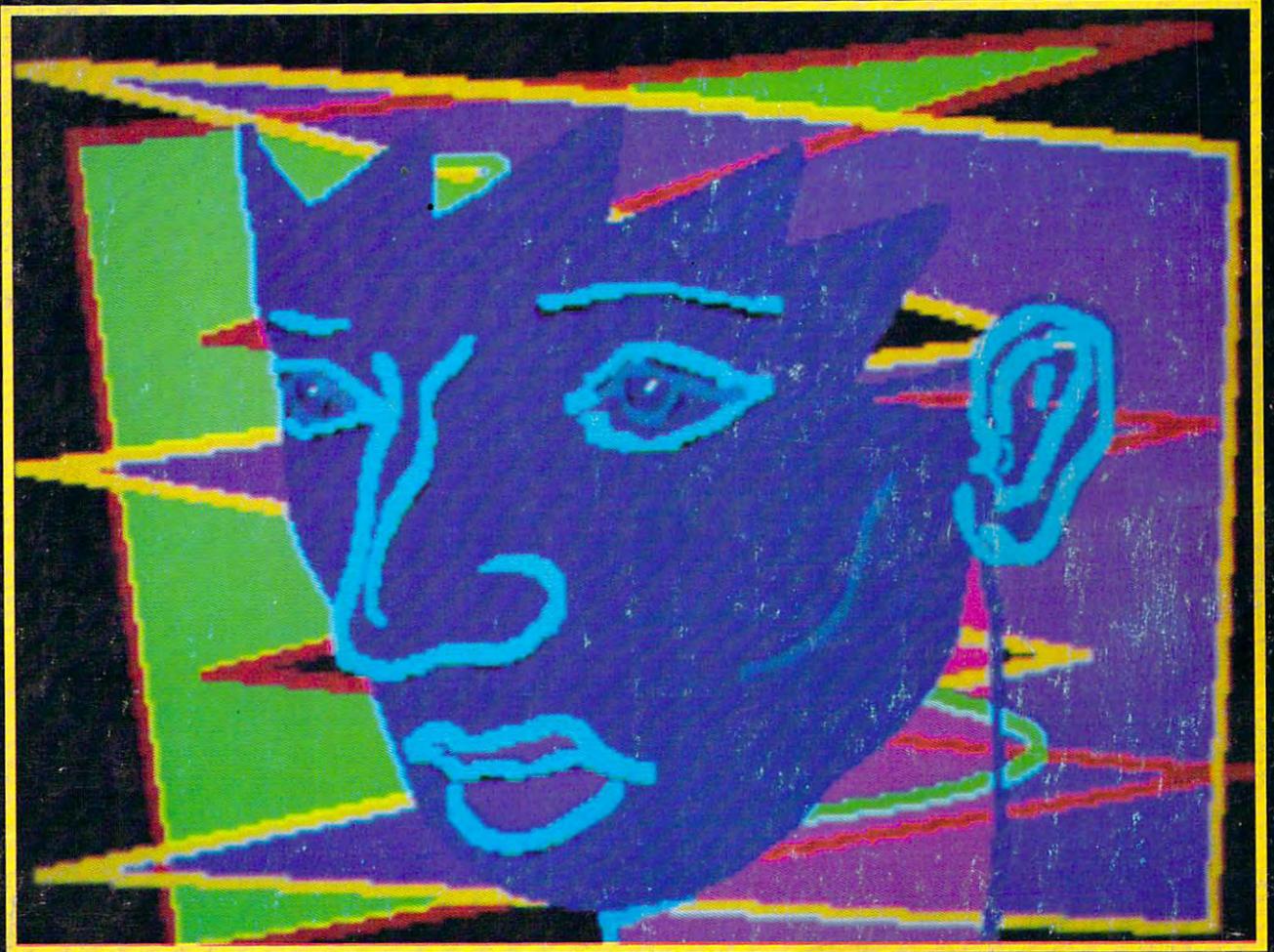


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PC Computing

[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] performs 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

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COMPUTE

AUGUST 1991

VOLUME 13 • NO. 8 • ISSUE 132

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PETER SCISCO

If you make your living out on the road, the current surfeit of small, light, powerful computer products offers a distinct advantage over the tools of five years ago.

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ALAN R. BECHTOLD

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The kind of power you need to manage your time and resources may be sitting in the palm of your hand. A recent explosion in hand-held electronic organizers now puts reams of data and powerful applications in your pocket.



ON THE COVER

The art on this month's cover was created by Barbara Nessim using an Amiga 1000 computer and *DeluxePaint* software. As yet untitled, the work was an experiment born of the artist's interest in the integration of color and lines. Nessim's work has been shown in museums and galleries worldwide.

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TEST LAB

We Put Input Devices Through Their Paces in Our Lab This Month 33

In this issue's Test Lab we benchmark and review a wide range of input devices, from the traditional mouse to the newest in portable trackballs and pens. As human-computer interfaces advance, so do the tools we use to control them. Check out these devices for your home and for the road.

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TONY ROBERTS

There are millions of PCs out there for which *Windows 3.0* is not a practical option. But don't despair. You don't have to lose the interface war. With a little work, a little creativity, and a handful of utilities from this issue's *COMPUTE's PC Disk*, you can put some snap in your DOS interface and make your PC system easier for you and your whole family to use.

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Learning your way around your PC can be a daunting task, but if you take it one step at a time, you'll be up and running in no time.

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TONY ROBERTS

This issue's MS-DOS disk is a grab bag of utilities that will help you with batch file programming, documentation printing, and disk maintenance.

Hardware Clinic 75

MARK MINASI

You want to turn your 286 into a 386 screamer? If your machine uses a standard-size motherboard and you

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COMPUTE

can get your hands on some memory, you're on your way to real computing power.

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DENNY ATKIN

If you have trouble navigating the telecommunication waters, here are some helpful hints.

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ROBERT BIXBY

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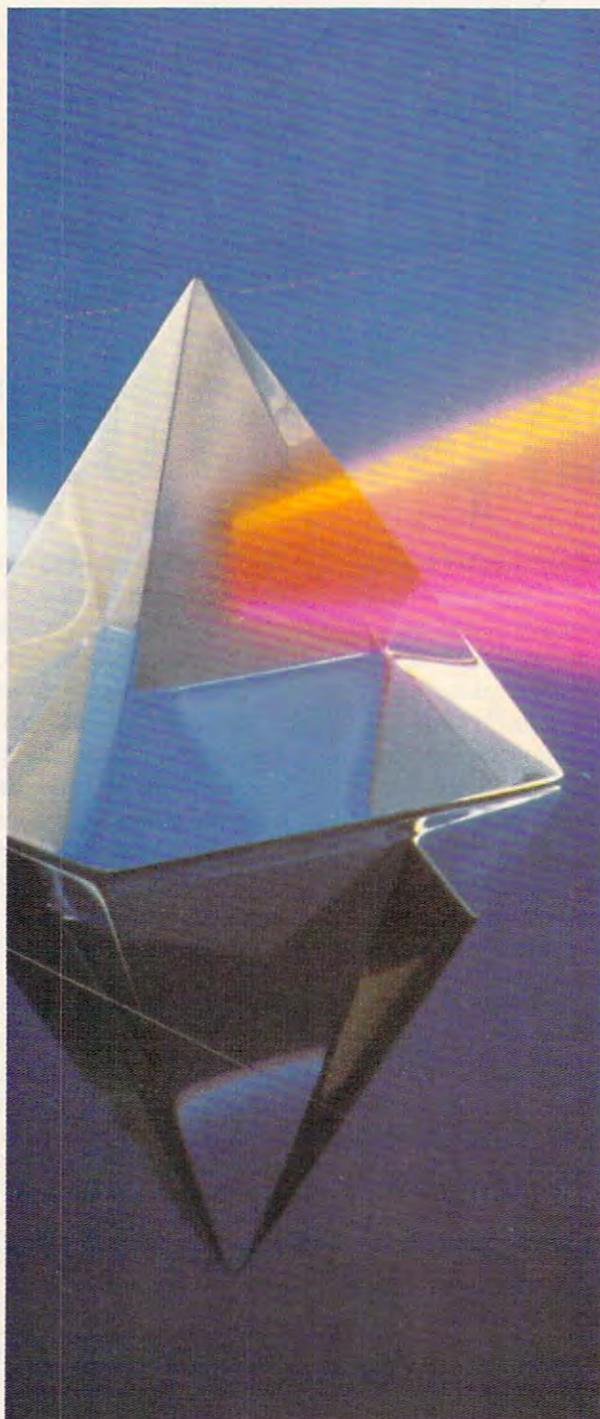
STEVEN ANZOVIN

Science teacher Vinnie Cusimano, a 25-year veteran of the New York City public school system, has a different idea of what high school science education should be. And PCs are a big part of it.

Space Shuttle Technology 92

PHILIP CHIEN

The phrase *space shuttle computer system* probably brings visions of a high-tech, state-of-the-art computer command system to mind. Surprisingly, each of the shuttle's five on-board computers has the equivalent of only 400K—less than most micros! Here's a look on board America's flag-bearing voyager to space.



ENTERTAINMENT

GamePlay 98

ORSON SCOTT CARD

There's good software to be found on full-service information networks like Delphi, GEnie, and CompuServe. Best of all, some of it is free.

The Fingertip Arcade 100

GREGG KEIZER

Modern life's too much like the military: Hurry up and wait. But now you can carry big-time computer entertainment in your pocket.

REVIEWS

Reviews and analysis of software, books, and accessory products in the areas of games, productivity, and learning. Complete with our experts' COMPUTE Choice recommendations.

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DAVID ENGLISH and PETER SCISCO

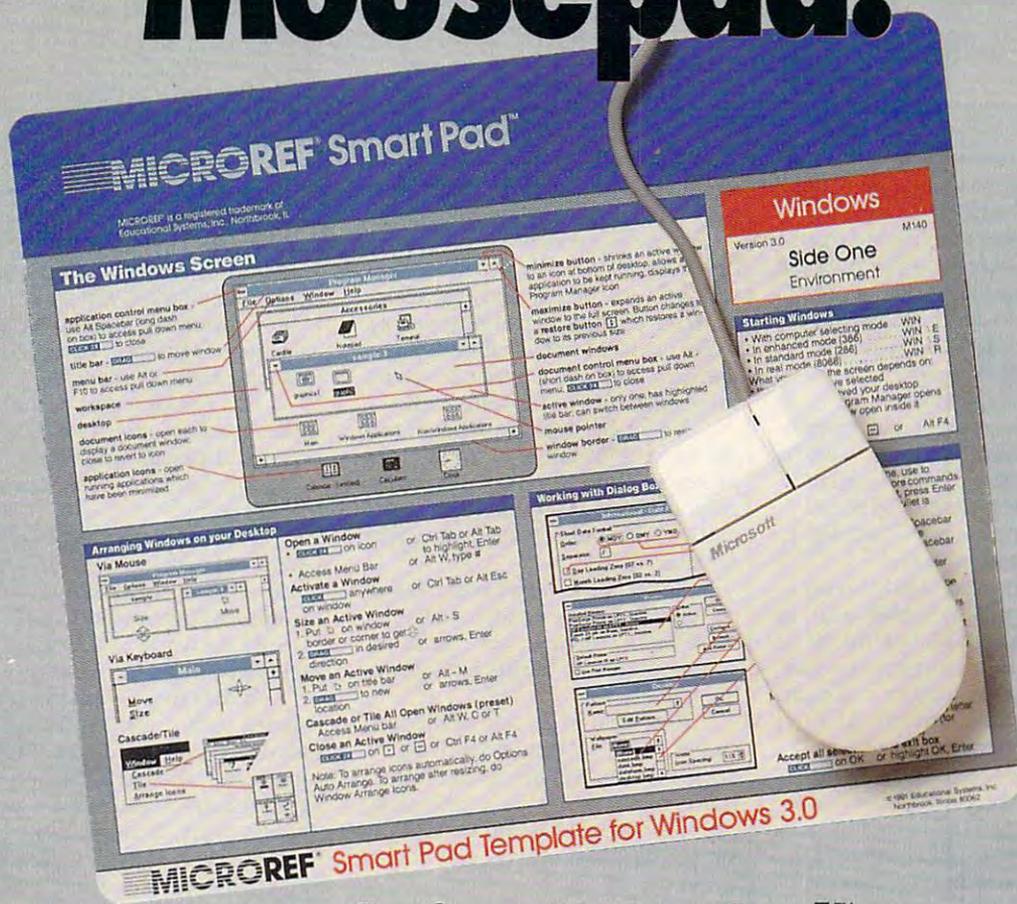
First looks at the Sound Blaster Pro and *Where in America's Past Is Carmen Sandiego?*

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B.A.T., *PageMaker*, and *Dance of the Planets* get our nod as Choice products for entertainment, productivity, and learning, respectively. In other stories, we look at *McGee at the Fun Fair*, *My Paint*, *Where in the World Is Carmen Sandiego? Deluxe Edition*, *For the Record*, *Outside In*, Lester the Cordless Mouse, *Spell-a-Saurus*, *Mickey and Minnie's Fun Time Print Kit*, *Micro-League Baseball Field Guide and Disk*, *Type from the Desktop*, *Overlord*, *Berenstain Bears Junior Jigsaw*, *My-Invoices*, *SideTalk II*, *Typist*, *Wonderland*, *LHX Attack Chopper*, *Death Knights of Krynn*, and more.

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P E T E R S C I S C O

If you make your living out on the road, the current surfeit of small, light, powerful computer products offers a distinct advantage over the tools of five years ago. Then, computers powerful enough to include hard disks and state-of-the-art displays were called *portables* without any sense of irony whatsoever.

The last five years have brought marked improvements to the world of portable computers. Each iteration makes use of new technologies and draws upon new engineering designs, both aesthetic and practical.

We have moved rapidly along the scale from transportables and lug-gables to notebooks and palmtops. In each case, our computing power has grown with steady insistence. This increase in power isn't merely an increase in the functionality of the computer's processor chip; it's also an increase in the computer's practical use.

When we take our computers with us, we have access to facts that serve to enlighten our choices. Those data range from workaday files to net-

work access to electronic mail—the possibilities are nearly endless.

Time is one of our most precious commodities—easily squandered, jealously guarded, bitterly regretted. Portable computers can help people make the most of their time, a fact not lost on a public that's snatching up these machines at a furious clip.

No longer does the office stop at the parking lot exit or at the end of the driveway. With the latest in portable computers, you can time-shift your daily workload to create quality time for your family.

If you're a gung-ho home-based entrepreneur looking for an edge, these small computers can make you competitive with the big boys down the freeway.

And what of the rest of the consumer public? What about those people who aren't involved on the executive level in business, who aren't running a business from their homes? What role will portables play in their lives?

The engineering feats that have brought computers down to the size of

paperback books ripple out over the technolandscape to influence the shape of life in the coming years. Electronic organizers, confined now to the executive market, will no doubt become commonplace among the rest of the public once they become easier to use and are less expensive.

In a classic repeat of the generational pattern, it is our children—with their enthusiastic adoption of handheld videogames—that indicate where we are going.

It's not too hard to imagine, given recent developments in various technological areas, living in an electronically linked world that is as routine as the world of television and telephones we live in today.

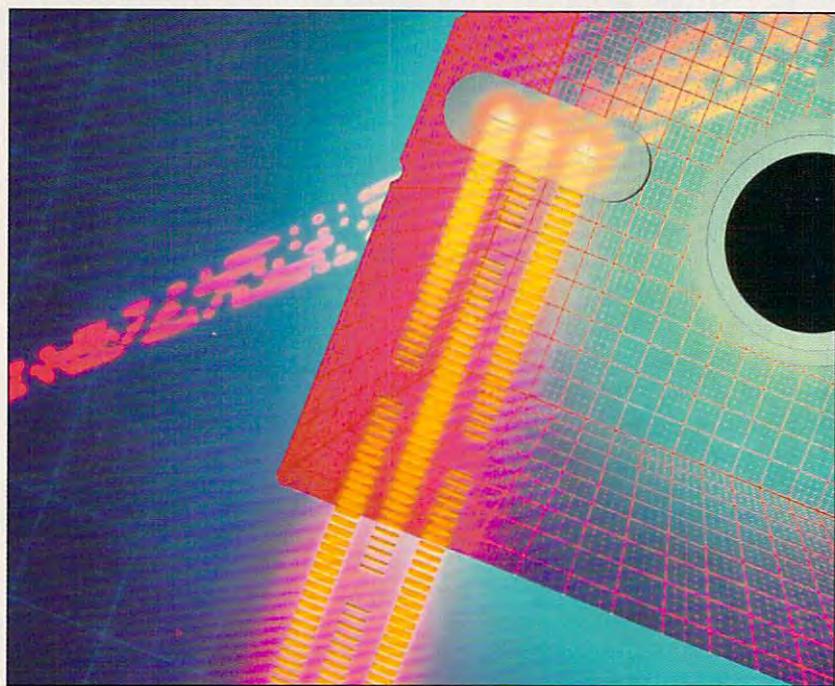
If Alexander Graham Bell envisioned such a world 150 years ago, it's hard to guess what shape it held in his mind and whether his vision resembled the communication networks we accept today. We have come to expect instant access—by airwaves, cables, and wires—to global and personal events.

Advances in user interfaces promise to make portable computers—in whatever shape—more palatable to the public at large and more effective in the hands of the technoworker.

Advances in cellular technology will make today's pocket pagers and mobile phones seem quaint compared with the portable info stations of tomorrow.

Flat panel displays and portable CD readers may finally usher in the age of the "docking station," as yet an ungainly collection of multiple peripherals.

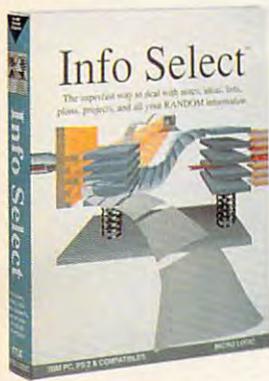
Recently, during a late night spate of bleary-eyed video grazing, I came across a show that portrayed the future as a world where solitude had been traded for total access. That cheerless world view is but one description of how our tools can define our selves. Still, it poses a large question that rightfully accompanies all technological developments—no matter how small the package. □



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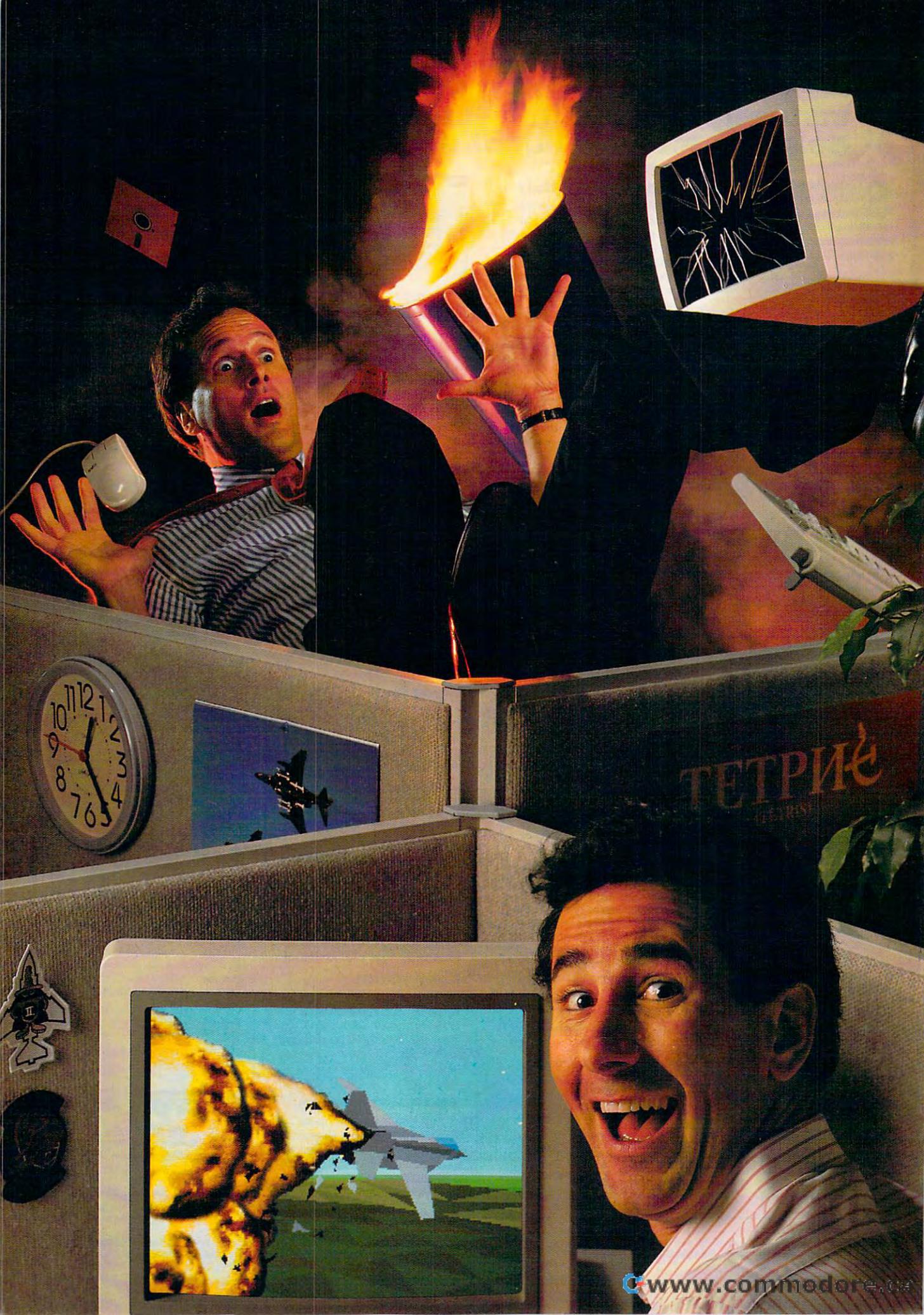
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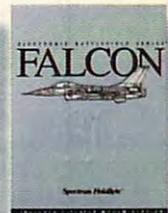
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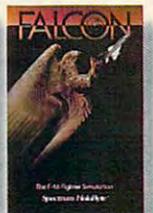
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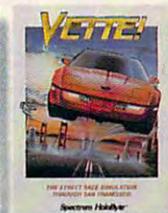
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NEWS & NOTES

Fewer IBM Workers

In light of its recent disclosure of significantly lower-than-expected 1991 earnings, IBM revealed plans to reduce its worldwide workforce this year by more than 14,000 employees. About 4000 jobs have been cut through the sale of the company's typewriter, computer keyboard, and low-end printers division. Attrition and voluntary incentive programs are expected to take care of the rest. IBM employs about 373,000 people worldwide, and these cuts are considered significant. Perhaps the new IBM laptop PC will help bring some of those workers back on the job.

Smudged Windows?

U.S. district court judge Walker Vaughn ruled that Apple Computer's lawsuit against Microsoft and Hewlett-Packard, alleging infringement of its graphical user interface, has merit. The ruling states that Apple's claims to copyright on the Macintosh graphical interface are valid and clears the way for Apple to take its copyright infringement suit to trial.

Microsoft, meanwhile, says it's satisfied with Judge Vaughn's order because it affirms the analytical framework of the case as recommended by Microsoft. Even though the ruling supported some of Apple's claims, it effectively rejects Apple's claim that the "total concept and feel" of the Macintosh graphical user interface is protectable under copyright. It also defines 179 elements of the display that will not be considered in the infringement case, leaving only 10 elements of the original Macintosh that will be considered when the case comes to trial.

Multiplying Mice . . .

Computer mice were aptly named for more than one reason. Not only do they resemble real mice, they *multiply* like real mice. Microsoft reports it's now sold more than 6 million computer mice worldwide. Sales more than doubled following the release of *Windows 3.0*. Of course, the graphical user interface almost demands the use of a mouse, so the little guys are now scurrying across the desks of computer users everywhere.

Microsoft's mouse is available with either a serial PS/2 interface, which attaches to a 9-pin serial, 25-pin serial, or 6-pin PS/2-style port, or a bus interface, with a variety of software options. It sells for a suggested retail price of \$125. A special bundle containing *Windows 3.0* lists for \$225.

. . . And They're More Portable, Too!

Now that mice are running all over the place in the millions, Microsoft has created a new breed that's more portable. The new BallPoint mouse is designed especially for use with laptop and notebook PC-compatible computers. Actually, for this device the word *mouse* is a bit of a misnomer. It's really a miniature trackball device that clips onto the keyboards of most popular laptop and notebook computers.

More than 2½ years in the making, the new BallPoint mouse could be just the thing laptop and notebook PC power users have been looking for. It will make using *Windows* and other graphics-based applications and interfaces easier to run on small computers. A universal clamp fits on the keyboard, and a positioner allows you to adjust the angle of the mouse relative to the keyboard. The BallPoint can also be removed from the clamp and used as a desktop trackball or held in the hand for presentations.

The Microsoft BallPoint mouse works with MS-DOS, *Microsoft Windows*, and OS/2 on laptop, portable, and desktop computers. It requires DOS 2.0 or higher with one double-sided 3½-inch drive and 20K available RAM. Alternatively, it will work with OS/2 version 1.1 or version 1.2, one double-sided 3½-inch drive, and a 9-pin serial port or PS/2 mouse port. Suggested retail price is \$175.

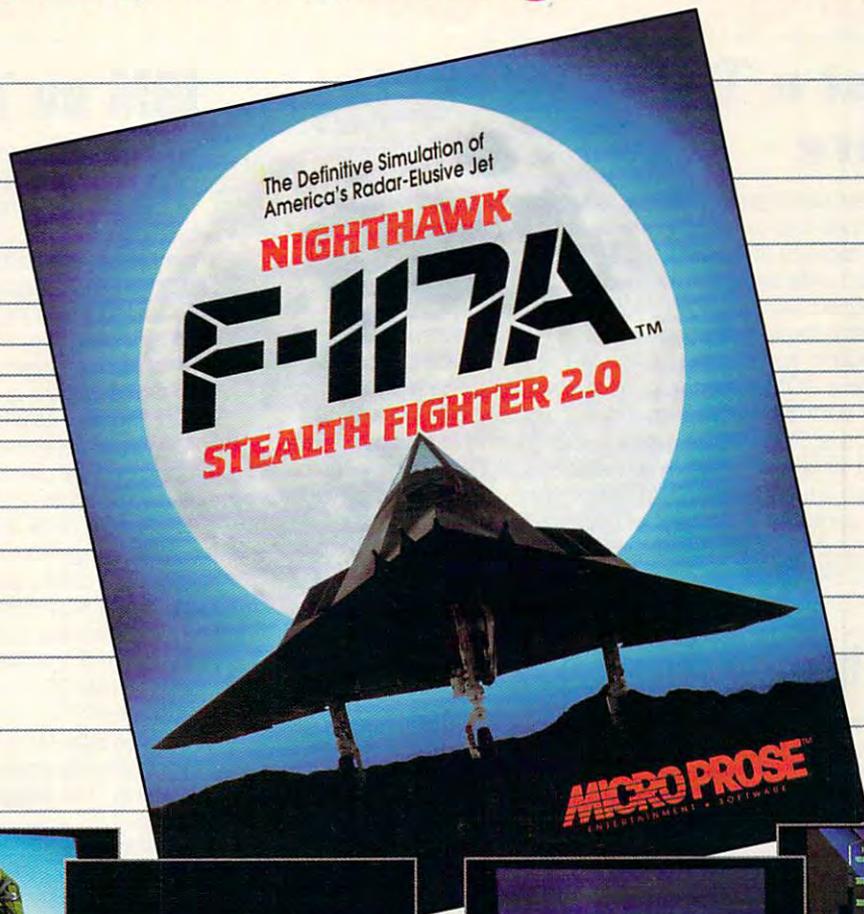
Tandy's Home Organizer Goes It Alone

Tandy's popular *DeskMate Home Organizer* companion, originally sold only with the Tandy 1000 RL home computer, is busting out on its own. Flooded with requests to sell the collection of home management software programs as a separate product, Radio Shack decided to go for it.

DeskMate Home Organizer consists of 15 easy-to-use home management applications, including financial, personal, kitchen, and math programs, and an Information Center program. The package runs on any Tandy, IBM, or compatible computer and retails for \$99.95 at Radio Shack Computer Centers, Radio Shack technology stores, and dealers nationwide.

Air Superiority...

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IBM-PC screens shown.



Fly the plane that baffled Baghdad radar systems and air defenses during the Persian Gulf War, the plane specifically designed for dangerous solo missions behind enemy lines.

F-117A Nighthawk Stealth Fighter 2.0 is a dramatic advancement of *F-19 Stealth Fighter*, MicroProse's critically acclaimed simulation of the radar-elusive jet, named Best Simulation of the Year in 1989. With **more worlds, more action, better and bolder graphics** and MicroProse's legendary dedication to authenticity and excitement, *F-117A* represents a new breed of combat flight simulator.

For IBM-PC/Tandy/compatibles. For the latest information on release dates and availabilities, call MicroProse Customer Service at 301-771-1151, 9 am to 5 pm EST, weekdays. © 1991 MicroProse Software, Inc., 180 Lakefront Drive, Hunt Valley, MD 21030.

- Dramatic sprite explosions and smoke.
- New, more accurate cockpit and in-plane graphics.
- Graduated horizons, landscapes, and seascapes in VGA.
- Spectacular night graphics with special night HUD features.
- Authentic graphic representation of the F-117A, in 3-D with more polygons and detail.
- Improved mission generation with brand new challenges and scenarios.
- Nine worlds in which to fly, including Cuba, North Korea, the Kuwaiti Theatre of Operations, Central Europe, Vietnam and the Middle East.
- Improved, more challenging enemy Artificial Intelligence.
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NEWS & NOTES

Not Just a Typewriter Anymore

As electric typewriters continue to look and act more like computers, one major typewriter manufacturer has decided to start producing personal computers. Smith Corona Acer recently unveiled a line of seven "simply smart" IBM PC-compatible computers designed for the home market.

The new computers, developed in conjunction with the Acer Group, are "plug and go" systems designed for ease of use. A menu screen guides users through the many built-in applications, which are already loaded, along with the operating system, on a ROM cartridge or hard drive, depending on the model. Models with a ROM cartridge come with *Smith Corona Word Processing 6.0*, *Desktop Reference*, and DOS 4.01. Models with a hard drive also come with *Microsoft Works 2.0* installed and ready to use. Six of the seven new computers will be 80286-based systems (three ROM cartridge models and three hard drive models), and one is an 80386 SX model with a hard drive. Suggested retail prices range from \$999 to \$1,899 for the system. For more information, contact Smith Corona Acer at (800) 443-5748.

A Microchip by Any Other Name

Intel lost a recent attempt to prevent other companies from using the number 386 to signify 386-based computers if they use 386 microprocessors not manufactured by Intel. The ruling by U.S. district court judge Walter Ingram stated that 386 is a term as generic in the computer industry as *automatic transmission* is in the automobile industry. Judge Ingram pointed out that Intel waited too long before attempting to claim the copyright—more than 2½ years after it began selling the product.

Now to differentiate its 386 chips from those of other manufacturers, Intel says it will refer to them as the *i386* or *Intel386 chips*. It's fair to say that a claim for patent and copyright on this designation is probably already in the works.

RoboLaptops

Police in Fremont, California, and other cities are now going high-tech with a combination of laptop computers and mobile packet radio modems. In Fremont, GRiDcase 1530 laptops are mounted near the dash in patrol cars next to the manual radio, not far from the upright shotgun visible in the front seat. Radio modems from Dataradio allow police officers to transmit and receive data on the computer via radio signals. Fremont police official David Jensen explained that a license plate number, for example, can be typed into the laptop computer and then transmitted to the department's main computer for an almost instant check of police and FBI files.

"After the officer requests a report on a driver or vehicle, a report flashes back on whether the car is possibly stolen or the driver has outstanding warrants or is wanted for some misdemeanor or felony crime," Jensen said. "We get much faster response than talking on the radio because officers don't have to wait for busy dispatchers to take down information and have someone feed it into a computer."

The laptop is based on an 80386 processor and also can be used to write crime and accident reports right in the car. It enables officers and dispatchers to communicate securely between police cars and headquarters without having conversations monitored by individuals with scanners. It also allows officers to quickly access information such as directions to addresses. Someday, police officials say, graphics, mug shots, and even fingerprints will be sent over the in-car computers. Modems attached to scanners can't be far behind.

IBM on Your Lap

IBM finally released its first real laptop PC, and the wait was worthwhile. The new Personal System/2 L40 SX is definitely loaded. It's a lightweight, durable, battery-operated 386SX that runs at 20 MHz. It weighs just 7.7 pounds and measures a mere 2.1 inches high, 12.8 inches wide, and 10.7 inches deep. It also comes with a leather slip-on carrying case at no extra cost.

The new IBM laptop has a full-size keyboard similar to the ones found on IBM desktop computers. It also packs a walloping 2MB of RAM, a 60MB hard drive, and a ten-inch VGA display as standard equipment. The laptop's memory can also be expanded up to a maximum of 18MB. IBM plans to release an AC-powered expansion unit that will provide connections to IBM 3270 and 5250 systems, and Token-Ring networks using AT half-size adapter cards. An array of other optional add-ons will also be available. The suggested retail price is \$5,995.

Prospective buyers can call (800) IBM-2468 to locate the nearest dealer.

Toward a Better Understanding

If you've worn out your printed version of the *WordPerfect 5.1* manual or just hate to thumb through printed pages to find what you need to know, Larson-Davis has a possible solution for you. The company has just introduced an electronic text version of the *WordPerfect 5.1* manual. Dubbed *InfoQue*, the new electronic version is compatible with networks, *WordPerfect* shells, and mice, and it allows you to search by word or phrase. Full-text pages are displayed. You can also page back and forth from any point of reference within the manual. The company is selling the electronic manual for an introductory price of \$25 and plans to bring more manuals for other popular software to market soon. For more information, contact Larson-Davis Information Systems at 1681 West 820 North, Provo, Utah 84601; (801) 375-8855.

Big Deal!

Imagine a VGA display of a beautiful rose. Imagine having the ability to instantly double the size of the display with virtually no erosion of its composition. According to Bill Salyers, director of programs at the National Easter Seals Society in Chicago, that's just what *MAGic*, a new memory-resident screen-magnification utility from Microsystems Software does.

The program magnifies a VGA screen by two times width and two times height in both text and graphics applications—even while running *Windows 3.0*. *MAGic* can be helpful for the visually impaired and for anyone who squints at tiny characters on laptop screens. It also helps when reading those pesky word processor page previews. "This is one product that must be seen to be truly appreciated," Salyers said.

MAGic, which retails for \$79, also provides complete type-through access and follow-the-cursor, follow-the-mouse, and attribute-tracking modes all in less than 8K of RAM. *MAGic Deluxe*, which retails for \$195, offers even more magnification capabilities and includes a bookmarking function that allows you to mark up to ten different areas of your screen and a magnification locator display that shows you which area of your screen is currently being magnified.

For more information contact Microsystems Software, 600 Worcester Road, Framingham, Massachusetts 01701; (508) 626-8511.

Super Debut

Nintendo's 16-bit Super NES game machine made its debut at the summer CES in Chicago this June. Sales are expected to exceed 2 million units by year's end once Super NES, packaged with *Super Mario World*, is released in September. A software library of 10 to 12 games will be available as well and will expand to include more than 60 titles by 1992. Super NES will have enhanced graphics, multiple scrolling screens, digital stereo sound, 3-D capabilities, and better, faster gameplay to set it apart from Nintendo's current 8-bit machine.

Growing Support

The current market acceptance of *Windows* has helped not only mouse sales but software sales as well. Sales of software applications for *Windows 3.0* have skyrocketed in the past year. Both market analysts and independent software vendors have documented major increases in sales of *Windows*-based applications, and continuing gains are predicted as developers create new programs for the fast-growing *Windows* market.

According to Ken Wasch, director of the Software Publishers Association, the *Windows* applications market is currently the fastest growing segment of the software market. Independent market research from International Data Corporation (IDC) projects the number of copies of *Windows*-based applications shipped in 1991 will reach 3.8 million units—a 150-percent increase over the 1.5 million units shipped in 1990. More than 700 software developers are writing new *Windows*-based applications at a fast clip, evidenced by the 48,000 copies of the *Microsoft Windows Software Development Kit* version 3.0 sold worldwide in the past nine months.

A Sound Investment

With the new SoundByte audio recording and playback unit hooked up to your PC, your CD player won't be the only thing in your house playing rich digital music. From Meridian Data, SoundByte can take audio input from any standard high-fidelity equipment, compress files in realtime, and store them on the computer's hard drive or on a network server. Playback can be from a floppy disk, a hard disk, a CD-ROM disc, or a network. SoundByte also supports MIDI-driven synthesizer functions.

The small, inexpensive processor plugs right into the computer's parallel port and can be used to attach very high-quality sound files to different applications like educational programs, multimedia programs, business applications, and games. Based on a single-chip, digital-signal processing (DSP) design, SoundByte's open architecture provides developers with an affordable, fully programmable audio technology for applications development.

SoundByte is fully compatible with MS-DOS and *Windows* platforms, supports the *Windows Multimedia* extensions protocol, and is priced at \$249.95. For more information, contact Meridian Data at 5615 Scotts Valley Drive, Scotts Valley, California 95066; (408) 438-3100.

A Thousand Ways to Find Software

Looking for some good software? How about a detailed index of more than 19,000 packages to help you with your research? The *Datapro Software Finder* is a new CD-ROM-based service program that provides a comprehensive reference guide to business and professional programs for micro-, mini-, and mainframe computers by allowing instant access to information on more than 19,000 applications programs. More than 130 types of software products are covered. Based on the *Datapro Directory of Software* and the *Datapro Directory of Microcomputer Software* print services, it provides the equivalent of 4500 pages of information on a single CD-ROM disc.

An annual subscription to *Datapro's Software Finder* (Complete Edition) with quarterly releases is available for \$1,770. Individual micro and midrange/mainframe edition subscriptions are \$995 each. For more information, contact Datapro at 600 Delran Parkway, Delran, New Jersey 08075; (800) 328-2776.

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



FEEDBACK

QUESTIONS FROM OUR READERS

Two Err Is Human

On page 20 of your April issue, you listed our number incorrectly. It's (714) 994-7400.

DARIANA TECHNOLOGY GROUP
BUENA PARK, CA

On page 97 of your April issue, an incorrect number is listed for our company. Customers should call (800) 334-6572 for sales and (302) 368-9990 for inquiries. Thanks for setting the record straight.

MICROLEAGUE SPORTS
NEWARK, DE

TeleVGA

I'm searching for a way to play a computer game on my VGA monitor and have output go to a standard TV at the same time. My family and I are avid game players and miss the days when we could sit around the TV set and watch each other play. When we upgraded to a 386SX with VGA, the family could no longer participate in the solving of mystery and role-playing computer games.

ROBERT E. PITCOCK
FLORENCE, AL

What you need is VGA-TV from Willow Peripherals. It's a VGA card with an output for a VGA monitor and an output for NTSC video (also known as composite color). The NTSC connector can be attached to any television with a monitor jack.

If you have an older television that has only antenna connections, you'll also need an RF modulator, which can be purchased from Radio Shack for around \$30. A 512K version of VGA-TV costs \$599. It provides a maximum resolution of 800 × 600 with 256 colors.

