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JANUARY 1998

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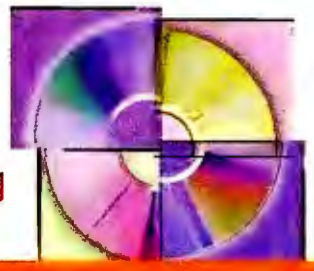

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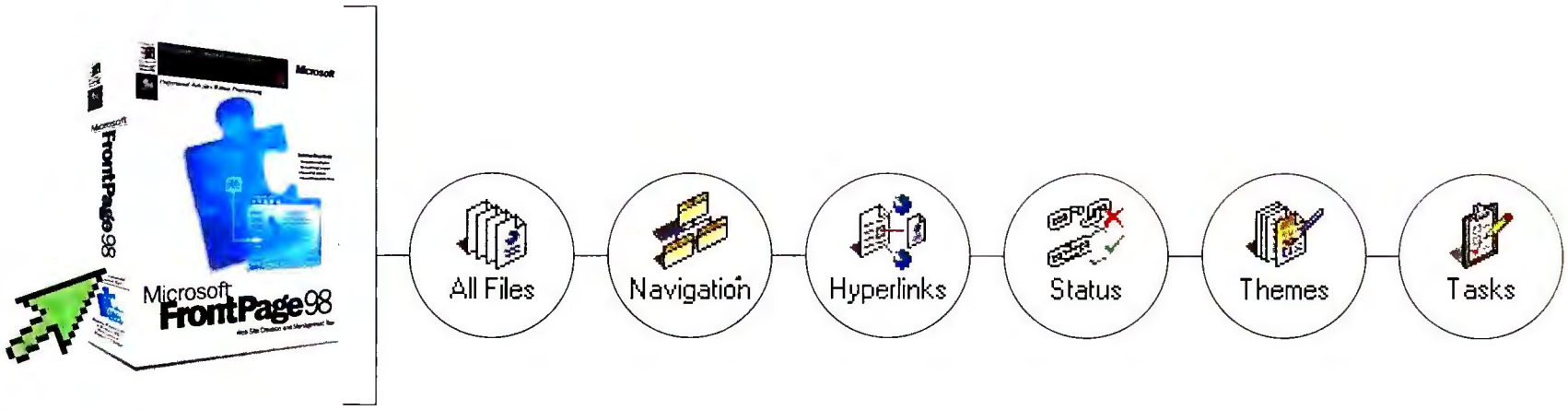

From: New Microsoft FrontPage 98
Time: Friday, 8:30 a.m.
To: Communications
Re: Anyone there know how to build a Web site?

Forget about all the coding **stuff**. Whether you're a novice or a pro, our new Microsoft® FrontPage® 98 program makes building a Web site as easy as typing a letter. That's because, as part of the Microsoft Office family, it's filled with familiar, intuitive tools. The new Navigation View helps you plan and organize your site. Drop your ideas into professionally-designed page themes, or use the new table drawing tool that makes designing pages as easy as sketching with a pencil. You can create and edit graphics and animation. As you work, you'll see your Web pages exactly the way they will look on the Web. And all the technologies that make Microsoft FrontPage 98 so powerful—such as Dynamic HTML and push technology—work behind the scenes. So when you're ready to go public, you just click on a single button and your site is on the Web. Check it out at www.microsoft.com/frontpage/ Yes, we built it with FrontPage 98. And yes, it was easy.

For example do how

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you know
to type?

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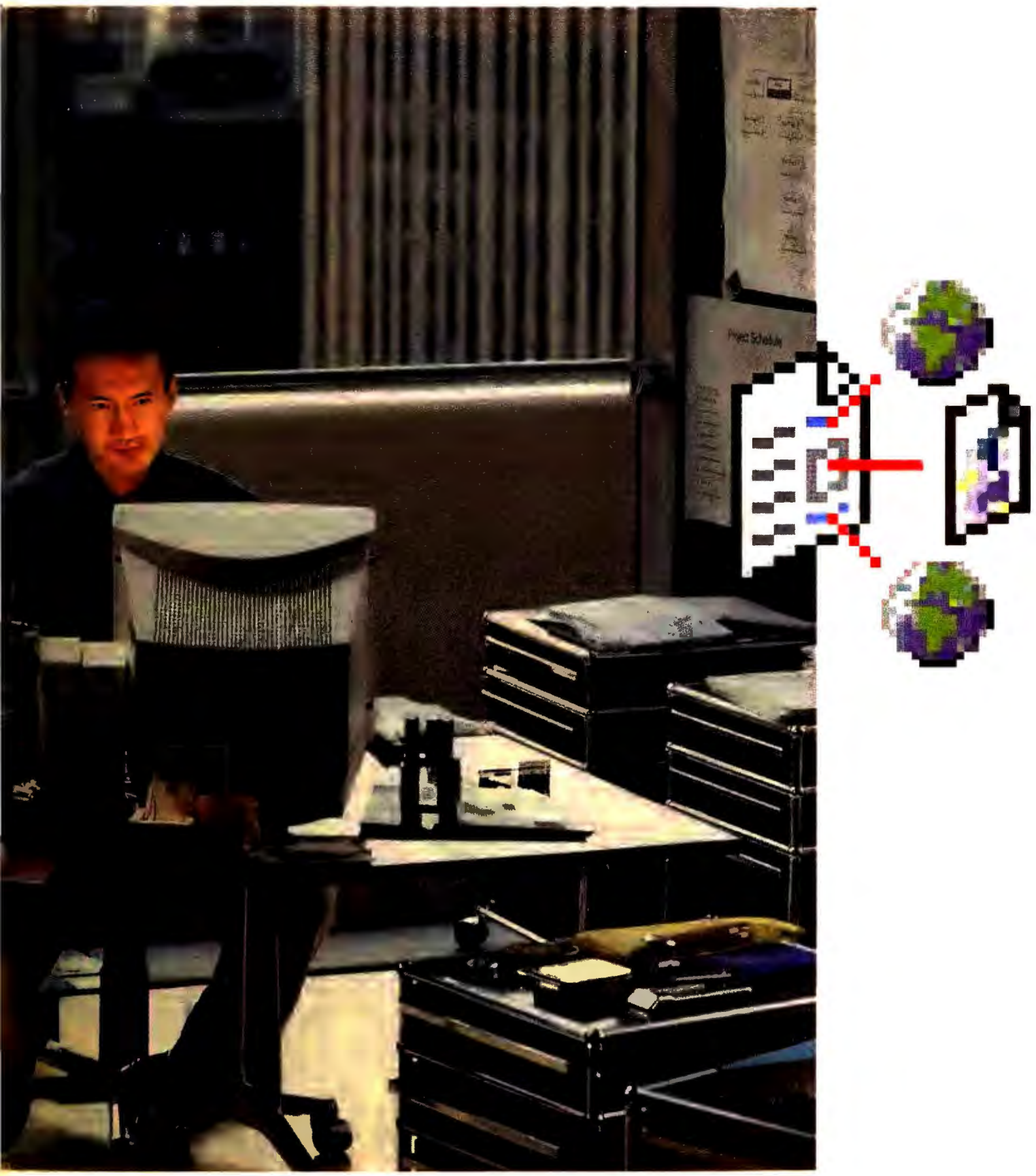
Building
a Web site
still requires
programming
skills.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Circle 138 on reader service card

PC WORLD

JANUARY

VOLUME 16 ◆ NUMBER 1

COVER STORY

132 THE PC OF TOMORROW

Technology is moving so fast that future PCs could be something out of *The Jetsons*: super-fast 400-MHz–plus computers, 20-inch flat panel displays, huge DVD drives, systems that'll actually execute voice commands. Here are views from PC visionaries and the latest on dramatic advances in CPUs, storage, displays, and other vastly improved technologies that could—and will—end up on your desktop.

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146 ISPs YOU CAN COUNT ON

REVIEW From America Online's busy-signal meltdowns to AT&T WorldNet's e-mail troubles, consumers are finding lots of reasons to go shopping for a new Internet service provider. We signed up with a dozen ISPs, surveyed more than 6000 Web users, and reviewed performance and reliability to lead you to the best providers online today.

177 PHOTO EDITING FOR THE MASSES

REVIEW Photo editing software has become essential for jazzing up images in presentations, newsletters, and Web pages. We tested eight software packages priced at $55 or less and found two Best Buys that are easy and fun to use.

195 DVD–FINALLY!

REVIEW Been waiting years for DVD-ROM drives? Your patience is about to be rewarded. New second-generation drives are hitting the stores, and *PC World* reviews the first of them—despite the scarcity of DVD software.

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THE WEB AND YOUR BUSINESS

211 WINNING THE WEB SERVER WARS

Running a business can require anything from file sharing and e-mail to newsgroup support. Could the right server for communicating on the Web and your company intranet give you the edge you need? Here's how your Web server can do battle on the front lines.

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Additional material available on PC World Online: www.pcworld.com

COVER *Illustration by Nick Fain; screen image by John Goddard*

ICONS: JEFFREY PELO

TOP OF THE NEWS

58 PROCESSORS LEAP AHEAD
Led by memory and chip-design advances from Intel and IBM, this could be a golden age for PC power, with more dramatic gains than ever. When will we see it all on real PCs? And what does this power mean for users?

63 NETSCAPE UPS ANTE ON MANAGING FILES FROM YOUR BROWSER
Netscape's upcoming file manager takes aim at Internet Explorer 4.0 and Win 98. Plus, it'll work with more files and all Windows.

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74 SUITE IMPORT TRIES TO MUSCLE IN
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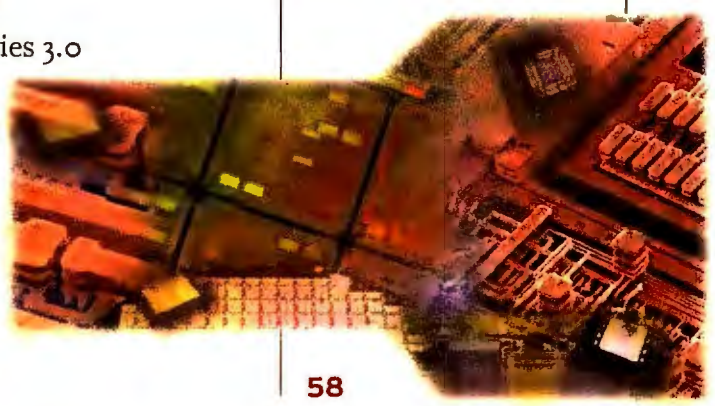

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230 POWER DESKTOPS
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259 WORKGROUP PRINTERS
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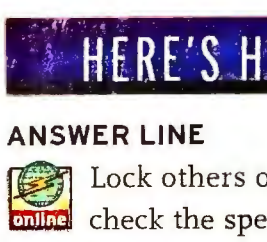

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372 FULL DISCLOSURE You know what's the problem with predicting the future of technology? We're usually wrong.

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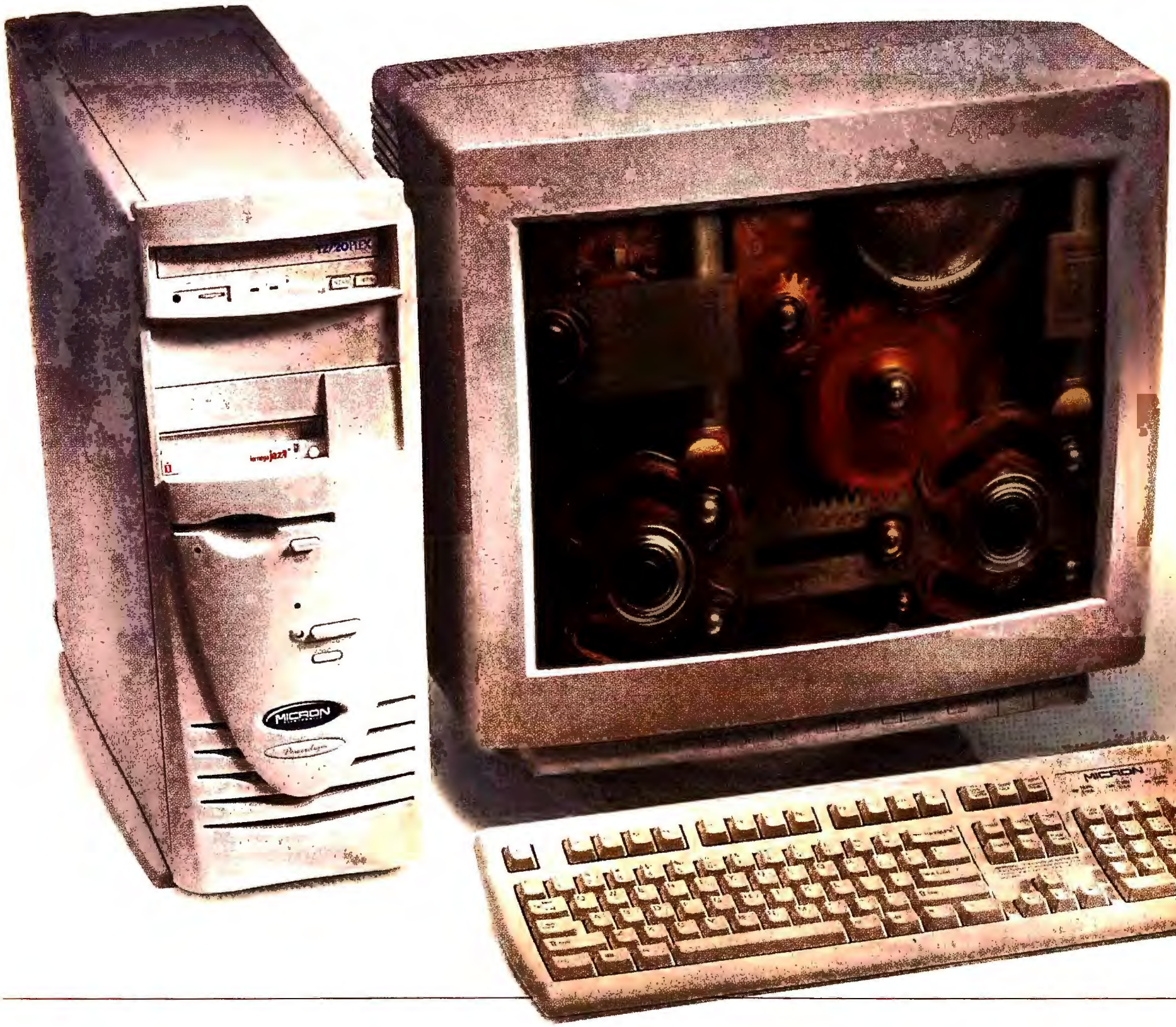

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September 1997

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30 days of free Micron-supplied software support for Micron desktop systems; 3 optional network operating system incident resolutions included for Micron server systems
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$3,499
Bus. Lease $119/mo.

*On-site service for the NetFRAME LV2000 and MV5000 servers is provided by Digital Equipment Corporation and is optional.

NetFRAME MV5000 SERIES

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Memory: ECC EDO or SDRAM option
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Dual integrated Symbios Ultra-Wide SCSI-3 controllers
Integrated Symbios Narrow SCSI controller
Intel EtherExpress Pro 100 NIC
Embedded RAID Upgrade option
I_2O Ready via embedded Intel i960-RD
5 Internal, hot-pluggable, hard drive bays (Upgradable to 10)
One 360 watt hot-pluggable power supply standard (Upgradable to 3 for added redundancy)
Rack Adapter Option
Intel LANDesk Server Manager v.2.8
Dedicated server technical support, 7x24
5-year/3-year Micron Power limited warranty
1-year next-business-day on-site service*

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Where's Web Access When You Need It?

ON TUESDAY, OCTOBER 28, 1997, the need for fast and reliable Web access acquired a new sense of urgency. A day earlier, the stock market had tanked. That night and the following day, investors were glued to CNBC and CNNfn, clogging phone lines to their brokers, and logging on to the Internet to check news and place trades through brokers' online sites. Trading on the New York Stock Exchange hit 1.2 billion shares that Tuesday—twice what was traded the day after the October 1987 crash. Online trading sites—Ameritrade, Charles Schwab, Etrade, and Fidelity—all struggled with record-breaking activity. Schwab's site logged about 11 million hits. Etrade handled 50,000 trades, about twice as many as normal.

The need for Web access isn't always so urgent, but as more of us depend on the Internet to do business and stay in touch with family and friends, reliable access is more critical than ever. And based on a recent *PC World* survey, as well as on our extensive testing of major Internet service providers, it's clear that not all ISPs are up to the task (see "ISPs You Can Count On").

Reliable Internet access is **more critical** than ever, but it's clear that **not all** ISPs are up to the **task.**

ONLINE SERVICES HIT BOTTOM

AMONG THE WORST providers are full-fledged online services. Think that America Online, the biggest with 9 million–plus subscribers, has finally solved its access bottlenecks and customer service problems? According to its marketing blitz last year, AOL sunk millions of dollars into fixing the problems that caused its legendary busy signals and led to lawsuits by angry customers. How has AOL fared lately? On Wednesday morning, October 29, a hardware failure prevented AOL subscribers from connecting for several hours and caused e-mail troubles for those who had already managed to log on. Five days later the system was down again, and millions of users could not send or receive e-mail. In our survey and testing, AOL received the lowest ratings for both customer satisfaction and performance—not the kind of track record to take a chance on when the stock market takes a dive.

What about the Microsoft Network? The second-largest online service is just a click away from potential subscribers who receive the software when they buy new Windows 95 PCs. Our testing and survey found that MSN falls in the middle of the pack in performance, continues to flub e-mail delivery, and fails miserably in customer satisfaction and service. CompuServe's ratings are almost the reverse of MSN's: fair in customer satisfaction, poor in performance.

During the last couple of years, AT&T, Sprint, MCI, and other phone companies have tried to cash in on the Web frenzy by offering Internet access along with local and long-distance phone services. Our survey results and testing show that these companies generally do a better job as ISPs than the online services, but not by much: Among them, only Sprint achieves both good performance and good customer satisfaction. At the opposite pole is MCI Internet. Its scorecard shows poor performance, bad software, and even worse customer support.

TROUBLE AHEAD?

THE QUALITY OF INTERNET service from AOL, CompuServe, and MCI bears close watching this year. The wild card is WorldCom, until recently a minor player in the telecommunications industry. In 1996 it bought UUNet Technologies, a major Internet backbone operator, and last summer it bought CompuServe's and AOL's data networks. And in November, MCI accepted WorldCom's $37 million takeover bid; federal authorities are currently reviewing antitrust implications of the proposed merger.

If the merger is approved, WorldCom will be the second-largest telecommunications company in the United States, outranked only by AT&T. It will own a huge data network, including four of the largest Internet backbone operators, and it will control a massive portion of the country's Internet traffic.

At this point, it's too soon to tell if WorldCom's new acquisitions will improve the Internet service provided by AOL, CompuServe, and MCI or whether service will deteriorate further. As part of WorldCom's complex deal, for example, AOL gets the burden of 2.6 million more subscribers from CompuServe, but it also gains access to more networking hardware from WorldCom. Moreover, given the volume of Internet access that it will control, WorldCom could begin charging higher rates. To date, the company says it will not increase prices, but it will be in a good position to do so.

Check the results of our survey and testing. During the coming year, monitor your ISP's performance, especially if it begins to charge premium rates. And remember one lesson we learned from our survey respondents: It pays to switch.

Cathryn Baskin is editor in chief of PC World.

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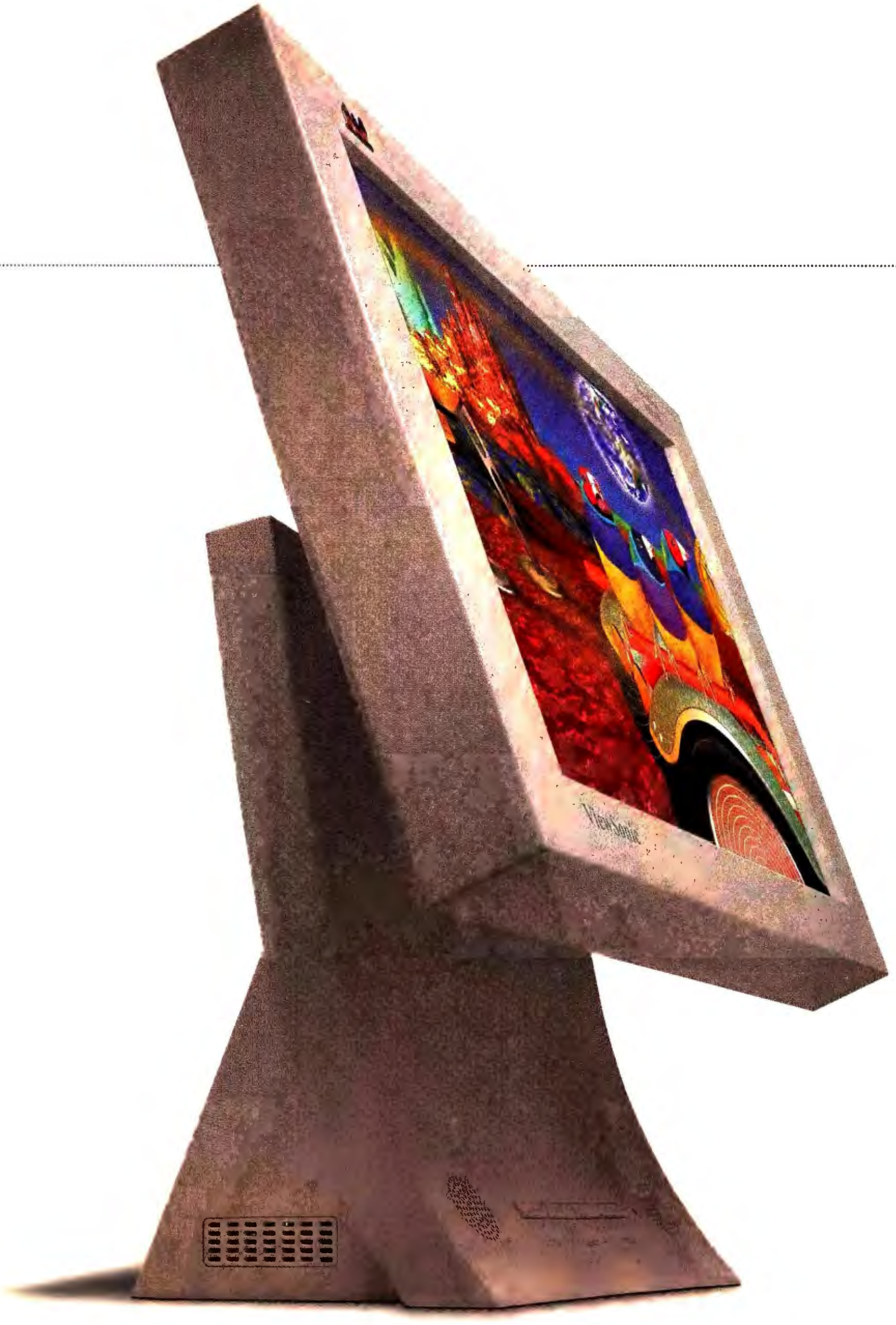

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YOUR TAKE ON: Microsoft, pro and con ◆ Your hard drive's actual size

ONLINE WITH SYMANTEC

AS SYMANTEC'S online services manager, I'd like to correct statements about Symantec's online support in "Want Good Tech Support? Good Luck..." [October]. The author states, "[Michael Cahlin] posted the questions on the Customer Service Discussion Group forum. Two weeks later, he'd gotten no replies." This is untrue.

