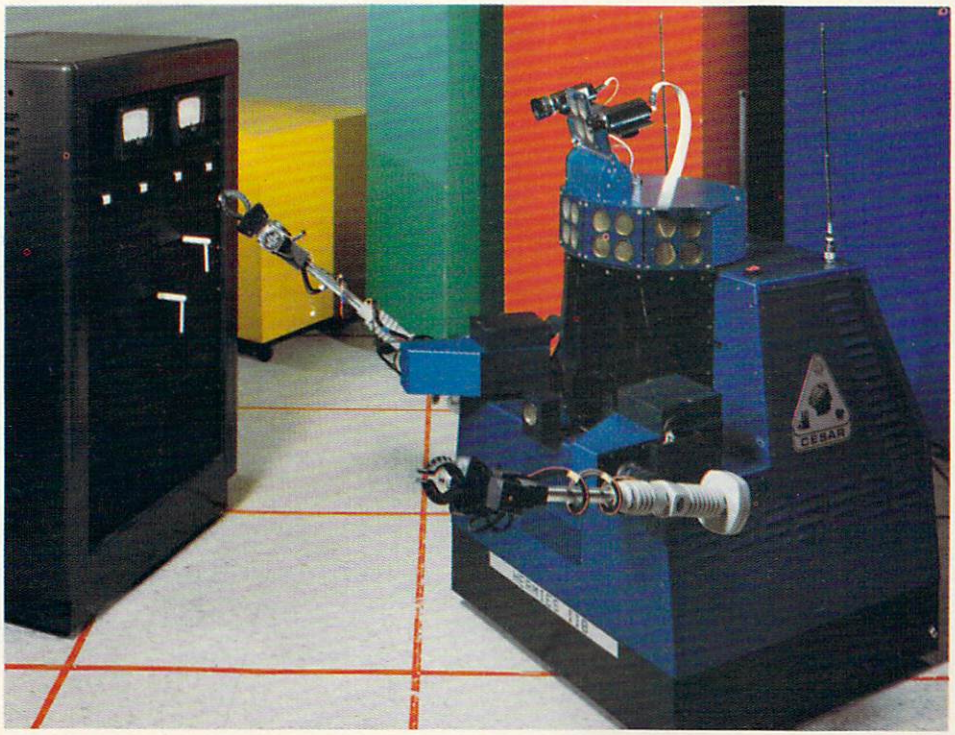
◀ Even when stripped of their firepower, mobile robots still keep humans out of harm's way. Mounted on a Honda ATV chassis, Sandia's Telemanaged Mobile Security Stations (THOMAS) patrols remote, potentially dangerous sites to detect intruders. Sitting atop a telescoping ten-foot-tall mast, THOMAS's onboard computer processes realtime data it receives from its sensor array. The computer compares the incoming data against known alarm conditions, factors in climatic conditions, and then decides whether to radio an alarm back to a monitored central command post. THOMAS uses high-discrimination infrared sensors and radar to detect intruders. The next generation of THOMASes, already under development, will operate autonomously and contain neural networks for acquiring and evaluating data. ▷

▶ In this time-sequenced photo, a robot built by Oak Ridge Laboratory uses a vacuum attachment to clean up a simulated chemical spill. Employing machine vision to locate and map the spill, the HERMIES III (Hostile Environment Robotics Machine Intelligence Experimental Series) employs three paralleled Motorola 68020 processors, one Intel 80286, and 16 Hypercube nodes for realtime image analysis and decision making.

Operating independently of human guidance, HERMIES uses a laser ranging camera plus multiple sonar sensors to navigate through an unknown area containing fixed and moving objects. Machine intelligence is supplied by a LISP-based artificial intelligence program supporting CLIPS, a public domain expert-system shell developed by NASA which controls high-level navigating decisions. The next generation HERMIES IV robot will incorporate VLSI fuzzy logic hardware to overcome the inherent rigidity of present-day rule-based programming.

HERMIES' ability to operate in hazardous areas and make independent decisions can free its operators from dangerous duty.





◀ Seen here at the controls is the HERMIES IIB, a smaller, earlier version of the independent, versatile robot. It receives instructions from a single Intel 80286 plus an NCUBE 16-node Hypercube computer (operating at 16 MIPS). Using its dexterous lightweight arms, this HERMIES IIB learned the sequences (including reading panel-mounted analog meters) required to shut down equipment that is malfunctioning and initiate an alarm-control sequence. Like its big brother, the HERMIES III, the IIB can use its on-board computational power to operate autonomously. The human overseer, located in a control room at a safe distance, is continuously apprised of the IIB's location and progress via an RS-232 wireless modem. ▷

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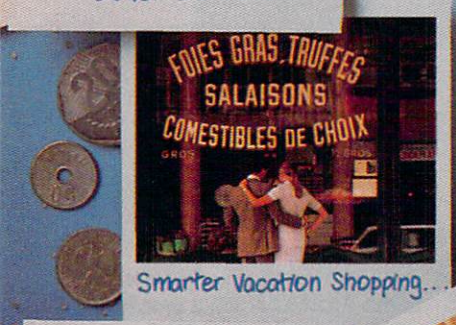

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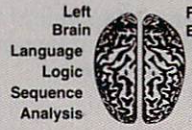

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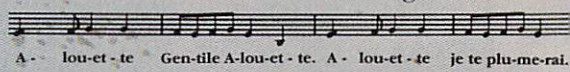

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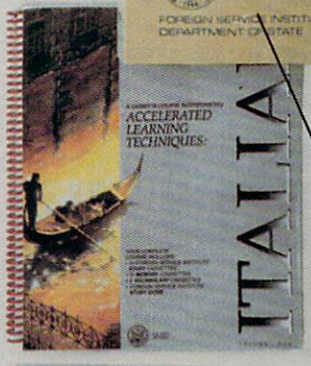

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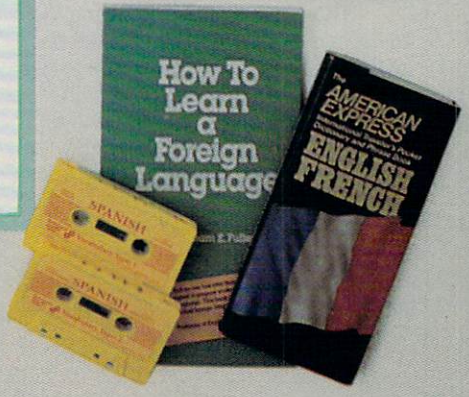

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They're becoming more common all the time. How do humans react to robots in everyday life?

Meeting a nine-foot-tall robot at a company bash can be intimidating. But it's nearly impossible not to like the bucket of bolts when it dons a bow tie and admits in a soft voice that parties make it nervous.

Logan Enterprises, a Greensboro, North Carolina, entertainment company, designs, builds, and operates nine-foot-tall robots for corporate events. The robots, which are actually intricate machine costumes with a human operator inside, are a melding of man and machine.

Creating interaction between humans and robots is the job of Logan inventors David Rawlins, David Hall, and Dan Hall. They have discovered that people respond positively to robots that project familiar human characteristics.

"If people see the humanness in the robot, they tend to react better," says David Hall. "For example, the robot can offer to shake hands, or it can give a compliment: 'That's a lovely sweater you're wearing.'"

Logan's hulking robots consistently win over children at Disney World in Florida, Hall says. "We'll go up to a kid wearing a Mickey Mouse hat and say 'I know you; you're Mickey Mouse.' The robot, which projects childlike innocence, easily makes a friend."

Incredibly, children show little fear of the Logan robots. "Eighty percent of the children come up and shake hands," Hall says. "They want to know how it's built and how it moves. Every kid has a robot in his world. Robots let people bring in their own imagination."

Logan's inventors have experimented extensively with body language, voice pitch, color (red eyes appear menacing, while blue ones come off as friendly), and accessories (from bow ties to sunglasses to jams) to unlock the human heart.

But personalizing the robot can go too far.

"There is a fine line, knowing the limitations of being human for the robot," Hall says. "You don't want to get too close to being human, as in androids, because that scares people."

Most humans would probably feel threatened by an industrial robot that can work three shifts without a coffee break—bow tie or no bow tie. But robots can do more than entertain at parties, build cars, patrol secure areas, and blast tanks to kingdom come. They can also occupy barstools.

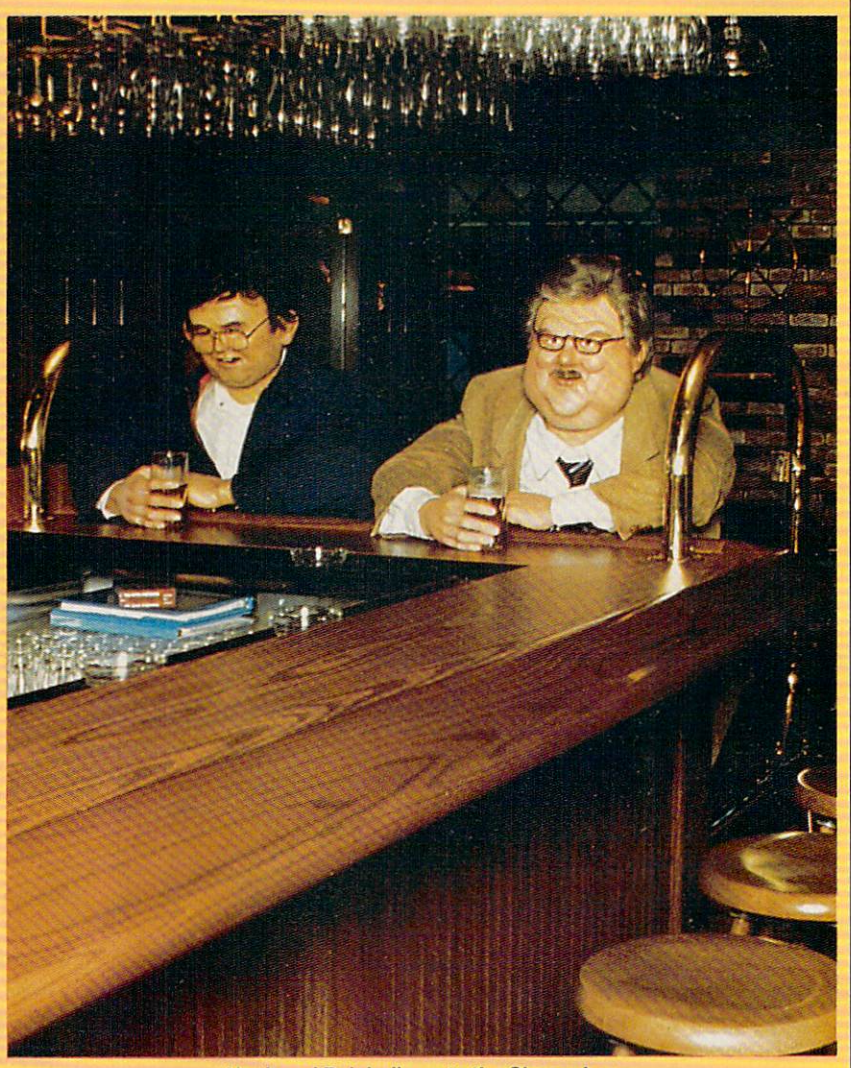
Host International, a division of Marriott, is cashing in on two trends—the attractive features of robots and the most popular program on television, "Cheers." Host operates airport concessions across the country. Now it's planning to open Cheers bars in 46 airports. Two have already opened, in the Detroit Metro and Minneapolis-St. Paul International airports. The bars are more than sawdust and brass, though. They feature mechanical drinking buddies permanently stationed at the end of the bar, like their human counterparts on "Cheers," Norm and Cliffy. Actually, because the actors who portray Norm and Clif refused to give permission to use their likenesses, the two robots look more like Laurel and Hardy. The two trade wisecracks and banter while cradling beers in their hands.

The robots— known as Hank Gifford, who sells hardware, and Bob Johnson, who sells insurance—currently vegetate in the Minneapolis-St. Paul location to celebrate its opening. New robots are being built to take their place in Detroit.

Advanced Animation, a Vermont company in the robot business for 30 years, created the dipsomaniacal robots. A representative of Host International stated that the public's response to the two robots has been "overwhelmingly positive." Far from the mundane, regular guys they portray, Hank and Bob have become celebrities, written about in newspapers from New York to Los Angeles, as well as in the Detroit and Minneapolis-St. Paul papers.

As a good example to the traveling public, Bob and Hank never actually take a drink from their glasses. Their robotic arms don't work. Only their upper bodies and faces are animated. ⊡

—SHERRY ROBERTS



Hank and Bob belly up to the Cheers bar.

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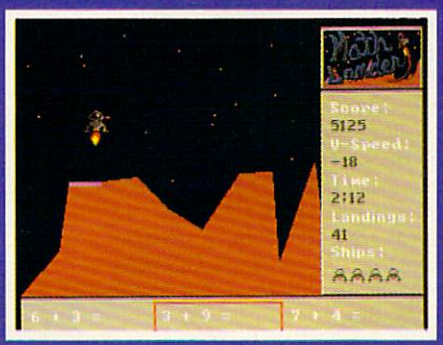

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WHAT YOU GET WITH THE NET

Most computer users don't have modems. Why? Probably because most people haven't had a good reason to get one. Who would they send messages to? Why not just pick up the phone and call?

But all that's starting to change. More and more people are finding the "good enough" reason to buy a modem is an online service like Prodigy, CompuServe, Delphi, or GEnie. There's something exhilarating about getting on an electronic information service and finding yourself in public conversation with people whose books or columns you've read or whose views you find fascinating.

I've been online (off and on) for years. For instance, I uploaded this column by modem, and my book *Ender's Game,* published back in 1984, was the first novel I know of that was published electronically *first* (on Delphi).

The rest of my family never even tried to log on until recently. Up to now, they just looked over my shoulder as I fumbled through Delphi and CompuServe. They added comments like, "Cool, I guess," or "What in the world are you doing?" or "That is so confusing." Then they walked away.

Until Prodigy. I tried it out to take part in an electronic conference with a Illinois college class, but the service was so interesting, I hung around awhile. And I like a lot of what I've seen.

The Prodigy concept is simple. Instead of using your own communications program and turning your computer into a dumb terminal with the mainframe a thousand miles away, Prodigy is loaded as a program in *your* computer, and most of the routine tasks are handled right there in your home. Only when you absolutely need to upload or download something from Prodigy do you access the main system. And when you do, the Prodigy program handles that automatically.

This means each person signed on to Prodigy uses only a fraction of the mainframe processing time needed to accomplish the same tasks on another online service. That lets Prodigy charge you a flat rate instead of a fee for each minute of connect time. Paying by the minute encourages you to get off as fast as you can, but a flat monthly fee encourages you to play around with the system, to explore its possibilities. (There's a surcharge of 25 cents per message for every message you send above 30 in any given month.)

Another Prodigy innovation is its humane interface, which is far less intimidating than the mostly blank screen you get from Delphi and CompuServe. To their credit, some of the other services have been making progress. *CompuServe Information Manager (CIM)* and GEnie's *Aladdin* automate many online tasks. *CIM* even has mouse support and pull-down menus for the IBM version. *Aladdin* is a keyboard-driven program, but it makes managing GEnie RoundTables and software libraries a breeze. Just set up your *Aladdin* program with the areas you visit most, and move to your favorite places with the touch of a finger.

But when my 12-year-old saw me dinking around with Prodigy, he didn't just walk away. He sat down, and in a few minutes, I had him signed on with his own membership (each household gets *six* memberships for the same fee). He was off and running.

Prodigy offers games online, but they're simpleminded—nothing to write home about. You can shop and browse through online catalogs, although my orders arrive much faster through telephone shopping than by means of Prodigy. On the other hand, I don't have to spend an hour on hold, and most companies are a pleasure to deal with.

But Prodigy's main attraction—and the best entertainment—comes from other users. The conversations and messages on the club bulletin boards are a great way to strike up some friendships. Best of all, from my point of view, there are lots and lots of *kids* online.

So not only did my computer-literate son, Geoffrey, take to Prodigy at once; so did my ten-year-old daughter, Emily. She cheerfully hooks up and carries on her own conversations with long-distance friends.

But there are drawbacks. You can't upload or download long files, and the message-length limitation, though lately improved, is still pretty severe. I've found, though, that the forced brevity of the messages helps me. On Prodigy it takes only a couple of minutes to read and answer letters from my fiction readers—so I actually complete my online correspondence. That doesn't happen very often with the U.S. Mail!

Of course, you can do all this—and a lot more—with GEnie, CompuServe, Delphi, or America Online. But can you do it as easily as you can on Prodigy? And will your less-than-expert family members feel as comfortable exploring these other services on their own? Not a chance!

Is Prodigy worth buying the modem for? You'll have to answer that yourself. But when I see my kids typing away, corresponding with people all around the country on an incredibly wide range of subjects, I can tell you *my* answer. Prodigy has made my kids use the computer for something besides homework and games, and it's made their world a little larger, too. Prodigy claims that 700,000 households are signed on to its system. I'm glad mine is one of them! ⊡

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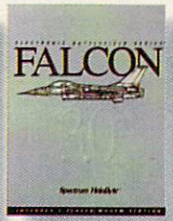

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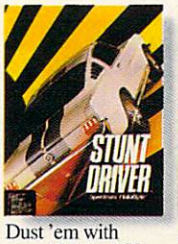

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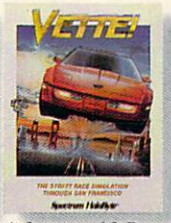

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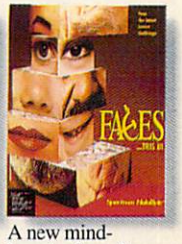

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Sherman, set the Wayback Machine for the year 1914. We're taking these software executives back to the birth of air combat—France during World War I.

Well, that's one explanation for the phenomenon of three major game publishers coming up with the same answer to the question *What next?* Another explanation, of course, is that they didn't ask *What's next?* at all but instead asked *What's left?* Planes, ships, tanks, and helicopters from World War II on up have been pretty well covered. So it seemed like a good time to revisit World War I air combat, when the fighting was up close and personal. What's even more amazing is that three companies could start from the same place and end up with games as different as *Blue Max* (Three-Sixty), *Knights of the Sky* (MicroProse), and *Red Baron* (Dynamix).

The first to reach the marketplace was *Blue Max.* This program sports one of the slickest introduction sequences I've seen, consisting of digitized photos and animated sequences. It's a pleasure to watch. But as stated in the documentation, this is not a true simulation—it's really more of a simulation/arcade hybrid. It would've been nice to put that on the box as well. *Blue Max* has the features found in most simulations, including multiple outside views, several choices of planes to fly, a VCR function, and a campaign mode. But the flight characteristics of the game are so far removed from reality that *Blue Max* takes on a pure arcade game feel when the planes are in the air.

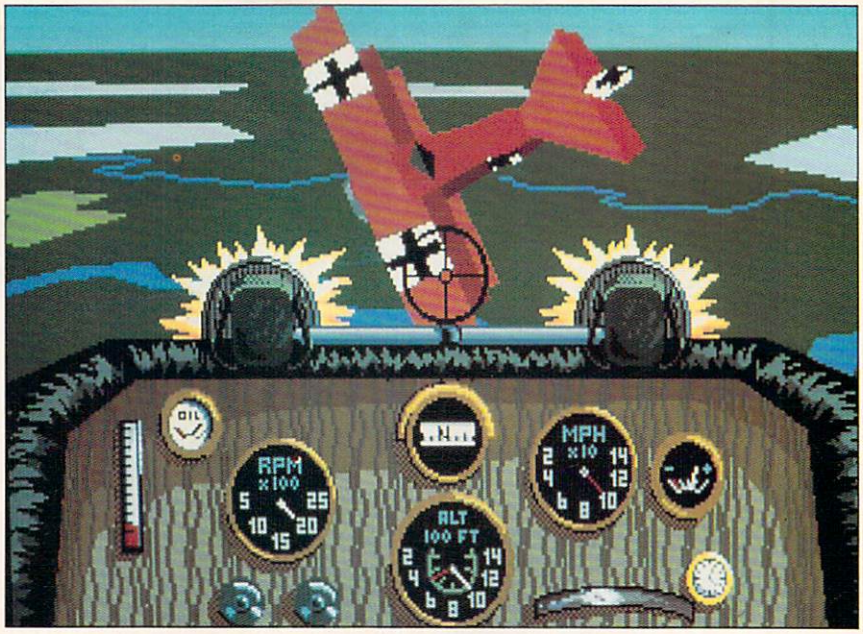
However, *Blue Max* offers several things not found in either of the other two simulations. First is a split-screen two-player mode that allows two players to dogfight head-to-head on the same computer or fly as a team in a two-player campaign. While this is not as much fun as a modem option, letting two people play on the same machine is a real plus. Since this game is not very hard to learn, you should have no trouble finding opponents or wingmen. The main problem with this mode is that it's very awkward when both players have to use separate sides of the keyboard and when one gets the joystick and the other the mouse; inevitably they're unevenly matched.

The other unique feature found in *Blue Max* is a strategy game mode. This combines simulation with board game; players take turns moving planes on a hex system playing board. While this may not have wide appeal, it will be enjoyable for serious board gamers.

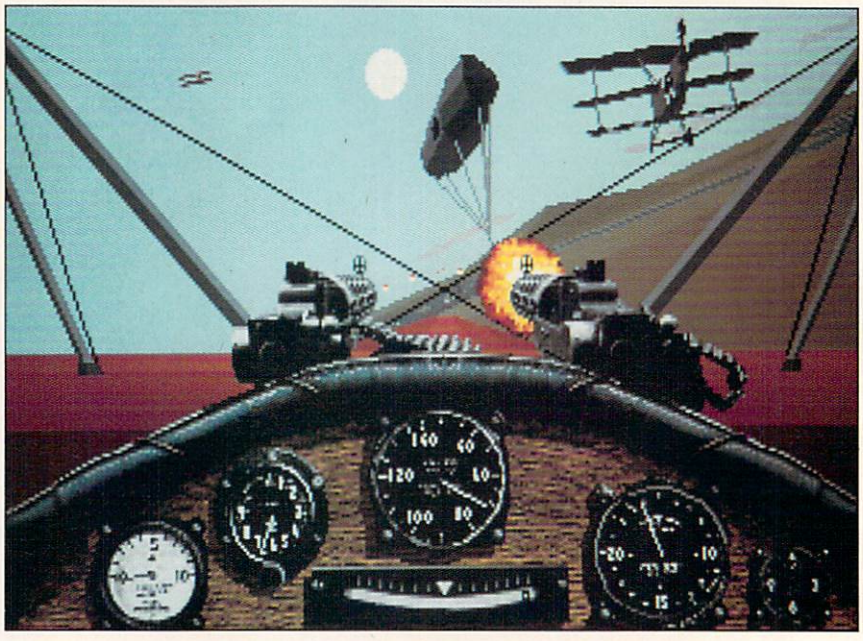
The next to make it into the fray was *Knights of the Sky* by MicroProse. As expected, this one lives up to the high standards of a MicroProse simulation. With 20 planes and a realistic flight model, *Knights of the Sky* is much more complete and realistic than *Blue Max.* A well-designed flight training mode with multiple difficulty levels helps get the new player off to an easy start. Learning to handle these low-tech aircraft and navigating by looking out of the cockpit takes a little getting used to, but soon enough you'll be ready for more of a challenge. The Dogfight option will provide you with plenty of challenges.

Choose a famous German ace as an opponent, and test your skills in close combat. But as much fun as the Dogfight option is, this game really shines in the World War I campaign mode. Of the three World War I sims, this game has the best campaign option. Your goal is to become the top ace of the war—the Ace of Aces—and to do that, you've got to stay busy in the air. News reports between missions on how the other great aces are doing add continuity and purpose to your campaign. If another ace has a big lead on you, follow the news to find out where he is, and go after him!

Ground-attack missions are assigned, as are the expected air-combat missions. Dropping a bomb by hand out of the cockpit requires a whole new set of skills when you're used to the smart weapons of the jet age.



***Knights of the Sky* takes out another enemy ace.**



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Another very interesting feature is the unexpected side action that can occur during missions. On your way home from battle, it's not unusual to spot a group of German aircraft about to pounce on a friendly observation balloon. Your gallantry would certainly be questioned if you didn't step in to lend a hand!

The VGA graphics and sound support are strong, and as if that weren't enough, they're topped off with a head-to-head-play modem option that saves you from connection headaches. Competing against a real live human adds a whole new level of enjoyment to the game.

Knights is not without its share of problems, however. Most notable is the fact that a single shot can kill you or your enemy. Such a clamor was raised over this feature that MicroProse has made an update available. The update not only takes care of this problem by adding degrees of damage, but it also includes some improvements to the already outstanding campaign mode. With the upgrade there will be even more action around you and friendly aircraft that may come to your aid. The upgrade is available directly from MicroProse, or it can be downloaded from either CompuServe or GEnie online services.

Red Baron, by Dynamix, was the last to arrive on the scene, but it was well worth the wait. *Red Baron* makes full use of 256-color VGA in both the user interface screens and the flying action. The interface uses numerous digitized photos and a very polished point-and-click system for making menu choices.

This game allows the player to fly any one of 28 aircraft and to fly for either side. The flight characteristics of each plane are very accurately portrayed, and each plane even sounds different. Strapping into a Fokker D.VII late in the war is a big change from flying the early Fokker E.III Eindecker and is certainly likely to boost your number of kills.

Since this is up-close combat, the level of detail shown is very important. *Red Baron* certainly leads the pack in this category. You should have little difficulty in identifying the other aircraft in the sky around you.

As in *Knights of the Sky,* you can choose to dogfight with the famous aces of the day. But here you have many more options. If British ace William Bishop is constantly ripping you up, put him in an old Airco D.H.2 and see how well he does. Flying against these famous aces is a real treat, since they're programmed to respond in the flying style of the real pilot. The artificial intelligence of the enemy pilots is the best I've seen in any air-combat simulator. The bad guys do much more than just fly around in circles—they can put some real moves on you.

A campaign mode is also included and is well done. Because of the repetitiveness of some of the missions, *Red Baron* isn't as much fun as *Knights of the Sky,* but at the same time, it's probably more realistic. In *Knights,* you can frequently get eight or nine kills in a single mission, whereas in *Red Baron* you feel lucky if you get one or two kills and make it back alive.

Red Baron sets a new standard for VCR-type mission recorders. You can record the entire mission and save it for playback later. And the playback is really slick. You can switch to an infinite variety of internal and external views, and a full range of editing features makes it possible to play movie director and put together a very entertaining "film" of your favorite encounters. These can also be shared with others. A number of great *Red Baron* movies are available for downloading on many of the online services.

Red Baron does have a few shortcomings. One is the lack of a modem option for head-to-head play. Another is the inability to land anywhere other than an aerodrome. Although the incremental damage feature and the ability to be wounded rather than be killed outright are great options, it would be nice to be able to set the plane down in an open field when in trouble rather than being forced to crash-land somewhere.

Counting its graphics, attention to detail, historical accuracy, sound quality, and mission recorder, *Red Baron* comes out on top in this three-way dogfight. But the upgraded version of *Knights of the Sky* may be the better choice for those interested in head-to-head modem play.

RICHARD SHEFFIELD

Features Chart

Feature	*Blue Max*	*Knights of the Sky*	*Red Baron*
VGA 256 color	yes	yes	yes
Play both sides	yes	no	yes
Copy protection	none	manual-based	none
Number of planes	8	20	28
VCR recorder	yes	no	yes
Instant replay	no	yes	no
Historical missions	no	no	yes
Campaign mode	yes	yes	yes
Modem option	no	yes	no
Ground attacks	no	yes	no
Balloon busting	yes	yes	yes
Famous aces	no	yes	yes
External views	yes	yes	yes
Medals/promotions	yes	yes	yes
Rudder controls	no	yes	yes
Variable-detail level	yes	yes	yes
Mouse support	yes	yes	yes
Multiplane squads	yes	no	yes
Customize aircraft	no	no	yes
Board-game mode	yes	no	no
Damage accumulation	yes	only in upgrade	yes
Start near action	no	no	yes
Quit without landing	no	no	yes

Blue Max
THREE-SIXTY
Distributed by Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404-2499
(800) 245-4525

IBM PC and compatibles; 512K RAM for CGA, EGA, Hercules, 640K RAM for MCGA, VGA, Tandy 16-color; joystick or mouse optional; hard drive recommended; supports Ad Lib, Sound Blaster, and Tandy sound cards—$49.95

Also available for Amiga—$49.95

Knights of the Sky
MICROPROSE
180 Lakefront Dr.
Hunt Valley, MD 21030
(800) 879-7529

IBM PC and compatibles; 512K RAM; CGA, EGA, VGA, Tandy 16-color; hard drive and mouse or joystick recommended; supports Ad Lib, Sound Blaster, Roland MT-32, and Tandy sound cards; modem option requires Hayes-compatible modem, 1200 baud or higher—$59.95

Red Baron
DYNAMIX
Distributed by Sierra On-Line
P.O. Box 485
Coarsegold, CA 93614
(800) 326-6654

IBM PC and compatibles (10 MHz or faster recommended), 640K RAM, EGA or VGA, high-capacity disk drive; hard drive and joystick recommended; supports Ad Lib, Sound Blaster, Roland MT-32, and LAPC-1 sound cards—$59.95 ⊡

64/128 VIEW

TOM NETSEL

In the recent Readership Survey, I asked you how you use your computers. Personal home finances, games, education, and word processing are the big four computing activities among Gazette readers. Programming and using databases and other application programs for home or office also are popular.

Some of you went into detail about how your 64 or 128 plays an important part in your daily activities. One reader in Maine had quite a list: letters, labels, budget on a spreadsheet, stamp inventory, household inventory, name-and-address databases, family newsletter, games, family tree, greeting cards, horoscopes, biorhythms, amortization schedules, and Christmas name tags with a graphic clue as to the contents of the package. "With all this and more, who needs an Amiga?" he asked.

A reader from Kansas City, Missouri, who's employed by a large greeting card company uses three 128s and nine disk drives at home to support his work at the office. *GEOS* handles about 99 percent of his chores.

We received surveys from all across the country, Mexico, and Canada, plus a good number from Australia and New Zealand. A subscriber in Sweden had trouble finding software for his 128 until he discovered Gazette and started buying items by mail. He uses his computer to keep track of the addresses of friends and relatives and members of his radio club. He says his 128 is also useful for creating party and fox-hunting invitations.

A good many use the 64 for interesting and unusual applications. One Canadian reader uses his to pick lottery numbers, although he didn't say if it helped select *winning* numbers. Another reader has two 64s at work connected to a magnetic-strip reader that controls the electronic locks on two doors. These security-conscious computers have been on the job 24 hours a day since 1985.

If you put your 64 or 128 to an unusual use, why not tell us about it? Describe your application in 500 words or less and send it to me on disk (Commodore ASCII) or printed double-spaced. I'll print the more interesting items in this column or in a separate article. Be sure to include your name, address, and telephone number, preferably one where you can be reached during the day. Send them to Gazette Editor, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

In the survey, I also asked you what you'd like to see in Gazette in the way of articles and programs. Your suggestions covered everything from more beginner material to more advanced programming information. Some wanted more games, while others asked for anything but games. Requests covered the software spectrum.

Games are popular, but many of you want more application software. You want programs that will make your life simpler, tackle some job around the home or office, or control appliances. There were many requests for programs that you could use with hobbies, such as amateur radio, photography, or baseball cards.

In June we published *CoilCalc*, a CAD program for designing coils for electronic circuits. We liked *CoilCalc* but felt it would appeal only to ham radio operators. I would appreciate your comments on this type of program. Should we publish similar niche applications or stick to programs with more universal appeal?

GEOS is another area of strong interest. Since many of you asked for *GEOS*-related programs and articles, I'm seeking qualified writers and programmers to supply material. Several *GEOS* columns are already in the works and should be ready soon.

Here's your chance, programmers. Games, *GEOS* programs, and application software for the 64—and especially the 128—are in big demand. Send your programs, with instructions printed out and saved on disk, to Gazette Submissions Reviewer at the above address. We want to purchase and publish your programs. ⊡

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NEWS & NOTES

What's New on Q-Link?

Interactive game players and casino fans have something new to check out on Quantum-Link. *Puzzler* is a word game for two to four players. Contestants spin a slot machine and guess the letters in a puzzle that appears on the tile board. Correct guesses cause the corresponding tiles to turn, revealing their location. The object of the game is to solve the puzzle before your opponents do and to earn as many points as possible in the process.

Players appear as animated contestants behind podiums. Online and offline character editors are available for Q-Link members to design and animate their own contestants. They can also create and submit their own puzzles for inclusion in the game's database.

Puzzler, Puzzle Editor, and *Contestant Editor* can all be downloaded from the Backstage Puzzler support area in Just for Fun. Other information and instructions can be found there, also.

Q-Link has also added enhancements to its four popular casino games. These new tools give the casino staff the opportunity to change the stakes in *Blackjack, Poker, Bingo,* and *Slots.* In addition, they have two new options in *Bingo*—the new Cover All game, where the entire card must be covered, or the standard Straight Line play.

In order to make distinctions between the kinds of games being played and the amount of Q-Chips needed to register or ante, check the color of the background screen or the dealer's hand. Various screen colors identify the different games and amounts. Check with Q-Link for complete details.

Quantum-Link (8619 Westwood Center Drive, Vienna, Virginia 22182; 703-448-8700) is a Commodore 64/128–specific online service.

Tee Up!

Are you an average golfer aware of your imperfections? If so, then check out *Personal Pro* ($39.95) from MicroLeague Sports (2201 Drummond Plaza, Newark, Delaware 19711-5711).

This interactive instructional golf package, which is due out in October, analyzes, diagnoses, and corrects your problem areas. *Personal Pro* displays animated diagrams of problems and solutions, records a file of your personal golf history, and prints out problem/solution checklists that you can take with you to the course or practice tee.

Unlike ordinary golfing manuals and instructional videos that try to teach you how to build a perfect swing—someone else's swing—*Personal Pro* is designed for the average golfer. It reviews the mistakes of each round and offers instant advice on how to correct them. Handicapping disks will also be available.

Hummingbird

***Hummingbird* by Robert Woodall of Rural Hall, North Carolina, is this disk's Picture of the Month.**

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 for "Gazette Gallery" 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.

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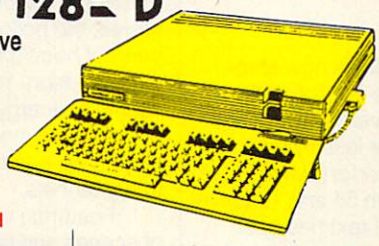

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NEWS & NOTES

Color Me Ninja

Those turtles are back! Merit Software (13635 Gamma Road, Dallas, Texas 75244) has released *Teenage Mutant Ninja Turtles' World Tour* ($14.95). This Electronic Crayon Deluxe release contains 30 pictures of those reinforced reptiles visiting famous world landmarks such as the Statue of Liberty, Mount Rushmore, and Stonehenge.

Children can color each picture again and again. They can also print banners, as well as posters and calendars, of their favorite turtle scenes.

Bible Study

SOGWAP Software (115 Bellmont Road, Decatur, Indiana 46733) is now shipping *Bible Search* version 3.1 ($79.95) for the 64 and 128. *Bible Search* is designed for general Bible study and in-depth Bible research. Its versatile search option can find any word or verse in the Bible in five seconds or less using a 1541. No hard disk or additional RAM is required for this fast performance.

Bible Search comes on seven double-sided disks with both 64 and 128 programs. Nearly 4.5 megabytes of Old and New Testament ASCII text has been compressed and indexed for use.

Other features include instant spelling check of the entire word list of more than 12,800 words. Search features include pattern matching, plus AND, OR, and NOT Boolean operators. Text can be displayed and scrolled in any direction. Printer and disk output are available for any verse. Disk output produces standard sequential text files for use with word-processing programs.

Bible Search is available in either the Authorized King James Version or the New International Version. It includes programs for the 64 and 128, a user's guide, and a disk storage case.

Trouble with a Capital *B*

UBI SOFT and Electronic Arts (1820 Gateway Drive, San Mateo, California 94404) have released *B.A.T.*, which stands for the Bureau of Astral Troubleshooters. You become one of the bureau's agents as you try to save the planet Selenia's only city, Terrapolis, from extinction.

Vrangor, a top scientist, and Mergio, a small-time crook, have announced their intention to set off bacterial bombs all over the city. This ultimatum leaves the government only ten days to evacuate the city and draw up a deed of ownership in Vrangor's name. Selenia contains vital energy matter that makes space travel possible. It's up to you to try to foil Vrangor's evil plans.

In this game, which comes on two double-sided disks, you can visit more than 1100 different locations, including discos, gunsmiths, restaurants, arcades, and parks. You can also program a computer implanted in your arm to understand extraterrestrial languages or to warn you when enemy robots approach. Create your own character or select one ready to go into action. You can also pilot the DRAG, a genuine flight simulator, across the planet's desert.

New Distributor

The *DMBBS* bulletin board program for the 64 or 128, formerly owned and distributed by ARTISoft, is now owned and distributed by A & C Enterprises, P.O. Box 71, Beachwood, New Jersey 08722-0071; (908) 349-9187 (voice), (908) 341-0945 (BBS).