The 256K version costs \$499. With this unit, you can get a maximum resolution of 640 × 480 with 16 colors. The card is shipped with drivers for WordPerfect, Lotus 1-2-3, Windows 3.0, AutoCAD, and Ventura Publisher.

Willow also offers a product known as VGA-TV GE/O (GE/O

stands for GENlock Overlay). This unit allows the VGA signal to be mixed with a normal television signal to create effects such as titling for videotapes. It costs \$895. You can write Willow Peripherals at 190 Willow Avenue, Bronx, New York 10454, or call (800) 444-1585.

Battery Drain

How do I determine when the internal battery in my AT needs to be replaced, and what problems will occur if it goes dead before I'm able to replace it?

H.W. CHRISTOPHER
FLORISSANT, MO

The internal battery used in AT-class computers supplies power to the CMOS RAM which retains the date, time, and configuration information about the system. (In XT-class computers, dip switches on the motherboard are used to store system configuration information.)

An inconsistent clock can signal a weakening battery. If you notice the clock losing a few hours a night, your battery needs replacing. If the battery is allowed to fail completely, you'll see a message on boot-up indicating that there's been a CMOS RAM failure. You'll be directed to run SETUP.

At this point, you must reformat the system about the memory, monitor, and disk drives that are being used. After that, you'll be able to compute normally until you turn the system off and the CMOS RAM loses its memory again.

The largest hurdle in this process is knowing the type number of the hard disk in your system. The type number is a code that tells the controller how many heads, platters, and cylinders your hard drive has, and without the correct code, you can't access the hard disk.

To avoid this problem and the fear that all your data is lost forever, run your system's SETUP program today and make note of the type number for your hard disk. Write this number on a disk label and stick it to the back

or bottom of your machine. When your battery does give out, you'll have the information you need to quickly get back to work.

MIDI Interference

I read the article in the Reviews section of the February 1991 issue of COMPUTE on Basic Composer 4.3, only to find a glitch. I'm interested in purchasing the program, but Mr. Latiimer failed to list the MIDI-compatible devices it supports. He said that it's "a powerful . . . alternative to costly and confusing MIDI-based . . . processors" and that it's unfortunate to hear only "one note at a time" because of hardware limitations. What's the hardware he's referring to?

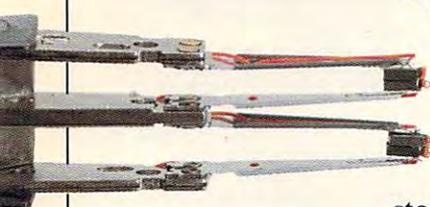
WILLIAM YODLOWSKY
LINDEN, NJ

Version 5.0 of Basic Composer (which is expected in the late spring or summer) will support the Sound Blaster and the Ad Lib music synthesizer cards, providing polyphonic playback with orchestral instrument timbres. However, version 4.3, the reviewed version, doesn't support MIDI input or sound cards; it plays back solely through the monophonic PC internal speaker. That's why it can play only one note at a time.

A spokesman for Education Software Consultants, the publisher of Basic Composer, says the company has aimed its product at individuals who want a powerful music editor but aren't interested in making a large investment in music software and hardware. Because of this, the company made the decision not to support MIDI input.

The spokesman warns that if you're interested in purchasing MIDI software, you should avoid the low-end music notation and printing programs (meaning anything less than \$300). Education Software Consultants recommends Music Printer Plus, Score, Personal Composer, or Theme. The spokesman also says that Basic Composer has features that aren't found in these expensive programs.

Hard Disks Die.



Hard disk manufacturers want us to believe that hard disk technology is absolutely reliable ... but experience teaches otherwise. We depend upon data storage to be flawless, but hard disk technology isn't. Surface defects, head alignment drift, and low-level format aging cause hard disks to fail.

A hard disk drive's low-level format fades with use. The drive's read/write heads lose their delicate alignment and move away from the original low-level format information. These new data track locations intersect unseen surface defects that were once harmlessly located between tracks. DOS's chilling "Abort, Retry, or Fail?" message inevitably results. Precious data is soon lost.

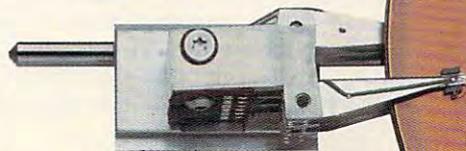
If left unchecked, data storage becomes more an act of hope and faith than one of science.

A return to science. The problem is known and understood, and the solution is clear. While a drive's data can still be read, the drive must be given a new, realigned and strong low-level format. Then all current surface defects must be located and managed.

This process prevents hard disk data loss.



An act of prevention. Gibson Research Corporation's SpinRite™ software program reads hard-to-read and impossible-to-read data from a DOS hard disk, nondestructively low-level reformats the drive's surface while optimizing the sector interleave factor, analyzes and scrubs each track of the drive for surface defects, and relocates any endangered data to safety. SpinRite easily restores hard disk drives to better-than-new condition with their data intact. Before any data is lost, SpinRite detects that a drive is "softening"



then determines and eliminates the cause. SpinRite readily recovers data that the system cannot read.

SpinRite won Byte Magazine's prestigious Award of Distinction and

continues to win computer industry praise and acclaim. It has proven itself to be effective in preventing hard disk failure. SpinRite will work for you.

SpinRite II features a detailed technical log, as well as support for DOS 4 and large device driver partitions. It is available immediately from local software retailers or directly from Gibson Research with a 30-day satisfaction guarantee.

Suggested retail price: \$89.

To receive additional literature or to purchase SpinRite II, call toll-free:



SpinRite II.
A return to science.
An act of prevention.

(800) 736-0637.



FEEDBACK

A Fate Worse than DeskMate

I bought a Tandy 1000, complete with DeskMate. When I turn on the computer, I go directly into the DeskMate menu, which speaks to me in plain English. Computer books and COMPUTE magazine seem to be totally involved in the peculiar foreign language of DOS. Am I missing out on something important? Should I be trying to learn a foreign language (DOS) or just relax and concentrate on trying to master the many facets of DeskMate?

ALBERT E. NELSON
SECHELT, BC, CANADA

DeskMate may be all you need. It certainly provides a complete array of useful built-in programs. Other programs, such as First Publisher, Quick-En, and Lotus Spreadsheet for DeskMate, make it even more versatile. DeskMate may look like a completely different language from DOS, but it uses DOS to perform its functions.

You may eventually want to move out of DeskMate and see what else your computer offers. There are some books available on DeskMate, including The First Book of DeskMate by Jack Nimersheim (Howard W. Sams) and Getting the Most Out of DeskMate 3 by Michael A. Banks (Brady Books), which will be sold in Radio Shack stores.

CAD Quest

I want to know if there are any CAD (Computer-Aided Design) magazines. I've been looking for a computer-aided design magazine for 1 1/2 years.

ROYLANCE C. WIESSNER
BLOOMINGDALE, MI

CAD is only half of a complex of hardware and software whose end product is formed metal, the result of computer-aided manufacturing. Most publications in the area of CAD actually deal with the engineering and metal-working end of the process rather than the design process. You might be interested in CADence (P.O. Box 23350, Austin, Texas 78702-3550; 512-250-1700) or CADalyst (1727 West Broadway, 4th Floor, Vancouver, British Columbia, Canada V6J4W6; 604-737-1088). Both specialize in AutoCAD.

CAD/CAM East (P.O. Box 4803, Troy, Michigan 48099-4803; 313-552-

8583) is a magazine that covers CAD software used for metal working. CAD/CAM Publishing publishes the Computer-Aided Design Report, a monthly 16-page newsletter, as well as books on CAD, CAM, and CAE (computer-aided engineering) with an emphasis on engineering. You can reach CAD/CAM at 841 Turquoise, Suite D, San Diego, California 92109; (619) 488-0533.

Finally, CAD/CAM Systems (395 Matheson Boulevard East, Mississauga, Ontario, Canada L4Z2H2; 416-890-1846) is a bimonthly written for mechanical engineers who use CAD software.

It covers both metal-working hardware and CAD software. COMPUTE magazine is taking a strong interest in computer-aided design and will cover graphics and design software in features and reviews. Autodesk, publisher of AutoCAD, was the source of this information.

It's the Law

In the March "News & Notes" column, Alan Bechtold mentioned that software rentals are now illegal. Could you give me the bill number of that legislation? In the same column, he talked about a software buyer's guide and merchandising service called InfoMaster. How can I find out more about it?

JEAN YEN
ADDRESS UNKNOWN

The Software Rental Amendments Act of 1989 is part of public law PL650, which took effect December 1, 1990. This law prohibits "the rental, leasing, or lending of commercial software without the express permission of the copyright holder."

InfoMaster is a product of Sellect, 2452 Watson Court, Palo Alto, California 94303; (415) 859-1100.

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 PC Feedback, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. We regret that we cannot provide personal replies to technical questions. □

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Just when you thought it was safe to use your computer, just when you were getting comfortable with its cantankerous ways, just when you felt like you knew your way around its drives, device drivers, and software . . . you're faced with a new challenge: a laptop computer. All kinds of new experiences await you as you learn about the care and feeding of the laptop. You'll find that it's a completely different beast from a desktop PC.

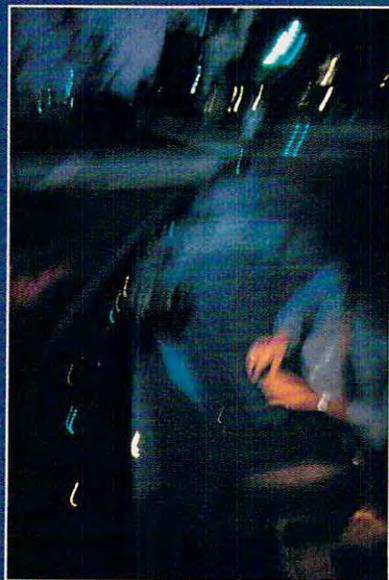
Sure, it's still DOS (although it may have special quirks), and sure, it runs standard software. But it has unique demands that come with its small size, its odd little flat monochrome screen, and its smaller-than-you're-used-to hard disk. And the need to carry it with you as you travel and to somehow lug all its essential and near-essential paraphernalia complicates things further.

No doubt about it: When you move to a laptop, you're entering brand new territory. But never fear. We'll help you learn the important things you'll need to know. Travel like a veteran, from your very first computerized trip.

Preparing for the Trip

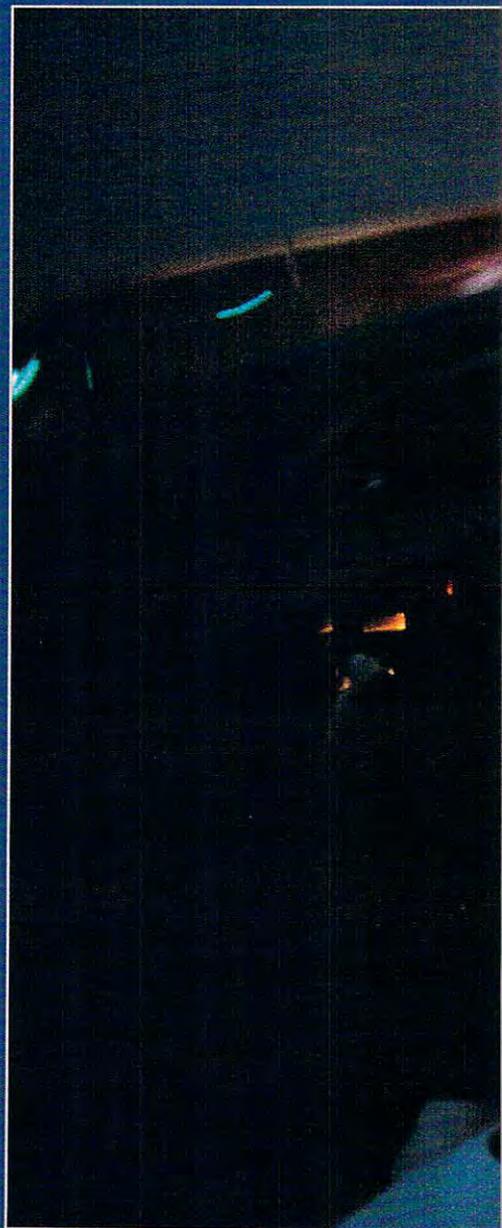
Plan the computer side of your trip by customizing a packing list. I've made a fairly extensive one; create your own by picking the elements you'll need and adding the few special things your sys-

THE MOVEABLE BEAST



**IS IT TIME
TO GET YOUR ACT
TOGETHER
AND TAKE IT ON
THE ROAD?**

BY RICHARD O. MANN





MARK WAGONER © 1991

tem needs. Prepare your list on the computer and save the file. Voilà! You'll have an instant packing list for your next trip.

Be sure to take everything you'll need, but don't take one ounce more. Balance your potential requirements against the cost of not having each item. This packing list contains just about everything you could conceivably need, but if you take all of it, your suitcase may not have room for your second change of underwear.

Setting Up the Computer

Surging laptop sales have brought a wealth of new products designed to overcome the inherent limitations of laptop computers. You'll want to consider them as you ready your computer for the road.

Setting up the computer will be a big job the first time; after that, it can become fairly routine. Using these laptop-specific products can ease the pains associated with portable computing.

Screen enhancers. Laptops have less-than-ideal screens. Your friends may start calling you "Squint Eastwood" behind your back. Fortunately, the screens can be improved by several ingenious but simple programs. You've probably noticed that it can be quite difficult to find the cursor at times, especially with word-processing programs. The blinking underline gets lost in a sea of low-contrast monochrome text.

The solution is SkiSoft's *No-Squint II*, which turns the cursor into a large blinking block. You set the blink rate on a scale from 1 (no blink) to 9 (very fast). The program is absolute simplicity itself, yet it makes a major-league difference in your ability to enjoy your laptop. (Laptop makers are beginning to catch on to this problem. The Texas Instruments TravelMate 2000 notebook computer I'm using to test products for this article comes with a similar cursor-fixing program built in.)

If your laptop has an EGA or VGA screen, there's even more help available. Personics' *Laptop Ultra-Vision* gives you not only a block cursor but a choice of beautiful, slightly larger, and more openly spaced screen text fonts. You also select reverse video or smaller type, as small as 60 lines per screen (normal is 25 lines per screen). Once you've seen these elegant typefaces on your laptop, you'll never want to go back.

Disk compression software. Because working with a laptop means that you're probably working with a rather small hard disk, getting the most out of that storage space should be high on your list of priorities. Start

by going through the disk with a sleek file manager such as *QDOS II* to remove any extraneous files. EDLIN (the clunky text editor that comes with DOS) and some word processors leave behind unwanted backup files with a BAK extension, for instance. You can usually delete them without harm. Remove the data files for completed projects and, if space is still tight, consider removing software you know you won't need on the trip.

There are some ingenious software packages that utilize hard disk space more efficiently than DOS. The simplest but least convenient is *PKZIP*, a shareware file compressor. You can't run files that have been zipped (compressed) without unzipping them to full size, but you can save a lot of disk space by storing inactive files in zipped format. You can also get a lot more onto a disk if you zip the files first. You can always save time and money by zipping files before transmitting them by modem. Just be sure the recipient has *PKUNZIP* to unzip the files.

An excellent new program, *Stacker*, can almost double your disk capacity. Using realtime lossless compression technology, *Stacker's* software compresses and decompresses your data on the fly. Once it's installed—an easy process—your hard disk is suddenly up to twice as big (because some files compress more than others, the exact amount of extra capacity depends on the nature of your data). On my TI TravelMate 2000 test unit, *Stacker* converted its 20MB hard disk with about 1MB available to a 40MB drive with 21MB available. I immediately loaded three large games that wouldn't have fit before and added *GeoWorks Ensemble*, and I still had almost 13MB open. It also worked beautifully with a half-dozen TSR programs, some odd device drivers, and a disk-locking program.

File transfer programs. Buy a good file transfer program that comes with a special cable to connect your laptop with any other computer and lets you copy files back and forth. Traveling Software's LapLink III and Rupp's *FastLynx* are two of the best. Install the program on the laptop and bring along a disk with the software for installing on potential host computers. (Bring it on a 5/4-inch disk, too, so you can rely on getting it onto any computer.)

You can usually install these programs on remote computers just by connecting the cable, but don't count on this working every time. Test the software by hooking up to another computer; be sure you know how it's done before you hit the road.

The TI TravelMate 2000 comes

Packing List

Here's a sample packing list that helps me maintain my sanity on business trips. Add to it or take away from it as your needs dictate.

- Computer
- Power cord
- External units: disk drives, batteries, power cord, port adapters
- Computer manual
- Printer cord
- LapLink cord
- Mouse/mouse substitute and adapters
- Mouse pad
- Surge protector
- Extension cord
- Road Warrior Toolkit or equivalent:
 - Screwdrivers
 - Multiple RJ-11 adapter
 - Phone cord
 - Pliers
 - Alligator clips
- Modem or fax/modem
- Extra batteries
- Software manuals, templates, quick reference cards
- Software books
- Laptop book
- Extra disks and sturdy disk carrier
- Disk labels and a felt-tip pen
- Portable printer
- Paper
- Copy-protection documentation for games
- Voltage converter for foreign travel
- Three-prong grounded outlet adapter
- DOS disk
- Auto power adapter
- List of phone numbers of online services in destination cities
- List of software and hardware customer support phone numbers
- Small but strong light source
- Aspirin or Tylenol
- Alka-Seltzer

with a special version of LapLink in firmware and a transfer cable. I had to load my standard LapLink III, however, because I couldn't stand the limited set of LapLink features available in the firmware version.

Security. Laptops are the new darling of sneak thieves. Where else can you get \$5,000 worth of readily marketable electronics so easily? You'd have to steal 20-30 VCRs to make that kind of haul. People carry laptops around like purses, set them on chairs in airport concourses, and leave them on the floor while they make phone calls. They're easy pickings.

Eternal vigilance is the best defense, but software aids are available as well. They won't deter a thief, but they will frustrate him and foil any attempt to steal your data. Rupp's *Fast-Lock* locks your hard disk so that the computer simply will not run without the password you have assigned. You

can boot it with a DOS disk, but you still can't access the hard disk without the password. Give it three bad passwords consecutively, and it sings out like an air-raid siren—or as much like an air-raid siren as a laptop speaker can sound.

You can also protect your data using the file-encryption feature of *PC Tools* and other programs or by using file passwords offered by many application software packages.

Tape your business card to the bottom of the computer. You never know when this may help. You can also offer a reward for the return of the unit on your business card and put such a message in your AUTOEXEC .BAT file, so that it will be on the screen every time the computer is booted.

Battery-monitoring programs.

Traveling Software's *Battery Watch* is designed to precisely determine the amount of battery capacity remaining. It also offers a deep discharge feature that beats the battery's shadow memory problem. Nickel-cadmium (ni-cad) batteries have a tendency to remember the point at which they were recharged and assume that this point is total discharge, even when there is plenty of capacity left. (A recent research report from a Florida battery maker concluded that the shadow memory problem is a myth and that deteriorating behavior of ni-cad batteries simply results from their slowly wearing out. The jury is still out on this controversial matter.)

RAM disk. A RAM disk is a simulated disk created in the computer's working RAM. Because it isn't a disk at all, but rather high-speed memory, it is many times faster than reading and writing to disks. There is a significant downside to using a RAM disk, however; if you lose power, you've lost what was on the RAM disk.

An important benefit of a RAM disk is that it doesn't drain the battery the way a real disk drive does.

Peripherals

Now that the computer is set up with all that special software, it's time to consider what additional equipment you may want to bring along.

Mice or mouse substitutes. There are some great new pointing devices designed for laptop users from Ap-point, Suncom, Microsoft, and Logitech (see the product list).

Modems and fax modems. Being on the road usually brings out a need to communicate by telephone with other computers. You will need to have a modem for that. You could even buy a fax modem, which adds the ability to send and receive faxes directly from the computer.

You can buy your laptop with an internal modem, or you can buy an external portable unit such as the Worldport 2496 Fax Modem from Touchbase Systems. Portable units add to the clutter of things to take, but they also work with any computer (not just laptops). One portable modem is all you need for any computer you may be using.

The Worldport 2496 is about the size of a deck of cards. It houses a 2400-baud modem for use with online services or computer-to-computer communications. It also includes a 9600-baud fax machine that sends images of computer files to any fax machine anywhere. It can also receive faxes, converting them to computer files that you can then read or print.

Batteries and extra batteries. Depending on how much time you plan to put in with your machine away from AC power, you may need extra batteries. If you need extras and haven't yet bought a laptop, investigate the prices of extra batteries and external chargers as part of your buying decision. There's nothing worse than traveling with an expensive computer that won't run because the batteries are dead. The price of battery packs varies greatly from machine to machine. Always leave home with fully charged batteries.

Printers. Believe it or not, there are some tiny, lightweight portable printers that aren't unreasonable to carry around with your laptop. Your mobile printing needs would definitely have to be beyond the normal to justify buying a portable printer, but truly portable printers are available. The Canon BJ-10e portable bubble-jet printer, for example, is amazingly little—the size of a notebook computer—and it produces near laser quality print.

Documentation

The next problem you will face in moving your computer is carrying sufficient documentation for your hardware and software. If you take the manuals for every program you use and for your computer and all its peripherals, in no time you'll have a three-foot bookshelf of volumes to lug around. Some of that documentation is necessary, and you'll have to take it (like the manual for the computer itself), but there are some good alternatives for the rest of it.

After you are familiar with a program, you may be able to get along with just a keyboard template, quick reference card, or just the online help. The lightest solution for other programs may be one of the series of small quick reference books that major publishers like COMPUTE, Que,

Osborne/McGraw-Hill, and Sybex put out for major software titles. These small books contain operating information boiled down to the essentials. In any case, carry a list of the customer support phone numbers for all the software and hardware you'll be taking.

Taking this parsimony one step further, look for special books for laptop owners. Sebastian Rupley's *Portable Computing Official Laptop Field Manual* (IDG) and H. J. Liesert's *The Laptop User's Guide* (Abacus) both contain highly condensed but useful instructions for the most popular software programs so you can leave all the other manuals at home. Liesert includes advice on hooking up printers and mice and offers general laptop advice. Rupley includes essential information on the most popular computers.

David H. Rothman's *The Complete Laptop Computer Guide* (St. Martin's Press) is full of common-sense advice, tips for successful laptop use, and information on various countries' customs requirements. The chapter on hooking your modem to phones under every conceivable circumstance is in itself worth the price of the book.

Proper preparation is the key to a successful laptop trip. If you've outfitted the computer with some of the above helps and thought through your packing list, your trip will be a breeze.

On the Road

One of the first obstacles on your trip is the airport security check. Is the security check hazardous to your computer and software? Opinions vary, as do official pronouncements, but if you're the play-it-safe type, insist they hand-check your computer and not run it through the x-ray machine. If you're a little more trusting—as I am—go ahead and run it through the x-ray. Although they may affect film, x-ray machines probably will not hurt the computer or disk. My computers have been x-rayed dozens of times without harm. On the other hand, metal detectors may tend to corrupt data stored on magnetic disks because the metal-detecting process involves electromagnetic fields.

Be prepared to unpack and boot your computer to prove to the security guard that it is indeed a computer and not a bomb. Allow plenty of time for this. Don't be stuck showing your computer to the security staff as your plane pulls away from the gate.

Once you're aboard the aircraft, you may want to use the computer. Because there is a potential for disruption of the sensitive electronic instrumentation of the aircraft, it is considered polite to check with the

Entertaining Yourself on the Road

One of the great disappointments of laptop computing arises when it's time for fun. Today's computer games feature fabulous 256-color VGA graphics and sound board support—which simply won't work with laptops. Many laptops have Stone Age CGA screens—and almost all are monochrome. And newer games don't even support CGA anymore.

A few games, more by a fortuitous accident in choice of contrasting colors than by design, provide recognizable monochrome screens. I've searched diligently for games compatible with laptops, finding among them these standouts:

Silpheed. This classic shoot-'em-up space game is primarily black-and-white even on a VGA color screen. It looks so good on a laptop that it might have been written for one. Imagine blasting away at alien ships from your airplane seat in the skies over Kansas.

Manhattan Software Card Games. Manhattan has nine excellent card games that provide only the simplest of graphics. The outstanding gameplay, however, more than makes up for the plain-Jane look, which, after all, is what makes the games work so well on laptops. My day isn't complete without a few hands of *Cutthroat Pinochle*, which is a guaranteed delight.

Hoyle's Book of Games I and II, Laptop Editions. These two Sierra games are the only laptop-specific games I've

seen. By stripping out the color and sound and limiting the video to CGA, Sierra can sell these games for a pittance. Volume I includes eight popular card games including Hearts and Gin Rummy. Volume II includes 28 solitaire games—all the traditional ones and a few making their first showing here. These visually stimulating games provide animated opponents, including characters from Sierra's King's Quest games.

GameTek's TV Game Shows. These inexpensive games, *Jeopardy!* and *Wheel of Fortune*, are both graphically simple and brain-ticklingly fun enough to earn a place in your travel kit.

Other games well suited to the laptop environment include *Tetris*, *Welltris*, *Solitaire Royale*, the early Accolade driving games (*The Cycles*, *Grand Prix Circuit*, and *Test Drive*), *Chessmaster 2100*, *Microsoft Flight Simulator 4.0*, *Qix*, *Empire*, *Action Stations*, *World Class Leader Board*, and *Tracon*. *Sim City* fans will find that it's possible to continue their addiction on a laptop, particularly with the newer VGA machines. Unfortunately, I have yet to find a fantasy role-playing game that is much fun on a laptop.

Take a few of these gems with you, and you won't be bored. But be prepared for odd looks from fellow airline passengers when you tell Princess Rosella to shut up and deal. And try not to growl imprecations at Xacalite, the evil enemy in *Silpheed*, until you get to a more private place.

stewardess before firing up your laptop, especially on foreign airlines.

One last airline hint: Aisle seats give you more elbow room for the sometimes difficult feat of lapping on an airline food tray.

Computing in the Hotel

Hotels present their own challenges to laptop users. The one you hear the most about is the difficulty of tapping into the phone lines with your modem, which can be a nightmare. If you are taking an extended trip and need access to the phones, you can call ahead and find a hotel that promises access to RJ-11 jacks (the standard modular phone plug), but don't expect hotel desk clerks to be knowledgeable about telephone equipment. They may know, however, when the hotel was built. Oddly enough, the older the hotel, the more likely you can use its telephone equipment without major problems.

Hotels built in the 1970s and 1980s purposely made it difficult to get at any kind of phone connectors—the worst situation being when they have wired directly from the wall to the receiver with no plugs anywhere along the line.

Use the Road Warrior Toolkit from Computer Products Plus in

these situations to alligator-clip onto wires in the unscrewed mouthpiece end of the handset. You can find jury-rigging equipment similar to those in the Road Warrior Toolkit at Radio Shack and similar stores. If you're assembling your own kit, don't forget pliers, screwdrivers, alligator-clip leads, RJ-11 jack doublers, and other adapters and converters. An easier but more expensive solution is an acoustic coupler, such as the Telecoupler from Computer Products Plus, which straps onto any telephone handset to feed the computer signals into the phone without a direct-wire hookup.

Another problem with doing your computer work in a hotel room is less obvious. Many of us travel, planning to work several hours in the hotel in the evenings. By the time the trip is nearly over, it's obvious that we've failed to meet our productivity goals. Why? Well, consider: Does your office have cable TV, including HBO? Does it have an inviting bed? Is there an interesting new city just outside, asking to be explored? Probably not. Add these distractions to the irritation of essential information you forgot to bring, and it's little wonder productivity plummets on the road, despite our best intentions. Just because you now have a computer available

around the clock, that doesn't mean you should expect to attain super-human production levels on a trip.

Online Services

The online services such as CompuServe and GENie can be lifesavers when you're on the road. Be sure to take the local access phone numbers for your destination cities.

These international computer networks give you access to almost unlimited communication facilities. Need to send a fax quickly from your hotel room? Dial up your online service, and with a few simple commands the fax is sent. There's a charge for this, but it's quite reasonable.

Electronic mail, or E-mail, is extremely handy as well. If your office or home has a computer and modem, you can leave private messages for the folks you left behind through the phone. You can even transmit whole computer data files through E-mail. E-mailing files makes them immediately available to the addressee from anywhere in the world.

The networks can also be an auxiliary file storage area. Important files can be uploaded and saved online until you download them upon your return. If your laptop dies or is stolen or if the airlines lose your luggage and all your floppy disks, your data file is still safely stored on the network.

Extensive databases of almost every kind are available through the online services, freeing you from the need to carry reference materials with you. And finally, the various special interest groups in the online services give you access to people who can help you with any kind of problem, computer or otherwise. (When I needed interviews for a magazine article I was writing at night on a business trip in Hawaii, I posted a notice on GENie. Within a few hours, I had all the people I needed, complete with quotations I could use without transcribing a tape.)

Running Your Computer

While running the computer on batteries, do everything you can to keep from accessing the hard or floppy disk drives unnecessarily. Most laptops save energy by turning off the disk drive motors when you haven't accessed the drives for a few minutes. Some require you to turn them off when you don't need them. As soon as you request data from the disk, the computer restarts the motor, spins the disk, and retrieves or writes the data. Any time the disk is spinning, you're eating away your battery power.

This is one of the benefits of the RAM disk we discussed above; it involves no spinning of disks. >

Product List

Battery Watch Pro

\$49.95
LapLink III
\$149.95
Traveling Software
18702 N. Creek Pkwy.
Bothell, WA 98011
(800) 343-8080
(206) 483-8088

Canon BJ-10e

\$499.00
Canon U.S.A.
One Canon Plaza
Lake Success, NY 11042
(516) 488-6700

The Complete Laptop Computer Guide

ISBN 0-312-050623
\$18.95
St. Martin's Press
175 Fifth Ave.
New York, NY 10010
(212) 674-5151

Cutthroat Pinochle

\$35.00
Manhattan Software
P.O. Box 148
Peterborough, NH 03458
(800) 432-5656

FastLynx

\$149.95
FastLock Plus
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Rupp
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Los Angeles, CA 90046
(800) 852-7877

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Suncom Technologies
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Wheel of Fortune Vol. II

Wheel of Fortune Vol. III

\$11.95 each
GameTek
2999 NE 191st St., Ste. 800
N. Miami Beach, FL 33180
(305) 935-3995

Laptop UltraVision

\$69.95
Personics
63 Great Rd.
Maynard, MA 01754
(800) 445-3311

The Laptop User's Guide

ISBN 1-55755-083-2
\$19.95
Abacus
5370 52nd St. SE
Grand Rapids, MI 49512
(800) 451-4319
(616) 698-0330

Logitech Trackman Portable

\$169.00
Logitech
6505 Kaiser Dr.
Fremont, CA 94555
(800) 231-7717
(415) 795-8500

Microsoft BallPoint Mouse

\$175.00
Microsoft
One Microsoft Way
Redmond, WA 98052-6399
(800) 426-9400

MousePen Professional PC

\$109.00
Appoint
1332 Vendels Cir.
Paso Robles, CA 93446
(800) 448-1184

No-Squint II

\$49.95
SkiSoft Publishing
1644 Massachusetts Ave., Ste. 79
Lexington, MA 02173
(800) 662-3622
(617) 863-1876

PKZIP

\$47.00
PKware
9025 N. Deerwood Dr.
Brown Deer, WI 53223
(414) 354-8699

Portable Computing Official Laptop Field Manual

ISBN 1-878058-10-X
\$14.95
IDG Books Worldwide
155 Bovet Rd., Ste. 730
San Mateo, CA 94402
(415) 358-1250

Road Warrior Toolkit

\$49.95
Telecoupler
\$149.95
Computer Products Plus
16351 Gothard St.
Huntington Beach, CA 92647
(800) 274-4277

Silpheed

\$34.95
Hoyle's Book of Games I and II
\$34.95 each
Sierra On-Line
P.O. Box 485
Coarsegold, CA 93614
(800) 326-6654

Stacker

\$149.00
Stac Electronics
5993 Avenida Encinas
Carlsbad, CA 92008
(800) 522 7822
(619) 431-7474

TravelMate 2000

\$3,199.00
Texas Instruments
P.O. Box 202230
Austin, TX 78720-2230
(800) 527-3500

Worldport 2496 Fax Modem

\$699.00
Touchbase Systems
160 Laurel Ave.
Northport, NY 11768
(800) 541-0345

A disk defragmenter (such as *Optune* or *Spinwrite II*) will make your disk accesses faster and more efficient and, over time, save a little battery juice.

Be aware that your laptop with its dependence on batteries and its exposure to unknown perils as you travel makes your data much less secure than it would be on a desktop unit. Back your data up frequently. Make floppy disk copies of files as you create them, just to be sure.

When You Get Home

When you get home, there are only a few essential things left to do. Download your network-stored files to your home or office computer. Upload your data files from the laptop to your desktop computer using LapLink or a similar product, or transfer them by floppy disk if there aren't too many. Clean up your hard disk and rerun your disk optimizer to defragment and pack your files again.

In this process of transferring the files back to your desktop computer, be wary of confusing older versions of files with newer ones. Concentrate and be sure that you are transferring the files in the right direction. More than one travel-weary computerist has absent-mindedly written the pretrip versions of his files over the newer ones generated on the trip.

Stash away all your travel kit items in good order so that everything will be ready for your next adventure. That way, once you've assembled your travel survival kit, you'll never have to worry about it again except for simple maintenance.

Pull up that packing list file you saved on the laptop before you left and have a critical look at it. What did you take that you didn't use? Delete it from the list. What did you leave home that you needed? Add it to the list. After a few trips, your packing list will be fine-tuned to give you exactly what you need every time.

Finally, if you set new records playing *Tetris* on your trip, copy the high score file from your laptop to your desktop so that the vanity board will reflect your new triumph.

Congratulations! You've made it through your first laptop trip. You'll agree, I'm sure, that your laptop is indeed a different breed of animal from a desktop unit, but you're well on your way to taming it. □

Richard O. Mann, CPA, CIA of Roy, Utah, is an internal auditor for the Church of Jesus Christ of Latter-Day Saints. His job has taken him to Brazil, Hawaii, Samoa, Tahiti, Cincinnati, and other exotic locales, always with a portable computer. Look for him on GENIE as R.MANN3.

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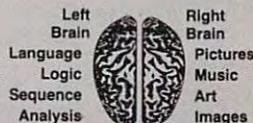
			
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"American managers with language skills open more doors."
Wall Street Journal Editorial
July 25, 1988

Accelerated Learning Language Series. The series is so effective, we guarantee you'll be hearing, reading, understanding and beginning to converse in your new language in 30 days - or your money back.

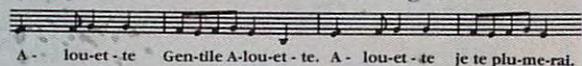
This unique new system links the left side of the brain (language and logic) with the right side of the brain (music and art) for dramatically increased retention and learning speed. In the same way you remember the words to a song with little or no effort, Accelerated Learning



uses Baroque music to "un-stress" the learning process.

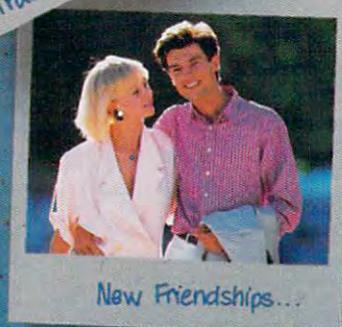
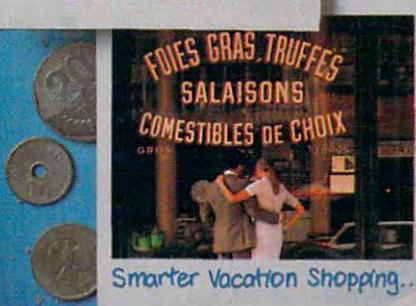
Boost your memory with music.

Have you ever wondered why you can remember the words to a song with little or no conscious effort? Music stimulates right brain



activity. Speech is a left brain activity. When the two are combined, as in a song, you have left/right brain linkage. You've used your whole brain, so your memory is much stronger. Accelerated learning uses the same technique. You will learn the language as *stresslessly* as a child does, by hearing new vocabulary and phrases in alternately loud whispered, and emphatic intonations, all accompanied by slow, rhythmic music. The effectiveness of Baroque music as a memory aid is well documented and leaves you feeling alert and rested.

"American ignorance of other tongues has been hurting American business executives in their competition for (overseas) markets."
The New York Times
September 5, 1988



Rewards of language?

			
JAPANESE 30 cassettes plus triple bonus \$265.00	CHINESE 30 cassettes plus triple bonus \$265.00	RUSSIAN New! Available Jan '91 \$265.00	BRAZILIAN Portuguese New! Available Jan. '91 \$265.00

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"I'm 52 years old, and if someone had told me I would have become articulate in a foreign language in four weeks, I would have said they were wrong."

Joseph A. Kordick
Ford Motor Company

course. Each language lesson contains a *study* tape and a *memory* tape. The study tape (along with the U.S. State Department text) explains rules and grammar of the new language. These are the tapes used by the **Foreign Service Institute** to train career dip-

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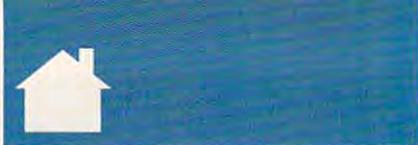
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***P.S.** Best Value! With a total of 32 cassettes plus study material, this offer represents the best value available today in language instruction. Compared to other programs, the Accelerated Learning series outperforms them with twice the audio and 20 times the study materials.

Another language is a major social and business asset.





SHAREPAK

R I C H A R D C. L E I N E C K E R

Want to create a masterpiece, take a learning voyage through space, or track the movement of the earth, sun, and moon? Then you'll want to get this month's *SharePak* disk, which has something for everyone. *TurboPaint* is a full-blown art program that runs in Hercules, CGA, EGA, Tandy, and VGA. *Math Voyager* is a commercial-quality arcade-style educational game, and *EARTHWATCH* is a program that helps you track the earth's movement with a time-lapse effect.

Each month we download hundreds of programs, screen them, and narrow the field down to a few of the best. The result is our *SharePak* disk—always packed with fine programs for one low price.

After downloading, we decide which programs are best suited for this month's editorial focus and then do one more round of testing to make sure our choices for you are up to snuff. Downloading as many programs as we do would cost you more than twice the price of COMPUTE's *SharePak* disk, so you save time and money by ordering the disk.

TurboPaint 1.5

This full-featured paint program will really surprise you. It has almost all the features of a commercial paint program, yet it's so easy to use. With its well-designed screen and clear pull-down menus, you'll be creating your own computer artwork in no time.

Plenty of different systems are supported, too. Hercules, CGA, EGA, Tandy 16-color, MCGA, and VGA cover the gamut of video modes. You also won't have trouble loading in different files, since PCX, IFF, and GIF picture formats are supported, and you can load in any GEM font, so fancy text is no problem. When you're through, you can print out your creation on any of 193 printers supported.

TurboPaint has all the drawing tools you would expect: lines, boxes, circles, ellipses, cut and paste, fills, air-brush, freehand, and ray tools. For

fine-tuning pictures, you can use the zoom feature and draw pixel by pixel.

To effectively run *TurboPaint*, you need 512K of free RAM. If your system has 512K built in, that means you have less than 512K available because DOS and memory-resident utilities use up some of it. Although the program's main control device is a mouse, you can run it without a mouse, since keyboard and joystick drivers are provided.