We researched this issue and determined that Cahlin had indeed posted a message on our discussion groups in late May, but we also determined that his questions were answered quickly and accurately. He actually received three quick responses, two from Symantec and one from another user.

Regarding the speed and usefulness of the automated services, the Support Genie and the Knowledge Base, we have made significant improvements since May. We have completely redesigned the support site (service.symantec.com) and have made system changes that have more than doubled the speed of the services.

Our goal is to provide our customers with solutions instantly using online automated services whenever possible. Although no automated system can answer 100 percent of the questions, we are committed to addressing the bulk of customer questions in the Genie and in the Knowledge Base. Other questions are answered at no charge within 24 hours (business days) on our public discussion groups.

Hal Stanley, Eugene, Oregon

Response: When I was researching the article, Symantec's tech support Web page did not say how I could expect to receive replies—so I assumed, since I was e-mailing questions directly to tech support, that they would respond the same way. Symantec has since added instructions on how to find answers to posted questions, including an explicit notice that "support technicians do not answer private e-mail." I recently resubmitted a question and indeed got a posted reply within 24 hours.

–Michael Cahlin

DUH

IN OCTOBER'S *Letters*, a technical support guy for an Internet service provider says that without seeing an article in your magazine about how to clear a cache, he would have had to turn a customer away.

Did anyone else wonder how he became a tech for an ISP without knowing how to do this trick? And what does such ignorance say about that ISP?

I don't know how to convert Lotus macros to script. Think I could get a job as a tech for Lotus 1-2-3 97?

Dan Wright, Tulsa, Oklahoma

USE THAT UPS!

"HOW TO KEEP Your PC Trouble-Free" [October] lists situations where an uninterruptible power supply may be needed. Because I suspected that the power where I live frequently drops low, I bought a UPS. The manual explains that the device gives a warning beep anytime the voltage drops to 103V. Until the power company recently replaced some wires and a ▶

HOT BUTTON

Tech Support: The Good, the Bad, and the Ugly

SINCE PURCHASING a complete computer system from a local superstore in June, we have had problems that required calling for help. I wish I had read Naomi Wise's article ["Want Good Tech Support? Good Luck..." October] before we started out on our phone odyssey.

After a number of days of frustration and wrong advice, I had the good luck to reach a knowledgeable technician at the computer manufacturer. In 5 minutes this person helped me identify and fix problems with the hard drive and printer and get rid of a persistent error message; he even helped me reinstall the scanner. All this even though my 90-day free phone support had expired two days earlier, and two of the brand-name products weren't really his responsibility.

I would underscore Wise's advice not to phone tech support after hours. My worst nightmares occurred at night, and I foolishly failed to log my calls or the names of people I talked to. All these support lines announce that the call may be recorded. Perhaps the customer should use this technique as well.

Elaine Williams
Birmingham, Alabama

I WAS HAVING a problem at work with a program called MapInfo. At MapInfo's Web page, I found a feature that generates an immediate callback from the company—all you do is click on an icon and enter your phone number. The salesperson who called me back was unable to help but said if I e-mailed her a description of my problem, she would forward it to tech support. Within 2 hours, I had a solution. Good going, MapInfo.

Paul Gyorke, Taylor, Michigan

TWO YEARS AGO I had difficulty installing OmniPage Pro on my machine. I called Caere's technical support eight times, and each time its phone system disconnected me. Then I called customer support (an 800 number). The lady who answered growled that Caere's phones "are fine!"

I called the corporate office and was promised a call from technical service within the hour. It never came. Then I sent a letter to the CEO via certified mail—once again, no response. Finally, I returned the product and contested the bill with MasterCard.

Since then I have used TextBridge from Xerox and have had only a couple of minor problems. Xerox's tech service answered my e-mail questions promptly and straightened things up very efficiently.

Gordon J. Ballard, Turlock, California

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transformer, the UPS beeped several times a day. Before installing the UPS, I experienced corrupted files and programs, lost files, cross-linked files, and so on several times a week. Now it rarely beeps.

You mention that a surge protector is essential when you have "ancient wiring," but it does not help with low power. With poor power, you can get unpleasant surprises—regularly.

David Hurlbut, Yuma, Arizona

WHAT'S THE HARD DRIVE'S ACTUAL SIZE?

I RECENTLY PURCHASED a PC advertised as having a 4GB hard drive, but I subsequently found out that the drive's capacity is really 3.72GB.

The PC's tech support said the difference was because of hidden files but couldn't explain how such files would eat up 300MB. My information systems manager gave me the real answer: 1KB is actually 1024 bits. Also, formatting the disk reduces actual hard drive capacity.

Now that monitors are finally listing their visible screen size, it seems odd that the hard drive issue remains unaddressed. Shouldn't consumers know how much hard drive space they can actually use?

James McNair, Middletown, Connecticut

NICE MICROSOFT

IN RESPONSE TO October's *Home Office* column by Steve Bass entitled "Today's Target: Microsoft," it is unfair to complain that Office 97 files cannot be read by previous versions of Word. I cannot think of any software upgrade in the past that allowed users of a previous version to view, edit, save, and print the files of the new version, and I think Microsoft should be commended for posting a patch on its Web site to create such file compatibility. This rebuts the widespread notion that Microsoft is forcing people to upgrade every six months.

Brent Northam, Boston

NOT-SO-NICE MICROSOFT

I THOUGHT COOKIES were something that a visitor to an Internet site could accept or reject. Now Microsoft has decided that if you do not accept its cookies, and fill out a registration form as well, you won't get anywhere trying to access its Web pages, including the Knowledge Base or the frequently-asked-questions files about its products. The company gives you a "Let's talk" pitch and tells you about all the good things a cookie can do for you. Yet I have read, over many months, articles in your magazine and others about avoiding these cookies and why it is a good idea to do so. I have never read anything that says, "But you don't have to apply these suggestions to Microsoft." And I do not like the idea of Big Brother looking over my shoulder.

Paul Riley, Internet

NO SYMPATHY

IN "YOU ARE BEING WATCHED" [November], a state employee named Robert was warned he would be fired if he went to pornographic Web sites, yet he continued doing so. When caught again, he explained he could not control himself. This guy chose to risk his job for cheap thrills. If he is incapable of controlling himself to that extent, he needs to be in a state institution, not working for the state.

Craig Strange, Northbrook, Illinois

PC World *welcomes your responses, ideas, and other letters to the editor.* *See page 14 for contact information.* ■

CORRECTIONS AND CLARIFICATIONS

NOVEMBER *Bugs and Fixes* gave an incorrect phone number for customer service at Corel. The correct number is 800/772-6735.

In December's *Top of the News*, the chart on page 84 inaccurately stated the amount of RAM in Hewlett-Packard's 360LX Windows CE 2.0 device. The 360LX has 8MB of RAM.

In December's "Text, Graphics, and... Photos?" some print quality ratings were unclear. The HP DeskJet 694C offers the best color photo printing with the special ink and paper used for our samples, but with its standard ink cartridge, color is only adequate. And as a clarification, the NEC Superscript 660plus's good text output was labeled worst because it could have been crisper and was indeed the worst among the top five printers in the roundup.

PC World regrets any confusion.

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Christian Murphy was non-verbal. He lived with a wall between himself and the world.

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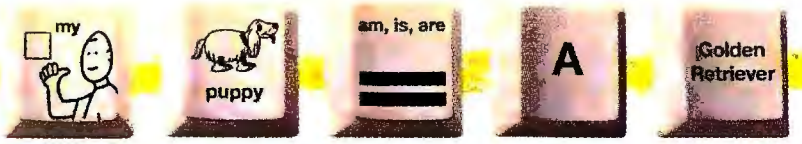

2 A TEACHER DISCOVERED *that Christian would respond to images from his life. She put visual cues to the story of his new puppy on a special keyboard.*

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Don't Throw That Old PC Away

A generous tax break is just one way you can profit from donating computers.

ILLUSTRATION: STUART BRADFORD

THE NEXT TIME YOU'RE in the market for new computers for your business, think about this: Those "old" PCs on your employees' desktops may yield a substantial tax deduction come April 15.

In an ingenious effort to get powerful computers into U.S. schools, Congress passed—and President Clinton signed—the 21st Century Classrooms Act last fall as part of the Taxpayer Relief Act of 1997. The provision, which takes effect January 1, 1998, and lasts until December 31, 2001, allows qualifying businesses (any C corporation) to deduct the full purchase price of any computer donated to a K–12 school within two years of purchase. That's a considerable increase: Under the prior law, the charitable tax deduction would have been limited to the resale value of the PC—often less than half the original sales price.

Although it's too soon to tell how many businesses will take advantage of the new act, the concept itself is brilliant: The pending tax break gives businesses an incentive to put old but viable technology to good use. It could also alleviate a serious computer shortage in our nation's public schools, where, according to the Bureau of Educational Statistics, one computer is shared by nine children on average.

The larger deductions will be a real impetus for businesses to donate newer computers to schools, says David Lenehan, a manager in AT&T's government affairs division in San Francisco. "Until now, businesses could deduct only the undepreciated value of equipment, which left almost nothing to write off," he says. Lenehan knows what he's talking about; over the last four years, he has worked with AT&T offices throughout the country to donate thousands of computers to schools.

TOOLS FOR SCHOOLS

UNDER THE CLINTON administration, the cause of getting more and better computers into schools has received lots of attention. Schools of all sizes nationwide are grappling with the expense and logistics of creating a technology-rich learning environment. But it's not just parents, teachers, and administrators leading the charge. Through equipment donations and volunteer time, businesses and their employees are also playing a big part.

In 1993 Lenehan hooked up with the Detwiler Foundation's Computers for Schools program. The San Diego–based organization was founded seven years ago to serve as an intermediary between businesses interested in donating used equipment and schools looking to increase their stock of PCs. After placing an estimated 34,000 computers in California schools, the foundation took its mission nationwide last fall and is now working to set up programs in more than 30 states. In a unique cooperative arrangement, the foundation has even teamed up with state correctional institutions, where inmates refurbish donated computers for placement in schools.

"The majority of used computers [at a company] get consigned to the basement or a closet, where they stay until they're taken to a ▶

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WHO TO CONTACT

HERE ARE JUST a few of the organizations looking for equipment and volunteers for school or community-based programs.

- The Detwiler Foundation (800/939-6000, www.detwiler.org) will take your company's used computer equipment, get it refurbished, and place it in needy schools. The foundation tries to accommodate donors who request that their computers be placed in a particular school or district.
- NetDay 2000 (www.netday2000.com) is an ongoing effort to wire all schools to the Internet. Local chapters of this national organization need volunteers to pull cable and lay wire in classrooms, computer labs, and school libraries.
- Plugged In (415/322-1134, www.pluggedin.org), in East Palo Alto, California, is a great resource for individuals looking to start a neighborhood computing center in their community.
- State chapters of United States Tech Corps (800/285-6781, www.ustc.org) specialize in matching computer-savvy professionals with schools in need of trainers or technical help.

recycler because they're no longer worth anything," says Lenehan. Organizations like the Detwiler Foundation make it easy for companies to donate equipment, especially when they don't have the resources to handle the logistics themselves. "It provides us with a nationwide procedure for passing on old equipment," he says. "That saves everyone a lot of time and trouble."

Corporate attorneys like the program because it takes the responsibility for repairs and maintenance away from the donating company. The Detwiler Foundation sees that all donated equipment gets refurbished before it goes to schools; companies don't have to worry about schools calling them with problems or questions.

"In the past, one issue for us was support," says Nancy Thomas, national contributions manager for Hewlett-Packard. "We're not prepared to support [donated] computers," she adds. And even when a company donates computers "as is," there's often some expectation of support. As part of a pilot program in 1997, HP gave the Detwiler Foundation 400 PCs that had been returned by customers, and followed up with roughly 100 computers a month afterward.

But it's not just high-tech companies that have equipment to give. Any C corporation qualifies for the beefed-up deduction under the new act. Unfortunately, individuals and unincorporated businesses don't gain as much financially from donating used equipment.

HERE COMES THE TECH CORPS

EQUIPMENT IS IMPORTANT, but it's just one part of furthering computer technology in schools. The other critical—and often overlooked—component is the ongoing need for training and maintenance. That's where members of United States Tech Corps are stepping up to the plate.

Founded in 1994 to work with Massachusetts schools, Tech Corps now has chapters in 40 states and the District of Columbia. Participants consist largely of men and women in high-tech companies who are putting their technical expertise to work by volunteering their time in schools. These people do everything from troubleshooting hardware and software problems to teaching teachers and students how to navigate the Web.

"We discovered early on that 70 percent of all U.S. households do not have school-age children," says Tech Corps spokesperson Sue Kuykendall. As a result, many of these computer-savvy professionals had no easy route into their local schools. So Tech Corps became the link for those potential volunteers.

Lawrence Zevon, director of new media for America House Communications in Newport, Rhode Island, has spent the last 18 months working with middle- and high-school students in his city as part of Tech Corps' efforts in the state. At 29, he doesn't have children. So why does he volunteer his time? Zevon explains: "The way I look at it, these kids are our future. We're really investing in each other." His employer agrees. As part of its effort to encourage employees to volunteer time in the community, America House allows ▶

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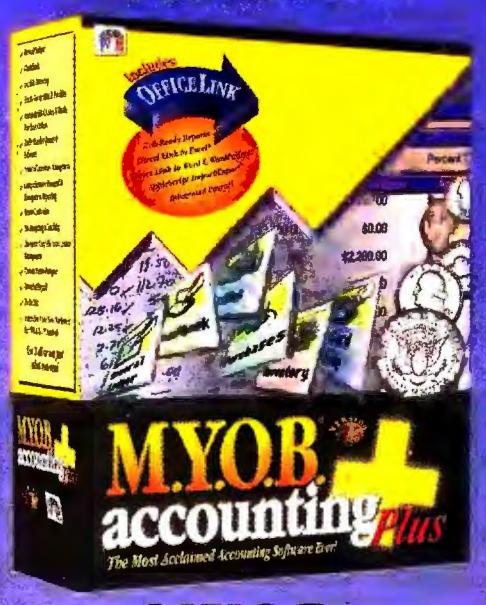

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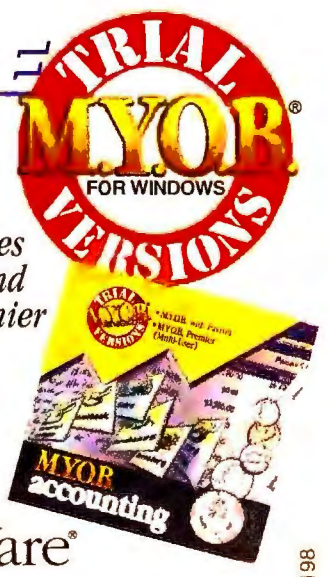

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New versions of your favorite suites are loaded with Web features and more powerful than ever—which means they hog even more disk space and processing power. Are these updates worth it?

THE BEST WAY TO BUY A PC

What's the smartest way to buy a new computer: Via direct mail? Online? At your local retail superstore? We sent five shoppers undercover to scout out the trials and travails of PC purchase, delivery, and return.

FASTER WEB ACCESS

Feel the need for speed? Fast Internet access is here, yet you're still surfing in molasses. From ISDN and cable to satellite and ADSL—here's the scoop on turbocharging your Web access.

DIGITAL CAMERAS CLICK

Whichever you are—corporate marketer, small-business owner, Webmaster, or photo hobbyist—digital cameras can change the way you take and use photos. We check out ten new models.

ALSO NEXT MONTH

▶**The PC World Top 100:** The top power desktops, budget desktops, notebooks, and home PCs, plus printers, monitors, graphics boards, and modems.

▶**Color Scanners for Everybody:** Getting photos and text pages into your PC is finally cheap and easy. We test 11 scanners, starting at an affordable $129.

▶**Here's How:** *Answer Line* on turning your PC off at the end of a workday, *Internet Tips* on surviving savage spamming, *Windows Tips* on creating a macro with Recorder.

PC WORLD

Zevon 5 hours of paid volunteer time each week. "The rest is on my time," he adds.

As worthwhile as these programs are, schools are just one avenue for making computers accessible to children and adults. Recognizing the need to serve the broadest possible community, an eclectic mix of local, state, and national organizations is painstakingly chipping away at the technology roadblock.

Some, like Plugged In and OnRamp in the San Francisco Bay Area, work to provide computer access as well as classes for residents of low-income communities. The Boston Computer Museum's Computer Clubhouse (www.net.org/clubhouse) and its affiliated neighborhood centers put sophisticated hardware and software tools into the hands of children who typically lack access to computing resources at home or at school. Many Clubhouse graduates have gone on to work in computer-related jobs in the Boston area.

YOU CAN DO IT, TOO

ON A NATIONAL LEVEL, the Gates Library Foundation (www.glf.org) is installing computers in public libraries in low-income neighborhoods throughout the United States. Funded with an impressive $200 million donated by Bill and Melinda Gates, the foundation also will establish training centers where library staff and local community members can learn how to use the new equipment.

Experienced PC users can provide an invaluable service to their communities by sharing their knowledge and technical skills with others. What better time than the start of a new year to resolve to add your equipment or expertise to the mix? You'll have the satisfaction of knowing you're doing your part to correct a glaring inequity. And who knows, with the new deductions for computer donations, you may even find that it's not just the folks you're helping who benefit.

What's happening to bridge the computing gap in your community? Send e-mail to consumerwatch@pcworld.com. Roberta Furger is a PC World *contributing editor. Her first book,* Does Jane Compute? *will be published by Warner Books.* ■

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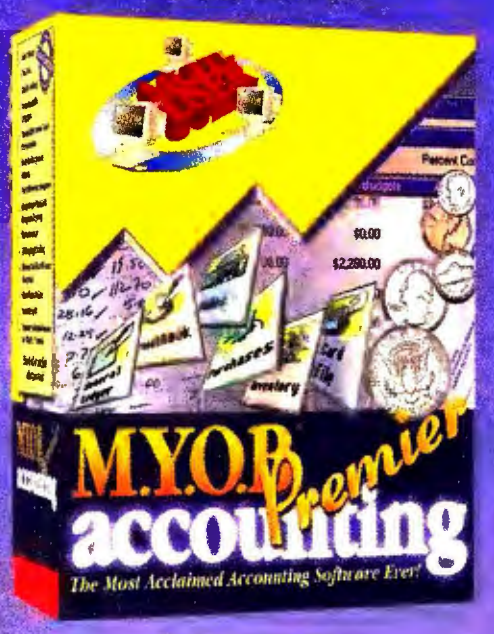

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Display	12.1" CTFT or 12.1" CSTN (SVGA)	12.1" CTFT or 12.1" CSTN (SVGA)	12.1" CTFT (SVGA or 1024 x 768)	12.1" CTFT (SVGA or 1024 x 768) or 13.3" CTFT (1024 x 768)
Standard/Max Memory	16MB EDO RAM up to 80MB	16MB up to 80MB	16MB or 32MB EDO up to 128MB	16MB or 32MB EDO RAM up to 144MB
Hard Drive (SMART)	1.4GB–2.1GB	1.6GB–2.0GB	2.1GB–4.0GB	1.6GB–5.0GB
CD-ROM	12X – 20X (varies with model)	20X optional	20X (standard on select models)	20X (standard on select models)
Modem	Integrated 33.6 Kbps data/fax	Compaq PC Card optional	Integrated 33.6 telephony on most models Upgradable to K56 flex protocol*	Integrated 33.6 Kbps telephony Upgradable to K56 flex protocol*
Integrated AC Adapter	Yes	No	No	Yes
Battery Type/Life**	Li-Ion up to 3.5 hr (up to 2 batteries)	Li-Ion up to 3 hr (up to 3 batteries)	Li-Ion up to 3 hr	Li-Ion up to 3 hr (up to 2 batteries)
Desktop Expansion	Convenience Base (with or without Ethernet)	Convenience Base (with or without Ethernet)	Convenience Base or ArmadaStation Exponsion Base (with tower stand optional)	Convenience Base or ArmadaStation Expansion Base (with tower stand optional)
Intelligent Manageability	Yes	Yes	Yes	Yes
Dimensions/Weight	2.1" x 12.2" x 9.6" / 7.4 lb–7.5 lb	Slimline: 1.5" x 11.4" x 8.8" / 5.3 lb Standard: 1.5" x 11.6" x 10.3" / 6.2 lb Multimedia: 2.3" x 12.6" x 9.5" / 8.3 lb	1.5" x 12" x 9.3" / 6.0 lb	2.0" x 12.6" x 9.5" / 7.8 lb–8.0 lb
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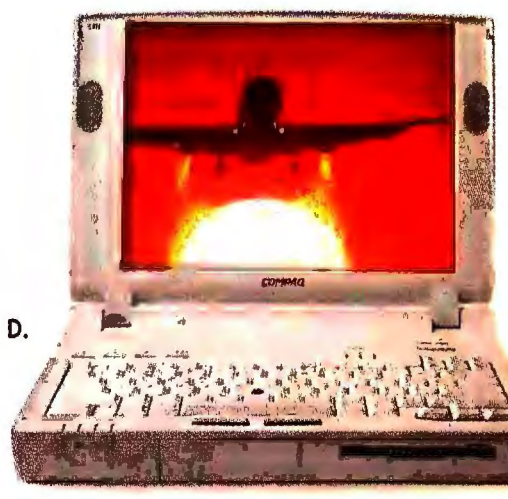

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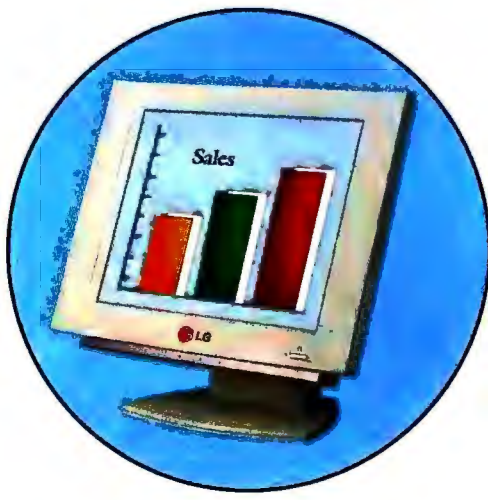

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Online Customers Get Fleeced

THE LATEST mail-order vendor to apparently fold in the night and leave customers stranded is Memory On-Line. I've gotten a number of letters from hapless victims of the company, which advertised in *PC World* and *PC Computing* and took orders for PC components over the Web. Customers reported rude phone representatives, orders that never came, wrong products that did arrive, and no way to return products.