How McFly Times

You won't need a DeLorean to take Marty McFly and Doc back and forth through time in this game. With a little help from Konami (900 Deerfield Parkway, Buffalo Grove, Illinois 60089), all you'll need is *Back to the Future II* ($29.95) and your 64.

Go back to 2015 to help save Marty and Jennifer's kids from themselves, the police, bully Biff and his gang of hoodlums, and Griff—Biff's evil grandson. You'll have lots of "items o' energy," "products o' points," and momentum boosters like plutonium, beverage cans, and your trusty tennies.

Featuring authentic re-creations of scenes and items from the film, *Back to the Future II* is really five games in one with each level—such as Jennifer's House of Fate and the Chase of a Lifetime—depicting a new chapter in the story.

Levels 1, 3, and 5 include arcade action where you'll need your hovercraft to fend off Biff's band of thugs. Levels 2 and 4 are logic puzzles that test your memory and ability to anticipate events. If you've seen the movie, you're one step ahead.

In Orbit

Edgeworth Software (44 Bower Street, Bedford MK40 3RE, England) has announced *E.S. Realorbit* ($7), a gravitational orbit simulator. Use your thruster jets to steer a spacecraft through a star's gravitational field. Try to achieve circular and elliptical orbits; then maneuver through a double star system. You can trace orbits and select jet power, star mass, distance between binary stars, and colors with this entertaining and educational simulator.

Edgeworth Software has recently left the U.S. and opened shop in England. Simon Edgeworth assures his 64/128 customers that all his products are still available and will remain compatible with U.S. computers. He accepts U.S. funds, either check or money order, and will ship all orders by airmail at no extra charge.

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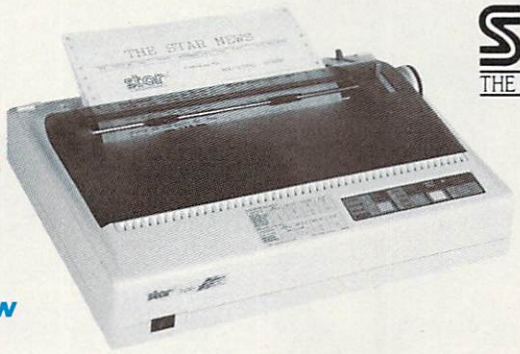

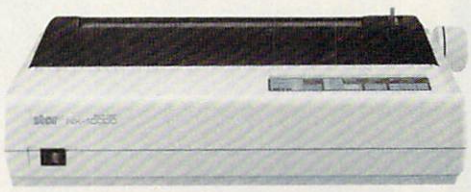

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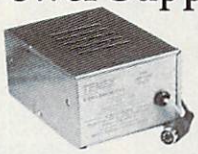

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MIRIAM SCHOTTLAND

Spotlight on Adventure

RUSS CECCOLA

MAGICAL KINGDOMS AND MYTHICAL CREATURES
ARE JUST A FEW OF THE EXCITING PLACES AND THINGS
AWAITING STALWART PLAYERS OF ADVENTURE GAMES

Adventure games make up almost a third of the game releases for all computers. Arcade/action games make up another third, and the remaining third is divided between sports and simulations. These percentages apply to 64 software as well. Let's take a look at the interesting adventure-game segment of the industry and see what's happening.

Because of their complexity and the demands they can make on players, adventure games are not for everyone. Still, there are some recent games that deserve mention. *B.A.T.* from UBI Soft, *Bill & Ted's Excellent Adventure* from Capstone, and *The Keys to Maramon* from Mindcraft are all fun games that cover a broad range of subject matter and difficulty levels. True adventure fans will want to check out several SSI releases and the latest from Origin, *Ultima VI.*

Save the City

B.A.T. stands for Bureau of Astral Troubleshooters, of which you are a member. Your job is to save the city Terrapolis on the planet Selenia from destruction at the hand of Vrangor, a mad scientist, and his crooked sidekick, Merigo. This evil duo plans to detonate nucturobiogenic bombs within ten days unless the city and all its assets are turned over to them.

Visit more than 1000 locations in *B.A.T.* and interact with seven species.

The game has a futuristic setting and an unusual interface that actually works well. *B.A.T.* is played with a point-and-click interface that uses menus and icons. In addition, items found in the game can be examined by clicking on them. Indeed, only by examining everything you see on the screen will you be able to play *B.A.T.* successfully. The game is huge. The game box claims 1100 rooms, and from what I've seen, this figure could be accurate. This variety keeps *B.A.T.* interesting for hours.

The first thing you do in *B.A.T.* is create your character. As is not the case in a lot of other games, your alter ego in *B.A.T.* is extremely well developed. It takes a while to set up your character, but the time spent will surely result in a better representation of yourself. In addition to all of the standard adventure-game options that can be brought up in the menus, you also have access to B.O.B., a bidirectional organic bioputer that connects to your arm. B.O.B. lets you translate languages and examine your statistics and health. You program B.O.B. with a rudimentary language that will inform you of various conditions and enable it to perform other functions.

The graphics in *B.A.T.* are pretty good for the 64. And even after you've managed to defeat Vrangor, you can still have fun exploring the city.

Adventure Calls

Bill & Ted's Excellent Adventure is primarily a movie tie-in, but the game is still worthwhile because of its random elements and the different skill levels allowed. In this game, you control the title characters as they attempt to collect "historical dudes" from the past for a school project. Different skill levels determine how many people you must collect. As you gather these historical characters, you return them to the San Dimas Mall. When you've gotten your quota, you take them to school.

You control Bill and Ted from a three-dimensional side view, using a telephone booth and circuits of time to travel throughout history. Some of the destinations involve completing arcade sequences. Others only require the use of a correct object to attract one of the "historical dudes." The quicker you reach your goal, the more points you earn.

I'll be honest. The graphics in *B & T* leave a lot to be desired. The 64 can handle better. Music and other sound are almost nonexistent. The game does not look appealing, yet gameplay is addictive. I found myself wanting to play *B & T* again at a higher difficulty level to see how quickly I could finish the game. Because each game of *B & T* is different, it's worthwhile playing again and again. A typical game doesn't take very long. *B & T* is a great diversion, if you don't mind graphics that look like they were poorly ported from the IBM version.

Rampaging Monsters

Mindcraft has a different way of thinking about adventure games. Its games take almost no effort to play yet have a lot to make them interesting. In fact, much about *The Keys to Maramon* is not evident on the surface. The manual is brief and explains only the basics. The rest of the game is left for you to discover. You can almost play *Keys* without reading the instructions at all, but it's still wise to go through them.

Keys puts you in the role of an adventurer who must save the town of Maramon from the monsters that rampage every night after dark. The game takes place in town and in the dungeons beneath. It requires a quick hand and well-balanced character to confront the monsters.

The game takes place in pseudo realtime. You have 12 hours to kill all of the monsters each night, or a building will be damaged. If they do too much damage to the town, the game's over. Budgeting your time is important, so don't think too long while the clock is ticking.

***Champions of Krynn* cuts unnecessary violence from many of its scenarios.**

Keys is a fast-paced game. You have potions and herbs to increase speed, strength, dexterity, armor, and life points. As the nights wear on, you'll need these aids to help you clear the town. Character interaction in the game is limited to conversation, but most people you encounter will offer valuable information. This moves the plot along.

You move your character around from an overhead view of the town and dungeons. Movement is quick and smooth. The graphics are nice, and you can easily identify each object and monster. After a couple of nights pass, you will know the town well enough to put away the map in the manual. *Keys* is not very difficult and can be played rather quickly. Exploring Maramon and discovering new things makes *Keys* enjoyable.

Advanced Dungeons & Dragons

One company that still supports the 64 is Strategic Simulations, Incorporated, more popularly known as SSI. With over ten years in the business and a large library of titles, SSI has journeyed through time with Commodore computers. In the past two years, SSI has produced a number of fine role-playing adventure games for the 64, most of which have been in its Advanced Dungeons & Dragons line of

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games. Using different-colored boxes to represent different types of AD & D adventures, SSI has a good variety of adventures.

The gold boxes contain large role-playing epics. Avoid two early games, *Pool of Radiance* and *Curse of the Azure Bonds,* unless you like an inordinate amount of combat. Two later games, *Champions of Krynn* and *Secret of the Silver Blades,* eliminate unnecessary combat and significantly improve the interface.

The two silver-box products are action games, with less role-playing elements and more arcade elements. Both are good, but *Dragons of Flame* is a big improvement over *Heroes of the Lance.*

War of the Lance in the green box is a war game in the fantasy world, so don't be deceived. The white-box game, *Hillsfar,* combines arcade and role-playing elements in a game with low difficulty and high fun factors.

SSI's *War of the Lance* is a war game set in the world of fantasy.

Finally, SSI's latest AD & D game is *Dragon Strike,* a dragon flight simulator in the Dragonlance gaming world. It's more arcade game than anything else; don't let the word *simulator* throw you. If AD & D games aren't your bag, try some of the older SSI titles, like *Phantasie, Wizard's Crown,* and the Questron series.

Lord British

Origin has also been a strong supporter of the 64. Almost all of its past games have been converted from IBM versions or developed on the 64.

Given the amount of time and resources required to develop adventures on the scale of Origin's Ultima series, it came as a surprise to me when Origin announced *Ultima VI* for the 64 before it released the Amiga version.

The Ultima series is one of the most popular adventure game series, and much of the credit for that success is due to the creativity and imagination of chief designer Richard "Lord British" Garriott. Each game in the series has far surpassed the previous one in most areas, including size, plot, interface, and graphics. *Ultima VI* is no different in this regard. As far as 64 adventures go, *Ultima VI* is at the top. This game can take months to explore, and all the time you're getting your money's worth. That's value.

Through a Moon Gate

In *Ultima VI,* your character must stop the spread of gargoyles that have slipped through a moon gate into the realm of Britannia. That's the basic plot, but more unfolds as you enter the game. Britannia is about as large as it was in *Ultima V,* but this time, instead of playing the game on two scales, you play it entirely from an overhead view of the characters and their surroundings.

The graphics are smooth, and it feels more natural to move around in one scale than it does in previous Ultima games that only show the individual characters in towns, dungeons, and other buildings. The past games jump to a map view of the game whenever the party travels into the wilderness. Because you can't see far ahead in *Ultima VI,* the cloth map comes in handy.

In addition to the overhead viewpoint, the objects and other graphics in *Ultima VI* are very nice. You can't distinguish objects in your inventory as well as you can larger objects in rooms, but this is no problem since you can examine objects effortlessly.

The interface in *Ultima VI* is an improvement over that in earlier episodes. Unlike the IBM version, which employs icons for all of the game commands, the 64 version requires keystrokes for commands. However, the number of commands has been reduced by the addition of a Use command, which replaces many others.

To use an object, just hit the U key and move the crosshairs to select an object from your inventory or one next to your character. This is the way to open doors, move levers, throw switches, and equip your character with weapons, armor, and other items necessary to survival and success.

Old Friends Return

Accompanying you in *Ultima VI* are characters from past games, namely Shamino, Iolo, and Dupre. Lord British starts you on your quest and can be consulted at any time for information. Object manipulation is easily accomplished from an inventory screen that readily identifies which object your character is carrying and which ones are nearby. It is best to distribute supplies to each character so no one is weighed down and you don't have to keep switching objects.

When the time comes, it's easy to fight in *Ultima VI.* Just choose a combat option and use the cursor to select a monster. Each monster has its own representative theme.

Ultima VI is a game chock full of characters, objects, locations, and dungeons. Characters follow a certain daily pattern. Some game objects are hidden behind paintings, under plants or crates. Discovering new things is what *Ultima VI* is all about.

You may never finish the game because of its size and scope, but designer Garriott doesn't care. (He'll give you a synopsis of this game in the manual of his next one.) Garriott believes it's more important for you to enjoy yourself exploring a rich world full of adventure. He's confident that there is much that you can do and gives you lots of room for discovery and pleasure.

SSI's *Curse of the Azure Bonds* is a role-playing epic filled with combat.

Ultima VI meets Garriott's criteria, and the game may be the largest adventure for the 64. It definitely is the most ambitious. Disk swapping is kept to a minimum in order to decrease the frustration factor. Sounds are appropriately scattered throughout the game, and the music is infectious. What results is a graphically rich world, full of places to go and things to see, where you can escape for minutes or hours. Plus, if you act now, you can probably still get the Special Edition of the game, celebrating the tenth anniversary of Ultima. This version is signed by the author and box artist. It contains an audio cassette of the history of Ultima narrated by Garriott and a higher-quality gemstone than that found in regular versions.

As you can see, adventure gaming for the 64 is alive and well. These are just a few of the many games out there. *Ultima VI* is my favorite, but the others are all fun and can be completed in a reasonable amount of time. In any case, if you're looking for a quest, try an adventure game. They're better than they were just a year ago. Happy questing! ⊡

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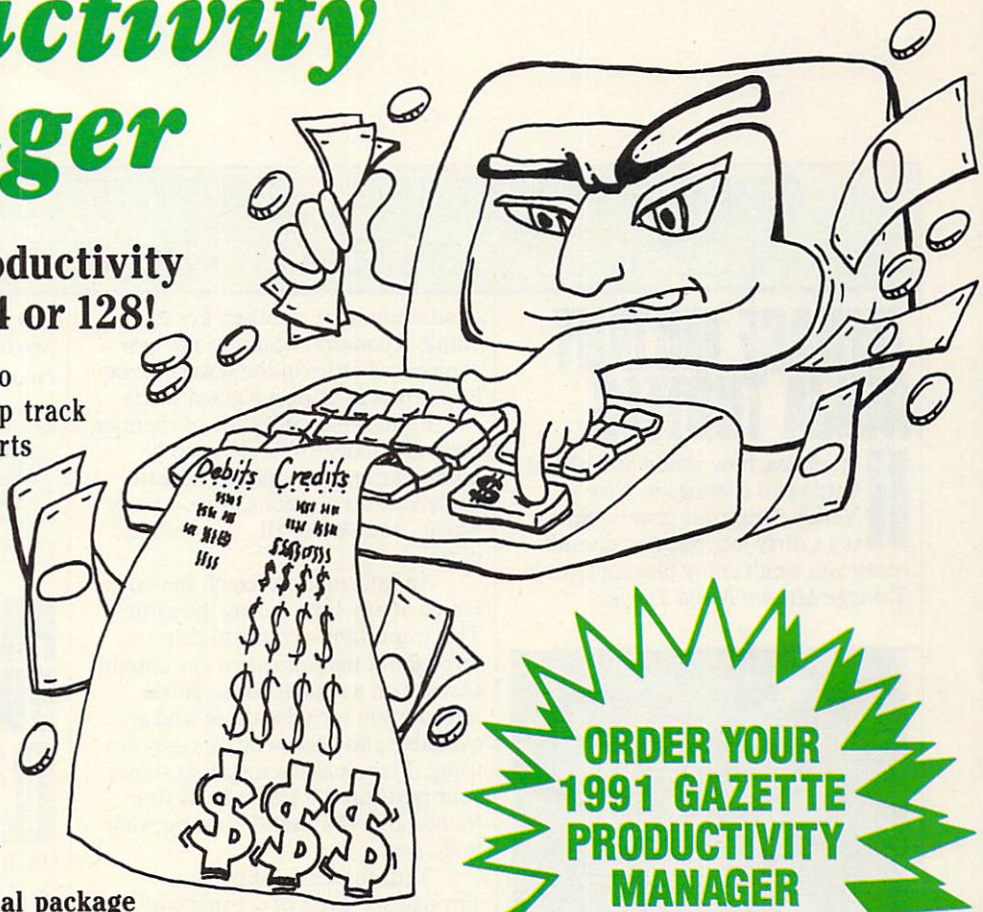

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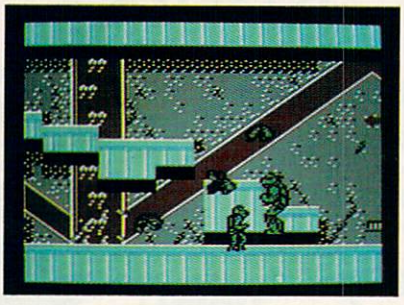
REVIEWS

CRIME-FIGHTING TURTLES • PRINTED CIRCUIT CAD PIECES FALLING INTO A PIT • BASKETBALL MANIA

TEENAGE MUTANT NINJA TURTLES

Hey, dudes, how would you like to battle evil enemies in New York's dangerous sewers? Sure it's a dirty job, but that doesn't mean you won't enjoy playing Ultra's *Teenage Mutant Ninja Turtles.*



Based on the famous movies, TV show, and comic books, this action-packed arcade game will give you hours of enjoyment. Raphael, Michelangelo, Leonardo, and Donatello are ready for your control. As the game begins, you must help these four pizza-loving turtles rescue their beloved friend, April O'Neil, who was abducted by the evil villain Shredder. You must rescue April, destroy Shredder, and take his life transformer gun to win.

Along the streets and sewers of New York, you guide the turtles to where April may be held hostage. You control their every move. Many evil creatures lurk about, so be prepared to fight. Mousers, Roller Cars, Foot Clan Soldiers, and many more foes are waiting to capture your reptilian warriors. Some enemies are easily destroyed, while others are not.

Strategy is important. Each of the four turtles has unique skills and weapons. Thus, one turtle may be better able to handle a particular enemy or situation than another. For example, Leonardo would be the best choice for battles in the sewers, since he's expert at using a Katana Blade.

Besides the multitude of enemies, there are many useful items to be found during your quest. These include various weapons, rope, a party wagon, and best of all . . . awesome pizza!

An information screen can be accessed at any time during the game. This important screen will help you throughout the game, and you should check it on a regular basis. Turtle information includes those who are available and what weapons they are using. There's also a map that shows your position. Messages from your friends give you useful hints on what to do next.

Your turtles must make it through six levels of combat without being captured. Each level has different phases to complete before you can move on to the next level. Looking at playability from this standpoint, the game can be rather difficult. Joystick movements for combat and travel throughout the game are, however, generally basic and simple. In this respect, I find the game easy to play.

After reading the short manual that comes with the game, you'll quickly be on your way to action and adventure. The manual is easy to understand and provides you with the necessary information. It tells you about the game controls, displays sample screens, lists the useful items to be found, and describes each enemy you will combat.

The sound and graphics are good. Most characters and items in the game are displayed clearly on the screen, and the background music is entertaining as well.

While it does not get high marks for plot originality, this arcade game is fun to play and provides many hours of entertainment. So, dudes, if you're up for some radical ninja action, just slip *Turtles* into your 64, grab your joystick, and go to town!

CHRIS STAWASZ

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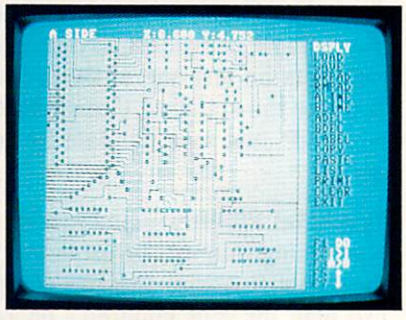
PRINTED CIRCUIT BOARD-64

Once again, I've stumbled across a 64 program that takes that wonderful machine into an entirely new area: printed circuit board (PCB) design and layout. Although it lacks some of the power and options of PCB programs used in the work world, *Printed Circuit Board-64* from MicroSentinel Systems does an impressive job on a 64 or 128.



This program is designed for the electronics hobbyist. If you need to put together a simple circuit board for some home project, it should take no longer to enter it into the computer than it does to devise it in the first place.

I must make a confession. I make a living as an engineer, and I'm familiar with circuit boards from college classes and from fixing arcade games and pinball machines for my brother's

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former vending business. For this reason, I expected to have no problem with *PCB-64,* but I wasn't too sure about people who lack those skills. What I found is that the program is easy for anybody to use, regardless of level of experience. *PCB-64* is best suited for hobbyists and circuit-board designers who want to get a head start on a project at home without having to use the company computer.

The package contains two main parts: the Layout Editor and the Artwork Editor. The former contains the tools and options to create your printed circuit board. The latter lets you add text, tweak the pad, trace sizes, and optimize the sizes of all components. Both programs are very simple to learn. You almost don't have to use the concisely written manual. With each program, you see a portion of the circuit board in the viewing screen and a list of commands along the right side of the screen. Select these commands with the keyboard and draw with the mouse or joystick.

A circuit board consists of pads (terminal points), traces (wires), and components (integrated circuit chips, resistors, and so on). The purpose of PCB layout is to design the board to accommodate the most electronic components in the smallest space possible. You could almost make a game out of PCB layout, with the object being optimization of space using a certain number of components.

PCB-64 lets you design two-sided circuit boards that can be as large as 8.8 × 6.4 inches. An important feature of *PCB-64* is that it allows you to scale the board to meet the specifications of many types and brands of printers. With a paint program interface that gives you pads and traces to define a board, the program is complete.

The other big feature of *PCB-64* is a list that the program generates upon request of all of the labels associated with components and their coordinates on the screen. Although *PCB-64* is not a program many people would use, it's a great little niche product. It lives up to its claims and will more than meet the specifications of someone who needs a low-cost circuit-board editor.

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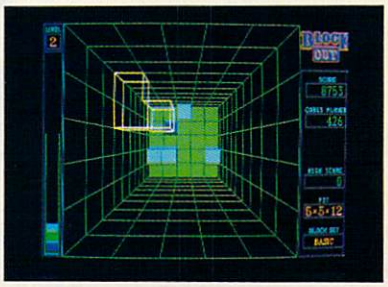
BLOCKOUT

For a perplexing challenge that exercises the brain instead of joystick reflexes, try *Blockout.* I highly recommend it to those of you who are looking for something more than just another shoot-'em-up.



***Block Out* will tax your hand-eye coordination. (IBM version pictured.)**

This game has a lot to offer—and it's not another *Tetris* clone. By taking the *Tetris* concept and making it three-dimensional, *Blockout* expands the old concept and takes it the next logical step.

As in *Tetris,* the object of the game is to drop irregularly shaped pieces into a pit. If you manage to fill

a level across the pit, that level vanishes, and you win bonus points.

Sounds simple, huh? It's not. Simplicity disappears as you advance and the game picks up speed. Pieces that used to float into the pit like feathers begin to drop like stones. I was quite happy reaching level 5, the pinnacle of my *Blockout* career.

Blockout's graphics are relatively simple but more than adequate for gameplay. The blocks themselves are 3-D, starting out as rotatable wireframe objects that solidify into colored layers as they reach the bottom of the pit. Your goal is to fill a layer so that it can be removed. If the shapes pile up and reach the top of the pit, you lose.

Blockout expands on the *Tetris* concept by offering you a selection of three sets of blocks. The sets range in shape from the simple to the complex. Some of the predefined games are described as Flat Fun (flat blocks), 3-D Mania (3-D blocks), and Out of Control (abnormal blocks). You can create a pit of your own dimensions and make a custom game. Any of the three block sets (Flat, Basic, or Extended) can be used in your custom pit.

Parameters for rotation speed and sound can be customized. Practice mode lets you play *Blockout* without having the pieces fall into the pit, thus giving you time to get used to the keyboard controls. Demo mode lets your computer show you how to play. Help is available to display the game's controls.

Blockout keeps track of your score. The ten high scores for each kind of pit (dimensions and block set) are saved to disk. The game's playability is good, but a little less keyboard control would've been nice. While this isn't a great handicap, using a joystick to control the game would've made it easier to play. As it stands, the joystick is used only for the program's menus, and some of the menu options are not even available to the keyboard user.

One thing I can say about *Blockout* is that if you don't own it, get it. It's a most perplexing puzzle that will be a favorite for years to come. So toss out those boring shoot-'em-ups and head for the computer store. Pick this one up—you won't regret it!

DAVID W. MARTIN

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basketball court for fast action.

This program's excellent graphics and sound effects make you feel like you're right there on the court. You hear the clock ticking away and the referee blowing his whistle. You can see your teammates' positions as well as the opposing team's players on the court as they pass the ball. Cheerleaders appear at halftime to root for you. Best of all, you can see your points mounting on the scoreboard each time the ball passes through the hoop.

Double Dribble is a game for one or two players. However, for two players, you'll need a second joystick. Playing against the computer is quite challenging, since the computer can match your every move. As the game begins, use the joystick to select such options as the number of players, the amount of time for each of the four quarters, and the NBA team that you want to represent during the game. You also have the option of selecting one of three levels of difficulty. If you find that you want to change any of these settings during a game, you can do so with a touch of the f3 key.

Your joystick controls all aspects of the game, and you can move across the court in eight directions. By putting your player in the path of the player with the ball and pressing the fire button, you can steal the ball from your opponent. The joystick also lets you pass the ball to another player of your choice with the press of the fire button. To take a shot, just aim the joystick toward the hoop and press the fire button. It's that easy.

There are several types of shots that you can take. These include foul shots, three-pointers, jump shots, set shots, as well as three types of slam dunks. A closeup of these slam dunks appears in detail as a team scores. *Double Dribble* also follows the same rules and regulations as pro-style basketball. Your blocking or charging will give an opposing team member a chance at the free throw line.

Overall, I found this game to be quite challenging and entertaining. I didn't play like Michael Jordan or Larry Bird, but I did manage to score a few points. So if you love basketball, give *Double Dribble* a shot!

CHRIS STAWASZ

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FEEDBACK

QUESTIONS FROM OUR READERS

Missing Sections

From looking at the advertisers index in the February 1991 issue of *COMPUTE*, a reader would get the idea that there are both Amiga and Gazette sections in each issue, but there aren't. Why the discrepancy, and how often will a section turn up missing?

TODD MOORE
PIEDMONT, MO

This was explained last year in "64/128 View" (October 1990), but since there still seems to be some confusion, we'll repeat it. After General Media purchased the four magazines we produced at COMPUTE! Publications, the four were merged into one basic COMPUTE *magazine. There are different versions, however.*

If you are a Gazette subscriber, we send you COMPUTE *with the Commodore 64/128 material in the Gazette section. Amiga Resource subscribers get* COMPUTE *and the Amiga section. PC subscribers get* COMPUTE *with the PC section. If you subscribe to* COMPUTE, *you get* all *the sections, but* without *the Gazette type-in programs. For those people who may have several different computers, including a 64 or 128, we offer a multiversion edition that contains all the material, including the type-in programs.*

Until recently, the Gazette and Amiga sections were also available in the newsstand editions. Now they are available only by subscription and in certain computer stores: Babbage's, Software Etc., and Software Boutique. From time to time some editions may contain additional sections. Since we use the same advertisers index for all editions, you'll see the references to all the different editions. On occasion, subscribers may receive the wrong version. If this happens, please contact our subscription office at (800) 727-6937.

From *SpeedScript* to Amiga

I have been using *SpeedScript 64* for a number of years, and I have written a large number of files that I'd like to keep. I also own an Amiga 1000, and I would like to transfer these files to the Amiga. Unfortunately, the terminal program I have for the 64 doesn't seem to be able to transfer the *SpeedScript* files. What do you recommend?

MICHAEL W. BELL
ROCKFORD, IL

The problem of converting Commodore-specific text files to true ASCII (American Standard Code for Information Interchange) is a recurring one. The reason for making the conversion usually involves transferring files from one brand of computer to another. The 64 and 128 derive their character set from a time when ASCII wasn't the de facto standard it is today, and the big players took no pride in being compatible. Consequently, the 8-bit Commodores confuse upper- and lowercase, neglect common characters such as the brace and underscore, and even assign some odd character codes to the characters that they do have. The remedy is to run a program that converts Commodore character codes—commonly called PETSCII *after the original Commodore PET—into true ASCII.*

There are several such programs available, and usually they read from and write to sequential files. But SpeedScript *adds a little more complexity to the situation by using its own special codes for formatting, handling text itself in an atypical fashion, and writing program files instead of sequential files.* SpeedScript *does offer two ways around this problem. It will write PETSCII sequential files if you print the file to the disk by pressing Shift–Control–P and then D (for* disk*) at the prompt. If you press Control-£ and then the A key on the first line of your document and then print it to disk, the file will be saved as a true ASCII file and will be easy to upload.*

Screen Dumps and Errors

I have a 64 and a Cardco Card B interface. The Cardco manual has a screen-dump program, but it doesn't seem to work. Is there a screen dump available from any vendor? I need one for my BASIC programs.

Also, I have a Blue Chip (BCD 5.25) disk drive that gives erroneous characters when I add a spreadsheet or game scores. I have several spreadsheets that will not work. I would appreciate hearing from other people who may have similar problems with their Blue Chip drives.

DENNIS LONG
MANASSAS, VA

Cartridges, such as the Soft Group's Super Cartridge Explode V.5 and LMS's Super Snapshot V5, offer screen dumps and many more features. CMD's JiffyDOS also has a screen-dump option. Advertisements for these products can be found in recent issues of this magazine. If you have back issues of Gazette, *check for a type-in program called* PrintScreen *(December 1987). It also offered a customizer program for different printers. There was also a program called* Hi-Res Screen Dump *(October 1984) for 1525 or compatible printers.*

We have never heard of a disk drive's being responsible for erroneous characters in spreadsheets or game scores. Are you certain you've entered the formulas correctly? If any other readers have experienced similar problems, we'll be happy to pass their information on to you.

Nifty Jiffy

I was pleased to see Art Hunkins's favorable review of Creative Micro Design's JiffyDOS 6.0 in the December 1990 issue. It's a terrific system, but I have to take issue with him on several points.

First, his apparent horror at the idea of replacing soldered-in ROM chips. What's the big deal? I did it twice in old 64s. No sweat. Just use common sense and a good soldering tool to pull the ROMs, a low-watt iron to solder the new sockets, and gentleness when inserting the new chips. It's nothing that an experienced amateur or technician couldn't do in ten minutes. That's all it took me, and I'm no

FEEDBACK

whiz kid.

Second, save-with-replace routine. That command works fine in my machine. All I do is have the revised program in memory, hit f1 for the directory, cursor to the filename, insert three spaces between the open quotes and the filename, type @0:, hit f6, and then hit Return. It's quite convenient.

Third, validate and format speeds. They definitely are improved on my 1541.

I do have some minor bones to pick with CMD. I wish it had retained the function-key RUN and LIST commands as in previous versions and relegated TLIST and LOAD ML to program-mode commands.

Otherwise, all's great, and kudos to *COMPUTE* for the new design.

RICHARD VAN FRANK
MONTCLAIR, NJ

Once you have some experience with a soldering iron, removing ROM chips and soldering in new ones without damaging anything may not be such a difficult task. But it's not the place for a beginner to start. If you have a newer 64 with chips that slide in and out of their sockets, installing the JiffyDOS replacements is a snap. CMD recommends you check to see which type you have before ordering JiffyDOS.

Reader-to-Reader Help

I am desperate and don't know where to turn next. I am looking for a 36-pin plug so I can print documents in Epson mode for my SR 2000 Dual Interface printer. I have a 64 and a 1541 disk drive. Does anyone know where I can purchase this plug?

BOB CHALFANT
12229 SE 196TH ST.
RENTON, WA 98058-7518

The information about my modem was recently destroyed, so I wrote a letter to the company requesting a copy. My letter was returned, since the company apparently has gone out of business. Can anyone help me find an instruction manual for a Westridge Communications modem, model MFJ-1237?

GARY LEE REYNOLDS
15 DANIEL ST.
UNIONTOWN, PA 15401

Blasts from the Past

I read in one of your magazines that you could order a back issue of *COMPUTE*, but I was wondering if it's possible to order a full year's worth. Also, is it possible to get back issues of the disks?

ERIC SCHNEIDER
KILLEEN, TX

We have back issues of many magazines and disks, but supplies vary. If you contact Single Copy Sales, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408, (919) 275-9809 and specify which issues you want, we'll see what we can do. Back issues of magazines are $6.00, and disks are $9.95. There are no issues for July, August, or September 1990, as we did not publish during those months.

Final Help

This is in reply to David Richards' Final Cartridge III question in the February 1991 issue about the Help and Replace commands. There is a slight difference in the way the commands act in 64s with different ROM versions, but all commands work. Enter PRINT PEEK(65408) to see which version you have. I have computers with versions 0 and 3.

Help is useful in debugging BASIC. It lists the last executed line. Just enter HELP after pressing Stop or after an error occurs.

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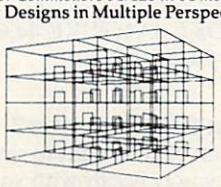

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FEEDBACK

It's nice when you can't see an error message onscreen.

Replace is my favorite command. It changes BASIC commands, numbers, or anything in quotes, excluding commas and quotation marks. For example, if you were to enter REPLACE "FOR J", "FOR K", it would change J to K in FOR-NEXT loops.

BRIAN KISSINGER
EVANSVILLE, IN

Software Resource

Here's a hint for your readers who want to find certain software for the 64, Amiga, Plus/4, VIC 20, or PET. It will also help you find the names and addresses of companies that produce that software. It's a book called *Software Information for Commodore Computers* by Menu. It can be found at public libraries. It's up to date and extensive.

JOHN REALING
SPOKANE, WA

You're right, John. We use it quite often. Menu, which is a division of Black Box, sold this 400-page directory to Commodore, which is now distributing it. If you would like to purchase a copy, write to Commodore—The Menu, Attention Customer Support, 1200 Wilson Drive, West Chester, Pennsylvania 19380. The cost is $12.95 plus $3.00 for shipping and handling.

Mangled Memory

I am working on a game program that uses redefined characters on the 64. The program also uses three-dimensional arrays. I have a problem with the screen elements turning to garbage after it runs for a while. A few reverse characters can be identified, but that's it. Can you help? Is it a problem with memory?

AL FREEMAN
MIAMI, FL

It sounds like you are experiencing a memory conflict. You've put new character shapes used in your game into a certain block of memory. As the program runs and uses different variables, BASIC stores these variables in the same memory where the character shapes are stored. This causes the individual character shapes to turn to garbage. Reverse character shapes are in the second half of the character set, so they are the last ones to be garbled.

The Video Interface Chip (VIC-II) handles all the video-related chores, including the display of character shapes. This chip can access only 16K of memory at a time. The default video bank is 0 (from location 0 to 16383), which means the screen, custom character shapes, and sprites must all reside in that same 16K block. Since a complete character set uses 2048 bytes, it's common to use the 2K at the top of the video bank for that purpose. This puts the custom characters at 14338–16383.

A 64's BASIC is built into a continuous section of memory. The 64 uses locations 0–1023 for its own purposes, and screen memory and sprite pointers occupy 1024–2047. The first byte available for BASIC is 2048. Read Only Memory (ROM) starts at 40960. So under normal circumstances BASIC controls the 38,911 bytes of the memory from 2048 to 40959.

What about the custom characters that are stored at 14336–16383? They are in the middle of the block of memory BASIC expects to use as its own. This is where the problem arises with your custom characters turning to garbage when your program runs. BASIC expects to use this area for its own purposes. As it uses more and more variables, memory fills up, and before long your character shapes have been overwritten by BASIC.

There are a couple of things you can do to get around this problem. Move the characters to another location, or move BASIC. Moving the character sets requires moving the video banks, which also means you have to move the screen and the HIBASE pointer at 648. If you do this, then you have to either disable the Restore key or avoid pressing Run/Stop–Restore. Most programmers find it easier to move BASIC to another location. To transfer the start of BASIC from 2048 to 16384 (which is just past the end of your character set), enter the following lines in direct mode before you load your program:

```
POKE 43,1:POKE 44,64: POKE
  16384,0: NEW
```

An ST Magazine?

First of all, I want to say that I'm not precisely happy with your decision to integrate Gazette into *COMPUTE*. Of course, I understand your decision, since there are fewer 64 owners; that means fewer subscribers. But I think you're going to lose more subscribers with this decision. Time will tell. Anyway, I'll probably renew my subscription, since I don't know of any good Commodore-only magazine other than yours.

The main purpose of this letter is not to complain, however. I've just bought an Atari 520 ST (I'll keep my good old 128), and I was wondering if you publish any ST-specific magazines or books.

JOSE LUIS REGUEIRO
MONTEVIDEO, URUGUAY

As 8-bit Commodore users upgrade to other systems, they also make changes in the computer magazines that they buy. It's true that Gazette doesn't have as many subscribers as it did when interest in the 64 was at its peak, but a more significant problem is the shrinking number of advertisers. For most publications to remain healthy, they must have advertisers as well as subscribers. Look at a Gazette from a few years ago and then look at this issue. Compare the number of ads for Commodore-related products.

By combining Gazette with COMPUTE, *which now has a PC focus (and more advertisers), we can somewhat offset the loss in 64 advertising revenue and yet still provide Commodore owners with the useful, entertaining, and informative material that they want.*

From 1986 until 1988, we published COMPUTE!'s Atari ST Magazine *with a companion disk. It failed to attract sufficient advertisers or a large enough base of subscribers to remain profitable. Back issues of the magazine and disk are still available. The price for each magazine and disk combination is $8. Foreign orders should add $6 for postage. To order back issues of any of our magazines, write to our Greensboro, North Carolina, address printed below.*

If you have a question, comment, or problem, we want to hear from you. Send your letters to Gazette Feedback, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. ⊡

PROGRAMMER'S PAGE

RANDY THOMPSON

This month "Programmer's Page" presents 128 programming tips—that is, programming tips for the Commodore 128 (not 128 tips). Got it? Good!