The registration price is \$20, which includes the latest version of *TurboPaint*, a fonts disk packed with over 80 fonts, a clip art disk, and an art disk.

Get this great program and paint up a masterpiece.

Math Voyager

Take a voyage into deep space. You'll have to be on your toes, though. By answering math problems, you'll guide your starship through the void, and if you're clever and fast, you can zap the aliens and chart a course to the destination star cluster.

This game is great for kids as young as eight years old, but after I finished playing, my own computa-

tional skills were honed razor sharp.

You can set the program for addition, subtraction, multiplication, division, or a combination of the four, and set numbers to whole, decimal, or mixed. You can also set the difficulty level to encounter black holes along the way.

You'll need at least 384K and a CGA graphics card to run this program. Mouse support is included if you have a Microsoft-compatible mouse.

If you decide to order the full-blown version for \$14.95, you'll see the graphics in EGA, Tandy 16-color, MCGA, or VGA modes.

Fine-tune your math skills and have a great time. Not only will this game provide hours of entertainment, but it might help your kids get better grades in school or even help *you* get an edge on your own math skills.

EARTHWATCH

This program graphically displays the earth-moon system's march through time. You'll see the 24-hour day-and-night cycles due to the earth's rotation, the moon's monthly phases, and the earth's annual trip around the sun with the passing of the four seasons.

A map of the world will slowly scroll eastward across the screen as the continents in turn move daily from predawn darkness through sunrise and daylight, and then through sunset back to night.

It's fascinating to watch the shape of the daylight zone change ever so slowly from day to day as the seasons progress.

As an added plus, you can call up a special almanac screen to display additional information such as comparison of sunrise and sunset times with those of the previous day.

For anyone with an interest in weather, astronomy, or time zones—fishermen and wildlife buffs, kids working on science projects, backyard stargazers—*EARTHWATCH* is a real find. It's a lot of fun, and it's a great way to keep track of the earth's natural cycles. Don't pass it up! □

With COMPUTE's *SharePak*, You'll

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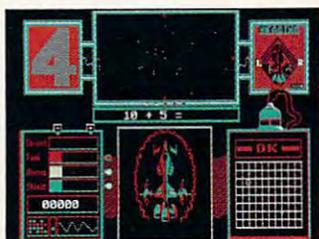
SAVE TIME—we carefully select and test all programs for you

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SAVE KEYSTROKES—our free DOS shell lets you bypass the DOS command line



TurboPaint 1.5



Math Voyager



EARTHWATCH

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

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COMPUTE's *SuperShell* requires DOS 3.0 or higher. Disks available only for IBM PC and compatibles. Offer good while supplies last.

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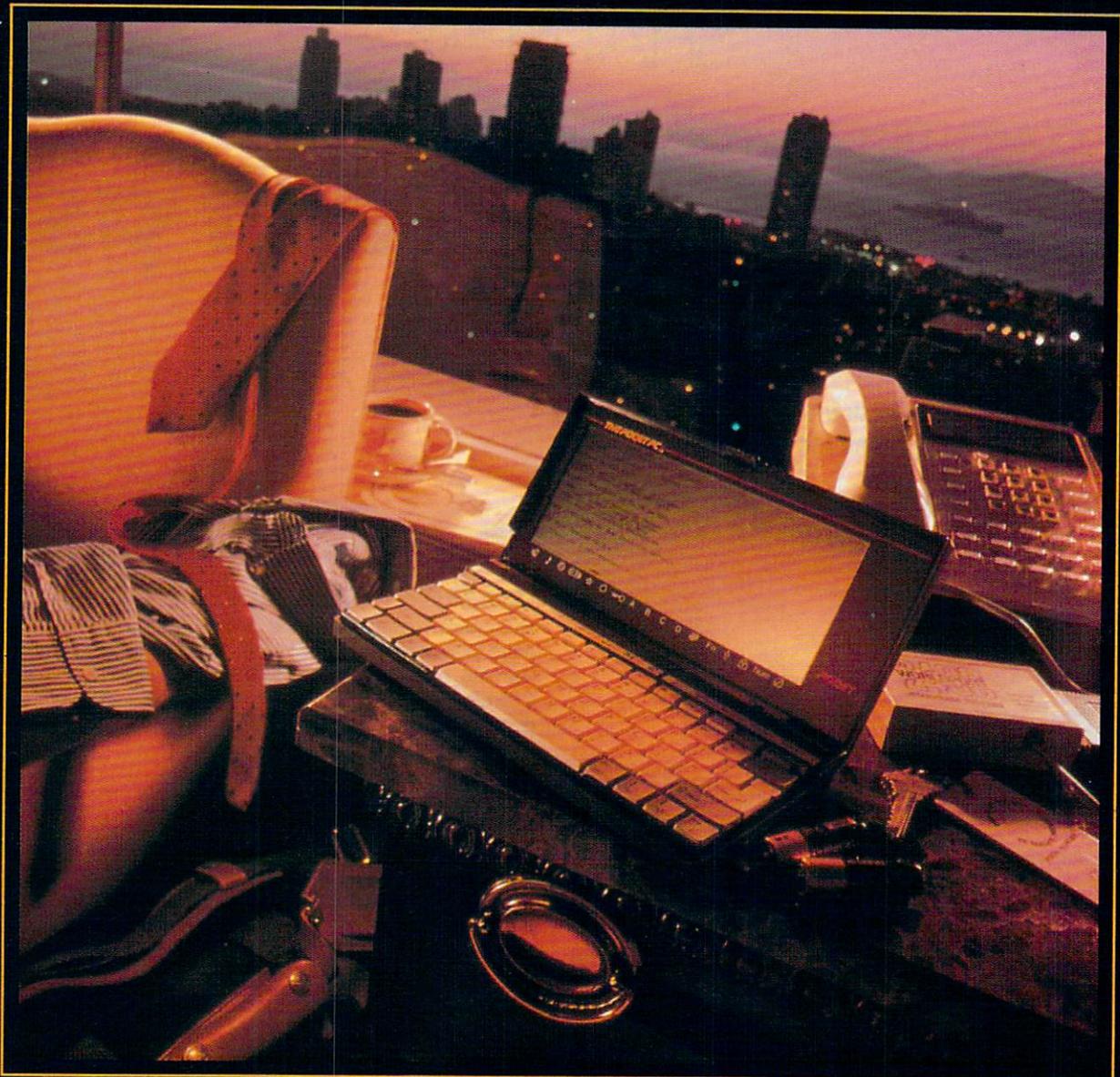
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POCKET COMPUTER CORP.

POWER IN YOUR POCKET

By Scott Leibs

Laptop and notebook computers let you take your work where you've never taken it before, but when you're standing at an airport pay phone or making your way through the crowded aisles of a trade show, they simply aren't portable enough.

Fortunately, a recent explosion in hand-held electronic organizers now lets you reach into your pocket and pull out reams of data as well as a variety of powerful applications. Push a few keys, and you can call up phone numbers and appointments, keep track of expenses, and maybe even recommend the perfect bottle of wine at dinner.

In fact there are so many electronic organizers, if you decide you need one, you could get completely disorganized trying to sort through them all. And with new models being introduced frequently and competitors copying each other's best features, the field can seem to be one big moving target. Fortunately, all this competition also means prices are dropping fast.

The first thing to do is set your spending limit; then decide how much computing power you need to hold in your hand. If you

want to keep to a minimum the price of your initial foray into this new breeding ground of electronic brains, the DataStor 1000c from SelecTronics might be a good place to start.

This device retails for about \$40 and offers the most basic functions—calculator, electronic memo pad, phone directory, and appointment calendar. Just slightly larger than a credit card, it has a two-line screen, alarm, battery-backed memory, and other features. Despite the fact that its limited functionality keeps programming to a minimal level, programming it isn't entirely intuitive—don't throw away the directions. But if you want to keep phone numbers handy and you can keep your memos brief (the non-QWERTY keyboard will likely frustrate anyone accustomed to touch-typing), the DataStor 1000c has its uses. If nothing else, it allows you to invest very little money to find out if you've got what it takes to leave diary and pencil behind and trust your appointments to an electronic device.

Far more function-rich—and expensive—are the high-profile Sharp Wizard and the Casio B.O.S.S. In fact, these are entire fam-

ilies of products, with new models added seemingly every month. They're powerful tools with many built-in features and they're enjoying a boom in the variety of available software.

The Sharp Wizard, the pioneer product in the field, comes in several different models ranging in price from \$110 to \$360 and weighing from five to ten ounces. The low-cost ZQ series is designed primarily for people who don't have extensive software needs. It has a QWERTY keyboard and up to 64K of memory, and it offers the ability to transfer data among members of the Wizard family (and with some models, between Wizards and IBM-compatible and Apple PCs) by using special cables.

The ZQ series offers built-in functions such as a calendar, calculator, scheduler, phone book, memo feature that can accommodate up to eight pages of data, and, on some models, a built-in ledger that tracks expenses as well as a to-do list that can prioritize activities. Data is displayed either 12 characters by four lines or 16 characters by eight lines.

The more sophisticated OZ series can accept software on smart cards. These credit-card-size circuit

boards offer applications ranging from language translators to city guides to a new fax/modem card to—naturally—videogames.

The OZ series also features a much better display of 40 characters by eight lines, more memory, and an expanded array of built-in functions, including a very useful built-in help feature. More software is coming every day (see sidebar), and the devices are proving popular among both consumers and business people. Several corporations, including Pepsi-Cola and Prudential, have bought thousands of units to give to field salespeople and others who need easy access to a wide range of information. San Diego Padres general manager Joe McIlvaine uses a Sharp Wizard to track the performance of minor league players, and New York Mets marketing vice president Jim Ross uses one to store the team's complete schedule as well as a list of good restaurants in each city the Mets visit.

The Casio B.O.S.S. (Business Organizer Scheduling System) is similar to the Wizard in virtually every way. While some Wizard models are meant to be opened like a book, with keyboard on one side and

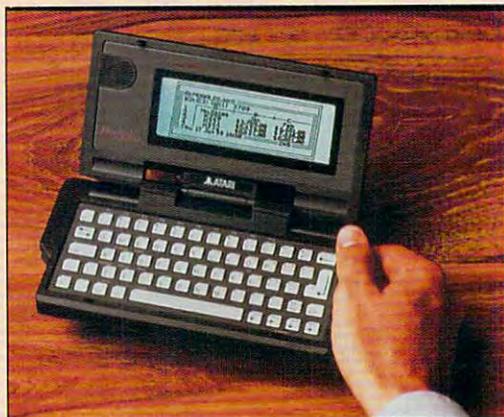
The kind of power
you need
to manage your
time
and resources
may be
sitting in the
palm
of your hand

BIG THINGS IN SMALL PACKAGES



COURTESY OF CASIO

In addition to business-oriented smart cards, the Casio B.O.S.S. accepts a number of "diskware" applications downloaded from a PC.



COURTESY OF ATARI COMPUTER

Atari's Portfolio is DOS compatible and comes with five built-in applications, including a Lotus 1-2-3 file-compatible spreadsheet.



COURTESY OF SHARP ELECTRONICS

The Oz version of Sharp Electronics' Wizard pocket computer is one of the more sophisticated pocket PCs.



COURTESY OF HEWLETT-PACKARD

Hewlett-Packard's 95LX is the newest palmtop to hit the market. The 95LX can act as an additional drive to a desktop PC.

screen on the other, all the Casio models open like a carton of eggs, with the keyboard held in the palm. While recent entries in the B.O.S.S. family accept software and memory upgrades in the form of smart cards, users can also buy some applications on 3½- or 5¼-inch disks that must be downloaded to the B.O.S.S. from a PC. While that's time-consuming, the applications cost only \$22.95. As of this writing, such "diskware" includes guides to wine, foreign languages, travel sites, weight loss and nutrition, and horoscopes/lottery numbers. Smart cards from Casio are more business-oriented and include a spreadsheet, expense tracker, and various dictionaries.

Casio has also begun to build some electronic-organizer capabilities into its calculators, allowing users to

program in phone numbers and brief memos. And two models of its Digital Diary fall squarely between the B.O.S.S. and upgraded calculators, allowing users to enter not just phone numbers but longer memos and schedules while also providing a month-at-a-glance feature.

Scientists and engineers who'd like a pocket-size tool all their own should take a look at Hewlett-Packard's \$350 HP 48SX (for Scientific eXpandable) calculator. This device lets you enter equations as you would write them on paper and provides a new level of graphics and calculus functions. The 48SX also accepts memory and applications smart cards, but be warned: This device is for the mathematically sophisticated. I literally had to read the owner's manual to figure out how to add 2 + 2.

For those who simply can't have enough power in hand, the emerging field of palmtop computers may be the answer. Like personal information organizers, these devices are lightweight (about a pound), can be held in one hand and operated with the other, and accept smart cards.

The similarities end there. The Poqet PC, a pioneer in the field, is a full-blown DOS computer with all the power that implies. The Poqet PC has a 77-key QWERTY keyboard, a display of 80 characters by 25 lines, and four drives (two internal, two that accept smart cards via sliding doors). By cabling it to a desktop PC, you can download any DOS application as well as transfer data in both directions. The unit comes with a handful of built-in (ROM-executable) applications, including a word processor,

Take your choice of these popular children's computer software programs worth up to \$59.95... **FOR JUST \$9.95!**

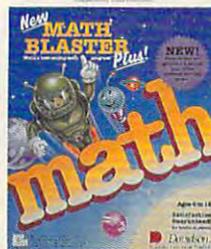
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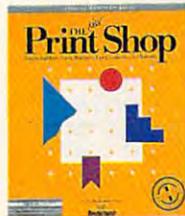
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SOFTWARE SELECTION GUIDE

Key to Colors:

- Ages 3-7
- Ages 7-10
- Ages 10-13+

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YES! Please send me the program I have indicated below to preview for 15 days at no risk or obligation. I may return the program after 15 days and have no further obligation. If I am pleased with the program, I'll pay for it at the special new member price of only \$9.95 plus \$2.95 shipping and handling, and enroll as a new member under the terms outlined on this page. As a new member, I need to buy just 3 more selections at regular club prices in the next year and may cancel any time thereafter.

Name _____
Address _____
City _____ State _____ Zip _____
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1. Please send me item number _____ to preview. (Please fill in identification number of program shown above.)
2. AGE of child (check one):
 3-7 7-10 10-13+
3. Computer you own and size of disk required (check one):
 IBM/Tandy & Compatibles with 5 1/4" disk drive
 IBM/Tandy & Compatibles with 3 1/2" disk drive
 Apple II Family & Compatibles with 5 1/4" disk drive
4. Child's name _____
 Child's birthdate: Month _____ Day _____ Year _____
5. Please check below if you have a:
 Printer Modem Color Monitor
6. Parent's Signature _____

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calculator, scheduler, and phone directory. An optional modem, external 3½-inch disk drive, and the ability to expand RAM up to 2MB takes you well beyond the typical electronic organizer, as does the \$1,450 list price. In fact, if your eyes are good enough and your fingers small enough, the Poqet PC could satisfy all your portable computing needs. Many other PC makers, including several Japanese companies, are aggressively pursuing the palmtop market, so the options here could mushroom by late 1991.

Smart Card Software

Hand-held information devices rely on a variety of miniaturized components. One of the most important is the integrated circuit (IC) card, also called a smart card or a RAM card/ROM card. These hard plastic cards are about the size of a stack of three credit cards. They hold from one to as many as eight microchips, depending on whether they are used to hold a software application or to expand memory.

The cards slide into a hand-held device in much the same way that a floppy disk slides into a desktop PC. One drawback at this point is that many devices have proprietary IC interfaces, meaning that a smart card for one will not work with another. Manufacturers of the cards are hammering out standards, which will ensure interoperability when used in machines that use the same operating system, although electronic organizers that use proprietary systems will continue to require specialized IC cards. That's a major reason why you should as-

sess the availability of software for a given model before you buy such a device. Currently, smart card applications are priced from about \$50 for games for the Wizard to \$495 for *XyWrite* for the Poqet PC. RAM cards follow a similar path, from about \$80 for 32K for the Wizard to \$700 for a 1MB card for the Poqet. As with the hardware, prices are expected to drop, although in the short term, the hassle of connecting to a desktop machine may be worth it. Many observers say that as computer makers try to cut the size and weight of laptop and notebook computers, floppy drives will be replaced by IC cards. If the U.S. embraces the cards for pay phones, pay TV, banking, and the many other things for which European consumers use them, you may need to be sure that every business suit you wear has two functional pockets: one for your hand-held computer and one for your smart cards.

—SCOTT LEIBS

Atari offers a sort of hybrid between the Poqet PC and the Wizard and B.O.S.S. Its Portfolio is a DOS-compatible \$300 device that has five built-in applications (*Lotus 1-2-3* file-compatible spreadsheet, text editor, calendar, address/phone directory, and calculator), a 40-character by eight-line display, and RAM expandable to 640K. As with the Poqet PC, one of the beauties of the Atari Portfolio is that it can run for weeks on three AA batteries (the Poqet uses two). A host of optional products, including a PC Card Drive, serial and parallel interfaces, file transfer cables, and 1200-baud modem let the user connect easily between the Portfolio and a desktop PC. While the base product doesn't pack the power of the Poqet PC, letting users buy peripherals as they are needed is a sound strategy.

Hewlett Packard's 95LX is the newest palmtop to hit the market. Weighing just 11 ounces with a 40-character by 16-line display, it's somewhat smaller than the Poqet and has 1MB of ROM and 512K of RAM. Designed primarily for spreadsheet users, it has a QWERTY keyboard with separate arrow keys and a separate nu-

mer keypad, and includes ROM-executable versions of DOS 3.22 and *Lotus 1-2-3* release 2.2 built in. The 95LX includes an advanced financial calculator and several printer drivers. Along with graphics, database, and macros features, *1-2-3* accessories include a filer, phone book, appointment book, communications module, and memo writer. Suggested retail price for the 95LX is \$699. The real power of the 95LX palmtop comes with an optional Connectivity Pack from Traveling Soft-

ware that includes *DOS Connect*, a TSR program that allows the 95LX to act as an additional drive to your desktop PC so you can access files without having to transfer them. The Connectivity Pack contains *DOS Connect* software and PC versions of the filer, phone book, appointment book, memo writer, and calculator; merge and translate utilities; and a special serial cable to connect your PC to the 95LX. Although not cheap at \$99.95, you'll want the Connectivity Pack if you get the HP 95LX. The power being packed into these hand-held devices is impressive, but they aren't panaceas. The QWERTY keyboards, for example, are a big improvement over the ABC type that many of the original pocket computer products offered, and the 95LX's separate keypad is certainly an advantage for spreadsheet users, but mainly they simplify the search for a given key; touch-typing is virtually impossible due to the small size of the keys and keyboards. And the displays are fine for reading a phone number or entering in a quick note to send so-and-so a business card, but draft a letter or two, and your eyeglass

prescription will suddenly be obsolete.

The efforts going into improving laptop screens and finding ingenious ways to make keyboards both portable and full-functioning (and, with folding keyboards, even full-size) are certain to further boost the potential productivity of these hand-held devices. Add to that the deep price cuts that intense competition is already inspiring, and business people in all walks of life will soon be reaching for pint-size computers the way they reach for pens today. □

Product List

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Dover, NJ 07801

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Connectivity Pack

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Sunnyvale, CA 94086

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MARK WAGONER © 1991

This month *COMPUTE*'s Test Lab focuses on mice, trackballs, and other pointing devices—14 in all. In combination with today's user-friendly software, especially today's popular graphical user interfaces, you can use these devices to traverse your screen and perform a variety of commands more easily. This month's lineup includes a variety of devices from mice to trackballs and special laptop peripherals such as the BallPoint, the MousePen Portable, and the ICONtroller. What's the best pointing device for your needs? Test Lab's expert reviews will help you decide. Our benchmark statistics offer you the specifics you'll need to choose the right device for your applications. And you'll find a variety of useful and interesting sidebars that explain the technology, provide background history, and show you how to maintain your mouse.

Appoint MousePen Portable
Kensington Expert Mouse
Key Tronic Professional Series Mouse
Kraft Mouse
Kraft Trackball
Logitech MouseMan
Logitech MouseMan Cordless
Microsoft BallPoint Mouse
Microsoft Serial-PS/2 Mouse
MicroSpeed PC-TRAC
ProHance Mouse
ProHance Trackball
Suncom ICONtroller
Z-NIX Cordless Super Mouse

APPOINT MOUSEPEN PORTABLE

The MousePen Portable is a unique attempt at solving a recent problem: bringing mouse control to laptop and notebook computers. It incorporates an age-old design into a new-age machine—a pointing device that you use like a pen.

The MousePen Portable's shape is, paradoxically, its advantage and disadvantage. The slim design means you can stick it in your shirt pocket or find room for it in your laptop case. You can use the MousePen on any kind of surface, including your leg.

Holding the pen correctly takes a lot of practice. The pen's manufacturer, Appoint, claims its studies show that people who are not predisposed to mice—that is, people who don't use them on a regular basis—adapt to the pen quite readily. For others, picking it up and using it correctly require extensive retraining.

What works best is to grasp the pen near the base, with an index finger on the lower button, which is equivalent to the left button on a desktop mouse. From this position you can move the pen as you would a ball-point pen. The movement of the pen as it relates to the onscreen cursor registers "dynamic gain," which means that the faster you move the pen, the more screen area you'll cover. Use small, slow movements for drawing, and swifter movements for menu selection or for selecting text.

The MousePen has two buttons, arranged vertically on the stem. The lower button has a raised knob on it to signal its function as the left button on a conventional desktop mouse. Connections are made through a PS/2-compatible connector or with the 9-to-25 pin serial-port adapter. The driver is Microsoft compatible, and I experienced no problems using the pen in *GrandView*, *Works*, and several other software applications.

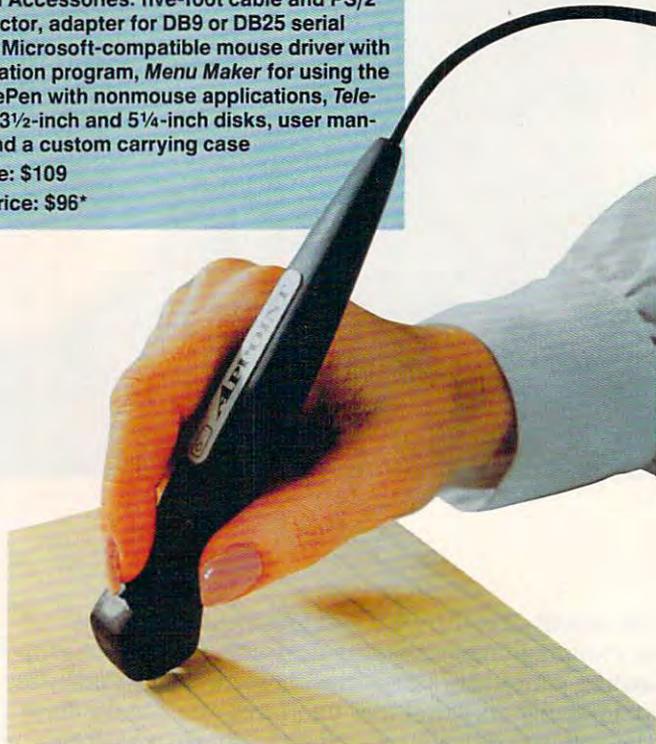
The MousePen package includes a mouse pad with a holder, which you can use if you decide to keep the

APPOINT
1332 Vendels Cir.
Paso Robles, CA 93446
(805) 239-8976

System Requirements: 256K RAM, serial port or PS/2 mouse port

Included Accessories: five-foot cable and PS/2 connector, adapter for DB9 or DB25 serial ports, Microsoft-compatible mouse driver with installation program, *Menu Maker* for using the MousePen with nonmouse applications, *Telepaint*, 3½-inch and 5¼-inch disks, user manual, and a custom carrying case

List Price: \$109
Street Price: \$96*



MousePen closer to home. The package also includes a basic paint program called *Telepaint* and a menu program you can use to design menus for your DOS applications.

For dyed-in-the-wool mouse mavens, the MousePen Portable is somewhat disappointing because its radical design poses as many problems as it solves. But it does work, and if you're prepared to put up with a nonstandard solution to the portable mouse

problem, it's certainly worth a test drive. It can also be useful for computer artists who are looking for a more natural drawing tool. In the meantime, the rest of us will wait for touchscreens on our laptops. ▶

PETER SCISCO

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

KENSINGTON EXPERT MOUSE

I've used the Macintosh version of this trackball for over a year now. Because it uses an optical sensor instead of mechanical moving parts, it's the only Mac trackball that comes close to the response of a mouse. When I heard that Kensington had developed a trackball for the PC, I was eager to give it a try.

The Expert mouse offers you the same look and feel as the top-selling Macintosh version. The entire unit is large (4½ inches × 5¾ inches) and sturdy—but more importantly, the ball itself is large and easy to move (it's about the same size as a billiard ball). The two oversized buttons are on either side of the ball and easy to reach. You can configure the unit as a one-, two-, or three-button mouse and even swap the two buttons for left-handed use.

You can also set up the Expert mouse with a handy click-lock mode. It's possible to configure the device with this option so that pushing and releasing one button (you decide which one) simulates holding the other button down. This option can be useful in graphics programs for drawing lines or dragging objects across the screen.

Kensington supplies its own mouse driver which lets you set the degree of automatic acceleration (the faster you move the ball, the more the cursor accelerates). You can also write your own acceleration curve table to further fine-tune the response. Unless you're using a high-resolution monitor (1078 × 768, or higher), the combination of a 200-dpi trackball and software-based acceleration should be sufficient for just about any of your applications.

As well as they work, trackballs aren't for everyone, so try one before you buy. If you do find you prefer a trackball to a mouse (or don't have the room to use a mouse), the Expert mouse is an excellent choice. ▶

DAVID ENGLISH

KENSINGTON MICROWARE

251 Park Ave. S
New York, NY 10010-7399
(800) 535-4242

System Requirements: up to 60K RAM, depending on how many of the drivers are selected for use

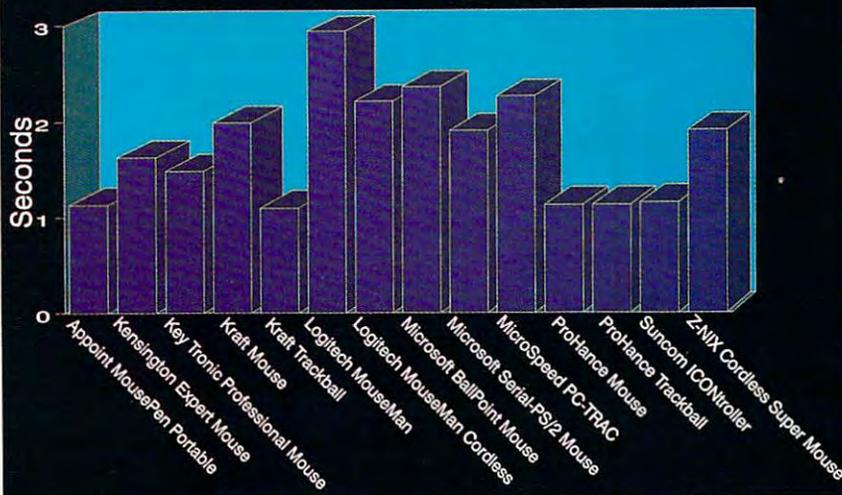
Included Accessories: manual, driver, menu software, and test software

List Price: \$149.95 for serial version (\$179.95 for bus version)

Street Price: \$100.50



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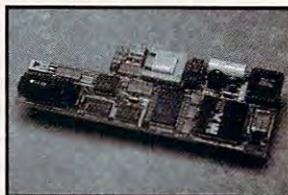


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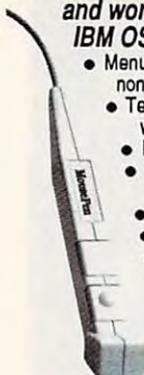


The MousePen

Uses existing drivers in Windows® and works with Microsoft or IBM OS/2 drivers. Includes...

- Menu Maker utility software for non-mouse applications
- TelePAINT® color paint program with VGA support
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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. #	DESCRIPTION	NSI
6451060	4MB Mem. BD PS/2 80-A21-A31	298.00
6450605	2-8MB Xpand Mem. PS/2 70&80	348.00
	w/2MB	
34F3077	2-14MB Xpand BD. PS/2 70&80	388.00
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6450609	2-14MB Xpand BD. PS/2 50-65SX	388.00
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256x4	5.35	5.70	6.00	6.75	7.50	
1MBx1	5.45	5.65	6.50	7.50		

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107854-001	4MB Mem. Xtionon 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 SH 286	162.00
110237-001	4MB Memory BD SH 286	630.00
112534-001	4MB Module DP386S-16	298.00
113131-001	1MB Module DP386E286, 386 20-25E	96.00
113132-001	4MB Module DP288E, 386 20-25E	228.00
113633-001	1MB Xpand Mem. DP386S-16	148.00
113634-001	4MB Xpand Mem. DP386S-16	358.00

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117077-001	512KB Mem. BD Portable LTE	119.00
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118689-001	2MB Module DP386N, 386S-20	168.00
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EP1000	1MB Epson EPL-6000	129.00
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EP4000	4MB Epson EPL-6000	249.00
T11000	1MB Texas Instrument MicroLaser PS	129.00
TB1000	1MB Toshiba Page Laser 6	118.00
TB2000	2MB Toshiba Page Laser 6	164.00
TB3000	3MB Toshiba Page Laser 6	208.00
TB4000	4MB Toshiba Page Laser 6	248.00

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M6005	1MB Apple LaserWriter II/INTX	85.00
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PC9-PA8340U	512K Mem Card Portable T3100E	120.00
PC9-PA8341U	2MB Mem Card Portable T3100E	168.00
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KTN2000	2MB Expansion Board /SX	440.00
KTN8000	8MB Expansion Board /SX	1,190.00

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500510-001	512K Upgrd Kit Prem 286 FASTRAM	39.00
500510-002	2MB Upgrd Kit Prem WS 386SX; WS 286; Bravo 286 & 386SX; Rampage Plus 286; Advntg Prem & 2; Ram Advntg; Advantage	118.00
500510-003	1MB Upgrd Kit Premium 386	96.00
500510-004	4MB Upgrd Kit Prem 386; Rampage Plus/MC; Advntg 286 & 386	310.00
500510-007	1MB Upgrd Kit Prem 386C; 386/16	65.00
500510-008	4MB upgrd Kit Prem 386C; 386/16	230.00
500510-010	512K Upgrd Kit Prem WS 386SX & WS 286; Bravo 286, Rampage + 286	39.00

CAT. #	DESCRIPTION	NSI
500510-011	128K Upgrd Kit Bravo 286	40.00
500709-001	512K Upgrd Kit Advn 2; Rampage PC	40.00
500709-003	512K Upgrd Kit Rampage Plus/MC	40.00
500718-001	1MB Mod. Prem 386/25 & 386SX/16	65.00
500718-002	1MB Mod. Prem 386/33-25; SX/16; 486/33; 25T; 25E; 25; 25E; Adapter Board 500722-004	75.00
500718-004	2MB Upgrd Kit Prem 486 Series	166.00
500780-001	8MB Kit Prem 486 Series	870.00
500818-004	1-16MB Exp Bd Prem 386/25-33; Prem 486's	450.00
ASTSX20	1MB Mod Prem II 386SX/20	84.00

HP MEMORY

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D1540A	1MB Up-Kit VECTRA QS/16S	62.00
D1540A	1MB Up-Kit VECTRA QS/16S	62.00
D2150A	1MB Mod VECTRA 486 PC	78.00
D2151A	4MB Mod VECTRA 486 PC	282.00
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KEY TRONIC PROFESSIONAL SERIES MOUSE

Key Tronic's Professional Series mouse is a two-button mouse, available in either a serial or a bus version. I reviewed the serial version.

Quick to install, the mouse came with complete and easy-to-follow documentation. You can connect the mouse to a 9-pin port or use the 9-to-25 pin adapter which comes with the mouse.

Key Tronic has contoured the mouse to fit your hand comfortably and has provided raised dots on the left button for quick orientation. Each of the buttons worked well; clicking and double-clicking achieved the desired results in the software I tried the mouse with. The mouse worked equally well on a pad or on a desktop.

Included on the disk is a nice extra: menuing software for *WordPerfect* 4.2 and 5.0, *Lotus 1-2-3* 1A and 2, and *dBASE III PLUS*. You also get a mouse test program.

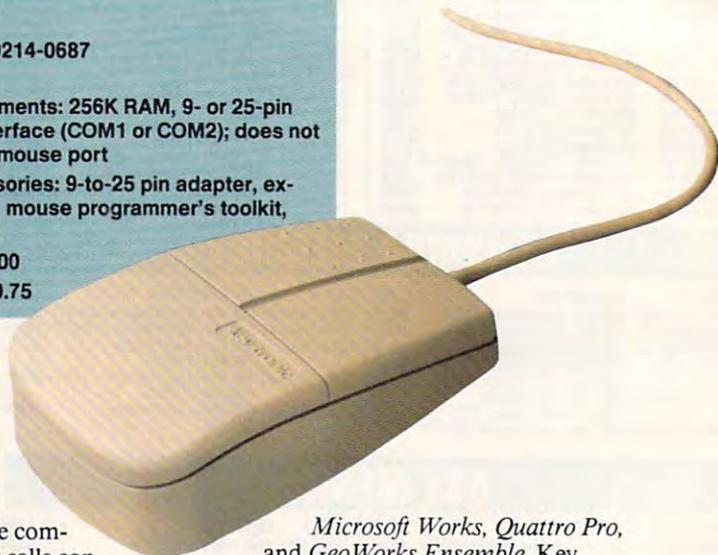
Another attractive feature is Key Tronic's toll-free support line, al-

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System Requirements: 256K RAM, 9- or 25-pin serial port interface (COM1 or COM2); does not support PS/2 mouse port

Included Accessories: 9-to-25 pin adapter, extension cable, mouse programmer's toolkit, mouse pad

List Price: \$109.00
Street Price: \$59.75



though I expect the company gets very few calls concerning the installation or operation of this mouse.

This mouse worked well with all the software I tried it with, including

Microsoft Works, Quattro Pro, and GeoWorks Ensemble. Key Tronic claims it will work with hundreds of software programs, including all of the most popular applications. ▶

STEPHEN LEVY

Mouse Driver Basics

My experience with mice has taught me one important lesson: Always use the latest Microsoft mouse driver.

Since almost every Microsoft product supports the mouse, most Microsoft software comes bundled with the latest driver. You may have ignored these drivers in the past, especially if you don't have a Microsoft mouse, but there are some good reasons to try them.

First, new applications often demand new drivers, and your current driver may not work with newer software.

In addition to compatibility, the latest driver is probably a better performer than previous ones, and it's usually more bugfree.

So, if you're offered a newer driver with a Microsoft product, try it. Since most mice are Microsoft compatible, the chances are good it will work with your mouse. The

problem you'll run into is that it probably won't work well. At least not without some adjustment.

With most non-Microsoft mice, the Microsoft driver will be sluggish. You can adjust the sensitivity of the driver and cure this problem, but unfortunately, the information you need to do this appears only in the mouse manual that comes with the Microsoft mouse. If you don't have a Microsoft mouse, you're left holding the short end of the mouse tail. Here are some guidelines to make your mouse work with a Microsoft mouse driver.

There are two ways to adjust the mouse's sensitivity. You can combine horizontal and vertical sensitivity into one number with

DEVICE = MOUSE.SYS /Sn

where *n* is sensitivity. Or specify horizontal and vertical sensitivity separately with

DEVICE = MOUSE.SYS /Hn /Vn

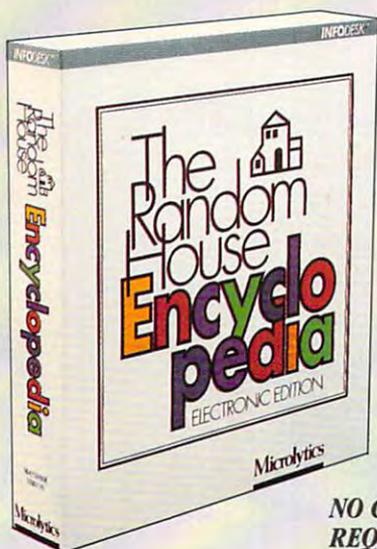
with the numbers after H and V indicating the horizontal and vertical sensitivities, respectively.

The value for *n* can range from 5-100. Higher numbers make for a faster mouse. The same syntax works for device drivers installed in CONFIG.SYS (MOUSE.SYS) or as a TSR (MOUSE.COM).

I've found that for non-Microsoft mice, sensitivities of 50 and higher work best. Start by finding the number that works well using the /S switch. Then fine-tune the mouse's movement by specifying separate numbers for horizontal and vertical sensitivities.

—CLIFTON KARNES

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THE MOUSE BENCHMARK TESTS REVEALED

You can hold it, maneuver it, and price it, but how will you know whether a mouse or other pointing device has what it takes for your applications? Our benchmarks should help. Following are some explanations to assist you in sorting out the facts.

Time for 60,000 Mouse Driver Interrogations

Mouse-driven software relies on the mouse driver to keep up with the status of the mouse, including the cursor position and state of each button. To get this information, applications need to make a call to the mouse driver that reads this information.

The faster the driver returns the information, the less time the application spends waiting for the update. That means that applications perform more efficiently and you spend less time waiting for the program to perform its housekeeping chores.

Our benchmark program timed 60,000 reads, and you can see the results in the chart labeled "Time for 60,000 Mouse Driver Interrogations." The lower bars indicate the better performances.

Vertical Sensitivity Reported for Entire Screen

Your mouse reports even the smallest movement to the software driver. A mickey is a unit of distance which is approximately

1/200th of an inch. The mouse software keeps track of where the mouse is by counting the number of mickeys the mouse device moves horizontally and vertically. The greater the sensitivity setting of the software, the greater the movement on the screen for each device movement.

We performed our vertical sensitivity benchmark test three times and then calculated the average of the three. The tests report the actual number of mickeys that the mouse moved as the cursor traveled from the top of the screen to the bottom of the screen. The greater the number, the more mickeys the mouse traveled and the greater the mouse device movement required to move the mouse cursor on the screen.

How do you know what's best for you? That depends on how you like your mouse to respond. If you prefer more movement of the mouse cursor for less movement of the mouse device, then greater sensitivity will suit you. If you look at the graphs, you'll notice that the lower bars indicate less movement of the mouse device required to move the cursor down the screen. That means they're a bit more sensitive.

If you use a desktop publishing, CAD, or art program, you might want the driver set to a lesser sensitivity. That will give you greater accuracy as you use your mouse.

Most mouse software can be config-

ured to various settings when it is installed. We used the default settings and then doubled that sensitivity for the second test.

Horizontal Sensitivity Reported for Entire Screen

Just as our vertical sensitivity benchmark test reports the number of mickeys that the mouse device traveled while the mouse cursor moved from the top of the screen to the bottom, the horizontal test reports the number of mickeys that the mouse device moved while the mouse cursor moved from the left side of the screen to the right.

The greater the number, the more mouse movement required to move the mouse cursor. So the higher bars indicate that the corresponding mice were set for less sensitivity.

Sensitivity Reported for One Inch of Vertical Screen Movement

This test reports the number of mickeys that the mouse moved for a vertical screen cursor movement of one inch.

Sensitivity Reported for One Inch of Horizontal Screen Movement

This test reports the number of mickeys that the mouse moved for a horizontal screen cursor movement of one inch.