But it gets worse. Memory On-Line has stopped answering its phones, the Web site has disappeared, and we've been unable to track down any of the principals. If you're waiting for a product or a return from this outfit, contact your credit card company now and ask it to cancel the charges. (I'm sure you know better than to pay for anything you've ordered over the phone or online with cash or a check, right?) In general, be very careful when ordering from a mail-order company you're unfamiliar with. There's no sure way to know if a company is legitimate, but check with the Better Business Bureau in the city where the company is located.

ILLUSTRATION: JAMES YANG

HEY, THAT'S TOO MUCH E-MAIL

WHEN LORENA GARMEN of Grand Rapids, Ohio, logged on to e-mail recently, she was surprised to find messages from the president of the service telling her she'd exceeded the limits for sending and receiving e-mail. Garmen, a Juno member, knew she wasn't sending mail in bulk—she sent only three to five messages a day. It turned out the problem wasn't the volume of mail; rather, Garmen had exceeded the daily limit for the number of times you may *connect* to the service.

Charles Ardai, president of Juno, says the company does set limits on how much the free service can be used. "The actual limit changes, but it's somewhere around a dozen," he says. The company also imposes a volume limit on mailings, which amounts to about 50 in a day.

RARE ROADSIDE SERVICE

MATTHEW LONERGAN OF Mountain View, California, shares a stunning story about his extraordinary service from Adobe Systems. While preparing documents to go up on the Web, Lonergan found he needed an Acrobat feature that wasn't yet available. Adobe's Web site claimed the new feature would be available soon. But Lonergan couldn't wait. He called Adobe's main offices in San Jose, California, and was connected to David Pratt, vice president and COO, who confirmed that the needed upgrade had not yet shipped. But Lonergan was not out of luck. Pratt jumped in his car and met Lonergan at a rest stop off the highway with the CD-ROM Lonergan needed. Wow!

AOL FOR BREAKFAST

A BEGUILING marketing ploy by America Online has Internet newsgroups up in arms. Apparently, boxes of Chex cereal came with a CD-ROM containing a children's game. When kids get to the end of the game, they're prompted to download the sequel from America Online. Of course, if kids aren't members of AOL, they're out of luck. The buzz on the Net is that their frustration will prompt them to ask their parents to sign up, and the unsuspecting parents will then let their kids loose on the big bad Web.

While admitting that it's trying to attract kids to the service, AOL insists it has taken security measures. According to spokesperson Wendy Goldberg, parents can still protect their kids from the dangers of the Web. After logging on to AOL, "with two clicks of a mouse, parents can select what they want the child to see and do on the Internet."

Think you've gotten a raw deal—or a great one? PCW Advocate *wants to hear the details at advocate@pcworld.com. We'll investigate complaints and publish items of the broadest interest. Christina Wood is a contributing editor for* PC World. ■

THE FINE PRINT

THE CURIOUS WORLD OF SOFTWARE RETURNS

THE POLICY EXPLAINED In the fine print of this CompUSA advertisement is unusually generous: CompUSA allows you ten days to return (for exchange) the software that you bought at the store, even if you opened it. If you buy from other retailers you might not be so lucky, so be sure to check the store's policy on software returns before purchasing the product.

If you buy your software preinstalled on your new PC, the story is different altogether. Some manufacturers won't let you open software packages at all, while others have quite liberal policies. Micron, for example, allows you to return opened software within 30 days without so much as a restocking fee. So check the manufacturer's policy before you open any of the software packages.

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PCComputing 1st July 1997

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PC Computing BEST
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PC MAGAZINE EDITORS' CHOICE
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OVER 250 AWARDS matrox

* Estimated Street Prices. Windows 95 and NT tests conducted by Matrox Graphics Inc. on a Dell XPS H266 configured with an Intel Pentium II 266 Mhz processor with 512K cache and 32 MB of RAM. Matrox Millennium II, Matrox Mystique 220 Business, Number Nine Imagine 128 Series 2, ATI 3D ProTurbo + PC2TV, Diamond FireGL 1000, Diamond Stealth 2000 Pro, and STB Nitro 3D were configured with maximum memory configurations using driver revisions 3.20, 3.63, 4.102.03, 3.1.76, 2.70 4.0.27, 4.03.00.3211, and 1.52A respectively. WinBench 97 business tests conducted at 1280 x 1024 @ 24 bits of Pixel vertical refresh using small fonts under Windows NT 4.0. Diamond FireGL is not supported at 1280x1024@24 for WinBench 97 business tests conducted at 1024 x 768 @ 24 bits of 75Hz vertical refresh using small fonts under Windows 95. All trademarks are the property of their respective owners.

Circle 143 on reader service card

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There's more to tell, but you probably have to be somewhere.

To learn more about the entire line of MultiSync monitors from NEC Technologies, call 1-800-NEC-INFO or visit www.nec.com.

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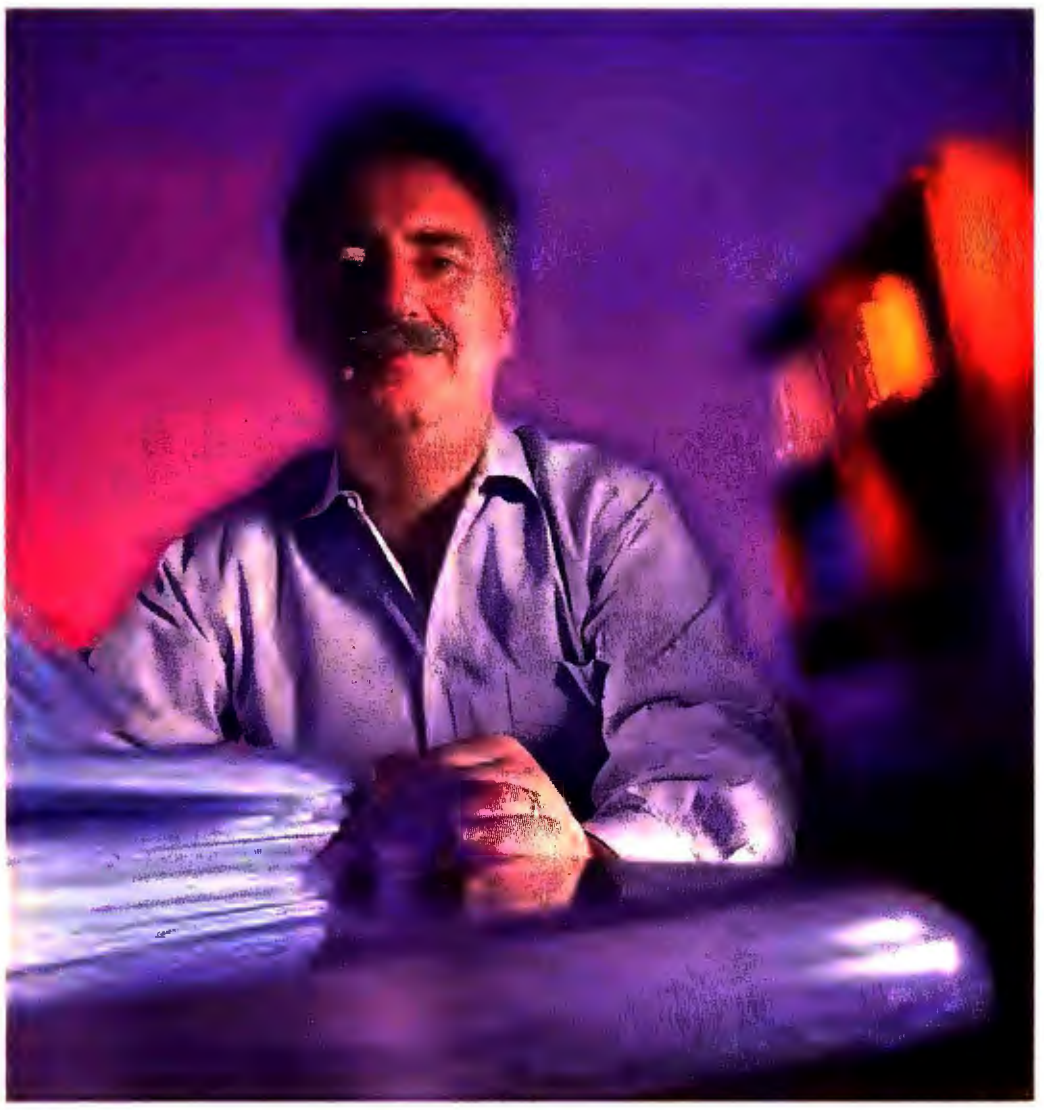
Circle 203 on reader service card

Saved by a Safety Net: Off-Site Backup

The night before he was to give a presentation, Tom Stynes discovered that his hard drive had gone south. Luckily, Stynes had backed up his files—on the Internet.



PHOTOGRAPH: ROBERT CARDIN

THE PROBLEM As a self-employed technology consultant to the financial industry, Tom Stynes has clients around the country. Because he's usually on the road rather than in his office in Foster City, California, Stynes often works on large documents—presentations and proposals with graphics—in transit. Concerned that his data files could be corrupted or his notebook stolen, he started carrying an Iomega Zip drive for backup. Then Stynes discovered a better way to back up: over the Internet. —*Editor*

In the course of one night, I was both doomed—and saved—by the Internet.

It happened during a business trip to Chicago. As managing director of Solutionpros LLC, a document imaging and payment systems consultant to the financial industry, I travel heavily for client meetings and presentations.

I became concerned about carrying so many important files without any backup, so I bought an Iomega Zip drive. But the drive added another 3 to 4 pounds to my already bulging suitcase. And making a full backup of my desktop PC's 1.2GB hard drive meant shuffling at least 12 Zip cartridges—a time-consuming process.

Living in California, I had another concern: earthquakes. If disaster struck, my backup files would be equally vulnerable. For the best protection, I needed an off-site backup system.

THE SOLUTION: BACK UP ON THE NET

THEN I READ ABOUT services offering backup over the Internet—off-site backup I could access from anywhere. At the time, Atrieva was offering a free 90-day membership, so I gave it a try.

Signing up for the service was simple. I enrolled at Atrieva's Web site by typing in my credit card number. You're asked to provide a password as well as an encryption key—which is a second password that gives you secure access to your files. (However, if you forget the encryption key, you can't access your data.)

I received Atrieva's CD-ROM a day or two later, installed the software, typed in my password and encryption key, and clicked an icon to go online. The application fired up my Internet link by reading what I'd entered into my Windows 95 Dial-Up Networking utility.

Atrieva's interface is fairly easy to use. You see two windows: One displays the contents of your hard drive, the other shows a directory of files you've backed up to the Atrieva server. You can copy files from your hard drive to Atrieva's server by dragging and dropping from one window to the other, as with Windows 95 Explorer.

Once you've dragged the files, Atrieva scans them for viruses, compresses them, and uploads them in batches to its servers in Seattle. Once one batch has been transmitted, Atrieva disconnects from the Net, then repeats the process with the next batch. It's all done in the background automatically, but you can't do anything else on the Net in the meantime.

Initially, I backed up only my most important files—Microsoft Word documents, mainly. ▶

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Circle 242 on reader service card

I didn't feel I needed to back up my applications. It took 3 hours to back up about 35MB of data using my 28.8-kbps modem.

The process was easy, save for a few bumps. For instance, Atrieva's software doesn't automatically recognize all file extensions; to back up my Intuit QuickBook files, I had to enter the .qbw file extension into an Atrieva menu.

Subsequent backups were a breeze. I've set Atrieva to copy my documents every Friday afternoon. At the appointed hour, Atrieva sends a message asking if I want to proceed. I click Yes, and 20 minutes later the week's backup is done.

And this brings me to the aforementioned doom-and-redemption scenario. There I was, out of town with my notebook, preparing a big presentation for the next day, when my hard drive went kaput.

A few days before, I'd downloaded a beta version of Microsoft Internet Explorer 4.0. Then I noticed it was causing conflicts with some apps, so I erased it from my laptop's hard drive. But the IE uninstall took some important Windows 95 files with it. As a result, I couldn't launch Windows 95 or any of my apps.

After consulting with my laptop's tech support, I found I had only one option: Reformat my hard drive—erasing everything on it, including the files for my presentation—and reinstall Windows 95 and my apps (fortunately, I had the program disks with me). Once I finished the reinstall, I went to Atrieva's Web site and retrieved the files I needed. If I had not backed up my data, I'd have been sunk.

Internet backup gives me the security of knowing that my data is safe and accessible, no matter where my work takes me. And because the service is so easy, I'm more inclined to back up regularly.

—Edited by James A. Martin

Atrieva Service

$14.95 per month for unlimited storage; Atrieva; 888/287-4382; www.atrieva.com

READER SERVICE NO. 629

James A. Martin is a PC World *contributing editor. If you've solved a problem in your business using a particular PC application or hardware device, we'd like to hear about it.* *See page 14 for contact information.* ■

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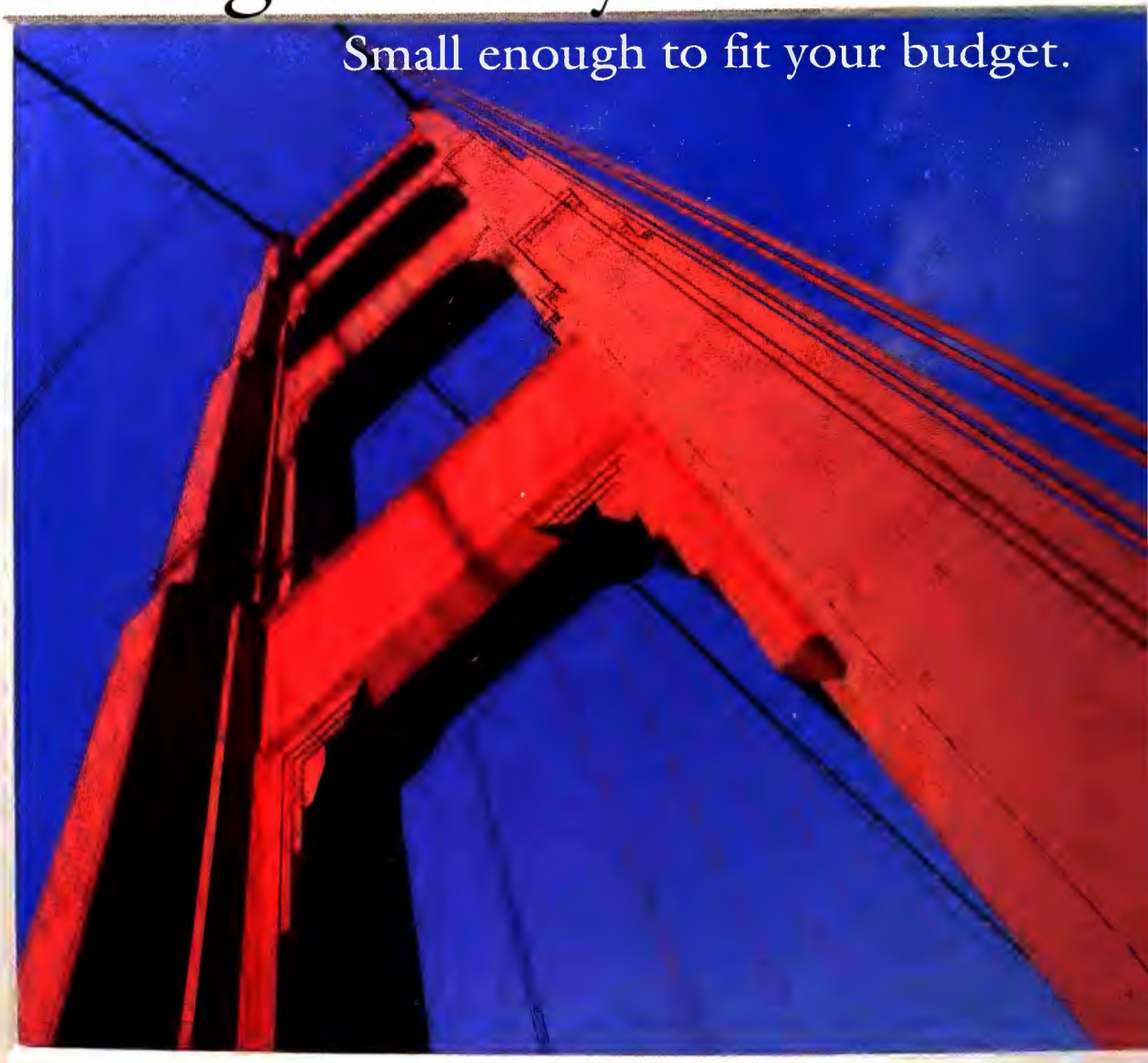

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USB

Circle 3 on reader service card

Internet Explorer 4.0 bugfest ◆ Excel 97 worksheet recalculation flaw

Internet Explorer 4.0, Problem Child

JUST TWO WEEKS after Microsoft posted the final version of Internet Explorer 4.0 to its Web site, the company issued a patch to close a security loophole. The "Freiburg issue," discovered by researcher Ralf Hueskes of Freiburg, Germany, allows Web hackers to view, but not alter, files on your computer. For details and a patch, check out www.microsoft.com/ie/security/?/ie/security/freiburg.htm.

More troubling, Microsoft's online KnowledgeBase (support.microsoft.com/support) already lists dozens more glitches and incompatibilities in the browser and its Outlook Express mail and news reader. Microsoft says version 4.01 will fix most of the installation glitches described below; see www.microsoft.com/ie/download/.

As we went to press, none of the confirmed bugs appeared to threaten your data, though your sanity may be at risk. Browser bugs include incompatibility with the Microsoft Office Manager toolbar; vanishing Start buttons, taskbars, and desktop icons; and Dial-Up Networking connections that freeze during dialing. Outlook Express cannot read news messages that contain lines starting with a period; it crashes when exporting messages into Microsoft Exchange; and it sends all messages immediately, even if they're scheduled for later delivery.

These buglets aren't IE 4.0's only pitfalls. Any number of installation missteps can make Windows all but unusable. To minimize IE 4.0 headaches, follow these guidelines:

- Install Windows 95 Service Pack 1 before installing IE 4.0.
- Don't install old versions of Microsoft Network or QuarterDeck's CleanSweep 3.0 if you ever want to browse the Web again.
- Remove IE 4.0 before you try to install IE 3.0 or restore a pre-IE 4.0 registry backup.

Of course, uninstalling IE 4.0 causes problems too. If you installed Office 97 after you installed IE 4.0, hyperlinks you created in Office documents will no longer work, and the Internet icon may vanish from the Control Panel. The solution is to reinstall Office 97 and install the Office 97 Service Release 1 patch.

And the troubles don't stop there. IE 4.0 won't display Adobe Acrobat files if the Content Advisor is turned on (or even mildly aroused) and works only with the latest version of the Acrobat Reader (3.01), downloadable from Adobe's Web site (www.adobe.com). Microsoft Money 97's online banking feature won't work on a computer with IE 4.0 installed until you add the 128-bit security extensions from www.microsoft.com/ie/ie40/download/128bit.htm. Norton Utilities 2.0's Protected Recycle Bin breaks down after you install IE 4.0. Use the program's Live Update feature to download an IE 4.0 compatibility patch. And Compaq Presario computers with the Home Base user interface installed roll over and die after you install IE 4.0. Find CPR instructions and an IE 4.0 compatibility patch at www.compaq.com/athome/ie40/instructions.html.

ICON: JEFFREY PELO

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IN BRIEF

Navigator Hits 3.04

THIS LATEST FIX solves minor interface bugs that cropped up in version 3.03. Find 16- and 32-bit Windows versions under ftp.netscape.com/pub/navigator/3.04/shipping/english/windows.

IE 3.02 Bell Labs Patch

MICROSOFT HAS finally posted the Internet Explorer 3.02 JavaScript security fix, reported here in October. Find it at www.microsoft.com/msdownload/jsprivacy/privupd.htm.

Panasonic Big 5 Trouble

NEW BIG 5 SQ-TC500N, 510N, and 512N CD-ROM changer software solves delays and crashes when switching among discs in Win 95 (www.panasonic.com/host/support/software-drivers-cdrom.html).

EXCEL 97 DOESN'T COUNT

BUG You probably haven't noticed, but your Excel 97 worksheets could be giving new meaning to the term *number crunching*. A bug in Excel 97 prevents worksheet cells from automatically recalculating under certain conditions. You can find a painstaking description of the problem at www.microsoft.com/Excel/Recalc.htm.