Taking It with You

Like to move to 64 mode without losing the current BASIC program? It's easy. Simply enter the following commands:

```
POKE 43,1
POKE 44,28
```

These POKE statements tell the 64 portion of your computer that the current BASIC program may be found in memory at 7169 ($1C01), the default location in 128 mode.

HENNING VAHLENKAMP
MATAWAN, NJ

Timely Program Saves

This utility programs one of your computer's function keys so that it saves the current BASIC program to disk. To keep successive saves separate, the elapsed time is added to the end of the program's filename.

When you run this utility, you are asked to enter a filename and a function-key number. As an example, enter MYPROGRAM, 5 (the 5 specifies the f5 key). Answer *Yes* at the RESET CLOCK prompt. Next, load the program you want to edit, make your changes, and then press f5. If 20 minutes and 32 seconds have elapsed, your program will be saved to disk using the filename MYPROGRAM 002032. Now let's say you make additional changes which take exactly 5 minutes. When you press f5, the program is saved with the filename MYPROGRAM 002532.

```
10 C$=CHR$(34):BL$="          "
20 INPUT "PROGRAM NAME,
   FUNCTION-KEY
   NUMBER";P$,K
30 P$=LEFT$(P$+BL$,10)
40 PRINT "RESET CLOCK?"
50 GET K$:IF K$<>"Y" AND
   K$<>"N" GOTO 50
60 IF K$="Y" THEN
   TI$="000000"
70 KEY K,"DSAVE"+C$+P$+
   C$+TI$+CHR$(13)
```

In addition to providing a way to differentiate between multiple versions of the same program, this utility also allows you to see how much time you spend between programming sessions.

JAMES A. SWIFT
ORLANDO, FL

HANDY PROGRAMMING FOR THE 128 ONLY

In Focus

To increase the readability of the 128's 80-column screen, try entering the following POKEs:

```
POKE 54784,9
POKE 54785,232
```

This smooths out the vertical appearance of the 128's slightly grainy 80-column character set.

JESSE SIEHLER
CUMBERLAND, MD

Undocumented Info

Although it's not mentioned in the 128 System Guide, you can use CTRL-S instead of the Scroll Lock key to pause screen scrolling. Press any other key to continue scrolling. Another undocumented keyboard tip is the ESC ESC sequence. Hitting the Escape key twice provides an alternative to the traditional ESC O sequence for canceling quote mode.

If you have a 128D or 128 with a ROM upgrade, enter the following instructions.

```
BANK15:FOR L=25589 TO
   25611:PRINT CHR$
   (PEEK(L));:NEXT
```

It reveals a secret message.

HENNING VAHLENKAMP
MATAWAN, NJ

Double-Spaced Listings

With the 128's expanded memory, programs can reach enormous lengths. Large BASIC listings can become quite a headache to debug, too. The following function-key definition can help out. After executing the code below, pressing the f7 key prints a double-spaced program listing to the screen.

```
KEY 7,"OPEN128,3:
   CMD128:LIST:CLOSE128:
   A"+CHR$(13)
```

Note the *A* at the end of the function-key string. This forces a syntax error which resets the computer's text output to normal, single-spaced printing. Without this *A*, strange side effects occur. If you'd like the option to list a specific range of program lines, use these function-key definitions:

```
KEY 7,"OPEN128,3:
   CMD128:LIST"
KEY 8,":CLOSE128:
   A"+CHR$(13)
```

To use these keys, press f7, enter the line-number range you want to list (or don't enter anything if you want to list the entire program), and then press f8.

ARTHUR MOORE
ORLANDO, FL

"Programmer's Page" is interested in your programming tips and tricks. Send all submissions to Programmer's Page, COMPUTE's Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. We'll pay $25–$50 for each tip we publish. ⊡

MACHINE LANGUAGE

JIM BUTTERFIELD

CALCULATING HI-RES SCREENS IT ALL ADDS UP

Programming hi-res graphics on the Commodore 64 or 128 (in 40-column mode) has always been a mystery to newcomers. The most confusing thing about the Commodore hi-res screen is the fact that it isn't laid out the way you might expect. The eighth pixel on the top row of the screen appears next to the ninth, but they are actually eight bytes apart. As you might expect, plotting points on a screen like this can involve some pretty complicated math.

This month's column should make it crystal clear. Given X (0–319) pixels from the left of the screen, and Y (0–199) pixels from the top, the calculation goes as follows. Divide X and Y by 8 (keeping the remainders XR and YR). The quotients represent the row (0–39) and column (0–24) of the character cell in which the pixel is located. Multiply the Y quotient by 40 and add the X quotient; that gives the character cell number. Multiply this result by 8 to get the byte number for the start of the graphics cell memory; add YR to get the actual byte. The resulting number, from 0 to 7999, determines the byte within graphic memory. Add the graphics base to get the actual address. The XR value will tell us which of the eight bits will be involved.

It sounds complex, but it can be worked out neatly in machine language. Multiplying and dividing by 8 is just a matter of three shifts, left or right. Dividing by a value such as 8, the remainder is even easier: The AND function will extract it for us. Looking more closely, we see that a division by 8 is followed by a multiplication by 8; that provides another shortcut.

In fact, multiplying by 40 seems to be the hardest part, and that's just multiplying by 5 and then by 8.

Assuming that the graphics base is at address $2000, and that the user will POKE values of X into addresses 78 (high byte, $4E) and 79 (low, $4F), and POKE Y into address 80 ($50).

```
033C  A5 50     LDA  $50
033E  29 07     AND  #$07
0340  85 52     STA  $52
```

Note that the EOR command will produce the equivalent of INT(Y/8)*8 in a single instruction. We'll do this again later for X.

```
0342  45 50     EOR  $50
0344  85 FC     STA  $FC
0346  A2 00     LDX  #$00
0348  86 FD     STX  $FD
```

We'll multiply by 4 and add the original value to get the effect of multiplying by 5. We're arriving at the equivalent of INT(Y/8)*40.

```
034A  06 FC     ASL  $FC
034C  26 FD     ROL  $FD
034E  06 FC     ASL  $FC
0350  26 FD     ROL  $FD
```

The earlier value is still in A, so we may add immediately. Can you see why we may be sure that the carry flag is clear?

```
0352  65 FC     ADC  $FC
0354  90 02     BCC  $0358
0356  E6 FD     INC  $FD
```

The calculated value is in the A register (low) and address $FD (high). Next you want to multiply by 8, so continue to use A. A loop is possible, but straight code is easy.

```
0358  0A        ASL
0359  26 FD     ROL  $FD
035B  0A        ASL
035C  26 FD     ROL  $FD
035E  0A        ASL
035F  26 FD     ROL  $FD
0361  85 FC     STA  $FC
```

Time to work on X.

```
0363  A5 4F     LDA  $4F
0365  29 07     AND  #$07
0367  85 51     STA  $51
0369  45 4F     EOR  $4F
```

The three low bits of the A register must be 0. We want to add the value in A to the value in $FC and $FD, and then add the Y remainder that we stored long ago in address $52. These values have no bits in common, so we can combine them and save a step using the ORA instruction.

```
036B  05 52     ORA  $52
036D  65 FC     ADC  $FC
036F  85 FC     STA  $FC
```

Video base address is assumed as $2000.

```
0371  A5 4E     LDA  $4E
0373  09 20     ORA  #$20
0375  65 FD     ADC  $FD
0377  85 FD     STA  $FD
0379  60        RTS
```

In the above coding, the carry flag has been doing exactly the right thing every time. A happy occurence.

Address FC/FD contains the address of the byte for manipulation. You'll need this bit-lookup table.

```
037A  80 40 20 10 08 04 02 01
```

Finally, this calling routine will calculate the location and set the pixel.

```
0382  20 3C 03  JSR  $033C
0385  A6 51     LDX  $51
```

```
0387  A0 00     LDY  #$00
0389  B1 FC     LDA  ($FC),Y
038B  1D 80 03  ORA  $037A,X
038E  91 FC     STA  ($FC),Y
0390  60        RTS
```

POKE 78,X-high (0 or 1); POKE 79,X-low; POKE 80,Y and then SYS 898 (that's address $382), and the pixel will be plotted. Although the above might seem like a lot of code, it's surprising how much good math you can pack into a relatively brief machine language program.

The following BASIC program may seem slow, but that's the fault of BASIC, not the ML code. Note that address 8192 (hex 2000) is within the activity area of the BASIC language; a larger program using this kind of code would need to look carefully so that the screen would not collide with BASIC.

```
100 DATA 165,80,41,7,133,82
110 DATA 69,80,133,252,162,0
120 DATA 134,253,6,252,38,253
130 DATA 6,252,38,253,101,252
140 DATA 144,2,230,253,10,38
150 DATA 253,10,38,253,10,38
160 DATA 253,133,252,165,79,41
170 DATA 7,133,81,69,79,5,82
180 DATA 101,252,133,252,165
190 DATA 78,9,32,101,253,133
200 DATA 253,96,128,64,32,16,8
210 DATA 4,2,1,32,60,3,166,81
220 DATA 160,0,177,252,29,122
230 DATA 3,145,252,96
300 FOR J=828 TO 912
310 READ X:T=T+X
320 POKE J,X
330 NEXT J
340 IF T<>9391 THEN STOP
400 REM SWITCH IN HI-RES
410 POKE 53272,24
420 POKE 53265,59
450 REM CLEAR COLOR
460 FOR J=1024 TO 2047
470 POKE J,118:NEXT
480 REM CLEAR CHARACTER
490 FOR J=8192 TO 16383
500 POKE J,0:NEXT
510 FOR X=30 TO 200
520 Y=20:GOSUB 900
530 Y=X-10:GOSUB 900
540 Y=X-9:GOSUB 900
550 NEXT X
790 FOR J=1024 TO 2047
800 POKE J,32:NEXT
810 REM SWITCH OUT HI-RES
820 POKE 53272,20
830 POKE 53265,27
840 END
900 POKE 78,X/256
910 POKE 79,(X AND 255)
920 POKE 80,Y:SYS 898
930 RETURN
```

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BEGINNER BASIC

LARRY COTTON

Although we studied this not long ago, we'll continue our BASIC math with a review of the somewhat arcane, but nevertheless quite useful, trigonometric functions sine, cosine, and tangent (or SIN, COS, and TAN, as they are used in BASIC). But first a brief course in trigonometry.

Triangles are the reasons trig exists. Without those ubiquitous three-sided figures, SIN, COS, and TAN probably would never have been invented. In the good old days, you had two methods for finding various sides and angles in triangles: trigonometry tables in books and a slide rule. Thanks to calculators and computers, trig functions are now a mere keypress away and more accurate than either the slide rule or tables. SIN, COS, and TAN can handle most triangulation problems you'd want to solve. Yes, there are more trig functions, but most of them can be derived from these basic three functions.

To use trig to discover unknown sides or angles, the triangle must be a right triangle—that is, one angle must equal 90 degrees. (In this column, *triangle* means "right triangle.")

You must also know at least two other things about it: the length of one side and the size of one angle, or the length of two sides. However, knowing all the angles is not sufficient to calculate the sides. Possibly the most common triangle is a 45-45-90 (so called because of its angles); both its short sides are the same length.

The next most common is a 30-60-90. The length of its shortest side is always half the length of its longest. Notice that the sum of a triangle's angles is always 180 degrees; if you know two angles, just subtract their sum from 180 to find the third angle. By knowing the lengths of any two sides of a triangle, you can find the length of the third side by using squares and square roots (see last month's column). Here's an example:

```
10 PRINT"[CLR][DN]IF YOU DON'T
   KNOW A SIDE,"
20 PRINT"JUST PRESS RETURN."
   :PRINT
30 INPUT"LONGEST SIDE";SL
40 INPUT"SHORTEST SIDE";SS
50 INPUT"SECOND LONGEST
   SIDE";SM
60 IFSL=0THENUS=SQR(SS↑2+SM↑2)
70 IFSM=0THENUS=SQR(SL↑2-SS↑2)
80 IFSS=0THENUS=SQR(SL↑-SM↑2)
100 PRINT:PRINT"UNKNOWN SIDE
    IS"US
```

When running this program, just press Return to denote the side you're trying to find. For instance, if you press Return at the first prompt, the value of the longest side will be 0. Then, after you enter the values of the two other sides, line 60 will execute. It detects that SL (the longest side) is 0, or unknown, and calculates its value.

We're using the Pythagorean theorem, which says that the square of the longest side of a triangle is the sum of the squares of the other two sides. Look at line 60. US (the unknown side) is calculated by taking the square root of the sum of the squares of the other two sides. Remember that math inside parentheses is done first. Therefore, SS (the shortest side) is squared first; then SM (the next longest side) is squared before those two numbers are added. The square root of that number is taken, giving the length of the longest side.

Line 70 or 80 is used if the longest side and one of the shorter sides are known. The longest side is squared first; then the known short side is squared. The latter result is

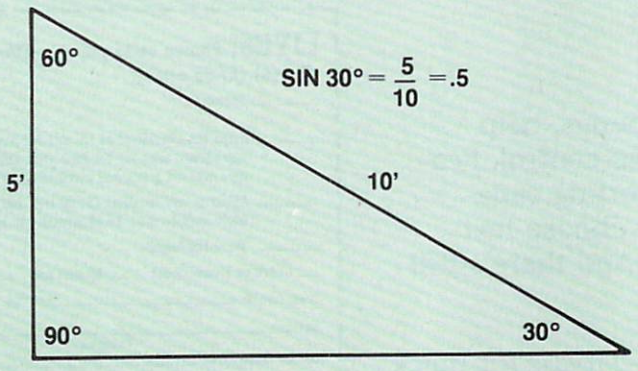

Figure 1

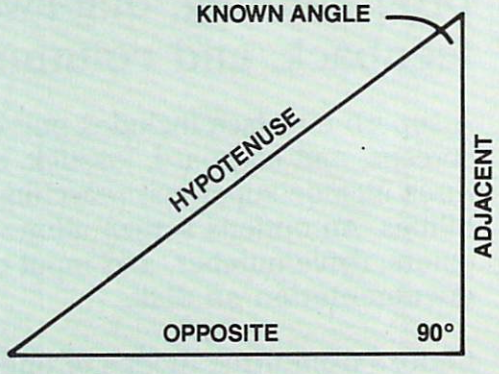

Figure 2

subtracted from the former, and the square root of that result is taken to get the answer. One of the IF-THENs will always be true if two legal values are entered. Even though three questions are always presented, only two positive values can be entered. Line 100 always prints the answer.

Try entering 5 for the longest side and 3 for the shortest. The second longest side will be 4. Another whole-number triangle is one whose sides are 5-12-13. In other words, if you just press Return at the first prompt and then enter 5 and 12, the answer will be 13. If you enter 13, skip the next, and enter 12 for the second longest side, the answer is 5.0000001, which should be exactly 5.

The reason for the very slight mathematical error is that the computer converts every decimal number you enter to a binary number, does the calculations in binary math, and then converts the binary answer back to decimal form. Some accuracy is lost in this conversion process.

SIN is simply a ratio of the lengths of two sides of a triangle. In a 30-60-90 triangle, if the shortest side is 5 feet, the longest will be 10 feet. The ratio of the two sides is 5:10, which can be written 5/10 or .5. The shortest side will be opposite the 30-degree angle. The SIN of 30 degrees is .5. The SIN of any angle is the ratio of the side opposite the angle to the longest side. (See figure 1.)

To find this value using the computer, try entering the following in the immediate mode.

```
PRINT SIN(30)
```

Surprisingly, the computer spits out −.988031623. What gives?

The computer calculates trigonometric functions in radians. There are pi (about 3.14) radians in 180 degrees; one degree equals about .017 radian. Therefore, in order to calculate SIN in degrees we must type the following:

```
PRINT SIN(30*π/180)
```

This will yield the correct answer, .5.

The side opposite the known angle is called, appropriately, the opposite side. The side next to the known angle is called the adjacent side, and the long side is the hypotenuse. (See figure 2.) As an example, if you know one angle and its opposite side, you can calculate everything else.

```
10 INPUT"[CLR][DN]SHORT SIDE";SS
20 INPUT"[DN]ANGLE OPPOSITE
   SHORT SIDE";KA
30 SL=SS/SIN(KA*π/180)
40 AN=180-90-KA
50 SM=SQR(SL↑2-SS↑2)
60 PRINT:PRINT"LONG SIDE IS"SL
70 PRINT:PRINT"NEXT LONGEST SIDE
   IS"SM
80 PRINT:PRINT"SHORT SIDE IS"SS
90 PRINT:PRINT"ANGLES ARE 90,"KA",
   AND"AN
```

Next month: more trig! ⊡

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D'IVERSIONS

FRED D'IGNAZIO

About a year ago I wrote a column announcing the Design-a-Robot Contest. Shortly after that piece appeared, COMPUTE! Publications went through major changes, and the Design-a-Robot Contest had to be postponed. Recently we've had a resurgence of interest in this contest, so we've decided to run it again.

When I was a little kid, the only robots I saw were on TV and in the movies. Back then there were no real robots, only robots of fantasy and science fiction—robots like Robbie, Tobor, Klaatu, and Gog. That didn't stop me from trying to build a robot of my own. I scavenged parts from old bicycles, washing machines, photocopiers, and toasters. I once even used a bedpan as a robot's body. During school I daydreamed about building a robot of my own—a man Friday, a servant, a buddy, a friend.

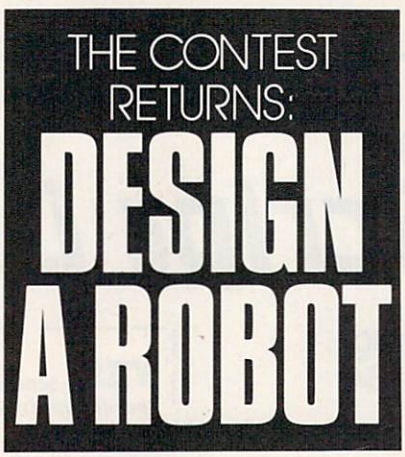
When I grew up, I learned that while I was dreaming up make-believe robots, real robots were being built in the U.S., Europe, and Japan. The real robots looked like long skinny sea monsters with pliers for jaws. They were called *robot arms* and were bolted to factory floors. They painted cars, welded, and lifted heavy objects.

NASA built other robots and launched them into outer space. In space or on earth, robots journeyed where humans could not go—into the poisonous atmosphere of Venus, the crushing gravitational pressure of Jupiter, and the cores of nuclear reactors. They became a sort of human *telepresence* that could explore the universe and take risks we humans dared not take.

Robots began doing jobs that were dull, dirty, or dangerous. Robots never got sick, didn't take coffee breaks, had an infinite attention span, and could work three shifts without dropping. Bosses liked them because they never talked back, didn't go on strike, and didn't belong to a union.

All these outer space, undersea, and factory robots were neat, but they weren't what I really wanted. I wanted a robot like C3PO, R2D2, or Vincent in Walt Disney's *The Black Hole.*

For a while, in the early 1980s, it looked as if I would get my wish. As personal computers grew in popularity, a new field of personal robotics emerged. An International Personal Robotics Congress was held in Albuquerque, New Mexico, in April 1984. The following two years personal robots were everywhere. Every week new robots came to my house so I could review them for *COMPUTE!'s Gazette* or for the TV program I was on, "The New Tech Times." When the show's TV crew arrived, I would plug the robots into my Commodore 64, turn them on, and let them roam the house.



For one of the TV shows I had 27 robots (monkeys, turtles, and robo-balls) all running at the same time.

I was in seventh heaven. My childhood dreams had (almost) come true. But then the bottom fell out in the personal robotics business. No new robots came to stay. I was sad. I missed the whir and buzz of the little motors, the tire tracks across my scrambled eggs, and the occasional wandering robot who ended up stuck in the bathtub, wedged under the toilet, or lost among the galoshes in the back of the closet. I missed their chipper voices, their songs (like "Old MacDonald Had a Robot"), and their clever remarks when they encountered the broom or the cat. "Hi!" they'd say. "Are you a human being?"

I can't wait around any longer. If the robot revolution isn't going to happen on its own, I'll make it happen with the Design-a-Robot contest.

Entering the contest is easy. All you have to do is invent a new personal robot on paper. It can be completely original or a combination of all the robots you've seen, dreamed about, or imagined. Draw a picture of the robot, label all of its interesting parts, and describe what each part does. Show me how the robot relates to your computer. Does the computer control the robot? Does it program the robot? If so, how? How are the signals and commands transmitted and received? What kind of programming language should the robot use? Can you invent commands of your own?

Along with the robot's diagram I would like a short description of what robots mean to you. Reach down into your heart. What would you do if you had a robot just like the robot you've designed? Be specific. Be imaginative. Be wild. Send me your creations.

All entries must be received by August 30, 1991, and winners will be selected by October 15. The first-place winner will receive a model robot valued at $200; five runners-up will each receive a smaller robot valued at $30.

Please send me your contest entry (pictures, labels, description, and so on) to Design-a-Robot Contest, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. Be sure to include your name, address, and telephone number. Winners must consent to have their robots featured in a future "D'Iversions" column without additional compensation. The odds of winning a prize will be determined by the number and quality of entries. The decision of the judges will be final, and COMPUTE Publications cannot be held responsible for entries misdirected in the mail. Entries become the property of COMPUTE Publications and cannot be returned. Employees of COMPUTE Publications are not eligible. ⊡

SIMON EDGEWORTH

MOONS OF JUPITER

LEARN MORE ABOUT THE NUMEROUS MOONS THAT ORBIT AROUND THE PLANET JUPITER WITH THIS ASTRONOMY PROGRAM FOR THE 64

In ancient times humans regarded Jupiter as the ruler of the sky. Recently, interest in the giant planet has rocketed due to the wealth of new information discovered by the Voyager spaceships. This program displays the 16 major moons and their orbits around Jupiter.

The program consists of two modules: JUP.BAS and JUP.ML. The first is written in BASIC. To avoid typing errors, use *The Automatic Proofreader* to type it in; see "Typing Aids" elsewhere in this section. When you've finished typing it in, be sure to save a copy of the program.

The second part of the program, JUP.ML, is written in machine language. Enter this module with *MLX*, our machine language entry program; again, see "Typing Aids." When *MLX* prompts you, respond with the values given below.

Starting address: C000
Ending address: C18F

When you've finished entering JUP.ML, be sure to save it with that name to the same disk as JUP.BAS. Load and run JUP.BAS; it will automatically load JUP.ML.

Choosing Moons

After a short pause, the main menu will appear. You'll see a list with Jupiter at the top, then the 16 moons, starting with Metis (the moon closest to the planet) and ending with Sinope (the moon farthest from Jupiter).

Use the up- and down-cursor keys to select which moon orbits you wish to see. Discs on the left of the screen will indicate which moons are currently selected. You can choose a group of either four or eight moons. Press the G key to display the moon orbits. After a pause for calculations, the graphic screen will appear.

Orbit Graphics

Jupiter is shown in the center of the screen. The scale depends on which moons you select, so Jupiter will appear as a circle when you select the inner moons and as a dot when you select the outer moons.

The moons are shown as dots at various distances from the planet. Press G, and the moons will move around the planet in their orbits, leaving a trace behind them. You can adjust the speed of the graphics by pressing the F key (faster) or the S key (slower).

At the lower left corner of the screen, a readout shows how many earth days have elapsed. The innermost moons take only a few hours to complete an orbit. The outermost moons take more than an earth year. To halt the moons, press X.

Names and Facts

While the graphic screen is halted, you can identify the moons shown by pressing the N key. A moon will flash while its name appears on the screen. To identify the next moon, press N again. When a moon is flashing, you can press I to view information about it.

To exit from any part of the program, simply press X. It will take you back to the previous screen.

Comparing Moons

Go back to the main menu and press the C key. The comparison menu will appear. Now hit P, D, E, or S to compare period, distance, eccentricity, or size, respectively. To make the figures more meaningful, the corresponding data for our own moon is also shown for comparison.

Customizing

You can easily change the program's colors on line 380. C0 is the border color, C1 is the screen color, C2 is the text color, and C3 is the color used for Jupiter and moon traces. Similarly, you can change the 16 moon colors on line 390, but don't make anything the same color as the screen, or it will be invisible.

Callistro's orbit should appear circular on your screen. If not, try slightly adjusting the value of SC on line 380.

If you want to tinker with the orbits, here's the data format in lines 110–270: name, diameter, semimajor axis, eccentricity, period, longitude of perihelion, longitude at start.

Notes

The graphics show views approximately from the ecliptic north. When viewed from the north, all the planets and most of the moons in our solar system orbit counterclockwise. Notice that four of Jupiter's moons orbit the other way around. One possible explanation is that they might have been asteroids captured by Jupiter's gravitational field.

JUP.BAS

```
RF 100 REM COPYRIGHT 1991 - CO
       MPUTE PUBLICATIONS INTL
        LTD - ALL RIGHTS RESER
       VED
JK 110 DATA METIS,40,128,0,.29
       5,0,0
DX 120 DATA ADRASTEA,40,129,0,
       .295,0,120
PF 130 DATA AMALTHEA,270X165X1
       50,180,.003,.489,0,281
MD 140 DATA THEBE,80,222,.013,
       .670,0,331
XP 150 DATA IO,3640,422,.004,1
       .77,0,233
```

PROGRAMS

```
DR 160 DATA EUROPA,3100,671,.0
       1,3.55,0,273
EQ 170 DATA GANYMEDE,5270,1070
       ,.001,7.16,0,81
MG 180 DATA CALLISTO,4990,1885
       ,.007,16.69,0,332
EE 190 DATA LEDA,16,11110,.147
       ,240,280,309
FG 200 DATA HIMALIA,96,11470,.
       158,251,249,101
XE 210 DATA LYSITHEA,16,11710,
       .107,260,11,297
BG 220 DATA ELARA,32,11740,.20
       7,260,149,81
DF 230 DATA ANANKE,16,21200,.1
       7,-610,180,36
FC 240 DATA CARME,16,22600,.21
       ,-690,6,239
BQ 250 DATA PASIPHAE,16,23500,
       .38,-734,0,90
BM 260 DATA SINOPE,16,23700,.2
       8,-760,226,243
RM 270 DATA OUR MOON,3478,384,
       .055,27.32,0,0
DR 280 IFI=0THENI=1:LOAD"JUP.M
       L",8,1
XX 290 POKE55,0:POKE56,136:CLR
       :Q=16
JR 300 DIMSN(255),CS(255),NA$(
       Q),DI$(Q),CR(Q),RA(Q),E
       C(Q),PE(Q),PA(Q),EA(Q)
JE 310 V=53248:PP=34816:SP=368
       56
DJ 320 S1=53200:S2=S1+8:S3=S2+
       8
MF 330 YC=139.5:XC=173.5:MI=0:
       RJ=71.6
SJ 340 TT$="{RVS} THE MOONS OF
        JUPITER {OFF}
       {2 SPACES}"
JM 350 CP$="COMPUTE PUBLICATIO
       NS INTL LTD (C) 1991"
JB 360 WT$="{3 DOWN}CALCULATIO
       NS WILL TAKE A FEW SECO
       NDS ...":CM$="COMPARISO
       N"
RS 370 DJ$=" DISTANCE FROM CEN
       TER OF JUPITER":TK$="TH
       OUSAND KM"
FS 380 C0=06:C1=0:C2=14:C3=11:
       SC=1.3
RF 390 DATA 2,3,4,5,6,7,8,9,10
       ,12,13,14,15,4,3,2
EK 400 PRINT"{CLR}"CHR$(142)CH
       R$(8):CT=11
PG 410 POKEV+32,C0:POKEV+33,C1
       :POKE646,C2
KA 420 PRINT CP$:PRINT
BR 430 PRINTTAB(8)TT$:PRINTWT$
BS 440 FORI=0TO255:J=I*↑/128
JA 450 SN(I)=SIN(J):CS(I)=COS(
       J):NEXT
KM 460 FORN=0TOQ
BS 470 READNA$(N),DI$(N),RA(N)
       ,EC(N),PE(N),J,K
KH 480 PA(N)=(J*256/360+.5)AND
       255
PM 490 EA(N)=(K-J)/360:NEXT
KP 500 FORN=0TOQ-1:READCR(N):N
       EXT
FC 510 FORI=PPTOPP+126:POKEI,0
       :NEXT
QQ 520 POKEPP+28,112:POKEPP+31
       ,112
KP 530 POKEPP+34,112:POKEPP+89
       ,112
CB 540 POKEPP+92,248:POKEPP+95
       ,248
JD 550 POKEPP+98,248:POKEPP+10
       1,112
MS 560 T=0:PRINT"{CLR}"TT$"MAI
       N MENU":PRINT
RC 570 PRINTCHR$(113)"JUPITER"
BE 580 FORI=0TO15:PRINT" "NA$(
       I):NEXT
PE 590 PRINT:PRINT"UP/DOWN=SEL
       ECT MOONS"
JB 600 PRINT"G=GO":PRINT"C=COM
       PARE":PRINT"E=END PROGR
       AM"
EK 610 IFMI>6THENMI=0
AQ 620 IFMI<0THENMI=6
CK 630 BI=(6ANDMI)*2
KP 640 BO=BI+3+4*(1ANDMI)
DB 650 PRINT"{HOME}{2 DOWN}":F
       ORI=0TO15
JF 660 J=113:IFI<BIORI>BOTHENJ
       =32
MX 670 PRINTCHR$(J):NEXT
XD 680 POKE198,0
GJ 690 GETK$:IFK$="G"THEN750
SP 700 IFK$="C"THEN1200
XJ 710 IFK$="{DOWN}"THENMI=MI+
       1:GOTO610
PE 720 IFK$="{UP}"THENMI=MI-1:
       GOTO610
AF 730 IFK$<>"E"THEN690
AG 740 PRINT"{CLR}":END
SP 750 PRINT"{CLR}"TT$:PRINTWT
       $
BJ 760 ONMI+1GOSUB770,780,790,
       800,810,820,830:GOTO840
QP 770 TL=.0004:TS=.005:TH=.04
       :RETURN
MC 780 TL=.005:TS=.02:TH=.1:RE
       TURN
EM 790 TL=.02:TS=.1:TH=.4:RETU
       RN
XC 800 TL=.1:TS=.2:TH=.7:RETUR
       N
HF 810 TL=.4:TS=3:TH=12:RETURN
FH 820 TL=1:TS=4:TH=16:RETURN
GS 830 TL=1.5:TS=6:TH=45:RETUR
       N
AR 840 MA=RA(BO)*(1+EC(BO))
FE 850 YS=99/MA:XS=YS*SC
BD 860 QB=BO-BI:CN=0
BQ 870 FORN=0TOQB:POKEV+39+N,C
       R(N+BI):NEXT
SQ 880 FORI=0TO23:POKES1+I,0:N
       EXT:SYS49281
BX 890 POKE53247,C1+C3*16:SYS4
       9521
MF 900 FORI=36800TOI+63:POKEI,
       32:NEXT
AS 910 SYS49208
QP 920 IFMI<3THEN960
PH 930 FORI=158TO160:FORJ=98TO
       100
GK 940 POKE253,I:POKE254,0:POK
       E255,J
FP 950 SYS49373:NEXT:NEXT:GOTO
       1000
MM 960 FORI=0TO255
DS 970 POKE253,159.5+XS*RJ*SN(
       I):POKE254,0
JH 980 POKE255,99.5+YS*RJ*CS(I
       )
SG 990 SYS49373:NEXT
PE 1000 GOSUB1980:GOSUB1600
MJ 1010 FORN=0TOQB:M=N+BI:E=EC
       (M):A=EA(M)+T/PE(M)
SG 1020 A=((A-INT(A))*256+.5)A
       ND255:IFE<.1THENX=-CS(
       A):Y=SN(A):GOTO1050
QD 1030 Z=(E*E-1)/(E*CS(A)-1):
       X=2*E-Z*CS(A):Y=Z*SN(A
       )
XE 1040 I=PA(M):J=X*CS(I)+Y*SN
       (I):Y=Y*CS(I)-X*SN(I):
       X=J
MF 1050 Y=INT(YC+Y*RA(M)*YS):X
       =INT(XC+X*RA(M)*XS)
XX 1060 IFY<40ORY>239ORX<14ORX
       >333THENY=0:X=0
HE 1070 POKES1+N,INT(X/256):PO
       KES2+N,XAND255:POKES3+
       N,Y:NEXT
RF 1080 SYS49281:SYS49331:IFHF
       THEN1150
HX 1090 PRINT" "RIGHT$(" "+STR
       $(INT(T)),3)"{UP}"
RR 1100 GETK$:IFK$=""THENT=T+T
       S:GOTO1010
MM 1110 IFK$="X"THENGOSUB1600:
       GOTO1150
RQ 1120 IFK$="F"THENTS=TS*1.5:
       IFTS>THTHENTS=TH
PC 1130 IFK$="S"THENTS=TS/1.5:
       IFTS<TLTHENTS=TL
BE 1140 GOTO1100
CX 1150 POKE198,0
BM 1160 GETK$:IFK$="N"THEN1660
FS 1170 IFK$="G"THENGOSUB1630:
       GOTO1100
CQ 1180 IFK$="X"THENGOSUB2010:
       GOTO560
QQ 1190 GOTO1160
JJ 1200 PRINT"{CLR}"TT$"COMPAR
       E MENU":PRINT
GE 1210 PRINT"P=PERIOD":PRINT
SK 1220 PRINT"D=DISTANCE":PRIN
       T
GH 1230 PRINT"E=ECCENTRICITY":
       PRINT
RE 1240 PRINT"S=SIZE":PRINT
HP 1250 PRINT"X=MAIN MENU"
EE 1260 POKE198,0
JM 1270 GETK$:IFK$="X"THEN560
HG 1280 K=VAL(K$)
SG 1290 IFK$="P"THEN1340
FK 1300 IFK$="D"THEN1410
RC 1310 IFK$="E"THEN1460
AP 1320 IFK$="S"THEN1520
MH 1330 GOTO1270
AR 1340 PRINT"{CLR}"TT$CM$:PRI
       NT
PA 1350 PRINT"ORBIT PERIOD"
DH 1360 PRINT"(EARTH DAYS)":PR
       INT
FQ 1370 FORI=0TO16
MR 1380 PRINTNA$(I),ABS(PE(I))
       ;
XS 1390 IFPE(I)<0THENPRINT"RET
       ROGRADE";
FH 1400 PRINT:NEXT:GOTO1570
XK 1410 PRINT"{CLR}"TT$CM$:PRI
       NT
DH 1420 PRINT"AVERAGE DISTANCE
        FROM PLANET CENTER"
SB 1430 PRINT"(THOUSAND KM)":P
       RINT
KD 1440 FORI=0TO16
ME 1450 PRINTNA$(I),RA(I):NEXT
       :GOTO1570
BF 1460 PRINT"{CLR}"TT$CM$:PRI
       NT
SC 1470 PRINT"ORBIT ECCENTRICI
       TY"
XJ 1480 PRINT"(CIRCLE=0)":PRIN
       T
MH 1490 FORI=0TO16
MQ 1500 PRINTNA$(I),:IFEC(I)<.
       01THENPRINT0:NEXT:GOTO
       1570
XR 1510 PRINTEC(I):NEXT:GOTO15
       70
```

```
DG 1520 PRINT"{CLR}"TT$CM$:PRI
        NT
SB 1530 PRINT"DIAMETER"
JS 1540 PRINT"(KM)":PRINT
QM 1550 FORI=0TO16
HF 1560 PRINTNA$(I),DI$(I):NEX
        T:GOTO1570
PG 1570 PRINT:PRINT"X=MENU":PO
        KE198,0
FA 1580 GETK$:IFK$="X"THEN1200
JM 1590 GOTO1580
AB 1600 GOSUB1790
FG 1610 PRINT"G=GO N=NAME X=ME
        NU{UP}"
CC 1620 HF=1:RETURN
XC 1630 GOSUB1790
JQ 1640 PRINT"{4 SPACES}EARTH
        {SPACE}DAYS{2 SPACES}F
        =FAST S=SLOW X=HALT
        {UP}"
BA 1650 HF=0:RETURN
XS 1660 POKE198,0
QM 1670 GOSUB1790:CM=CN+BI
FK 1680 PRINT"*"NA$(CM)"*"TAB(
        11)"I=INFO N=NEXT X=CO
        NTINUE{UP}"
QB 1690 J=9
AP 1700 J=J+1:IFJ=10THENPOKESP
        +CN,33
FS 1710 IFJ>19THENJ=0:POKESP+C
        N,32
DD 1720 GETK$:IFK$=""THEN1700
PX 1730 POKESP+CN,32
XS 1740 IFK$="I"THEN1800
QE 1750 IFK$="X"THENGOSUB1600:
        GOTO1150
KK 1760 IFK$<>"N"THEN1690
FQ 1770 CN=CN+1:IFCN>QBTHENCN=
        0
MH 1780 GOTO1660
HK 1790 PRINT"{37 SPACES}{UP}"
        :RETURN
KC 1800 GOSUB2010
QH 1810 PRINT"{CLR}"TT$:PRINT
SC 1820 PRINT"*"NA$(CM)"*":PRI
        NT
DC 1830 PRINT"AVERAGE"DJ$:PRIN
        TRA(CM)TK$:PRINT
DR 1840 PRINT"MINIMUM"DJ$:PRIN
        TINT(RA(CM)*(1-EC(CM))
        +.5)TK$:PRINT
HD 1850 PRINT"MAXIMUM"DJ$:PRIN
        TINT(RA(CM)*(1+EC(CM))
        +.5)TK$:PRINT
AM 1860 PRINT"ORBIT ECCENTRICI
        TY"
CK 1870 IFEC(CM)<.01THENPRINT0
        :PRINT:GOTO1890
EK 1880 PRINTEC(CM):PRINT
HC 1890 PRINT"ORBIT PERIOD"
EE 1900 PRINTABS(PE(CM))"EARTH
         DAYS":PRINT
RK 1910 PRINT"DIAMETER"
BX 1920 PRINT" "DI$(CM)" KM":P
        RINT
QX 1930 PRINT"X=CONTINUE"
BB 1940 POKE198,0
PK 1950 GETK$
JS 1960 IFK$="X"THENGOSUB1980:
        GOTO1660
XC 1970 GOTO1950
HF 1980 POKE808,234:SYS49232:S
        YS49248
FG 1990 POKEV+21,2↑(QB+1)-1:PR
        INT"{HOME}"
AP 2000 FORI=2TO24:PRINT"
        {DOWN}";:NEXT:RETURN
RX 2010 SYS49474:SYS49497:POKE
        808,237
JQ 2020 POKEV+21,0:RETURN
```

JUP.ML

```
C000:A9 0F 8D 19 D0 A9 1B 8D 4E
C008:11 D0 A9 34 8D 18 D0 A9 D6
C010:FF 8D 12 D0 A9 1C 8D 14 31
C018:03 4C 81 EA A9 0F 8D 19 CA
C020:D0 A9 38 8D 18 D0 A9 3B E6
C028:8D 11 D0 A9 F2 8D 12 D0 2C
C030:A9 00 8D 14 03 4C 31 EA 10
C038:A9 00 85 FB A9 A0 85 FC D6
C040:A9 00 A8 A2 20 91 FB C8 DD
C048:D0 FB E6 FC CA D0 F6 60 C5
C050:AD 00 DD 29 FC 09 01 8D 92
C058:00 DD A9 8C 8D 88 02 60 42
C060:78 A9 7F 8D 0D DC A9 01 81
C068:8D 1A D0 A9 1B 8D 11 D0 ED
C070:A9 F2 8D 12 D0 A9 00 8D 11
C078:14 03 A9 C0 8D 15 03 58 25
C080:60 A2 07 BD D0 CF 4A 2E 20
C088:F8 CF CA 10 F6 A2 07 A0 C5
C090:0F BD E0 CF 99 E8 CF 88 BA
C098:BD D8 CF 99 E8 CF 88 CA 25
C0A0:10 EF A2 10 AD 11 D0 10 DE
C0A8:FB BD E8 CF 9D 00 D0 CA 0B
C0B0:10 F7 60 A2 07 8E F9 CF A4
C0B8:BD E0 CF F0 1C 38 E9 28 18
C0C0:85 FF BD D0 CF 85 FE BD 1A
C0C8:D8 CF 38 E9 0E 85 FD B0 83
C0D0:02 C6 FE 20 DD C0 AE F9 30
C0D8:CF CA 10 D9 60 A9 00 85 C3
C0E0:02 A5 FF 29 F8 0A 26 02 9D
C0E8:0A 26 02 0A 26 02 85 FB 1A
C0F0:A6 02 86 FC 0A 26 02 0A DD
C0F8:26 02 18 65 FB 85 FB A5 FA
C100:02 65 FC 85 FC A5 FD 29 79
C108:F8 18 65 FB 85 FB A5 FE E0
C110:65 FC 85 FC A5 FF 29 07 8C
C118:18 65 FB 85 FB A9 A0 65 06
C120:FC 85 FC A5 01 29 FE 85 AD
C128:01 A5 FD 29 07 AA A9 00 1E
C130:38 6A CA 10 FC A0 00 11 40
C138:FB 91 FB A5 01 09 01 85 AB
C140:01 60 78 A9 00 8D 1A D0 41
C148:A9 31 8D 14 03 A9 EA 8D 02
C150:15 03 A9 81 8D 0D DC 58 1F
C158:60 AD 00 DD 09 03 8D 00 C4
C160:DD A9 14 8D 18 D0 A9 04 F3
C168:8D 88 02 A9 1B 8D 11 D0 B1
C170:60 A9 00 85 FB A9 8C 85 0C
C178:FC AD FF CF A0 00 A2 04 31
C180:91 FB C8 D0 FB E6 FC CA 32
C188:D0 F6 60 00 00 00 00 00 3E
```

DANIEL LIGHTNER

NOAH'S ARC

ARCHIVE FILES FOR EASY UPLOADING AND DOWNLOADING WITH THIS UTILITY FOR THE 64

If you call an electronic bulletin board system (BBS) and browse through its library of programs available for downloading, chances are that many of the files have been archived—that is, several programs and instruction files may have been combined into one master program.