—RICHARD C. LEINECKER

KRAFT MOUSE

The Kraft mouse is a three-button mouse whose low-current design accommodates a wide range of computers, from laptops with 5-volt RS-232 ports to standard desktops with 12-volt ports. The mouse also comes with 9- and 25-pin connectors, making it easy to connect to any serial port.

Pressing the middle of the Kraft's three buttons is the same as pressing the left and right buttons simultaneously. The exact operation depends on the software you happen to be using.

The mouse driver can be installed manually or automatically on hard drives or floppy drives. Installation and operation are clearly explained in the two slim manuals that accompany the mouse. Advanced users can customize their installations.

The accompanying software offers users a resident utility for changing the resolution of the mouse from 10 to 1150 dots per inch (dpi). Most mice have a resolution of 200 to 340 dpi. You can make adjustments at any time while running most mouse-supported applications.

Additional features permit the Kraft mouse to be used with applications that normally do not support a mouse. Several menus are supplied for such programs as *Lotus* and *WordPerfect*. An accompanying script language permits you to create custom pop-up menus for almost any application that does not normally support a mouse.

The Kraft mouse appears to be well made, has a solid feel, and comes with a five-year warranty. The ability to fine-tune its cursor sensitivity is a particularly attractive feature. When used with a fast-moving arcade game, the ball occasionally seemed slow to engage the contacts. In testing with other games, applications, and CAD packages, however, the Kraft mouse performed extremely well. ▶

TOM NETSEL

KRAFT SYSTEMS
450 W. California Ave.
Vista, CA 92083
(619) 724-7146

System Requirements: 128K RAM

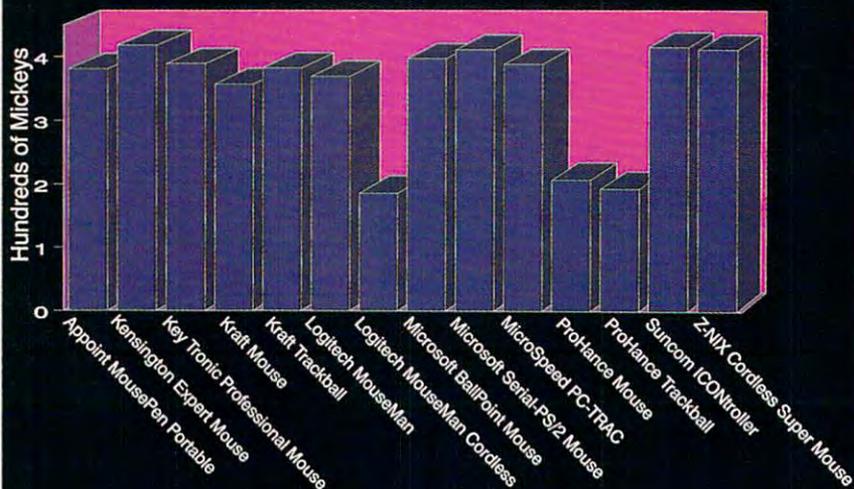
Included Accessories: two manuals, 3 1/2- or 5 1/4-inch disks with drivers, *MenuPops* software

List Price: \$79.95 (\$99.95 with *Telepaint* software)

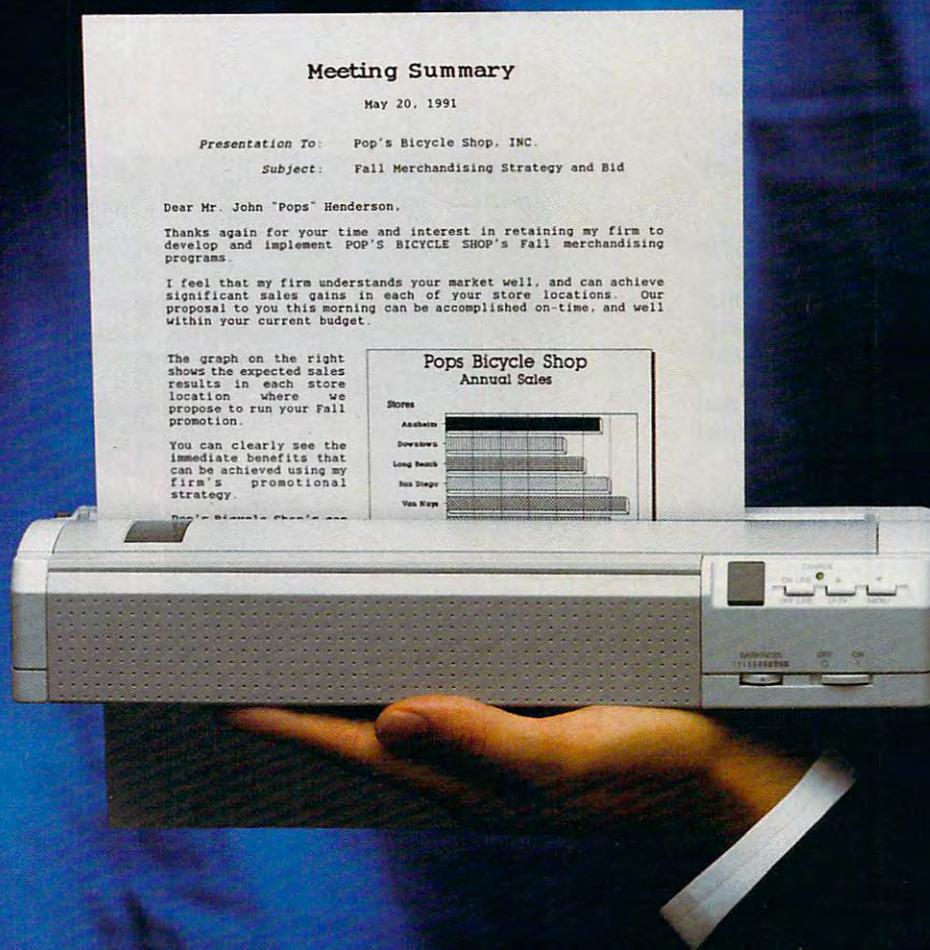
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KRAFT TRACKBALL

Most mice would feel right at home amid the clutter of my desk top—but not mechanical mice. That's why the prospect of using this Kraft trackball intrigued me. Finally I'd have room on my desk, not to mention the freedom to move unencumbered around the desk top on my screen.

Software installation was a snap—I just followed the directions in the documentation, which I rate as very good. Don't overlook the on-disk documentation, which provides plenty of valuable information about optimizing for your applications.

Switching from my mouse to the Kraft trackball took some getting used to—rather like learning a new gear-shift configuration. With practice, however, I began to appreciate it. I placed my middle fingers on the ball and my thumb on the leftmost of three buttons below the ball and was able to traverse the screen fairly easily. Using the right button or the middle button is less natural, more difficult, and, thankfully, seldom required. A few of the applications I use allow me to highlight text by clicking and dragging, and this would be unbearably awkward had Kraft not been thoughtful enough to include a fourth button above and to the left of the ball. It functions like the left button, but click it once, and it's locked—end of problem. Drag to your heart's content.

I have only two problems with the trackball. The buttons are harder to push than the mouse buttons on my Microsoft mouse, though not unreasonably so, and occasionally the ball skids while the pointer jogs in place. I remedied the latter problem with a quick back-and-forth movement.

Interestingly, the software that comes with the trackball lets you use it with mouse-driven applications and those that aren't mouse driven. You can customize the mouse driver several ways to set speed, port recognition,

and other elements. Kraft includes an adapter so that you can use your trackball with either a 9-pin connection or a 25-pin connection.

If your mouse is hampered by the clutter on your desk and you're ready to consider an alternative, take a look at the Kraft trackball, a capable and versatile pointing device. ▸

MIKE HUDNALL

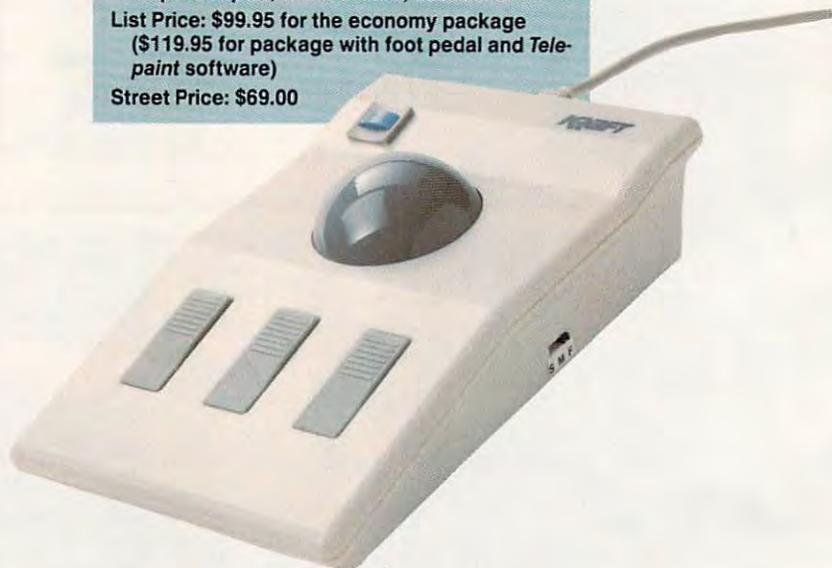
KRAFT SYSTEMS
450 W. California Ave.
Vista, CA 92083
(619) 724-7146

System Requirements: 128K RAM

Included Accessories: 3½-inch and 5¼-inch disks with Microsoft-compatible drivers, 9-to-25 pin adapter, two manuals, dust cover

List Price: \$99.95 for the economy package (\$119.95 for package with foot pedal and Tele-paint software)

Street Price: \$69.00



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.

LOGITECH MOUSEMAN

If you think all mice are created equal, try Logitech's new MouseMan. It sports a radical new shape that fits your hand like a leather steering wheel in an expensive sports car. And because Logitech recognizes that everyone isn't right-handed, the company offers the ultimate in custom tailoring—right- and left-handed models.

For a long time I've been an avid fan of the Microsoft mouse. But after using the MouseMan, I must say that I prefer it considerably over the Microsoft mouse. First, it has a more natural feel because of the slight right-hand downward slope of the case. You'll find it much less fatiguing than the average mouse. Second, it has three buttons for complete flexibility in your applications.

The MouseMan comes packaged with Logitech's latest version of *MouseWare Utilities*. Most of the utilities are easy to use and quite helpful in configuring the mouse or for use with other applications. The drivers allow you to adjust cursor sensitivity for pinpoint precision or extra high speed. I found the 400-dpi resolution adequate for my desk top. A Control Panel TSR lets you make quick and easy adjustments at the touch of a button. You get a custom mouse driver for *Lotus 1-2-3* and one that provides three-button support in *Microsoft Windows*. In addition, you get *Go-Menu*, a program that lets you create mouse menus for applications that are keyboard based. Logitech's manual offers clear explanations of these utilities, as well as examples of how to implement them.

I found the Logitech MouseMan package very complete and easy to use. The MouseMan itself is very sturdy and feels better than any other mouse I've tried. If you're thinking about buying a new mouse, I strongly recommend the MouseMan. ▸

TROY TUCKER

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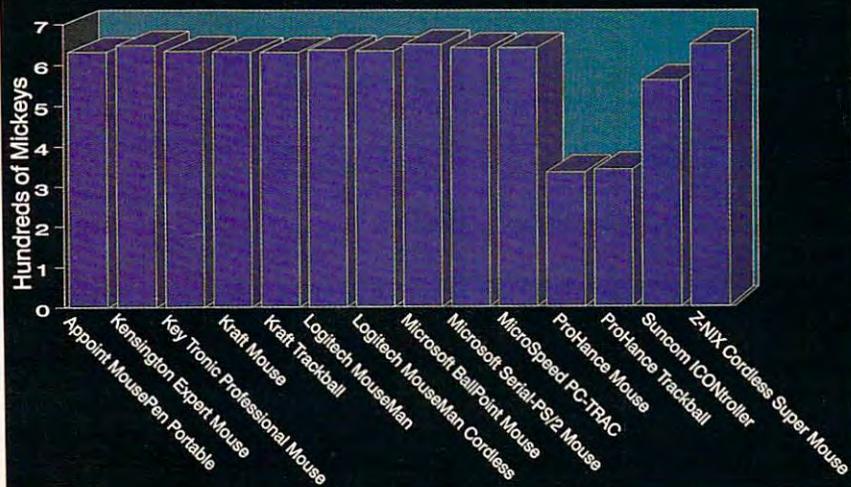
System Requirements: 384K RAM, dual floppy drives or one floppy drive and one hard drive, DOS 3.0 or higher (3.1 or higher for use with Windows), 9- or 25-pin serial port

Included Accessories: *MouseWare*, Getting Started manual, Getting the Most from Your Mouse manual, 3½- and 5¼-inch disks with drivers

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Street Price: \$72.50



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LOGITECH MOUSEMAN CORDLESS

The best-laid plans of mice and men, or rather mice and Logitech, have finally come together. The result is the MouseMan Cordless, a mouse that runs mazes around any trackball or short-tailed mouse that dares to come near it.

Movement of the MouseMan Cordless is practically unlimited without a cord to get in the way. The mouse itself is light and easy to move, and the buttons press easily. I found the tracking a bit too sensitive at the default setting, but that's easily fixed with the *CLICK* pop-up menu included in the software.

The MouseMan is programmed with an adjustable ballistic effect that causes the cursor to speed up and slow down with your movements. Low sensitivity in tandem with a high ballistic effect gave me the most control and the best feel.

Installation is a snap. A radio transmitter in the mouse unit controls the onscreen pointer. Its eight-channel receiver plugs into your computer's serial port or PS/2 dedicated port.

Software includes mouse drivers; *Mouse-2-3*, for use with *Lotus 1-2-3* versions 2.2 and lower; *LOGI-MENUS*, which contains other pre-programmed menus for popular nonmouse applications; and *GO-MENU*, which allows you to create or customize your own menus. Another nice feature is the ability to swap buttons for left-handed use, which, surprisingly, doesn't feel that awkward.

My only real criticism is that I found no advantage to having the unit shaped for my right hand. A smaller unit designed for either hand would have been a lot more comfortable.

Although Logitech's MouseMan Cordless isn't perfect, it could, with a little refinement, be the best thing that ever happened to computer mice. >

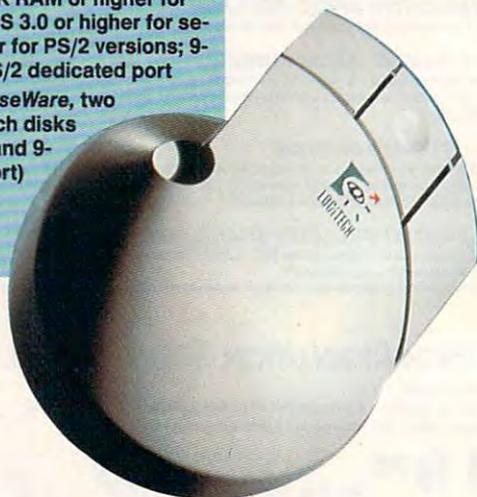
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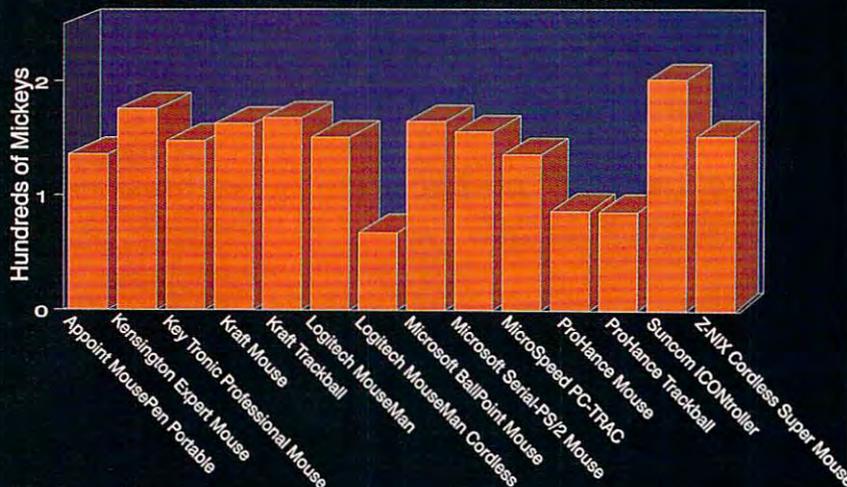
System Requirements: 256K RAM or higher for *MouseWare* software; DOS 3.0 or higher for serial versions, 3.3 or higher for PS/2 versions; 9- or 25-pin serial port or PS/2 dedicated port

Included Accessories: *MouseWare*, two manuals, 3½- and 5¼-inch disks with drivers, 9-to-25 pin and 9-to-6 pin (for PS/2 style port) adapters

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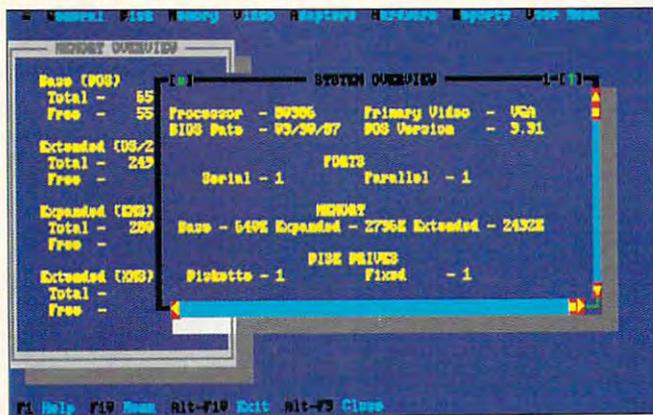
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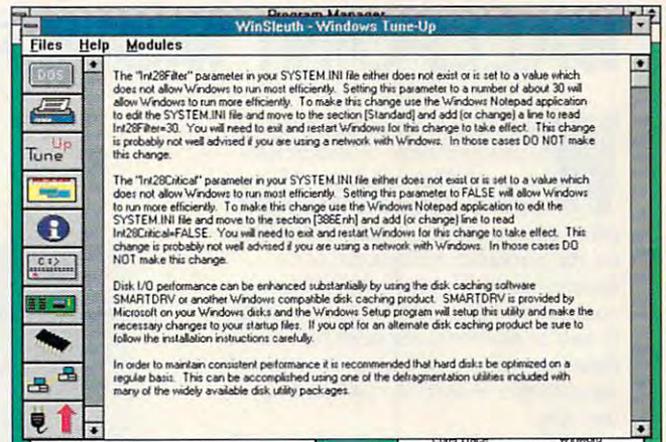
"PC Magazine Editor's pick... the 33 best utilities... System Sleuth"
PC Magazine, June 26, 1990



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MICROSOFT BALLPOINT MOUSE

When Microsoft comes out with a laptop mouse, it had better be good. Not only does Microsoft sell more mice than any other company, but it has a lot riding on the universal acceptance of its mouse-based *Windows*. With laptop computers expected to comprise nearly half of all computer sales by 1994, a growing number of laptop owners will want to run *Windows* just like everyone else.

Microsoft's answer is a small 400-dpi trackball that clamps onto your laptop computer. Because laptops come in many shapes and sizes, the package includes several sizes of clamps that let you attach the BallPoint directly onto your laptop.

The BallPoint's mouse driver lets you choose any combination of its four buttons and set up its orientation. (Because you can position the BallPoint in a variety of angles, you need to tell the mouse driver which directions are up, down, left, and right.) The package also includes a new *Windows* Mouse Control Panel that lets you adjust the BallPoint's acceleration, double-click speed, and vertical and horizontal sensitivity.

At first, I didn't like the BallPoint—I couldn't attach it in a way that seemed comfortable for me. I also didn't like having to detach it every time I moved my laptop. (With most laptops, you can't close the case until you remove the BallPoint's clamps.) Later, when I discovered I could take off the clamp mechanism and set the BallPoint beside my laptop, I was won over.

Microsoft understands that BallPoint users may need a warming-up period—the company is offering an unusual 30-day money-back guarantee. The only way you'll know if it's right for you is to try it. ▶

DAVID ENGLISH

MICROSOFT
One Microsoft Way
Redmond, WA 98052-6399
(206) 882-8080

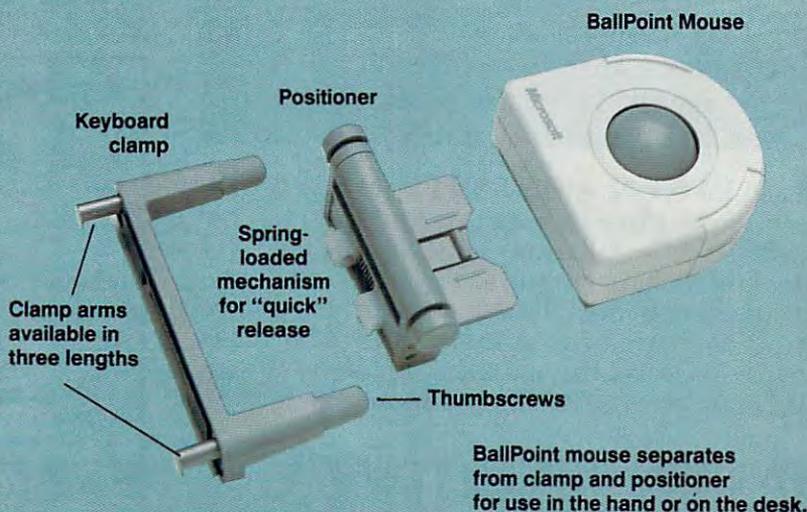
System Requirements: 20K RAM,
9-pin serial port or PS/2 mouse
port (optional 25-pin serial port
adapter available)

Included Accessories: universal clamp,
Microsoft mouse driver 8.0, carrying
case, adapter for PS/2-style port

List Price: \$175
Street Price: n/a



BallPoint Installation



MICROSOFT SERIAL-PS/2 MOUSE

Microsoft revolutionized the mouse world when it introduced its third-generation Dove-bar mouse in 1987. In addition to a new streamlined shape and Ivory-soap color, the Microsoft mouse boasted two revolutionary firsts: Its two buttons were different sizes (the left button, which is the workhorse button, was larger than the right), and the ball, traditionally placed under the palm of the hand, was moved forward, nearer the buttons.

The Serial-PS/2 mouse reviewed here has everything that revolutionary mouse had plus two important extras: higher resolution and a ballistic driver.

While the original Dove-bar mouse had a resolution of 200 dpi, the newest Microsoft mouse boasts a resolution of 400 dpi. The higher resolution means that it takes less mouse movement to spirit the cursor across the screen. In short, the mouse is faster.

The ballistic driver makes mouse movement more efficient by trying to second-guess your intentions. It assumes that if you're moving the mouse quickly, you want to cover a lot of screen territory fast, and it thinks that if you're moving slowly, you must be doing careful positioning.

The driver works by detecting increases in mouse speed and moving the cursor faster than normal when a speed threshold is crossed. The Microsoft driver uses 16 thresholds, so it is constantly adjusting to the speed you move the mouse.

As an example, when you move the Serial-PS/2 mouse quickly, it crosses a normal 80-column text screen with less than 1 inch of mouse movement. If you move the mouse slowly, the same cross-screen journey takes more than 3½ inches. The high-

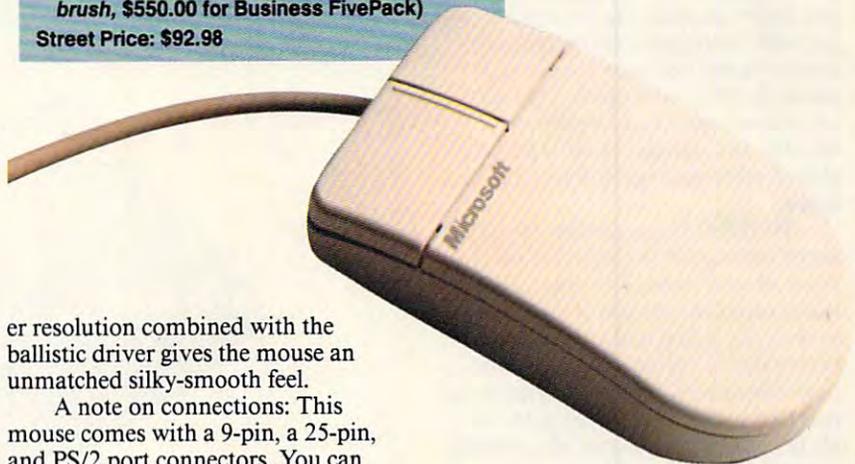
MICROSOFT
One Microsoft Way
Redmond, WA 98052-6399
(206) 882-8080

System Requirements: 14K RAM, CGA, EGA, or VGA graphics card

Included Accessories: driver software

List Price: \$125.00 (\$225.00 for package with Windows 3.0, \$150.00 for package with Paintbrush, \$550.00 for Business FivePack)

Street Price: \$92.98



er resolution combined with the ballistic driver gives the mouse an unmatched silky-smooth feel.

A note on connections: This mouse comes with a 9-pin, a 25-pin, and PS/2 port connectors. You can plug it into almost anything but a wall socket.

For me, the Microsoft mouse is close to perfection. Its shape and balance are ideal, its high resolution easi-

ly laps the competition, and its ballistic drivers are the fastest and most surefooted in the industry. >

CLIFTON KARNES

How an Optomechanical Mouse Works

Mice of this genre combine the best of both worlds—mechanical and optical—in that they use a moving ball to turn sensing rollers mechanically as well as an LED and photosensors to read and interpret the movement data. Instead of the rollers turning electrical resistors as in the mechanical mouse, the rollers in an optomechanical mouse rotate wheels with slots or holes in them through which the LED beams are aimed. The interruptions caused by the solid portions of the wheels "breaking" the beam

received by the photosensors are counted and translated into data which, in turn, controls the cursor movement onscreen. Since optomechanical mice also utilize roller balls and other mechanical components, their heft and feel make them quite similar to their purely mechanical counterparts. Optomechanical mice are very popular, second to mechanical mice, and are available from several manufacturers.

—TOM BENFORD, PRESIDENT
COMPUTER PRODUCT TESTING SERVICES

MICROSPEED PC-TRAC

The PC-TRAC from MicroSpeed is the perfect solution if your computer desk top is crowded or cluttered. The unit's innovative two- or three-button configurability and ergonomic design make the PC-TRAC a standout in the crowded pointing-device market.

PC-TRAC's cueball-sized ball is bordered by wraparound buttons on each side and a third, smaller button at the top. This arrangement is the best I've seen on a trackball; since the left and right buttons extend above and below the ball, you can readily use either your palm or fingertips to move the ball and your thumb and pinkie to click the buttons. This arrangement should also work well whether you're right- or left-handed and whether your hand is large or small.

PC-TRAC's low-profile sloped shape is designed to fit the natural curve of your hand. The case front actually meets the surface of your desk, so that, according to the manufacturer, the step of earlier designs is eliminated along with the wrist aggravation that came with it. In reducing the angle of your wrist and arm, MicroSpeed has minimized fatigue while at the same time allowing you to maintain precision and control.

The smaller third button can optionally emulate a middle mouse button, or, more usefully, act as a drag lock. One major problem when using trackballs with GUIs such as *Windows* and *GeoWorks Ensemble* is that it's very hard to move the pointer while holding down a selection button. With the drag lock feature enabled, you can click the middle button after you've positioned your pointer, move the pointer, and click the middle button again to release. As far as the computer knows, you were holding down the button the whole time. PC-TRAC also has a chord mode, which allows you to simulate holding down both buttons while moving the

mouse. Generally I've found trackballs awkward to use with GUIs, but drag lock eliminates this awkwardness. PC-TRAC was much easier to use than a mouse for games such as flight simulators.

MicroSpeed selected the 2.25-inch ball because its research showed a significant increase in pointing control with larger-diameter balls. Research revealed as well that higher mass also contributed to user control, and the 2.25-inch ball offers 30 percent more mass than a 2-inch ball and 70 percent more than a 1.5-inch ball.

For its suspension design, MicroSpeed uses bearings made of Delrin plastic. In addition to being self-lubri-

cating, they are more resistant than metal bearings to pitting, dirt, and damage due to mechanical shocks (such as being dropped).

Software support is excellent. The trackball is fully compatible with the Microsoft mouse driver. The included PrecisionPointer drivers for DOS and Windows offer a number of trackball-specific enhancements, such as ballistic gain (the distance the pointer moves depends on how fast you spin the ball). Also included is KeyMAP, a driver for text-based applications, as well as a *Tetris* driver and a special trackball-compatible version of the ever-popular *Welltris*. ▸

DENNY ATKIN

MICROSPEED
44000 Old Warm Springs Blvd.
Fremont, CA 94538
(415) 490-1403
System Requirements: available bus slot (for bus version) or serial port
Included Accessories: PrecisionPointer device driver with AutoAdjust resolution, AutoCad ADI digitizer driver, KeyMAP keyboard emulator with templates, Welltris, 9-to-25 pin adapter
List Price: \$119.00 (\$139.00 for bus version)
Street Price: \$52.50



PROHANCE MOUSE

Few accessories prove as useful as the ubiquitous mouse, and almost no mouse user would want to surrender such a timesaving tool. Mouse quality does vary, however, and for discriminating shoppers, the ProHance mouse is a contender for best buy.

The ProHance mouse driver supports resolutions of 50–800 dots per inch (dpi), allowing for extremes of precision or speed, whatever your needs may be. For intricate pixel-by-pixel drawing, the ProHance mouse provides more than enough steady control, and for moving place to place in a hurry, 800 dpi is plenty. Some DOS-based applications don't ordinarily offer mouse support (*Lotus 1-2-3* and *WordPerfect* prior to version 5.1 are good examples), so ProHance includes a set of pop-up menu templates that transparently provide abbreviated keystrokes and rapid cursor movement—a welcome boost to your productivity.

If your favorite software isn't already supported, a separate utility allows for custom menu creation. Used with software that features mouse adjustment as part of its architecture—the *Windows* control panel, for instance—the ProHance driver complies with such adjustments without grumbling, allowing for trouble-free transitions from DOS to multitasking environments.

Designed to be used as either a PC or Microsoft mouse, the ProHance mouse comes with the three requisite buttons for PC mode. Because I prefer a firmer button press, the ProHance mouse's plastic *click* left me feeling ambivalent toward the mouse design.

ProHance Technologies gives you an antistatic mouse pad for superior tracking, though control suffers little on other surfaces, such as a desk top. A mouse pocket, complete with adhesive backing, may be affixed to your monitor, your computer, or another convenient spot, and provides

PROHANCE TECHNOLOGIES

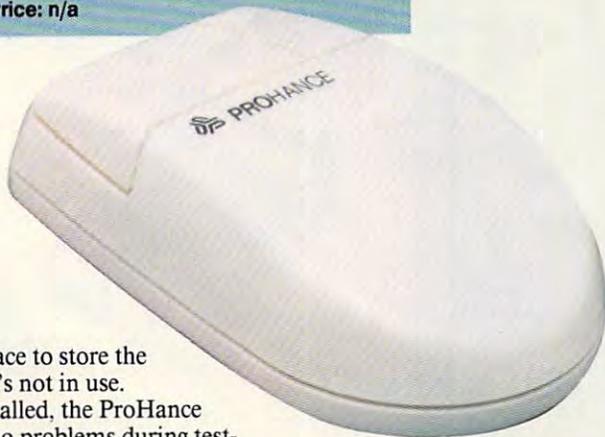
1307 S. Mary Ave., #104
Sunnyvale, CA 94087
(408) 746-0950

System Requirements: 10K RAM, serial port or PS/2-style mouse port

Included Accessories: driver, 9-to-25 pin adapter, mouse pad and pocket

List Price: \$69.95 (\$74.95 for bus mouse, \$104.95 for bus mouse package with mouse pocket and pad and professional paint program)

Street Price: n/a



an excellent place to store the mouse when it's not in use.

Easily installed, the ProHance mouse posed no problems during testing and worked well in both games and productivity software. As either a replacement or first-time mouse purchase, this mouse delivers both stand-

ard versatility and a few extras—a solid value at its price. ▶

DAVID SEARS

How a Mechanical Mouse Works

As you might guess from its name, the mechanical mouse uses mechanical means to generate signals governing cursor movement. A heavy ball (either solid hard rubber or steel covered in rubber) moves against sensing rollers inside the mouse body. The rollers have contact brushes which stroke a sensing conductor with multiple segments. Electrical impulses are generated as the rollers rotate along the segments of the sensor and are counted by the electronic circuits within the mouse body.

Forward movements of the mouse

generate positive impulses, while rearward movements produce negative impulses; in a like manner, left and right movements produce either positive or negative impulses from the lateral (side) rollers. Angular movements causing both the vertical and lateral rollers to rotate simultaneously produce dual readings for oblique directions. The counting circuitry calculates the x and y screen coordinates from the rotational data produced by these rollers and conveys the signal to the cursor of the host PC.

—TOM BENFORD, PRESIDENT
COMPUTER PRODUCT TESTING SERVICES

THE TALE OF THE MOUSE

Where did mice come from? They have become so popular so quickly that it might seem they came out of the woodwork. But it was a bit more complicated than that . . .

The mouse actually evolved from a philosophy that computing should be interactive—a revolutionary notion, in fact.

It might seem incredible to think so now, but there was a time when even an intense computer user would have only a passing familiarity with the hardware. In 1978, for example, my wife was attempting to run a criminology study using the campus mainframe at Central Michigan University. She had to submit programs to the system operator in batch format on printed cards, wait overnight, and then retrieve a print-out (usually full of mysterious error messages) the next day. It took her all semester to get it to run properly, and even at that, she was the first person in the class to succeed.

Being able to *interact* with a computer in realtime, through the use of a terminal or by actually having a microcomputer on the desk in front of you, is really nothing short of revolutionary, when you consider how awkward it once was to "run" a computer.

But once it was possible to interact directly, the keyboard instantly seemed inadequate. After all, the computer could easily cope with our input even if we could type thousands of words a minute. Your computer spends most of its time patiently waiting for you to press another key when you're word processing or programming or giving your computer commands on the command line.

At the same time that computers were becoming more democratic and interactive, new ways of looking at files were emerging. Files began to be thought of not

as interminable strips of code on tapes or disks but as objects that could be manipulated. You could pick up a file here and place it there, copy it in a moment, and start up the application that created it by performing a command on the file itself. Shortly thereafter, these objects began to be thought of as objects, and soon as visual objects—actual rectangles on the screen. They cried out for some easy way to manipulate them, to move them around. This was the impetus behind the creation of a mouselike input device. It was

and the close-knit microcommunity members (many of whom had met as minicomputer hackers, homebrew computerists, and phone phreaks) were proud to show off their latest developments to friends and competitors alike. One fellow who took the cook's tour of Xerox PARC was Steve Jobs, then the head chutzpa at Apple Computer. He liked what he saw, as was evident in the Lisa computer, which took many of the ideas Xerox had introduced on its own failed computer, the Star. Lisa also managed to fail, probably because she was

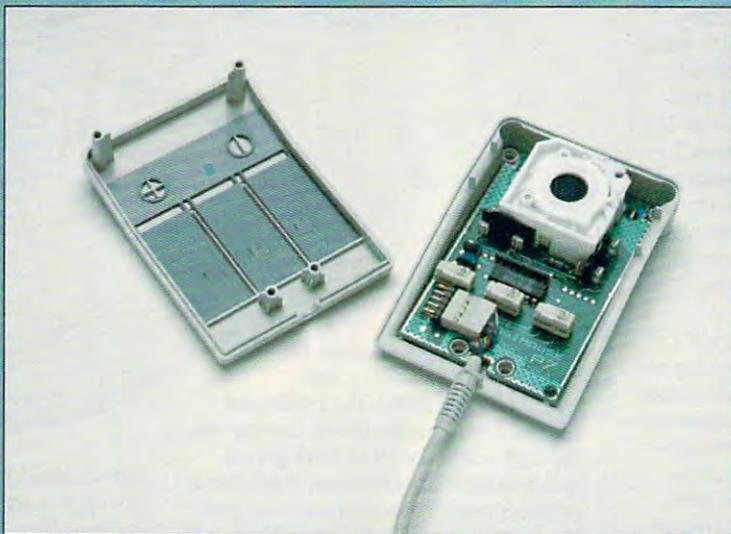
extremely overpriced (at \$10,000) and moderately underpowered. One thing everyone could agree on, though, was that the operating system and the innovation of the mouse (provided with each Lisa) made file management a breeze.

Little wonder that when Jobs came out with the Macintosh, a computer that was only moderately overpriced (but made up for it by being extremely underpowered), he continued to provide the mouse. Yuppies bought Macintoshes by the bushel, and the rest is history.

Microsoft created *Windows* to provide a mouse-driven, graphical interface for the PC. Thereafter, no computer could be taken seriously unless it had a

mouse. Even the waning 8-bit computers were dutifully outfitted with mice. Within a period of about three years, mice had completely saturated the market, changing the way people interact with and think about computers forever. Mice have led the graphical revolution, in essence allowing the user not only to interact directly with the computer but to reach inside the computer and manipulate files. What's the difference between entering `ERASE filename.ext` on the command line and sliding a file icon in the trash can? Simply, a mouse and a mouse-based operating system.

—ROBERT BIXBY



Today's mouse makes computing easier and more interactive than ever.

equipped with a roller underneath, two switches, and a long cord that carried its impulses to the computer. Because of its size and shape, with switches a little like ears and a cord a lot like a tail, the device was dubbed *the mouse*.

But so far, the mouse was a meek and little-noticed creature. It scurried around desk tops at a research facility operated by Xerox: the Palo Alto Research Center, known familiarly as PARC.

Those were exciting, freewheeling times. Microcomputers were just appearing on the market. The concept of trade secrets was still largely a thing of the future,

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MOUSE RESOLUTION

Your computer's screen is composed of thousands of points called *pixels*. The number of pixels horizontally and vertically is often referred to as the *screen resolution*.

Mouse manufacturers typically list the resolution that their products are capable of in dots per inch (dpi). They might specify a capability of up to 1150 dpi or a capability of 10-1150 dpi. These numbers translate to the number of dots that the mouse cursor moves for every inch that you move the mouse. If you move the mouse one inch in a resolution of 300 dpi, the mouse cursor will move 300 dots.

How do dots relate to pixels? That depends on your monitor. To start with, check your monitor manual for its dot pitch specification. A typical dot pitch might be .29 points per pixel. That means there are about three dots for every screen pixel. If your mouse is set to 300 dpi, then moving the mouse one inch on your desk would move the mouse 100 screen pixels.

Your monitor's dot pitch isn't all you need to know; some video modes have pixels that are larger than others. In text mode, for instance, each text cell is really com-

posed of eight pixels horizontally and vertically. That means that each time the mouse cursor moves in any direction, the mouse driver has registered the equivalent dot movement for eight pixels. Low-resolution CGA, EGA, and MCGA also have screen pixels that are larger. For these modes the mouse driver registers more dot movement for each pixel movement of the mouse cursor than for each pixel movement in higher-resolution modes.

Why buy a mouse with high-resolution capabilities? Some kinds of applications, such as computer-aided design (CAD) packages, require a very high degree of detail and input control. Using a mouse at lower resolutions would be like drawing with a crayon; the lines you draw wouldn't be any wider, but the lower resolutions would not afford the degree of control you'd need for sophisticated drawing applications. On the other hand, using a mouse at high resolutions would be like drawing with a precision writing instrument. The greater the resolution, the better your control as you move around the screen. ▸

—RICHARD C. LEINECKER

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ProHance Trackball

The best thing about using the ProHance trackball is that you don't have to worry about room to maneuver your arm. On the other hand, my thumb got a real workout, and my wrist didn't suffer any less.