FIX The good news—a mere 46KB patch (at www.microsoft.com/OfficeFreeStuff/Excel/dlpages/XL8P1.htm) gets Excel back into shape. The bad news—you can't apply the patch unless you have already installed the 7MB Office 97 Service Release 1 (www.microsoft.com/office/office97/ServiceRelease). After you install the patch, pressing <Ctrl>-<Alt>-<F9> the first time you open up any Excel worksheet that has the problem will trigger the recalculation.

online *Find files from this article on PC World Online (www.fileworld.com). Scott Spanbauer is a senior associate editor for* PC World. ■

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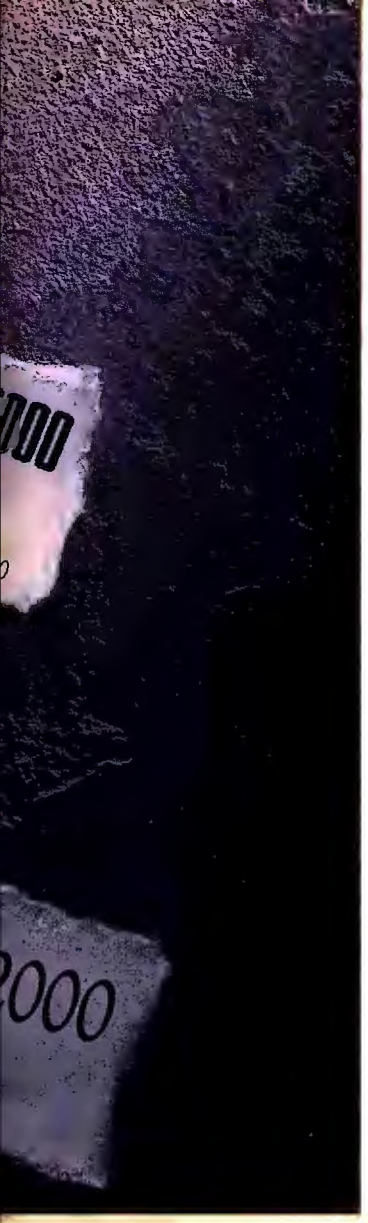

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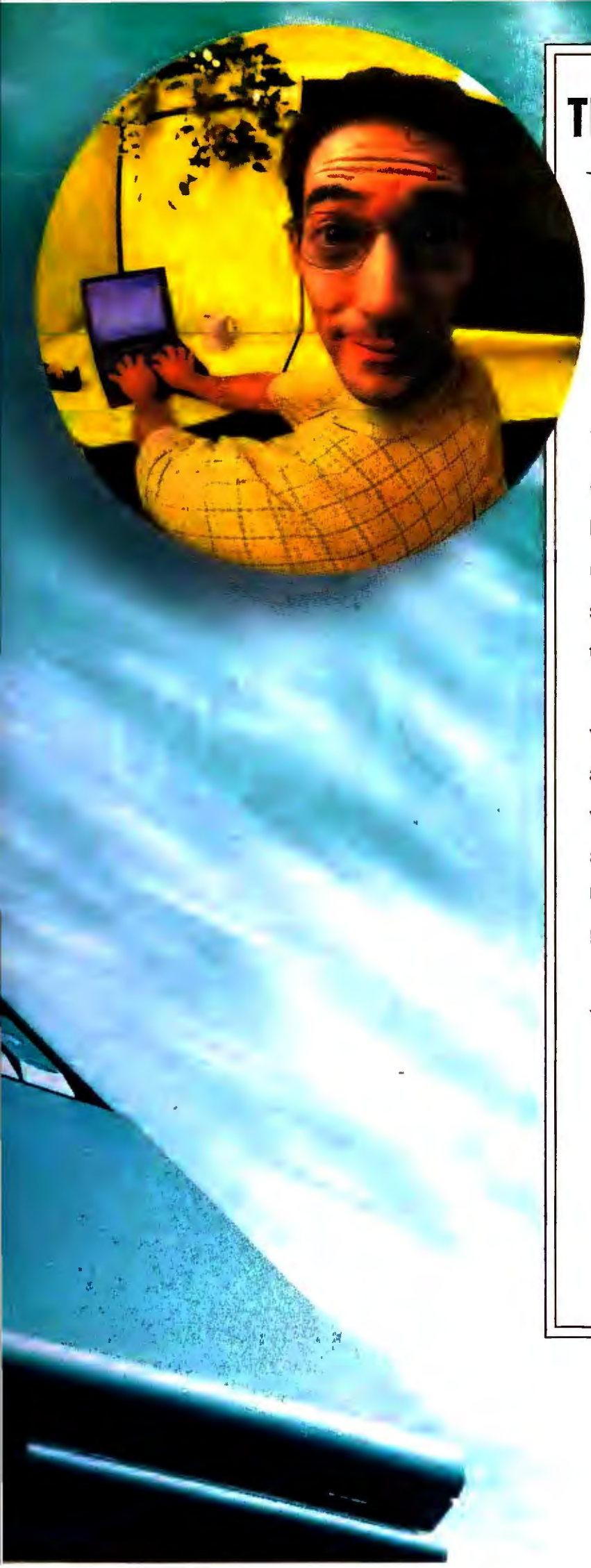

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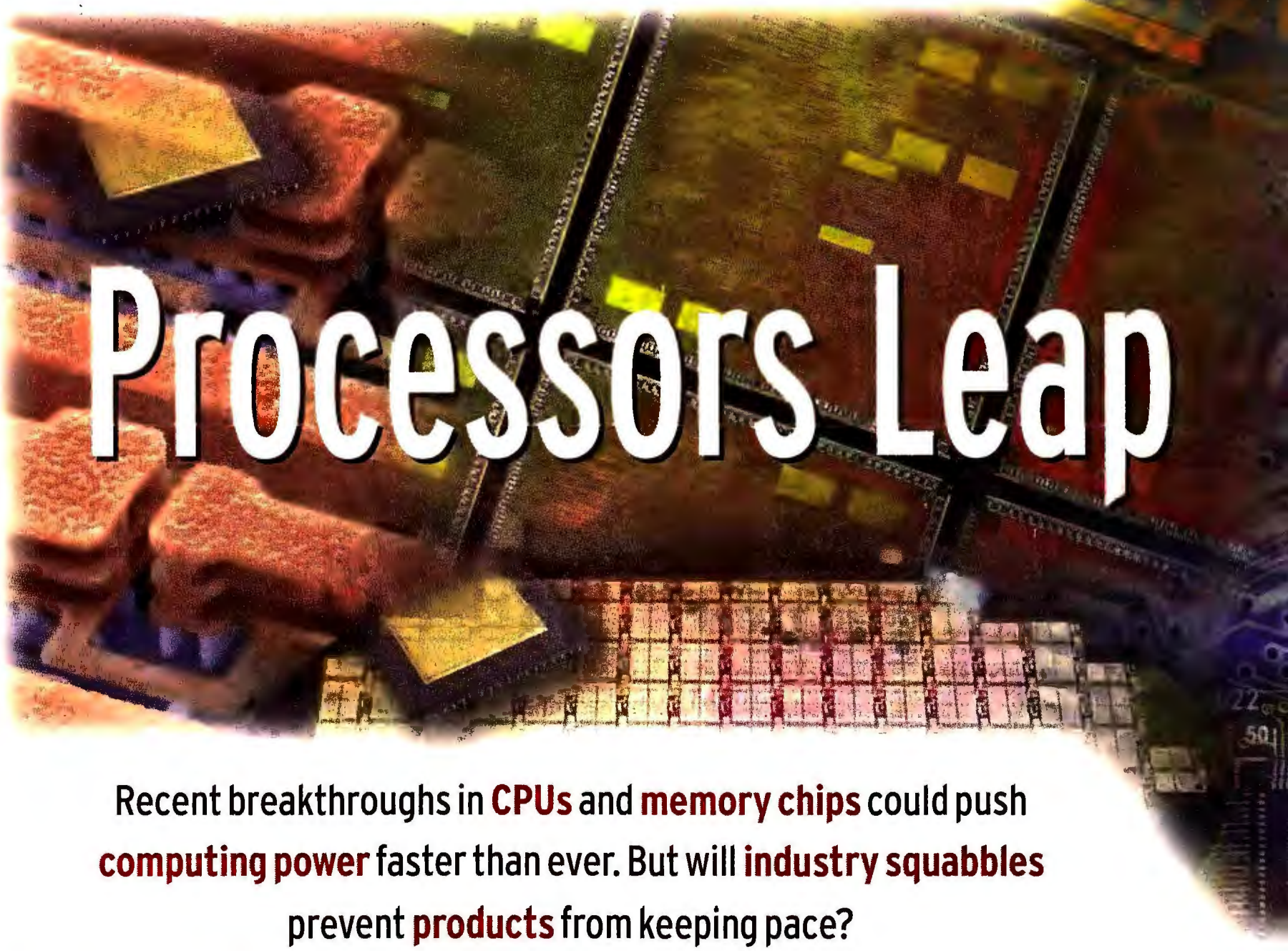

Processors Leap

Recent breakthroughs in CPUs and memory chips could push computing power faster than ever. But will industry squabbles prevent products from keeping pace?

ANALYSIS

LAWS AREN'T MEANT to be broken, but if two recent announcements by Intel and IBM deliver on their promises, one venerable computer-industry statute may at least be stretched. Moore's Law, named for Intel cofounder Gordon Moore, states that chips get twice as powerful every 18 to 24 months. The prediction, made in 1965, has proved remarkably accurate.

But a new type of memory from Intel and a new chip design process from IBM hint at an acceleration in this evolutionary timeline. Intel has introduced a new type of flash memory that stores twice the amount of data in the same space, and IBM has unveiled a method of using copper to shrink chip sizes while boosting performance. Competitors challenge the technologies' short-term impact. But at the least, they illustrate that "chip design and process technology are moving faster than any technologies in history," according to Nathan Brookwood, a semiconductor analyst with Dataquest in San Jose, California.

Meanwhile, the next few months will bring notebook computers controlled by new versions of Intel and Advanced Micro Devices processors. By the end of 1998, new chips will push PCs beyond 400 MHz and carry instructions that promise to speed the display of 3D graphics, much as MMX instructions speed multimedia performance (see also "The PC of Tomorrow" in this issue). And by late 1999, say vendors and analysts, mainstream desktop PCs will hit speeds near 600 MHz, while high-end servers and workstations will approach an astonishing 800 MHz (see "A Raft of New

Ahead

ILLUSTRATION: JEFF BERLIN; ICONS: JEFFREY PELO

CPUs Is Coming Your Way").

Are we entering the golden age of chip technology? Perhaps, but bear in mind that nearly all of the aforementioned advancements still live in research labs and press releases. Here's what to expect between now and the time they finally make the trek to your desktop.

EDITED BY

Charles Piller, Randy Ross, and Bill Snyder

DOUBLE-DIP MEMORY

MOST OF THE BUZZ in the chip world deals with processor design, but memory technologies are also evolving. In September Intel announced StrataFlash, a *multilevel-cell* flash memory—the specialized memory that retains its contents even when you turn off the device. Instead of assigning one of two possible voltage levels to a memory cell, StrataFlash assigns one of four. So instead of having two possible states—on and off—StrataFlash cells have four—two ons and two offs. Thus, each cell can store twice the data of a conventional flash chip (see "How StrataFlash Doubles Flash Memory...").

Multilevel flash memory will find obvious applications in digital cameras, handheld computers, cell phones, and digital answering machines and audio recorders. Digital cameras, for instance, could provide twice the image capacity or twice the image resolution. Windows CE palmtops could use full-featured programs. And answering machines and audio recorders could hold more messages and longer recordings. Devices that use StrataFlash may be announced soon, but don't expect them to appear until the second half of 1998.

StrataFlash isn't the only multilevel-cell flash technology. Rival SanDisk has been shipping its Double Density flash memory since November 1996. Never heard of it? SanDisk doesn't attract Intel-scale media attention. But SanDisk is also concentrating only on the mass storage portion of the flash memory market, particularly digital cameras. Intel is pushing StrataFlash at the mass storage market, plus the larger code storage market, where flash memory replaces RAM or ROM in devices ranging from palmtops to network routers to modems.

SanDisk points out that StrataFlash chips have a rated lifetime of 10,000 erasure cycles, as opposed to the 100,000-cycle life-

JUST IN

Win 98 Update: It's Late

MICROSOFT PLANNED to release beta version 3.0 of its forthcoming operating system upgrade to a limited group of testers in December 1997, which is when the finished code was supposed to have been sent to manufacturing. The company plans to release a wider public beta version to thousands of users in January 1998, with the final product not due out until summer. The back-to-back beta releases will contain minor fixes and only one new feature not in the current beta: the ability to upgrade a Windows 3.1 system.

New Minor Pentium Bug

INTEL CONFIRMED there is a bug in its Pentium and Pentium MMX processors that causes system freezes when the CPUs execute a certain line of program code. "This is not a string of code that you're going to find in commercially available software," says Intel spokesperson Manny Vara. After a freeze, you can reboot and go right back to work, he says. But you may lose unsaved changes. Mike Feibus, principal of Mercury Research, says he doesn't believe the bug is especially dangerous, although it does provide another opportunity for virus writers. Intel says that a fix for the bug can be implemented through the ▶

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A Raft of New CPUs Is Coming Your Way

COPPER IS THE WAVE of the future for CPUs and other microprocessors, but most of the upcoming processors that will emerge soon will be incremental improvements on today's designs. Here's a look at the probable advances by key manufacturers in 1998 and beyond.

1998

FIRST QUARTER

- AMD: 300-MHz K6, mobile K6
- Cyrix: MMX support for MediaGX, AGP support for 6x86MX
- Intel: PII-333 ("Deschutes")

SECOND QUARTER

- AMD: K6 3D with special 3D instruction set, AGP support
- Centaur: 266-MHz C6+ with special 3D instruction set
- Intel: mobile PII, 350-MHz PII, 100-MHz system bus
- Digital: 21264 Alpha (future Alphas depend on the plans of Intel, which will gain rights—pending federal approval—to produce the chip)

THIRD QUARTER

- AMD: 350-MHz K6+ 3D
- Centaur: 300-MHz C6+, 100-MHz bus
- Cyrix: MXi with integrated 3D graphics coprocessor
- IBM: up to 400-MHz copper chips
- Intel: 400-MHz PII, Slot 2 for servers/workstations

times of SanDisk's Double Density flash memory. (Most conventional flash chips are also rated at 100,000 erasure cycles.) Another competitor, AMD, suggests that StrataFlash may suffer reliability problems. Intel dismisses the reliability concerns and argues that even 10,000 erasure cycles is a long life—for example, roughly enough to take 240,000 exposures on a digital camera (10,000 rolls of film in the old-fashioned equivalent).

PEDAL TO NEW METAL

WITHIN DAYS OF Intel's StrataFlash announcement in September, IBM made its own challenge to Moore's Law, announcing a new manufacturing process using copper to yield smaller, faster, and less expensive CPUs and ASICs (application-specific integrated circuits, used in everything from graphics accelerators to automobile engines).

Copper promises to speed up processors by allowing smaller, more power-efficient circuitry (see "Why Copper Means Faster Processors..."). Smaller circuitry means a shorter commute for the electrons within a chip; that improves performance. Intel's now-elderly 386 processor used a 1.5-micron manufacturing process. (A micron is one-thousandth of a millimeter.) Current Pentiums use a .35-micron process, shrinking the electron commute by more than three-quarters.

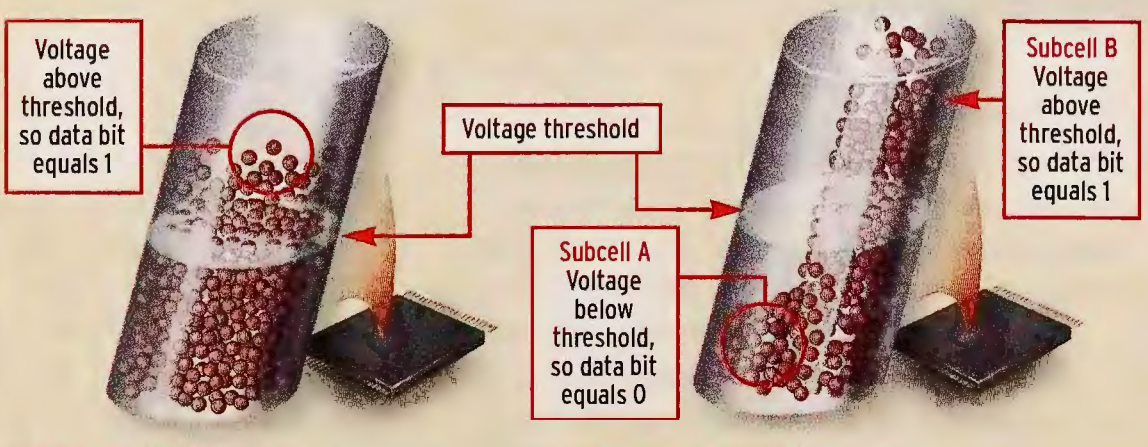
At a certain point, chip performance becomes hamstrung by the microscopic aluminum wiring that connects the chip's components. As circuit dimensions shrink below roughly .35 micron, aluminum's electrical resistance threatens to limit performance. A short commute isn't fast on slow roads.

Copper conducts current with less resistance. The first

INFOGRAPHIC: ARNE HURTY

How StrataFlash Doubles Flash Memory...

FLASH MEMORY IS WIDELY USED in digital cameras, phones, and voice recorders, as well as in handheld computers and other devices. Unlike other memory chips, flash retains its contents even when a device is turned off. Intel's new StrataFlash technology changes a fundamental characteristic of flash memory, yielding a chip with double the standard capacity.



Old Flash: One Bit of Data Conventional flash memory uses one of two voltage states to store information—it's limited to a single data bit per memory cell. Below a certain voltage threshold, the cell is read as a 0; above that level, it's read as a 1.

New Flash: Two Bits of Data StrataFlash regulates and senses cell voltages more precisely. This allows each cell to contain two bits of data: In effect, each of two virtual subcells can be read as either a 0 or a 1.

...to Enhance Portable Products

Handheld PCs should offer full-featured applications.

Cellular phones may acquire advanced Web, e-mail, and fax capabilities.

Digital cameras will store more images or higher-resolution images.

FOURTH QUARTER	1999	2000
■ Intel: 400-MHz–plus PII with special 3D instruction set	■ AMD: 500-MHz K7, Slot A (akin to Intel's Slot 1) ■ Cyrix: new, faster chip core ■ Intel: near-600-MHz successor to PII ("Willamette"), 800-MHz CPU ("Merced") for servers/workstations, copper chips	

Source: manufacturers, MicroDesign Resources

of this new breed will be copper versions of the PowerPC 750 now used in some of Apple's high-end Macintosh computers. By next summer IBM hopes to be shipping PowerPC chips that run at speeds up to 400 MHz and manufactured at .20 micron, 20 percent smaller than the upcoming generation of aluminum-based chips. Subsequent generations will be .18 micron or smaller. IBM also builds *x*86 chips, but don't expect to see copper versions of them until the first half of 1999, predicts Linley Gwennap, editor in chief of *Microprocessor Report*.

IBM's breakthrough sounds simple, but it involves more than just substituting copper for aluminum. Copper contaminates silicon, causing a chip's transistors to fail. IBM won't say precisely how it insulates the copper. But copper's role as an essential ingredient in tomorrow's chips is no secret. Last August, Sematech, an industry research consortium whose members include all major chip manufacturers (including IBM), announced the successful manufacture of copper chips. And eight days after IBM's announcement, Motorola said it plans to build .20-micron copper processors by September 1998. By 2003, most mainstream chips are likely to be based on copper.

Still, aluminum has plenty of life left in it, according to Intel and other *x*86 competitors. "We will go to copper, but at a more leisurely pace than IBM," says Intel spokesperson Howard High.

Intel is currently developing aluminum-based .18-micron circuitry. Expect it to appear in 1999. To shrink the circuitry without falling victim to aluminum's inferior conductivity, Intel will narrow the wiring within the chip but retain its height, says High. Think of the company's approach as akin to adding a second deck to a narrow bridge. Intel figures that aluminum will be cost-effective until circuits shrink to about .13 micron, and then it will be time to switch over.

> "Chip design and process technology are moving faster than any technologies in history."
> –Nathan Brookwood, Dataquest

3D CONFUSION

WHILE COPPER MAKES its claim on the future, processor manufacturers battle in the present. You'll see more new chips and enhancements to the *x*86 architecture in the next 24 months than at any time in recent history. Accelerated Graphics Port, once exclusive to PCs with Intel's Pentium II CPU and 440LX chip set, will be nearly universal.

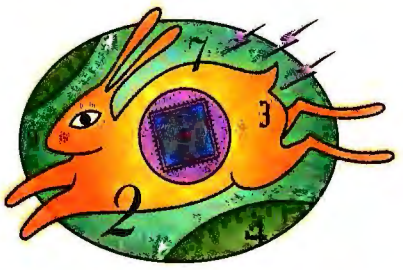
Intel, Cyrix, AMD, and Centaur are also working on new 3D operating instructions. When running software optimized for them, the instructions should boost floating-point and 3D performance. But this time Intel may not be out in front. AMD's K6 3D, due in systems by mid-1998, will run at 300 and 350 MHz, support enhanced MMX as well as new 3D instructions, and run on a 100-MHz system bus.

AMD-based systems have competed well against Intel-based PCs on business applications (see *Top of the News*, November 1997), but tend to lag when put to the MMX test. With the new instruction sets "we're not going to match Intel performance; we're going to exceed it," vows Lance Smith, AMD's technical marketing director.

Cyrix's MXi, slated to come out in late 1998, will compete with PIIs up to 400 MHz, contain Cyrix's 3D and floating-point instructions, and support AGP. Cyrix also plans to beef up MMX performance in its next generation of chips and add MMX to its entry-level MediaGX processors.

What about Intel? Here ▶

operating system, and that it is working with OS vendors to develop effective work-arounds.



Line Bonding Products to Speed Up Modems

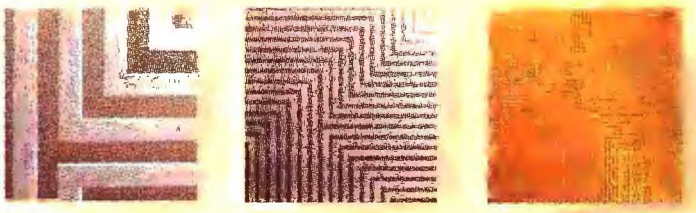
SEVERAL VENDORS now offer products that bond two phone lines into a single data pipe. XLR8 announced a **$50 Web OverDrive program that lets Windows 95 users nearly double the speed of Web page downloads,** the vendor claims. Unlike the bonding technology built into Windows 95's Dial-Up Networking, Web OverDrive doesn't require Internet service providers to reconfigure their connections. In related news, Diamond Multimedia unveiled its own bonding software, Shotgun, which will ship with Diamond's Supra Express 56-kilobits-per-second modems in the first quarter of 1998. Diamond has also developed a hardware technology that works with Shotgun to monitor a second line and disconnect it for incoming and outgoing voice calls while maintaining the connection on the first line. The technology will be built into forthcoming Diamond modems.

Tidbytes

$999 IBM Aptiva: IBM's new low-price multimedia desktop PC sports an AMD K6-166 MMX processor, 16MB of SDRAM, a 256K secondary cache, an 8.6X-20X CD-ROM drive, and a 56-kbps modem; a monitor costs extra. **Apple Polishes Plans:** Apple will sell built-to-order Macintoshes directly to customers through the Internet.

Why Copper Means Faster Processors...

IBM IS JUMPING FIRST, but eventually all major processor makers will replace aluminum chip circuitry with copper, which offers the prospect of faster chips thanks to smaller circuit pathways.