If all of a program's related files have been combined, a caller has only to download one file to obtain all the programs, modules, sprite data, music files, and instructions required for proper operation. Archiving (or *arcing* as it's often called) is a convenient method for uploading and downloading BBS files.

Some archived files need a special rate program to separate (or dearc) the files into their original form. Others are self-dearcing (SDA), meaning that one has only to load and run the master program for it to separate and save its individual files to disk, ready for running.

Typing It In

Noah's Arc is such a program. It creates SDA files that separate automatically. It is written entirely in machine language, but it loads and runs like a BASIC program. Use *MLX*, our machine language entry program, to type it in; see "Typing Aids" elsewhere in this section. When *MLX* prompts, respond with the following values.

Starting address: 0801
Ending address: 1298

Be sure to save a copy of the program before exiting *MLX*.

Using the Program

Noah's Arc will load a collection of files and save them in a single master

file. It accepts program, sequential, or user files, and it does not matter if different types are loaded together. In addition to making it convenient for sending files via modem, SDA files are also useful for creating backups.

When you run *Noah,* it asks for the number of files you wish to archive. Respond with a number less than 100. Try not to use more files than will fit into memory at one time. *Noah* can handle about 160 disk blocks, depending on the number of files, not the file size. *Noah* reserves 25 bytes of memory per file in its own directory located at $0960 hex or 2480 decimal. This directory has to be saved along with the SDA file.

If you aren't sure of the number of files, you can check the directory by entering $ and pressing Return. The directory listing can be stopped and started by touching any key. This is useful in determining which and how many files you wish to load.

After you enter the number, *Noah* asks for the filenames. It will then ask if it is a program, sequential, or user file. Just press the corresponding number. *Noah* checks the disk for that file and returns the disk error status. If all is well, it continues loading the file into memory.

This process repeats until the memory is full or all the files have been loaded. Anytime you are asked for a filename, you can enter $ to get a directory or enter @ to abort and save the files already loaded.

When all the files have been loaded, *Noah* asks for a master filename. At this point make sure that the disk has enough room on it for the file you are saving. *Noah* appends an *SDA* suffix automatically to the file name. If a disk error occurs during a save, *Noah* lets you try the procedure again.

Noah can be useful as a file copier as well. If you enter @ when *Noah* prompts for a Save filename, it will dump all files in memory to disk in their original form. To make more copies of these files, when *Noah* comes back with a prompt asking if you wish to create more files, press N, and you will be returned to BASIC. Put another disk in the drive and enter SYS2088. You can repeat this process as many times as you like. *Noah* always saves to drive 8.

If you load an SDA file and list it, you'll see the number of files the SDA file contains. To dearc an SDA file, just load and run it. If you wish to save an SDA file to another disk, load it and enter SYS2088.

Most smaller SDA files can be loaded and saved like BASIC programs, but some larger ones may pose a problem because *Noah* stores files under BASIC ROM. If you try saving a file that is too big, you'll get an OUT OF MEMORY message. *Noah's Arc* itself can be loaded and saved like a BASIC program, but do not try to save it after it's been run. If you wish to restart it at any time, enter SYS50675 and press Return.

NOAH'S ARC

```
0801:22 08 0A 00 9E 32 30 38 BB
0809:38 20 20 3A 31 39 39 31 F6
0811:20 43 4F 4D 50 55 54 45 86
0819:2E 2E 2E 20 20 20 20 20 75
0821:00 00 00 0B 0A F3 C5 AD 3B
0829:24 08 8D B2 02 AD 25 08 43
0831:8D B3 02 AD 26 08 85 FD 6A
0839:AD 27 08 85 FE A9 8E 85 84
0841:FB A9 08 85 FC 18 A5 FB A2
0849:6D B2 02 8D B4 02 A5 FC CB
0851:6D B3 02 8D B5 02 A0 00 15
0859:B1 FB 91 FD 18 A5 FB 69 0C
0861:01 85 FB A5 FC 69 00 85 40
0869:FC 18 A5 FD 69 01 85 FD EA
0871:A5 FE 69 00 85 FE A5 FB B0
0879:CD B4 02 F0 03 4C 88 08 4F
0881:A5 FC CD B5 02 F0 03 4C DE
0889:59 08 6C 26 08 AD 0E DC 28
0891:29 FE 8D 0E DC A5 01 29 31
0899:FE 85 01 AD 0E DC 09 01 7C
08A1:8D 0E DC 20 CC FF A9 00 53
08A9:8D B4 02 8D 20 D0 8D 21 47
08B1:D0 A9 0B 85 73 A9 CD 85 B1
08B9:74 20 F9 CC A9 36 85 73 BC
08C1:A9 CD 85 74 20 F9 CC 20 B4
08C9:6A C9 AD 35 03 C9 24 D0 E2
08D1:06 20 80 CC 4C 22 C6 AD EF
08D9:34 03 C9 03 B0 DE C9 00 C2
08E1:F0 DA A0 00 B9 35 03 C9 A7
08E9:30 90 D1 C9 3A B0 CD C8 06
08F1:CC 34 03 D0 EF 20 34 CA 16
08F9:20 45 CB 20 76 CA C9 27 80
0901:F0 BA 20 E8 C9 A0 00 A9 47
0909:01 85 FB A9 08 85 FC B9 21
0911:64 CD 91 FB C8 C0 C8 D0 66
0919:F6 A0 00 A9 C9 85 FB A9 6F
0921:08 85 FC B9 2C CE 91 FB 8F
0929:C8 C0 E9 D0 F6 AD B5 02 F5
0931:8D B0 09 A9 B0 8D BA 02 25
0939:A9 09 8D BB 02 A0 00 18 7A
0941:AD BA 02 69 19 8D BA 02 26
0949:AD BB 02 69 00 8D BB 02 A7
0951:C8 CC B5 02 D0 E9 18 A9 D9
0959:B0 69 01 8D B2 02 A9 09 11
0961:69 00 8D B3 02 AD C5 02 69
0969:8D 16 08 AD C6 02 8D 17 14
0971:08 20 F4 CC 20 D2 FF 20 67
0979:6A CA 20 F4 CC 20 6A C9 4C
0981:AD 34 03 C9 01 D0 14 AD 95
0989:35 03 C9 40 F0 0A C9 24 9B
0991:D0 09 20 80 CC 4C D7 C6 68
0999:4C DE C8 20 34 CA 20 76 28
09A1:CA C9 27 F0 CC A0 00 B9 22
09A9:E4 CF 20 D2 FF C0 05 F0 51
09B1:42 C0 09 F0 44 C0 0D F0 75
09B9:46 C8 C0 10 D0 E9 A5 CB 7F
09C1:C9 38 F0 0E C9 3B F0 15 F7
09C9:C9 08 F0 1C 20 E4 FF 4C 83
09D1:24 C7 85 FB 20 EF CC 20 D2
09D9:49 CA 4C 6B C7 85 FB 20 EF
09E1:EF CC 20 5F CA 4C 6B C7 3F
09E9:85 FB 20 EF CC 20 54 CA 1B
09F1:4C 6B C7 20 49 CA 4C 1F 2D
09F9:C7 20 5F CA 4C 1F C7 20 1F
0A01:54 CA 4C 1F C7 A9 0D 20 8C
0A09:76 CA C9 27 D0 03 4C 0B EC
0A11:C7 A5 FB C9 38 F0 08 C9 ED
0A19:3B F0 0A C9 08 F0 0C 20 21
0A21:91 CA 4C 94 C7 20 A6 CA 5A
0A29:4C 94 C7 20 BB CA 20 E5 B2
0A31:CA AC 34 03 88 A9 52 99 B5
0A39:35 03 20 F4 CC 20 F4 CB 98
0A41:20 3A CA 20 F4 CC AD 34 B9
0A49:03 A2 35 A0 03 20 BD FF 4C
0A51:A9 02 A2 08 A0 02 20 BA 97
0A59:FF 20 C0 FF 20 2F C9 C9 A8
0A61:0D F0 33 A2 02 20 C6 FF E6
0A69:AD BA 02 85 FD AD BB 02 BB
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0AA9:8D B3 02 AD C2 02 8D BA 80
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0AC9:FF A9 02 4C C3 FF 20 2A D5
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0AD9:02 85 FC A0 00 A5 FD 91 1E
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0AF9:69 01 8D BA 02 A5 FE 69 6E
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0B21:D7 C6 20 F4 CC 20 F4 CC C5
0B29:20 EF CC A9 12 20 D2 FF 36
0B31:20 6A CA 20 DE CB 20 F4 A8
0B39:CC 20 6A C9 AD 34 03 C9 B5
0B41:01 D0 14 AD 35 03 C9 40 F2
0B49:D0 0D A9 9E 8D 81 09 A9 58
0B51:CB 8D 82 09 4C 28 08 20 C4
0B59:34 CA 20 76 CA C9 27 F0 64
0B61:C1 20 D0 CA 4C 50 CB A9 0C
0B69:40 85 73 A9 CF 85 74 20 A7
0B71:F9 CC 20 5E CC 20 05 C8 5B
0B79:A9 C2 85 73 A9 CF 85 74 09
0B81:20 F9 CC 20 2A C8 A5 CB 4D
0B89:C9 0D F0 14 C9 0A F0 0A 89
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0BC1:FB 69 30 8D 17 08 4C 88 09
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0C11:3E 20 D2 FF A9 9A 20 D2 75
```

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0C29:40 C9 7B B0 F1 C9 11 F0 18
0C31:ED C9 13 F0 E9 C9 1D F0 C5
0C39:E5 C9 22 F0 E1 C9 2C F0 89
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0C49:C0 10 F0 D2 20 D2 FF 20 7D
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0C61:34 03 99 35 03 EE 34 03 1A
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0E09:A0 03 20 BD FF A9 01 85 44
0E11:FB A9 08 85 FC A9 FB AE 24
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0E31:73 A9 CF 85 74 20 F9 CC A8
0E39:20 F4 CC 20 F4 CC A9 7C E8
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0E89:CF 85 74 4C F9 CC A9 97 30
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0EC9:CF 90 0F 8D D1 02 AD D0 6F
0ED1:02 FD F3 CF 8D D0 02 C8 66
0ED9:D0 E3 98 CA F0 11 C9 B0 27
0EE1:F0 03 8D D2 02 2C D2 02 7E
0EE9:30 05 AD D3 02 F0 05 29 59
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0F49:F0 22 A5 C6 F0 FC A9 00 58
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0F59:AA 20 CF FF 20 16 CC 20 E1
0F61:EF CC 20 CF FF F0 D0 20 31
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0F79:FB 20 CF FF 05 FB 60 20 90
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0FB9:43 4F 50 59 52 49 47 48 7B
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0FF1:55 20 53 55 52 45 20 3F A9
0FF9:20 96 59 2F 4E 00 22 08 AA
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1009:4E 4F 41 48 27 53 20 53 EA
1011:44 41 20 20 20 20 46 49 01
1019:4C 45 53 20 20 20 00 00 9E
1021:00 2F 00 00 00 AD 0E DC BC
1029:29 FE 8D 0E DC A5 01 29 D8
1031:FE 85 01 AD 0E DC 09 01 24
1039:8D 0E DC 18 EE B0 09 EA F7
1041:EA A9 08 85 BA A9 0F 85 BA
1049:B9 A0 00 A9 00 8D 20 D0 50
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1061:69 01 8D BE 02 A9 09 69 46
1069:00 8D BF 02 AD BE 02 85 F6
1071:FB AD BF 02 85 FC A0 00 74
1079:B1 FB 8D C4 02 18 A5 FB 27
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1099:A5 FC 69 00 85 FC A0 00 5A
10A1:B1 FB 8D C0 02 C8 B1 FB E9
10A9:8D C1 02 C8 B1 FB 8D C2 29
10B1:02 C8 B1 FB 8D C3 02 18 92
10B9:A5 FB 69 04 8D BE 02 A5 2A
10C1:FC 69 00 8D BF 02 EE B2 2A
10C9:02 AD B2 02 CD B0 09 D0 E0
10D1:03 4C 67 09 AD C6 02 85 16
10D9:FB AD C7 02 85 FC A0 00 DD
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10E9:08 D0 F5 A0 00 B1 FB 20 E9
10F1:D2 FF C8 CC C4 02 D0 F5 27
10F9:A9 0D 20 D2 FF AD C4 02 A5
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1109:FF A9 02 A2 08 A0 02 20 E6
1111:BA FF 20 C0 FF A2 02 20 4F
1119:C9 FF A0 00 AD C0 02 85 2E
1121:FB AD C1 02 85 FC AD C2 43
1129:02 85 FD AD C3 02 85 FE 78
1131:B1 FB 20 D2 FF 18 A5 FB 04
1139:69 01 85 FB A5 FC 69 00 B4
1141:85 FC A5 FB C5 FD F0 03 E4
1149:4C 33 09 A5 FC C5 FE F0 C7
1151:03 4C 33 09 A2 00 20 C9 1E
1159:FF A9 02 20 C3 FF 20 83 0A
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1169:FE 8D 0E DC A5 01 09 01 42
1171:85 01 AD 0E DC 09 01 8D C7
1179:0E DC CE B0 09 4C E2 FC FA
1181:20 CC FF A5 BA 20 B4 FF 01
1189:A9 6F 85 B9 20 96 FF A9 AD
1191:0D 20 D2 FF 20 A5 FF C9 FD
1199:0D D0 F6 20 D2 FF 4C AB 32
11A1:FF 0D 53 41 56 49 4E 47 41
11A9:20 2C 50 2C 57 2C 55 2C F5
11B1:57 2C 53 2C 57 50 52 4F A7
11B9:47 52 41 4D 00 55 53 45 52
11C1:52 00 53 45 51 55 45 4E 84
11C9:54 49 41 4C 00 81 20 46 E1
11D1:49 4C 45 4E 41 4D 45 20 23
11D9:3F 00 0D 0D 1C 20 4F 55 63
11E1:54 20 4F 46 20 4D 45 4D 92
11E9:4F 52 59 0D 00 20 46 49 9A
11F1:4C 45 53 00 20 53 2E 44 E4
11F9:2E 41 2E 20 46 49 4C 45 80
1201:53 20 46 49 4E 49 53 48 BA
1209:45 44 00 20 46 4F 52 20 17
1211:53 41 56 45 20 00 9A 20 A4
1219:43 52 45 41 54 45 20 4D 75
1221:4F 52 45 20 46 49 4C 45 61
1229:53 20 96 59 2F 4E 20 3F 99
1231:00 0D 20 4C 4F 41 44 49 B2
1239:4E 47 20 00 0D 20 53 41 2B
1241:56 49 4E 47 20 00 20 81 E3
1249:42 59 54 45 53 20 52 45 C8
1251:4D 41 49 4E 49 4E 47 00 8C
1259:2E 53 44 41 0D 0D 20 12 F4
1261:9A 20 53 2D 53 41 56 45 A9
1269:20 41 2D 41 42 4F 52 54 EF
1271:20 43 2D 43 4F 4E 54 49 F5
1279:4E 55 45 20 0D 00 0D 0D 54
1281:9E 20 31 20 0D 20 32 20 92
1289:0D 20 33 20 0D 0D 01 00 43
1291:0A 00 64 00 E8 03 10 27 E1
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PROGRAMS

GUS VAKALIS

MINER

DIG FOR GOLD BUT WATCH OUT FOR DEADLY SURPRISES IN THIS ARCADE GAME FOR THE 64

Mining for precious metals is a tough and dangerous occupation that's part skill and part luck. Miner is an arcade-style game that requires some skill and a lot of luck. It can also be dangerous for your onscreen miner.

The action is simple and straightforward. Use a joystick plugged into port 2 to control your miner as he digs around the screen searching for gold nuggets. Each screen contains 40 nuggets, and you must collect at least 20 of them in a specified amount of time in order to advance to the next screen. That's the simple part.

In addition to the gold, the earth your miner tunnels through contains a couple of deadly hazards—namely, pockets of methane gas and deposits of highly radioactive uranium. You want your miner to collect the gold and make it back to the surface without succumbing to these subterranean perils or running out of time.

Miner is written entirely in machine language, but it loads and runs like a BASIC program. Enter the program with *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: 1BB0

Be sure to save a copy of the program before exiting *MLX*.

Starting the Game

The game begins with one of your three miners standing in the doorway of a local bank. The bank is where you sell your gold for cash. You'll collect any gold nuggets that your miner uncovers, but you must deliver them to the bank before time runs out, or you'll lose whatever he's found.

Push the fire button to start the game and pull down on your joystick to have the miner dig straight down; push forward to move him up. Push left or right, and he'll dig in that direction in search of gold. You'll have to maneuver him around boulders that you see scattered across the screen. Occasionally he'll uncover immovable blocks of granite and have to make a detour around them.

Deadly Perils

There's more than gold and granite waiting for your miner to uncover. The two hazards, as mentioned earlier, are methane gas and uranium deposits. The number of hazards per screen is proportional to the skill level you've selected. Skill level 1 contains one or two uranium deposits and two to four methane pockets. Skill level 2 has two to four uranium deposits and four to six methane pockets, and so on up to skill level 5. Methane pockets appear as blue bubbles, and uranium deposits appear as gray oblong balls, not to be confused with the gray boulders that litter the screen.

When you first expose a hazard, you'll have about one second to get away from it before it becomes lethal. Once the grace period expires, the methane bubble will begin to move through the tunnel network that you've dug. Uranium deposits remain stationary at first, but they soon begin to flash and emit deadly radiation. This radiation slowly spreads throughout the tunnel system unless you can seal off tunnels with some of the boulders you've uncovered. Position your miner next to a boulder and push it in the desired direction.

If the gas or radiation reaches a miner or if he's below ground when time runs out, you'll lose one miner. You can play with a longer time limit, but nothing is free. Gold nuggets are worth 100 points in the 150-second game, 75 points in the 200-second game, and 50 points in the 250-second game. Before you start a new game, you can buy more time by pressing the 1, 2, or 3 key to select either a 150-, 200-, or 250-second game.

Onscreen Info

At the top of the screen, you'll see a readout of the number of miners you currently have, the number of gold nuggets that the active miner is carrying, the time remaining on the clock, and your score. Also displayed are the skill level and whether you're playing screen 1 or 2 of that level. You must complete two screens at each skill level in order to advance to the next level. You'll receive an additional miner for every 5000 points.

Once you deposit some gold in the bank, a counter will appear in the bank itself displaying how much gold you've deposited. Once this counter reaches 20, you can advance to the next screen by pressing the fire button. You may continue to mine the present screen, but be sure to deposit any gold you have before pressing the fire button.

Press the space bar to pause the game. When the border turns red, the game is paused. Press the space bar again to resume play. The Restore key resets the game to the title screen.

Strategy

Avoid digging large cavernous rooms, since the more surface area the radiation has, the more quickly it spreads. Try to protect the entrance to the bank, or you won't be able to deposit your gold. Remember that the clock is just as deadly as the radiation or methane. Don't let time run out on you.

After playing a few games, you may discover that some areas are

usually free of radiation or methane. Gold nuggets are distributed randomly over the screen as are boulders and the immovable granite blocks.

Methane bubbles tend to move in a counterclockwise direction and always start by moving to the left. When a methane bubble encounters an obstruction and cannot move in any other direction, it will then double back on itself. Knowing this may enable you to dig traps for the bubbles so they can't follow you through the tunnels. You may also want to block off tunnel sections with boulders as you dig them; then, should you uncover a uranium deposit that you can't quickly seal, radiation won't spread throughout the entire tunnel.

MINER

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:31 00 00 00 A9 93 20 D2 60
0811:FF A9 00 8D 20 D0 8D 21 E4
0819:D0 20 00 14 A9 0F 8D 18 97
0821:D4 A5 9D 29 7F 85 9D A9 42
0829:80 8D 91 02 78 A5 01 29 B4
0831:FB 85 01 A2 00 BD 00 D8 BA
0839:9D 00 38 BD 00 D9 9D 00 9D
0841:39 BD 00 DA 9D 00 3A BD 2A
0849:00 DB 9D 00 3B BD 00 DC B1
0851:9D 00 3C BD 00 DD 9D 00 46
0859:3D BD 00 DE 9D 00 3E BD 8C
0861:00 DF 9D 00 3F E8 D0 CD 2A
0869:A2 00 BD 4F 15 9D D8 3A 82
0871:E8 E0 A0 D0 F5 A5 01 09 A0
0879:04 85 01 A9 FF 8D 7E 18 F2
0881:A9 72 8D 14 03 A9 14 8D 6A
0889:15 03 58 A9 FF 8D 6D 18 B3
0891:A9 41 8D 18 03 A9 15 8D 70
0899:19 03 AD 18 D0 29 F0 09 44
08A1:0E 8D 18 D0 A9 FF 8D 7E 13
08A9:18 8D 6D 18 A9 00 8D 20 E0
08B1:D0 A9 93 20 D2 FF 18 A2 72
08B9:03 A0 0D 20 F0 FF A2 00 E3
08C1:BD EF 15 20 D2 FF E8 E0 9A
08C9:B8 D0 F5 18 A2 10 A0 05 46
08D1:20 F0 FF A2 00 BD A7 16 B4
08D9:20 D2 FF E8 E0 70 D0 F5 9D
08E1:A9 07 8D EB DA A9 00 8D 04
08E9:70 18 A9 EB 85 03 A9 DA 92
08F1:85 04 20 B9 10 20 9D 10 B1
08F9:AD 6E 18 F0 52 AD 6F 18 CE
0901:4A B0 F2 4A B0 EF 4A B0 F1
0909:06 4A B0 22 4C F6 08 AD E4
0911:70 18 F0 E1 A0 00 A9 06 FB
0919:91 03 CE 70 18 C6 03 C6 3E
0921:03 A9 07 91 03 20 57 14 74
0929:20 F6 0E 4C F6 08 AD 70 33
0931:18 C9 04 F0 C0 A0 00 A9 83
0939:06 91 03 EE 70 18 E6 03 B6
0941:E6 03 A9 07 91 03 20 57 5D
0949:14 20 F6 0E 4C F6 08 A9 25
0951:93 20 D2 FF A9 33 8D 9F 64
0959:18 A9 01 8D AA 18 8D AD 59
0961:18 A9 00 8D 8E 18 8D 8F 42
0969:18 8D 90 18 8D 96 18 8D 03
0971:97 18 8D 98 18 A9 FF 8D 85
0979:7E 18 18 A2 00 A0 00 20 A0
0981:F0 FF A2 00 BD 17 17 20 F8
0989:D2 FF E8 E0 59 D0 F5 AD D7
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0999:81 18 8D 82 18 8D AB 18 B2
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09A9:11 20 2D 11 20 AA 12 A9 7C
09B1:00 8D 91 18 AD AD 18 C9 F8
09B9:01 D0 06 20 9D 14 4C CF E8
09C1:09 C9 02 D0 06 20 B7 14 4C
09C9:4C CF 09 20 D1 14 20 CF 08
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09D9:00 85 F7 A9 40 85 F8 A9 9A
09E1:04 8D 71 18 A0 00 98 91 D0
09E9:F7 C8 C0 C8 D0 F9 18 A5 13
09F1:F7 69 C8 85 F7 A5 F8 69 7D
09F9:00 85 F8 CE 71 18 D0 E4 EB
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0A11:A9 09 9D 78 D8 9D 54 D9 37
0A19:9D 30 DA 9D 0C DB E8 E0 BF
0A21:DC D0 DF A2 00 A9 61 9D 05
0A29:78 04 9D C0 07 A9 03 9D BC
0A31:78 D8 9D C0 DB E8 E0 28 E3
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0A41:A9 04 85 F8 85 FA A9 D8 AF
0A49:85 FC 85 FE A9 C7 85 F9 71
0A51:85 FD A0 00 A9 61 91 F7 A9
0A59:91 F9 A9 03 91 FB 91 FD B7
0A61:18 A5 F7 69 28 85 F7 A5 6D
0A69:F8 69 00 85 F8 18 A5 F9 1A
0A71:69 28 85 F9 A5 FA 69 00 80
0A79:85 FA 18 A5 FB 69 28 85 C7
0A81:FB A5 FC 69 00 85 FC 18 5B
0A89:A5 FD 69 28 85 FD A5 FE 0E
0A91:69 00 85 FE A5 F7 C9 C0 5C
0A99:D0 BA A5 F8 C9 07 D0 B4 C9
0AA1:AD 70 18 D0 03 4C 1A 0B 41
0AA9:C9 01 D0 03 4C 03 0B C9 7B
0AB1:02 D0 03 4C EC 0A C9 03 46
0AB9:D0 03 4C D5 0A A9 08 8D 72
0AC1:74 18 A9 0B 8D 75 18 A9 18
0AC9:0A 8D 72 18 A9 0D 8D 73 26
0AD1:18 4C 31 0B A9 06 8D 74 D0
0AD9:18 A9 09 8D 75 18 A9 08 C5
0AE1:8D 72 18 A9 0B 8D 73 18 84
0AE9:4C 31 0B A9 04 8D 74 18 C3
0AF1:A9 07 8D 75 18 A9 06 8D A6
0AF9:72 18 A9 09 8D 73 18 4C C9
0B01:31 0B A9 02 8D 74 18 A9 DF
0B09:05 8D 75 18 A9 04 8D 72 20
0B11:18 A9 07 8D 73 18 4C 31 1D
0B19:0B A9 01 8D 74 18 A9 03 72
0B21:8D 75 18 A9 02 8D 72 18 3C
0B29:A9 05 8D 73 18 4C 31 0B 9D
0B31:20 EF 13 AD 1B D4 C9 23 73
0B39:90 F9 C9 29 B0 F5 8D 71 CB
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PROGRAMS

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1911:E0 18 A0 00 B1 0B C9 5C 77
1919:F0 05 C9 62 F0 12 60 A5 9A
1921:0B 85 03 A5 0C 85 04 A9 1D
1929:68 8D 76 18 20 C7 0E 60 DF
1931:68 68 20 20 19 4C 59 13 77
1939:38 A5 12 E9 28 85 0B A5 E4
1941:13 E9 00 85 0C 60 18 A5 87
1949:12 69 28 85 0B A5 13 69 BA
1951:00 85 0C 60 38 A5 12 E9 D2
1959:01 85 0B A5 13 E9 00 85 EE
1961:0C 60 18 A5 12 69 01 85 CC
1969:0B A5 13 69 00 85 0C 60 12
1971:A9 A1 85 12 A9 04 85 13 2E
1979:60 20 71 19 A0 00 B1 12 1E
1981:C9 68 D0 04 A9 67 91 12 2D
1989:20 99 19 A5 12 C9 BF D0 B7
1991:EB A5 13 C9 07 D0 E5 60 C9
1999:18 A5 12 69 01 85 12 A5 02
19A1:13 69 00 85 13 60 A5 03 78
19A9:8D 84 18 A5 04 8D 85 18 9A
19B1:60 AD 84 18 85 03 AD 85 AA
19B9:18 85 04 60 A5 03 8D 84 B8
19C1:18 A5 04 8D 85 18 A5 05 9F
19C9:8D 86 18 A5 06 8D 87 18 4F
19D1:A5 07 8D 88 18 A5 08 8D C7
19D9:89 18 A5 0B 8D 8A 18 A5 A8
19E1:0C 8D 8B 18 AD 76 18 8D 75
19E9:8C 18 AD 77 18 8D 8D 18 BF
19F1:60 AD 84 18 85 03 AD 85 EA
19F9:18 85 04 AD 86 18 85 05 99
1A01:AD 87 18 85 06 AD 88 18 59
1A09:85 07 AD 89 18 85 08 AD A4
1A11:8A 18 85 0B AD 8B 18 85 43
1A19:0C AD 8C 18 8D 76 18 AD F5
1A21:8D 18 8D 77 18 60 A2 00 D2
1A29:A9 01 9D 48 54 E8 E0 12 C4
1A31:D0 F8 60 20 BD 19 A9 01 C0
1A39:8D A9 1B AC A9 1B B9 24 1E
1A41:54 85 0D C8 B9 24 54 85 BB
1A49:0E D0 03 4C F2 19 AD A9 DE
1A51:1B 4A 8D AA 1B A8 B9 48 39
1A59:54 8D A7 1B A0 00 B1 0D 37
1A61:C9 64 D0 03 4C 48 1B AD 45
1A69:A7 1B 4A B0 09 4A B0 21 80
1A71:4A B0 39 4A B0 51 20 E3 B1
1A79:1A 20 23 1B 20 F3 1A 20 FD
1A81:23 1B 20 13 1B 20 23 1B FD
1A89:20 03 1B 20 23 1B 4C 48 5A
1A91:1B 20 F3 1A 20 23 1B 20 5F
1A99:03 1B 20 23 1B 20 E3 1A 87
1AA1:20 23 1B 20 13 1B 20 23 7C
1AA9:1B 4C 48 1B 20 03 1B 20 9C
1AB1:23 1B 20 13 1B 20 23 1B 2E
1AB9:20 F3 1A 20 23 1B 20 E3 E9
1AC1:1A 20 23 1B 4C 48 1B 20 FA
1AC9:13 1B 20 23 1B 20 E3 1A BF
1AD1:20 23 1B 20 03 1B 20 23 2C
1AD9:1B 20 F3 1A 20 23 1B 4C D3
1AE1:48 1B A9 FF 8D 7B 18 A9 6A
1AE9:FF 8D 7C 18 A9 01 8D 7D 7C
1AF1:18 60 A9 28 8D 7B 18 A9 36
1AF9:00 8D 7C 18 A9 02 8D 7D 90
1B01:18 60 A9 01 8D 7B 18 A9 D4
1B09:00 8D 7C 18 A9 04 8D 7D A9
1B11:18 60 A9 D8 8D 7B 18 A9 62
1B19:FF 8D 7C 18 A9 08 8D 7D C9
1B21:18 60 18 A5 0D 6D 7B 18 06
1B29:85 0B A5 0E 6D 7C 18 85 8D
1B31:0C A0 00 B1 0B C9 5C F0 D9
1B39:24 C9 62 F0 57 60 AC AA 8F
1B41:1B AD 7D 18 99 48 54 EE 27
1B49:A9 1B EE A9 1B EE A9 1B 96
1B51:AD A9 1B C9 25 F0 03 4C 08
1B59:3C 1A 4C F2 19 68 68 A5 CD
1B61:0D 85 03 A5 0E 85 04 A9 72
1B69:5C 8D 76 18 20 C7 0E A5 63
1B71:0B 85 0D A5 0C 85 0E AC C9
1B79:A9 1B A5 0D 99 24 54 85 5C
1B81:03 C8 A5 0E 99 24 54 85 8C
1B89:04 A9 65 8D 76 18 20 C7 CD
1B91:0E 4C 3F 1B 68 68 A9 FF B3
1B99:8D 78 18 8D 7E 18 20 F2 18
1BA1:19 68 68 4C 59 13 00 00 67
1BA9:00 00 00 00 00 00 00 00 DF
```


ONLY ON DISK

When you buy *Gazette Disk* ($9.95 plus $2.00 shipping and handling), you not only get all the type-in programs found in that month's magazine, you also get "Gazette Gallery," bonus programs, and more. To order, write to Gazette Disk, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. Here's a description of this month's bonus.

Sector Patrol

Grant Young

Battle Thraxion space fighters in this fast-paced arcade game in a race to collect four quarters of a magic crystal of unlimited power. For each fighter you destroy, you'll collect one bomb to be used against the renegade unit patrolling that sector. Destroy a unit and teleport to a new sector.

PROGRAMS

BRYAN CHRIST

DUNGEON TRIALS

DEFEAT THE POWERFUL DEMONS THAT BLOCK YOUR WAY TO SAFETY IN THIS ADVENTURE GAME FOR THE 64

You and your allies have been accused of murdering the king of Acacia. Due to uncertainty about your guilt among the High Council judges, you and your party have been locked in a maze filled with magical doors and powerful demons. Legend has it that the gods of the underworld will determine who is guilty and who is not.

Here is where you will be tested. Those who are untruthful have their fates sealed from the beginning. It will only be a matter of time before it's apparent who among your party is innocent and who is guilty. Those who escape the dungeon trials alive will be excused of all charges, and their names will be cleared.

Typing It In

Dungeon Trials is written entirely in BASIC. To avoid typing errors, enter the program with *The Automatic Proofreader;* see "Typing Aids" elsewhere in this section. Be sure to save a copy of the program when you've finished typing it in.

Enter the Dungeon

Plug a joystick into port 2 to play *Dungeon Trials.* Load and run the program; then wait for a minute while the computer reads the sprite data. When the main screen appears, you'll see what your party sees.

There are doors on all sides of each room. These doors match a compass rose in that north is straight ahead, east is to the right, and west is to the left. South is always behind you and can't be seen. Above the room are the six members of your party.

As you search for the exit, a variety of evil foes will appear, blocking your path. You can't leave a room until you've defeated each demon in combat. Even after one of your party has defeated a foe, another one may appear immediately.

When you select Fight from the menu, you'll be asked which of the six members of your party will engage the monster. Enter that member's number and press Return. At this point the background screen will clear, and a crosshairs pointer will appear. Try to maneuver the crosshairs over the head of the demon, and press the fire button before the demon can move away. The head is the only vital spot, and your timing is very important.

The snake is the exception. You must aim just over its head and strike the lower part of its tail. If your blow strikes it there, the snake will be banished to its realm.

You get only one chance to defeat a demon. If you miss, your party member dies. The maze has 150 rooms; the object is to reach the last one. There are five magical doors that will teleport you to other parts of the dungeon, but you won't be able to return to the teleport by retracing your steps.

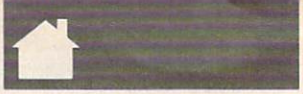
Good luck—I hope you have been truthful.

DUNGEON TRIALS