If you're right-handed, you'll find the ProHance effortless to move with the flick of a thumb, and the buttons simple to press. Hand position was comfortable overall, but constantly moving the ball with my thumb was somewhat tiresome.

If you're accustomed to using a mouse left-handed, be prepared for some problems. My little finger wasn't nearly as flexible as my thumb when it came to rolling the trackball left-handed.

Difficulty of control is probably the biggest drawback—you have to watch the screen closely, and it's hard to get a real feel for moving the pointer around. You're allowed to set resolution anywhere between 50 and 800 dots per inch (dpi), although changing it from the default (200–400 dpi) didn't give me a better feel.

The ProHance is available in serial and PS/2 versions. The serial version is compatible with a two-button Microsoft mouse or a three-button PC mouse.

A disk included with the package contains, along with the mouse driver, pop-up menus for 14 nonmouse programs, including *WordPerfect*, *WordStar*, DOS, and EDLIN.

Also, for those who can't live without a mouse or trackball device for *everything*, you can use the menu builder to create your own pop-up menus for nonmouse programs. MENU.DOC contains the instructions, along with a tutorial to help simplify the process for nonprogrammers.

The ProHance trackball is a nice piece of equipment if space is short and you really don't like dealing with mice—and if you're right-handed. ▸

JILL CHAMPION

PROHANCE TECHNOLOGIES

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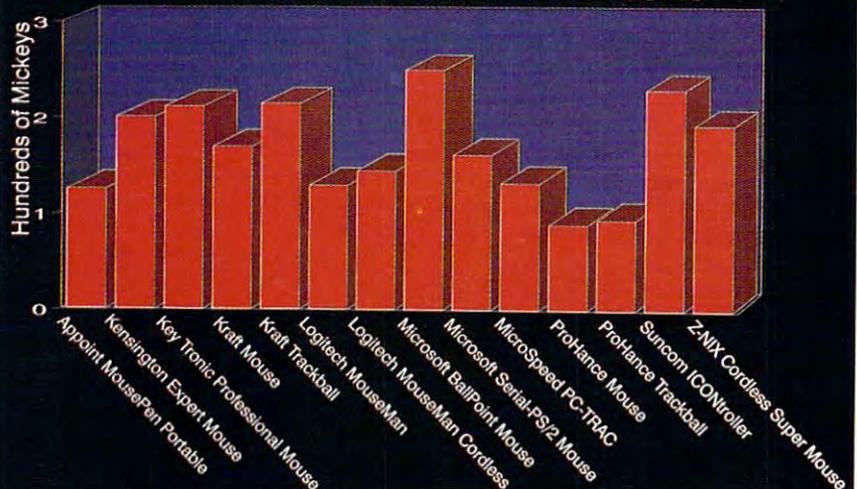
System Requirements: 10K RAM, serial port
Included Accessories: driver, pop-up menus for nonmouse programs, menu-builder program, 9-to-25 pin adapter

List Price: \$99.95 (\$109.95 for PS/2 version)

Street Price: n/a



Sensitivity Reported for One Inch of Horizontal Screen Movement



SUNCOM ICONROLLER

This tiny, wedge-shaped joystick works as an alternative mouse and is primarily intended for laptops.

The ICONtroller is more than a joystick, though, despite appearances. It plugs into the serial port and mimics mouse movement. But it's more than a mouse, too. It's festooned with buttons that make adjustments, such as the speed of cursor movement and the kind of mouse emulation. The ICONtroller provides pixel-by-pixel movement when the joystick is deflected less than 20 degrees.

Suncom has located the mouse buttons about where you would expect to find the fire buttons on a normal joystick. There's even a "thumb button" at the top of the joystick. Holding the joystick between my thumb and second finger, I operated this button with my index finger as if it were my left mouse button. It was an intuitive positioning that I adjusted to instantly.

Although you can attach this unit to the side of your keyboard with Velcro patches, I found it more natural to operate it two-handed, with the base in my left hand and the joystick in my right. I came to appreciate the advantages of joysticks: no more desk space sacrificed to the mouse pad and no more fights with desktop clutter for control of the mouse cord, to name but two.

Don't try to draw with the ICONtroller. Technically, it's completely proportional, but my experience was that the cursor wanted to move in one of eight directions (N, NE, E, SE, S, SW, W, or NW). Therefore, it's better used as a general pointing device than as a complete mouse substitute, and in this role it was a success.

The ICONtroller was the simplest to install of all nonmouse mice I've tried and the friendliest to *Windows* and *GeoWorks Ensemble*. ▸

ROBERT BIXBY

SUNCOM TECHNOLOGIES

6400 W. Gross Point Rd.
Niles, IL 60648
(708) 647-4040

System Requirements: serial port

Included Accessories: driver on installation disk
(3½- and 5¼-inch)

List Price: \$99.95

Street Price: n/a



How an Optical Mouse Works

Unlike the mechanical mouse, the optical mouse has *no* moving parts within its body. Instead of relying on the rotation of a ball against rollers to generate a signal for processing corresponding cursor movements, the optical mouse uses light beams produced by an LED (Light-Emitting Diode) and reflected from a special mouse pad to establish vertical and lateral positioning. The mouse pad used by an optical mouse has a special reflectorized surface with grid lines embedded in it at precise intervals. An LED in the mouse body shines its beam on this pad, and a photoreceptor within the mouse

body reads the reflected light. The grid lines interrupt the reflectivity of the beam when it passes over them. These interruptions are counted by the internal sensing circuits, and the data is passed along to the computer to control the cursor. Optical mice are very lightweight and glide effortlessly over their special reflectorized mouse pads. Though they don't have any moving parts to wear out as mechanical mice do, optical mice still do not seem to be as popular as mechanical mice.

—TOM BENFORD, PRESIDENT
COMPUTER PRODUCT TESTING SERVICES

Z-NIX CORDLESS SUPER MOUSE

The words *sleek*, *sporty*, and *unencumbered* best describe the Z-NIX Cordless Super Mouse.

Instead of moving the mouse, untangling the cord, and then watching the cursor move, you move the mouse, and the cursor moves. It's what mice should have been from the beginning.

This mouse fits perfectly in the palm of my hand, moves across my mouse pad with little resistance, and has perfectly placed buttons. I've never had to divert my train of thought from my work to the task of making the mouse behave properly. It's the easiest and most comfortable way I've found to improve productivity with mouse-based software.

Its battery recharges every time you set it in its cradle. The cradle gets its power from the computer, so you won't have to worry about another plug. You will, however, have to remember to park it in the cradle anytime you're not using it. That way the batteries stay fully charged. It's not a design flaw; it's a matter of retraining yourself to use the mouse a new way. But the small effort to develop this habit is well worth the effort.

I didn't find any software that presented incompatibility problems. As a matter of fact, I used it to run some of the most demanding software there is, such as Microsoft's *Codeview*. If a mouse and its driver perform under these circumstances, they'll usually do well just about anywhere else. But I made sure; I put it through its paces. *Windows*, *DeluxePaint*, *Applause II*, and many more large applications didn't turn up any problems.

After publicly stating that I'd never trade my Microsoft mouse for another, I'm eating my words. This mouse will make a convert of just about anyone who uses it. □

RICHARD C. LEINECKER

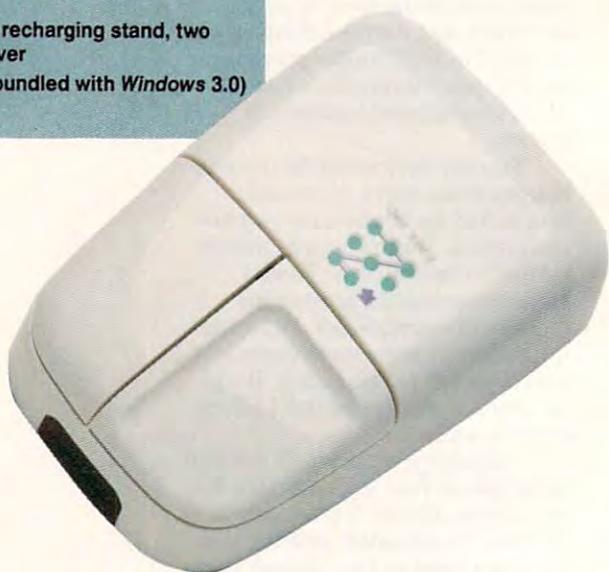
Z-NIX
211 Erie St.
Pomona, CA 91768
(714) 629-8050

System Requirements: 16K RAM, serial port, one floppy drive

Included Accessories: recharging stand, two batteries, mouse driver

List Price: \$164 (\$282 bundled with *Windows 3.0*)

Street Price: n/a



Important Dates in Mouse History

1963. Douglas Engelbart invents the first computer mouse—a simple analog device with an exterior of wood and one button.

1970. Xerox's Palo Alto Research Center commissions Jack S. Hawley to build the first digital mouse. The mouse becomes an integral part of the Alto computer system, which later grows into the Star, which in turn inspires both the Macintosh and *Windows* interfaces.

1983. Microsoft introduces its first bus mouse for the IBM PC. The mouse uses two small buttons and is mechanical.

1984. Apple releases the Macintosh, the first personal computer to come with a mouse as standard equipment.

1984. Microsoft releases a serial version of its mouse that attaches directly to an RS-232 serial port.

1985. Logitech introduces its famous wedge-shaped three-button mouse, the C7.

1987. Microsoft introduces its Dove-bar mouse. The ball is moved to the front of the mouse, and the two buttons are larger and nonsymmetrical (the left button is larger than the right).

1989. Microsoft introduces the 400 Series mouse, which provides 400 dpi, double the resolution of the 1987 mouse. The new mouse driver is ballistic, which means that the faster you move the mouse, the farther the cursor moves on the screen.

—CLIFTON KARNES

GOOD MOUSEKEEPING

The best thing that you can do for your mouse is to give it a sterile environment—squeaky clean, including the mouse pad and the hands that use it—and retire it to its dust jacket at the end of the day.

How can you tell when your mouse or trackball is ready for the cleaners? The most obvious sign is reduced performance—the pointer skips on the screen, or traction feels too light or even nonexistent. In most cases, the culprit is dirt and grime on the ball and rollers. Dust and dirt on the electronic parts become electrically charged, attracting more dust and even moisture. The longer your mouse goes without a good cleaning, the faster it accumulates dirt.

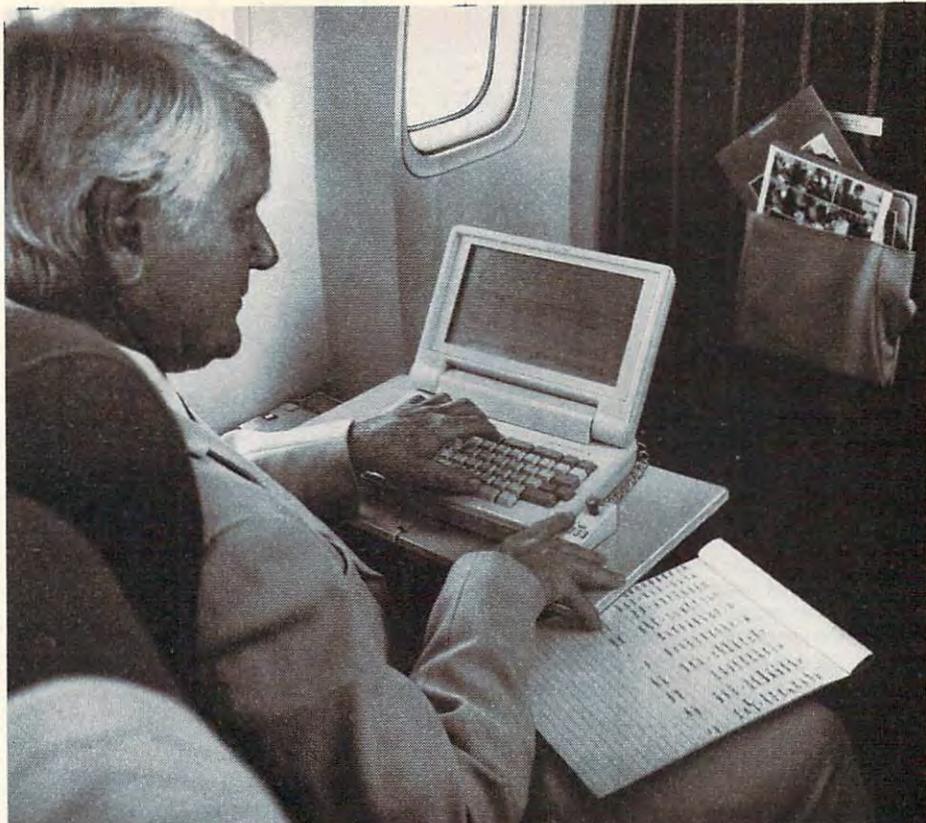
Most mice have a removable tracking ball, which makes it easier for you to get inside and clean the rollers. If you don't have a removable tracking ball, your best defense is to maintain a very clean work area to prevent dirt from entering the mouse to start with. Save the snacks and sodas for the kitchen, and make sure that your hands are clean before you handle your mechanical rodent.

Also, you should keep your mouse dry. Excessive moisture, spilled drinks, and open windows on a rainy day all add up to a drowned rat.

Some manufacturers recommend cleaning the ball, after you've removed it, with a mild detergent or noncorrosive substance like hydrogen peroxide. Others suggest wiping it with a dry, lint-free cloth. Also, the rollers must be cleaned very carefully. Use a toothpick or Q-Tip, and handle the entire unit very gently—as if it were actually *alive*. How often you use your mouse will help determine the frequency, but as a rule, the more you use it, the more often you should clean it. In fact, you probably can't clean a mouse too often. Be sure to consult your documentation for the best cleaning procedures. If you're not exactly sure how to maintain your mouse, call the manufacturer's technical support line.

If you use a mouse pad, make sure that it's lint-free and not the hairy variety—those can be hazardous to your mouse's health, quickly causing it to clog up and operate poorly. If you prefer the tabletop to a mouse pad, be sure that the surface is clean and dry and that it's dusted on a regular basis.

—JILL CHAMPION



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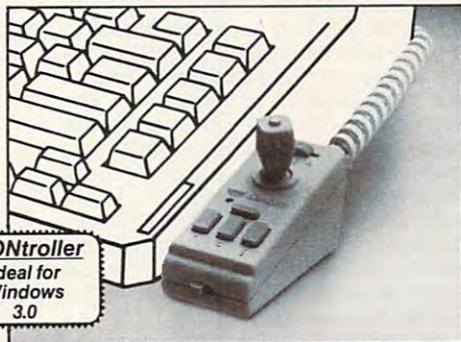
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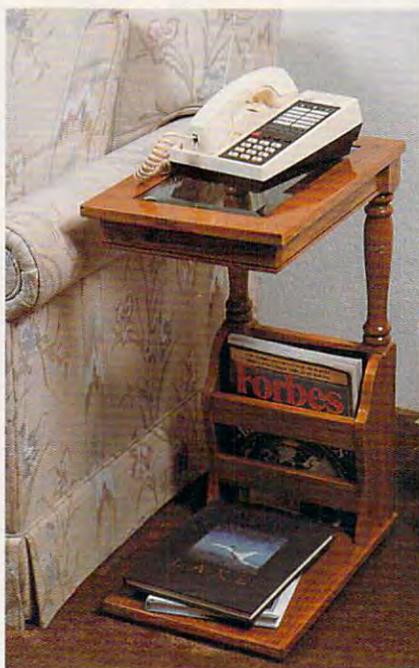
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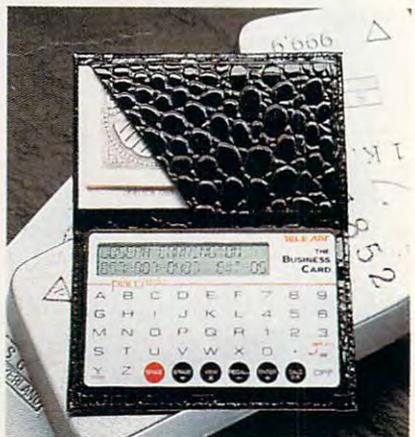
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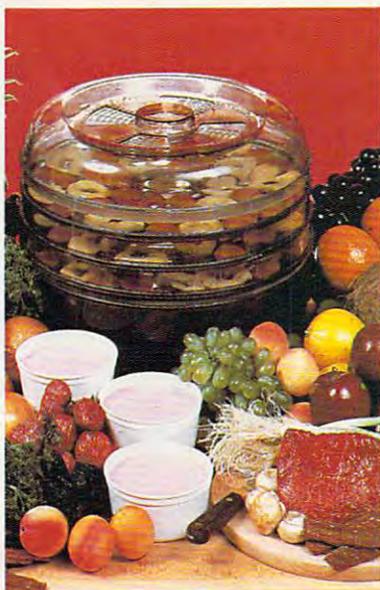
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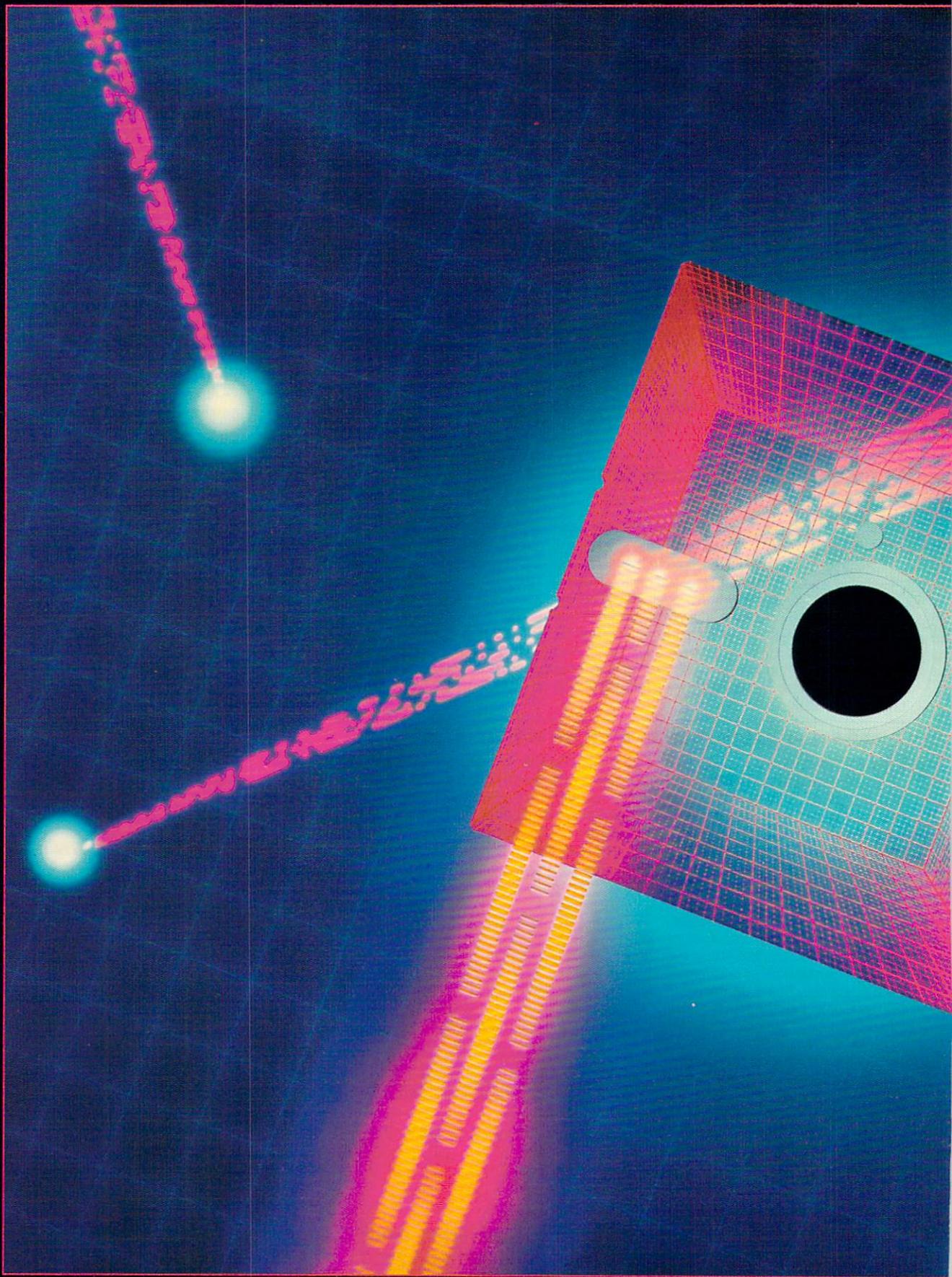
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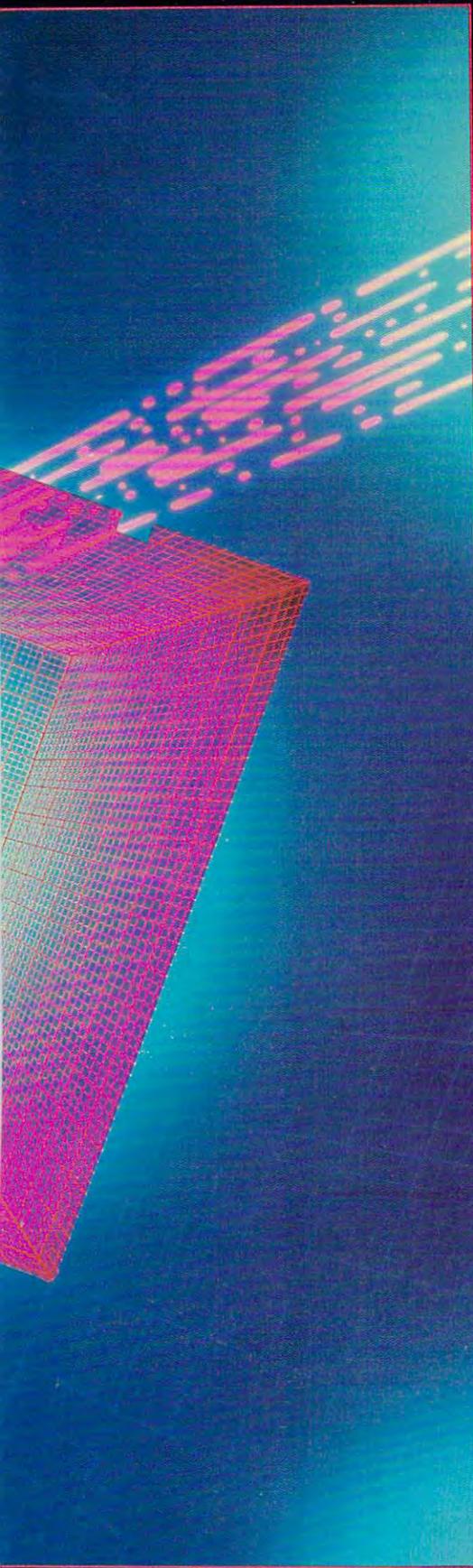
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BEAUTIFUL BATCH FILES

DAZZLING BATCH FILES
ARE JUST AROUND THE CORNER

Since *Windows 3.0* hit the streets, it's almost embarrassing to be caught operating your PC from the old DOS prompt.

Let's face it, though. There are millions of PCs out there for which *Windows 3.0* is not a practical option. They'd need more memory, more speed, and more hard disk space than the budget will allow for anytime in this century.

But don't despair. With a little work, a little creativity, and a handful of utilities from this issue's *COMPUTE's PC Disk*, you can put some snap in your DOS interface and make your PC system easier for you and your whole family to use.

This article shows you how to create a batch file system that you can use to

- Run programs from menus rather than from the DOS prompt.
- Instruct your system to behave differently depending on who's running it.
- Create and display attractive menus and help screens.
- Include musical signals to let you know when an operation is completed.

One of the problems with DOS's batch language is that it's missing a few important features that would make it practical for a powerful menuing system.

Problem Number 1

The main deficiency with DOS's batch language is its inability to accept and act upon user input. Solving this problem is relatively easy using a stand-alone program that accepts user input and passes an exit code back to your batch file. In fact, such a program is the centerpiece of any enhanced batch file programming and is demonstrated in the program *MENUDEMO.BAT* that accompanies this article.

Several versions of this type of utility are available under names like *GETKEY.COM*, *ASK.COM*, or *CHOOSE.COM*. *COMPUTE's* version of *GETKEY*, which is included on this issue's *PC Disk*, reports back to the batch file the ASCII code of a key pressed by the user. The *MENU* program, also on the disk, provides another method of accepting user input.

If you don't have *COMPUTE's* version of either *GETKEY* or *MENU* but do have a similar program

BY TONY ROBERTS

that accepts user input for use in batch files, you should be able to adapt it to MENUDEMO.BAT with little difficulty.

Once your program is able to accept commands from the user, you can use the other programs on the disk to make your batch programs sparkle with everything from colorful text and boxes to music.

Variable Blues

Another problem batch programmers face is that there's no straightforward provision for using variables. This difficulty can be circumvented, though, by using environment variables to keep track of changing information. MENUDEMO.BAT shows how to capture user input, act on it, and store and retrieve environment variables. This program, although large by most batch file standards, doesn't do very much itself. It's simply a shell you can use to build your own program based on the characteristics of your system.

You'll notice that this batch program uses labels and GOTO statements liberally and keeps the entire program in one file. This keeps things simple. It saves you the trouble of remembering dozens of batch file names, and it can save quite a bit of disk space.

On a typical hard disk, where each file uses a minimum of 2,048 bytes of disk space, ten 100-byte batch files would consume 20,480 bytes while one 1,000-byte batch file would use only the minimum 2,048 bytes.

Faster Floppies

If you run batch files from a floppy disk, however, it might be wise to break your menu system into several small files to improve execution time. If you have DOS 3.3 or above, you can use the CALL command to execute one batch file from inside another.

Why is this faster? When batch files are run, the disk is read as each program line is executed. A large batch file, run on a floppy disk, will be very slow because DOS will slog through the file line by line looking for the appropriate section.

Note also that the batch file extensions demonstrated in the program have some overhead themselves. When you execute a PUTTEXT command, for example, the PUTTEXT program runs, delivers your message to the screen, and then returns control to the batch file.

All of this activity takes time. If you want really fancy programs and plan to use several BOX and PUTTEXT statements, you'll be better off building your screens and saving them with SAVESCRN. Then your batch

MENUDEMO.BAT

```
@ECHO OFF
REM MENUDEMO.BAT
REM A demonstration of how batch programming extensions, such as
REM BOX, PUTTEXT, NOTES, MENU, and TIMEDATE might be used in setting up
REM a master menu for your system.
IF (%user%) = ( ) GOTO logon
:mainmenu
CLS
BOX 2 5 15 3 116 2
PUTTEXT 3 7 116 Hello %user%
BOX 2 25 40 3 116 2
PUTTEXT 3 31 116 Our Family's Computer System
BOX 8 20 40 12 113 1
PUTTEXT 18 22 113 Please make a selection.
IF %user% == BILL GOTO bill
IF %user% == MARY GOTO mary
IF %user% == TOMMY GOTO notyet
IF %user% == SUZIE GOTO notyet
ECHO Valid User Not Found
PAUSE
PAUSE
GOTO end
:bill
PUTTEXT 10 22 113 A. Run CHKDSK
PUTTEXT 11 22 113 B. Set the Time
PUTTEXT 12 22 113 C. Log In New User
PUTTEXT 14 22 113 X. Exit to DOS
GETKEY
IF ERRORLEVEL 65 IF NOT ERRORLEVEL 66 GOTO chkdisk
IF ERRORLEVEL 97 IF NOT ERRORLEVEL 98 GOTO chkdisk
IF ERRORLEVEL 66 IF NOT ERRORLEVEL 67 GOTO setclock
IF ERRORLEVEL 98 IF NOT ERRORLEVEL 99 GOTO setclock
IF ERRORLEVEL 67 IF NOT ERRORLEVEL 68 GOTO logon
IF ERRORLEVEL 99 IF NOT ERRORLEVEL 100 GOTO logon
IF ERRORLEVEL 88 IF NOT ERRORLEVEL 89 GOTO end
IF ERRORLEVEL 120 IF NOT ERRORLEVEL 121 GOTO end
GOTO bill
:chkdisk
CLS
CHKDSK
NOTES 523 36 494 9 440 18
PAUSE
GOTO mainmenu
:setclock
TIME
GOTO mainmenu
GOTO end
:mary
PUTTEXT 10 22 113 A. Checkbook
PUTTEXT 11 22 113 B. Calendar
PUTTEXT 12 22 113 C. Log In New User
PUTTEXT 14 22 113 X. Exit to DOS
GETKEY
IF ERRORLEVEL 65 IF NOT ERRORLEVEL 66 GOTO cbook
IF ERRORLEVEL 97 IF NOT ERRORLEVEL 98 GOTO cbook
IF ERRORLEVEL 66 IF NOT ERRORLEVEL 67 GOTO calendar
IF ERRORLEVEL 98 IF NOT ERRORLEVEL 99 GOTO calendar
IF ERRORLEVEL 67 IF NOT ERRORLEVEL 68 GOTO logon
IF ERRORLEVEL 99 IF NOT ERRORLEVEL 100 GOTO logon
IF ERRORLEVEL 88 IF NOT ERRORLEVEL 89 GOTO end
IF ERRORLEVEL 120 IF NOT ERRORLEVEL 121 GOTO end
GOTO mary
:cbook
CLS
PUTTEXT 5 5 31 Enter commands for CHECKBOOK program in this section.
PAUSE
```

MENUEMO.BAT cont.

```
GOTO mainmenu
:calendar
CLS
PUTTEXT 5 5 31 Enter commands for CALENDAR program in this section.
PAUSE
GOTO mainmenu
:logon
CLS
TIMEDATE
SET user=
MENU t=System Log On,m=[B]ill,m=[M]ary,m=[T]ommy,m=[S]uzie
IF ERRORLEVEL 255 GOTO NOPICK
IF ERRORLEVEL 3 IF NOT ERRORLEVEL 4 SET USER=SUZIE
IF ERRORLEVEL 2 IF NOT ERRORLEVEL 3 SET USER=TOMMY
IF ERRORLEVEL 1 IF NOT ERRORLEVEL 2 SET USER=MARY
IF ERRORLEVEL 0 IF NOT ERRORLEVEL 1 SET USER=BILL
GOTO mainmenu
:nopick
ECHO No logon selected.
SET user=
NOTES 330 9 330 9 330 9 262 18
GOTO end
:notyet
CLS
PUTTEXT 5 5 7 When setting up programs of this type, it's wise to include
PUTTEXT 6 5 7 a section that can stand in for parts of the program that
PUTTEXT 7 5 7 have not been written yet.
PUTTEXT 9 5 7 In this case, I haven't written the menus for Tommy and Suzie,
PUTTEXT 10 5 7 so the program comes here, tells you there's still work
PUTTEXT 11 5 7 to be done, and lets you proceed without error.
NOTES 1046 9 1568 9 1046 9
PAUSE
GOTO logon
:end
CLS
```

files can use LOADSCRN to load in the screen files faster than redrawing them.

Finally, if you don't have a hard disk, you can get the best performance out of this type of system by installing a RAM disk, copying the batch files and the batch file extension programs to the RAM disk, and running everything from the RAM disk.

How MENUEMO Works

By way of a quick walk-through of MENUEMO.BAT, the program is an assembly of several sections, each of which is labeled. Each section ends with a GOTO command to transfer control to another section. The program keeps returning to the main menu section until the user chooses to exit to DOS.

MENUEMO first checks to see if an environment variable called *user* exists. If not, the log-on section is executed, a menu of valid users is displayed, and the *user* variable is established.

Next, the main menu is displayed, and choices pertinent to the current user are presented. From there, the program acts on any selec-

tions made by the user and returns to the main menu when finished.

Note that one of the options in every user's menu is Log In New User. This makes it easy to switch from user to user without having to reboot or rerun the program.

Once you get going with this system, carry it as far as you like: Design separate menus for each member of the family rather than filling in one generic template as this program does. Introduce a games submenu that's accessible from every user's main menu. If you telecommunicate, create a submenu that runs scripts to log you on to all your favorite services with the touch of a key.

If you've stayed with me this far, you probably enjoy tinkering with your computer as much as you enjoy running software. The other members of your family, however, probably want results, not challenges.

They'll appreciate being able to turn on the computer and run their programs without having to call on you to find the correct subdirectory, look up the proper parameters, reset the printer, load the printer driver, and on and on and on.

Turbocharge Your Batch Files

In the predecessors of today's PCs, batch processing was a method of instructing the computer to carry out tasks without operator intervention. Long printing tasks and other time-consuming business was scheduled to run unattended late at night when drowsy humans were sleeping and wakeful computers were looking for some action.

As DOS developed, the batch programming language it incorporated was designed to accomplish the same goals—getting work done without operator intervention.

PC users, however, did not behave like mainframe programmers. Rather than using batch programs to handle work while the operator is away, most PC users employ batch files to carry out repetitive tasks while they're sitting right in front of the screen.

Whereas no one cared what the display on the mainframe console looked like, PC users want boxes, colors, noises, and otherwise interesting and informative screens.

To make the batch language conform better to our needs, COMPUTE has developed a handful of small programs to provide the visual excitement and interactivity that normal batch programs lack.

These programs, BOX, GET-KEY, LOADSCRN/SAVESCRN, MENU, NOTES, PUTTEXT, and TIMEDATE, are all available on this issue's *PC Disk*. (These programs and more can also be found on *COMPUTE's PC Productivity Manager*

Batch File Tips

- Don't assume anything. Before executing the command to run a program, use the CD command to change to the proper directory. If there's any chance you'll be logged on to the wrong drive, log on to the proper drive first.
- Include a command to return to the root directory at the end of your batch files.
- If a batch file requires parameters to run properly, test to make sure the parameters were provided. If no parameters were supplied, print a message telling the user what is expected.
- Include remarks in the batch file so two years from now you'll remember why you wrote it.
- If batch programs create temporary files, make sure they clean up after themselves and delete those files before returning control to DOS.
- If you have DOS 3.3 or above, you can place the commercial at sign (@) in front of any command to prevent that command from being displayed when the batch file is executed.

Musical Notes and Frequencies

Note	Frequency				
A	55	110	220	440	880
A#	58	117	233	466	932
B	62	123	247	494	988
C	65	131	262	523	1046
C#	69	139	277	554	1109
D	74	149	294	587	1175
E	82	165	330	659	1319
F	87	175	349	698	1397
F#	93	185	370	740	1480
G	98	196	392	784	1568
G#	104	208	415	831	1661

By using NOTES, you can program your PC's speaker to play something more lively than the usual beep. This chart provides frequencies for five octaves of musical notes. For reference, the frequency of middle C is 262.

disk, a collection of 38 batch file extensions and power utilities.)

Here's a rundown of how to use these batch file extensions.

BOX—Draw boxes anywhere on your screen using this utility. You control the size, shape, border type, and color. To use the program execute the command

BOX row column width height color border

Valid values for *row* are 0–24, and this indicates the row number for the top of the box. *Column*, which can be from 0–79, indicates the column number for the left side of the box. *Width* and *height* define the size of the box in columns and rows, respectively. To determine a color value, multiply the background color by 16 and add the foreground color. (The accompanying Color Selection Table will make this task a little more convenient.)

To select a border, enter 0 for no border, 1 for a single-line border, and 2 for a double-line border. If you enter any other character, that character will be displayed as the border.

GETKEY—This program is important for setting up interactive batch files. First display a menu of choices; then enter the command GETKEY. The batch program pauses until a key is pressed.

GETKEY returns an exit code that can be tested with the IF-ERRORLEVEL command to determine which key was pressed.

The exit code returned is the ASCII value of the character pressed. (See "Understanding ERRORLEVEL" for more details.)

LOADSCRN/SAVESCRN—This pair of programs makes it possible to build screens ahead of time and display them in a flash. This is especially helpful if you're running your batch files from a floppy disk. Batch files are slow-running programs because the system keeps going back to the disk to read and execute each line.

Creating elaborate screens full of boxes and text requires several lines of programming and takes several seconds to display.

To use these utilities, write a batch file that creates your screen and

then, as the last line in the batch file, issue the command `SAVESCRN filename`. The screen display will be recorded as a file on your disk using the filename you provide.

Later, when you want to display that screen as part of a batch file, issue the command `LOADSCRN filename`, and all the boxes and text will be loaded quickly with a single command.

MENU—This utility makes it easy to create, display, and use menus. You can make menu selections with the keyboard or the mouse. To set up a

Understanding ERRORLEVEL

The IF-ERRORLEVEL construction in the DOS batch programming language provides a lot of programming punch, but it's a pain to deal with.

Fortunately, though, once the programming is done, you can forget about ERRORLEVEL while the program does its work. The value of ERRORLEVEL's service clearly compensates for the difficulties of setting it up.

ERRORLEVEL's original purpose was to provide a way to monitor the exit codes generated by the BACKUP and RESTORE commands of DOS 2.0. Assuming that users would want to use batch files to handle hard disk backups, the designers provided the ERRORLEVEL codes as a crude method of passing along information about the success of the backup operation.

ERRORLEVEL is used with the batch programming's IF command to execute commands conditionally based on the exit code provided by the most recently run DOS program. Exit codes can be in the range of 0–255. The syntax is

IF [NOT] ERRORLEVEL *n* COMMAND

In this syntax, replace *n* with the ERRORLEVEL exit code number being tested and *COMMAND* with the action to take if the conditions of the statement are met. The NOT is optional and is used to determine whether an exit code fails the test.

An ERRORLEVEL condition is true if the exit code is equal to or greater than the number in the condition. In other words, if a program returns an exit code of 4, the statement `IF ERRORLEVEL 2 ECHO Two` would pass the condition.

Dealing with this idiosyncrasy requires that conditions be tested in a descending order. Here's an example:

```
IF ERRORLEVEL 5 GOTO OPTION5
IF ERRORLEVEL 4 GOTO OPTION4
IF ERRORLEVEL 3 GOTO OPTION3
IF ERRORLEVEL 2 GOTO OPTION2
IF ERRORLEVEL 1 GOTO OPTION1
IF ERRORLEVEL 0 GOTO END
```

This method is adequate if your program produces a limited number of predictable exit codes, but if there are many more possibilities (as is the case with GETKEY, the program on this issue's PC Disk), an-

other solution is required. GETKEY returns an exit code equal to the ASCII code for a key pressed on the keyboard.

Testing all 255 possible ASCII codes would take all afternoon.

The solution is to combine two IF conditions in one statement, using one normally and one with the NOT option. For example, to test whether the A key, ASCII 65, had been pressed, the following line would work:

```
IF ERRORLEVEL 65 IF NOT ERRORLEVEL
66 ECHO UPPERCASE 'A' WAS
PRESSED.
```

Translated into English, the first condition, IF ERRORLEVEL 65, is true for any character with an ASCII value of 65 or greater. The letter A qualifies, as do all the letters in both the upper- and lowercase alphabets. The second condition, IF NOT ERRORLEVEL 66, is true for any character with an ASCII value below 66.

Combining the two conditions, the letter has to have an ASCII code of at least 65 and less than 66. An uppercase A, ASCII 65, is the only character that meets both conditions and will allow the ECHO statement to be processed.