386: 1.5 micron | Pentium II: .35 micron | IBM copper: .18 micron

Copper Replaces Aluminum

Copper can mean faster, smaller chips because it offers less electrical resistance than aluminum. But it also contaminates the silicon base.

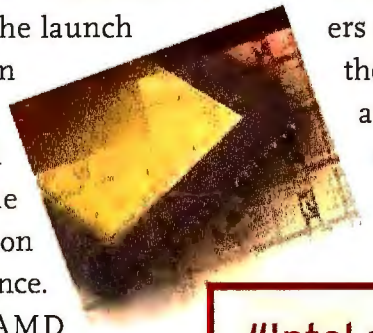
Sealing Off the Circuits

IBM solved the contamination problem by insulating (1) the copper circuit (2) from the silicon (3), then sealing (4) the copper.

...and Shrinking Pathways

AS CPUs SHRINK, they draw less power, are cheaper to make, and operate faster. Copper chips should allow pathways of .20 micron in 1998, and below .13 micron —considered aluminum's limit—eventually.

is where this sweep of innovation begins to show its dark side—creating confusing dilemmas for buyers. Intel's new 3D and floating-point instructions won't appear until late 1998 or early 1999, say industry sources. When Intel was readying the launch of its Pentium MMX processor, it disclosed details of the MMX instruction set well in advance. That meant AMD and Cyrix could ship compatible versions just a few months later. So far, Intel is keeping mum—and may not play ball with its smaller rivals.



AMD, Cyrix, and Centaur planned to go it alone. In that scenario, they could get to market first. But would software developers write code that takes advantage of instructions present on only a small percentage of the systems on the market? Supporting multiple sets of instructions isn't too technically difficult, but may be economically unfeasible. If developers follow the pattern set by MMX, software optimized for one set of instructions will run on other computers, but not as well. At worst, those apps could take a performance hit with the wrong chip.

Alternately, developers could ignore all of the instruction sets, and instead write software to talk to DirectX, Microsoft's multimedia operating system routines. That isn't ideal—going through the OS yields slower performance than writing directly to hardware. And it isn't clear whether CPU vendors have moved quickly enough to meet the deadline for inclusion in DirectX 6.0, due this spring. But so far Microsoft has not involved itself beyond pointing out that separate 3D instructions for each vendor would be "lunacy," says Carl Stork, Microsoft's general manager for Windows hardware strategy.

> "Intel seems willing to let the architecture fragment to weaken its competitors."
> —Michael Slater, *Microprocessor Report*

At least one vendor might be pleased with a fractured approach to 3D. "Intel seems willing to let the architecture fragment to weaken its competitors," says Michael Slater, editorial director of *Microprocessor Report*. If that happens, don't count on seeing a lot of enhanced 3D software anytime soon. Developers, including Microsoft, may simply avoid the hassle. "It would be very unlikely for us to support what are essentially little fragments of the industry," Stork says.

So, what's the likely outcome? At press time *PC World* learned from Jamal Haider, Centaur's marketing director, that "a unified 3D instruction set is imminent." He said that AMD, Cyrix, and Centaur have been working on a common approach, and that Centaur and AMD are close to cross-licensing their 3D instructions. Another knowledgeable industry source confirmed Haider's assertions.

Still, such scrambling shows it's prudent to take manufacturers' promises with a grain of silicon and base buying decisions on what's available today. You don't need Moore's Law to tell you that the future will bring faster, cheaper processors. But remember that it's up to software and hardware manufacturers to exploit the capabilities of these chips.

In the end you must decide whether you really need the chips' enhanced spunk. For graphics professionals and avid gamers, dramatic speed boosts make life worth living. But for mainstream business users, the sizzle of 400 MHz won't always improve on the 233-MHz experience. Good decisions about what kind of power you need don't require a law—just common sense.

—Jim Heid and Bill Snyder

INFOGRAPHIC: ARNE HURTY

Netscape Ups Ante on Managing Files From Your Browser

FIRST LOOK

NETSCAPE HAS PREVIEWED a new technology, code-named Aurora, that lets you view and organize a wide variety of data, including local files, e-mail, and Web information, with a single browser-like tool. If you think this sounds similar to the main new ingredient in Microsoft's Internet Explorer 4.0, you're right. But Aurora will manage more types of data and run on more types of computers and operating systems than IE 4.0. It appears it won't be free like IE 4.0, because Aurora is scheduled to debut in future versions of Netscape's Communicator suite, which currently carries a list price of $59.

In a demonstration of an early version, Aurora displayed a hierarchical list of items, almost like a menu, down the right side of a Windows 95 desktop. From within Aurora's interface you can tap into data stored on your hard disk or the Web and access messages from Communicator's LAN-based applications, such as e-mails and notes from discussion forums. But to view messages with IE 4.0, you must first open its mail client, Outlook Express.

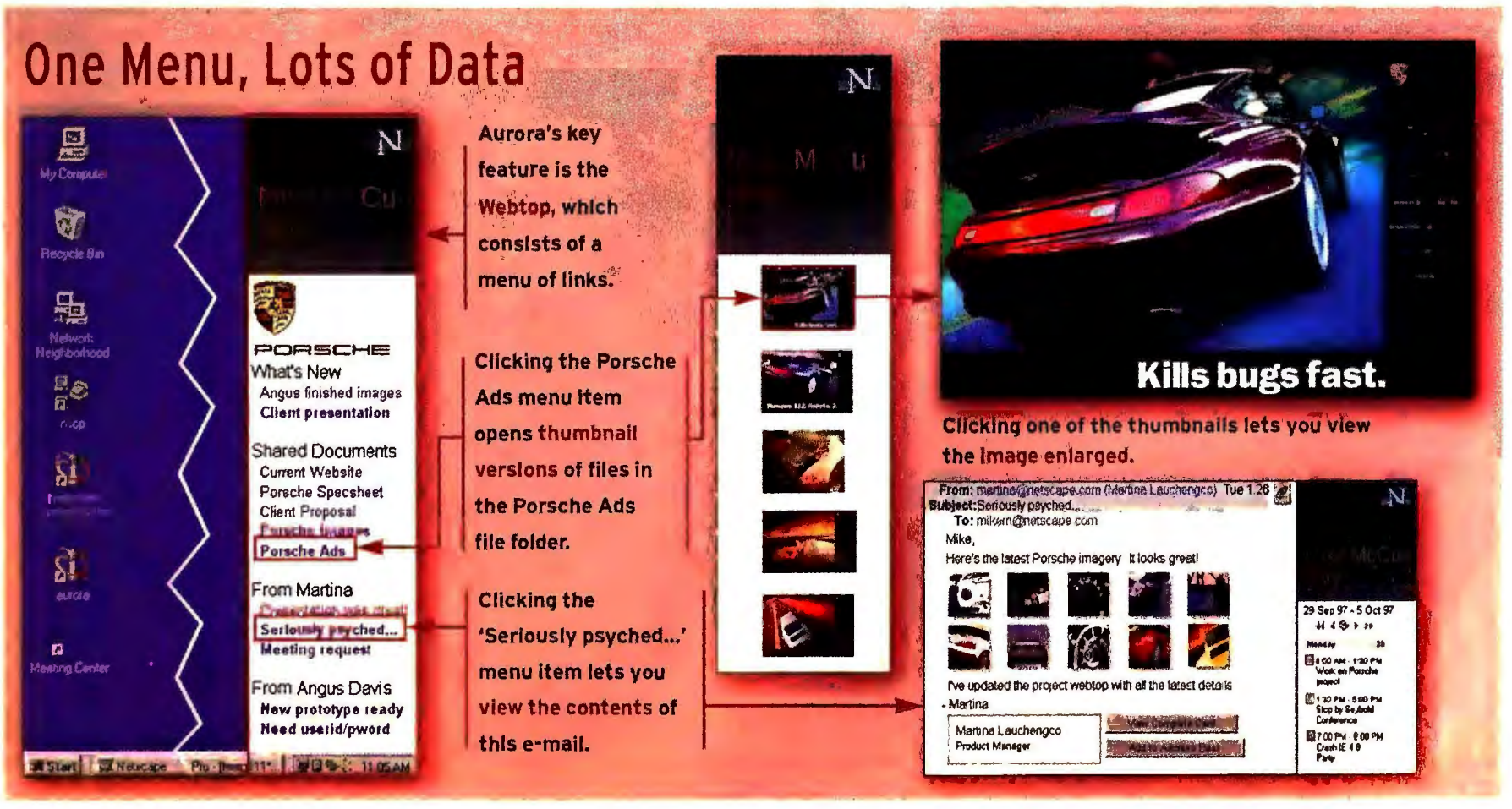
> From **within** Aurora's interface you can tap into data on your **hard disk,** the **Web,** or LAN-based applications.

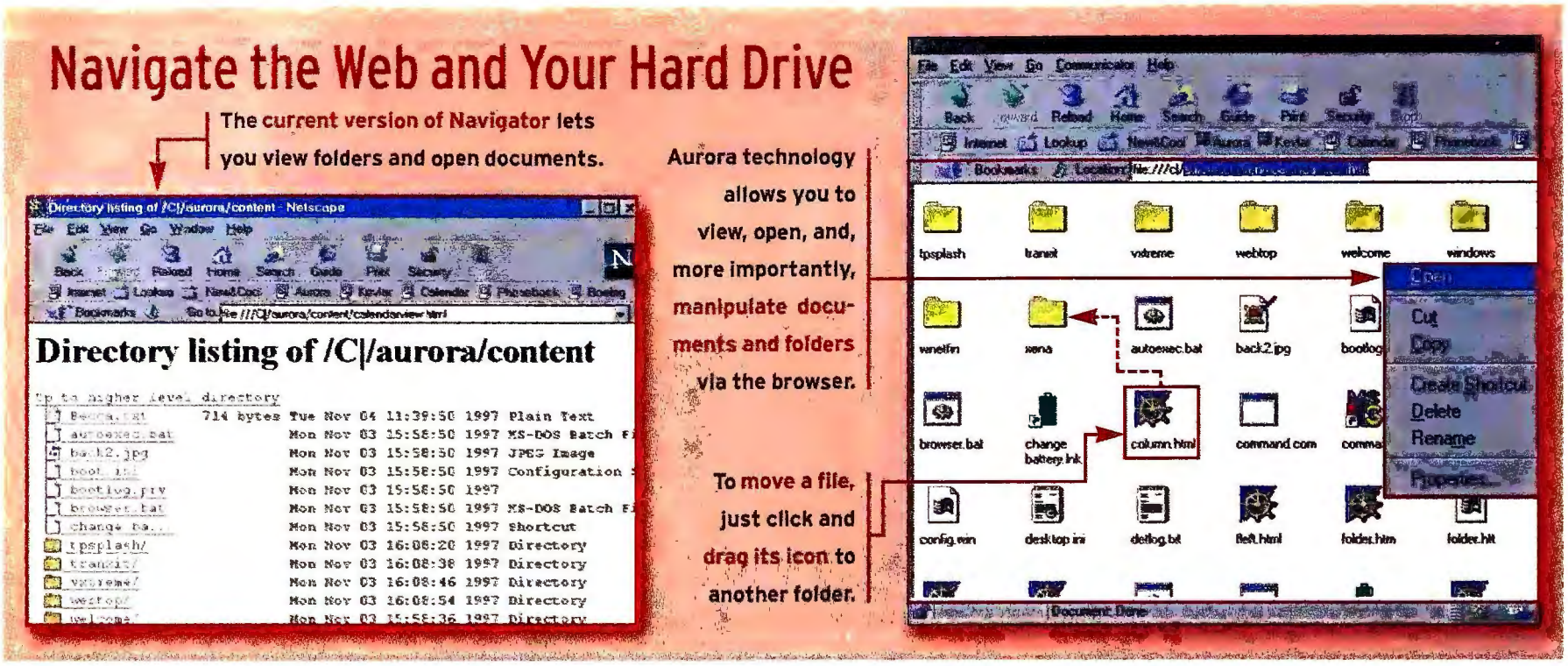
Once you locate the files you want, you can view or organize them in a variety of ways, say by topic or date, from the desktop. As with IE 4.0, if you drill down to a folder containing graphics, Aurora can be customized to display them as thumbnails. To view the full version of a file—whether it contains graphics, spreadsheets, or other types of data—click the file icon or thumbnail once, and a viewer displays the file. To edit, click anywhere on the file being viewed, and a toolbar appears for an associated application.

MULTI-OS OPTIONS

NETSCAPE CLAIMS Aurora will offer other capabilities not currently found in IE 4.0. The technology will be available in versions for a wide variety of platforms, including Windows 3.1, 95, 98, NT 3.5, NT 4.0, and NT 5.0; Mac OS versions 7.1 and higher; and even UNIX systems. Netscape says that as in the demonstration using Windows 95, Aurora will likely appear as a menu on the desktop or equivalent on the other operating systems it runs on. This versatility makes Aurora particularly nice for large companies that want to save on training and support costs by providing users with a single browser and file management tool. Also, the customizable interface will allow IS staff to create a standard interface. At press time IE 4.0 was expected to be available only for Windows 95, 98, NT 4.0, and NT 5.0.

Aurora may also include some smaller niceties, such as improved file transfer support—of interest to anyone who manages a Web site. Netscape demonstrated Aurora's ability to upload files to an FTP server and to drag and drop them into directories. IE 4.0 can't perform either of those functions. ▶





PREVIEW REVIEW

WHAT WE SAW was clearly an early version of a new technology, so drawing firm conclusions and comparing Aurora to existing products can be a perilous exercise. Moreover, Netscape cautioned that the features and interface may change by ship time. At press time Netscape could not provide a ship date for Aurora.

Regardless of how slick the technology is when finished, anyone considering a new tool for managing data must face a key issue: Are the advantages sufficiently compelling to woo you away from your current file management tool? If you already spend most of your time within Communicator, the answer is probably yes. If you don't, then this tool may not mean much to you even though it will likely include capabilities not found in Windows 95's Explorer and Microsoft Internet Explorer 4.0.

Will the product be stable, or will it crash regularly as browsers are wont to do? Will it affect system performance? Aurora is essentially a shell that resides on top of the operating system. Adding this extra overhead to a Windows 3.1 system could impede the performance of an older, underpowered computer that can just manage this operating system. Netscape says that the technology is "lightweight" and won't affect performance. At press time we were unable to test Aurora for performance or stability, and Netscape executives could not provide system requirements.

Still, if the shipping product includes the core features we saw, at the very least Aurora will provide users of today's Communicator with an enticing upgrade.

—Paul Heltzel ▶

Aurora Will Add Superior Search Features

NETSCAPE'S AURORA technology will support a proposed data specification called Resource Description Framework that promises to help you more easily find and manage data, whether it resides on your desktop, on the company LAN, or on the Web.

New Data Descriptor

TODAY'S SEARCH tools can sift through documents and locate files with specific words, but can't make sense of what they find. RDF provides a way to describe the data inside documents, say a Web page or a file on your hard drive. This capability should yield more relevant search results.

Say you want to track a competitor by collecting pricing information from Web sites that sell its products. Right now your search engine can't distinguish pricing data from other information. But if the prices on the page were tagged as prices, a browser could identify them and retrieve just the cost information you want. RDF will also provide interoperability between file formats, so you can search for information stored in a variety of locations.

When finished, Aurora may display search results as menu items on your desktop, or be set up to constantly scan Web sites, e-mail, or network databases for items that meet your search criteria.

Tool to Rate Web Sites

RDF COULD also be used to rate content on the Web. Currently, if you want to keep your kids from sites you feel are inappropriate, you can use a filtering program to look for keywords. But such programs typically make many mistakes. RDF could allow multiple rating systems. You might choose one that would let your browser open *Catcher in the Rye* but not *Penthouse*. Of course, you'd still have to decide what would happen if a site was not RDF compliant. You might configure your browser to lock out unrated sites.

Unfortunately, RDF isn't standardized. The World Wide Web Consortium, a standards-setting body, should issue a recommendation by early next year. Even when RDF is standardized, Web pages and other types of files you may want to search will have to be modified to take advantage of its capabilities. Netscape and Microsoft say modification tools will be available soon. But no matter how easy and efficient the tools, it will take time and money to move us into an RDF-friendly world.

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Digital Cash Gets Real: Good-Bye to Free Web Content?

ANALYSIS

PICTURE THIS: You're putting the final touches on a sales presentation and need the perfect graphic to illustrate a key point. You check your stock of clip art images but nothing grabs you, so you log on to the Web and peruse an image database available from your favorite online cataloger of digital art. You find just what you want, but when you attempt to download the file, you discover that the once free images now come at a price: $2 in digital cash, to be exact.

This scenario could one day become a reality. No fewer than five companies are marketing or plan to market forms of digital cash—electronic equivalents of the coins and bills we carry around every day. Digital Equipment Corporation, which launched an aggressive commercial pilot program in December, is the newest entrant in the digital cash sweepstakes. Microsoft and Netscape are also weighing in; both Internet heavyweights now support digital cash payments in their latest browser releases.

The technology behind the various digital cash options varies from use of scrip to smart cards to electronic cash that's stored in a "wallet" on your system's hard drive. These options are all based on the same economic proposition: Credit cards are fine for a lot of Web transactions, but for purchases that are less than $10 they are too costly for vendors to process. As proponents of the technology see it, consumers will use digital cash to pay for everything from up-to-the-minute news to the chance to download and listen to a song by a favorite artist.

WHAT'S IN IT FOR CONSUMERS?

THE ADVANTAGE OF digital cash for businesses is fairly straightforward: It's an economical way for online merchants to charge for low-cost items, such as a single news article or a one-time visit to a premium Web site. The benefits to consumers are far less clear, however, particularly in light of the high-quality news and information that is already available online free of charge. Moreover, the list of merchants accepting DigiCash's Ecash or CyberCash's CyberCoin (the two currencies currently available) is unimpressive. Although digital cash proponents hint of more big-name merchants and information providers participating in the future, getting consumers to pay will still be tricky.

Users may not like paying for content at first, but in the long run they may not have a choice, according to Stanley Hayami, a business development manager at Digital. The company is planning to roll out MilliCent, a payment option based on the use of scrip (electronic coupons of specified value), by the time this story appears.

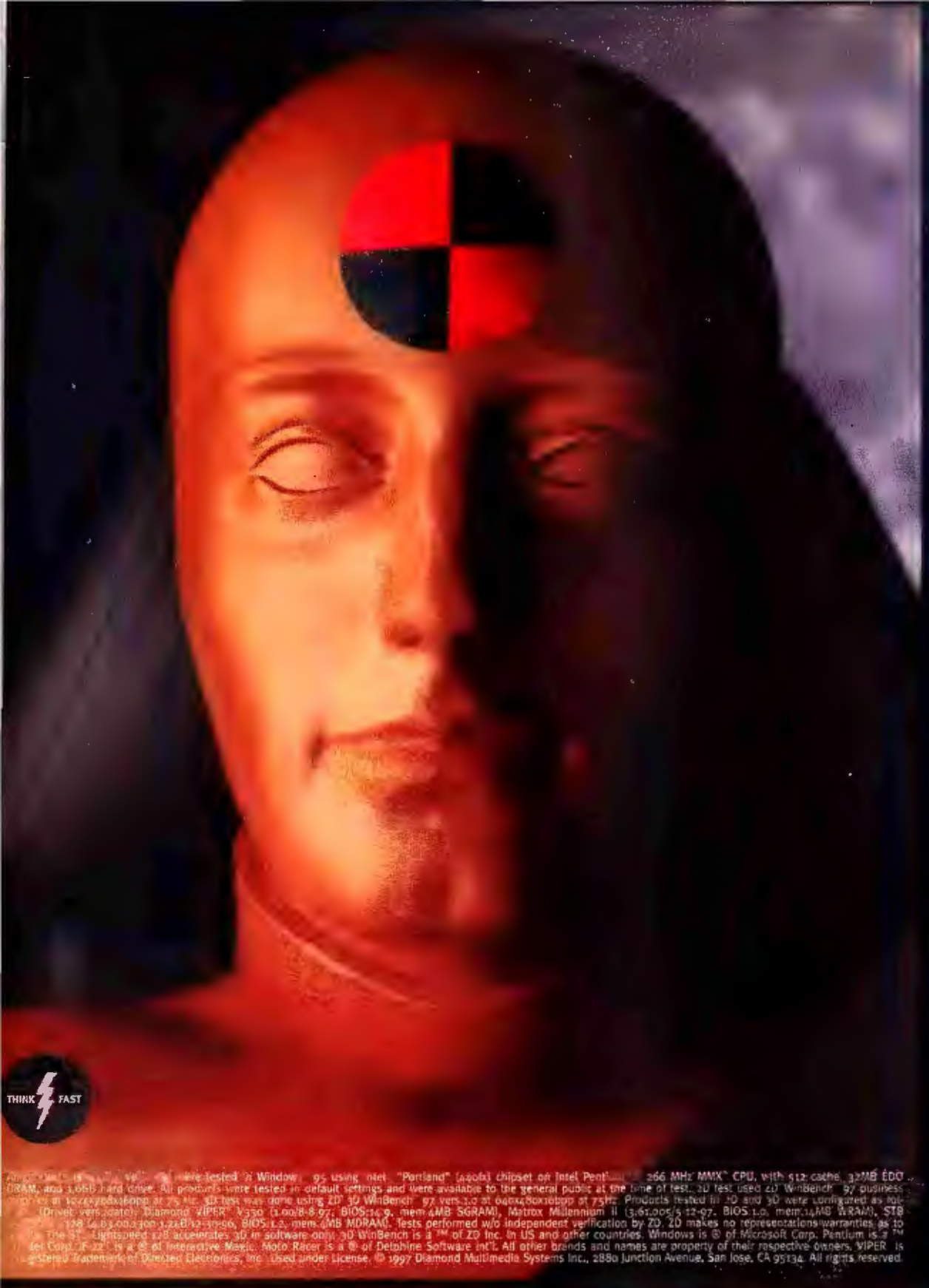
"The Internet is stagnating," says Hayami. He says that companies aren't experimenting with new ways to introduce content because they won't get paid for the information. Some of these early entrants, he adds, are also questioning the high cost of maintaining a Web site. But, says Hayami, if you give businesses a mechanism for charging for their online material, then innovative content will follow.