```
XG 100 LVL=1:RM=5
AP 110 MF=12:TSF=63
PF 120 FOR T=1TO6
MM 130 CH(T)=0
KE 140 NEXTT
CM 150 PRINTCHR$(147);
FJ 160 POKE53281,0:POKE53280,1
       1
BG 170 PRINTTAB(12);"{YEL}READ
       ING DATA..."
PX 180 FORCA=12672TO12734:READ
       QA:POKECA,QA:NEXT
KM 190 FORCB=12736TO12798:READ
       QB:POKECB,QB:NEXT
SF 200 FORCC=12800TO12862:READ
       QC:POKECC,QC:NEXT
HE 210 FORCD=12864TO12926:READ
       QD:POKECD,QD:NEXT
XM 220 FORCE=12928TO12990:READ
       QE:POKECE,QE:NEXT
AQ 230 FORCF=12992TO13054:READ
       QF:POKECF,QF:NEXT
MM 240 FORDA=12288TO12350:READ
       ZA:POKEDA,ZA:NEXT
FJ 250 FORDB=12352TO12414:READ
       ZB:POKEDB,ZB:NEXT
DD 260 FORDC=12416TO12478:READ
       ZC:POKEDC,ZC:NEXT
JF 270 FORDD=12480TO12542:READ
       ZD:POKEDD,ZD:NEXT
KP 280 FORDE=12544TO12606:READ
       ZE:POKEDE,ZE:NEXT
CC 290 FORDF=12608TO12670:READ
       ZF:POKEDF,ZF:NEXT
PD 300 PRINTCHR$(147);
GB 310 V=53248
HA 320 POKEV+23,TSF
ES 330 POKEV+28,TSF:POKEV+37,7
       :POKEV+38,10
KE 340 POKEV+0,50:POKEV+1,58
HC 350 POKEV+2,80:POKEV+3,58
HJ 360 POKEV+4,110:POKEV+5,58
DH 370 POKEV+6,140:POKEV+7,58
SX 380 POKEV+8,170:POKEV+9,58
CH 390 POKEV+10,200:POKEV+11,5
       8
SP 400 POKE2040,198:POKE2041,1
       99
QQ 410 POKE2042,200:POKE2043,2
       01
HG 420 POKE2044,202:POKE2045,2
       03
CM 430 POKEV+21,TSF
JQ 440 POKEV+39,5:POKEV+40,6
KC 450 POKEV+41,8:POKEV+42,4
FS 460 POKEV+43,6:POKEV+44,5
GG 470 PRINTCHR$(19);
JC 480 POKE214,6:PRINT
BB 490 PRINT"{WHT}{4 SPACES}1
       {3 SPACES}2{3 SPACES}3
       {2 SPACES}4{3 SPACES}5
       {3 SPACES}6"
AJ 500 PRINT"{2 SPACES}{RVS}
       {WHT}{24 SPACES}"
JX 510 FORT=1TO8
HM 520 PRINT"{2 SPACES}{RVS}
       {WHT} ";TAB(25);"{RVS}
       {WHT} "
AC 530 NEXT
BH 540 PRINT"{2 SPACES}{RVS}
       {WHT}{24 SPACES}"
FP 550 PRINTCHR$(19);
DE 560 POKE214,8:PRINT
BC 570 FORT=1TO8
PF 580 PRINT"{3 RIGHT}{RVS}
```

PROGRAMS

```
        {BLU}{22 SPACES}{WHT}"
JH 590 NEXT
QK 600 PRINTCHR$(19);
MP 610 POKE214,8:PRINT
SM 620 PRINTTAB(11);"{RVS}{5}
       {E}{R}{E}{R}{E}{R}"
KC 630 PRINTTAB(11);"{RVS}{5}
       {R}{E}{OFF}£{*}{RVS}
       {R}{E}"
CR 640 PRINTTAB(11);"{RVS}{5}
       {E}{R}{OFF}{2 SPACES}
       {RVS}{E}{R}"
JS 650 PRINTTAB(11);"{RVS}{5}
       {R}{E}{OFF}{2 SPACES}
       {RVS}{R}{E}"
MX 660 PRINTTAB(11);"{RVS}{5}
       {E}{R}{OFF}{2 SPACES}
       {RVS}{E}{R}"
RX 670 PRINTTAB(10);"{BLU}£
       {6 SPACES}{*}"
GR 680 PRINTTAB(9);"{BLU}{OFF}
       £{8 SPACES}{*}"
SM 690 PRINTTAB(8);"{BLU}{OFF}
       £{10 SPACES}{*}"
JD 700 PRINTCHR$(19);
SS 710 POKE214,10:PRINT
DP 720 PRINTTAB(8);"{BLU}{OFF}
       £";TAB(19);"{BLU}{OFF}
       {*}"
AG 730 PRINTTAB(7);"{BLU}{OFF}
       £ ";TAB(19);"{BLU}
       {OFF} {*}"
DJ 740 FORT=1TO2
GD 750 PRINTTAB(7);"{OFF}
       {2 SPACES}";TAB(19);"
       {OFF}{2 SPACES}"
FP 760 NEXTT
RR 770 PRINTTAB(7);"{BLU}{OFF}
       {2 P}";TAB(19);"{BLU}
       {OFF}{2 P}"
CF 780 PRINTTAB(7);"{OFF}
       {2 SPACES}";TAB(19);"
       {OFF}{2 SPACES}"
BX 790 DM=INT(RND(0)*MF)+1
AK 800 IF DM>6 THEN MC$="
       {5 SPACES}NONE"
DB 810 IFDM=1THENSM=192:MNC=12
       :MC$="{4 SPACES}SHADOW"
PF 820 IFDM=2THENSM=193:MNC=1:
       MC$="{4 SPACES}GHOST"
HD 830 IFDM=3THENSM=194:MNC=5:
       MC$="{3 SPACES}SERPENT"
PF 840 IFDM=4THENSM=195:MNC=6:
       MC$="WINGED WARRIOR"
XM 850 IFDM=5THENSM=196:MNC=1:
       MC$="{3 SPACES}SKELETON
       "
SA 860 IFDM=6THENSM=197:MNC=2:
       MC$=" VAPOR DEMON"
BX 870 PRINTCHR$(19);
HX 880 PRINT
CP 890 PRINTTAB(31);"{WHT}
       {OFF}FOE"
MD 900 PRINTTAB(31);"{WHT}
       {OFF}{3 U}":PRINT
DM 910 PRINTTAB(26);"{WHT}";TA
       B(26);MC$
CX 920 IF DM>6THEN990
HM 930 POKEV+23,TSF+64:POKEV+2
       8,TSF+64
XB 940 POKEV+37,7:POKEV+38,10
MA 950 POKEV+12,124:POKEV+13,1
       40
BG 960 POKE2046,SM
FP 970 POKEV+21,TSF+64
PA 980 POKEV+45,MNC
DH 990 PRINTCHR$(19);
RJ 1000 POKE214,7:PRINT
CB 1010 PRINTTAB(29);"{WHT}
        {OFF}OPTIONS"
PX 1020 PRINTTAB(29);"{WHT}
        {OFF}{7 T}"
RD 1030 PRINTTAB(29);"{WHT}
        {RVS}F{OFF}IGHT"
QX 1040 PRINTTAB(29);"{WHT}
        {RVS}N{OFF}ORTH"
KD 1050 PRINTTAB(29);"{WHT}
        {RVS}S{OFF}OUTH"
GA 1060 PRINTTAB(29);"{WHT}
        {RVS}E{OFF}AST"
PB 1070 PRINTTAB(29);"{WHT}
        {RVS}W{OFF}EST"
CK 1080 GETKY$:IFKY$=""THEN1080
BJ 1090 IF MC$="{5 SPACES}NONE
        " THEN 1120
PS 1100 IF KY$="F"THEN 1170
JG 1110 GOTO1080
BH 1120 IF KY$="S"THEN2040
PQ 1130 IF KY$="N"THEN2200
AD 1140 IF KY$="E"THEN2350
KG 1150 IF KY$="W"THEN2490
KM 1160 GOTO 1080
FG 1170 PRINT CHR$(19);
ED 1180 POKE214,18:PRINT
DA 1190 PRINTTAB(2);"{WHT}CHAR
        ACTER TO"
PG 1200 INPUT"{2 SPACES}FIGHT
        {SPACE}WITH";C
FC 1210 IF C>6 THEN 1250
EX 1220 IF C<1 THEN 1250
SQ 1230 IF CH(C)=255 THEN 1250
BX 1240 GOTO 1320
SJ 1250 PRINTTAB(2);"THAT CHAR
        ACTER DOES NOT EXIST!"
XM 1260 PRINTTAB(2);"CHOOSE AG
        AIN."
FG 1270 FORO=1TO1000:NEXTO
AK 1280 PRINTCHR$(19);
KP 1290 POKE214,18:PRINT
GA 1300 FORO=1TO4:PRINT"
        {34 SPACES}":NEXTO
SF 1310 GOTO 1170
JX 1320 PRINTCHR$(19);
KC 1330 POKE214,8:PRINT
RJ 1340 FORT=1TO8:PRINTTAB(3);
        "{22 SPACES}":NEXTT
QE 1350 PL=1024:PC=55296
QQ 1360 MY=124
DJ 1370 PX=14:PY=13
DJ 1380 IF C=1 THEN CW=30:WC=9
EH 1390 IF C=2 THEN CW=66:WC=6
DK 1400 IF C=3 THEN CW=30:WC=9
PX 1410 IF C=4 THEN CW=42:WC=4
BF 1420 IF C=5 THEN CW=43:WC=7
GF 1430 IF C=6 THEN CW=30:WC=9
DJ 1440 POKE53275,255
DD 1450 MDR=INT(RND(0)*2)+1
PM 1460 IF MDR=1ANDMY-4<50THEN
         MDR=2
MJ 1470 IF MDR=2ANDMY+4>192THE
        N MDR=1
KR 1480 IF MDR=1 THEN MY=MY-8
PQ 1490 IF MDR=2 THEN MY=MY+8
RM 1500 JY=PEEK(56320)
GC 1510 IF JY=127 THEN1620
KD 1520 IF JY=119 THEN WX=1
RQ 1530 IF JY=123 THEN WX=-1
AD 1540 IF JY=125 THEN WY=1
RK 1550 IF JY=126 THEN WY=-1
AG 1560 IF JY=111 THEN 1660
XQ 1570 IFPEEK(1024+PY*40+(PX+
        WX))=160THENWX=0
QP 1580 IFPEEK(1024+(PY+WY)*40
        +PX)=160THEN WY=0
KA 1590 POKE1024+(PY*40)+PX,32
HJ 1600 PX=PX+WX
XR 1610 PY=PY+WY
XJ 1620 POKEPC+(PY*40)+PX,3
KE 1630 POKE1024+(PY*40)+PX,91
        :WX=0:WY=0
CF 1640 POKEV+12,MY:POKEV+13,1
        40
XM 1650 GOTO 1450
CB 1660 SWX=1664
KS 1670 FX=SWX+PX
SE 1680 FOR FY=FX TO (1024+40*
        PY+PX) STEP-40
AC 1690 POKEPC+(FY-1024),WC
MJ 1700 POKEFY,CW
SJ 1710 FORGJ=1TO10:NEXTGJ
DE 1720 POKEFY,32:NEXTFY
BB 1730 IF MDR=1 THEN MY=MY+8
HR 1740 IF MDR=2 THEN MY=MY-8
SG 1750 HM=INT(MY/8)
JH 1760 IF PY=11 THEN 1790
AF 1770 IF PY=12 THEN 1790
BJ 1780 GOTO 1890
SF 1790 IF PX+1=HM THEN 1820
KF 1800 IF PX+2=HM THEN 1820
MP 1810 GOTO 1890
BG 1820 FORGJ=1TO10:FORT=0TO15
XR 1830 POKE V+45,T
XC 1840 NEXTT:NEXTGJ
MD 1850 POKEV+21,TSF
FE 1860 POKE53275,0
QX 1870 PRINTCHR$(147);
PH 1880 GOTO 470
QA 1890 IF C=1 THEN VP=39:TSF=
        TSF-1
BH 1900 IF C=2 THEN VP=40:TSF=
        TSF-2
BB 1910 IF C=3 THEN VP=41:TSF=
        TSF-4
KJ 1920 IF C=4 THEN VP=42:TSF=
        TSF-8
FA 1930 IF C=5 THEN VP=43:TSF=
        TSF-16
BB 1940 IF C=6 THEN VP=44:TSF=
        TSF-32
XS 1950 CH(C)=255
XX 1960 FORGJ=1TO10:FORT=0TO15
HH 1970 POKE V+VP,T
FP 1980 NEXTT:NEXTGJ
AR 1990 POKE53275,0
CM 2000 POKEV+21,TSF
AF 2010 IF TSF=0 THEN 2810
FH 2020 PRINTCHR$(147);
CJ 2030 GOTO300
SP 2040 IF RM=1 THEN 2640
PJ 2050 IF RM=4 THEN 2640
AS 2060 IF RM=5 THEN 2640
EX 2070 IF RM=10 THEN 2640
QS 2080 IF RM=11 THEN 2640
EQ 2090 IF RM=12 THEN 2640
FD 2100 IF RM=15 THEN 2640
AB 2110 IF RM=17 THEN 2640
JA 2120 IF RM=18 THEN 2640
JQ 2130 IF RM=20 THEN 2640
RB 2140 IF RM=23 THEN 2640
FH 2150 IF RM=24 THEN 2640
RG 2160 IF RM=25 THEN 2640
XP 2170 IF RM=28 THEN 2640
AS 2180 IF RM=29 THEN 2760
FP 2190 RM=RM+1:GOTO300
FB 2200 IF RM=1 THEN 2640
SG 2210 IF RM=5 THEN 2640
BE 2220 IF RM=6 THEN 2640
CF 2230 IF RM=11 THEN 2640
ME 2240 IF RM=12 THEN 2640
CM 2250 IF RM=13 THEN 2640
EX 2260 IF RM=16 THEN 2640
```



PROGRAMS

```
DR 2270 IF RM=18 THEN 2640
PQ 2280 IF RM=19 THEN 2640
MJ 2290 IF RM=21 THEN 2640
JX 2300 IF RM=24 THEN 2640
AR 2310 IF RM=25 THEN 2640
JQ 2320 IF RM=26 THEN 2640
PB 2330 IF RM=29 THEN 2640
KB 2340 RM=RM-1:GOTO300
MS 2350 IF RM=2 THEN 2640
RR 2360 IF RM=3 THEN 2640
PA 2370 IF RM=9 THEN 2640
QD 2380 IF RM=11 THEN 2640
SA 2390 IF RM=14 THEN 2640
QH 2400 IF RM=17 THEN 2640
EF 2410 IF RM=18 THEN 2640
QE 2420 IF RM=19 THEN 2640
CH 2430 IF RM=22 THEN 2640
KE 2440 IF RM=26 THEN 2640
BM 2450 IF RM=27 THEN 2640
KK 2460 IF RM=28 THEN 2640
JX 2470 IF RM=25 THEN 2760
PS 2480 RM=RM+5:GOTO300
PF 2490 IF RM=1 THEN 2640
AF 2500 IF RM=2 THEN 2640
KE 2510 IF RM=3 THEN 2640
CM 2520 IF RM=4 THEN 2640
PK 2530 IF RM=5 THEN 2640
MX 2540 IF RM=7 THEN 2640
DR 2550 IF RM=8 THEN 2640
KS 2560 IF RM=14 THEN 2640
KD 2570 IF RM=16 THEN 2640
HB 2580 IF RM=19 THEN 2640
SQ 2590 IF RM=22 THEN 2640
CQ 2600 IF RM=23 THEN 2640
FD 2610 IF RM=24 THEN 2640
DA 2620 IF RM=27 THEN 2640
PE 2630 RM=RM-5:GOTO300
PD 2640 PRINTCHR$(19);
XG 2650 POKE214,8:PRINT
XF 2660 FORT=1TO4
PB 2670 PRINTTAB(3);"{RVS}{5}
        {E}{R}{E}{R}{E}{R}{E}
        {R}{E}{R}{E}{R}{E}{R}
        {E}{R}{E}{R}{E}{R}{E}
        {R}"
RB 2680 PRINTTAB(3);"{RVS}{5}
        {R}{E}{R}{E}{R}{E}{R}
        {E}{R}{E}{R}{E}{R}{E}
        {R}{E}{R}{E}{R}{E}{R}
        {E}"
QP 2690 NEXTT
KA 2700 PRINTCHR$(19);
XR 2710 POKE214,11:PRINT
SA 2720 PRINTTAB(7);"{WHT}A WA
        LL BLOCKS"
AP 2730 PRINTTAB(7);"{WHT}
        {2 SPACES}THIS HALL
        {2 SPACES}"
AM 2740 FOR O=1TO1000:NEXTO
DG 2750 GOTO 300
FB 2760 IF LVL=1 THEN LVL=2:RM
        =3:GOTO300
RK 2770 IF LVL=2 THEN LVL=3:RM
        =18:GOTO300
QA 2780 IF LVL=3 THEN LVL=4:RM
        =11:GOTO300
SA 2790 IF LVL=4 THEN LVL=5:RM
        =28:GOTO300
SG 2800 IF LVL=5 THEN 2880
QK 2810 PRINTCHR$(19);
DF 2820 POKE214,11:PRINT
DX 2830 PRINTTAB(7);"{WHT}
        {2 SPACES}GAME OVER"
RH 2840 PRINTTAB(7);"{WHT}REST
        ART (Y/N)"
GD 2850 GETKY$:IF KY$=""THEN28
        50
CJ 2860 IF KY$<>"Y"THENSYS6473
        8
EM 2870 IF KY$="Y"THEN RESTORE
        :GOTO100
EA 2880 FOR J=1TO10:FORT=0TO15
FC 2890 PRINTCHR$(19);
XB 2900 POKE214,11:PRINT
KM 2910 POKE646,T
JK 2920 PRINTTAB(6);"CONGRATUL
        ATIONS!"
BS 2930 NEXTT:NEXTJ
GX 2940 GOTO2840
GJ 2950 REM--ARCHER (GIRL) *LE
        FT--
QA 2960 DATA1,0,0,4,0,0,4,85,8
        0
FX 2970 DATA16,63,80,16,15,64,
        16,63,0
DG 2980 DATA16,12,0,62,170,160
        ,30,171,232
MD 2990 DATA16,42,224,16,42,0,
        16,8,0
XK 3000 DATA4,34,0,4,170,128,1
        ,170,128
MC 3010 DATA0,170,128,3,192,24
        0,3,192,240
FG 3020 DATA3,192,240,10,0,40,
        42,0,168
QQ 3030 REM--HUNTER (GIRL) *RI
        GHT--
JS 3040 DATA128,0,0,128,0,0,12
        8,21,80
AP 3050 DATA128,87,192,64,31,0
        ,128,95,192
ED 3060 DATA129,95,192,128,12,
        0,131,191,128
JD 3070 DATA131,239,176,143,17
        1,172,240,42,172
QB 3080 DATA128,15,204,128,10,
        128,128,58,240
AS 3090 DATA128,62,240,128,60,
        240,128,252,252
SG 3100 DATA128,240,60,128,160
        ,40,128,168,42
RQ 3110 REM--ARCHER (GUY) *RIG
        HT--
GM 3120 DATA10,160,32,42,168,8
        ,34,252,8
DB 3130 DATA2,192,2,0,252,2,0,
        48,2
QS 3140 DATA10,138,2,14,171,2,
        63,175,194
EX 3150 DATA240,168,254,192,16
        8,2,0,168,2
BG 3160 DATA0,32,2,0,168,2,0,1
        68,2
MG 3170 DATA2,170,2,2,138,8,10
        ,138,8
GX 3180 DATA10,10,32,12,3,0,15
        ,3,192
KE 3190 REM--WIZARD (GUY) *RIG
        HT--
SQ 3200 DATA2,160,0,10,168,0,8
        ,188,0
GK 3210 DATA4,240,0,0,252,0,0,
        48,8
HE 3220 DATA0,168,38,2,170,8,1
        0,170,172
QF 3230 DATA10,170,172,56,170,
        40,50,170,8
JP 3240 DATA0,136,8,10,34,8,10
        ,170,8
XJ 3250 DATA10,170,8,10,170,8,
        42,170,8
AK 3260 DATA42,170,8,170,171,8
        ,60,3,200
MK 3270 REM--WANDERER (GUY) *L
        EFT--
GA 3280 DATA0,0,0,0,42,0,0,168
        ,128
JG 3290 DATA0,248,0,0,56,0,0,2
        48,0
PP 3300 DATA0,48,0,2,186,192,1
        5,171,240
GP 3310 DATA62,34,48,48,136,16
        ,0,168,68
PM 3320 DATA0,168,0,0,32,0,0,1
        68,0
GX 3330 DATA2,170,0,2,138,0,10
        ,10,0
FE 3340 DATA10,2,128,15,3,192,
        63,15,192
DD 3350 REM--HUNTER (GUY) *RIG
        HT--
KD 3360 DATA2,0,0,10,160,0,8,1
        68,0
EQ 3370 DATA0,172,0,0,176,0,0,
        252,0
BP 3380 DATA0,32,0,3,168,80,95
        ,233,16
BC 3390 DATA93,85,85,0,164,64,
        0,165,0
SH 3400 DATA0,168,0,0,32,0,0,1
        68,0
CJ 3410 DATA2,170,0,2,138,0,10
        ,10,0
FH 3420 DATA10,10,0,12,3,0,15,
        3,192
PJ 3430 REM--SHADOW--
HA 3440 DATA0,0,0,0,32,0,0,32,
        0
KM 3450 DATA0,136,0,0,136,0,2,
        70,0
EQ 3460 DATA2,2,0,0,136,0,0,16
        8,0
PQ 3470 DATA2,170,169,10,170,1
        69,10,42,40
RC 3480 DATA10,138,8,10,106,0,
        1,106,0
EM 3490 DATA2,170,0,10,170,0,1
        0,170,0
PM 3500 DATA42,170,128,42,170,
        128,170,170,128
FS 3510 REM--GHOST--
BS 3520 DATA0,40,0,0,170,0,0,1
        70,0
HJ 3530 DATA2,40,128,10,40,160
        ,42,170,168
EB 3540 DATA42,170,168,40,170,
        40,160,170,10
GP 3550 DATA162,170,138,162,17
        0,138,130,170,130
QK 3560 DATA162,170,138,34,170
        ,136,2,170,128
PE 3570 DATA10,170,160,10,170,
        160,10,170,160
AF 3580 DATA42,170,168,10,170,
        160,0,0,0
AA 3590 REM--SERPENT--
BR 3600 DATA0,0,0,0,160,32,2,1
        68,160
GJ 3610 DATA10,170,176,10,138,
        192,42,0,0
JA 3620 DATA42,10,128,42,42,16
        0,42,22,80
AR 3630 DATA168,38,96,168,42,1
        60,168,32,32
FA 3640 DATA168,10,128,170,15,
        192,42,175,192
DE 3650 DATA42,191,0,10,191,0,
        2,252,0
AQ 3660 DATA0,0,0,0,0,0,0,0,0,0
SA 3670 REM--WINGED WARRIOR--
PK 3680 DATA0,0,0,0,0,0,5,65,8
```

```
         0
SS 3690 DATA21,125,84,21,255,8
         4,21,60,84
DR 3700 DATA21,255,84,21,125,8
         4,23,191,212
AA 3710 DATA95,191,245,127,239
         ,253,125,251,125
PQ 3720 DATA117,254,93,125,170
         ,125,85,170,85
GX 3730 DATA86,130,149,70,130,
         145,70,130,145
PM 3740 DATA66,130,129,2,0,128
         ,10,0,160
KS 3750 REM--SKELETON--
MS 3760 DATA0,170,0,2,170,128,
         2,40,128
PD 3770 DATA2,0,128,2,170,128,
         0,170,0
RP 3780 DATA0,130,0,8,40,32,34
         ,40,136
KE 3790 DATA0,130,0,32,40,8,32
         ,130,8
JD 3800 DATA32,40,8,32,130,8,0
         ,40,0
XR 3810 DATA0,130,0,0,130,0,0,
         130,0
GR 3820 DATA2,0,128,2,0,128,10
         ,0,160
FR 3830 REM--VAPOR DEMON--
PC 3840 DATA2,170,128,10,170,1
         60,8,170,32
XS 3850 DATA10,40,160,10,170,1
         28,2,170,160
AC 3860 DATA10,130,160,10,40,1
         28,2,170,128
CR 3870 DATA0,170,128,2,170,0,
         0,170,128
JR 3880 DATA0,170,0,0,170,0,0,
         40,0
AM 3890 DATA0,168,0,0,40,0,8,8
         ,0
GM 3900 DATA0,32,136,2,32,0,32
         ,2,32
```

MARK GERHARDSTEIN

METEOR MATH

PRACTICE ADDITION OR MULTIPLICATION WHILE FLYING THROUGH SPACE IN THIS EDUCATIONAL GAME FOR THE 64

The Meteor Mining Company is hiring pilots to fly a fleet of ships for collecting asteroids in outer space. It has devised a test to discover people who have the necessary talents to pilot a spaceship while simultaneously solving problems to decide which asteroids are valuable.

The object of *Meteor Math* is to collect correct answers to simple math problems while avoiding the incorrect ones. You'll be given the first number in an addition or multiplication problem and its answer. It will be your job to maneuver your ship through a field of moving numbers to collect the one that completes the problem.

Getting Started

Although *Meteor Math* loads and runs like a BASIC program, it's written entirely in machine language. 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 given below.

Starting address: 0801
Ending address: 1658

When you've finished typing, don't forget to save a copy of the program before exiting *MLX*.

Playing the Game

When you run *Meteor Math*, the title screen will offer you several options. Press f1 and f3 to set the beginning and top levels. The level is the first number in the math equation. You can solve problems that start with the same number each time or cycle through them in consecutive order.

Press T to set the game's time limit. Games can last from one to nine minutes and will continue until that time limit has been reached or three ships have been destroyed.

You set the speed at which the answers scroll by pressing B for beginner, N for normal, or E for expert. This option always defaults to normal, although the other options will remain as you've set them.

When you're ready to begin, press f7 to complete addition problems or f5 to complete multiplication ones. Control your ship with a joystick plugged into port 2.

As your ship flies through the field of possible answers, you want to collect the right one. Touching a correct answer with your ship collects it. You'll receive two points for each correct answer and a bonus for each level you complete. The amount of the bonus depends on the level that you've finished. Level 9 is worth more than level 8, for example.

Running into an incorrect answer will destroy your ship. You may have to let some correct ones go by if they're too close to other numbers. When a ship has been destroyed or you've collected the correct number, the math problem changes; stay alert.

If your ship needs extra speed to snare the correct answer, press your fire button. This engages your turbo-thruster, which doubles the speed of your ship. Turbo fuel is expensive; this speed can be maintained for only about ten seconds per ship. The game ends when either the time limit has expired or you've crashed three ships into incorrect answers.

There's no real qualifying score in *Meteor Math*. I wrote this program to give my children practice with addition and the multiplication tables and to keep them from figuring out the answers by counting on their fingers. I made it flexible so that they could design their own tests, spending more time practicing problems in their areas of biggest need.

METEOR MATH

```
0801:14 08 0A 00 9E 32 30 37 B3
0809:30 3A 8F 20 4D 41 52 4B 13
0811:47 32 00 00 00 A9 80 8D 86
0819:0B D4 A2 00 BD 99 12 9D 4E
0821:00 20 BD 99 13 9D 00 21 BA
0829:BD 99 14 9D 00 22 BD 99 78
0831:15 9D 00 23 CA D0 E5 A9 74
0839:40 A9 00 9D BF 23 CA D0 9E
0841:F8 20 44 E5 A2 2F BD F6 01
0849:09 9D 00 D0 CA 10 F7 A9 82
0851:80 8D FA 07 8D FC 07 8D D0
0859:FD 07 A9 83 8D FE 07 A9 B7
0861:8B 8D F8 07 A9 8A 8D FB B8
0869:07 A9 8D 8D FF 07 A9 8C ED
0871:8D F9 07 A2 19 BD 25 0A E5
0879:9D 00 D4 CA 10 F7 A9 3E 91
0881:85 FC A9 0A 85 FD A0 00 CE
0889:B1 FC F0 0C 20 D2 FF E6 C3
0891:FC D0 02 E6 FD 4C 87 08 3B
```

PROGRAMS

```
0899:AD 4C 11 8D 47 11 09 30 4F
08A1:8D 29 06 AD 4D 11 18 69 A6
08A9:2F 8D 51 06 A9 01 8D 48 F3
08B1:11 A9 30 8D 01 12 A9 02 39
08B9:8D 4A 11 A9 09 8D 46 11 FB
08C1:A9 00 8D 26 10 A9 00 8D 6F
08C9:25 10 A9 00 8D 27 10 A9 78
08D1:FF 8D 28 10 A9 1E 8D 4B 77
08D9:11 AD 49 11 09 30 8D 41 7D
08E1:07 20 3A 0D A5 CB C9 16 9B
08E9:F0 31 C9 04 F0 30 C9 05 19
08F1:F0 46 C9 06 F0 73 C9 03 91
08F9:F0 55 C9 1C F0 14 C9 0E 4C
0901:F0 13 C9 27 F0 12 4C E5 4A
0909:08 A5 C5 C9 40 D0 FA 4C 65
0911:E5 08 4C 84 09 4C A8 09 BD
0919:4C 96 09 4C BA 09 AE 47 7B
0921:11 E8 E0 0A D0 02 A2 01 87
0929:8E 47 11 8E 4C 11 8A 09 24
0931:30 8D 29 06 E8 4C 43 09 4C
0939:AE 4D 11 E8 E0 0B D0 02 7D
0941:A2 02 8E 4D 11 8A 18 69 18
0949:2F 8D 51 06 4C 0A 09 78 F5
0951:A9 8A 8D FB 07 20 44 E5 73
0959:20 D1 09 A9 00 8D 0A DC D2
0961:8D 09 DC 8D 08 DC 4C 5E 9B
0969:0D 78 A9 8E 8D FB 07 20 C8
0971:44 E5 20 D1 09 A9 00 8D BC
0979:0A DC 8D 09 DC 8D 08 DC 14
0981:4C EE 0D A9 02 8D C9 06 91
0989:A9 00 8D 48 11 A9 30 8D C3
0991:01 12 4C 0A 09 A9 0E 8D 6B
0999:C9 06 A9 01 8D 48 11 A9 B0
09A1:30 8D 01 12 4C 0A 09 A9 B6
09A9:05 8D C9 06 A9 01 8D 48 EF
09B1:11 A9 F0 8D 01 12 4C 0A A0
09B9:09 EE 49 11 AD 49 11 C9 C4
09C1:0A 90 02 A9 01 8D 49 11 B9
09C9:09 30 8D 41 07 4C 0A 09 B8
09D1:A2 09 A0 00 CA CA 30 18 85
09D9:8A 99 00 D8 E8 8A 99 00 C9
09E1:D9 E8 8A 99 00 DA CA 8A 91
09E9:99 00 DB CA C8 D0 E5 60 A6
09F1:A2 09 4C D5 09 20 D2 20 0D
09F9:D2 32 39 1B 57 19 6E 32 09
0A01:6E 20 3C 32 4D BC 99 5D EC
0A09:E2 00 FF C8 00 15 78 F0 51
0A11:19 76 08 00 00 06 00 F1 5A
0A19:F2 F3 07 04 05 F4 07 04 D2
0A21:07 07 0A 0E 00 3C 00 00 8D
0A29:00 00 E9 00 00 00 00 81 FB
0A31:00 FF 00 FF 00 00 80 00 46
0A39:00 00 80 02 CA 11 9E 20 75
0A41:20 20 20 20 20 20 20 20 55
0A49:20 20 20 20 20 4D 45 54 90
0A51:45 4F 52 20 4D 41 54 48 88
0A59:0D 11 9C 20 20 20 20 20 AF
0A61:20 20 43 4F 4C 4C 45 43 4C
0A69:54 20 43 4F 52 52 45 43 B6
0A71:54 20 41 4E 53 57 45 52 99
0A79:53 0D 20 20 20 20 20 20 62
0A81:20 57 48 49 4C 45 20 41 12
0A89:56 4F 49 44 49 4E 47 20 3C
0A91:49 4E 43 4F 52 52 45 43 E4
0A99:54 0D 9E 53 48 49 50 53 7F
0AA1:9C 20 20 4F 4E 45 53 0D 40
0AA9:0D 20 20 20 20 20 20 20 34
0AB1:1E 54 48 45 20 46 49 52 46
0AB9:45 20 42 55 54 54 4F 4E F6
0AC1:53 20 45 4E 47 41 47 45 28
0AC9:53 0D 20 20 20 20 20 20 B2
0AD1:20 59 4F 55 52 20 54 55 9C
0AD9:52 42 4F 20 54 48 52 55 51
0AE1:53 54 45 52 2E 0D 0D 9F E1
0AE9:20 20 20 20 20 20 20 59 37
0AF1:4F 55 20 53 54 41 52 54 DC
0AF9:20 57 49 54 48 20 9E 33 95

0B01:9F 20 53 48 49 50 53 2E 3E
0B09:96 11 0D 20 20 20 20 20 34
0B11:96 CF B7 B7 B7 B7 B7 B7 9C
0B19:B7 B7 B7 B7 B7 B7 B7 B7 2F
0B21:B7 B7 B7 B7 B7 B7 B7 B7 37
0B29:B7 B7 B7 B7 B7 B7 B7 B7 3F
0B31:D0 20 0D 1D 1D 1D 20 96 5F
0B39:20 A5 9E 20 46 31 2D 20 10
0B41:53 45 54 53 20 53 54 41 4A
0B49:52 54 49 4E 47 20 4C 45 44
0B51:56 45 4C 20 20 20 31 20 73
0B59:20 92 96 A7 20 0D 1D 1D FD
0B61:1D 20 20 A5 9E 20 46 33 A1
0B69:2D 20 53 45 54 53 20 45 52
0B71:4E 44 49 4E 47 20 4C 45 66
0B79:56 45 4C 20 20 20 20 20 79
0B81:31 20 20 92 96 A7 20 0D 06
0B89:1D 1D 1D 96 20 20 A5 20 6F
0B91:20 20 20 20 20 20 20 20 A7
0B99:20 20 20 20 20 20 20 20 AF
0BA1:20 20 20 20 20 20 20 20 B7
0BA9:20 20 20 20 20 A7 20 0D CA
0BB1:1D 1D 1D 20 96 20 A5 99 5D
0BB9:20 42 20 2D 20 53 45 54 74
0BC1:53 20 42 45 47 49 4E 4E 70
0BC9:45 52 20 53 50 45 45 44 B6
0BD1:20 20 20 20 20 20 92 96 43
0BD9:A7 20 0D 1D 1D 1D 96 20 E9
0BE1:20 A5 99 20 4E 20 2D 20 14
0BE9:53 45 54 53 20 4E 4F 52 E5
0BF1:4D 41 4C 20 53 50 45 45 36
0BF9:44 20 20 99 20 20 20 4E E7
0C01:20 96 20 A7 20 0D 1D 1D D9
0C09:1D 20 96 20 A5 99 20 45 A5
0C11:20 2D 20 53 45 54 53 20 FF
0C19:45 58 50 45 52 54 20 53 BF
0C21:50 45 45 44 20 20 20 20 81
0C29:20 20 20 20 92 96 A7 20 BD
0C31:0D 1D 1D 1D 96 20 20 A5 A7
0C39:20 20 20 20 20 20 20 20 51
0C41:20 20 20 20 20 20 20 20 59
0C49:20 20 20 20 20 20 20 20 61
0C51:20 20 20 20 20 20 A7 20 78
0C59:0D 1D 1D 1D 96 20 20 A5 CF
0C61:9C 20 54 20 2D 20 53 45 32
0C69:54 53 20 54 49 4D 45 20 F3
0C71:4C 49 4D 49 54 20 20 20 C3
0C79:20 20 20 20 32 20 96 20 0F
0C81:A7 20 0D 1D 1D 1D 96 20 93
0C89:20 A5 20 20 20 20 20 20 03
0C91:20 20 20 20 20 20 20 20 A9
0C99:20 20 20 20 20 20 20 20 B1
0CA1:20 20 20 20 20 20 20 20 B9
0CA9:A7 20 0D 1D 1D 1D 20 81 30
0CB1:20 A5 9F 20 46 35 2D 20 BA
0CB9:53 54 41 52 54 53 20 4D 5B
0CC1:55 4C 54 49 50 4C 49 43 40
0CC9:41 54 49 4F 4E 20 20 20 09
0CD1:20 92 96 A7 20 0D 1D 1D 78
0CD9:1D 20 81 20 A5 9F 20 46 EC
0CE1:37 2D 20 53 54 41 52 54 BA
0CE9:53 20 41 44 44 49 54 49 59
0CF1:4F 4E 20 20 20 20 20 20 2D
0CF9:20 20 20 20 92 96 A7 20 8E
0D01:0D 1D 1D 1D 96 20 20 CC A0
0D09:AF AF AF AF AF AF AF AF 23
0D11:AF AF AF AF AF AF AF AF 2B
0D19:AF AF AF AF AF AF AF AF 33
0D21:AF AF AF AF AF AF BA 20 C1
0D29:00 60 00 01 02 03 04 05 94
0D31:06 07 08 09 00 01 02 03 AC
0D39:04 A2 09 A9 0B 9D 2B 0D EB
0D41:CA 10 F8 A2 09 AD 1B D4 18
0D49:C9 0A B0 F9 A0 09 D9 2B 88
0D51:0D F0 F2 88 10 F8 9D 2B DF
0D59:0D CA 10 E9 60 AE 46 11 A8
0D61:30 48 E0 0A B0 4A AD 47 B3