If your program allows either upper- or lowercase input, be sure to test for both versions of each possible letter.

```
IF ERRORLEVEL 65 IF NOT ERRORLEVEL
66 GOTO OPTION_A
IF ERRORLEVEL 97 IF NOT ERRORLEVEL
98 GOTO OPTION_A
```

The presence of both of these statements would make sure the program branched to the OPTION_A subsection no matter whether A was pressed in a shifted or unshifted state.

Do keep in mind, however, that each IF-ERRORLEVEL test takes time, especially if the program is being run from a floppy disk. It pays to structure your program so you test for the more likely option first and the less likely option last.

In the examples above, testing for the letter A makes sense as written if the user is likely to have CapsLock engaged. If the user usually enters commands in lowercase, it would be more prudent to reverse the statements and test for the lowercase letter first.

Color Selection Table

	Black (0)	Blue (1)	Green (2)	Cyan (3)	Red (4)	Magenta (5)	Brown (6)	White (7)
Black (0)	0	16	32	48	64	80	96	112
Blue (1)	1	17	33	49	65	81	97	113
Green (2)	2	18	34	50	66	82	98	114
Cyan (3)	3	19	35	51	67	83	99	115
Red (4)	4	20	36	52	68	84	100	116
Magenta (5)	5	21	37	53	69	85	101	117
Brown (6)	6	22	38	54	70	86	102	118
White (7)	7	23	39	55	71	87	103	119
Gray (8)	8	24	40	56	72	88	104	120
Light Blue (9)	9	25	41	57	73	89	105	121
Light Green (10)	10	26	42	58	74	90	106	122
Light Cyan (11)	11	27	43	59	75	91	107	123
Light Red (12)	12	28	44	60	76	92	108	124
Light Magenta (13)	13	29	45	61	77	93	109	125
Yellow (14)	14	30	46	62	78	94	110	126
Bright White (15)	15	31	47	63	79	95	111	127

The BOX and PUTTEXT programs require a color parameter. To determine the correct number to use, choose a background color, multiply it by 16, then add the foreground color. The chart above simplifies the process. Choose a background color from those listed at the top, select a foreground color from those along the side, and use the number that falls at the intersection of the two rows.

menu, enter the command:

MENU T=title, M=[M]enu Item 1, M=[M]enu Item 2, and so on.

You can enter several menu items, placing the hot key for each item in the square brackets. For example:

**Menu T=SYSTEM OPTIONS
M=[C]HKDSK, M=[F]ormat Drive
A, M=[W]ord Processing**

When a menu selection is made, an exit code is returned that can be tested with IF-ERRORLEVEL, and the program can branch to the appropriate section. If the first menu selection is picked, an exit code of 0 is returned; if the second menu selection is chosen, an exit code of 1 is returned; and so on. If Cancel is chosen, either by clicking on the cancel box or by pressing Esc, an exit code of 255 is returned.

NOTES—This program elicits something a little more interesting from your computer's speaker than the usual flat beep. To use NOTES, enter

NOTES frequency delay [frequency] [delay] and so on.

For reference, the frequency of middle C is 262. See the accompanying chart for other values.

Delay, which specifies how long the note should be played, is measured in intervals of 1/18 of a second. Specify a delay of 18 to play a note for 1 second, 9 to play a note for 1/2 second, and so on.

A crude rendition of "Mary Had a Little Lamb" looks like this:

NOTES 330 3 294 3 262 3 294 3 330 3 330 3 330 6

PUTTEXT—Here's a big improvement over the ECHO command. With PUTTEXT, you tell DOS where you want your message to appear and in what color. The syntax is PUTTEXT *row column color text*. The color parameter is calculated by multiplying the background color by 16 and adding the foreground color.

TIMEDATE—Here's an easy way to add the date and time to your menus.

Just issue the TIMEDATE command by itself to get both the time and date or specify TIMEDATE T for time only or TIMEDATE D for date only.

If you use TIMEDATE with a B parameter, the display will be boxed and centered on your screen. □





POINT & CLICK

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

Most people think the *Windows* startup screen is as inevitable as death, taxes, and Unrecoverable Application Errors. Surprisingly, it isn't. Not only can you tell *Windows* to skip the screen altogether, but with a little effort, you can have anything you would like displayed on startup.

First off, if all you want to do is bypass the startup screen, there's a simple way to do that. Just type *WIN :* to run *Windows*. Be sure to put a space before the colon. This doesn't make *Windows* load any faster, but you'll get to look at a calming black void instead of Microsoft's blue logo.

Changing your startup to some other graphic is easier than you might think, but it does involve several steps. First, a little background.

When you run *Windows*, you execute *WIN.COM*, found in your *WINDOWS* subdirectory. If you look at *WIN.COM*, you'll notice it's fairly small, and you might reason that this one file is not all of *Windows*. You're right. *WIN.COM* really does just three things: It checks your system configuration, displays the startup screen, and loads the rest of *Windows*.

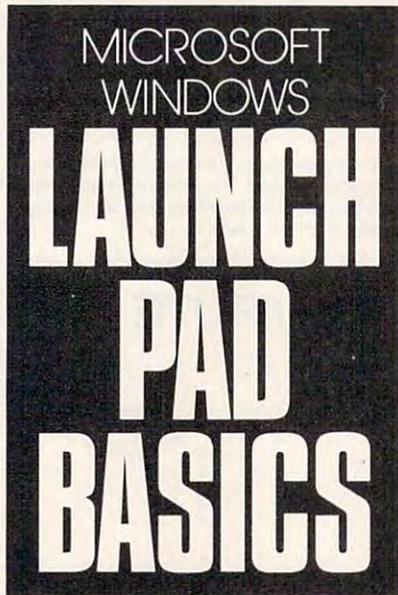
The interesting thing about *WIN.COM* is that it's the concatenation—the combination—of three other files, all found in your *SYSTEM* subdirectory: *WIN.CNF*, *VGALOGO.LGO*, and *VGALOGO.RLE*. The configuration portion of *Windows* is *WIN.CNF*, *VGALOGO.LGO* is the loader for the startup screen, and *VGALOGO.RLE* is actually the startup screen itself.

To get your feet wet and prove that all this is really so, let's combine these three files into an alternate *Windows* startup called *WIN2.COM* (we want to be sure not to overwrite our original *WIN.COM*). To make our new *Windows* *COM* file, we'll use the *DOS COPY* command with the binary switch, since these files contain binary, as opposed to text, information. Change to your *SYSTEM* subdirectory, and enter the following command: *COPY/B WIN.CNF+*

VGALOGO.LGO+VGALOGO.RLE WIN2.COM.

In this command string, */B* is the binary switch, the plus sign is the concatenation operator, and the last filename is the destination file.

Now, move *WIN2.COM* to your



WINDOWS subdirectory, and check out the *WIN.COM* and *WIN2.COM* file sizes. They should be identical. Run *WIN2.COM* (exit *Windows* first). It's the same as your old *WIN.COM*. OK, so now you know where *WIN.COM* comes from. How do you change it?

That's easy. All you have to do is substitute your own graphic screen for *VGALOGO.RLE*. To do this, you need either a prepared *RLE* screen (*RLE*, by the way, stands for *Run Length Encoded* and is a method for compressing information) or *WinGIF* (SuperSet Software, P.O. Box 1036, Orem, Utah 84059; \$15), an excellent shareware graphics file viewer and converter. You can find *WinGIF* and lots of *RLE* screens on CompuServe, GENie, and most other BBSs.

The only restrictions are that your graphic must be 640 × 480 with 16 colors and that the total size of

your *WIN.COM* file must be less than 64K, which means your *RLE* graphic must be fairly small.

Many people will want to create their own startup screens, so let's go through that procedure. Fire up *Windows Paintbrush*, and create a bitmap. For your first experiment, try something simple like your initials.

When you've finished, you'll need to get your *Paintbrush* file into *WinGIF*. You can save the *Paintbrush* image as a *BMP* or *PCX* file and load that into *WinGIF*, or you can use the *Clipboard* and express-mail the image to *WinGIF*. Since the latter process is faster and easier, let's do that.

Run *WinGIF*, return to *Paintbrush*, and select your picture (or a part of it) with the rectangular cutout tool found in the upper right corner of the toolbox. Press *Ctrl-Ins* to transfer your selection to the *Clipboard*. Next, make *WinGIF* active and press *Shift-Ins* to paste the image from the *Clipboard*.

Now that you have your image in *WinGIF*, you need to save it as an *RLE* file. Select *File Save* and choose a name for your logo. Next press the *Format* button. Click on *4bpp* and *RLE 4*. Now press *Save* to save your *RLE* file.

You already know the next step. Let's say your *RLE* file is named *MYLOGO.RLE* and you want to call your new *Windows* command file *MYWIN.COM*. You'd enter *COPY/B WIN.CNF+VGALOGO.LGO+MYLOGO.RLE MYWIN.COM*.

Again, make sure you and your *RLE* logo are in the *SYSTEM* subdirectory before entering the command. Now move *MYWIN.COM* to your *WINDOWS* subdirectory, and you're all set.

If the file is too large, *Windows* simply won't load. Since you didn't overwrite *WIN.COM*, you can type *WIN* to get back into *Windows* and tweak your graphic.

To downsize a too-large *RLE*, return to *Paintbrush* and select a smaller part of the image with the cutout tool, and repeat the process. □



PROGRAMMING POWER

T O M C A M P B E L L

For a long time, I've used a utility by J.P. Garbers called LF that lists the files in a directory alphabetically by extension and then alphabetically for each extension. Reimplementing LF in *PowerBASIC* for this month's column was illustrative, because it highlighted in an interesting way the tradeoffs between high-level and low-level languages.

This month's program is DE.EXE, for Directory by Extension. You'll need *PowerBASIC* to type it in and compile it. The command line syntax is simple:

DE d:path

Without the optional drive and path, DE lists the files in the current directory. Otherwise, it uses the specified location. The output looks like this:

```
. files:      FOO
.BAK files:  COL0691  COL0791
.BAS files:  DE        FT
.EXE files:  DE        FT
.TXT files:  COL0691  COL0791
```

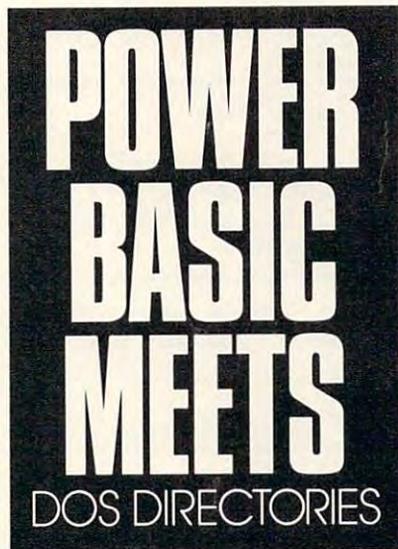
You can pause the output by pressing Space or quit by pressing Esc. This lets you bail out if you typed the program name by accident or if you only need to see the first part of the listing.

Writing DE took a couple of hours. Thanks entirely to *PowerBASIC* features, it runs very fast. It lists a 236-file directory in one second on my 386 versus two seconds for LF. Its output, however, can't be redirected, as LF's can. On the other hand, LF doesn't let you cancel by pressing Esc or pause by pressing Space (although you can pause the output using DOS's built-in Ctrl-S feature).

DE requires almost 30K when compiled versus 478 bytes for LF. Had I chosen to write DE in assembly language, it would have taken me several days, and while I doubt I'd get it as tiny as 478 bytes, it certainly wouldn't have reached the 1K mark. Conclusion? I'll take *PowerBASIC* any day of the week for a job like this.

A decade ago, every byte of disk space counted, and BASIC wasn't available as a compiler on the PC. Today, my time is too valuable to spend writing a simple utility like DE in assembly if I can help it.

This month's column explains how to get a list of the filenames in a directory. You'll need this skill to write utilities like DE or pick list boxes for loading files. It also showcases some of *PowerBASIC*'s special features: very fast printing to the screen, array sorting (*PowerBASIC* pays for itself with this feature alone), and the versatile DIR\$ function.



Power Directory

Surprisingly, getting the names of files in a directory isn't easy to do in most versions of BASIC for the PC. *Turbo Pascal* handles it the best of any language I know of, and *QuickBASIC* requires you to employ an assembly language interface to DOS, but *PowerBASIC* has a handy function called DIR\$ to help out. It's a highly unusual function in that its syntax is different on the first invocation than it is on subsequent invocations. The first time, it's passed the file specification as the first parameter (for example *.* , *.txt, win*.* , or foo.bar) and the attri-

bute of additional files as the second parameter. The most common attribute is 0, for normal files. You can add files to the search by adding the following values: 2 for hidden files, 4 for system files, 8 for the volume label, and 16 for subdirectories.

DIR\$ then returns as a string the name of the first file in the directory matching the file specification and attribute mask. After the first invocation, use DIR\$ by itself, without the parameters, to return the rest of the matching files. Here's a simple program that lists all the files in the directory:

```
' First file.
NextName$ = DIR$( "*. *", 0)
' Get rest.
WHILE NextName$ <> ""
  PRINT NextName$
  ' No params.
  NextName$ = DIR$
WEND
```

Because DIR\$ employs DOS functions 4Eh and 4Fh, it inherits a ridiculous limitation of these functions. There's no way to select *only* subdirectories, *only* the volume label, and so on. Any invocation will return all normal files matching the file specification in addition to those requested by the mask (the second, numeric parameter). I would much rather *PowerBASIC* return only files matching the attribute and file specification. *Turbo Pascal*'s implementation suffers the same deficiency, but since the return value from its FindFirst routine (a superset of *PowerBASIC*'s DIR\$) is a compound data structure including file size, attributes, and other information in addition to the name, your program can weed out the undesirables more efficiently. As we'll see in a moment, handling subdirectories in the file specification posed a problem.

Doing What's Expected

Easily the most challenging aspect of writing DE was its handling of the optional drive and path specifications. Nothing came easy here; DE follows



PROGRAMMING POWER

the syntax of DOS commands such as DIR. For example, where you have a subdirectory on the drive D called \UTILS, the command line

DE D: \UTILS

really means

DE D: \UTILS \ *.*

The DOS Find First and Find Next functions don't make this substitution for you, and with good reason. What if there's a file using the name D: \UTILS? COMMAND.COM and most external DOS utilities resolve this ambiguity by assuming you want to look for a subdirectory, but, of course, it means that you *can't* search for a file that has the same name as a subdirectory.

Since Find First doesn't make this choice for you, you must first check the file specification to see if it's a subdirectory. The routine IsDir% does this for you. It's a nice little black box to have around. Just call it, passing it the name of the prospective subdirectory, and IsDir% returns a nonzero value if the name is a subdirectory and 0 if not. The brute-force method it uses is to see if anything (file or subdirectory) matches the specification.

If there's no match, IsDir% immediately exits, returning 0. If there is a match, we still don't know if it's a file or a subdirectory, thanks to the less-than-helpful Find First. (Note here that IsDir% is one of the rare times you'll see DIR\$ used only once.) We then try opening a file by that name. If that can be done, IsDir% again returns false. Otherwise, we've narrowed it down—the input does indeed represent a subdirectory.

In any case, the command line is parsed, and DIR\$ is used to get the list of filenames. A single, incredibly powerful command called ARRAY SORT does what it would take me a couple of days to write—a machine-coded QuickSort on the array of filenames. The filenames are upended with the extension first so that the sort will proceed properly, in one fell swoop sorting by extension and then alphabetically within. Files are displayed with no extension at all, since each group's listing is preceded with the note <ext> files.

```
' Compiled using PowerBASIC 2.10a
FileList$ = COMMAND$ ' Get the command line.
IF FileList$ = "" THEN FileList$ = "**.*" ' List all files if no command line.
LastChar$ = RIGHT$(FileList$, 1) ' Get last char in filespec.
IF IsDir$(FileList$) THEN
  IF INSTR(FileList$, "**") = 0 THEN ' Don't append if there already.
    IF Right$(FileList$, 1) <> "\" AND Right$(FileList$, 1) <> ":" THEN FileList$ =
FileList$ + "\".*" ELSE FileList$ = FileList$ + "**.*"
  END IF
END IF
Count% = 0 ' Total files in this directory.
NextName$ = DIR$(FileList$, 0) ' Get first file matching spec.
WHILE NextName$ <> "" ' Get the rest of the files
  Count% = Count% + 1 ' that match and keep count.
  NextName$ = DIR$ ' After 1st call, use no params.
WEND

IF Count% = 0 THEN ' Quit if no files at all
  PRINT "No files in " + FileList$ ' match the filespec.
SYSTEM
END IF

DIM Directory$(Count%) ' Allocate memory for the array.

Directory$(1) = DIR$(FileList$, 0) ' Copy in the first filename.
NextName$ = DIR$ ' After 1st call, use no params.
FOR Total% = 2 TO Count% ' Copy the rest of the files into
  NextName$ = DIR$ ' the array. First, move the
  NameLen% = LEN(NextName$) ' extension to the front of the
  ExtPos% = INSTR(NextName$, ".") ' filename.
  IF ExtPos% <> 0 THEN ' But only if there is one.
    NextName$ = MID$(NextName$, ExtPos%+1) + "." + MID$(NextName$, 1, ExtPos%-1)
  ELSE ' Fake a null extension if none.
    NextName$ = "." + NextName$
  END IF
  Directory$(Total%) = NextName$ ' Add tweaked name to the array.
NEXT Total%

ARRAY SORT Directory$() ' Sort the array--fast!

PrevExt$ = CHR$(0) ' Set sentinel value.
Total% = 1 ' Tracks our position in WHILE loop.
NameWidth% = 9 ' Width given each name.
NameStart% = 15 ' Starting column.
ScreenMax% = 80 - NameStart% + NameWidth% ' Farthest right a name can start.
NamePos% = NameStart% ' Position of leftmost name.
WHILE Total% <= Count% ' Loop through whole array.
  CALL GetPause ' Let user interrupt.
  NewExt% = 0 ' Assume extension isn't new.
  ExtPos% = INSTR(Directory$(Total%), ".") ' Find its position.
  Ext$ = LEFT$(Directory$(Total%), ExtPos%-1) ' Parse it out of the filename.
  IF PrevExt$ <> Ext$ THEN ' A new extension has been found.
    PRINT : PRINT " " + Ext$ ' Print a blank line & the extension.
    LOCATE CSRLIN, 5 ' Move to the right.
    PRINT " files:" ' Note which files are being listed.
    NewExt% = 1 ' Flag that a new extension's hit.
    LOCATE CSRLIN, NameStart% ' Go where the filename belongs.
  END IF
  NamePos% = NamePos% + NameWidth% ' Position for the next filename.
  IF (NewExt%) THEN NamePos% = NameStart% ' Wrap to beginning if necessary.
  IF (NamePos% > ScreenMax%) THEN ' And go back to the first
    PRINT ' column of names.
    NamePos% = NameStart%
  END IF
  LOCATE CSRLIN, NamePos% ' Move to the next column.
  ' Print the filename without its extension.
  PRINT RIGHT$(Directory$(Total%), LEN(Directory$(Total%)) - ExtPos%);
  PrevExt$ = Ext$ ' Note the extension.
  Total% = Total% + 1 ' Track position in loop.
WEND

' Returns nonzero if InputDirName$ is a directory or 0 if not.
FUNCTION IsDir$(InputDirName$)
LOCAL ThisDir$
DirName$ = DIR$(InputDirName$, 16)
IsDir% = 0
IF DirName$ <> "" THEN
  ON ERROR GOTO ErrorTrap
  OPEN DirName$ FOR INPUT AS #1
  GOTO EndFunc
ErrorTrap:
  IsDir% = 1
  Resume EndFunc
END IF
EndFunc:
CLOSE #1
END FUNCTION

' Quit if Esc is pressed, or just pause if Space is pressed.
SUB GetPause
LOCAL NextKey$
IF NOT INSTAT THEN EXIT SUB
SELECT CASE INKEY$
CASE CHR$(27)
  PRINT : PRINT "Interrupted before all
  SYSTEM
  RETURN TO DOS.
CASE " "
  WHILE NOT INSTAT : WEND
  NextKey$ = INKEY$
END SELECT
END SUB
```



TIPS & TOOLS

H I N T S A N D T I P S F R O M O U R R E A D E R S

Floppy Copycat

If you have a fairly common system setup with three drives (drive A, 5¼-inch 1.2MB; drive B, 3½-inch 1.44MB; and drive C, hard drive), you're up a creek when it comes to copying files from one disk to another disk of the same type (5¼-inch to 5¼-inch, for example). You have to copy from drive A to C and then back to A and so on. An easy way to remedy this is to add the following lines to your CONFIG.SYS file.

```
DEVICE=DRIVER.SYS /D:0 /F:1
DEVICE=DRIVER.SYS /D:1 /F:7
```

These two lines allow the use of drive A as either A or D and drive B as either B or E. To copy the files from A to A, enter COPY *filename* D:, where *filename* is the one you want to copy. You can use wildcards to copy more than one file at a time.

*Jim Reece
Tuscon, AZ*

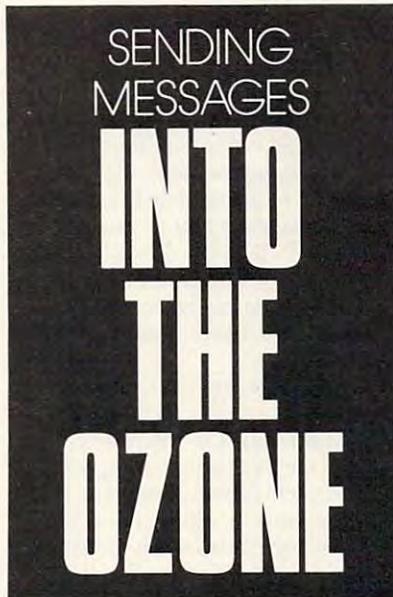
Shutting Off Error Messages

You probably know that you can redirect the output of most DOS utilities to NUL as a way to switch off their output. For example, you might have a batch file that does this:

```
COPY *.* A: > NUL
```

This runs the COPY command, but instead of displaying its message on the standard output device, the screen, it redirects the output to the NUL device, which is a sort of special file that doesn't do anything (nor does it take up disk space). But some commands or error messages those commands issue refuse to cooperate with redirection to NUL. That's because they send their output to the standard *error* device, not the standard *output* device. For example, if you already have a directory called TMP and you enter the command MKDIR TMP on the command line, you will see the error message *Unable to create directory*. This harmless but ominous-looking error message can make naive

users uncomfortable. The answer is to use CTTY but to use it within batch files only. CTTY causes all further output (even the standard error device) and keyboard input to be delivered through the device named on the command line. If you make that device NUL, output will be halted altogether—but so will input. That's why



you must use the CTTY NUL command in a batch file; by setting it to NUL, you nullify the possibility of keyboard input. To demonstrate, run this batch file:

```
MD TMP
CTTY NUL
MD TMP
CTTY CON
```

The first line creates the directory TMP. If it already exists, you will see the message *Unable to create directory*. If it doesn't, nothing appears at all. The second time an MD occurs, the error message is issued. But since CTTY has been set to NUL, the message is sent into that great bit bucket in the sky, and you don't see it. CTTY CON sets input and output back to

their default state. If you neglect the CTTY CON in your program or try CTTY NUL interactively by entering it at the command line, your machine will lock up (remember that it's not accepting keyboard input), and you'll need to reboot.

*Tom Campbell
Irvine, CA*

Getting Keyboard Input

One of the lesser-known tricks of the trade allows you to enter a string from the keyboard that a batch file can use. There are a couple of caveats, however. The user must finish typing with the F6 key and then Enter. Also, the string is copied into the environment, where there's often a severe shortage of space. First, create a file called SETIT.TXT as follows (no deviations, and don't use your text editor—use COPY CON):

```
COPY CON SETIT.TXT
SET TMP=~Z
```

This will form the basis of a batch file called SETIT.BAT that'll be generated on the fly. Second, type in this batch file:

```
ECHO off
ECHO Please enter your name and
press F6 and then Enter when you're
finished.
REM Get the user's name from the
keyboard.
COPY CON SETIT.TMP
REM COPY SETIT.TMP onto the end
of SETIT.TXT to create
SETIT.BAT.
REM Neither SETIT.TMP nor
SETIT.TXT is disturbed. The +
is a
REM little-used feature of the COPY
command called concatenation.
COPY SETIT.TXT + SETIT.TMP
SETIT.BAT
DEL SETIT.TMP
REM Replace CALL with
COMMAND/C if your DOS
version is < 3.3.
CALL SETIT
ECHO Hi, %tmp%
```



TIPS & TOOLS

IF %tmp% == Tom ECHO Your user level is #1.
IF %tmp% == Bubba ECHO Your user level is #2, Bubba!
IF %tmp% == Clif ECHO You shouldn't even be on this system!

Run this file (as TEST.BAT or whatever) and enter the names *Tom* and *Clif* as input on separate runs, being careful to end the name with F6 and then Enter. This program is case sensitive. If you run out of environment space, use SHELL= in your CONFIG.SYS. A line like

shell=command.com /P /E:1024

gives you an environment of 1024 bytes rather than the default of 160. The /P option runs AUTOEXEC.BAT. If you're using versions of DOS before 3.3, divide the E figure by 16.

*Tom Campbell
Irvine, CA*

Backing Up Is Hard to Do

Put this batch file, NDBACKUP.BAT, in a directory specified in your PATH statement. It displays the files located in the current subdirectory that aren't backed up.

@ECHO OFF
ATTRIB *.* %1 | FIND "A" | MORE

It lists the names of the files and their attributes. The ATTRIB command reports on files that are not backed up by putting an *A* (Archive) next to their filenames. It also reports files that are read-only by putting an *R* next to their names. The ATTRIB command looks at the file attributes, and the FIND filter shows only those files with the *A* attribute. I added the MORE pipe so the filenames wouldn't scroll off the screen. To run the batch file, enter NDBACKUP /S at the DOS prompt. Make sure that FIND.COM and MORE.COM are available to the system when you run the batch file. (They should be in a subdirectory listed in the PATH.)

The /S switch reports on not only the current subdirectory but any subdirectories below the current subdirectory. Invoke this batch file from the root, and it will report on every file on the drive that hasn't been backed up.

*Mark Minasi
Arlington, VA*

The Long Unwinding PATH

The proliferation of larger hard disks has brought out an insidious DOS bug: the long path bug.

As you use larger disks, you end up with more places to store things on the disks. More places to store things means more items on your path, and that means that your path gets longer. The path has a maximum length of 128 characters.

You can't enter a path longer than 128 characters on the command line. If you type in *any* DOS line longer than 128 characters, DOS will beep at you. So you're protected from trying to create a long path with the keyboard.

But most of us create our paths from batch files—AUTOEXEC.BAT in particular. More and more new programs come with automatic install programs that create subdirectories for the new program, copy the program's files to the hard disk, and modify the PATH statement in your AUTOEXEC.BAT file. When you have installed a number of them, the PATH statement can grow beyond 128 characters. That's when the problem occurs.

There is no internal DOS check against PATH statements that set paths longer than 128 characters. Worse, it seems that paths longer than 128 characters actually overwrite part of DOS, leading to random errors!

I discovered this when invoking the batch file that gets me into the *Microsoft BASIC Professional Development System*. My batch file added a few items to the path and activated the *Microsoft BASIC Professional Development System*. The only problem was that it never got to BASIC. Instead, an endless series of printscreens were sent to my printer. (This gets your attention when you've got a laser printer; believe me!) I ran around in circles trying to figure out the problem for a few days until I realized that the batch file was extending the path length. When I ran the part of the batch file that extended the path, bingo—endless printscreens. Once I removed the part of the batch file that extended the path, the batch file worked fine. I have discovered other machines with the same problem, so it may be becoming more common.

*Mark Minasi
Arlington, VA*

Filing Floppies

If floppy disks multiply faster than jack rabbits in your computer room, try this filing system. Pick up some index card file boxes at an office supply store. The boxes I use look like shoe boxes—5 × 6 × 12 inches.

Use one for original program disks, one for backup copies, and another for working disks and data disks. Since each box holds well over 100 floppies, it only takes a few boxes to clean up most disk dumping grounds. These boxes stack neatly on shelves, hold more disks, and are easier to use than most of the files sold specifically for disks.

*Tony Roberts
Greensboro, NC*

Bad Batch Memory?

Do you write batch files and then find yourself weeks, months, or years later wondering what they do or how to use them? The solution is to make each batch file self-documenting.

If the batch file uses a replaceable parameter, have the first line of your program test to see if the parameter has been supplied. If not, have the program go to an ECHO statement that explains how to run the program.

```
IF (%1) == ( ) GOTO HELP
PROGRAM LINE 1
PROGRAM LINE 2
...
PROGRAM LINE X
GOTO END
:HELP
ECHO Put instructions for using
  program here. Use as many lines
  as you need.
:END
```

When you forget how to use a program, just run it without specifying the parameters, and you'll get the help you need.

*Tony Roberts
Greensboro, NC*

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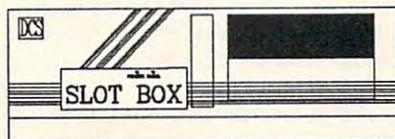
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INTRODOS

T O N Y R O B E R T S

People often ask how they can make their computers easier to use. Much as I'd like to provide a simple answer, nothing cut-and-dried comes to mind. I do have some suggestions, though, that if implemented over time, will help anyone to be a more confident and productive computer user.

- Use your computer. It may be complex, but it's not too difficult to handle. Remember getting your learner's permit and sliding behind the wheel of an automobile for the first time? Driving a car is a complicated process, but by doing it every day and using all the options, you quickly mastered it.

Computers are no different. You can learn complicated processes by using them repeatedly and regularly.

- Protect yourself from disaster. Mistakes occur; programs crash; disks go bad. Make copies of your work often enough so you can recover important information quickly if problems occur.

Keep in mind that computers and software are just tools, and like other tools, they go out of balance and break down.

Don't ruin your day by getting angry when a mishap occurs. Simply do what's necessary to correct the problem and take what steps you can to minimize the chance of the problem recurring.

- Don't learn on deadline. Nothing tightens the nerves more than covering new ground in a crisis.

Imagine this scene: The boss pops in one sunny morning and says, "Your word processor does mail merge, right? Great. Let's send this letter to the 500 names on this list. I'd like to get it out this afternoon."

If you're now turning to the mail-merge chapter of your manual for the first time, it's going to be a long day.

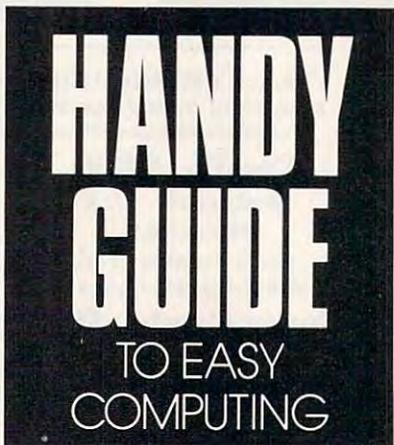
To avoid this kind of crunch, test all the features of your software under nonthreatening circumstances.

You could learn to use mail merge by preparing invitations to your child's birthday party. By com-

pleting a small project, you go through all the necessary steps of using the software—without the fear that your job is on the line if you make a mistake.

An understanding boss may even allow you to use company time and equipment to conduct such personal business, as long as you make it clear that you're doing so to improve your ability to handle future assignments.

- Know the manual. I know it's possible to muddle through many pro-



grams without reading the book, and I know manuals are deadly dull, but they sure can make life easier. Remember, however, that the process for reading a manual isn't the same as for reading a spy novel.

To get the most out of a manual, read as much of the introductory material as seems appropriate to get the program up and running; then page through the rest of the book, looking at what's there but not trying to read it.

Look at the headlines, the illustrations, and any tips or warnings that are highlighted in bold type or with boxes.

The goal is to learn what's in the manual and where to find it when you need it. Later, as you explore the software, be willing to pick up the manual and read fully the sections

that pertain to the commands or functions you're using.

Finally, take a few minutes from time to time to page through the entire manual again. This time, stop and read items that catch your eye. As your familiarity with the software grows, instructions and explanations that once seemed cryptic will begin to make perfect sense.

- Keep a notebook. It's difficult to learn some procedures because they're not performed often enough for you to remember them well. For example, if you have trouble remembering how to set up a monthly report, jot the steps down while they're fresh in your memory. Next month, follow your notes, and the job will be a breeze.

Whenever you ask someone for help, try to summarize the problem and the process to solve it in your notebook. Your local computer whiz will always be willing to assist you as long as you don't ask him to solve the same problem month after month.

- Learn to take shortcuts. When you give someone directions to your house, you have them travel the most well-known streets even if that path is longer and more time-consuming. You, on the other hand, use side streets, back alleys, and other lesser-known thoroughfares to get home as quickly as you can.

When you learn software, you usually learn the long way. Don't let yourself stop there; once you become comfortable with the program, check out the shortcuts.

- Finally, remember that computers are wonderful at performing repetitive tasks. Recognize actions that are taken repeatedly and learn to automate these tasks. Use batch files to set up printers, make network connections, and launch programs.

Use the macro capabilities of your software to help with editing and reformatting data. It might take you ten minutes to program a macro today, but whenever you use that macro in the future, you'll be getting a big payback in time saved. □



ON DISK

T O N Y R O B E R T S

This issue's MS-DOS disk is a grab bag of utilities that will help you with batch file programming, documentation printing, and disk maintenance.

Take a look at this lineup.

MicroMacroBat

The old saying that good things come in small packages is appropriate when applied to *MicroMacroBat*, a batch program extender that brings color, animation, and excitement to batch files like never before.

Programmer Bill Fitzpatrick created the program as an exercise to test a new compiler that was advertised to create compact code. It apparently worked because this program, which allows for box drawing, scrolling, printing, coloring, and a plethora of other functions, is bundled into a 17K file.

You have to see the demo to believe everything *MicroMacroBat* can do. The demo, which fully exercises most *MicroMacroBat* functions, runs a little slowly from a floppy disk, but it really sails when placed on a hard disk.

MicroMacroBat is shareware with a \$35 registration fee. The registered version includes a typeset manual and breaks the program into three separate modules so loading time is reduced and performance is enhanced.

Productivity Manager

The editors and programmers at *COMPUTE* put together a disk called *Productivity Manager* which contains 38 DOS utilities and enhancements. We took a handful of utilities from the disk—those that make batch files more powerful—and used them to illustrate the article on batch file programming in this issue.

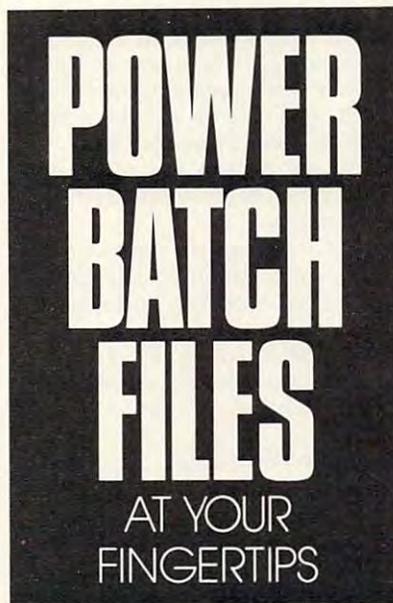
These batch program enhancements—BOX, MENU, GETKEY, PUTTEXT, NOTES, SAVESCRN, and LOADSCRN—are included on this issue's disk and carry no registration fee.

By calling these programs from your batch programs, you can create

menus and batch files that respond to users' keystrokes and mouse clicks.

DOC2COM

Here's a nifty program that turns regular text files into executable COM files. This is the perfect way to deliver messages, instructions, or documentation on disk; those who have to read the files will thank you for your thoughtfulness in giving them an easy, convenient way to read your wisdom.



DOC2COM presents information a screenful at a time and allows full forward and backward scrolling. It's impossible to get lost when using files prepared with *DOC2COM* because the program provides a helpful prompt if the user tries to use keys that are not valid.

De Pyper, who is currently working on an enhancement to the program, doesn't require registration or payment for *DOC2COM*, but in the spirit of shareware, he says he will accept \$5-\$10 donations.

MicroText

This program is a shareware lover's dream. *MicroText*, written by the for-

mer author of this column, George Campbell, can print up to four pages of information on one sheet of paper.

This paper-saving feat is accomplished by having the printer use a tiny font and by reformatting the text file to eliminate wasted space. This is a great way to store hardcopy of material you refer to only occasionally.

MicroText features a clean, simple-to-use interface with drop-down menus. The program can also be run directly from the command line. The program works with most dot-matrix and PCL, but not PostScript, printers.

MicroText is shareware. The registration fee is \$10.

Also included on this disk is *Print 4 in PostScript*. Similar to *MicroText*, *Print 4 in PostScript (P4PS for short)* performs its magic on PostScript and PostScript-compatible printers.

AltPage

AltPage is another paper-saving printer utility, but this one uses normalized text and allows printing both sides of the page.

AltPage breaks text files into two separate files—ODD.TXT and EVEN.TXT. Once the breakup is complete, print ODD.TXT first, and then turn the paper over and print EVEN.TXT on the back side.

Because the program only works with straight ASCII files, a second program, *Strip*, is provided to help convert files that originate in word processors that use a character's high bit for certain control functions.

AltPage is shareware, and its \$20 registration fee entitles the user to a disk containing the program plus several other utilities by the same author, Jack A. Orman.

CPU Usage Meter

Here's something that will intrigue users of *Windows 3.0*. *CPU Usage Meter* monitors the CPU activity and lets you know how busy your processor is.

With this program you can see which applications are the real resource hogs and which ones wait

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are called into action.

The program creates an icon that indicates the percentage of available CPU time that's being used. The icon is refreshed every three seconds, giving you a good idea how much strain various operations put on your processor.

Jim Seidman says he created the program just to see what was going on in his own machine. It's available as freeware. There is no registration fee.

Sweep

This handy utility searches all corners of a hard disk looking for specified files that can be deleted. *Sweep* is a quick way to get rid of the BAK or TMP files that seem to accumulate with some programs.

You create a configuration file specifying what should be swept out: *.BAK or *.TMP for example. Then, whenever the program runs, files that match those patterns anywhere on the specified disk will be deleted.

It's also possible to limit the program's action to certain subdirectories, if desired.

Before using any program such as this, you'll want to have a good commercial "undelete" utility on hand in case you have second thoughts about losing any of the files *Sweep* lists as deleted. *Sweep* is freeware with no registration fee.

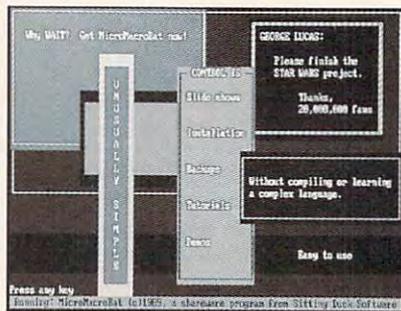
Print 4 in PostScript

Print 4 in PostScript (*P4PS* for short) is similar to *MicroText*, but it performs its magic on PostScript printers.

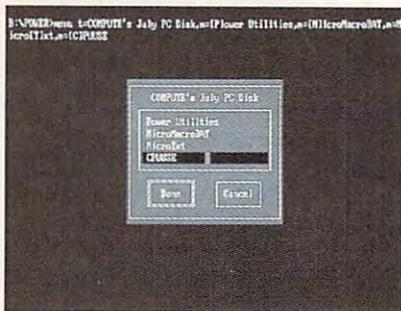
P4PS runs from the command line and is very fast and easy to use. Beneath its straightforward face, however, are myriad options that you can select if you're interested.