Digital has signed up 68 merchants for its launch of MilliCent and is negotiating with major financial institutions to serve as brokers for the scrip. In an aggressive attempt to gain market share, the company will make the MilliCent wallet and scrip available free to consumers for three to four months after the launch. Thereafter, Digital will provide free scrip for use ▶

ILLUSTRATION: POLLY BECKER

CYBER BUYING SCHEMES PROLIFERATE

CURRENCIES	Technology	Status	Comments
CyberCash CyberCoin www.cybercash.com	digital cash	available now	Easy to set up, works with Netscape Communicator 4.0 and Internet Explorer 4.0.
DigiCash Ecash www.digicash.com	digital cash	available now	Cumbersome to establish account, supports payments to and from individuals.
Digital MilliCent www.millicent.digital.com	digital cash	commercial pilot	Digital wallet and scrip (electronic coupons of specified value) available free during pilot.
Mondex International Mondex www.mondex.com	smart card	commercial pilot	Backed by MasterCard, can be used in retail establishments. Pilot with AT&T under way.
Visa International Visa Cash www.visa.com/cgi-bin/vee/pd/cash/main.html	smart card	pilot for Visa and Bank of America employees only	Can be used in retail establishments, employees testing with six online merchants.



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Digital Dollars—The Shopping Experience

FOR ALL THE fanfare surrounding digital cash, the selection of merchants and merchandise is underwhelming. I took a look at some Web sites accepting the two commercially available forms of digital cash: CyberCash's CyberCoin and DigiCash's Ecash.

EASY MONEY

CYBERCOIN was easier to use. It took me only a few minutes to load the CyberCash wallet plug-in for Netscape Communicator 4.0 and fill it with CyberCoin cash. (CyberCash also works with the new Microsoft Wallet in Internet Explorer 4.0.) I just entered identifying information, such as name, address, and so on. I purchased CyberCoin currency with a credit card and was ready to shop.

What could I buy? Not a whole lot. The list of participating merchants was a hodgepodge of providers of various Internet services and sports or gaming sites. Business-related offerings were few: There was a job description creation site, multimedia art to go, and a site for obtaining patent information. I purchased an article on how to avoid carpal tunnel syndrome (for $2) and a week's worth of dinner menus, complete with recipes and shopping lists (for $1), but I found little else of interest.

CYBERCASH'S WALLET software, required for Web purchases with CyberCoin, has an easy interface that made for smooth transactions.

HARD CURRENCY

ACTIVATING AN Ecash account is a multistep process that can take several days to complete. First you have to fill out an online application, print out a receipt, sign it, and either fax it or mail it to a participating bank. Then bank personnel have to mail or fax you a password and URL for downloading the software. Moreover, you must mail or wire funds to the bank. I didn't want to waste time, so I wired the money. The electronic transfer cost me $32.

The version of the Ecash software I tested was confusing to install—there's no help function or on-screen messages to guide you through the process. The software is being revamped and a new version should be available by the time you read this.

As with CyberCoin, the selection of Ecash merchants of interest to businesspeople is limited. Besides the Internet service sites, there was a consulting site with information on a wide range of business and legal questions. For nonbusiness purchases, Ecash had one bright spot: CDNow, an online retailer of music CDs.

Both CyberCoin and Ecash employ multiple steps to verify the authenticity of the purchaser, so chances of your digital wallet being picked are pretty slim. And because the software notifies purchasers that the transaction has been completed, there's no worrying that your money has been lost in the ether.

on any new "MilliCent-enabled" Web site to encourage consumers to begin sampling the offerings. The idea, Hayami explains, is to get as many wallets on consumer computers as possible, and then allow people to try out all of the new content free of charge. Once these consumers become hooked on the content, they will be willing to spend real money when the trial ends. That's the theory, at least.

But MilliCent isn't without competitors. Besides CyberCoin and Ecash, both Visa and Mondex International (backed by MasterCard) are experimenting with smart cards for online payments that use smart-card readers.

These devices pop into a computer's floppy drive just like a standard floppy disk, and the smart card would, in turn, be inserted into these readers. Although smart-card technology has been slow to take off in the physical world, some analysts continue to contend that it may be the ultimate winner in the race to devise an online payment mechanism for low-cost goods and services.

Digital cash does not offer obvious benefits to consumers.

GIVE AND TAKE

DISCUSSIONS OF digital cash typically revolve around consumer payments for goods and services, but proponents of the various options also envision other uses for their currency. Digital believes that merchants will pay consumers in MilliCent for viewing new portions of their Web site or for filling out online marketing surveys. And a company called CyberGold (not affiliated with CyberCash), working with online merchants, pays consumers for visiting its Web site and making online purchases. Among the payment options: CyberCoin, the digital cash option that was developed by CyberCash.

So will you be paying for Web information that was previously free? Eventually, maybe, but not in the next couple of years. In the coming months, some sites will experiment with digital cash. Some will give it away. Others will offer it to visitors who view advertisements. But until technical kinks are ironed out and the benefit to consumers becomes obvious, digital cash will not be widely deployed. "ATM cards were around for roughly 25 years before their use became commonplace," notes David Weisman, an analyst at Forrester Research. "It takes a long time for consumers to accept a new form of payment."

—Roberta Furger ▶

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Suite Import Tries to Muscle In on Big Boys' Office Turf

DOES THIS country need another business-application software suite? Germany's Star Division hopes so. The company intends to roll out its latest StarOffice suite by late 1997, according to Marco Börries, Star Division president. Long popular in Europe, StarOffice will be taking on the entrenched giants of the suite world: Microsoft's Office 97, Lotus's SmartSuite 97, and Corel's WordPerfect Suite 8. (The StarOffice suite nearly arrived three years ago; IBM seriously considered marketing it here before it acquired SmartSuite along with the rest of Lotus in 1995.)

While the big suites have grown bloated, StarOffice 4.0 takes a different, leaner approach, somewhat akin to that of integrated "works" packages like Microsoft Works and ClarisWorks. A single Windows 95/NT application, it includes a word processor, spreadsheet, presentation designer, and database, plus a Web browser and e-mail.

A standard installation of StarOffice 4.0 takes up 91MB of hard disk space—relatively trim compared to the almost 200MB of space required for a typical installation of Microsoft Office 97 Standard Edition, for example.

I reviewed a prerelease version of StarOffice on a Pentium-133 with 32MB of RAM, a system that regularly chokes when running the most recent suites from the big three. With StarOffice I was able to work in several documents, browse the Web, and use e-mail, without ever slowing down.

I'd spent some time with it.

Intriguing interface aside, StarOffice must still be judged on its core components. The results are mixed. The word processor compares well to the competition, offering a spelling checker and thesaurus; index and footnote tools; plus support for multiple columns, tables, and Web page creation. Although the spreadsheet doesn't provide all the what-if analysis tools that its competitors offer, it fills cells intelligently, works with multiple sheets in one workbook, and even provides advanced tools like conditional formatting. Likewise, the presentation module is perfectly fine for making transparencies, paper presentations, and basic multimedia shows.

The least-developed module is the database—it's no match for Paradox, Access, or Approach, which all offer better help and guidance in building databases. Also in the minus column, StarOffice has none of the scheduling features found in the big-name suites.

Integration between the modules could also stand some fine-tuning. For example, you can't just merge a spreadsheet into a word processing document by dragging it onto the Desktop window from the Beamer. Instead, you have to use StarOffice's Insert OLE Object command.

StarOffice doesn't match the big suites feature for feature, but it's got the basics covered, and its built-in Web and e-mail access are nice extras. There's no reason to opt for it if you're happy using another package, but for small or home office use, it's worth considering.

—Peter Scisco

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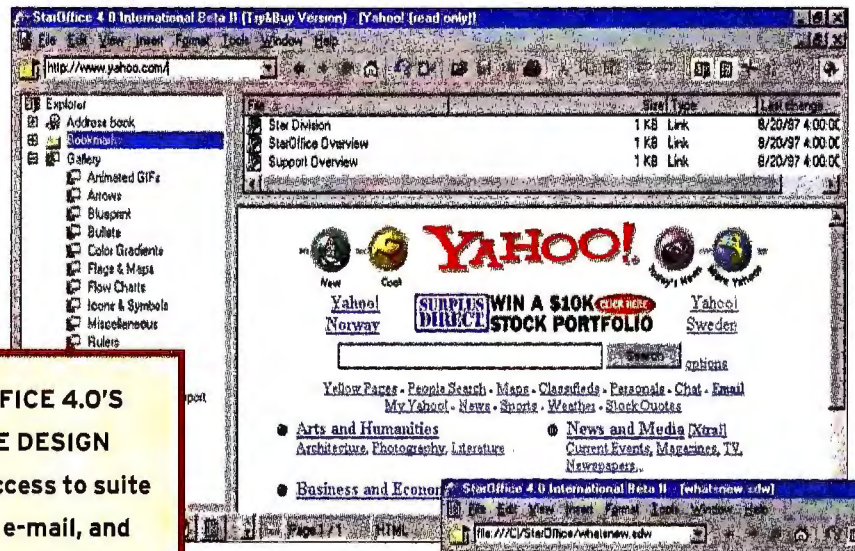


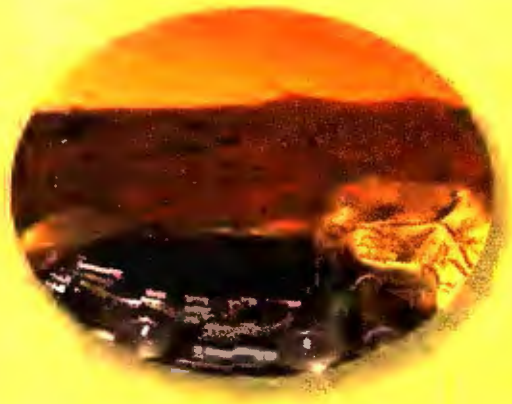
STAROFFICE 4.0'S UNIQUE DESIGN provides access to suite modules, e-mail, and even Web sites using a browserlike interface.

THE SUITE'S WORD PROCESSOR boasts a full complement of tools, including styles, multiple columns, and graphics.

LIKE IE 4.0

THE STAROFFICE DESKTOP allows you to open a few word processing files or spreadsheets, jump to a Web page or folder on your hard disk, and then move back and forth using arrow buttons. I found this interface very handy once I'd spent some time with it.

the moon, late 1960's



mars, late 1990's

corolla, 1998

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Year 2000: Impending PC Disaster? Not If You Plan Ahead

ANALYSIS

TWO YEARS: the span of a junior college education. The wait between *Batman* movies. Half of Jimmy Carter's presidency. And it's the time you have left to prepare for the year 2000 problem. And no, it isn't just something that mainframe programmers have to worry about.

This problem, also called the millennium bug, is the result of some astonishing shortsightedness. To conserve storage space—once far more precious than it is today—many PCs, mainframes, and applications use only two digits to store years. When you type '01/16/98', a computer knows that you mean January 16, 1998. This works fine until the dawn of a new century. Then if you enter '01/16/00', the computer gets confused: Is the year 1900 or 2000?

In the world of big organizations, giant computers, and ancient software, this confusion spells trouble. One example: Computerized electric power plants are programmed to shut down machinery that has gone too long without routine maintenance. So if the last tune-up was done in 1999, and come the year 2000 the plant's computer system decides that it's really 1900, it may cut off the power.

There's a common belief that this isn't really a problem for modern PCs—that today's off-the-shelf software for personal computers is ready for the new millennium. If you're using the current version of a program, or even one that's a couple of years old, that's almost certainly true. But the real issue is how you are using that software, and how the people around you use it. Why? Because a program that can subtract 1998 from 2004 still needs to know that the '98' and '04' you typed in or imported from an older program are in fact years in different centuries.

SOFTWARE TARGETS

Which applications should you worry about? Spreadsheets, databases, and accounting programs are the main candidates for problems. But other types of software can cause trouble if they don't understand centuries. Intuit's Quicken 3.0 for DOS personal finance package, for instance, allows you to enter only two-digit years: Type '01', and your entries will be dated 1901. Type '00', and you'll get an error message.

The good news is that virtually all current versions of applications can recognize dates in the 21st century. Every version of Lotus 1-2-3 and Microsoft Excel ever released knows that 2001 comes three years after 1998. And the Windows version of Quicken can handle dates properly. The few notable exceptions, such as Novell NetWare 3.12, are in the process of being fixed.

Of course, even up-to-date software needs the right information. Consider how you enter years into a spreadsheet. Many people simply type in two-digit numbers without formatting the informa- ▶

Prepare for the Millennium

SEVERAL FREEWARE programs can tell if your system can handle the transition to the year 2000. You'll find a selection at www.fileworld.com. Even if your PC fails the tests, there's a good chance that setting the date manually the first time you boot up in 2000 will solve the problem. If you can't stand the suspense, contact your PC vendor for a BIOS upgrade now.

APPS ARE TRICKIER

PREPARING YOUR software will be more of a challenge.

1 SET YOUR APPLICATIONS to display and output four-digit years. You can change many apps with one setting in Windows 95: From the Start menu, select *Settings•Control Panel*. Double-click the *Regional Settings* icon, then click the *Date* tab. From the drop-down list box next to the 'Short date style' field, select *M/d/yyyy*. Then click *OK*.

2 DETERMINE the pivot years for your critical databases, spreadsheets, and custom applications. Enter several dates that have two-digit years—for example, **01/01/00**, **01/01/30**, and **01/01/50**. If your program displays four-digit years (see step 1), you'll instantly see which century it put your entries into. Find the lowest two-digit year entry that the app prefixes with '19'. That's the pivot year. Remember it when you enter dates.

3 DETERMINE how you share data between apps and with coworkers. Are you sharing a worksheet with someone? Make sure they are also following steps 1 and 2. If you're working with a network database, find out what format it uses to pass data to your local applications.

ILLUSTRATION: PAMELA HOBBS

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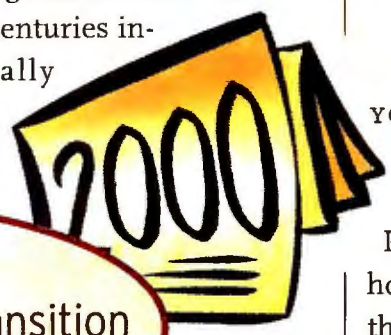
tion as a date. As a result, the spreadsheet would treat a '00' entered in a Year column not as the year that comes after 1999, but as the number that comes before '01'. A late payment that was due in 1999 but received in 2000 would go on the records as having been paid 99 years early. To correct this problem in an existing spreadsheet, you may have to modify the numbers or formatting manually.

If you enter '01/16/98', your Windows spreadsheet program will recognize it as a date, and will automatically convert the two-digit year into four digits. Spreadsheets and other programs guess centuries by something called the *pivot year*. If a program's pivot is 50, it will assume that a year entered as '49' or below is in the 21st century, while '50' and above is in the 20th. But pivot years vary from program to program, and even between versions. Excel 7.0's pivot year is 20, while Excel 97's—to make it compatible with other Office 97 programs—is 30, so the two versions place a date entered as '1/5/28' into different centuries.

Your best bet is simply to type only four-digit years—or at least format dates so they're always displayed with four-digit years.



Your PC may not handle the millennium transition without a little help.

The problems become worse when data gets passed around. Say you copy a table from your word processor or a Web site and paste it into your spreadsheet. Maybe you're collaborating on a report with Ernie in Accounting, passing files back and forth. Or your worksheet may use OLE to access a company SQL database, and you don't even know it.

SHARING ERRORS

THIS IS WHERE the real disaster could be lurking. Even if a program understands the centuries internally (*not* always the case with vertical applications and custom databases), it may export data with two-digit years. When you load that data into another program, the pivot-year guessing game returns: Dates that Excel sees as belonging in the 20th century will be interpreted by 1-2-3 as belonging in the 21st.

There's no simple solution. You'll need to find out where your data is originating and determine how dates are handled. Try sending a file with 21st-century dates to see how networked databases or coworkers' apps handle them.

THE PC CLOCK IS TICKING

YOUR HARDWARE may not handle the millennium transition without help. A PC's clock mechanism is a hodgepodge of timekeepers in the operating system, BIOS, and a chip called the CMOS RTC. But most apps read the date from the OS, so most date problems originating in hardware are easy to spot in your applications and almost as easy to fix. Setting the clock manually once should do the trick.

Of course, all this preparation could be irrelevant. If your power company doesn't solve its year 2000 problem, you won't have any electricity.

—Lincoln Spector ■

WEB BROWSER

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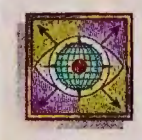
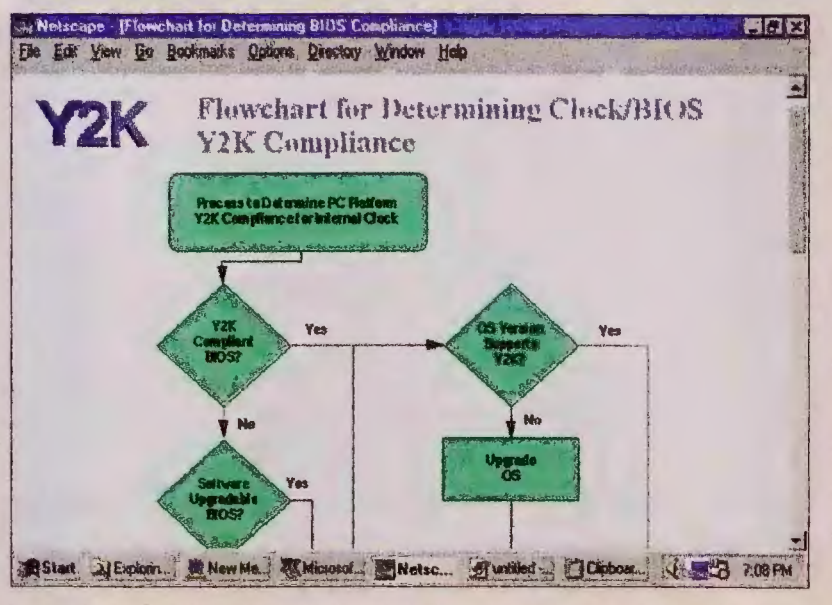


IF YOU'RE IN a position of responsibility with your company, you should be worried about the year 2000 problem. And the first thing you need to do is educate yourself about it so you can understand where your PC's weak points are and what you can do about them.

Luckily, the World Wide Web doesn't lack for year 2000 sites. In fact, if you took the time to read all of them, you'd probably find yourself facing the year 3000 problem. Here are some of the best sites around.

Check out the Mitre/Esc Year 2000 Homepage (www.mitre.org/research/y2k). Mitre is a nonprofit organization providing technical support to the U.S. government. The site offers briefings, answers to frequently asked questions, a list of compliant BIOSes, and a page called 'Steps to Take NOW'. As might be expected, there's also a page of related links (many of which are connected with the military) that includes helpful descriptions.



THE MITRE/ESC Web site offers lots of solid information for both technically savvy and nontechnical PC users.

If you're using Microsoft software (and you almost certainly are), you'll want to check out Microsoft Executive Computing's Year 2000 Date Transition Issue (www.microsoft.com/CIO/year.asp). Here you'll find a list of known year 2000 bugs in Microsoft programs, plus BIOS information, an extensive FAQ list, and links to useful year 2000 utilities.

You might also want to check your system vendor's Web site for information on your particular PC. Use the site's own search engine to find pages containing the phrase 'year 2000'.

Sometimes, however, it's good to have people with whom you can discuss the problem and share information. For that more human-centered approach, Usenet newsgroups outdo the Web. For an ongoing discussion of the issue, check out comp.software.year-2000.

—Lincoln Spector

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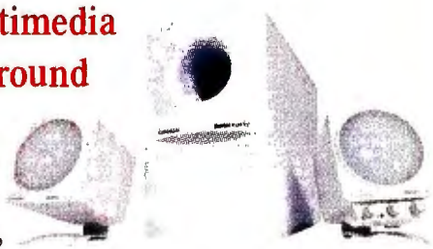

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Gateway Solo 9100, PC Magazine *Editor's Choice, August 1997*

Gateway Extras

(Some items only available to new or existing Gateway customers or with the purchase of a PC.)

- Auto/Airline Adapter **$99**

- Gateway Solo Mini Docking Station **$199**
- 33.6 Data/14.4 Fax PC Card Modem** *(with cellular support)* **$200**
- Additional 2300/9100 Lithium Ion Battery **$200** *(with system purchase)*

- Canon® BJC®-80 Color Bubble Jet Printer **$299**

- Gateway Solo Docking Station **$599**

**Maximum data transfer rate dependent on certain variables including particular modems with which you are communicating, telephone lines, communications software and communications protocols.*

MMX™ intel inside pentium® PROCESSOR

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800-424-1462

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Gather 'Round
The Future Of Digital Media

The powerful computer features and digital television capabilities of our new Destination Digital Media Computers (DMC) have fanned the flames of the digital future. Entertainment and information will never be the same.

The DMC, descendant of the Destination Big Screen PC/TV, is a big hit with digital pioneers. Enormous 31-inch or 36-inch (35.5-inch viewable) SVGA monitors give the whole gang a great view. Imagine sitting 10 feet away and still being able to read text on the screen! Amazing digitally enhanced television is displayed at resolutions up to 640 x 480. And the clarity of this monster monitor is unbelievable — 3-D practically jumps off the screen thanks to the Apocalypse 3Dx graphics accelerator.

Digital Versatile Disc (DVD) cranks up your experience with improved quality and more storage: seven times as much as a CD. Plus it supports two surround-sound standards: Dolby® Digital and Dolby Pro Logic®. The precision of our harman/kardon speaker system takes Dolby Pro Logic to extremes!

Our Destination systems give you independence that goes far beyond the cordless keyboard and Field Mouse remote. Don't be left out in the cold. Get yours today.

Gateway Destination D6-300XL
Digital Media Computer
Get in the holiday spirit at www.destination.com/fireplac

'ordless Keyboard and ïeld Mouse® Remote

ultidirectional, 4-Channel Radio Frequency
25' range • Control Buttons: Power, Volume,
nannel, Mute and Recall • TV/PC Control
Keyboard Specifics: 4 AA Batteries (included),
' Alpha-numeric keys and Microsoft Windows 95
:y, EZ Pad touch pad, PS/2® Mouse Port
Remote Specifics: 4 AAA Batteries (included),
eft and Right Mouse Buttons, Easy-Access Mouse
utton on Back, Integrated Trackball, Numeric Keypad

1-inch SVGA Monitor

ata Grade CRT: 33" Diagonal (31.5" viewable)
Invar Shadow Mask • Resolution: 640 x 480 @
)-72Hz, 800 x 600 @ 60Hz • Unlimited Display
olors • Scanning Frequency: Horizontal, 31 to
3kHz; Vertical, 50Hz to 72Hz

6-inch SVGA Monitor

ata Grade CRT: 38" Diagonal (35.5" viewable)
Invar Shadow Mask • Resolution: 800 x 600 @
)Hz • Unlimited Display Colors • Scanning
requency: Horizontal, 31 to 37kHz; Vertical, 59Hz
75Hz • Autoswitching PC/TV Mode

)igital TV Capabilities

igital Line Doubling, Progressive Scan • Digital
omb Filter • Two-tap Vertical Line Interpolation
Five-tap Horizontal Line Interpolation • Brooktree
64 Graphics Chip • 829a Video Decoder
181-Channel, Cable-Ready TV/Tuner

arman/kardon® Home Theater urround Sound System

VR-10 Audio/Video Receiver w/ Remote
Frequency Response: 0.5Hz-100kHz @ 1W
-0/-3dB) • Signal-to-Noise Ratio: CD - 93dB;
ideo - 83dB • Four 3.5" Paper-Cone Satellite
peakers • Center Channel w/ 3.5" Paper-Cone
oofers (2) and .5" Polycarbonate-Dome Tweeter
/ Acoustic Lens in D' Appolito configuration, and
0W specially designed 6.5" Paper-Cone Subwoofer

The crisp, clear images of DVD on the Destination Digital Media Computer make analog video as unpopular as coal. (Television horizontal resolution calculated assuming a composite video signal.)