0D69:11 09 80 8D FA 07 AD 4A D0
0D71:11 30 34 BD 2B 0D 09 30 52
0D79:8D 45 11 BD 2B 0D 18 6D D4
0D81:47 11 C9 0A 90 11 18 69 BF
0D89:76 8D FD 07 A9 81 8D FC DD
0D91:07 20 29 10 4C 5E 0D 09 5C
0D99:80 8D FD 07 A9 80 8D FC EE
0DA1:07 20 29 10 4C 5E 0D 4C AF
0DA9:1A 0F 20 B7 0D 4C 5E 0D 77
0DB1:20 E5 0D 4C 5E 0D A9 09 3F
0DB9:8D 46 11 EE 47 11 AD 47 5E
0DC1:11 0A AA 20 A7 0F AD 47 5A
0DC9:11 CD 4D 11 F0 0D C9 0A F3
0DD1:D0 05 A9 01 8D 47 11 20 A6
0DD9:3A 0D 60 AD 4C 11 8D 47 44
0DE1:11 4C D8 0D A9 09 8D 46 56
0DE9:11 20 3A 0D 60 A9 00 85 DB
0DF1:FC AE 46 11 30 48 E0 0A 7E
0DF9:B0 4A AD 47 11 09 80 8D 64
0E01:FA 07 AD 4A 11 30 34 BD 26
0E09:2B 0D 09 30 8D 45 11 BD 83
0E11:2B 0D AC 47 11 A9 00 18 57
0E19:7D 2B 0D 88 D0 F9 C9 0A F4
0E21:90 07 E6 FC E9 0A 4C 1F 23
0E29:0E 09 80 8D FD 07 A5 FC CB
0E31:69 80 8D FC 07 20 29 10 BE
0E39:4C EE 0D 4C 1A 0F 20 B7 A2
0E41:0D 4C EE 0D 20 E5 0D 4C A4
0E49:EE 0D 4C 42 08 9E 4D 49 6C
0E51:53 53 49 4F 4E 20 43 4F D2
0E59:4D 50 4C 45 54 45 11 9D 85
0E61:9D 9D 9D 9D 9D 9D 9D 9D 7D
0E69:9D 99 49 4E 11 9D 9D 11 14
0E71:9D 9D 9D 05 20 30 30 20 0A
0E79:9A 4D 49 4E 11 9D 9D 9D 1C
0E81:9D 9D 9D 05 30 30 20 9A F4
0E89:53 45 43 1E A6 A6 A6 A6 AE
0E91:A6 A6 A6 A6 A6 A6 11 9D 79
0E99:9D 9D 9D 9D 9D 9D 9D 9D B5
0EA1:9D A6 20 20 20 20 20 20 1E
0EA9:20 20 A6 11 9D 9D 9D 9D FF
0EB1:9D 9D 9D 9D 9D 9D A6 20 62
0EB9:20 05 30 30 30 30 20 20 D2
0EC1:1E A6 11 9D 9D 9D 9D 9D CE
0EC9:9D 9D 9D 9D 9D A6 20 20 91
0ED1:20 20 20 20 20 20 A6 11 EB
0ED9:9D 9D 9D 9D 9D 9D 9D 9D F5
0EE1:9D 9D A6 20 9C 50 4F 49 19
0EE9:4E 54 53 20 1E A6 11 9D F9
0EF1:9D 9D 9D 9D 9D 9D 9D 9D 0E
0EF9:9D A6 20 20 20 20 20 20 76
0F01:20 20 A6 11 9D 9D 9D 9D 59
0F09:9D 9D 9D 9D 9D 9D A6 A6 42
0F11:A6 A6 A6 A6 A6 A6 A6 A6 2F
0F19:00 58 A2 05 A0 0F 18 20 83
0F21:F0 FF A2 00 BD 8C 0E F0 39
0F29:07 20 D2 FF E8 4C 25 0F FE
0F31:A9 00 8D 08 D4 8D 07 D4 16
0F39:A2 0D A0 0C 18 20 F0 FF E3
0F41:A2 00 BD 4E 0E 20 D2 FF E3
0F49:E8 E0 3E 90 F5 AD 26 10 A7
0F51:09 30 8D 2D 05 AD 25 10 BD
0F59:09 30 8D 2C 05 AD 27 10 B9
0F61:09 30 8D 2B 05 A9 BF 8D 50
0F69:15 D0 AD 09 DC 29 0F 09 3F
0F71:30 8D B9 06 AD 09 DC 29 17
0F79:70 4A 4A 4A 4A 09 30 8D B4
0F81:B8 06 AD 0A DC 29 0F 09 86
0F89:30 8D 91 06 AD 0A DC 29 2E
0F91:70 4A 4A 4A 4A 09 30 8D CC
0F99:90 06 EE 20 D0 A5 CB C9 DF
0FA1:40 F0 F7 4C 42 08 EE 26 16
0FA9:10 AD 26 10 C9 0A D0 17 30
0FB1:A9 00 8D 26 10 EE 25 10 4F
0FB9:AD 25 10 C9 0A D0 08 A9 E3
0FC1:00 8D 25 10 EE 27 10 CA E7
0FC9:D0 DC A9 23 85 FD A9 C0 27
```

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0FD1:85 FC A0 1A AD 26 10 20 ED
0FD9:EE 0F A0 19 AD 25 10 20 1B
0FE1:EE 0F A0 18 AD 27 10 20 1B
0FE9:EE 0F 4C 0B 10 0A 0A 0A 44
0FF1:AA A9 33 85 01 BD 80 D1 60
0FF9:91 FC E8 C8 C8 C8 C0 30 E4
1001:B0 03 4C F6 0F A9 37 85 46
1009:01 60 A9 8F 8D FE 07 A9 10
1011:40 8D 17 D0 A9 48 8D 1D 4B
1019:D0 A9 36 8D 1C D0 A9 0A 2D
1021:8D 2D D0 60 00 00 00 FF 73
1029:20 F7 11 20 4E 11 AD 0A 97
1031:DC CD 49 11 90 03 4C 1A B0
1039:0F AD 28 10 F0 19 AD 00 99
1041:DC 29 10 D0 12 CE 28 10 55
1049:D0 05 A9 0C 8D 20 D0 20 B7
1051:4E 11 A9 80 8D 07 D4 AD F9
1059:1F D0 29 01 F0 CA A9 04 7C
1061:85 FD A9 00 85 FC AD 01 75
1069:D0 E9 31 4A 4A 4A F0 0F A3
1071:AA A5 FC 18 69 28 85 FC 65
1079:90 02 E6 FD CA D0 F4 AD 50
1081:10 D0 29 01 D0 18 AD 00 55
1089:D0 4A 4A 4A 38 E9 03 4C 4E
1091:A8 10 AD 00 D0 4A 4A 4A 4E
1099:38 E9 03 4C A8 10 AD 00 56
10A1:D0 4A 4A 4A 18 69 1D 18 63
10A9:65 FC 85 FC 90 02 E6 FD 94
10B1:A2 03 A0 04 B1 FC CD 45 9A
10B9:11 F0 6F C9 20 D0 14 88 1E
10C1:10 F2 A5 FC 18 69 28 85 67
10C9:FC 90 02 E6 FD CA D0 E2 DA
10D1:4C 41 11 A9 20 91 FC A9 10
10D9:00 8D 27 D0 A9 81 8D 04 C1
10E1:D4 EE 21 D0 20 F7 11 20 7C
10E9:F7 11 20 F7 11 20 44 E5 45
10F1:20 D1 09 CE 21 D0 CE 4A D8
10F9:11 AD 4A 11 09 80 8D FE CC
1101:07 A9 00 8D 17 D0 A9 08 41
1109:8D 1D D0 A9 76 8D 1C D0 E0
1111:A9 FF 8D 28 10 A9 06 8D FC
1119:20 D0 A9 05 8D 27 D0 A9 59
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1129:41 11 A9 20 91 FC A9 11 4C
1131:8D 04 D4 A9 10 8D 04 D4 E3
1139:CE 46 11 A2 02 20 A7 0F 8F
1141:AD 10 D0 60 30 05 05 00 FD
1149:02 0A 00 01 02 AD 00 DC A2
1151:29 0F C9 0F D0 0F A9 00 0C
1159:8D 08 D4 8D 07 D4 AD 21 BF
1161:D0 8D 28 D0 60 AD 00 DC F7
1169:4A B0 03 20 8B 11 4A B0 25
1171:03 20 9C 11 4A B0 03 20 FC
1179:AD 11 4A B0 03 20 D2 11 5A
1181:EE 28 D0 A9 10 8D 08 D4 75
1189:60 00 AE 01 D0 CA CA E0 E9
1191:32 B0 01 60 8E 01 D0 8E C7
1199:03 D0 60 AE 01 D0 E8 E8 6E
11A1:E0 E9 90 01 60 8E 01 D0 E0
11A9:8E 03 D0 60 A8 AE 00 D0 C4
11B1:D0 08 AD 10 D0 29 FC 8D A7
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11C1:8E 00 D0 8E 02 D0 98 60 13
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1251:FC CA 10 CC 60 A9 04 85 AC
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12C1:00 B8 2E 00 B8 2E 82 B8 16
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12D9:00 00 00 00 2A 00 00 2E 7D
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1311:00 00 2A 00 00 00 00 7C F8
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1321:F8 2F FF F8 2E AA B8 2E DA
1329:00 B8 2A 00 B8 00 00 B8 41
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1341:AA A8 2E 00 00 2E 00 00 65
1349:2E 00 00 2E AA A8 2F FF BF
1351:F8 2A AA A8 00 00 00 C4 23
1359:00 00 00 AA AA A8 BF FF A1
1361:F8 BF FF F8 BA AA B8 A8 1E
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1391:F8 AA AA A8 00 00 00 BC 7B
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1419:00 00 00 0A AA A8 2F FF 38
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1461:F8 2A AA B8 00 00 B8 00 E2
1469:00 B8 00 00 B8 00 02 F8 82
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15C1:00 00 08 82 20 00 00 00 16
15C9:00 00 00 00 00 00 00 00 F3
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15D9:00 00 00 00 00 00 00 00 04
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1641:C0 00 E0 E0 00 00 00 00 F7
1649:00 00 00 FF FF FF FF FF 75
1651:FF FF FF FF 00 00 00 BA 38
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TYPING AIDS

MLX, the machine language entry program for the 64 and 128, and *The Automatic Proofreader* are utilities that help you type in Gazette programs without making mistakes. These labor-saving utilities are on each *Gazette Disk* and printed in issues of *Gazette* through June 1990.

If you don't have access to a back issue or to one of our disks, write and we'll send you free copies of both of these handy utilities. We'll also include instructions on how to type in Gazette programs. Please enclose a self-addressed, stamped envelope. Write to Typing Aids, COMPUTE's Gazette, 324 West Wendover Avenue, Greensboro, North Carolina 27408.

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

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

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

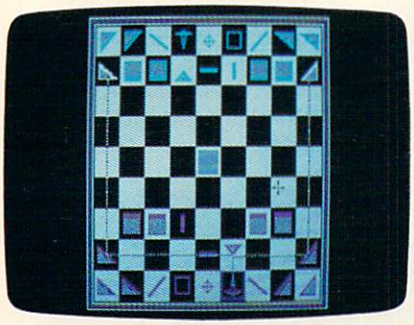
For Commodore 64 Only

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

Super Publisher's Closeout Sale

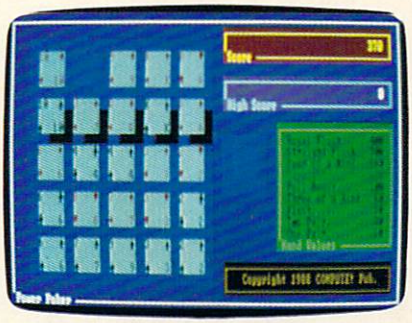
COMPUTE's BEST PC GAMES

Don't miss these six dazzling, ready-to-run games complete with a 16-page magazine jammed with instructions!



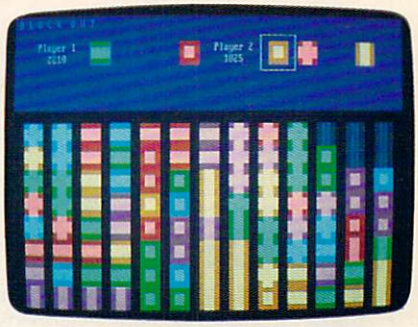
Laser Chess

Award-winning, two-player strategy game patterned after chess—but with an exciting new twist.



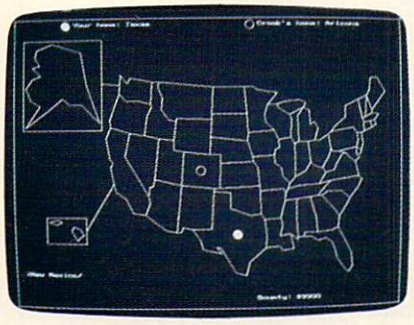
Power Poker

Addictive strategy game with a new dimension. Fun for one player or a group.



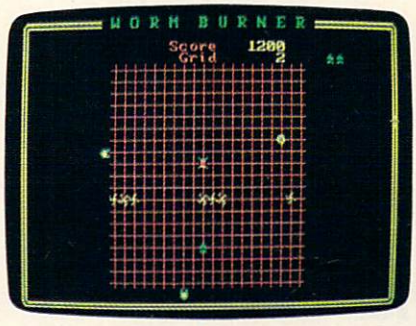
Block Out

Colorful and delightful strategy game that everyone in the family will want to play.



Bounty Hunter

Catch the crook and collect the bounty! So much fun, you'll never know you're mastering U.S. geography.



Wormburner

Skill and arcade action combine to form an unbeatable challenge.

QuikServe

Fling those fries! Sling those shakes! Bounce those burgers! A frenzied arcade-style game for the stout-hearted only.

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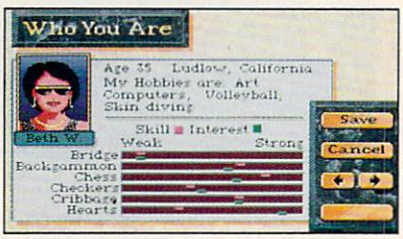
SNEAK PEEKS

THE SIERRA NETWORK

What can you do if it's Saturday afternoon and there's nobody around you can play chess with? Or if you're a shut-in and there's no one around to talk to? Or if you're an avid *Red Baron* or *Stellar 7* player looking for a new level of excitement? The Sierra Network (TSN), which was announced on May 6, may hold the answer. It's the first computer network dedicated to online game playing.



Your dossier and mugshot (which you create yourself) help other people to get to know—and play—you better.

In fact, the philosophy behind the Sierra Network is person-to-person game playing. There's no option to play against the computer, nor will there be. Human interaction is key. Chess, checkers, hearts, backgammon, bridge, and cribbage are the games available as this is being written, but according to the comments left in the bulletin board area, there is a strong demand for other kinds of two-player adventure and action games. Sierra intends to use TSN as a conduit for modem games like *Red Baron* and *Stellar 7,* allowing players to fight a realtime dogfight or tank engagement against a human opponent anywhere within the bounds of Telenet.

TSN displays the distinct Sierra EGA 16-color look: blocky letters, Larry Laffer graphics, and two-line dialog boxes for conversation. But the company promises that soon the network will boast 256-color graphics and scanned images for playing boards, a segregated area for grown-ups called *Larry Land* (complete with a casino), and other exciting amenities.

TSN can also be used to carry on a text conversation. And you can get in some checkers at the same time!

ROBERT BIXBY

Scheduled to come online: June 1991
For IBM PC and compatibles—$11.95 per month in selected cities; $2.00 an hour from 6:00 p.m. to 6:00 a.m. in others)

SIERRA ON-LINE
P.O. Box 485
Coarsegold, CA 93614
(209) 683-4468

CHUCK YEAGER'S AIR COMBAT

The new *Chuck Yeager's Air Combat* is the most versatile, exciting combat flight simulator to land on the PC. You'd think a program that lets you fly six combat aircraft ranging from the piston-engined P-51 Mustang to the Mach 2–capable MiG-21 Fishbed against 17 different types of enemy aircraft would be full of compromises. Not this one. Whether your combat is over WWII Europe, Korea, or Vietnam, you'll find the program as realistic as single-era simulators.

As you'd expect in a simulation bearing the Yeager name, the planes fly very accurately. You won't be making hairpin turns at Mach 2 in your F-4, and you can't climb vertically in a Focke-Wulf 190.

The preset scenarios are a welcome change from standard flight simulator fare. Many missions bring unexpected complications, such as enemy MiGs showing up on what's supposed to be a ground attack mission. Others are unique; in one mission, you take on the role of Lt. Kim Sok Ho, the North Korean MiG-15 pilot who defected with his plane for a $100,000 reward.

Take wing against a variety of enemy aircraft in this latest simulation.

The game uses a refined version of the graphics system used in EA's *LHX Attack Chopper* and *Stormovik* simulators. The full release version promises digitized speech and explosions, as well as sound card support. Control with a mouse or trackball was awkward; this game definitely requires a joystick for full enjoyment.

Fast action, original missions, and fascinating fantasy combat make this a must-have program for PC pilots.

DENNY ATKIN

Scheduled Release: June 1991
For IBM PC and compatibles, 640K RAM—$59.95

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San Mateo, CA 94404
(415) 571-7171

What Are Sneak Peeks?

Sneak Peeks are advance reviews of upcoming software and hardware products. Every effort is made to ensure that the information contained in these reviews is accurate at the time they are published. *COMPUTE* will review the final edition when it becomes available.

A NEW WIZARDRY

Ten years ago, Wizardry set the standards in FRP. Now, after two million copies have been sold and 25 international awards have been won, Bane of the Cosmic Forge raises and redefines those standards. This new Wizardry, the truest simulation ever of Fantasy Role Playing, will push your computer, your mind and your sense of adventure to their very limits.

True FRP Simulation!

Like a true game master, Bane of the Cosmic Forge rolls the dice, consults its charts and applies the rules. From the 400 items of armor and weaponry researched for authenticity – right down to their weights – to the realistic combat structure – incorporating Primary and Secondary attack – everything, absolutely everything, is calculated.

Full-Color, Animated Graphics!

You'll see swords swinging before your eyes; creatures of all shapes and forms will move before you; spells coming from your magician will swirl through the air. You'll walk under gargoyle-laden arches and watch candles flicker in their sconces. Your PC's internal speaker will play all of these digitized sounds without any add-on hardware . . . swords swinging, monsters venting their anger and spells letting fly.

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GAMES

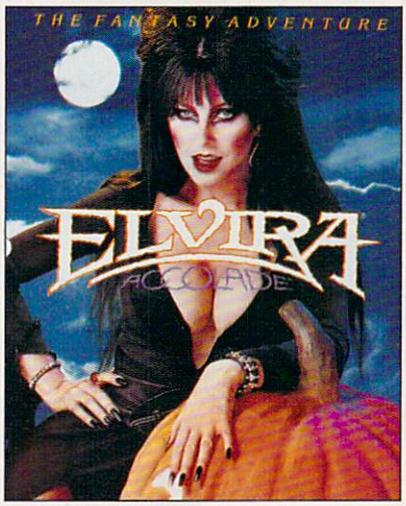
CHOICE

ELVIRA, MISTRESS OF THE DARK

Killbragant Castle looms before you, looking nothing like the description the adventurers' union gave of a quaint castle in the peaceful English countryside. Still, all you've got to do is help the sweet young thing that lives there solve a tiny problem with some unwanted guests. "Piece of cake," they said, "a pleasant vacation." One glance at the captain of the guard confirms your worst fears—Killbragant is hardly quaint. You're in trouble all right, big trouble!

Thus begins the fantasy adventure game *Elvira, Mistress of the Dark,* a successful mixture of a graphics adventure and fantasy role-playing game. As for that nice vacation, forget it; this vacation is the stuff of nightmares. It seems Elvira's great-grandmother, Queen Emelda, is due for a resurrection and plans to rule the world with the help of her evil minions. Your task is to help Elvira find her chest and the six keys that open it in order to put a stop to Grandma's imminent return. Of course, Elvira's unwanted, not to mention undead, houseguests, including everything from zombie soldiers to a beautiful but deadly vampiress, are dead set on seeing to it that you fail.

Elvira may start a new trend in graphics-oriented adventures. Many games sacrifice depth and length of play in favor of striking graphics. Accolade, however, has created a game that provides hours of play in addition to stunning graphics. As you enter the castle, the attention to detail becomes apparent, and thanks to *Elvira's* first-person perspective, the feeling of being there is immediate. As you wander the ancient grounds of Killbragant, you'll have the opportunity to battle a variety of creatures, all of which will grimace, scream, and snarl at you in remarkable detail. I found the animation to be excellent. At one point in the game you'll encounter a falcon, which scrolls smoothly across the screen just before ripping out your eyes. Another excellent animation sequence is the werewolf transformation. I recommend that you bring some silver when you visit this guy, and I'm not talking about your fork and spoon.



Visually stunning and full of dangerous surprises, *Elvira*'s only for the intrepid.

The box states that *Elvira* contains blood-curdling graphics. This is a warning as well as a selling point; the game contains graphic violence. You will be beheaded, have your throat ripped out, and sustain various other fatal and unpleasant injuries—all with minute attention to detail. The results are sometimes shocking. For this reason, I feel that *Elvira* is not suitable for young children.

Of course, a superior adventure game relies on more than good graphics for its appeal, and *Elvira* is no exception. The game boasts an excellent soundtrack and supports today's most popular sound cards. I found the music to be very well done, creating tension at just the right moment. Another excellent feature is the incorporation of digitized sound effects. No matter what sound card you're using, you'll still be able to hear screams, cries of agony, and the clash of steel on steel as you engage in battle. For those of you whose only source of sound is the PC speaker, Accolade has done a creditable job with the music, and you'll even be able to hear the digital sound.

Elvira is an icon-driven game that uses a point-and-click interface. All the necessary icons are located on one screen, which speeds gameplay by minimizing the amount of mouse pushing you'll do. Needless to say, because of the nature of the interface, a mouse is highly recommended.

During the game all text, descriptions, and inventory items will appear in a lower window. Arrows direct your movement along the four compass points, and up or down arrows allow you to negotiate stairways. You manipulate objects by using command icons such as Examine, Open, Close, Use, and the like. Picking up an object is a simple matter of clicking on it and dragging it to your inventory. Another interesting feature, the ability to drop things in a room and retrieve them later, isn't found in many of today's graphic adventure games.

During combat, when you confront one of the castle beasties, a special combat window appears, alternately displaying Lunge/Hack and Block/Parry. The intelligent combat interface requires you not only to select the proper attack or defense but also to time your defense correctly. Not that it's going to help you much. There's going to be a lot of blood spilled here—mostly yours. One more note on combat: Once you engage in battle, it's a fight to the death. If you wish to run or use magic against your enemy, you must do so before the combat window appears.

Out for your blood, the ghastly denizens of Killbragant close in for the kill.

Strategy for *Elvira* is somewhat simplistic; try to stay alive and grab everything that isn't nailed down. In the castle, you find some of the better weapons and other items used throughout the game. You'll have to

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engage in combat to enter many of the rooms in the castle, and since fighting is strictly on-the-job training, save often. The game has so many items you can pick up that I recommend selecting a centrally located room in the castle as a repository. I found that the library serves nicely, since it's never guarded. Make sure you read the documentation, as it contains some good pointers. Last, but not least, if you truly get stuck, Accolade does offer an excellent hint book that includes a layout of the castle and grounds.

Despite my disappointment with the lack of a user-friendly installation process and some minor documentation oversights, I consider *Elvira* a noteworthy achievement. If a dank and dangerous setting is your element, you'll be right at home in Castle Killbragant. Grab a copy and begin your adventure—exploring *Elvira* may take days, but every moment's a thrill.

GREGG OWENS

IBM PC and compatibles; 640K RAM; EGA, VGA, or Tandy 16-color; hard drive; 8-MHz or faster processor recommended; mouse recommended; supports Ad Lib, Sound Blaster, Roland MT-32, Casio CT460, and CMS—$59.95

Also available for Amiga—$59.95 and Atari ST—$59.95

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THE DREAM TEAM 3 ON 3 CHALLENGE

With the long, hot days of summer quickly approaching, basketball fans find themselves dreading the long wait for the action of their favorite sport to heat up. The wait is over! In *The Dream Team 3 on 3 Challenge,* three of the NBA's top stars are waiting to bring their brand of half-court action right into your living room.

Joe Dumars, Patrick Ewing, and Dominique Wilkins are the team to beat in this fast-moving arcade challenge. For one or two players, *The Dream Team* can be played either competitively or cooperatively and with one-, two-, or three-man teams. In any variation, players are chosen from a roster of 24 of the NBA's finest.

You can also participate in the ultimate challenge, the Dream Team Tournament. This single-elimination showdown is played between eight three-man teams, which are randomly paired in each game. Up to eight of the teams can be controlled by humans, so you can invite seven of your friends over to see which of you really is number 1.

Basketball season never ends with *The Dream Team Three on Three Challenge.*

The mechanics of this game are easy to master. Your players dribble automatically as they move; everything else is just a matter of positioning and timing. Press button 1 on your joystick to shoot, rebound, or block a shot; press button 2 to pass. The colored "pad" that appears beneath the feet of one of your players makes it instantly apparent which player you control at any given time.

The Dream Team also involves tactical considerations, requiring you to select one of four active plays before inbounding the ball. Choose from 16 preprogrammed plays, or design your own. You can change your active plays as often as you like. Calling plays adds a bit of realism to the game and makes passes easier to execute because you can anticipate the movements of your players.

The Dream Team's designers obviously paid a great deal of attention to creating an attractive game, and it shows: This is easily the best-looking basketball game on the market. The graphics are rich and detailed to the point of shading the ball so that it appears rounded and three-dimensional. Unlike some other games, *The Dream Team* won't strain your eyes. The players are large, bright, and colorfully animated, with moves such as a behind-the-back lay-up and a soaring two-handed slam along the baseline.

The weakest part of this game involves the sound effects, which are limited to the sound of dribbling, the ball hitting the rim, and the referee's whistle. While these effects are well done, there should be more. Where are the squeaking sneakers? Where is the roar of the crowd when a player comes up with a big slam-dunk or a long three-pointer?

Overall, this is a commendable effort from Data East. The graphics and animation are engaging, the sound effects are sparse but good and, most important, it's fun to play. So all you sports gamers out there—grab a joystick, lace your sneakers up, and try *The Dream Team 3 on 3 Challenge.*

RICHARD RAPP

IBM PC and compatibles; 512K RAM for CGA, EGA, and Hercules; 640K RAM for VGA and Tandy 16-color; 10 MHz or faster recommended for VGA or Tandy graphics; supports Ad Lib and Sound Blaster sound cards; joystick recommended—$49.95

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KING'S QUEST I

A classic game, *King's Quest* now boasts a new, easier-to-use interface that hasn't upset the game's balance. It only enhances by eliminating the drudgery of keyboard control. To find out about an object, just point at it and click the right mouse button. To move the hero, Sir Graham, you merely need to click on the desired location, and Graham obligingly moves in that direction. And while *KQ*'s graphics are no longer state-of-the-art, the soundtrack and overall quality of the game are still remarkable. In sum—bravo! *King's Quest* has been given a new lease on life.

TOM CAMPBELL

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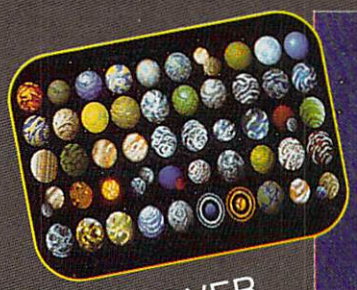

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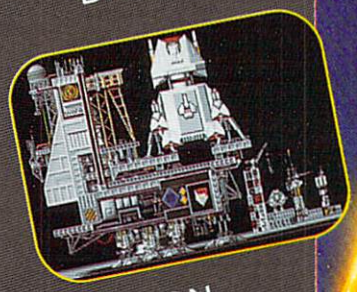

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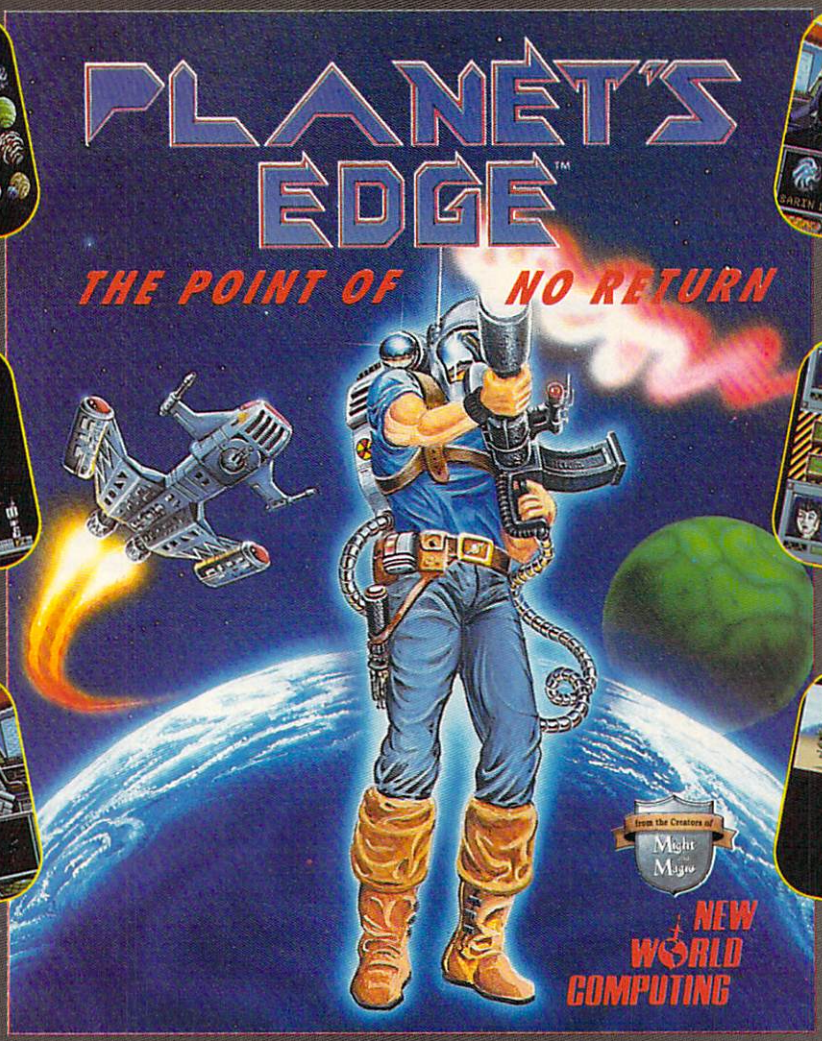

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GAMES

FUTURE CLASSICS COLLECTION

Arcade lovers will get a bang out of this five-game omnibus. In *Diskman* you gather floppy disks, while avoiding magnets, bombs, and other deadly devices. *Diet Riot,* on the other hand, gives you a chance to close down junk-food restaurants. Don't eat those hamburgers and French fries! You'll get fat. Other games include *Blockalanche,* a 3-D *Tetris*-like puzzle; *Lost 'N Maze,* a first-person-perspective maze treasure hunt; and *Tank Battle,* a simple combat game.

While none of the games is conceptually original, each is cleverly implemented. Moreover, they boast much better graphics than you might expect from a budget collection. At the price, *Future Classics Collection* is a steal.

CLAYTON WALNUM

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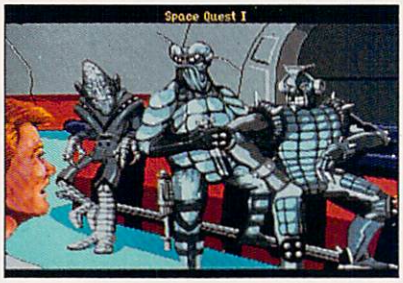
SPACE QUEST IV: ROGER WILCO AND THE TIME RIPPERS

Roger Wilco foils Sludge Vohaul's plans for revenge by jumping into the Time Rip, and the adventure has just begun. Roger won't rest until he's seen *Space Quest XXII,* revisited *Space Quest I,* and stopped briefly at *Space Quest X.*

Familiarity with Sierra's line of terrific software didn't prepare me for the dazzling opener. Stunning 256-color MCGA graphics, a soundtrack rivaling Hollywood's best, and a well-planned introduction to an exciting story kept me on the edge of my seat.

When you play, don't try typing *Look Around.* The parser of old has been replaced with a new-generation interface. Click the Eye icon in the area you want to look, and you're given a full report. With the Hand, Walking, Nose, and Tongue icons, you'll have an easy time figuring out what to do.



You run into some pretty tough customers in *Space Quest IV.*

The story line is full of surprises. When the Latex Babes captured Roger, I witnessed Roger's former lover exacting revenge. And experiencing the Skate-O-Rama in the mall, with its antigravity instead of skates, reminded me that the Galaxeria Mall, after all, was in the middle of deep space. One of the biggest surprises is meeting Roger's son and seeing a hologram of his wife. I won't give things away, but you'll be in for a shock because of his wife's notoriety.

There are technological twists, too. Roger plugs into Vohaul's supercomputer to find the programming room for the supercomputer and avoid the security detail. Once at the programming room, he has an opportunity to format Vohaul's evil storage media.

If you're a Space Quest fan or you just love games that have great graphics and wonderful sound, get this game. It's hard to guess how Sierra will follow this act after exposing you to the far-flung future of *Space Quest XXII,* but I imagine it will be every bit as stimulating as this adventure.

RICHARD LEINECKER

IBM PC and compatibles, 640K RAM, MCGA or VGA; supports mouse or joystick, supports Ad Lib, Roland, Game Blaster, PS/1, and Sound Blaster sound cards—$59.95

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LORD OF THE RINGS, VOL. I

Hobbits are good guys, honest and tough, the kind of folks you wouldn't mind having next door. One of them, Bilbo Baggins, found a ring of unimaginable power and gave it to his nephew Frodo. Now Frodo must destroy the ring, but its creator, the dread Sauron, wants it back.

Are these the makings of adventure? You bet! Author J. R. R. Tolkien used these very ingredients to create his celebrated fantasy, *Lord of the Rings.* Now Interplay Productions has adapted them to the phosphor screen with *Lord of the Rings, Vol. I,* a computer-based version of the Tolkien classic.

The denizens of Tolkien's Middle Earth come to life in *Lord of the Rings.*

Interplay has done a good job of equipping you for your quest. You move with your mouse (highly recommended) or keyboard (awkward), and the interface is icon-based, allowing you to readily procure and use objects, cast magic spells, and attack enemies. You can recruit some characters to help you in your quest and talk with others to get information you need. Depending on where you are, you can acquire new weapons, learn new spells, or eat food to restore lost life points. You can even put the ring on your finger, rendering yourself invisible. But be careful if you do; the ring drains your will, and if your will falls to zero, you are, for all practical purposes, dead.

Icons initiate action, and you'll see plenty of that, but you'll need information, too, and information comes from written words. Some of those words are written on neat little

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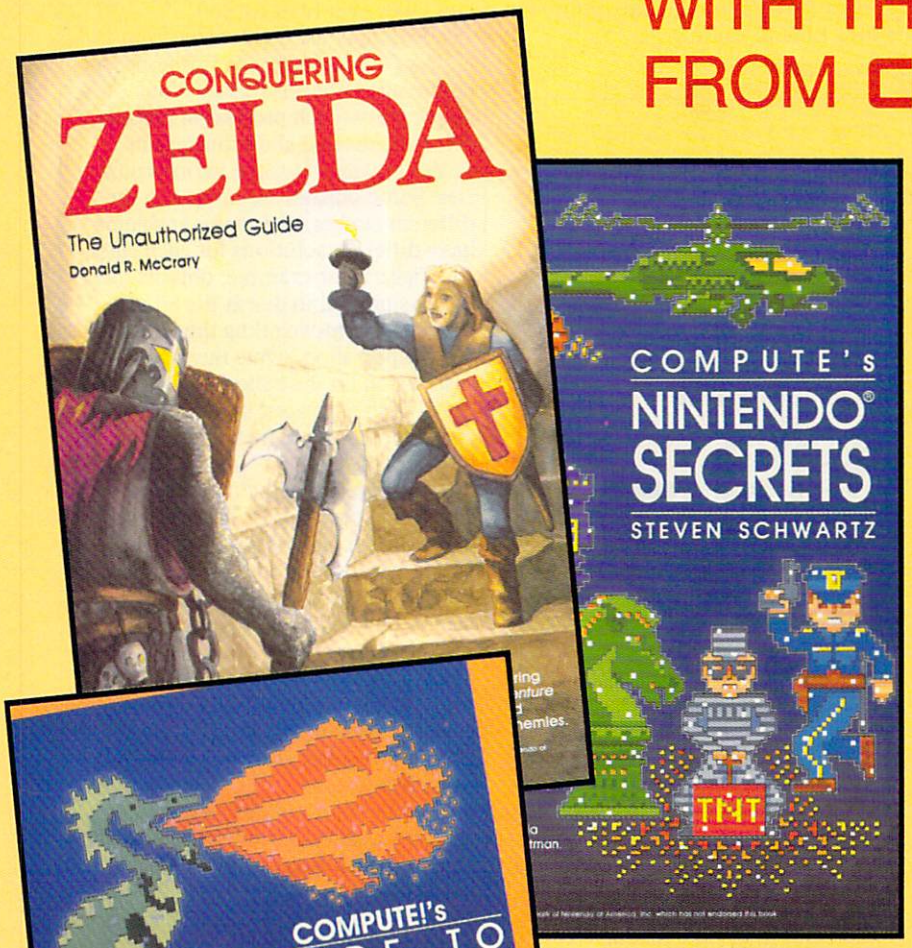

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yellowed scrolls that magically appear and then automatically unfurl whenever the need arises. These may, for example, give you the lowdown on what's in a room. As you explore, the ever-helpful scroll also tells you if there are desirable items to be found wherever you happen to be. It works like this: As you enter a room, the scroll may pop up and roll down and notify you that there are items of interest nearby. Sure enough, when you call up the Get icon, you'll find that there are indeed worthwhile objects waiting for you, but you'd never know it by looking, since there's no visual hint. Don't real adventurers always depend on their eyes?

Other words are printed in your *Lord of the Rings* play manual, where you'll find 259 numbered blocks of text. From time to time, the yellowed scroll will prompt you to refer to paragraph such and such, and you've got to open the manual and locate the paragraph. Is this the poor man's text adventure? Admittedly, the paragraphs add depth to the game, but why not just put the information on the screen?

The program has other quirks, too. For example, you can pick up something useful and then discard it, but if you try to pick it up again, it may not be there. Another thing that's puzzling: Since wearing the ring makes you invisible, you'd expect your cohorts not to notice you when you slip it on. But even when you wear it, they'll still dutifully follow you around.

Another problem lies with the scrolling screen itself. It's good, not great. When you move, your character stays more or less stationary on the screen while the background scrolls past. The scrolling is jerky, and with more than 9000 screens worth of Middle Earth terrain to explore, eyestrain is inevitable.

How effective is this translation of a fantasy classic into the language of microprocessors? I'm caught in the middle, loving the gameplay but disappointed by visuals that could never live up to those of my imagination. Interplay's Middle Earth citizens are remarkable in VGA, but some of them seem to be a cross between Elvis Presley and Mr. Spock. If you're a reader of Tolkien, this computer-granted glimpse of the land the Hobbits call home may or may not match your own mental image, but even if it doesn't, don't let that keep you from enjoying Interplay's *Lord of the Rings.* Rest assured that those little guys will keep you on the road to adventure for a long time to come.

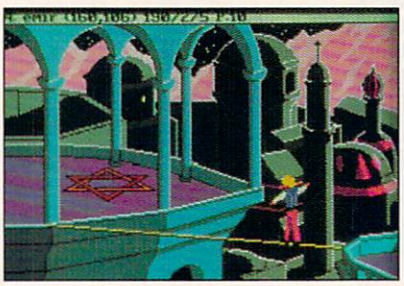
STEVE HUDSON

IBM PC and compatibles; 512K for CGA or EGA, 640K for MCGA, VGA, or Tandy 16 color; hard disk and mouse recommended—$54.95

INTERPLAY PRODUCTIONS
3710 S. Susan, Ste. 100
Santa Ana, CA 92704
(714) 549-2411

QUEST FOR GLORY II: TRIAL BY FIRE

When a designer tries to graft role-playing onto adventure, the result is usually a Frankenstein monster of a game that returns to haunt the author, the publisher, and the game players of the world. *Hero's Quest* scored high marks as one of the few games to successfully blend the puzzle-solving aspects of an adventure with the combat and skill elements that characterize role-playing games. The sequel, which bears a different name due to a trademark conflict with a board game, is even better than the original.



Tightrope walking in *Trial by Fire* isn't safe, but it certainly is heroic.