Here's what *P4PS* does: prints four pages of text on a single sheet, handles 80-column or 132-column text, prints to any DOS device or file, prints multiple copies, provides macros to control page header information, allows printing of an entire document or a range of pages, and offers double-sided printing.

P4PS is a shareware program, so if you use it, you should register it with the author. The \$29.95 registration fee entitles you to a copy of the registered version of *P4PS* and a printed manual. □



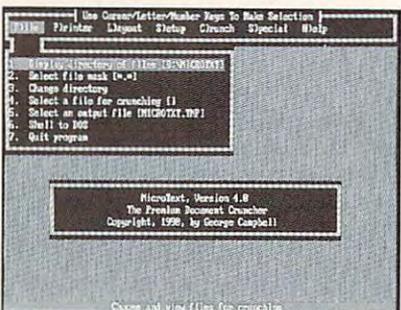
MicroMacroBat



Productivity Manager



DOC2COM



MicroText



HARDWARE CLINIC

M A R K M I N A S I

I'm buying a new motherboard because I'm tired of waiting for my 10-MHz 286 clone to do *Windows* redraws. I'm lucky because (years ago) I bought a clone in a regular generic AT-type case.

That means that the motherboard is standard size, so I can make the whole system a 386 screamer just by replacing the motherboard. Come on along and see how you can jazz up your system, too.

Oops—I forgot to tell you just what a motherboard is. If you take the cover off your PC, you'll see, off to the left, a bunch of upright circuit boards. Now take a look at what they're standing on—another circuit board, a big one lying flat on the bottom of your PC's case. The board lying down is the motherboard.

The motherboard is the Big Cheese in your PC. It's the board that most likely contains your main CPU, your math coprocessor, some memory, your BIOS, and other items.

Because it's so important, changing the motherboard changes your PC's entire personality, as well as its speed and, in some ways, its flexibility. Motherboard surgery isn't for everyone.

If you've got a strange-shaped case, like one of those "slimline" or "small footprint" PCs, your manufacturer achieved that small footprint by using a nonstandard-size motherboard, which pretty much lets you out of this discussion. (Stick around anyway; you'll get some tips on buying your next computer.)

I want a lot of features in a motherboard—some necessary, some merely nice. My necessary list includes room for at least 16MB of RAM on the motherboard; the ability to disable shadow RAM; a BIOS with user-defined hard drive type; BIOS contained in two ROM chips, not one; BIOS from AMI, Award, or Phoenix; eight expansion slots; and a 16-MHz 386SX or 20-MHz 386DX processor.

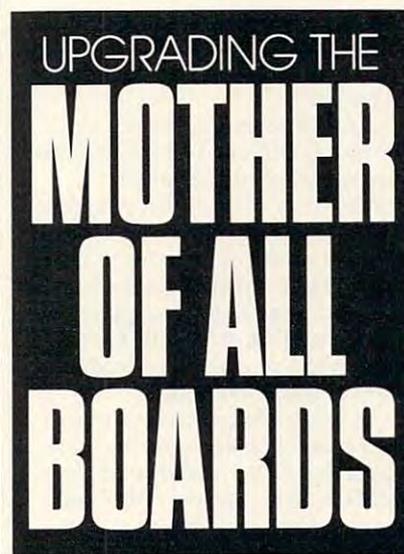
The unnecessary-but-highly-desirable list includes adjustable bus speeds,

a faster CPU with cache, and a motherboard that's XT size, not AT size.

Thanks for the Memories

I dream of a day when I won't want more memory.

Sounds crazy when I say to you, "You must buy motherboards that accommodate at least 16MB of RAM," but it's true. Blame it on *Windows* 3.0. Blame it on *386Max* and *QEMM*. The fact is that four megabytes is a bare minimum required to get anything done with *Windows*. Eight megs is much comfier. And more software's coming down the pike that will give you even more reasons to want more RAM.



So I figure that in a year or two, everyone will have eight megs and will want more. At about \$45 per megabyte for RAM chips and SIMMs, it's not unreasonable.

But, of course, there are a few catches. In the XT and AT days, you just expanded memory by buying a memory expansion card, putting memory chips on it, and putting the card into one of the PC's expansion slots. But you can't do that with faster PCs. No matter how fast your PC is—20, 25, 33 MHz—the expansion slots

still only run at 8 MHz.

Why do the slots run so slowly? Because most expansion boards can't operate above 8 or 10 MHz. So whenever the system is accessing an expansion board, it slows down to 8 MHz. That sounds pretty awful, but it's not that bad. Most boards in expansion slots communicate with things that are fairly slow anyway, like floppy drives, printer ports, modems, and the like.

What really hurts is having to put a memory card in an expansion slot. Memory runs best when it runs at the full speed of the CPU, so it's a crime to make a 25- or 33-MHz machine slow down to 8 MHz when accessing memory.

By the way, a few motherboards give you the option to experiment with a faster bus. For example, I've got a 20-MHz 386 system that lets me set my bus speed to 6, 8, or 10 MHz.

If all of your expansion boards are a bit faster than average, you can get away with running the bus at the practically illegal rate of 10 MHz, and speed up video and disk access in the process. More on this in a future column, but having the speed adjustment is a nice motherboard option.

Manufacturers have found two ways to avoid this problem. First, some manufacturers design a special high-speed slot for the motherboard that will only accommodate a particular card—a memory board.

If you buy a motherboard of this type, make sure you get the memory board at the same time you buy the motherboard, or you won't be able to put any memory on the system.

Other manufacturers put sockets for memory right on the motherboard, eliminating the need to deal with the expansion slots. If you buy one of these motherboards, ensure that there's enough room for at least 16MB.

Be warned, however, that most of the boards on the market only have room for 8MB, so pick carefully. Some motherboards, by the way, combine both methods—they have



HARDWARE CLINIC

room for about 8MB on the motherboard itself and also have a high-speed memory slot for a board that will hold another 8MB.

You don't need the memory board until you're ready to exceed 8MB of total system memory, but buy the board immediately anyway. Why? Because the board may not be available when you need it in a year or two. These boards generally run \$100-\$200.

Me and My Shadow

Many 386 systems have a feature called *shadow RAM*. It's supposed to speed up system response. Actually, shadow RAM has little real-world value and can cause trouble when running *Windows 3.0* and other programs. I don't mind having the feature with the system, but I sure want to disable it. Make sure your system gives the option to disable shadow RAM.

You see—shadow RAM speeds up any attempt to read the BIOS, a basic, low-level piece of software that controls your keyboard, disk, screen, and printer.

The argument goes that any input/output operation will be sped up by shadow RAM. This argument is specious because it overlooks an important fact: Most software bypasses the BIOS and controls the PC hardware directly in order to achieve maximum speed.

If software used the BIOS, shadow RAM wouldn't be a bad idea—but most software doesn't. It looks good on benchmarks (which politely access the hardware via the BIOS), but *Windows, 1-2-3*, and *WordPerfect* (to name a few) will be unaffected by shadow RAM, so don't feel bad about disabling it.

Buying the Best BIOS

I just mentioned the BIOS and that it's a piece of software. It's an unusual piece of software, however, in that it's encased in hardware. Where most software is loaded from a floppy or hard disk into the computer, the BIOS comes in a chip called a *ROM (Read Only Memory)*.

When shopping for ROMs, it turns out you've got to be concerned both with the software in the chip and with the way the chip is packaged.

First, ask who's writing the soft-

ware. The BIOS software must be very, very compatible with an IBM BIOS, or your system won't be 100-percent PC compatible. Developing compatibility takes lots of practice, so buy a BIOS from a vendor with some experience.

I'd recommend AMI (American Megatrends, Incorporated), Award Software, or Phoenix Software brands. That doesn't mean the other guys are trash, understand—they just need some more time. Stay with AMI, Phoenix, and Award, and you'll be OK.

And there's no reason why you can't get a BIOS from the vendor of your choice—all three make BIOSs for just about every 386 system under the sun.

The BIOS's original job was the low-level hardware functions I described earlier, but nowadays there's more to look for. First and probably most important is a user-defined drive type. Since the advent of the IBM AT in 1984, 286/386/486 BIOSs have contained a table of hard disk drive types—descriptions of common hard disks.

As ROM space is limited, most ROMs only contain 47 drive descriptions, which, of course, aren't enough—there are new drives appearing every day.

If the drive you're trying to install doesn't match anything on the table, either you won't be able to install the drive or you'll have to settle for a description of a smaller drive, leading the PC to waste some space.

In 1989, AMI and Award introduced a useful new feature, the user-defined drive type. It allows you to describe a drive directly, rather than trying to match your drive to the closest prestored type. Since then, most BIOS vendors have included user-defined drive types, so make sure your BIOS includes this feature.

Other desirable BIOS features are a built-in system setup (which eliminates the need to hunt around for the *SETUP* disk every time you make a change to the system), the ability to set memory wait states, the ability to enable and disable blocks of memory in the BIOS (rather than having to physically remove memory in order to isolate and test it), and the ability to set keyboard speeds via the BIOS (freeing you from having to use third-

party utilities to make your keyboard more responsive).

The last BIOS feature has to do with its packaging. Most BIOSs are shipped as a pair of chips called the *even ROM* and the *odd ROM*. More recently, however, I've seen motherboards that use a BIOS packaged as a single ROM.

I would counsel you against these motherboards simply because it will be more difficult to find ROM upgrades in the future. There are several ROM vendors in the U.S., and none that I've talked to were prepared to offer a single ROM BIOS—they all use the more normal dual-chip BIOS.

So for the sake of easy upgrades later, stick to motherboards that use a pair of ROMs to house the BIOS. (Why would you want to upgrade your BIOS? To solve new compatibility problems or to support new hardware, such as the upcoming 2.88MB floppy drives.)

Odds and Ends

Most 386 motherboards used to be large, about the same size as an old AT motherboard. More advanced chip design has reduced the number of chips on the motherboard, reducing power consumption and leading to smaller, XT-size motherboards. I'd recommend the smaller XT motherboards because you can fit them into smaller cases, which take up less space on your desk.

But don't buy a motherboard that achieves smaller size by reducing the number of expansion slots—you want an eight-slot motherboard. The more slots, the more long-term expandability you'll have.

I know you're waiting for me to make a recommendation about a brand. I don't have space to discuss all the motherboards I like, so I'll just say that there are actually lots of terrific no-name motherboards. New vendors appear and disappear almost weekly. Check out your local clonemeister's offerings: A decent 33-MHz motherboard with cache will set you back about \$900.

No matter which 386 motherboard you buy to replace your current 286 PC's motherboard, you'll be quite pleased by the results. But as you can see, attention to a few extra details will make using your newly improved system even more satisfying. □



ONLINE

D E N N Y A T K I N

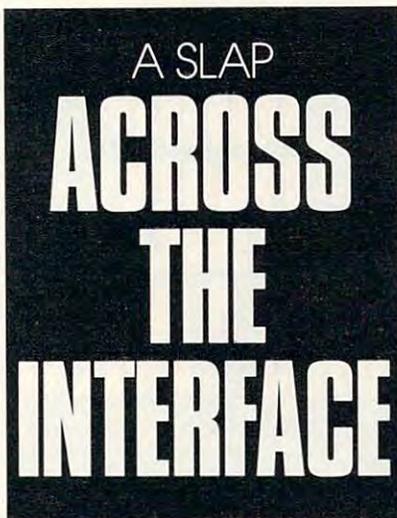
You hand the usher your E Ticket and sit down as a deep, monotonous voice fills the room. "Welcome to ModemWorld, the land of the user-hostile. We'd appreciate it if you'd check your mouse and GUI at the door. No, madam, you can't enter that way. We deal in doors here, not *Windows*. Now, if everyone will please fasten the safety straps, we'll begin our journey back into that archaic world where ASCII characters are king, icons are forbidden, and you'd better know your stop bits from your parity bits if you hope to survive." An evil laugh fills the room, and you lurch forward as your car plunges down into the bitstream.

Riding through the vast network of online services and BBSs is like taking a trip back through time to the days when IBM PCs shipped with text-only display cards, UNIX was considered to be a relatively user-friendly operating system, and graphics were something only game players cared about. While you may have a nice GUI-based terminal program, those menus are only good for controlling what's happening on your computer, not communicating with the remote service.

Once you're logged on, the only interaction you'll have with the service is through the keyboard. That in itself is not horrible; many of us use older MS-DOS programs all the time with clunky, text-based interfaces. However, not only do most BBSs and online services have interfaces that date back to the 1970s, but they also all have different interfaces! A user might type *G* (Good-bye) to log off one system, *O* (Off) to log off another, and *BYE* to exit yet another. No wonder getting online for the first time can be overwhelming.

Some services have begun the move to graphical user interfaces, but as yet they're still awkward and clunky, and will bring back memories of using *Windows 1.0* or a 128K Mac—they have potential, but their limitations overshadow their ease of use. Generally, you're faced with a

service like Prodigy, which is very easy to use but just as easy to outgrow, or America Online, which addresses many of Prodigy's limitations but is still so young that you won't find the variety of offerings available on more mature networks. And I've still never encountered a full GUI on a BBS, although the Amiga's SkyPix protocol comes close.



You could avoid BBSs and just use front-end programs like *Aladdin*, *GEE!*, *Whap!*, or *TapCIS*. But local bulletin boards are too much fun to miss out on. And while front-ends are very handy for quickly gathering messages and files from online areas you've visited before, they're useless for exploring the systems—you have to already know what you want to read. Plus, if you encounter problems online that confuse the front-end program, you've got to know the basics of navigating that service to get the program unstuck.

Don't let the variety of intimidating interfaces keep you from going online, though. While the learning curve can be steep, the eventual results are worth the effort. The best thing you can do, for your wallet as well as your sanity, is to pick up a good book with instructions, tips, and tricks for your

favorite terminal program or online service.

The best all-around book I've seen so far for both the beginning and experienced telecommunicator is McGraw-Hill's *Dvorak's Guide to Desktop Telecommunications*, ostensibly written by John Dvorak and Nick Anis. (Many chapters of this formidable 776-page tome were actually written by experts in the fields covered by those sections; for instance, noted Amiga sysop Harv Laser penned most of the text in the chapter "Communicating by Amiga.")

To risk a cliché, if you only buy one book on telecommunications, get this one. It starts with a general description and history of telecommunications, then moves on to tips on selecting and installing telecommunications hardware and software.

The book covers not only most of the major (and minor) online services but also many commonly used BBS systems. It explains concepts like BBS doors (programs that can be run from within BBS software) and file transfer protocols in easy-to-understand terms. Techies will appreciate the chapters on how a modem works and on new communications technologies such as ISDN. There's even a four-page listing of emoticons. The book doesn't take the narrow view that all telecommunicators use MS-DOS computers. There are chapters with online tips for Amiga, Macintosh, OS/2, and UNIX users as well.

If you're a heavy user of GENie or CompuServe, you might want to check out McGraw-Hill's other offerings. *Glossbrenner's Master Guide to GENie*, by Alfred Glossbrenner, covers every service GENie offers. The author's friendly writing style makes this thorough and informative guide a pleasure to read, even for the experienced GENie user. CompuServe users will find similarly helpful information in *The Complete Guide to CompuServe*, by Brad and Deborah Schepp.

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



ARTS & LETTERS

R O B E R T B I X B Y

If you want to make me happy, send me a board to install in my computer or a pile of spaghetti wire to plug into its various ports. I've had much enjoyment recently trying out tools and boards.

First, ComputerEyes (Digital Vision, 270 Bridge Street, Dedham, Massachusetts 02026), one of the oldest names in video digitizing, is bigger and better than ever, providing the desktop publisher on a budget a tool that captures video signals in a trice and converts them to useful, editable graphics. It can cope with a range of screen resolutions and input devices as various as TVs, VCRs, computers with composite output, and still and motion video cameras.

It provides an interactive preview that shows a fast-capture input screen so you can set the focus and aperture of your camera. Then you can elect to capture a screen at various speeds (from 1.6 to 24 seconds), with the resolution related to the speed (it supports screen formats through Super VGA—640 × 480 with 256 colors).

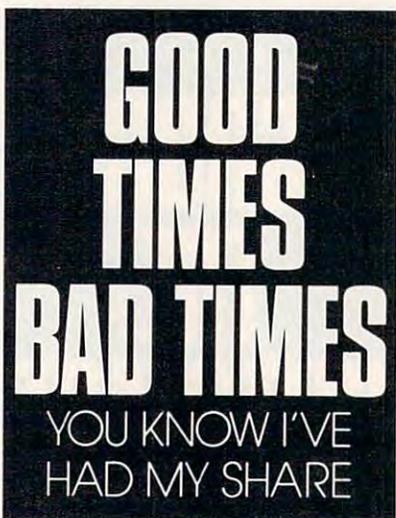
ComputerEyes can work with 24-bit color (16.7 million colors) or 8-bit gray scales (256 gray levels). When the image is captured, you can use its editing tools to adjust the image or save it out to one of several formats (including TIFF, PCX, *DeluxePaint* LBM, MSP, IMG, Targa, and *Splash*) for editing in your favorite paint program. ComputerEyes lets you generate real-world art for your desktop publishing projects.

I was less taken with FTG Data Systems' light pen (10801 Dale Street, Suite J-2, P.O. Box 615, Stanton, California 90680). I don't like the mouse as an input device—particularly for drawing—and I'm always looking for useful alternatives. As soon as I read about the FTG light pen, I wanted to look at it. But after about a week of trying to make it work with *Windows* and my ATI graphics board (and extended phone calls with the helpful folks at FTG), I gave up utterly.

Windows slows to a crawl whenever the pen is pointed at the screen. I

accumulated a list of anomalies no one could explain (the cursor followed the pen everywhere on the screen except the menu bar, to name one frustrating example). Upgrades may improve its performance, but currently this tool isn't viable for *Windows*.

A year ago I had an opportunity to review a new input device called the Wiz (CalComp, 2411 West La Pal-



ma Avenue, P.O. Box 3250, Anaheim, California 92801). For various reasons, I wasn't impressed by its performance, but I liked the idea. The Wiz combines a digitizing tablet with a mouse (or a pen) to provide extremely tight cursor control. CalComp has a new driver for DOS and *Windows* 3.0 that works beautifully. It also offers a template system that allows you to enter *Windows* or DOS commands (or specialized commands for many popular programs) by clicking on various positions on the touch tablet. Although it works, I have never liked this part of the system.

CalComp provides a pen that can be substituted for the mouse. It allows you to draw in a very natural way, holding the electronic pen as you would an ink pen and drawing on the digitizing tablet as you would on a paper tablet.

The only problems I had were in double-clicking and accessing the right mouse button. When you bear down on the pen, its point clicks, simulating a left mouse button click. Unfortunately, it's very difficult to double-click the point without moving the point on the digitizer surface, which prevents the double-click from registering. Also, the pen's second button isn't designated to function as the right mouse button. You can make it act as the right mouse button, or you can make the point act as the right button and the pen's side button act as the left mouse button, but that's not much help. Clicking on the side of a pen without moving the point is also next to impossible.

The Wiz is compatible with the Microsoft mouse (if you have the new 1.1D Wiz driver), but you still may have to go through some setup gymnastics to get it to work. *GeoWorks Ensemble* required that I install *GEOS* so that its own mouse driver was ignored. *Presentation Team* from Digital Research required that I install the program as if I were using a bus mouse. The control was remarkably tight when the mouse was in use, and the pen worked well, except for the clicking problems I mentioned. You have to get used to the fact that the mouse must be aligned with the pad for the movement of mouse and cursor to be analogous.

If you know of a good light pen (or other interesting input device), send me the name and address of the manufacturer, and I'll try to review it in these pages.

Although it isn't a tool or board, not to mention *CorelDRAW!* would be a sin after the hours of enjoyment it's given me. Corel Systems isn't the type of company to add a few bells and whistles to something and call it a product upgrade. The next "Arts & Letters" column will be a close-up of *CorelDRAW!* 2.0. It has all the features you've heard so much about for the last couple of years, plus a generous measure of tools you'll wonder how you got along without. □

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FAST FORWARD

D A V I D E N G L I S H

If your graphics card and monitor are your computer's video system, why can't you just hook up your television to your computer? Or why can't you run a cable to your VCR, pop in a videocassette, and paste Aunt Ethel into your paint program? Better yet, why can't you use your paint program to create a colorful title (something like *Our Summer in the Rockies*) and zap it down your monitor's cable directly into your family's vacation tape?

After all, it isn't so hard to bring text—or even sound—into and out of your PC. So what's so special about video? And how much money do you have to spend before you can send Aunt Ethel dancing across your computer screen?

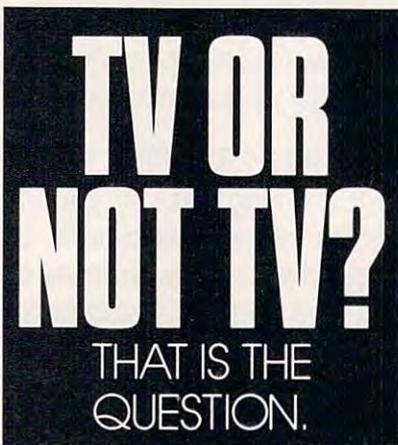
More than anything else, it's a question of standards. All television equipment in the U.S. must conform to the NTSC (National Television Standards Committee) specifications.

Because your TV, VCR, video camera, and laser disc player speak the same video language, you can hook them together without giving it a second thought. Each of these video devices displays the same number of horizontal scan lines, uses a particular kind of interlaced blanking, and alters the phase of the chroma signal to create a specific range of colors.

Even though any NTSC device can accept the video signal from any other NTSC device, you run into trouble if you try to mix two or more signals together. Video devices have to be synchronized with each other, as well as with the NTSC standard. Because videotape can stretch, you'll also need a time-base corrector (TBC) to compensate for timing deviations from the NTSC standard.

That's just on the video side. When you try to bring NTSC video to your computer, you'll have to deal with overscanning, different horizontal and vertical sync rates, and different aspect ratios. It's no small feat to design a card that can send a video image to your computer screen and have it look at all like its earlier form.

Fortunately, the situation is improving. Faster processors and higher-resolution monitors are driving a whole new generation of affordable NTSC video cards. While we're a long way from plug-and-play video, with a bit of patience and a lot of perseverance, you can begin to bridge the gap between TV and CPU. NewTek, for instance, has a Video Toaster/Amiga product that interfaces with the PC.



If all you want to do is watch TV on your computer, check out DESKTOPTV (AVVIEW Technology, 2401 North Forest Road, Buffalo, New York 14226; 800-866-7288; \$395). It's a full-size card that lets you display live video on your computer screen. The card includes a built-in 119-channel television tuner, which you can control from either of two DESKTOPTV programs—a TSR or a *Windows* application.

Before you get too excited about the possibilities of watching "I Love Lucy" reruns in the corner of your *Excel* spreadsheet, let me bring you back down to earth. Only the high-end (and very expensive) video cards let you see computer and full-motion video images simultaneously. With DESKTOPTV, you can view one or the other—but not both at the same time. You can listen to the sound all the time, so if you hear something interesting, you can quickly pop over and

see what's going on. But with this system, it's an either/or situation—your screen is either a computer monitor or a television set.

If you want to bring a video image into one of your programs, take a look at ComputerEyes/Pro (Digital Vision, 270 Bridge Street, Dedham, Massachusetts 02026; 617-329-5400; \$399.95) and VideoLinX: FrameBuffer (VideoLinX, 20111 Stevens Creek Boulevard, Suite 100, Cupertino, California 95014; 800-222-0042; \$695.00). Both let you grab a single video image and convert it to a standard PC graphics file. ComputerEyes/Pro can accept composite video or the higher quality S-video (used by SuperVHS and Hi 8 video recorders). It can convert to PCX, TIFF, Targa, ColoRIX, and other formats.

VideoLinX: FrameBuffer includes video out as well as video in. The video in works much like the ComputerEyes card by converting individual composite-video images to PCX, Targa, TIFF, and other formats. The video out operates in the other direction, converting graphics files into video pictures that you can display on a television set or record on a VCR. Keep in mind that these are individual pictures, not moving images. To create animation with the FrameBuffer, you would need to purchase a special \$2,000 VCR with single-frame capability.

Both cards support (but can't display) 24-bit color for 16.7 million colors. (Most programs that handle 24-bit color files will display them in 16 or 256 colors with VGA or Super VGA cards.) FrameBuffer lets you view 24-bit color files on your TV—a real plus if you work with 24-bit color but don't have a 24-bit color graphics card.

So how much money does it take to have Aunt Ethel dance across your computer screen? At this point, live full-motion video is still just around the corner. But with lower hardware prices and *Multimedia Windows*, Auntie may be ready to do her thing sometime in late 1991. □

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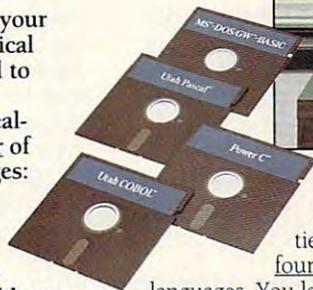
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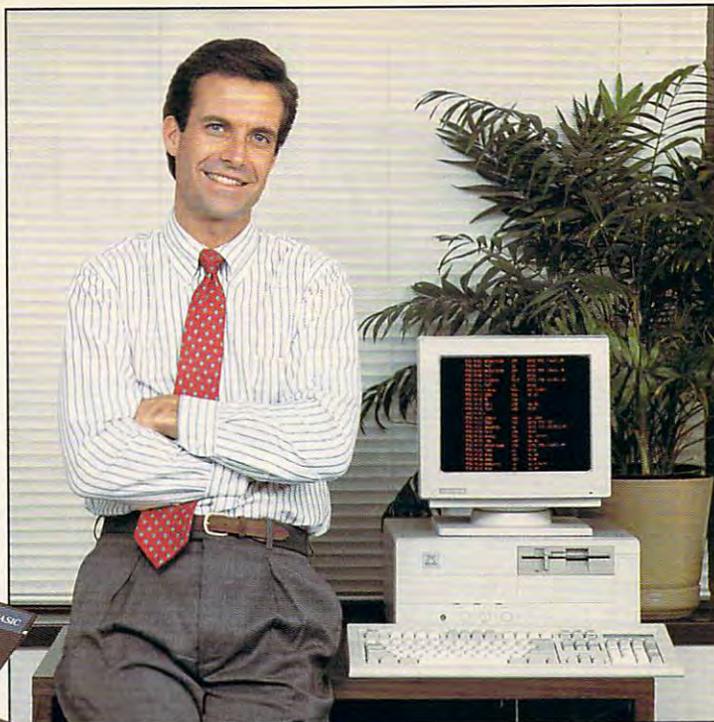
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WORKPLACE

D A N I E L J A N A L

How'm I doin'? That's what former New York City mayor Ed Koch liked to ask people to find out his ratings. People who work from their homes need to ask the same question. After all, our counterparts in the office can judge their accomplishments by title, salary, and office accouterments.

How can we judge ourselves? All the home officers I know are presidents, make as much money as they want, take their vacations without prior approval from supervisors, and usually have their offices furnished with stereos, couches, and microwaves. They have their own private executive parking spots, too. So how can we tell if we're really making it?

When I first started out, the "burn ratio" was useful to determine how long you could afford to stay in business. It went something like this: You have fixed expenses of \$1,500 a month and \$6,000 in the bank. Divide the money by the expenses, and you come up with 4. That equals four months of living expenses. If no money comes in during four months, you've burned your capital.

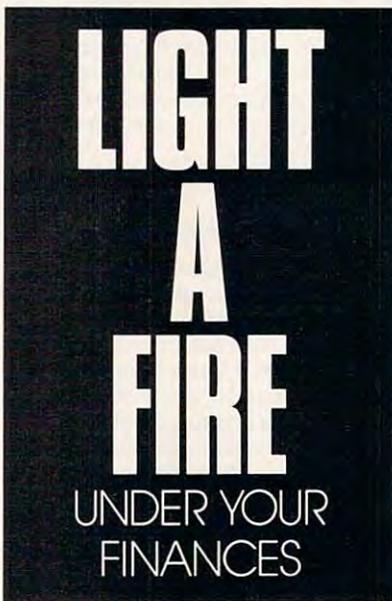
You can do that kind of math in your head. But when you become successful and start spending money on discretionary items like travel, entertainment, and 20 other categories, and you earn your income from several different clients, you need a computer to do it for you.

I began using a spreadsheet program called *Quattro* from Borland to do my math quickly and accurately. I created a table with all my expenses listed in the left-hand column of the screen, and month and totals listed horizontally across the top. Every month, I faithfully retrieved my expense receipts and entered the figures into the computer, where *Quattro* instantly added them up.

I turned into a spreadsheet junkie. I soon added an extra column that figured out what percentage each expense accounted for. Devising the mathematical formula that calculated that figure and displayed it as a whole

number ranks as one of my greatest lifetime achievements.

Quattro also kept track of my accounts receivable. This table had five columns: Clients, Professional Fees, Client Expenses, Total, and Date Payment Received. I faithfully typed in the information as I sent out each bill and logged in my income within seconds of ripping open the envelope. Totals at the bottom of each column told how much money was earned, how much was outstanding, and how much tax was due.



If you put your receipts in a shoebox and dump them on your accountant's desk on April 14, not only should you be ashamed of your sloth, but you're also denying yourself one of life's great pleasures—seeing your money add up every month. Talk about instant gratification and positive reinforcement! Get a spreadsheet.

Nearly all the calculations can be done with simple formulas that add the contents of the cells. You don't have to be a rocket scientist or buy *Bozo's Big Book of Macros* to figure it out. Most people can use spreadsheets effectively with just a few commands.

I used this system for four years, and it worked well enough for me to know my burn rate instantly. The spreadsheet system also helped me wrap up income taxes in one painless visit to the accountant. But then everyone began talking about *Quicken*, a check-writing program. I soon discovered this was more than an electronic replacement for my mother who wrote checks for me once a month.

Quicken is a combination spreadsheet and database that creates every report you need to figure out how well you're doing. It can create net worth statements, cash flow analyses, year-by-year budgets, and reports of investments and income by client.

You can get all these reports simply by telling the computer three pieces of information when you write a check or make a deposit: the name of the payee or client, the category, and the amount. After selecting a report format, which *Quicken* lets you adjust by date, amount, payee, or just about any other variable, you press the Display key to see your results either onscreen or on paper. The process is so fast that you can check your financial progress every day in just seconds! Now that's *really* instant gratification.

My favorite feature is the budget analysis, which lets me compare this year's budget to last year's to see how things are going. *Quicken* also saves me a lot of time by finding "missing" checks. Because the program tracks payments by payee, you can quickly print a list of all checks paid to the phone company, for example. So if someone claims I haven't paid my July invoice, *Quicken* quickly finds the entry for the disputed check.

Quicken makes it so easy to keep finances on track that you'll probably toss away your shoebox. While I could still use my spreadsheet to tabulate the information, *Quicken* does it faster, and it already includes report templates—something spreadsheet programs usually don't have.

So how'm I doin'? Just fine, thanks. □

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HELP
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PLAN TO SUCCEED

BY TOM CAMPBELL

You have a great idea for a business. You've finally decided to make the leap. Your carefully chosen network of potential clients, employees, and future contacts is strong enough to support a new company. You're willing to give up vacations and weekends. You're ready to face a career where the 40-hour week is a misty daydream and a 60-hour week means you're slacking off. But there's a hitch; you need money. A lot of it. ▸

Other People's Money

It's a nasty contradiction, but sometimes starting your own business—your dream of independence embodied—means depending on other people for money. If you need more money than you have to get started—or need to borrow a substantial amount of money after startup—you'll need a business plan.

In short, the purpose of a business plan is to convince people that they can make money by lending it to you or by purchasing part of your company. I found creating and presenting my business plan an eerie recap of the same things that sent me screaming from a traditional job: surrendering control, dealing with people I didn't always want to deal with, asking for more money, writing résumés, and depending on other people for my livelihood. But the excitement of running my own business made it all worthwhile.

You need to look at your business plan as others will. Step into the shoes of the people you need to convince and see whether your plan makes the right sort of impression.

Who will see your business plan? Bankers, venture capitalists, or small investors willing to risk a few thousand dollars. In general, bankers loan amounts up to the hundreds of thousands. Venture capitalists start at about \$100,000 (though many won't touch anything under a million). Who are the small investors? Generally people you know, people with a couple of thousand lying around collecting dust and insufficient interest in a savings account or CD. When it comes to handing out your business plan, don't forget Mom and Dad. Even if they don't require one, you should write one—the process of writing it will often cause you to make major changes in your game plan. Reading this article and writing a business plan will also help you avoid some common pitfalls, such as mistaking marketing for sales and learning the importance of a good presentation after the marketing plan has been written.

A Word Is Worth \$1,000

In high school, your English teacher probably tried to explain the importance of being able to write a coherent essay, and a business plan is structured like a good essay. You tell 'em what you're going to say, say it, and tell 'em what you said. It worked in high school, and it works in business plans, too. Depending on how busy your potential investor is, the table of contents and introduction may be all that ever get read. If you're a bad writer, you should get a professional writ-

er to do it for you. A typical business plan has the following elements:

- Cover
- Table of contents
- Introduction
- Description of your product or idea
- Description of what the investor gets in exchange for the investment
- Market research and sales projections
- Marketing plan
- Sales plan
- Distribution plan
- Plans for future enhancements, product lines
- Profit and loss projections
- Job history and experience for you and any other people involved

The description of your product or idea and market research are very important. The product description may only take up a page or two, but it had better excite the person reading it.

Ironically, your dream of independence requires that you depend on other people for money.

Market research is problematic, but you'll find even the least sophisticated potential investors will ask for market research.

I managed to sell my idea with none, arguing that market research would be expensive and, more to the point, would tip off other software companies to the idea. Still, if I had to do it over again, I would have done the market research, even though more than 75 percent of the people to whom my partner and I gave our presentation bought stock.

I've since realized that any but the simplest of ideas is probably safe, just because the kind of people who tend to steal ideas don't tend to be very good in their execution. So take the time to find out about your customers. Your market research should contain as many hard numbers as possible, presented with charts and graphs, and it should emphasize the unique aspects of your venture.

When you write your description of the product or idea, bear in mind that the reader may know nothing about the industry you work in. Make no assumptions about his or her level of knowledge. Read the description over and over, pestering family, friends, and passersby at the bus stop until you've distilled it into a highly focused miniesay. Like a newspaper article, it should go from broad to narrow, doing everything it can to catch the reader's attention without larding the information with puffery and hype. You're forgiven the urge to wax eloquent in the sales projections, but make the description totally straightforward. People who are about to sink their hard-earned cash into a speculative venture don't want to be entertained at this point in the plan.

Market research shows who will buy your product or service. A marketing plan maps the strategy you'll use to get it to them. For example, my product was a utility program for power users, MIS directors, and consultants. This determined my market. My marketing plan was to focus on getting free press by sending out creative press kits to narrowly focused computer magazines, appearing at user groups, and getting the product reviewed in major magazines. As the product made money, we would take out display ads in the appropriate publications; the marketing plan described what publications would be good to advertise in.

Since I had done similar work for other companies before, I was able to include samples of previous work as a demonstration of my value—not only could I program, the theory went, but I could write press releases, too. As it turned out, my partner did most of the marketing, but my ability to wear several hats impressed potential investors.

The sales plan details how the marketing will be executed. *Marketing* means determining who buys the product or service; *sales* means getting it to those people. For example, if your marketing plan details the kind of ads you'll run and their placement, the sales plan details how much the ads will cost to run, how you'll get the phone orders when they start rolling in, and so on. As you'll find out when you read the sidebar, "Selling It," you'd better be a good salesperson when you present your own plan. I found that my enthusiasm carried me where intimate knowledge of sales didn't.

The distribution plan shows the logistics of getting your product to dealers and keeping it there (if you're selling a service, this section probably won't apply). It tells how you'll create

a dealer network, how you'll maintain it by offering them special discounts at certain quantities, how you'll train the dealers, what sort of special promotional materials you'll create for your dealers, and how you'll prune out the deadwood dealers. Many small companies, including software companies, can function well as their own distribution networks, although I dislike this end of the business. I'd rather have Egghead move 1000 copies of my product a month than sell those copies to individuals, even though the individuals buy at list price and Egghead gets a sharp discount. Economies of scale are just as important for a small business as a big one.

Your plan for future products and enhancements shows potential investors that you have a good grasp on the market. No one told me this before I wrote my business plan, but it turned out that this was one of the strongest

points of my plan. In fact, I scaled this part down because I thought it would make me look less pragmatic than I am, too much like a dreamer. Instead, many people were impressed with the clarity of vision—and at the thought of being able to make money on my product years after its introduction.

Your profit-and-loss projections (P & Ls) will be important to any investor with a sophisticated knowledge of money, even though planning it a year ahead of time is pure voodoo. I skirted the issue by creating three versions, from pessimistic to reasonably optimistic. This turned out to be a standard practice, even though I secretly thought it a copout. P & Ls shouldn't be too detailed. Look in a book or a big company's annual report for examples.

Finally, your job history and experience must be included. A one-page summary is fine; you need in-

clude only what's relevant. Your job working at Wendy's in 1974 isn't relevant unless you're opening up a fast food joint. On the other hand, if you're opening a computer store, your experience working as a support tech at the city college ought to be included. Under no circumstances should you lie or waste the reader's time.

General Tips

Here are some things to bear in mind before and during your creation of the business plan:

Write well. While most books on writing a business plan tell you to find writers in the local directory or writer's organizations, I suggest that you go to the source. Contact a writer you've seen in the local paper's business section, someone whose writing you like. If your kid brought home a term paper with snappy, cogent notes from the teacher, consider hiring the

POLISHING PRESENTATIONS WITH PCs

Your PC can help every aspect of your business presentation, from words to numbers to pictures. Here's how.

Words. Your business plan should be either typed on a typewriter or printed on a laser printer. Use someone else's laser printer if you must, but avoid dot-matrix at any cost. I prefer to use soft fonts and a Hewlett-Packard LaserJet II or III; I feel that these bitmap fonts look even better than PostScript fonts in small sizes. Speaking of size, use 10- or 12-point type for the body text; never go smaller. A 12-point face is good because many people have trouble reading small text and appreciate being able to read your document without glasses.

Avoid garishness. If you aren't a graphic designer, stick with Times Roman or some other conservative serif font for the body and Times Roman or Helvetica for the headlines.

If you aren't positive about your layout, copy someone else's. You don't want to end up looking like an amateur when you hand a copy of your report to someone with \$100,000 to invest. Simple never hurts, but tacky does.

If you're good at teaching people, you may have a hidden talent that will please any investors who know PCs. Demonstrating that you not only know how to use software for more efficient business practices but can train new employees on software will elevate investors' estimation of your skills. Thanks in part to Apple Computer's advertising, Wall Street knows that PCs are severely underused in the workplace. If you have a knack for getting employees to work better with existing tools, you can demonstrate that your PC knowledge has a concrete value to the business. If you show another bar chart to a venture capitalist, it'll be just one of doz-

ens; but show that same person your nifty envelope printing trick in *WordPerfect*, and you'll be one of the standout presentations of the week!