GATEWAY ™ Destination® Digital Media Computers

D5-166

- Intel® 166MHz Pentium® Processor with MMX™ Technology • 32MB SDRAM • 512K Pipelined Burst Cache • 31" SVGA Monitor • 2GB 11ms Ultra ATA Hard Drive • 12X min/24X max CD-ROM Drive • Boston Acoustics® MicroMedia™ 3-Piece Speaker System

$2499 As low as× $87/mo.

D6-233

- Intel 233MHz **Pentium® II** Processor with 512K Cache • 64MB EDO DRAM • 31" SVGA Monitor • 4MB Apocalypse 3Dx Graphics Accelerator • 4GB 11ms EIDE Hard Drive • DVD-ROM Drive with Hardware MPEG2 and AC3 Decoding • harman/kardon Dolby ProLogic Sound System

$3999 As low as× $139/mo.

D6-300XL

- Intel 300MHz **Pentium II** Processor with 512K Cache • 64MB EDO DRAM • 36" (35.5" viewable) Multimode SVGA Monitor • 4MB Apocalypse 3Dx Graphics Accelerator • 8.4GB 8.5ms EIDE Hard Drive • DVD-ROM Drive with Hardware MPEG2 and AC3 Decoding • harman/kardon Dolby ProLogic Sound System

$4999 As low as× $174/mo.

All Destination Systems Include:

- 2MB 2-D Graphics with Multiple Input Digital TV Tuner
- 3.5" Diskette Drive
- 32 Voice Ensoniq® Wavetable Digital Sound
- TelePath® Modem *for Windows* with x2 Technology**
- 7-Bay Charcoal-Colored PC Case
- Cordless Keyboard w/ EZ Pad® Pointing Device
- Cordless Field Mouse Remote
- Microsoft® Windows® 95
- Microsoft Choice Software
- Gateway Gold℠ Service & Support◆ for Digital Media Computers

Gateway Extras

(Some items only available to new or existing Gateway customers or with the purchase of a PC.)

- Microsoft SideWinder® Joystick **$59**
- Epson Stylus® COLOR 800 Ink Jet Printer **$399**
- harman/kardon® High-Fidelity Sound System Upgrade from Boston Acoustic speakers **$400**

MMX™ intel inside pentium® II PROCESSOR

GATEWAY2000

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800-424-1462

www.destination.com

Destination 31-inch and 36-inch monitors are covered by a one-year limited warranty. Call or write for a free copy.

Digital Media Computers

Make Your Network Connection At Gateway

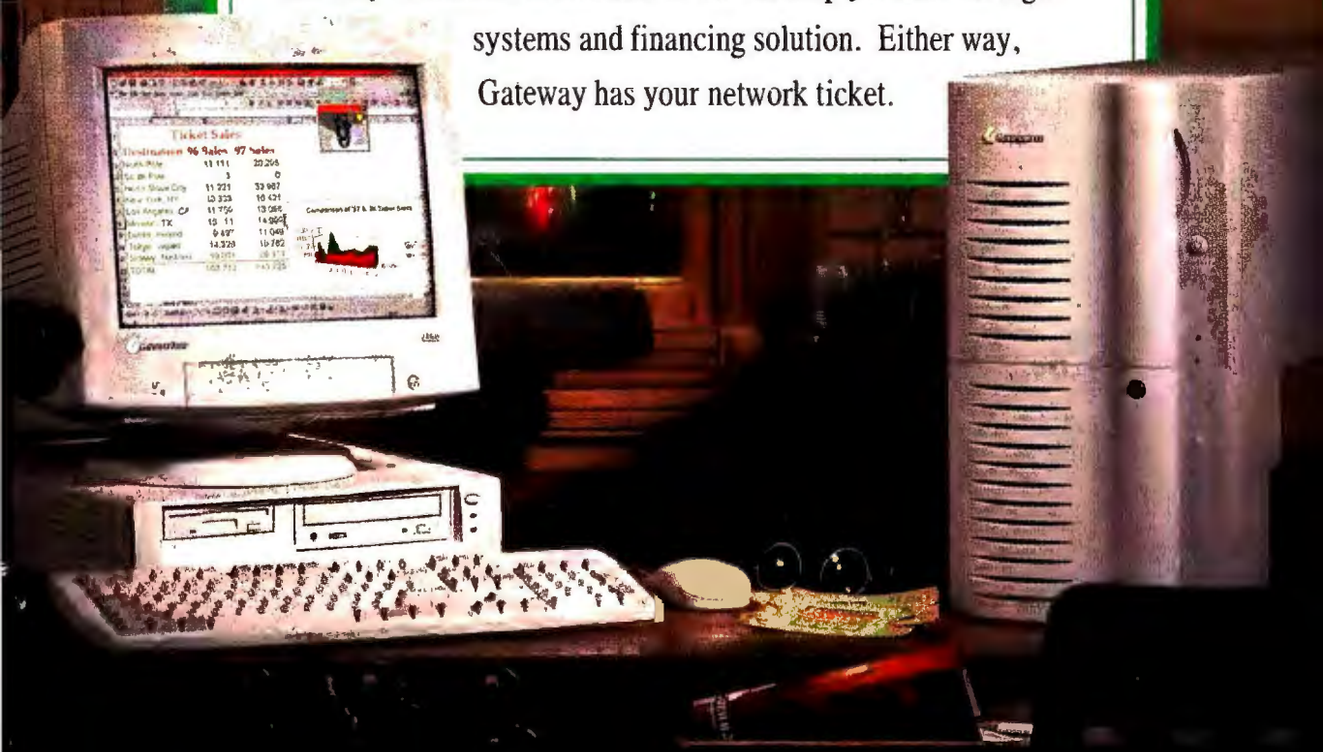
Gateway's servers and network-ready PCs have arrived. We have all the right products, systems and people in place to take business to the next level. And you're the conductor, because we're here to meet your needs. The addition of Gateway Business Direct, NS-Series servers and GP5-166E desktops means now our business customers can count on the personalized service, fresh technology and outstanding value that made Gateway what it is today: a leading direct-marketer of professional PCs.

Businesses have always turned to Gateway for the best overall value, and with the introduction of the GATEWAY™ NS-Series server line, we can do even more for your business.

Our reliable NS-Series servers are based on proven technologies from ALR, a Gateway subsidiary. Trademarked ALR technology, like the InforManager subsystem with ActiveCPR, make our servers easier to manage. Plus they offer the scalability necessary to grow with your business.

The featured NS-7000 entry-level server is a great print and file server as well as a reliable network hub for workgroups, classrooms and small departments. Couple this savvy server with Gateway's low-cost, network-ready GP5-166E systems and our affordable financing options, and that network you've been considering becomes a reality.

Check out our Web site and get price quotes. Then call our Gateway Business Direct team so we can help you find the right systems and financing solution. Either way, Gateway has your network ticket.



GP5-166E Network-Ready Desktop PC

NS-7002 Server

Gateway NS-Series Server

NS-7002

- Intel® 233MHz Pentium® II Processor with 512K ECC Cache
- SMP-Compliant (Dual-Processor Ready) Supporting Up To Two Pentium II Processors (upgradable to 266MHz and 300MHz)
- 32MB EDO Memory (expandable to 512MB)
- ECC Memory System
- 4GB Ultra Wide SCSI-3 5,400 RPM Hard Drive
- Integrated Ultra Wide SCSI-3 Controller
- 12X SCSI CD-ROM Drive
- 3.5" Diskette Drive
- 3Com® 10/100 Twisted Pair Ethernet Adapter
- Three 32-Bit PCI, Two EISA, One PCI/EISA Slots
- 4 DIMM Slots
- EV500 .28 Screen Pitch 15" Monitor (13.9" viewable)
- Integrated 32-Bit PCI Graphics with 2MB DRAM
- Seven-Bay Server Tower Case with 325-Watt Power Supply, Includes five External Bays (three 5.25" and two 3.5") and two 3.5" Internal Bays
- 104+ Keyboard & Mouse
- Microsoft® Windows NT® Server 4.0 (1-4 CPUs, 10 User Licenses)
- ALR InforManager™ Server Management System with ActiveCPR™ Processor Protection (maintains processor thermals, cooling fan and voltage levels for additional security and reliability)

$3653 Gateway GoldValue Lease† $128/mo.

GATEWAY BUSINESS DIRECT

Gateway Extras for Servers

(Some items only available to new or existing Gateway customers or with the purchase of a PC.)

- 3-Channel ADAC RAID Card **$1130**
- 3-Drive RAID Cage **$100**
  (requires 3-Channel ADAC RAID Card)
- Three 4.2GB SCSI SCA Drives **$1955**
  (requires 3-Drive RAID Cage)
- ADAC RAID Memory Upgrades
  (Call for upgrade pricing.)
- 2nd Pentium II 233MHz Processor with 512K ECC Cache **$730**
- 4GB Ultra Wide SCSI 7,200 RPM Hard Drive
  9GB Ultra Wide SCSI 10,000 RPM Hard Drive
  (Call for upgrade pricing.)

Gateway GP-Series PC

GP5-166E

- Intel 166MHz Pentium® Processor with MMX™ Technology
- 16MB SDRAM
- 256K Pipelined Burst Cache
- EV500 .28 Screen Pitch 15" Monitor (13.9" viewable)
- Integrated PCI Video with 2MB DRAM
- 2GB 11ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- Integrated 16-Bit Business Audio
- Integrated 10/100 Ethernet Twisted Pair Adapter
- Low Profile Desktop Case
- 104+ Keyboard & Mouse
- MS® Windows® 95 & MS Office 97, Small Business Edition plus Bookshelf® 98
- Intel LANDesk® Client Manager 3.01
- Desktop Management Interface (DMI) 1.1 Compliant
- Gateway Gold Service & Support for GP-Series PCs

$1249 Gateway GoldValue Lease† $44/mo.

E-Series Systems

Large enterprise customers interested in volume purchases should contact Gateway 2000 Major Accounts, Inc. to learn more about the full line of Gateway E-Series desktop PCs, workstations and servers. **800-779-2000**

Gateway Extras for Desktops

(Some items only available to new or existing Gateway customers or with the purchase of a PC.)

- 3Com PCI 10/100 TP Adapter **$64**
- 16-Bit Token Ring Adapter **$159**
- MS Windows NT Workstation 4.0 **$99**
  (upgrade from PCs that include MS Windows 95)
- 2GB 11ms Ultra ATA Hard Drive
  4GB 11ms Ultra ATA Hard Drive
  6.4GB 10ms Ultra ATA Hard Drive
  (Call for upgrade pricing.)
- 4GB Ultra Wide SCSI 5,400 RPM Hard Drive
  9GB Ultra Wide SCSI 10,000 RPM Hard Drive
  (Call for upgrade pricing.)

MMX™ intel inside pentium® II processor

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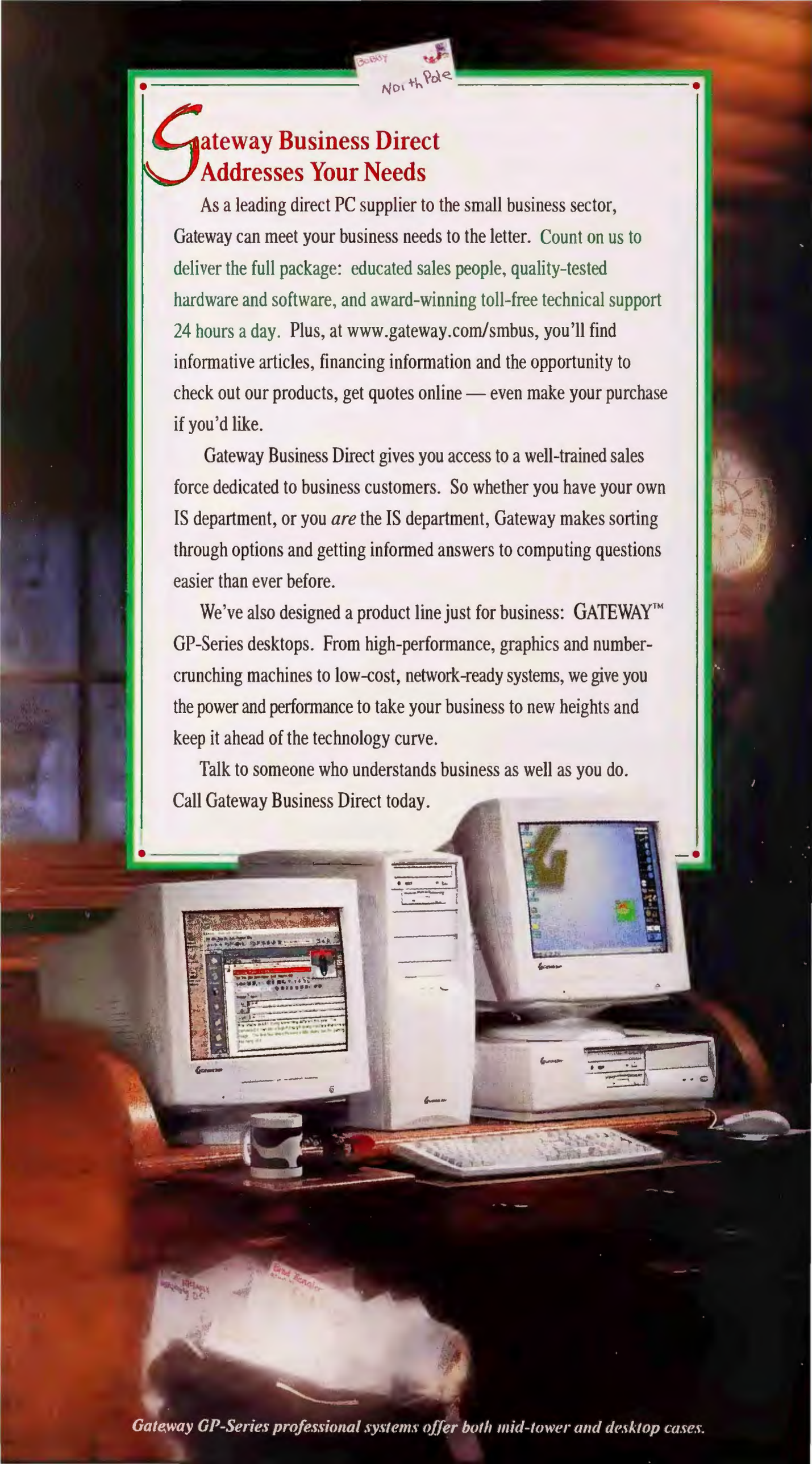
Gateway Business Direct Addresses Your Needs

As a leading direct PC supplier to the small business sector, Gateway can meet your business needs to the letter. Count on us to deliver the full package: educated sales people, quality-tested hardware and software, and award-winning toll-free technical support 24 hours a day. Plus, at www.gateway.com/smbus, you'll find informative articles, financing information and the opportunity to check out our products, get quotes online — even make your purchase if you'd like.

Gateway Business Direct gives you access to a well-trained sales force dedicated to business customers. So whether you have your own IS department, or you *are* the IS department, Gateway makes sorting through options and getting informed answers to computing questions easier than ever before.

We've also designed a product line just for business: GATEWAY™ GP-Series desktops. From high-performance, graphics and number-crunching machines to low-cost, network-ready systems, we give you the power and performance to take your business to new heights and keep it ahead of the technology curve.

Talk to someone who understands business as well as you do. Call Gateway Business Direct today.



Gateway GP-Series professional systems offer both mid-tower and desktop cases.

Gateway GP-Series PCs for Business

GP5-166

- Intel® 166MHz Pentium® Processor with MMX™ Technology
- 32MB SDRAM
- 512K Pipelined Burst Cache
- EV500 .28 Screen Pitch 15" Monitor (13.9" viewable)
- 2MB 3-D 64-Bit PCI Graphics
- 2GB 11ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Desktop Case
- 104+ Keyboard & MS® IntelliMouse™
- Microsoft® Windows® 95 & MS Office 97, Small Business Edition plus Bookshelf® 98
- Gateway Gold℠ Service & Support for GP-Series PCs

$1349 Gateway GoldValue Lease† $48/mo.

GP6-233

- Intel 233MHz **Pentium® II** Processor with 512K Cache
- 32MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- ▸ **nVidia™ 4MB 3-D AGP Graphics**
- 4GB 11ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Mid-Tower Case
- 104+ Keyboard & MS IntelliMouse
- MS Windows 95 & MS Office 97, Small Business Edition plus Bookshelf 98
- Gateway Gold Service & Support for GP-Series PCs

$1999 Gateway GoldValue Lease† $71/mo.

Gateway GP6-233, PC World Power Desktop, October 1997

GP6-266

- Intel 266MHz **Pentium II** Processor with 512K Cache
- 64MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- ▸ **nVidia 4MB 3-D AGP Graphics**
- 8.4GB 8.5ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Mid-Tower Case
- 104+ Keyboard & MS IntelliMouse
- MS Windows 95 & MS Office 97, Small Business Edition plus Bookshelf 98
- Gateway Gold Service & Support for GP-Series PCs

$2499 Gateway GoldValue Lease† $89/mo.

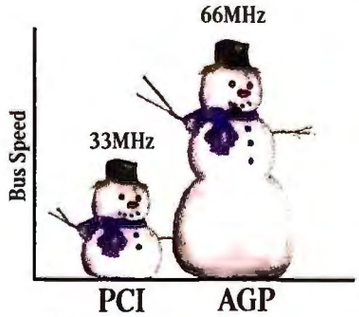
GP6-300 BEST BUY

- Intel 300MHz **Pentium II** Processor with 512K Cache
- 64MB SDRAM
- ▸ **EV900 .26 Screen Pitch 19" Monitor** (18" viewable)
- ▸ **nVidia 4MB 3-D AGP Graphics**
- 8.4GB 8.5ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Mid-Tower Case
- 104+ Keyboard & MS IntelliMouse
- MS Windows 95 & MS Office 97, Small Business Edition plus Bookshelf 98
- Gateway Gold Service & Support for GP-Series PCs

$2949 Gateway GoldValue Lease† $105/mo.

E-Series Systems

Large enterprise customers interested in volume purchases should contact Gateway 2000 Major Accounts, Inc. to learn more about the full line of Gateway E-Series desktop PCs, workstations and servers. **800-779-2000**



AGP, Intel's next-generation graphics system, widens the flow of data to the monitor creating smooth, fast video and sophisticated 3-D performance at twice the bus speed.

Gateway Extras

(Some items only available to new or existing Gateway customers or with the purchase of a PC.)

- 3Com® PCI 10/100 TP Ethernet Adapter **$64**
- TelePath® Modem *for Windows* with x2™ Technology** **$79**
- MS Windows NT® Workstation 4.0 **$99** *(upgrade from PCs that include MS Windows 95)*
- Iomega® Internal ZIP™ Drive with Two Discs **$99** *(with system purchase)*
- TR4 IDE 4GB Tape Backup Unit with Tape **$199** *(with system purchase)*

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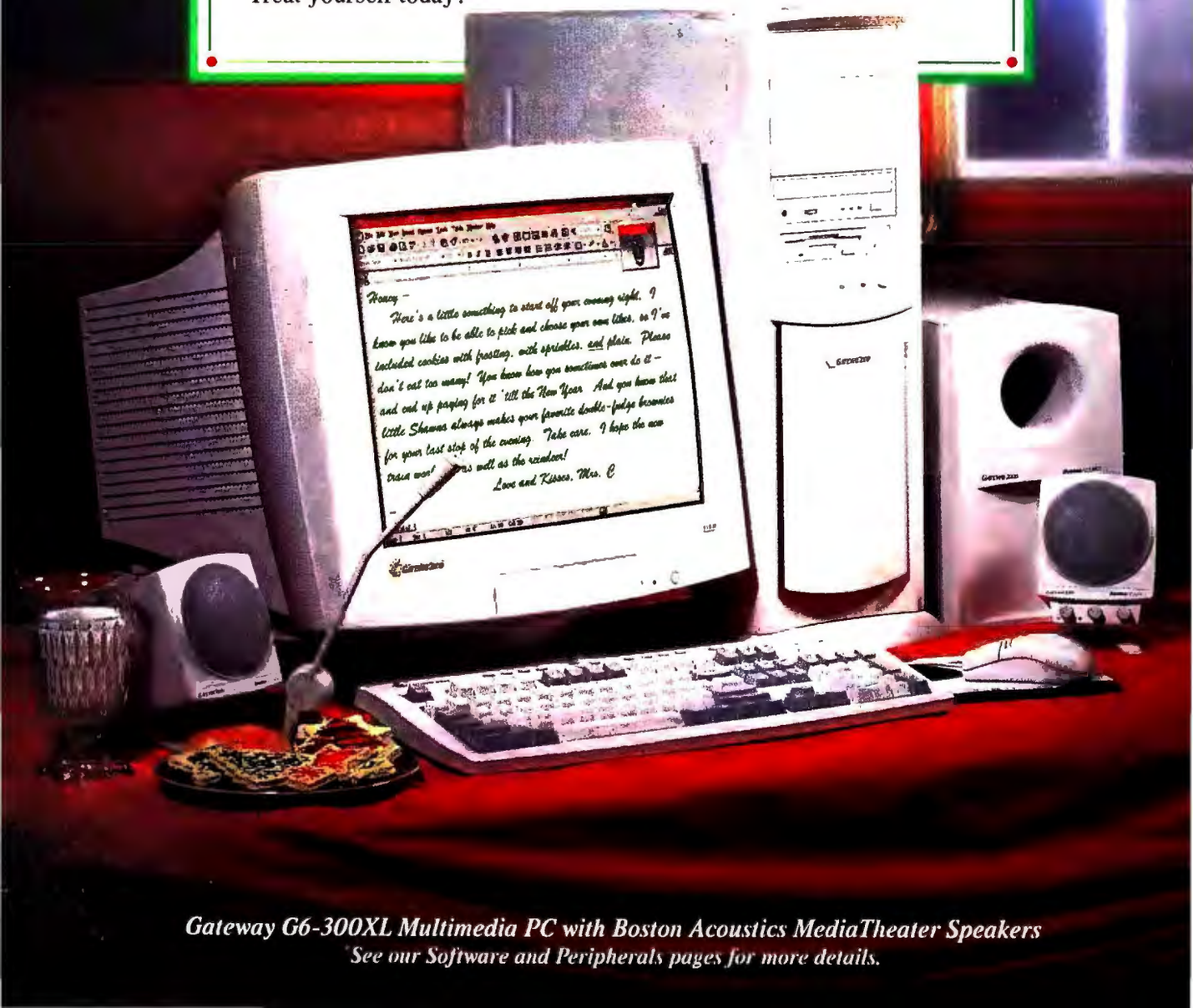
PCs Made Especially For You

We're whipping up delectable multimedia performance and value. No one else comes close to having all Gateway's multimedia goodies.