Our hero has traveled from the forests of Europe to the burning sands of the Mideast for this story. In the desert city of Shapeir, things have not been shaping up according to the sultan's plan. The emir in the nearby city of Raseir has fallen victim to the evil plot of his sinister sibling. Your quest is to find the missing ruler and set things right in Raseir before the villain takes over Shapeir, too.

You may use a character from *Hero's Quest* or roll up a fresh one. As before, the choice is fighter, thief, or magic user—each profession possessing strengths and shortcomings in skills necessary to solve various puzzles. Some puzzles are unique to the different classes, and many problems have different solutions for each class. The fighter, for example, obtains the bellows needed to defeat the air elemental by arm-wrestling the man in the weapon shop, while the magic user casts Fetch on the bellows (at night) to get it. In most places, the magic user and thief rely more on wits; the fighter on strength.

I enjoyed battling the brigands and giant scorpions of *Trial by Fire* more than the villains of *Hero's Quest,* because the combat system has been revamped and improved. Instead of viewing a first-person picture of the foe, you watch animated figures of both characters. There are only a few combat commands, so they're easy to learn and execute. Magic is useful in combat as well as when solving puzzles.

As in *Hero's Quest,* your character can improve certain skills if he or she uses them successfully. Pick enough locks, and you'll find the next lock easier to pick. In a major leap forward over *Hero's Quest, Trial by Fire* lets your characters advance to higher classes; a fighter strives to become a paladin, for instance. This gives the quest a dual purpose: to save the land and to get your character promoted. An added feature is a different final scene for each character class, so you have more incentive to replay that character, and more fun doing so.

Trial by Fire supports everything from 16-color VGA to Hercules and sound boards that haven't even been invented yet, but it doesn't employ the "cinemagraphics" and icon interface of *King's Quest V.* You still type words into a parser to interact with people and things, and the graphics are cartoonish. This is apppropriate, however, considering the abundance of humor here. Authors Lori and Corey Cole display a rare talent for

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GAMES

demented puns and obscure jokes. The weapon shop, for instance, is run by a man called Issur, a play on A. E. van Vogt's classic novel, *The Weapon Shops of Isher*. For its playfulness and improvements over the original, *Trial by Fire* is highly recommended.

SHAY ADDAMS

IBM PC and compatibles, 640K RAM, CGA, EGA, MCGA, VGA, or Hercules; 8 MHz or higher recommended, supports Roland MT-32, Ad Lib, Sound Blaster, PS/1 Audio Joystick Adapter, and other music synthesizers—$59.95

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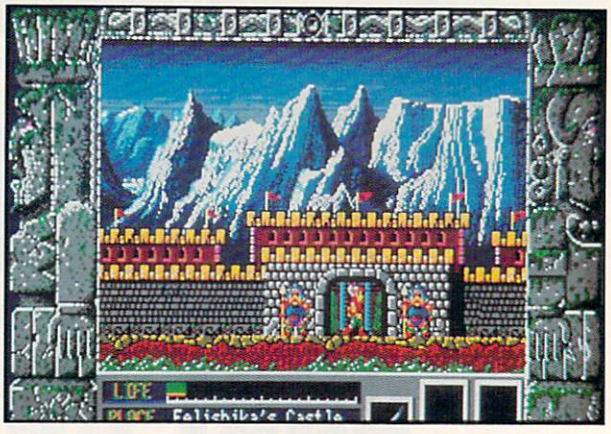
ZELIARD

I don't like sword-and-sorcery games, but twenty minutes after beginning *Zeliard,* I took the phone off the hook and put my rudest Do Not Disturb sign on the front door.



You come across a mountain fortress in *Zeliard*.

A Japanese import from Sierra's Game Arts division, *Zeliard* is a well-crafted, entertaining hack-and-grab fantasy adventure. As Duke Garland, you must search for the Tears of Esmemanti, nine crystals that are the only defense against the demon Jashiin, who has laid waste the land and turned the princess into stone. Your quest takes you through caverns where you do battle with evil frogs, slugs, owls, fire-spitting serpents, and the inevitable giant monsters. Along the way, you have the chance to buy better weapons and increase your strength and endurance, and if you persevere to the end, you'll restore the land of Zeliard to its former happy state. OK, you've heard it all before, but *Zeliard*'s familiar premise profits immensely from detailed graphics (even on CGA), limited but clever animation, satisfyingly convoluted labyrinths, and an original musical score that, for a wonder, is pleasant to listen to.

Not that there aren't problems: On slower systems the lags during screen changes may be infuriatingly

slow, playing the game without a hard drive will involve frequent disk swapping (three 5¼s, two 3½s), and after several deaths, you'll wish it were possible to save a game without leaving the cavern to go to the Sage's house in the village. But the first two problems are probably signs that it's time to upgrade your system, and the last problem will at least keep you on your toes. On the whole, the obvious care that went into the creation of *Zeliard* makes playing the game a lot of high-quality unsophisticated fun.

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UMS II: NATIONS AT WAR

Have you ever wanted to fight a battle in a war game that hasn't been developed yet? Have you ever wondered what would have happened had Napoleon faced Alexander the Great in battle in the twenty-first century with nuclear weapons, missiles, and air power? This capability is what Ezra Sidran and the staff of Intergalactic Development have programmed into their new Microplay release, *UMS II: Nations at War*.

UMS II is a computer war game simulation which purports to have real artificial intelligence and a depth of simulation not yet realized in any other war game. This may or may not be true, but *UMS II* certainly does have complex algorithms that define thousands of variables including leadership, morale, supply level, experience, efficiency, and unit strength. The game player can set and reset these values to study the effects of a variety of combat circumstances. Terrain, weather, elevation, and military formations must also be taken into account. For the realist, these are welcome details.

UMS II has the further advantage of being a game system that promises the imminent release of a planet editor that will allow you to create your own planetwide battles. While the editor doesn't come with the game, it's easily the most appealing aspect of *UMS II*. Expect the editor to be available within the next two months, though there is some confusion as to whether the planet editor will be a free upgrade to the original program. Unlike its predecessor, *UMS, UMS II* transcends the limitations of a mundane, geographically limited battlefield and engages you in planetwide conflicts instead.

Obviously, *UMS II* targets the true war gamer who has hours of time to pore over manuals and to enjoy and master the intricacies of gameplay, not the average gamer. Even when you use one of the three enclosed scenarios, the game isn't an undertaking for a few afternoon hours. Schedule a whole day or night to complete a single game.

Functioning better with a mouse than a keyboard, the interface is adequate, but not obvious or easy to learn. Ex-

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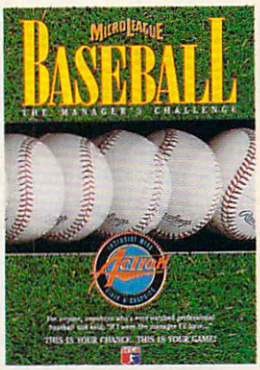

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GAMES

pect to make many mistakes, and don't expect the manual to answer all your questions: The documentation is not quite sufficient. To make up for this problem, the designers provide a free newsletter, complete with tips and warnings against pitfalls.

Offering no sound effects and possessing limited color graphics , *UMS II* has sacrificed glitz to afford players greater control of the simulation. When designing the artificial intelligence of generals, for example, you decide whether they're passive or aggressive, or desire the destruction of opposing forces over the conquest of territory. But if you're looking for a stereo shoot-'em-up, this is not your game. Only the highly cerebral need look into this military simulator. The current version of *UMS II* is version 1.2.4. You need to send your original game disks and registration card to Intergalactic Development to get the upgrade. This new version improves on the earlier version and addresses many user complaints. The newer version runs faster and is far more capable of unattended play than the prior game. Lengthy battles need trouble you no longer; array your forces and let the game resolve the combat while you clean the garage or make a sandwich. Upon your return, view the results and issue another set of commands.

UMS II: Nations at War is by far the most monumental and ambitious undertaking in military war game history. Be aware of the drawbacks of the system, however, and remember that this game is not for everyone. I would recommend *UMS II* for anyone who intends to purchase the planet editor (assuming the upgrade isn't free) and who is an avid war gamer—or perhaps for anyone who enjoys alternate history or wants to set his or her own conditions for worldwide conflict without actual bloodshed.

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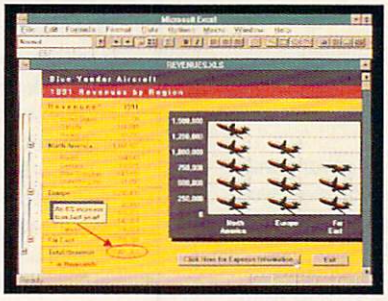
PRODUCTIVITY

C H O I C E

MICROSOFT EXCEL

If there's one immutable law in personal computing, it's this: For any hardware platform or operating system to succeed, it must be the delivery system for a killer spreadsheet. This may sound strange, but if you look at history, you'll see that it's true.



The new *Excel*'s toolbar makes the program faster and easier to use.

When *VisiCalc* hit the scene in 1979, it turned the Apple II from a toy into a powerful business tool. Apple II sales skyrocketed, and the machine became *the* personal computer for computing's first generation. *Lotus 1-2-3* was the next standard. It was a great improvement on *VisiCalc* and the epitome of user-friendly software in 1983. *Lotus 1-2-3* made businessmen and -women really want to buy MS-DOS–based, 8088-powered PCs. And they did . . . by the *millions.*

Since *1-2-3*'s success, there have been many spreadsheet contenders, but none have really captured the computing public's imagination and driven users to a new hardware or operating-system platform.

Lotus tried recapturing the magic and setting a new standard with *1-2-3* 3.0, but without much success—most users who upgraded went with the lower-end 2.2 version of *1-2-3.* And Microsoft has tried before with *Excel* 1.0 and 2.0, but previous versions of *Excel* simply didn't have the wiles to lure people away from the comfort of DOS, *1-2-3,* and their 8088s.

Now we have *Excel* 3.0. Is it just another also-ran, or is it the spreadsheet to set a new standard and fuel the blastoff of *Windows* 3.0 and the 386 hardware it demands?

Keep reading. In the next five minutes, you'll find out.

First, don't let anything you've heard about previous versions of *Excel* influence you. Version 3.0 has been completely redesigned from the ground up. Not only does *Excel* 3.0 have amazing new features and power, but Microsoft has made dramatic strides in making the program easier to use.

Right off the bat, you'll notice that the new *Excel* looks different. When you run it for the first time, you'll see one of its most impressive new features, the toolbar. The toolbar is a horizontal bar that rests under the menus and contains groups of push buttons. These push buttons are shortcuts for commonly used commands, the mouse equivalent of accelerator keys, and they make using *Excel* both easier and faster.

The toolbar isn't a new idea. It's borrowed from *Microsoft Word for Windows,* which places often-used word-processing commands on a bar called the ribbon. But the toolbar concept seems even more of a natural for a spreadsheet than a word processor.

You can easily get a feel for what's new with *Excel* by looking at what's on the toolbar. Going from left to right, you'll see buttons for selecting styles, promoting and demoting outline elements, toggling outline display on and off, selecting visible cells, autosumming (which automatically sums rows or columns), bold and italic, alignment (left, center, and right), selecting graphics objects, drawing (including buttons for drawing lines, rectangles, ellipses, and curves), autocharting, creating text boxes, creating your own user-defined buttons, and recording macros.

One of these buttons, autosum, is especially useful. Microsoft did some impressive research to determine just what users wanted and needed in a spreadsheet. One of the things the research showed was that summing rows and columns was the most repeated task for almost all spreadsheet users.

To make summing as easy as possible, Microsoft created autosum. ▷

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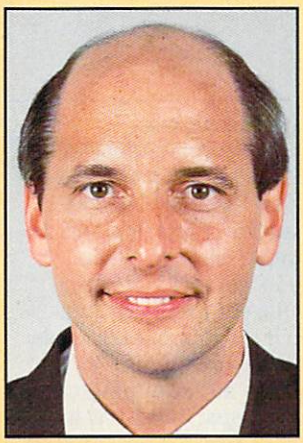

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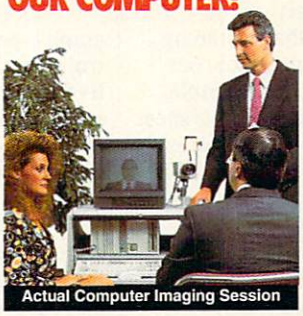

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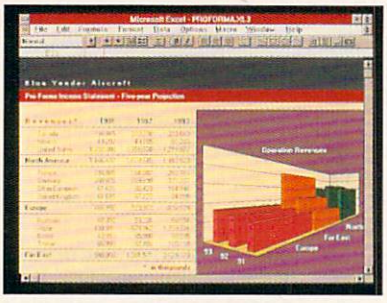
To use it, you place the cursor at the end of any row or column at the point where you want your total to go. Next, click on the autosum button. The program places the SUM formula in the current cell and selects a range based on the configuration of your data. If autosum finds cells filled in to the right or left of your sum cell, it chooses that part of the row. If it finds cells above the formula (the more common situation), it selects the column above. I've found that autosum almost always chooses the right range for the sum, but when it doesn't, it's easy to compress or extend the selection or to move it somewhere else on the work sheet.



You can control both the color and perspective of *Excel*'s 3-D charts.

Autosum may be *Excel*'s most frequently used new feature, but it's just one example of the care that went into the design of 3.0. Another thoughtful extra is *Excel*'s new automatic best fit for column width. To use this, place the pointer between any two cells and double-click. The program adjusts the width of the column on the left and makes a best fit for the data therein. Resizing your spreadsheet's columns for optimum width is now easy—and it's almost fun.

When you need to take a quick look at a note attached to a cell, you don't want to have to navigate through menus. With 3.0, all you have to do is double-click on any cell that contains a note (cells with notes are identified by a small red dot in the upper right corner of the cell) to display the note's text.

When it's time to print your spreadsheet, you'll be pleased to find that this new version of *Excel* knows all about fonts. Version 2.0 was limited to four fonts per work sheet, but 3.0 gives you unlimited access to your system's entire font arsenal. It's also worth noting that *Excel* works flawlessly with both Bitstream's *Facelift* and *Adobe Type Manager* font packages.

To top off new output enhancements, 3.0 now offers style control. You can access styles with the style combo box on the toolbar, just like the style box on the *Word for Windows* ribbon. To define a style, select an area of your work sheet and format it with the font you want (you can specify bold, italic, underline, or strikeout) and its point size. Click on the style box and type in the name for your new style. Now the style appears on your style combo box menu. Fonts and style control are a double-edged sword, however. If you want to keep your spreadsheets from looking like ransom notes, stick to Helvetica for numbers and perhaps one serifed font—like Times or Bookman—for headlines.

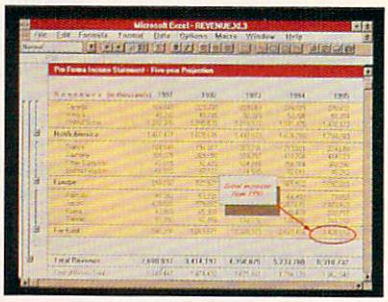
All the features mentioned so far make *Excel* faster and easier to use, but this version also has several new tricks to make power users' mouths water. At the top of the list is outlining. With it, you can structure your spreadsheet in an interrelated hierarchy, and even more important, you can display selected parts of the spreadsheet based on that hierarchy.

Here's a quick look at how outlining works. Let's say, for example, that you're working on a balance sheet containing several subtotals, and each is the sum of 50 to 100 numbers. The work sheet to contain all these numbers could easily be 400–500 rows long. With a length like that, it would be nearly impossible to see the important data. The trees would block the forest.

With outlining, the solution is simple. First, select the range of the rows that comprise each subtotal and demote them with the right-pointing arrow on the toolbar. You'll see a small button with a minus sign on it and a line indicating the range of the button. Click on the button (which will change to a +), and the range will be hidden. If you click on the + button again, your range will appear. If you change your mind and want to promote the cells you demoted earlier, just select the range again and click on the left-pointing arrow on the toolbar. The small outline button with the minus sign in it will disappear.

If you have several outline levels in your spreadsheet, you'll appreciate the program's outline display button, also on the toolbar. Press this, and the outline buttons disappear. When you're ready to work with outlining again, press the outline display button, and you'll see your outline levels and their associated buttons.

The toolbar, autosumming, and outlining are all great, but *Excel* has a little something extra for the kid in all of us—dazzling, eye-popping graphics. You'll find all the standard (and often boring) graphs supplied, but you'll also find gorgeous 3-D area, column, line, and pie charts. With all



With *Excel*'s new drawing tools, you can fine-tune your spreadsheets.

graph types, you have complete control over the chart's rotation, perspective, and color. You can also incorporate graphs right in your spreadsheet. It's easy, and as you might expect, you do it with the toolbar.

To create a graph, select a range of cells, click on the graph button on the toolbar, and draw a box on your work sheet (by clicking and dragging the mouse) just where you want the graph to go.

If you have the soul of an artist, you can even use *Excel*'s on-board drawing tools to jazz up your chart and make your point in style.

Last, there's *Excel*'s database. This is the only module in the program not completely redesigned and upgraded for release 3.0, and it does show its age a little. Microsoft, however, has solved the database problem by bundling Pioneer software's *Q+E* database with *Excel*.

Q+E has been billed as a database editor, but it's much more than that. With it, you can import files (*Ex-*

cel, dBase, and text), edit them, and perform SQL queries. You can also create databases in *Q+E*. The whole affair is wrapped in a MDI (Multiple Document Interface), like *Excel*'s own, that features multiple overlapping windows. *Q+E* is an impressive and useful database program in its own right. Match it up with *Excel* and DDE, *Windows'* Dynamic Data Exchange, and it's a real winner.

So, is *Excel* the one? The new spreadsheet standard that's going to propel us into the next generation of hardware and operating systems? It is indeed. It's the spreadsheet we've been waiting for.

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CORELDRAW!

Ordinarily, I would be wary of recommending a graphics package that costs as much as *CorelDRAW!*. If it costs that much, it had better do it *all*. After working with *CorelDRAW!* intensively for about a year and with *CorelDRAW!* 2.0 virtually full-time since January in connection with a book project, I can tell you without hesitation or fear of contradiction that *CorelDRAW!* will do the job for you as far as graphics are concerned, almost without regard to the kind of job you need done. If you've outgrown *Corel*'s list of options, you have simply outgrown the PC, and you should be shopping for a workstation.

I would've had a more difficult time making that recommendation prior to the emergence of the 2.0 version (which may be updated to a higher number by the time you see this, to account for minor bug fixes that are underway as of this writing). Although the earlier version was a noble effort and certainly a heavy hitter among graphics packages, there was nothing that sufficiently distinguished it from the pack of other CAD programs to make a specific recommendation. Each of the major players had a special trick or two, and there was as much compelling evidence that you should purchase one as another. *Corel*'s programmers eliminated all the waffle room with version 2.0, beating the competition at its own game and leaving it in the dust. The cleaned-up version that will shortly emerge from the current upgrade process will be bulletproof.

I will attempt the daunting task of listing the reasons why you should invest $695 in a graphics program—and why you will count that investment as money well spent.

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itive little pluses like a Repeat command in the File menu that allows you to reiterate an action, no matter how complex, with a single menu selection. It allows you to add perspective to your drawing automatically, to "extrude" a two-dimensional object into the third dimension, and to distort at will the envelope containing a drawn object as if it were printed on a sheet of rubber or Silly Putty. *CorelDRAW!* has a complete blend option for the first time with version 2.0. It features a broad range of import and export features that will make it a ready partner for all your other graphics software. The *CorelDRAW!* fonts are famous for their variety and attractiveness, but they offer much more: These fine fonts can be exported in various forms for use with your other applications, provided that you have a font manager to work with *Windows.*

The Mosaic feature turns your *CorelDRAW!* on-disk graphics portfolio into an onscreen gallery of drawings that you can peruse at will, looking for the specific piece of art that you need at the moment. But even if you opt not to use Mosaic for whatever reason, the Open dialog box displays a thumbnail sketch of whatever file is selected in the list box, providing a similar, if less dramatic, service in the basic software.

New in *CorelDRAW!* 2.0 are the vector and raster fill options. These options provide you with the ability, for example, to grab a section of a drawing on the screen and use it as a continuously tiling fill inside of another object. You can also import any bitmap (TIFF or PCX) drawing as a fill pattern. Once the fill has been imported, you can color it as you please, size it, edit it with *Corel's* pattern editor, and save it for future use in the gallery of raster fills or, if it's a vector fill, as a special kind of *CorelDRAW!* fill file.

One of the drawbacks of the earlier versions of the product was that you couldn't offset a fountain fill. A fountain fill was always squarely centered in the selection rectangle of an object, and the only way you could alter the way it filled was to combine the filled object with some irrelevant bit of data off in the direction of the desired offset. This minor irritant was removed in the 2.0 version with the addition of an offset option.

In many ways, *CorelDRAW!* was always just as good as its principal rivals, *Micrografx Designer* and *Arts & Letters Graphic Editor,* but it lacked the friendly fountains of *Designer* and the powerful blending options of *Graphic Editor.*

There are still areas that could use improvement. The powerful *Corel TRACE,* an associated program provided with *CorelDRAW!,* is functional enough when it comes to turning raster graphics into line art, but its options aren't particularly intuitive, and it seems slow, particularly when compared with the spritely performance of *Designer. Corel* also has an autotrace feature within the program. Someday it would be nice to have this autotrace made powerful enough to stand up next to *Designer's* so you wouldn't have to leave the program to perform your traces. Likewise, the font-export option is the envy of the industry, but for a novice at moving fonts around, it's not well documented (and the information in the *Windows* 3.0 manual is as good as nonexistent). The ability to alter fonts and use them as your own is another good reason to purchase *CorelDRAW!,* but you'll have to become a *Windows* expert before you'll discover how to use these fonts with other *Windows* programs.

Both intuitive and powerful, *CorelDRAW!* is the premier paint program for *Windows.*

But even with these minor problems, *CorelDRAW!* has more to recommend it than any other *Windows* graphics program.

ROBERT BIXBY

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WILLMAKER

Nobody enjoys making a will and keeping it current, but everybody knows that the chore must be done for the sake of loved ones. One way to do it is to visit a lawyer. That places some demands on your time and checkbook. A more convenient and inexpensive method is provided in *WillMaker* 4.0.

WillMaker 4.0 comes from Nolo Press, a company well known for its authoritative books on legal matters for lay people. The manual states that in the past 50 years the legal profession has scored a public relations coup by convincing many people that writing a will without a lawyer is like doing your own brain surgery. This, the authors insist, is nonsense. Their program produces a will which you can understand, in clear language without jargon such as "I hereby give, bequeath, and devise." And it's a will that will stand up in court.

After a simple installation process, *WillMaker* takes you through a series of questions regarding the allocation of your estate. When you type an answer, a window shows you how your answer will appear in your will and seeks your approval.

Let's say you are married and wish to leave everything to your spouse and your children. A will meeting these conditions can be completed in a very few minutes. The program asks for your name, your social security number, your state and county of residence, and the names of your children. The program prompts you for the name of a contingency custodian for any beneficiaries who are minors, and suggestions for alternate forms of custodianship are given.

If your will is more complicated and you have specific bequests, the program makes provision for those. It also cautions you about what you cannot do in a will with provisional bequests. For example, you cannot leave something to Uncle Bill provided that he quits smoking. Such a bequest would probably be set aside by a probate court.

When you have finished the sequence of screens, you may review the finished document, make alterations to your answers if you wish, and print the will, which makes provision for

the signatures of three witnesses, plus their initials, on each page. The printout also produces a "self-proving" affidavit. Nolo urges you to complete this document, which must have the notarized signatures of yourself and your witnesses. In most states, its existence will make it unnecessary for your witnesses to appear in probate court.

Documents produced by *WillMaker* are state specific, taking into account variations in state laws. The manual asserts that the documents are valid in all states except Louisiana, where laws are based upon the French legal system. The manual contains far more information than just instructions for the use of the program. It points out the limitations of a will, provides information about the probate process, and discusses action you may wish to take, outside your will, to avoid probate. It also discusses situations which a simple will cannot cover and suggests steps you may wish to take to avoid estate taxes if your estate is substantial. It even suggests that there are circumstances under which you may wish to consult a lawyer.

WillMaker 4.0 is an excellent program and deserves your consideration for use in matters of estate. Ask yourself these questions: Is your will up to date? Are you sure? *WillMaker* 4.0 offers some peace of mind.

CHARLES IDOL

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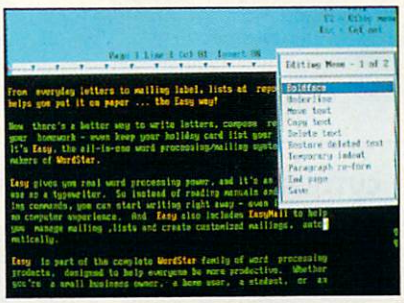
WORDSTAR LAPTOP COLLECTION

Laptop software can unfortunately be a bit like microwave meals—convenient, but less substantial and satisfying than conventional fare. If you've longed to beef up your laptop menu, now's the time. That longtime favorite of touch-typists, *WordStar,* is now available in a laptop version you can really sink your teeth into—*WordStar Laptop Collection.*

The collection gives you basically a modified version 6.0 along with *LapLink Special Edition,* which facilitates transfers between your laptop and desktop (the cable costs extra), and *OnTime,* a flexible calendar pro-



Take touch-typing power on the road with *WordStar Laptop Collection.*

gram. Although you don't have every single feature offered in the desktop version, there's still plenty to work with: a spelling dictionary, a thesaurus, a definitions dictionary, multiple help levels, pull-down or classic menus, an extra-window capability, dot commands, word counts, headers, footers, an advanced page preview, abundant printer support, and much more. (For a fuller discussion of basic program features in version 6.0, see the December 1990 *COMPUTE* review.)

In using the program, I haven't felt that I lacked any features necessary for normal laptop use. *WordStar* seems every bit as full-featured on the laptop as it does on my desktop computer. In addition to the program proper, you get *WordStar's MailList* program for generating form letters, printing labels or envelopes, and creating mailing lists. You also get a quite capable communications program, *TelMerge,* which lets you access online services, send or receive electronic mail, and communicate with other computers. Conveniently, each of these programs is accessible from within *WordStar.*

Like the desktop version, *WordStar Laptop Collection* offers free membership in CompuServe with $15 usage credit, free Bitstream typefaces, and free Agfa typefaces.

What's missing from the original 6.0 version? You don't get integrated text and graphics, *PC-Outline, Profinder* (a shell program), and *StarExchange* (which converts file formats between this and several other word processors). Once you become a registered user of the laptop edition, however, you qualify to buy the desktop version for a mere $99. And as the company points out, that's like getting both products for less than the retail price of the desktop version—quite a bargain.

While you'll enjoy many of the desktop version's features in the laptop edition, the company has clearly adapted the program with the laptop user in mind. The README file, the installation and customization program, and the manuals all reflect that a laptop is being used. And yes, you can run the program on a floppy system. WordStar supplies a quick-start disk with a condensed version of the program, and you also get tips on installing the program on a high-capacity disk.

If you've been waiting for a full-featured word processor for your laptop, this is a great one. And if you've enjoyed *WordStar* on a desktop computer, this new laptop edition might be just the excuse you need to buy a laptop.

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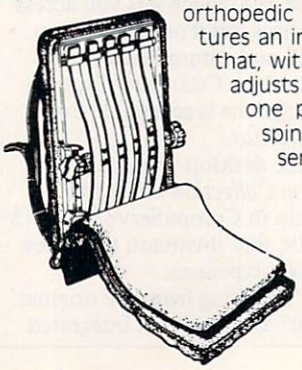

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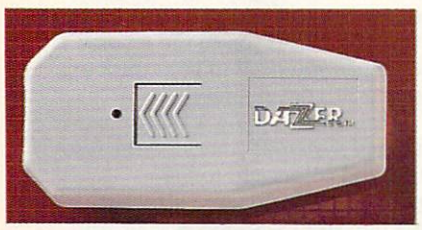

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LEARNING

C H O I C E

SIMEARTH

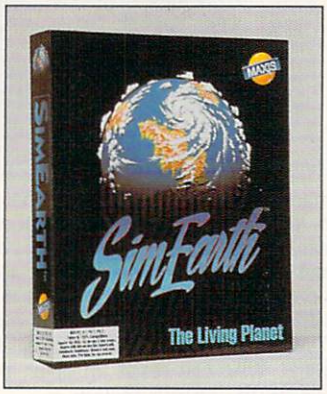
Every player a god, every pixel a species.