Numbers. While most of your presentation should be understandable to computer neophytes, you are given free reign when it comes to presenting numbers. Spreadsheet printouts and graphs are not only acceptable but desirable. Remember that the person investing in your business

investors aren't afraid of numbers, they become very impatient with numbers you can't explain or numbers that appear simply to help you fill up a page. If you can't explain exactly why the row marked *Misc.* accounts for 25 percent of projected expenses, you haven't done your job. And Murphy dictates that you will be found out at the worst possible moment.

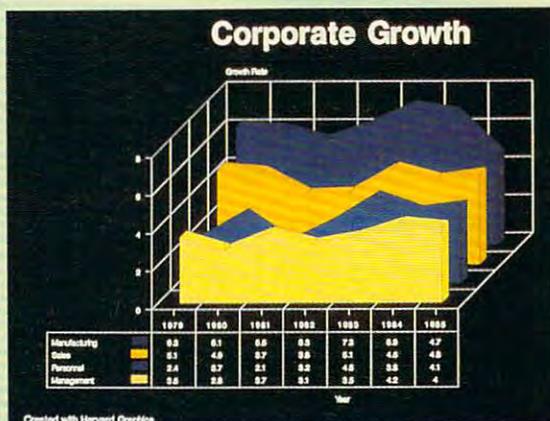
Pictures. Your PC is a remarkable source of dramatic imagery, and good

pictures can turn a good presentation into a great one. This is a double-edged sword, however—good pictures with a bad presentation can easily wreck your pitch. Investors are usually highly pragmatic and very busy. They don't want to be snowed any more than your high school English teacher did.

If pictures are a part of your business, cut loose and show investors everything you can. If you're pitching a real estate database that employs digitized pictures of the houses for sale, create a mock-up with half a dozen records. If you want to start a slide bureau, do some work for free and include those slides in your presentation. If you're selling a software product that requires VGA, show what it would look like in

CGA mode to explain why you're foregoing 30 percent of the market.

Using your EGA- or VGA-equipped PC for a lowball multimedia show isn't a bad idea, either. You may already have the tools to do it. *Windows* comes with a fine paint program that uses PCX files, and there's a wealth of PCX screen show or capture programs and clip art available as inexpensive shareware. The advantage in a pricier approach, such as *Zenographics Pixie* or *Microsoft PowerPoint*, is that these programs come with templates you can use if you're not an artist yourself.



Harvard Graphics will help you create graphs for a professional quality presentation.

is probably already a spreadsheet user and no doubt shuffles numbers with a facility approaching that of instinct. I was fascinated at how quickly even the least computer literate of my prospects could scan a spreadsheet printout; they cruised through them as easily as a soap opera buff reads the tabloids. Knowing how to speed-read spreadsheet data is how they make a living, and they will rely on these numbers for as long as they hold stock in your company. Your cost and profit projections will serve as a reference point for years to come, and the corollary to this principle is that while in-

teacher. Or scan author blurbs in magazine articles you like for a writer living near you.

Leave a trail of evidence. Anytime you can illustrate a point in your business plan, do it. If you plan to distribute fliers, staple one to the back and refer to it in the marketing plan. If you wrote—or were written about—in any industry trade magazine, by all means include copies of those articles. Seeing your name in print gives the investors a feeling that they are dealing with a known quantity.

Throw away your computer. Take a moment to imagine your presentation without all the bells and whistles. Imagine what your presentation would be like if you didn't have a computer: a typed business plan, no graphics, and no animated slide shows on your Super VGA monitor. If the presentation stands on its own, you've done a good job, and your other presentation tools will make it a slam dunk. If it doesn't stand on its own, pretend that you've had to throw away your computer. Start from scratch. Your potential investors almost invariably have a lot of common sense. They'll see through a hollow presentation as if it were printed on gauze.

Borrow a computer. Now that you have a good presentation, you'll want to make it better. A PC can be a powerful ally in giving a business presentation (see "Polishing Presentations with PCs"). If your PC isn't up to the task or if you need expensive hardware such as a laser printer, there are several ways to get access to high-end computers and peripherals. In my area there are at least three junior colleges with excellent Macintosh and PC facilities. I was able to get access to them by purchasing a membership in the school library (enrolling in a course is another good way to do it). Several local print shops also have Mac networks, where the machines can be rented for \$10 or so an hour. If you want to present a multimedia show to a group of investors and don't think huddling them around your PC in the master bedroom is a good idea, consider renting a training center on an off night. Radio Shacks in my area make their training facilities available when they aren't in use.

Watch yourself. Having been on the ground floor with both successful and unsuccessful companies, I've concluded that a few simple, fundamental, and somewhat out-of-fashion truths endure. Above all, never lie to yourself or your investors. It's often more difficult to tell the truth in the short run, but it's almost always easier in the long run. For example, if a potential investor asks you about your

marketing skills and you say they're great when they're not, you'll face some hard questions when sales don't meet projections. And you might find out too late that that same investor knew a really good, but hungry, startup agency that would've created some great ads on the cheap. If you don't know exactly why shipping costs much more than you think it should, ask around. Maybe one of your stockholders knows how to work a deal with the shipping company. If you find yourself answering questions with more authority than you have just because you're the boss, apologize immediately and learn to say "I don't know."

Avoid cram. Avoid cramming more than three or four phrases worth of text on word charts, avoid using clip art that doesn't help the presentation directly, and be very conservative in your use of color. Above all, never use pictures when they're not needed. It might lead an investor to think you have nothing to say.

The Royal Road

Writing your business plan can lead you to unexpected revelations. You might discover that you don't want to run a business after all. Or that if you do, you might want to choose a slower growth plan and use the business to finance itself.

You might even discover that you need a partner, rather than stockholders, because writing the plan has helped you identify some important gaps in your own abilities. Or you might discover the opposite: I realized while writing my business plan that my seemingly checkered past in the job market resulted in a wide array of skills—I was competent in enough areas that we were able to cut the personnel requirements substantially.

Writing a business plan isn't just a way to raise money. It's a way to sharpen your powers of observation and a way to learn about yourself. It can even be the touchstone of a whole new way of thinking about your business—and about life. □

SELLING IT

Writing a business plan is only half of the story. The other half is finding qualified investors and presenting the plan to them efficiently and effectively.

Finding Qualified Investors

Selling the idea of your business is like selling anything else, and part of your job is to find the right people to sell to. My approach was a little unusual but highly effective; I went to my tax advisor and asked him how to raise money for a software company. He inquired in detail about my idea, sat back, and said, "Let me think about this for a few days. I'll get back to you." The next day he called back with a proposal. For a cool 25 percent of the company, he'd take responsibility for raising the necessary money and managing the books. Over the next year and a half he raised about \$200,000 from his tax clients directly, and referrals from those clients brought in another \$100,000. During this time he sold his practice, eventually becoming president of my company.

A more traditional method is to use the resources of your bank. As you might imagine, your history with the bank counts for a lot. Equity in a home or ownership in some other large, salable item counts for even more. I had no such equity, so approaching a bank was out of the question. I thought that my idea counted as a sort of "brain equity" and would be enough, but a bank, naturally, thinks only in terms of failure: How can it get the money back if your idea doesn't pan out?

Finally, you can always check with Mom and Dad, or Uncle Vinny. Chances are they won't require a business plan. But there's nothing like a large quantity of money exchanging hands to bring out the traits of a family. If you have a solid relationship,

losing Uncle Vinny's money will strain your conscience, but it might even bring you closer. On the other hand, if you and Vinny have any old resentments lingering between you, they'll be brought into vivid focus if something goes seriously wrong with the investment.

Pitching the Plan

Presenting your business plan is as much an art as writing it, and it deserves no less attention. The first lesson: *The business plan will not sell itself.* You may think that your idea stands on its own merits, but it doesn't. It is imperative that you talk about your product with genuine enthusiasm and conviction. If you find that no one is interested and you've already reevaluated the business plan itself and found it flawless, take a Dale Carnegie course or some other sales course for tuning up your ability to project confidence. This is especially helpful if you find yourself betraying the tiniest bit of uncertainty or fear in your presentation. Many people are unable to let their natural enthusiasm show around people they've just met, but you *must*. If you don't, potential investors may be afraid you don't believe in your own idea, even if you do.

Finally, don't make too many assumptions about your prospects. We found, for example, that successful entrepreneurs with large amounts of money to invest were much easier to sell than individuals with modest sums. Large investors identified with us, whereas small investors tended to be much more cautious. On the other hand, venture capitalists in our neck of the woods (southern California) want total control, a much slicker business plan, and businesses virtually guaranteed to gross a lot of money over the short term.

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PATHWAYS

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

I'm probably not the only adult who remembers with less than affection the sights and sounds of high school chemistry class: the sour smell of hydrochloric acid, the rattle of boiling water in beakers perched over Bunsen burners, the endless hours of reading about moles, covalent bonds, and benzene rings.

One day my chem teacher gave us a break and showed us how to mix up a mild explosive—good for making rude bangs when painted on the soles of the class clown's shoes—but it didn't help us understand chemistry's relevance to us and why we should bother studying it.

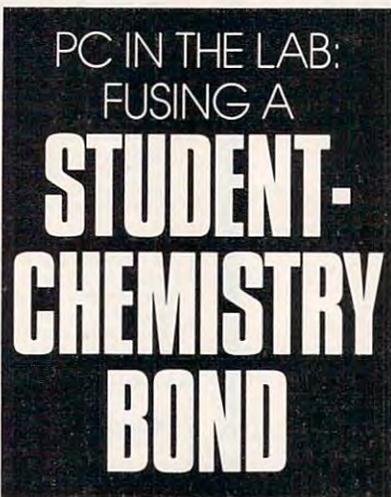
I flunked chemistry, and so did about 20 percent of the class. That was considered the normal attrition rate; nobody thought there might be something wrong with the way we were taught.

Science teacher Vinnie Cusimano has a different idea of what high school science education should be, and PCs are a big part of it. Cusimano is a 25-year veteran of the New York City public school system. Five years ago, when the NYC Board of Education was seeking a way to reach students turned off by traditional methods of teaching science, Cusimano came up with a proposal to integrate computers with lab technology. (You might think this is an obvious idea, but as late as 1988, some 85 percent of eleventh graders had never used a computer in a science class—and neither had their teachers.) The goal was to stimulate students to do real problem solving rather than just memorize facts to pass a test.

Called Partnership in Technology for the Physical Sciences (offices are at Susan E. Wagner High, 1200 Manor Road, Room 456, Staten Island, New York 10314; 718-698-4200), the program won a National Science Foundation grant and receives assistance from IBM. Currently, it's being tested in five high schools throughout New York City, ranging from middle-class Susan E. Wagner High on Staten Is-

land to Thomas Jefferson High in a high-minority, low-income neighborhood of Brooklyn. The students are mostly ninth graders, many of them below-average achievers.

One physical science classroom at Wagner is fully wired for science and computing. Along with the expected black-top lab tables are standard IBM compatibles and PS/2s networked to instructor Walter Styczynski's computer. Sensing probes are linked to the network so experimental data can be displayed right on-screen. The PCs run off-the-shelf software—a spreadsheet template, a



graphing program, a word processor, and a database—and are involved in every aspect of the class.

Kids investigating the nature of heat energy, for example, can do an experiment, collect temperature data with the sensors, and then pump those numbers directly into a graphing program or spreadsheet. At that point they can ask what-if questions and perhaps go back to the experiment. Reports are typed with a word processor, and data is stored in a database for later use. This system works for classroom demonstrations as well. The teacher can perform an experiment at the front of the room with the networked science probes, locking the

students' screens so everyone can see the experimental data as it feeds into a graph. Then the screens are released so students can manipulate the information themselves.

At first the program met some resistance from teachers inexperienced with computers and wary of the complex curriculum (the documentation, written mainly by the teachers themselves, runs to 800 pages). But after a few months of the program, says Cusimano, teachers were hooked, deluging him with new ways of using the technology.

The effect on the kids, though, is what counts, and that is profound. "People think that if you put computers in the room, kids are motivated, but it's not true," says Cusimano. New students realize right away that they can't hide in the back of the class—there's no place to be but in the group and learning.

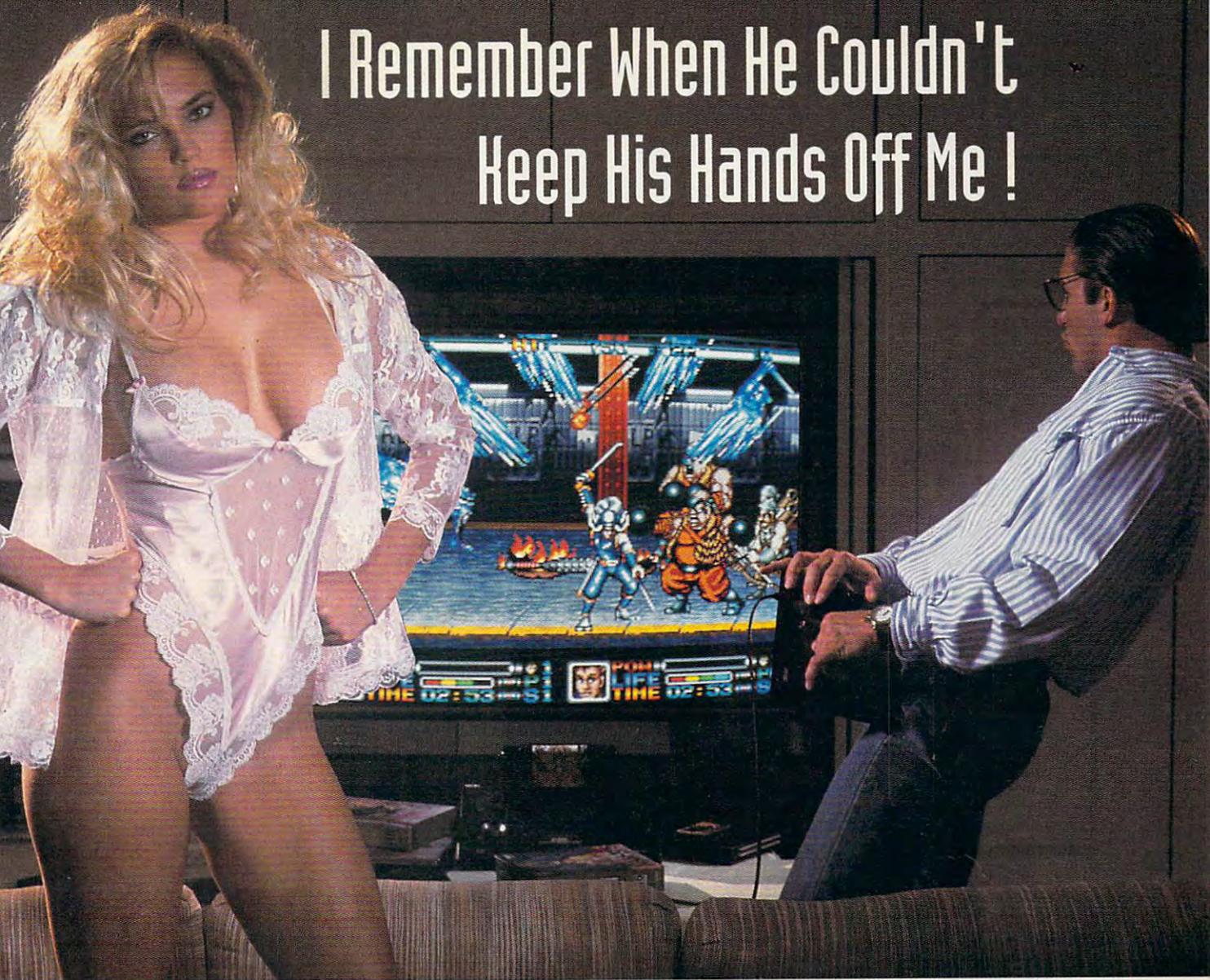
Soon, however, students begin to pool data and methods on their own and to cooperate in small groups without prompting from the teacher. Within six months, even low achievers are proud to show their work.

Styczynski is amazed at how comfortable the students have become with computers and sees them bringing away an understanding of science that they often couldn't have before.

David Podell and Sally Kaminsky of the Research Foundation of City University, who are evaluating the program for the Board of Education, note that students who have participated are more likely to take higher-level science courses, score better on the state's Regents' Competency Test in Science, and even have better attendance. It's the independence computers provide that seems to make all the difference.

Students themselves give the best evaluation of the project, says Cusimano. "If you go in a class, you can feel the kids' enthusiasm. They say, 'Come here; look at this.' If any science teacher can get a kid to say that, he is successful." □

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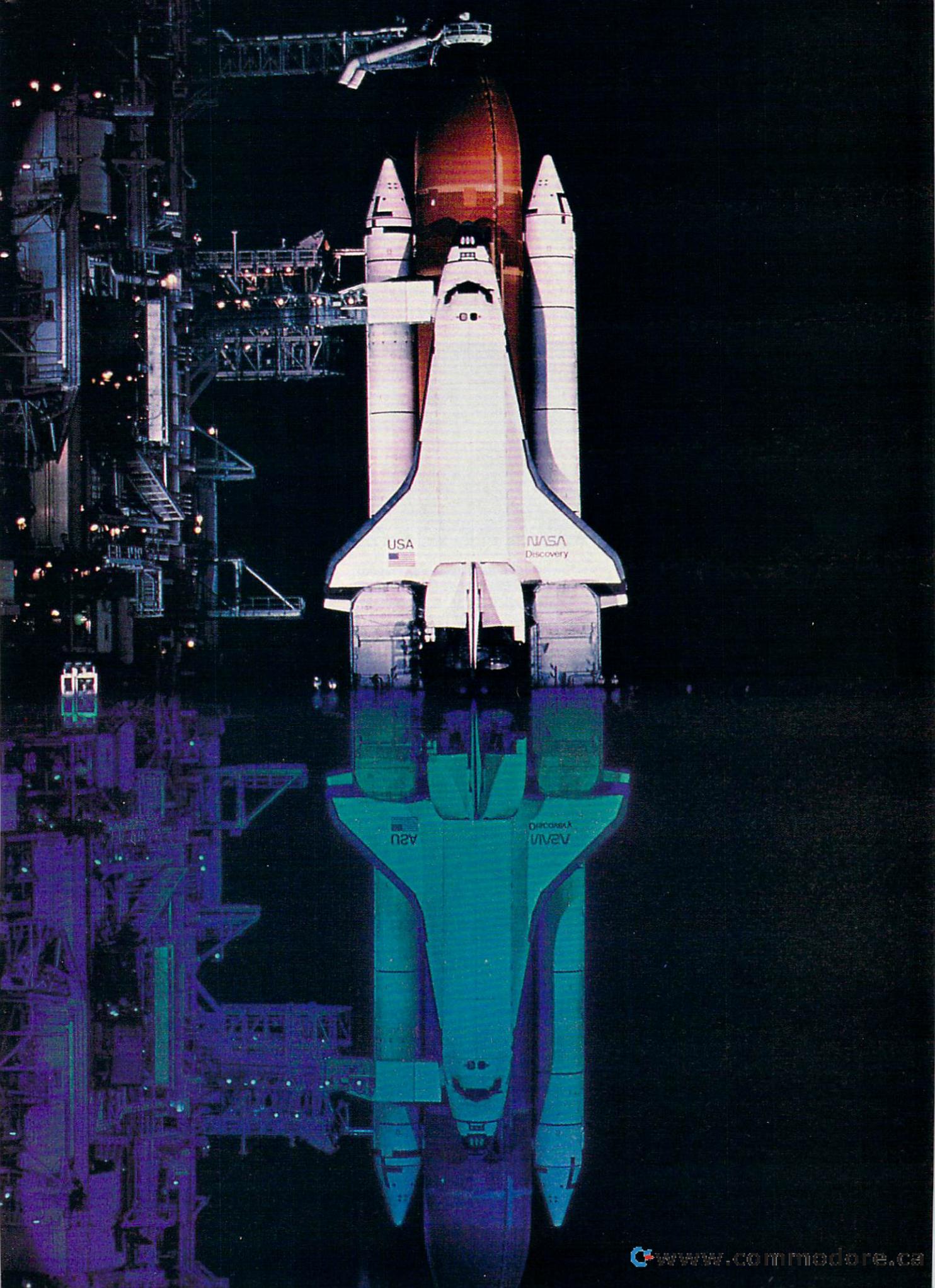
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BY PHILIP CHIEN



Space shuttle computer system. The words probably bring visions of a high-tech, state-of-the-art computer command system to mind. Or perhaps you think of the most advanced flight simulators designed for aerospace use.

Surprisingly, each of the shuttle's five on-board computers has the equivalent of only 400K—less than most micros!

When the space shuttle's General Purpose Computer (GPC) was originally designed in January 1972, NASA chose state-of-the-art flight computers, similar to those proposed for the F-16 fighter. Unfortunately, state of the art for the 1970s *wasn't* state of the art for the 1980s when the shuttle was first launched.

In earlier spacecraft, astronauts could take manual control if their computers failed. Neil Armstrong and Buzz Aldrin overrode their Lunar Module computer when it almost landed them in a crater. However, the shuttle is a much more sophisticated vessel, combining the capabilities of a spacecraft, a truck, and a glider, and it's much more computer dependent.

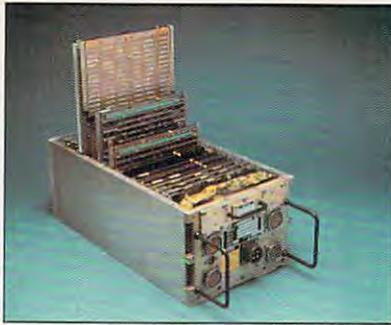
The GPC in Its Infancy

The earliest General Purpose Computer, the AP-101B, has 104,000 32-bit words of iron-core memory (small iron rings threaded on a loom and magnetized to determine ones and zeros). It uses 650 watts of power, weighs 51.8 kilograms (114 pounds), performs 400,000 benchmark tests per second, and has an MTBF (Mean Time Between Failures) of 5200 hours.

Each shuttle has more than 300 electronic "black boxes" with over 300 miles of wiring and 120,400 wire segments with 6,491 connectors. The total weight of the black boxes, wiring, and connectors is 7,780 kilograms (17,116 pounds)—heavier than a fully loaded Apollo Command Module spacecraft.

Since the computers are essential, NASA decided to use five identical computers in operation for critical periods like launch and landing. Four of the units operate together, and if one has a different result, it's presumed wrong and is "outvoted." The fifth computer is programmed separately from the other four and acts as a backup to prevent possible generic software errors from causing problems. In addition, an offline spare—a sixth GPC—is carried, which can be swapped with a malfunctioning GPC in orbit if necessary.

The OPS 101 program controls the shuttle from T-20 minutes in the countdown-through-orbit insertion sequence. All five computers must be in



The new AP-101S General Purpose Computer. Five identical units will operate in tandem aboard the shuttle.



The AP-101S (left) uses only one box, operates three times faster, and is twice as reliable as its 18-year-old cousin, the AP-101 (right).



Left to right: AP-101S General Purpose Computer (GPC), Mass Memory Unit (MMU), Keyboard, Display Unit (DU), and Display Electronics Unit (DEU).

sync and working properly; otherwise, the launch is scrubbed (see the sidebar, "Fewer GPC Failures for the Future?").

When the shuttle arrives in space, the crew reconfigures the computers for orbital operations. Two GPCs run the on-orbit program, and one GPC is dedicated to payload operations. One GPC is powered down but has the landing program loaded in case an emergency requires the crew to return in a hurry. The final GPC is powered down until needed.

If one GPC fails in orbit (or even two), the mission won't necessarily be aborted if the problem isn't expected

to affect the other GPCs. In theory, any of the five computers has the capability to land the shuttle safely. During reentry and landing, all five GPCs operate together again. Sophisticated control loops command the shuttle's aerodynamic surfaces and respond to the pilot's inputs.

While the original GPCs have worked well, their age is showing, and their limited capabilities now put a strain on the shuttles' operations.

A New GPC Is Launched

For the past six years, NASA has been designing, building, and testing upgraded AP-101S computers. One of the most important requirements in the new computers' design is that they're functionally compatible—in both physical connections and software.

Functional Test and Instruction Set Test Programs have verified that the hardware and CPU will produce the same results. Astronaut Kenneth Reightler explained that one of the key factors in implementing the new computers was to make the change completely transparent to the astronauts, although software differences would be necessary at the programmers' level.

The new GPCs were tested for functionality in the avionics laboratories with the actual flight software, and hardware validation tests were performed before they were installed in the shuttle simulator. In all, the AP-101S computers were tested for three years.

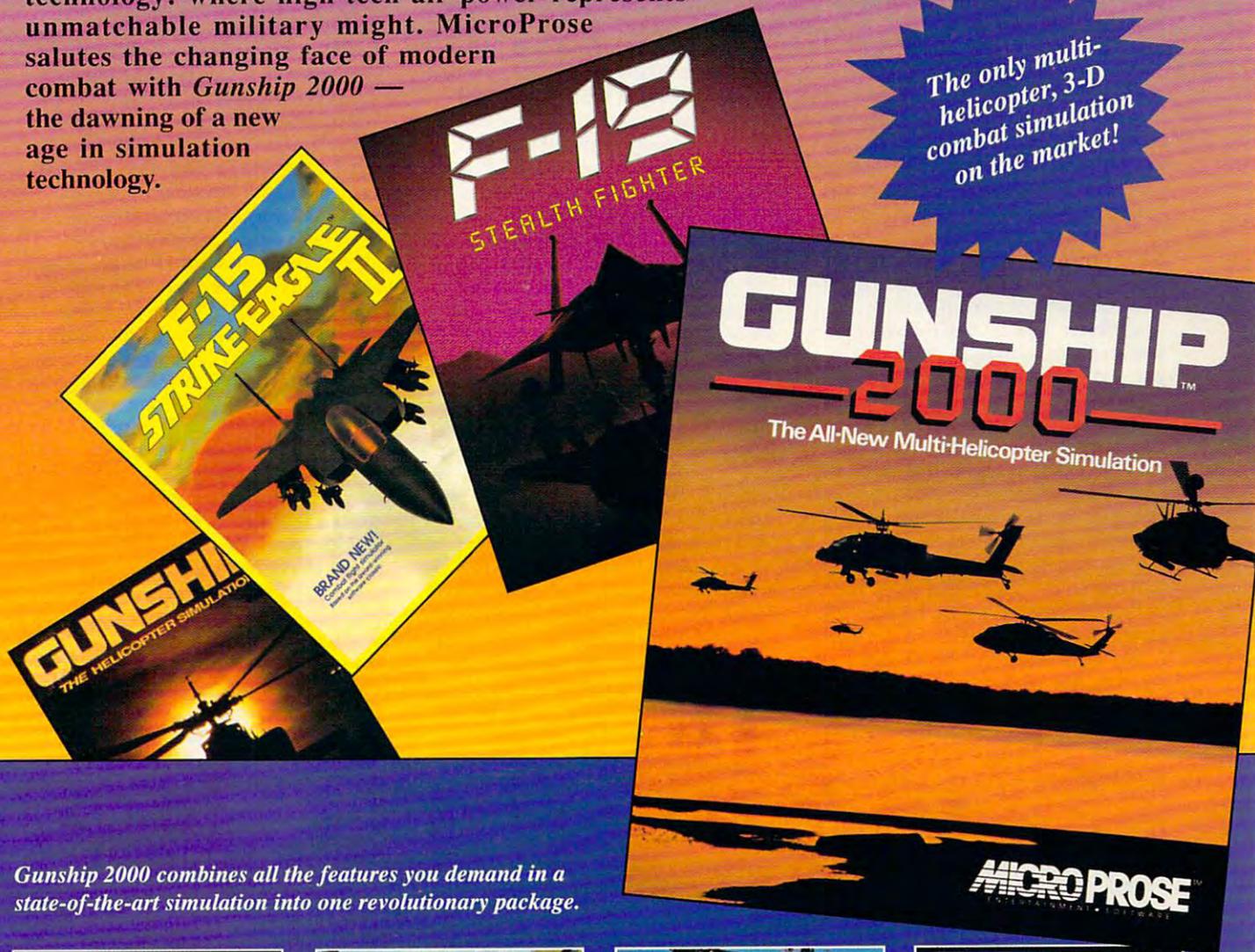
Atlantis was the first orbiter to launch with the new GPCs. STS-37 (Space Transportation System is NASA's designation for the shuttle program) was launched on April 5, 1991, just a week shy of the tenth anniversary of the first shuttle's launch. Launch director Bob Sieck said, "We couldn't tell any difference during the countdown. We didn't have to alter our procedures or software, so [the change] was essentially transparent after we installed the [new GPCs]."

Discovery also carried the new GPCs, and *Endeavour* and *Columbia* will have them installed for their next flights, which are scheduled for mid 1992. The last flight of the original GPCs was the STS-40, *Columbia's* Spacelab Life Sciences (SLS) mission which was scheduled to launch in May, but eventually went up in June after several delays. One of the old GPCs failed early in the countdown and had to be replaced. While *Columbia* was controlled by five of the old AP-101SL computers, it also carried modified versions of the AP-101S, which were used to control its Spacelab cargo.

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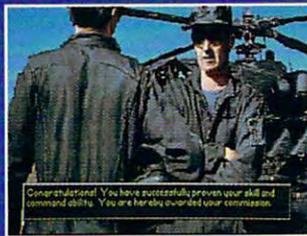
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On the previous Spacelab mission, both 1970s-era French-built DDS (Data Display System) computers failed halfway into the mission, forcing the controllers and flight crews to control the telescopes manually. Spacelab managers were glad to replace the DDS computers with the brand-new AP-101SL models.

The AP-101S GPC has 256,000 32-bit words (roughly equivalent to 1MB of RAM) of CMOS (Complementary Metal Oxide Semiconductor) memory. It uses 550 watts, weighs 29 kilograms (64 pounds), and performs 1.2 million benchmarks per second. It has an MTBF of 10,000 hours, and fits into one box instead of two. In other words, the new GPCs have 2½ times as much memory, use less power, weigh less, operate up to three times faster, take up half the volume, and are twice as reliable as their 18-year-old cousins, the AP-101B.

More Memory, Less Risk

Iron-core memory, used in the original GPCs, is slow and bulky and uses a lot of power, but it does have two advantages over silicon memory. It doesn't require power to retain its contents, and it isn't sensitive to radiation.

CMOS memory requires constant power, and cosmic rays can easily flip a bit. However, the AP-101S memory has a fail-safe battery backup and an automatic error-correction circuit that constantly scans the memory

for upsets and corrects errors.

The programmers were ecstatic to double their memory. (Remember when you doubled *your* computer's memory?) The additional memory will be used for routines that couldn't fit within the earlier limitations, and now multiple programs can be combined, unlike before.

Will the additional capabilities really be useful? The STS-26 launch in September 1988, the first since the *Challenger* accident, was delayed due to unexpectedly calm upper-level winds. The GPCs were programmed for higher winds, but there was neither enough memory to permit more than one wind profile nor enough time to load another profile into the GPCs. The launch was delayed for almost two hours until the winds picked up enough for a positive safety margin.

While delays due to memory limitations can be annoying, a lack of memory can also cause life-threatening problems during an emergency abort.

The original GPCs have just enough memory for the OPS 101 program from T-20 minutes through launch, potential launch aborts on the launch pad, and the dangerous RTLS (Return To Launch Site) abort mode in which a shuttle would literally make a U-turn and land back at the Kennedy Space Center if something were to go wrong early in flight.

All of these functions have to be squeezed into RAM, which doesn't

leave enough additional memory for the TransAtlantic Landing (TAL), another abort mode. In a TAL abort, the shuttle would continue to fly across the Atlantic Ocean, but the main engines would shut down early, and the shuttle would land in either Africa or Europe, depending on the flight path and fuel reserves.

While neither abort mode has been needed, a TAL is preferable to the RTLS abort since it's much less stressful on the orbiter's structure and doesn't require a U-turn. Unfortunately, the original GPC doesn't have enough memory to store the launch and TAL programs simultaneously.

Astronauts must change programs *during* the abort. It takes 15 to 20 seconds to load in the TAL software—time during which the pilots have to control the shuttle manually and anything can go wrong.

The next version of the flight software, which will use the capabilities of the AP-101S, will store the TAL program in an unused portion of memory and move it into active memory if it's required—similar to using a RAM disk on a micro. In addition, dozens of other improvements are planned that wouldn't have been possible with the earlier GPCs.

The additional speed, reliability, and memory all make the AP-101S computers much more useful. But one of the best features is that at \$1 million for each flight unit, they're half the price of the original GPCs. □

Fewer GPC Failures for the Future?

What does an MTBF of 5200 hours mean in real life? The shuttle's flight computers have thousands of power-on hours for each mission, including check-out time while the orbiter is being prepared for flight, tests and rehearsals on the launch pad, and the actual mission. The five GPCs must all be working in tandem before NASA will approve a shuttle launch.

During three countdowns, GPCs were replaced with spares when they failed while the shuttle was being prepared for flight. Also, there have been a couple of GPC failures in flight where the backups had to take over.

The most exciting GPC failure was during the countdown for the very first shuttle mission. On April 10, 1981, the long-awaited, heavily delayed first shuttle launch was finally ready to go. Astronauts John Young and Bob Crippen were in the cockpit, and the countdown clock was running as thousands of spectators watched. But at T-20 minutes, the back-

up computer wouldn't sync with the four primary computers, and the launch was scrubbed for two days.

What is astonishing is that a software bug that caused the sync problem was a 1-in-400 coincidence. Most of the time, the primary and backup GPCs will start together, but 1 out of 400 times they'll be off by one cycle. The GPCs were tested countless times before with thousands of simulated countdowns in test stands and aboard the orbiter and in several simulated countdowns and engine tests. Naturally, the GPCs had to wait until the most critical launch day to mis-sync!

As Kennedy Space Center software engineer Mike Peacock explained, a simple solution would have been to reset the countdown and restart the computers, but since this was the first shuttle launch, the launch team wanted to be safe, wisely choosing to examine the problem and make sure it couldn't happen again. Two days later, with a quick patch to the flight

software, *Columbia* was launched.

There have been two in-flight failures of GPCs. During the ninth shuttle mission in November 1983, two GPCs failed when they were started up to prepare for landing. Mission controllers kept the orbiter up another 90 minutes while they examined the problem and determined the shuttle could be landed safely using the three functioning GPCs. Post-landing analysis determined that microscopic aluminum particles had entered the GPCs and shorted them out.

To date, the only in-flight changeout of a GPC was during the STS-30 mission where the astronauts swapped out GPC4 on their reentry day when it didn't start up properly. The reentry burn was delayed one orbit to give the astronauts time to disconnect the malfunctioning computer and hook up the spare.

With the new GPCs twice as reliable as the earlier ones, flights should be delayed less often, with fewer mission problems due to computer failure.

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GAMEPLAY

O R S O N S C O T T C A R D

Last month I wrote about playing around online, and I recommended Prodigy as a family online service. However, if you're hoping to find some neat shareware games by using your neat new modem, Prodigy will be no help at all—it doesn't allow uploading or downloading of software.

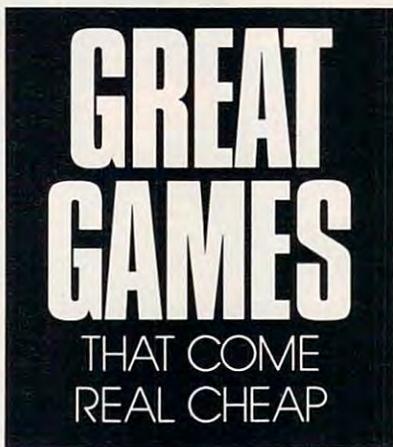
There *is* software to be found on the full-service networks like Delphi, GEnie, and—above all—CompuServe. Some of it is *freeware*—stuff you can download and use without paying for anything more than the connect time that it takes to download it. But most of it is *shareware*—software that you can try out for free but which you must (or at least *ought to*) pay for if you're going to use it over the long haul.

For instance, the game that Kristine and I are totally addicted to right now is a nifty little *Windows*-based backgammon game from Graphics Software Labs (7906 Moonmist Circle, Huntington Beach, California 92648). Like most shareware products, the free tryout version has some built-in annoyances designed to goad you into paying the registration fee (in this case a mere \$15) to get the latest version. But it's fully playable as is. You'll find your computer a worthy, challenging opponent.

Still, the game isn't always a genius about using doubling, so you *can* get the upper hand. I'm ahead right now, by more than 150 games. Why? Because I'm dang good, that's why. And because I must have played 500 games since I downloaded it to my computer last week!

Some of the shareware that you find online isn't really up to professional grade. For instance, I downloaded *Blackout* (Zarkware, 2243 East Thompson Street, Springfield, Missouri 65804) from CompuServe. The game's author made no bones about the fact that it was a pretty simple little game. I found it dumb, but fun enough to play a few dozen times, so I registered it for a mere \$12—the author did *not* have an inflated idea of its value!

Another game has become something of a cult hit on CompuServe. While there are several shareware mah-jongg games available online, Nels Anderson's version has a huge following. Why? Because along with his game he includes a great little tile editor that allows you to design your own set of playing pieces. Designing your own tile sets is one of the most popular options in the game. A lot of enterprising tile makers have uploaded their tile sets (uploading is free on CompuServe) so others can enjoy the fruits of their labors. That makes Anderson's *Mah Jongg* into a kind of



communal experience. I'm tempted to make a tile set of my own to upload.

I had never played mah-jongg in my life, by the way, until buying Microsoft's *Windows Entertainment Pack*, which includes a version of mah-jongg that I'm sad to say is a bit more smooth-playing than Anderson's game. But Anderson's game doesn't require *Windows*. And the *WEP* version doesn't let you design your own tile sets.

Speaking of *WEP*, it also includes, besides a ho-hum *Tetris*, the most diabolically addictive game I've seen lately: *Minesweeper*. If you've got *Windows* and you have enough cast-iron self-control to get your real work done before you play, then this game is worth the entire price of *WEP*

(\$39.95). But be sure to read the instructions—the game is almost unplayable unless you learn some tricks, and you can't save games in progress.

Sometimes the best prizes you find online aren't, strictly speaking, games at all. I'm not talking about the serious shareware programs, either, though I've picked up a free DOS text editor and a first-rate (but *not* free) *Windows* program editor online. What I'm talking about is a strange little program called *Babble* (Korenthal Associates; 76004,2605 on CompuServe; 212-242-1790).

Written by Jim Korenthal, *Babble* is more of a DOS toy than a game. Feed it any ASCII text file, and it analyzes it and plays it back to you in a strange babbled form.

At first glance there's nothing remotely useful about this program—but you can't stop reading the babble, if only for the sheer weirdness of it.

The program comes with a fistful of prebabbled files that you can combine for even stranger results. Text from Shakespeare, "Leave It to Beaver," and *TV Guide*, combined with a few choice insults, results in stuff like: "What light from grade-B Wally, you blithering soft upon her cheek." Pure poetry. You can soup it up even more with special effects and ethnic accents ranging from Elmer Fudd's voice to a Texas drawl.

It's most fun, though, when you analyze your own files. It's almost restful, after you finish a term paper or a report or a memo or (in my case) a story, to save it also as an ASCII file and then load it into *Babble* for analysis. What comes back at you is your own language, in your own style, but now insane. And yet, sometimes out of the madness come wonderful combinations that have given me insights that change the shape of the story.

Imagine this scenario, if you would: When your boss sends you a particularly obnoxious memo, you can babble it and pass the nonsense version around to your coworkers. As long as you don't lose your job, it makes *Babble* well worth the price! ☐