That neatly sums up *SimEarth,* the expansive exploration of planetary management from Maxis. Like its ancestor *SimCity,* this simulation puts you in charge of life, lets you say who gets liberty, and even demands that you oversee the pursuit of happiness. But instead of lording it over a measly city, *SimEarth* sets you up as master of an entire planet.

SimEarth is nothing if not ambitious. It may be a toy compared to planetary models developed for climate and weather research, but it's a toy that's hard to put down. Loosely based on the Gaia hypothesis—that our world is a living system that adapts to changing conditions—*SimEarth* includes everything from climate control and continental drift to evolution, mutation, and the quest for fire. All of these are integrated into an entertaining and educational look at the dynamics between a planet and its inhabitants.

You can sit back and watch a world develop on its own, but the real fun is in getting your hands dirty and messing around. You'll make a dozen decisions every minute, many under pressure, so ease of use is critical. *SimEarth* sports a graphical interface clearly taken from its Macintosh version (Maxis develops first on the Mac), so you'll need a mouse to enjoy the game. Though the interface proves more than adequate, PC users would've been more comfortable with a true *Windows* approach.

SimEarth offers up seven ready-to-evolve planets, from Earth of the Cambrian Era to Aquarium, an all-water world. You can terraform Mars and Venus, build continents on Aquarium, or even test the Gaia hypothesis on Daisyworld. Play with Earth of 1990 and see if you can motivate humanity to head into space. Or try to make dinosaurs the intelligent



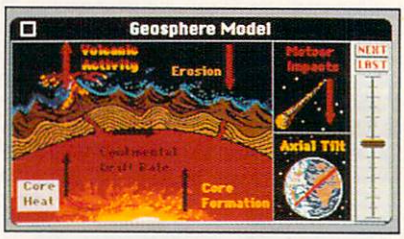
Create and maintain a world.

life form by manipulating Earth of 550 million years ago (they're not that smart; they still have wars).

The real challenge comes in letting *SimEarth* create random worlds. You can start at any of four points in time, but the best place is at the beginning, when the world's a slag heap. Customize continents with earthquakes, tidal waves, meteors, and more. As oceans form, you populate them with single-celled species and propagate life. At your whim you can extinguish some creatures while promoting the evolution of others.

As millions of years slip by, you'll evolve multicell organisms—it's not hard—and move to the next step, creating intelligent life. That's not always easy, for some planets seem stubborn about letting advanced life flourish. Fortunately, you've got a well-stocked set of planetary tools. Windows open to show you simplified models of the geosphere, atmosphere, and biosphere. A click of the mouse button slows down the greenhouse effect to cool off a hot world, speeds up mutations to push evolution, or puts a stop to continental drift to hold land in place. Changing a variable costs energy, the currency of *SimEarth,* but if you're playing in experimental mode, money's no object. In any other mode, energy is limited, and your options restricted to what you can afford. It's a nice brake on out-of-control terragenesis.

Later, if your world matures, you'll get a shot at guiding the dominant species toward civilization and then through its technological stages. You set priorities for your wards in an attempt to stop plagues and wars (or promote them if you're in a bad mood). And you can try to nudge them to use more efficient energy sources, though the consequences—emissions from fossil fuels and possible radiation poisoning from atomics—are as well known to your random world as they are to our own.



You can modify and monitor planetary formation in the geosphere window.

Manipulating all this sounds daunting. It's not. Icons and buttons change the satellite-from-space view to give information about cataclysmic events, air and water temperatures, animal and plant distribution, and wind and water currents. Other icons open selections to place life forms or perform acts of God. Menus at the top of the screen lead you to the reports and graphs you need to keep track of your world's development.

Play *SimEarth* on a VGA-equipped system if you can—the resolution and colors add to the experience. The program also supports the Ad Lib, Sound Blaster, and Sound Master boards, so you can listen to quality sound effects and music when meteors splash and new life evolves. You may have problems with mouse cursor ghosts in high-resolution modes, but the solution is simple for most, and Maxis' technical support is helpful. *SimEarth* is slightly unstable; the simulation crashed twice in as many days with no warning and for little reason. Memory requirements are high but not unreasonable

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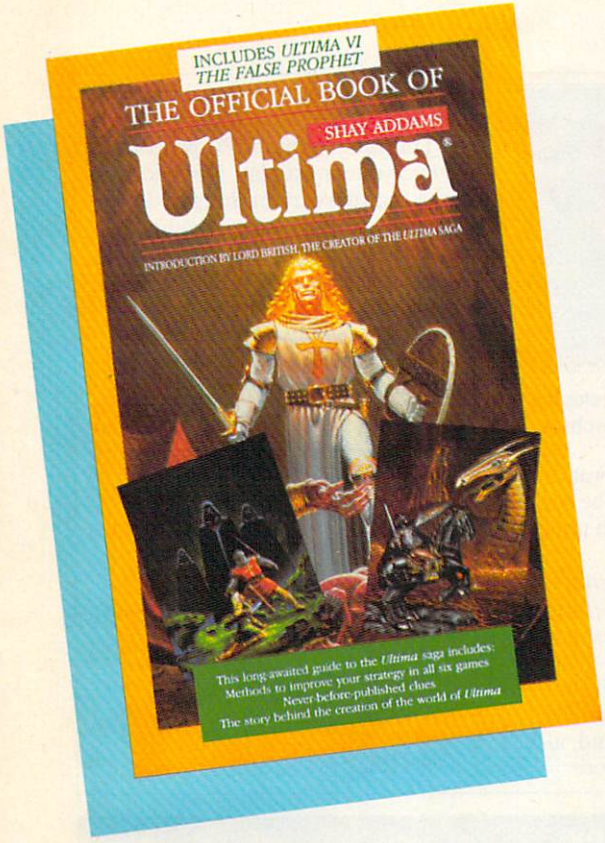

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LEARNING

for most systems, assuming you don't run TSRs or crowd RAM with device drivers. Even on a 20-MHz 386SX system, though, *SimEarth* seemed sluggish.

More than just a good time, *SimEarth* is an excellent example of transparent learning. You walk away from this simulation with a better understanding of global interconnections. Watch firsthand how planetary heat buildup snuffs out species, how high mutation rates make evolution leap like a Mexican jumping bean, and how technologies always have trade-offs.

True, *SimEarth* makes assumptions not everyone agrees with. All *SimEarth* life is carbon based, worlds easily form oceans, and the game developers apparently take the Gaia hypothesis as gospel. No one said the world—even a made-up one—was perfect. On the other hand, you can play with ideological incorrectness if you want. Smash civilizations by

Add new life forms to your developing planet and subtly alter the biosphere.

eliminating moral barriers to war or obliterate entire species with the click of a button. It's all fun because none of it's real.

SimEarth may be less inviting than the boffo bestseller *SimCity,* if only because it's more complex, and the intricacies of the 'ologies—geology, meteorology, biology, and technology—are scary compared to simple city planning. On the other hand, although *SimEarth* demands more from you, it gives back much more in return.

This is a landmark PC program that everyone must play. Not because it's the morally correct thing to do, but because it fires your imagination like few other pieces of software. If absolute power corrupts absolutely, I plead guilty to addictive corruption. I've nurtured worlds, and I've killed worlds. Go ahead—indict me. Just keep your hands off my planet.

GREGG KEIZER

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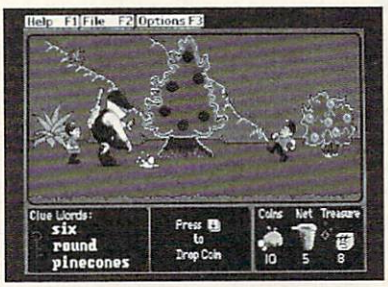
SUPER SOLVERS TREASURE MOUNTAIN!

How do you engage children's attention long enough to teach basic skills? What can you do to encourage kids to practice skills they've learned? Try inviting them on an electronic excursion to *Treasure Mountain!* This "fantasy-exploration" software combines action-packed, arcadelike entertainment with puzzle-solving challenges to keep players creatively absorbed for hours. The Learning Company's *Treasure Mountain!* pits infamous Morty Maxwell against fast-thinking Super Solver detectives. Immoral Morty has maliciously made off with the mountain's magic crown. Sagacious Super Solvers must stop the merciless Maxwell from using the crown to steal the mountain's magic gold. Will Super Solvers successfully rescue the crown and beat misguided Morty at his own game?



***Super Solvers Treasure Mountain!* scores major points for educational fun.**

Enterprising detectives embark on a journey up the mountain in search of hidden treasures. To prevent the unrelenting Maxwell from carrying out his dishonorable deeds, players must successfully retrieve enough booty to fill the treasure chest at the mountaintop. The task is not an easy one. There are several obstacles to overcome along the way.

Success depends on capturing the mountain's elusive elves. Youngsters must hunt for elves who carry scrolls. When nabbed in Super Solver nets, the sprightly (but sometimes pesky) beings offer clues to treasure whereabouts. Players who correctly answer an elf's question win a clue. Answers may require solving a math problem, completing a word puzzle, recognizing word patterns, or applying a scientific principle.

Super Solvers have three chances to answer an elf's question. They win two gold coins and a clue word for answering correctly on the first try, one gold coin and a clue word for a correct answer on the second try, but just a clue word (no gold coin) for questions answered correctly the third time around. As Super Solvers move up in the clubhouse ranks, scroll-bearing elves become harder to catch, there are more hidden treasures on each mountain level, and players must successfully avoid mischievous elves who throw coin-eating magic dust.

Treasures are hidden in places that match two of the three word clues. For example, if clue words are *five, flowers,* and *round,* enterprising detectives must be on the lookout for items like five flowers, round flowers, or five round objects (possibly rocks or bushes). When youngsters come upon a mountain location that matches two of the clue words, they drop a coin. If there's a treasure hidden in that spot, it is automatically theirs. When Super Solvers find the spot that matches all three clue words, they obtain a key that unlocks the path leading up to the next mountain level.

Players' nets deteriorate with every elf captured. Eventually, nets are so damaged that elves can easily escape. When this happens, Super Solvers must locate a "net cave" and use the gold to pay for repairs. Luckily, players who do not have enough coins eventually find more coins along the mountain path.

Unlike conventional arcade diversions, *Treasure Mountain!* offers more than just mindless entertainment. The game encourages children to use analytical reasoning to solve puzzles, inductive thinking to infer connections, deductive logic to test hypotheses—all without imposing time limitations. Colorful animated graphics, realistic sound effects, and positive audiovisual reinforcement make the mountain a wonderful place to visit.

Treasure Mountain! rewards curiosity, motivates exploration, and reinforces basic elementary school subject areas. In the final analysis, however, the software succeeds because children find that it's a lot of fun to play! And for parents, *Treasure Mountain!* means that children spend playtime productively.

CAROL HOLZBERG

IBM PC and compatibles, 512K RAM (640K RAM for the Tandy 1000 series), CGA, EGA, MCGA, VGA, or Tandy 16-color; 8 MHz or faster recommended, includes 3½- and 5¼-inch disks, supports Ad Lib and Sound Blaster sound boards, mouse optional, hard drive installable—$49.95

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LEARNING

PLAYING WITH MICKEY MOUSE MEANS LEARNING

You sit at your home computer, your favorite driving simulation loaded and running. As you concentrate on avoiding a fiery crash, suddenly a small voice about hip level pipes up, "Mom, can I play, too?"

Your three-year-old can't race cars with you but wants to play computer games. What should you buy that can involve both of you? An excellent first purchase would be one of the following Mickey Mouse packages from Disney.

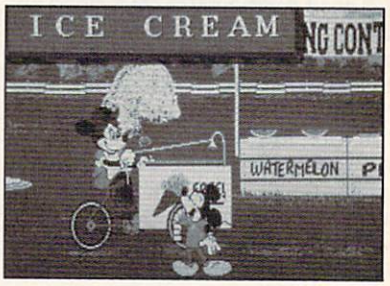
Mickey's Colors and Shapes is subtitled *The Dazzling Magic Show.* In this particular package, America's favorite mouse comes on stage and performs various magic acts, such as juggling and pulling an animal out of his hat. A friendly lady's voice leads your child through the game, and you can watch and help him or her make choices.

Mickey's 123's is called *The Big Surprise Party.* Your child plans a party for one of the Disney characters; buys toys, food, and decorations; and sends invitations. At the end, he or she serves the food.

Mickey's ABC's offers you *A Day at the Fair.* You begin by waking Mickey up at home and then go with him on a interesting trip to a country fair. Again, the friendly voice helps your child along.

Children will find the controls for all these games to be user-friendly. There are no wrong moves. The animation is top-quality and quite imaginative. Your child will be entertained and may never notice he or she is also learning numbers, letters, and shapes!

How do the three packages compare to one another? I played all three games with my three-year-old son, and he liked each one. But *ABC's* is my favorite by far. My son is well acquainted with the alphabet and spelling, and we both were challenged by the game. Besides offering a chance to become familiar with letter shapes and sounds, this game also teaches many useful cognitive skills necessary for computer use—primarily learning to make the connection between what you see on the screen and what you need to do with the keyboard. Your child will learn how to control Mickey's actions and how to anticipate events that are offscreen. He or she will learn to go through several steps to arrive at certain places or to see certain actions.



Your child and Mickey spend a day at the fair together in *Mickey's ABC's.*

My least favorite Mickey Mouse adventure is *123's.* It is only slightly more interactive than television. Each number that is pressed causes a lengthy animation sequence. My son enjoyed looking at it, but he was not very involved in what was happening. A lot of number information was handed to him, without much opportunity for active thought until the party at the end of the game.

Colors and Shapes is my son's favorite game. It calls for the most creativity, particularly during the segment in which he creates his own picture by selecting colors and shapes. The animation is less dramatic than that in *ABC's,* but that didn't affect his level of interest. This game comes with a soft rubber template printed with color blocks and shapes that fits over the keyboard. I think this makes it an especially suitable first computer game for the youngest of children.

Which of these packages should you purchase if you can afford only one? *Colors and Shapes* is best for the child who has the least computer experience and is still unfamiliar with letters and numbers. If your child likes Candyland, he will love *Colors and Shapes. ABC's* is the most complex, interactive game. It is best for the more computer-literate, verbal child who is able to discern patterns and make complex connections. Somewhere in between, *123's* is the

one to pick if your child is one of those who has a love of numbers.

BETH ANN MURRAY

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BOOKS

COMPLETE LAPTOP COMPUTER GUIDE

Some recent analytical surveys suggest that the laptop PC, the category of personal computers with the fastest-growing sales, will in a few years account for more than half of the computers sold in the United States. More and more people are looking to portables, laptops, and notebooks as their secondary, or even primary, machine. Students, writers, accountants, sales reps—anyone who needs portability and functionality needs a laptop. That person also needs a solid grounding in what the laptop computer can and can't do.

This book, by David H. Rothman, leads readers through the promise and peril of laptop use. The early pages are devoted to detailed descriptions of various laptop designs, with pros and cons clearly spelled out. Chapter 3 is devoted to software solutions for laptop users (who are always short of storage space, especially with less expensive models).

In light of Rothman's statement that laptops are superior to all other communication devices, it isn't surprising that several of the book's chapters are devoted to that idea. Here you'll find everything from a tour of online services to a primer on logging on, no matter how inhospitable or adversarial the terrain.

Throughout, the author maintains a good balance of fact and humor, which will help readers get more from these pages. Only a couple of biases mar an otherwise clear—if somewhat lighthearted—approach. Rothman hates mice and especially abhors graphical user interfaces (GUIs). Considering the movement toward such environments, Rothman could have served his readers better with solid information about using a laptop with a GUI, rather than dismissing them outright. These faults are outweighed, however, by the book's overall usefulness.

PETER SCISCO

Author: David H. Rothman
384 pages—$18.95

ST. MARTIN'S PRESS
175 Fifth Ave.
New York, NY 10010

CYBERPUNK—OUTLAWS AND HACKERS ON THE COMPUTER FRONTIER

It all started with the phone phreaks. These outlaws made monkeys out of the biggest monopoly on earth—the telephone company—and tweaked the noses of the electronic lawmen determined to track them down. And because nobody *really* loves AT & T, there may've been a certain amount of tacit support for their activities among the common folk, who were happy to see someone finally getting back at the big, impersonal bureaucracies of the world. William Gibson knew how to tap into that latent desire for revenge when he wrote *Neuromancer,* as did John Brunner when he wrote *Shock Wave Rider,* Bruce Sterling when he wrote *Islands in the Net*—just as George Orwell knew it when he created the tragic hero of *1984.*

It was an easy step for these miscreants to take from telephone hacking to computer hacking, and since

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BOOKS

this was primarily a province of juveniles and the juvenile at heart, it was inevitable that some frat-house pranks might occur. The problem is that dropping a cherry bomb down a toilet in the campus administration building frosts only a few well-deserving cookies. Dropping an electronic bomb on an international network of million-dollar computer installations represents a hazard to business, the military, and millions—perhaps billions—of lives.

The stories related by the husband and wife team of Katie Hafner and John Markoff are legend: Kevin Mitnick, the telephone hacker rumored to have ruined the credit rating of a judge who ruled against him; Karl Koch, the paranoid computer spy who identified himself as Hagbard Celine, after the hero of a conspiracy novel, and ended up horribly killing himself by self-immolation; and rtm, the brilliant Cornell student and son of a computer security expert whose innocent worm crashed computers from coast to coast and landed him in a legal quagmire.

Many of the people in this book take on other identities online—Pengo, named after a penguin in a videogame; Obelix, after a French cartoon character; Captain Crunch; the Phantom; the Cheshire Catalyst; and so on. But what makes the book so successful is that it enters these identities. And, as you can imagine, the human stories behind a man who would identify himself as a penguin or a woman who would call herself Susan Thunder are rife with attendant ironies.

By using stolen credit card numbers and network user identifications, the hackers were able to take advantage of system operators' gullibility, huge corporations' fear of bad publicity, and a kind of telephone con game called *human engineering* to break down seemingly impregnable security, and in the process they earned the admiration and respect of fellow hackers and impressionable young people throughout the world.

The authors take you inside the minds and value systems of hackers, showing how human curiosity, and longing to be on the inside and privy to secret power, can become highly destructive impulses. The writing takes on a tense journalistic style that reveals the incredible depth of the research performed. Without becoming bogged down in technical details, it explains in layman's terms how the nets operate and how they were breached. Each of the hackers' stories is told in an insightful biography. Many of the characters in *Cyberpunk* seem driven, like addicts, unable to control their appetites for power, more to be pitied than censured.

But there is no ambiguity about the carnage they have left behind. The authors look with a jaundiced eye upon the kind of society that results when fears of terrorism and vandalism overwhelm the desire to communicate and remain open to human interaction.

In all, *Cyberpunk* is a valid look at recent history, as important in its own way as any of the industry insiders' books about the corporate role in the computerization of America, and far more broad ranging and complete than Cliff Stoll's book *The Cuckoo's Egg* (to say nothing of the fact that *Cyberpunk* is far better written). Stoll appears now and then as a minor character in *Cyberpunk*. It was very enlightening to see this character (whom I felt I had come to know so well through his book) from the outside. *Cyberpunk* is a masterwork of reportage, and it belongs on your bookshelf.

ROBERT BIXBY

Authors: Katie Hafner and John Markoff
336 pages—$22.95

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BOOKS

ALEX RANDALL'S USED COMPUTER HANDBOOK

Known as a computer hardware junkie by most of my friends and associates, I spend a fair amount of time out looking for "good deals." I own two complete systems, but there always seems to be some card or peripheral needing an upgrade to a newer/faster/enhanced version. For those of you looking to buy a computer, whether for the first time or as an upgrade to a better system, reading Alex Randall's book will expedite the decision-making process.

This 240-page book covers the ins and outs of acquiring a used computer for both you and your business. Randall explains the tactics to employ whether you're the seller or the buyer of a system. Also covered well are where to advertise a computer and what to look out for, from both the seller's and buyer's perspectives. Even a computer novice will soon gain a better idea of what to look for and how much to pay.

The author relates a few amusing stories regarding people he's dealt with and reveals common misconceptions concerning both price and value of different products (hint: four- to five-year-old computers are generally not worth 90 percent of the original sales price, but you'd be surprised at how many people hold this misconception). The explanation of how systems depreciate is useful if you're looking to sell a computer (as I am) and may help steer unwary first-time buyers away from that "real good deal" that isn't. Quite useful and enjoyable, *Alex Randall's Used Computer Handbook* makes clear the state of the secondhand computer market. Don't shop without it.

MIKE HUBBARTT

Authors: Alexander Randall V and Steven J. Bennett
240 pages—$14.95

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THE COMPUTER BUYER'S HANDBOOK

If you're in the market for a personal computer or just want to learn more about computers in general, then you should take a look at this new guide. Author Wayne Parker's experiences as a writer and a computer programmer/user allow him to cover the A–Zs of selecting a computer to fit your needs.

The Computer Buyer's Handbook cuts through the rhetoric so pervasive in today's advertisements, explaining in layman's terms the technical jargon that surrounds peripherals such as monitors, modems, hard drives, printers, and mice; and the handbook offers recommendations regarding brands to try. Unix and OS/2 also receive coverage, and new computer owners will welcome the overview of software.

Although quite partial to 80386 IBM and IBM-compatible systems, the author does briefly cover other systems like the Macintosh, NeXT, and Amiga computers. *The Computer Buyer's Handbook* lacks an index, does not cover in any detail either interrupt or I/O address conflicts between add-on cards, and uses price information that was inaccurate as of April, 1991 (understandably, since the publication date is November, 1990, and six months can make a big difference for prices in the computer industry).

Loaded with valuable information, *The Computer Buyer's Handbook* proves both useful and an enjoyable read. Before wantonly purchasing your peripherals, consider picking up *The Computer Buyer's Handbook*. Its $16.95 price tag could save you money, time, and plenty of headaches.

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Author: R. Wayne Parker
238 pages—$16.95

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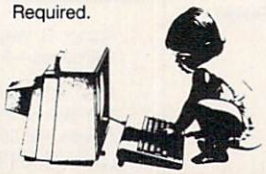

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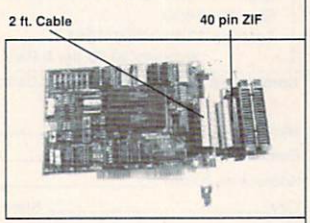

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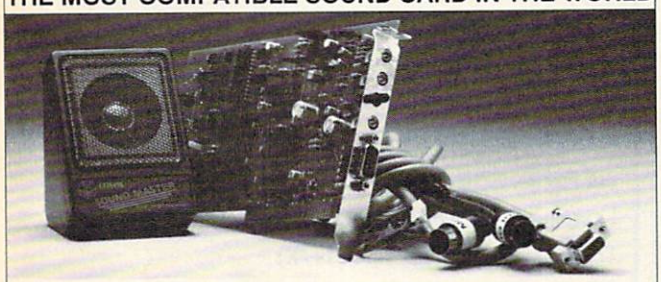

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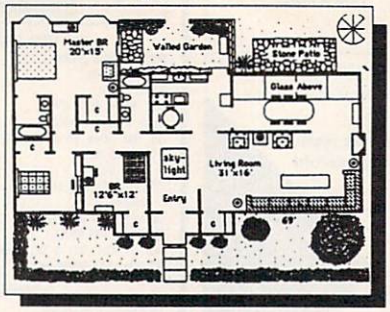

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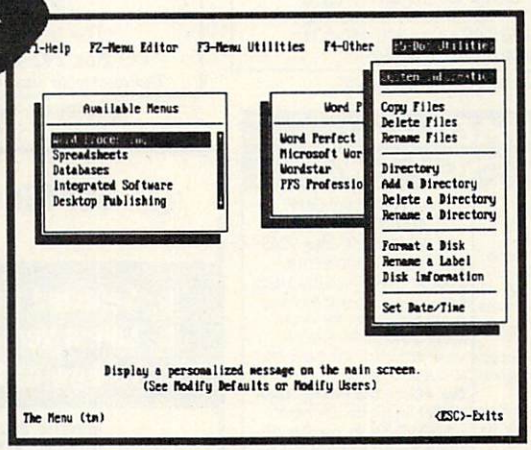

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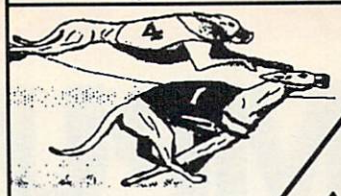

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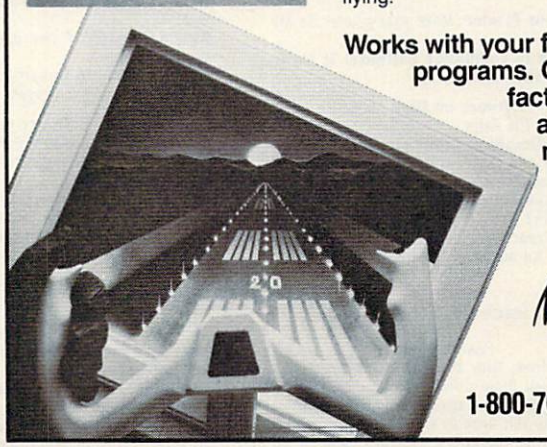

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BACK ISSUES

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March 1988, Issue 4, Vol. 2, No. 2

Feature

Flying Home: *Flight Simulator* adventure

Software on Disk

TheDraw: Design custom menu screens, presentations, or animated sequences
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FileFinder: Locate any file, in any directory
SuperTiler: More power for BASIC's PAINT (CGA)
Hover: Futuristic tennis game (CGA)
DOS Help: Help screens for DOS commands

May 1988, Issue 5, Vol. 2, No. 3

Feature

Advanced Spreadsheets: Special techniques for power tools

Software on Disk

Quick Scheduler: Organize yourself!
Source Code XREF: Debugging made easy
Text File Compare: Find out which file is which
WHOA!: Control your PC's speed (EGA not supported)
Las Vegas Solitaire: Solitaire with casino rules
States & Capitals: Learn U.S. geography and have some fun (CGA)
QikServe: Arcade fun in a fast-food setting (CGA)

July 1988, Issue 6, Vol. 2, No. 4

Features

How to Build Your Own PC Clone: Expert advice on a money-saving alternative
In Praise of PC Play: PC blasts into the game market
Talking to Your Printer: Make your printer do all its tricks
Buyer's Guide to Simulation Software: 38 exciting games put you in command

Software on Disk

JLSCAN: Super file lister
Presentation Graphics: Create professional-looking graphs and charts (CGA)
File-It: Save text screens to disk
Graphics Shape Editor: Design your own graphics for games (CGA)
Ancient Empires: The glory of battles past (CGA)
Power Poker: An old favorite with a new twist

March 1989, Issue 10, Vol. 3, No. 2

Features

Laser Power from Your Dot-Matrix Printer: Supercharge your 9-pin printer
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FixBeep: Control your PC's speaker
ColorSet: Choose your own screen palette (CGA)

May 1989, Issue 11, Vol. 3, No. 3

Features

Game Designers' Favorite PC Games: Five pros pick their favorites
How to Install a Hard Disk: It's as easy as 1-2-3
Future Games: Put your imagination into overdrive
Buyer's Guide to Sports Games: 62 super diversions

Software on Disk

Iskib: Save the planet from hostile aliens (CGA)
Dr. Sleeptite and the Nightmare Factory: Foil the villain and destroy his Dream Machine (CGA)
Block Out: Fast-paced strategy for the whole family (CGA or EGA)
Vmusic: Compose and play three-part music
Rich Levin's Checkup: Defend your system against virus attack
SearchIn: Find the text you want—fast!
Subdir: Soar through directories
Snooper: Uncover messages hidden in program files

July 1989, Issue 12, Vol. 3, No. 4

Features

PC Video Systems Made Easy: It's all in the cards
Desktop Publishing Revolution: Get started in style
King's Quest IV: A new dimension in PC entertainment
Buyer's Guide to Desktop Publishing Software: 50 hot publishing packages; 101 clip-art collections

Software on Disk

TurboTYPE: Kiss DOS's TYPE command good-bye
CGA: At last! CGA programs on your monochrome graphics card
Menu-Matic: One keypress runs any program
Nifty James' Famous Utilities: Zap backups, calculate online, and get a quote for the day
PrtLabel: Design and print custom labels

September 1989, Issue 13, Vol. 3, No. 5

Features

Best-Kept Secrets: Five word processors priced at under $100
Learning Is FUN!: 60 games that instruct and delight
CD-ROM: Dazzling new graphics and sound
Buyer's Guide to Self-Improvement Software: 70 ways to improve your skills and career

Software on Disk

Lumpies of Lotis IV: Aliens meet their match!
WPK: Word processing for kids
DOS Help: Never look up a command again
Touch Type Tutor: Be a keyboard superstar
QDups: Zap duplicate files in a flash

November 1989, Issue 14, Vol. 3, No. 6

Features

Hot Paint: How to get started with PC art
Get It Together with Integrated Software: 5 programs that do it all
Online Art: Best PC graphics
Buyer's Guide to Integrated Software: 30 integrated solutions; 16 desktop organizers

Software on Disk

MemTool: Organize your desktop
To_Quick: Subdirectories at your fingertips
DynaBoot: Reboot any configuration
BIO-CAL: Master biorhythms
Kingdom of Kroz: Run for your life!

March 1990, Issue 16, Vol. 4, No. 2

Features

High-End Word Processors: Four writers meet four top-rated tools
Power Breakthrough: How to Upgrade to a 386
FYI: Floppy Disks
Buyer's Guide to 386 Motherboards: High-powered replacements
Future Computing: Expert's guide to neural networks

Software on Disk

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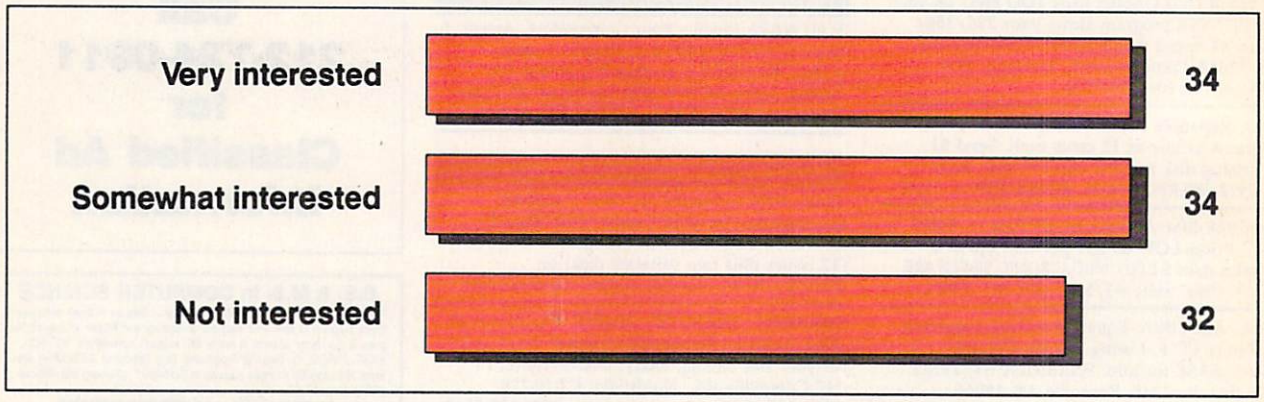

According to a recent report published by the American Library Association (ALA), two out of three Americans would like to use a home computer to connect with the public library. The report was based on a survey conducted for the ALA by Louis Harris and Associates and sponsored by Equifax. The report also said that 46 million Americans—25 percent of the population—have or have access to a home computer to make such a connection.

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This past March, the Software Publishers Association met in San Francisco and granted awards for what its members considered the best in software for the past year. The Association presented awards for business and consumer products. In addition, the SPA's Consumer Software and Critics' Choice sections presented several other prizes, including one for best industry analysis to Keith Ferrell, a former senior editor with *COMPUTE* and now editor of *Omni* magazine.

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B. Is this your first computer? ☐ Yes (7) ☐ No (8)

C. How long have you owned your computer? _____ (9) Years _____ (10) Months

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G. What is your total household income? ☐ >$30,000 (23) ☐ >$40,000 (24) ☐ >$50,000 (25) ☐ >$75,000 (26)

H. What is your age? _____ (27) Years

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J. Do you advise other people on computer purchases? ☐ Yes (32) ☐ No (33)

K. Comments: _____ (34)

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☐ Macintosh (4) ☐ Apple II (5) ☐ Commodore 64/128 (6)

B. Is this your first computer? ☐ Yes (7) ☐ No (8)

C. How long have you owned your computer? _____ (9) Years _____ (10) Months

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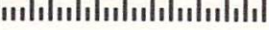

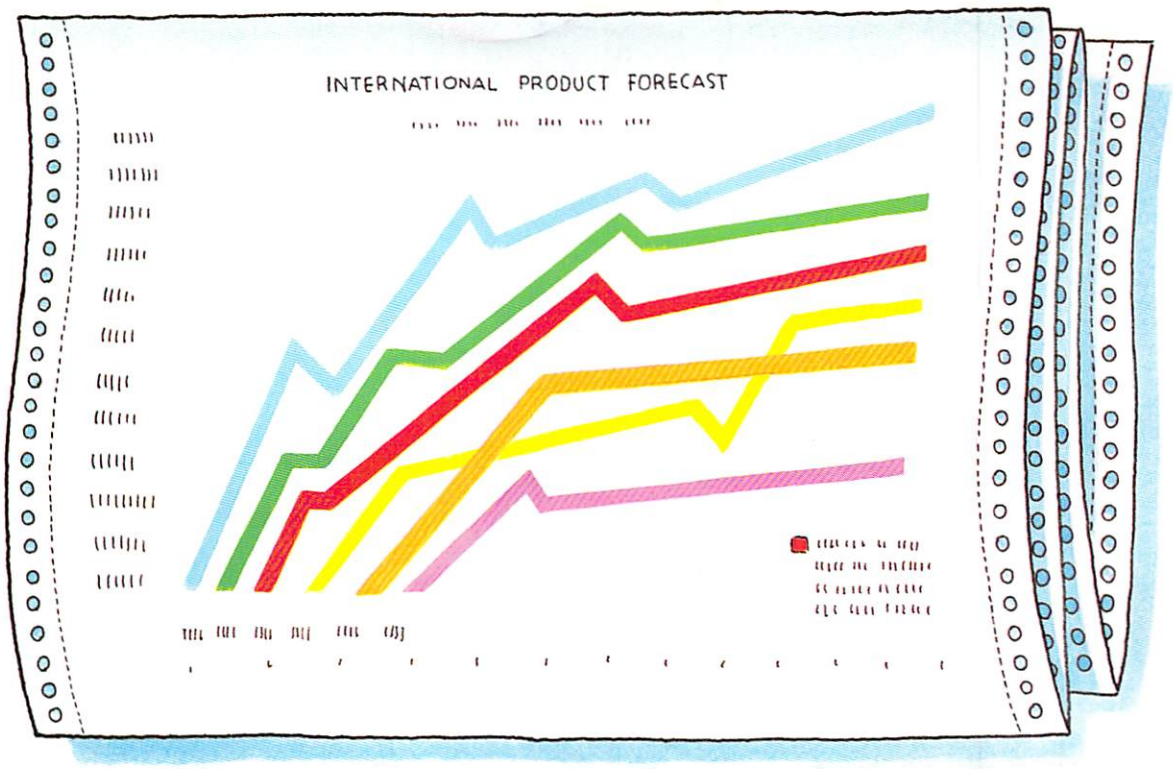

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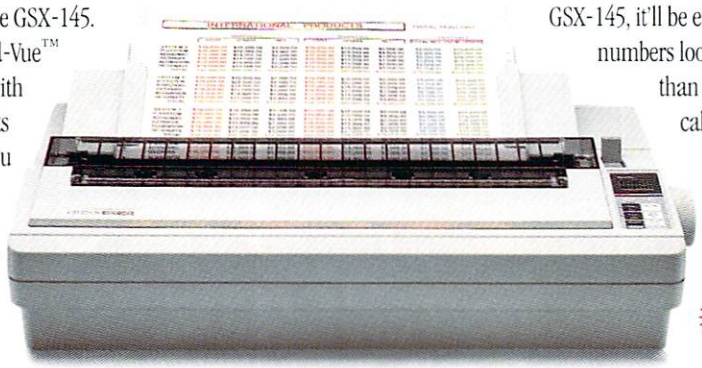

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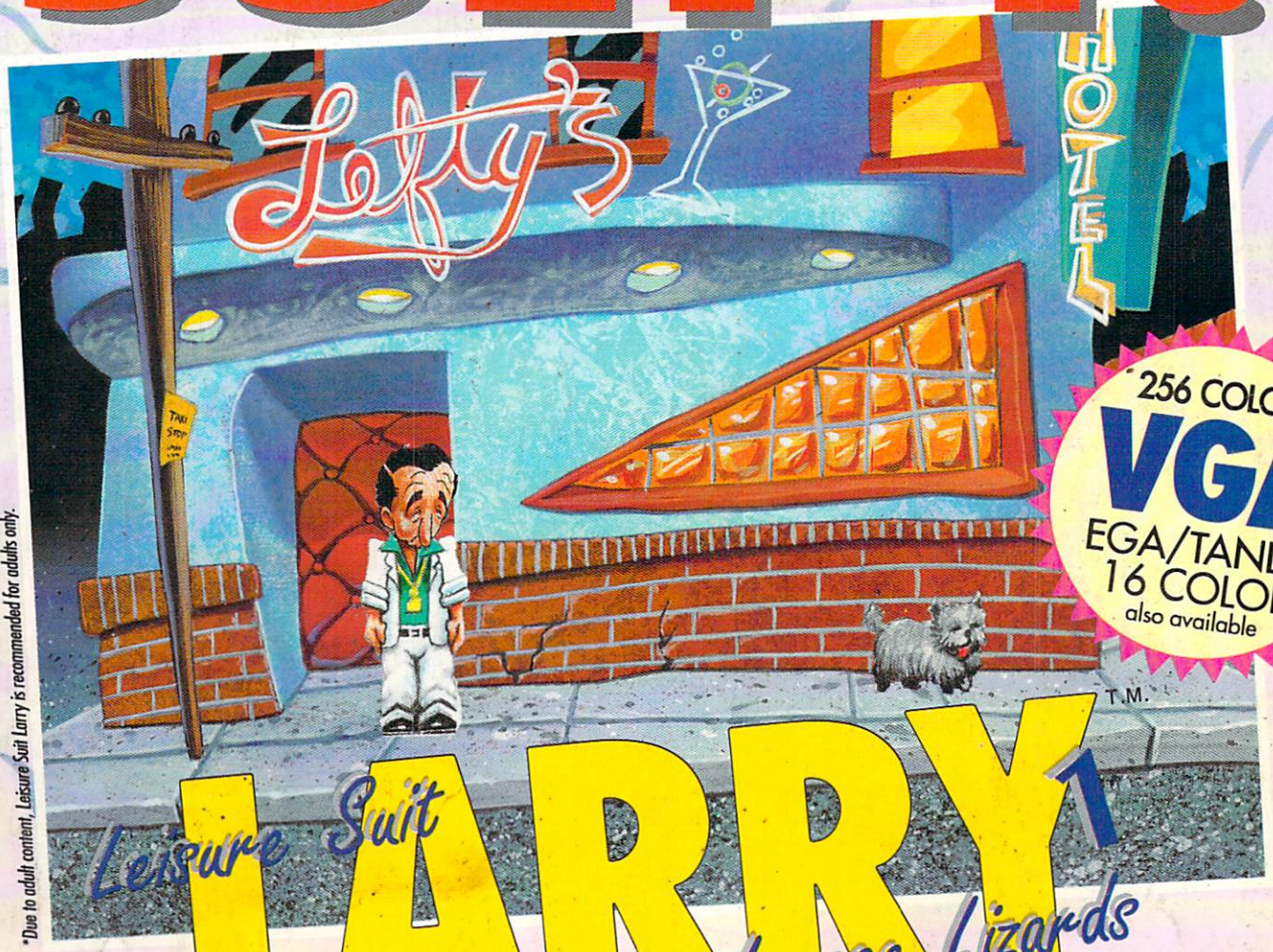

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