We start off right by giving you a choice of software. Not just *any* software, it's all from Microsoft and DreamWorks Interactive. We joined forces with these creative, cutting-edge software and entertainment companies to create "Microsoft Choice" — four exceptional packages of top-selling software. You tell us which best meets your needs.*

Of course we have the hardware to make all this amazing software really cook too. We've even found a way to deliver Intel's next-generation processor technology, the **Pentium® II** processor, for less than $2,000! That's only $70 a month. Now the question isn't whether you can afford it, it's how could you possibly let this amazing opportunity pass by? Because the processor isn't the only cool thing on this system. It's loaded with all the frosting and sprinkles for amazing value. We've blended feature-packed systems, award-winning service and support, and great prices to make Gateway G-Series multimedia systems both irresistible and affordable. And each is unique because we make them after you order. Treat yourself today!



Gateway G6-300XL Multimedia PC with Boston Acoustics MediaTheater Speakers

See our Software and Peripherals pages for more details.

Gateway G-Series Multimedia PCs for the Home

G5-166

Intel® 166MHz Pentium® Processor with MMX™ Technology
16MB SDRAM
512K Pipelined Burst Cache
EV500 .28 Screen Pitch
15" Monitor (13.9" viewable)
2MB 3-D 64-Bit PCI Graphics
1.6GB 12ms Ultra ATA Hard Drive
12X min/24X max CD-ROM Drive
3.5" Diskette Drive
Ensoniq® Wavetable Audio
Altec Lansing® ACS-41 Speakers
TelePath® Modem *for Windows* with x2™ Technology**
G-Series Desktop Case
MultiFunction Keyboard & Mouse
Microsoft® Windows® 95
Microsoft Home Essentials Software
Color Bubble Jet Printer
Gateway Gold℠ Service & Support for G-Series PCs

$1499 As low as× $52/mo.

PC World *Best Buy August 1997*

G6-233 BEST BUY

- Intel 233MHz **Pentium® II** Processor with 512K Cache
- 32MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- **nVidia™ 4MB 3-D AGP Graphics**
- 2GB 11ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- Ensoniq Wavetable Audio
- Altec Lansing ACS-41 Speakers
- TelePath Modem *for Windows*, with x2 Technology**
- G-Series Mid-Tower Case
- MultiFunction Keyboard & Mouse
- MS® Windows 95
- Microsoft Home Essentials Software
- Gateway Gold Service & Support for G-Series PCs

$1999 As low as× $70/mo.

PC World *Best Buy September 1997*

G6-266

- Intel 266MHz **Pentium II** Processor with 512K Cache
- 32MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- **nVidia 4MB 3-D AGP Graphics**
- 6.4GB 10ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- Ensoniq Wavetable Audio
- Boston Acoustics® MicroMedia™ 3-Piece Speaker System
- TelePath Modem *for Windows*, with x2 Technology**
- G-Series Mid-Tower Case
- MultiFunction Keyboard & MS IntelliMouse
- MS Windows 95
- Microsoft Choice Software
- Gateway Gold Service & Support for G-Series PCs

$2499 As low as× $87/mo.

G6-300

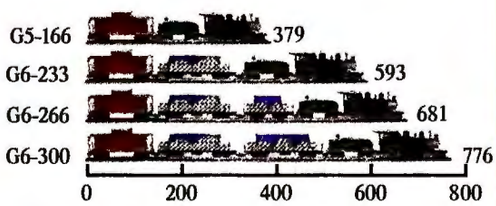
Intel 300MHz **Pentium II** Processor with 512K Cache
32MB SDRAM
EV900 .26 Screen Pitch
19" Monitor (18" viewable)
nVidia 4MB 3-D AGP Graphics
8.4GB 8.5ms Ultra ATA Hard Drive
12X min/24X max CD-ROM Drive
3.5" Diskette Drive
Ensoniq Wavetable Audio
Boston Acoustics MicroMedia 3-Piece Speaker System
TelePath Modem *for Windows* with x2 Technology**
G-Series Mid-Tower Case
MultiFunction Keyboard & MS IntelliMouse
MS Windows 95
Microsoft Choice Software
Gateway Gold Service & Support for G-Series PCs

$2999 As low as× $104/mo.

G6-300XL

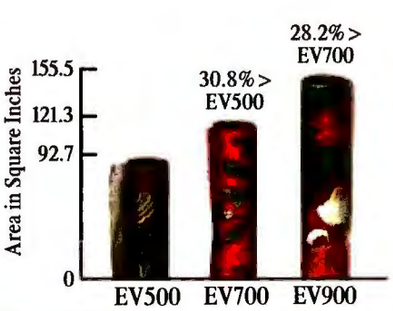
- Intel 300MHz **Pentium II** Processor with 512K Cache
- 64MB SDRAM
- **EV900 .26 Screen Pitch**
  19" Monitor (18" viewable)
- **nVidia 4MB 3-D AGP Graphics**
- TV/FM Tuner Card
- 8.4GB 8.5ms Ultra ATA Hard Drive
- **DVD-ROM Drive & DVD Decoder Card**
- 3.5" Diskette Drive
- Ensoniq Wavetable Audio
- **Boston Acoustics MediaTheater™ 3-Piece Speaker System**
- TelePath Modem *for Windows* with x2 Technology**
- G-Series Tower Case
- MultiFunction Keyboard & MS IntelliMouse
- MS Windows 95
- Microsoft Choice Software
- Gateway Gold Service & Support for G-Series PCs

$3599 As low as× $125/mo.



CPUmark$_{32}$ is a 32-bit test that reflects the processor usage of 32-bit applications and focuses solely on a PC's CPU, RAM, cache and cache controller.

For more information on how these benchmark scores were achieved, please call the Gateway FaxBack® service and request document #2471. Benchmark information is also available on our Web site, www.gateway.com.



The EV900 increases your viewing area and has a smaller footprint than other 19-inch monitors. That means one less roll of wrapping paper this holiday season.

Gateway Extras

(Some items only available to new or existing Gateway customers or with the purchase of a PC.)

- **EV900 .26 Screen Pitch**
  19" Monitor (18" viewable)
  - upgrade from EV500 **$400**
  - upgrade from EV700 **$200**
- **Gateway Gold Pemium Service and Support** — an extended Three-Year On-Site Agreement†† including priority 800 number for access to technical experts.
  - At time of system purchase **$99**
  - Within current on-site service agreement **$129**

Get Connected

Now your Gateway family is closer than ever before. All new Gateway G-Series computers and Destination Big Screen PC/TVs and DMCs include state-of-the-art x2 modem technology and access to our exclusive *gateway.net* customer Internet service.

††On-site service is available to most locations in the continental United States, Alaska, Hawaii, Puerto Rico and Canada after you and your Gateway technician determine an on-site visit is necessary. On-site service is provided by PC Technology Services, Inc. On-site is not available for any monitor, mouse, keyboard, or portable system. Write or call for a free copy of the on-site service agreement.

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Through a special arrangement with premier software developer, Microsoft, we've put together a trainload of top-of-the-line software — including titles from entertainment giant DreamWorks Interactive. You choose your standard software from four options, but we don't stop there. You can easily and affordably add more software to your PC as an upgrade.

Microsoft® Home Essentials

Microsoft Home Essentials comes standard on our special G5-166 and G6-233 Best Buy packages. All the essential tools for home computing are there, including: Word, Works, Encarta® Encyclopedia, Money, Greetings Workshop and Entertainment Pack: The Puzzle Collection. Plus it's easy to add another specialty pack from our software upgrades. You won't find a better deal anywhere.

Microsoft Choice Options

Gateway G-Series PCs (except the G5-166 and G6-233 Best Buy), and all GP-Series PCs and Destination® systems, let you continue to personalize your PC with Microsoft Choice. Look over the following packages and tell us which one best meets your needs. Microsoft Office 97, Small Business Edition does not include Microsoft Home Essentials, while the other three suites do.

- **Microsoft Office 97, Small Business Edition**

Get organized and get connected with the office suite that integrates intelligent, productivity-enhancing applications with the power of the Internet. Includes Microsoft Excel, Word, Publisher, Bookshelf®, Small Business Financial Manager and Outlook™.

- **Microsoft Professional Resource Suite Plus Microsoft Home Essentials**

Increase your productivity and efficiency with volumes of information at your fingertips. Award-winning content and interactive environments are combined in these easy-to-use applications. Includes Publisher, Bookshelf, Encarta Virtual Globe, Expedia™ Streets and Expedia Trip Planner.

- **Microsoft Action Titles Plus Microsoft Home Essentials**

Experience incredibly realistic graphics, explore new worlds and tackle tough challenges with these action-packed games. Includes Close Combat™; Flight Simulator; Age of Empires™; Monster Truck Madness™; DreamWorks Interactive™: DILBERT'S™ Desktop Games; and DreamWorks Interactive: The Neverhood™.

- **Microsoft Child Adventure Suite Plus Microsoft Home Essentials**

Kids love these educational and entertaining software titles designed to encourage adventure and exploration. You'll appreciate the parental control and PC security features. Includes Plus! For Kids; DreamWorks Interactive: Chaos Island: The Lost World™; DreamWorks Interactive: Goosebumps™: Attack of the Mutant™ 98; Scholastic's The Magic School Bus™ Explores in the Rain Forest; 3-D Movie Maker; Scholastic's The Magic School Bus Explores in the Age Of Dinosaurs and Creative Writer 2.

Microsoft Developer's Tools

Now you can get Developer's Tools from Microsoft. That's exciting! Because we wanted to make sure we were putting together the best package of development software available, we weren't quite ready with the details at press time. Please call your sales rep or check out our Web site for all the specifics.

Add All The Trimmings!

Whether you've been part of the Gateway family for years, or you're just joining us today, we have great deals on extras to make your holidays merrier and help you make the most of your GATEWAY™ computer.

Software Upgrades

Keep personalizing your Gateway PC and add software for all your interests. It's all been tested with Gateway PCs, so there are no hassles. Why limit yourself? Have it all!

Microsoft Software Upgrades

- **Microsoft Action Titles Upgrade $99**
- **Microsoft Professional Resource Suite Upgrade $99**
- **Microsoft Child Adventure Suite Upgrade $99**

GATEWAY SELECT

Our Gateway Select program lets you know you're getting software that meets or exceeds our standards for quality, value and ease of use.

Gateway Software

- **Finance Pack II** *(U.S. Shipment Only)* Includes Quicken® Deluxe 6; Quicken Financial Planner™ 2; Quicken Family Lawyer™ 7; Quicken Parents' Guide to Money™ and TurboTax® Deluxe coupon. **$69**
- **Family Reference Bundle** Includes Grolier Multimedia Encyclopedia®; Mindscape's® World Atlas 6.0; Rand McNally TripMaker™; National Geographic® Swinging Safari Really Wild Animals™ and Mayo Clinic® Family Health. **$79**
- **Gamer's Pack** Includes DeadLock™; Jack Nicklaus® 4; Super Bubsy®; Sega Rally™ Championship; Mixman 3-Mix™ and PC ProPad gaming device. **$99**
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- Microsoft SideWinder® Joystick **$59**
- Starter Kit **$59** *(wrist rest, APC® surge protector, CD wipes, monitor wipes, ten formatted 3.5" diskettes, diskette/CD box and keyboard cover)*

Starter Kit

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- APC Back-UPS® Office **$149**
- PalmPilot™ Personal Data Organizer **$249**

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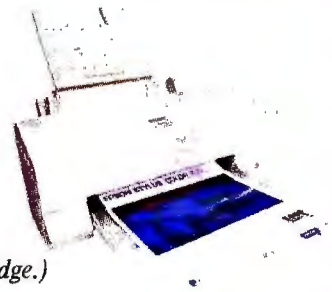
- Hewlett®-Packard ScanJet 5Pse Color Scanner **$299**
- APC 650 Pro UPS **$319**



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(Each printer includes cable and ink cartridge.)

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- Epson® Stylus® COLOR 400 Ink Jet Printer **$199**
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- Epson Stylus COLOR 600 Ink Jet Printer **$269**
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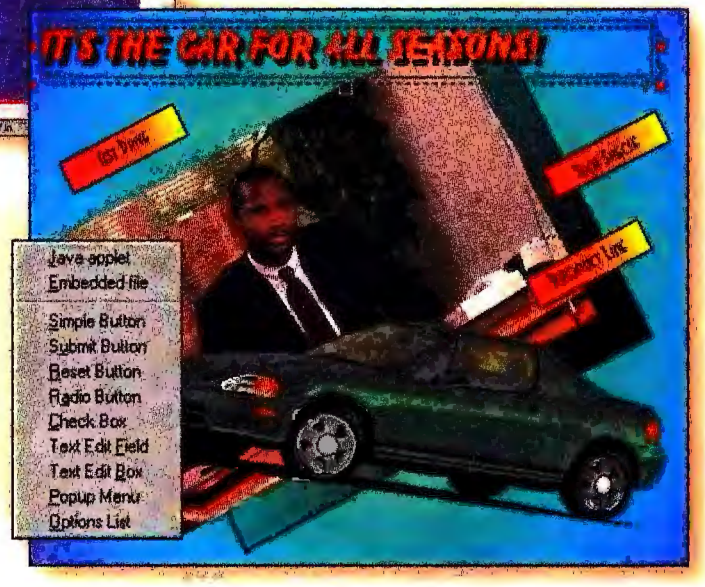
NEW PRODUCTS

CorelDraw and Canvas: Graphics With Web Feet

CANVAS'S URL Attachment tool makes it easy to assign and manage links to images and text in a Canvas document.



WITH CORELDRAW'S new Internet Objects toolbar, you can easily add buttons, check-boxes, and links to your Web-bound graphics.

GRAPHICS SPURRED BY the rapid growth of the Web, graphics software packages are gaining features that help graphic artists and designers produce materials for the online world. The latest versions of CorelDraw and Deneba's Canvas are no exception.

Both the $480 **CorelDraw 8** and the $399 **Canvas 5.0.3** packages streamline the job of creating graphics that contain links, such as a Web page image map with hot spots. Canvas's new URL Attachment toolbox lets you assign links to any element—shapes, text, photos—with just a few mouse clicks. CorelDraw goes further with a new Internet Objects toolbox that also allows you to add predesigned buttons, check boxes, menus, and other options to your Web graphics.

With both Canvas and CorelDraw, you can save your work in the popular GIF and JPEG Web graphics formats, but only CorelDraw also lets you save files as ready-to-go HTML Web pages.

I tested preproduction versions of both products and found each to be a graphics gold mine of tools and features. Both CorelDraw and Canvas offer an assortment of graphics capabilities—including vector illustration, bit-map image editing, and a truckload of clip art—that make them excellent choices for everything from routine technical drawings to jazzy photo collages. But each package delivers graphics goodies in its own way: Canvas puts everything in a single application that also integrates basic layout tools, while CorelDraw is a graphics suite that includes illustration, photo editing, and 3D rendering applications, as well as utilities for scanning, tracing, and creating textures.

I especially liked the ability of both programs to remember where you left various tools and palettes the last time you used them. CorelDraw goes a step beyond Canvas with its new Workspace feature, which lets you save cus-

CorelDraw 8

PRO: Enhanced Web features, wizards, lots of graphics capabilities.

CON: Modules are not integrated.

VALUE: Still the leader for all-around graphics.

Corel Corp.
800/772-6735
www.corel.com
Street price: $480, upgrade $220
READER SERVICE NO. 748

Canvas 5.0.3

PRO: Integrated vector illustration and bit-map editing.

CON: Lacks wizards, relatively steep learning curve.

VALUE: Great graphics if you have time to master the software.

Deneba Software
800/622-6827
www.deneba.com
Street price: $399, free upgrade from version 5.0
READER SERVICE NO. 749

tom interface configurations for different projects—a time-saver for regular users.

I also generally found creating graphics with CorelDraw easier and faster thanks to its step-by-step wizards, tutorials, and on-screen help. For example, CorelDraw has a new Template Wizard; the Corel Texture utility includes a Texture Wizard; and the CorelDream module has a 3D Scene Wizard—all great for jump-starting your work. Canvas, on the other hand, lacks CorelDraw's wizard approach and overall ease of use, which means you'll require more time or artistic talent to produce equally professional-looking graphics.

If you don't need all of CorelDraw's functions, or prefer learning one package rather than several modules, Canvas may be for you. But while CorelDraw 8 costs more, its easier-to-use features and richer tool set—which includes more Web graphics capabilities—place it above Canvas and many other packages in the graphics software pantheon.

—Richard Jantz

Pentium II-233 Joins the Budget Bunch

DESKTOP

PITY THE POOR Pentium II-233 chip, eclipsed in power by its beefier, not-much-more-expensive PII-266 siblings and in price by the almost-as-powerful Pentium MMX-233. Small wonder that no Pentium II-233 system made either our budget or power desktops chart this month. But Gateway 2000's newly reconfigured **G6-233** just may change this. The shipping system we tested boasts a very good PC WorldBench score of 247, a motherboard outfitted with Intel's new 440LX chip set, a 56-kilobits-per-second modem, and a graphics card that won't soon be outdated—all for only $1999.

In fact, at this writing the new G6-233 costs $124 *less* than Gateway's similarly configured GP5-233, the top-ranked PMMX-233 system on this month's Top 20 Budget Desktops chart. The GP5-233 does come with Microsoft Office 97 Small Business Edition (the G6-233's home-oriented bundle includes Microsoft Word and Works), but its PC WorldBench score was a few points lower than the G6-233's. Pentium II-266 systems are getting less expensive, but they're not budget desktops yet: Even the lowest-price PII-266 on our Top 20 charts will cost you $2349—that's $350 more than this Gateway machine.

The system comes with 32MB of SDRAM; a 12X–24X CD-ROM drive; an STB graphics board with an NVidia chip, 4MB of SGRAM, and Accelerated Graphics Port support; Ensoniq's wavetable sound card; a Telepath Windows 56-kbps x2 modem; and Gateway's 17-inch EV700 monitor. On the downside, the 2GB hard drive is skimpy (though an extra $85 will double capacity to 4GB). Also, you can't get Microsoft Office even as an upgrade.

GATEWAY 2000'S G6-233 delivers Pentium II power and a 17-inch monitor for $1999—but the software bundle and hard drive are skimpy.

G6-233

PRO: Solid, basic Pentium II-233 system at a good price.

CON: Small hard drive, skimpy software bundle.

VALUE: Name-brand Pentium II PC for budget-minded buyers.

Gateway 2000
800/338-0169
www.gateway.com
Street price: $1999

READER SERVICE NO. 750

Note that you can get about equal performance in business applications from Micro Express's $1299 MicroFlex-F210E, equipped with an Advanced Micro Devices K6-200 processor. Or consider the $1899 USA Flex Performer, which is slightly slower but comes with a 4GB hard drive, WordPerfect Suite, and a Cyrix 6x86MX-PR200 chip.

But if you're set on a Pentium II system from a major vendor, Gateway's $1999 G6-233 is an excellent deal.

—Yardena Arar ▶

EDITED BY
Yardena Arar and
Laurianne McLaughlin

INTERNET

online

FOR MORE PRODUCT news and the latest announcements, check out the PC World Daily News Service at www.pcworld.com/news.

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Agfa and Olympus: Digital Cameras for Pros

DIGITAL CAMERA

FOR MOST serious photographers, consumer-oriented digital cameras have been little more than intriguing toys. But prices for cameras with professional features can easily slide into five figures. The new **Agfa EPhoto 1280** and **Olympus D-500L** break the pattern by delivering high-quality, high-resolution digital photos—and some innovative design features—for $899 each. That's still steep for occasional users, but businesses and professionals may find the improvements well worth the price.

Agfa's EPhoto 1280 doesn't even look like a camera at first glance. It has a lens and a flash, but instead of the usual eye-level viewfinder there's a big, bright 2-inch color LCD. The 3X zoom lens and camera body swivel independently, allowing you to take photos from a wide range of angles.

DIGITAL CONTORTIONIST: The Agfa EPhoto 1280's swiveling LCD viewfinder lets you snap photos from many positions.

The EPhoto offers five different resolution settings, ranging from 640 by 480 to 1280 by 960 (software-interpolated from the hardware-native 1024 by 768, but with no obvious loss in quality). A single 4MB SmartMedia card is included with the camera. Additional cards are $69 apiece; each holds 6 photos at the highest resolution and 60 at the lowest.

The Olympus D-500L is the first single-lens-reflex digital camera in this price range. It has an eye-level viewfinder, a 3X zoom lens, and a 1.8-inch LCD on the back panel so you can view pictures after you've taken them.

The camera's hardware-native 1024 by 768 resolution is identical to the Agfa's. There's no interpolated high-resolution option, but the combination of higher-quality optics and a wider range of professional features—such as extensive exposure and focus control—gives the D-500L a slight edge in quality. This is especially true in its Super High Quality mode, which doesn't use the JPEG compression that other modes employ to squeeze more photos onto a SmartMedia card (compression invariably exacts a slight penalty in quality). Lower-quality 1024 by 768 and 640 by 480 modes are available.

The D-500L comes with a single 2MB SmartMedia card, which holds 3 images captured in high resolution, or 25 at low resolution. You can purchase extra 4MB cards for $49.95 each. If you want higher resolution, Olympus also offers a D-600L model with native 1280 by 1024 resolution for $1299.

CAMERA CONVERGENCE: Olympus's D-500L gives you extensive control over your photos.

Both the Agfa EPhoto 1280 and the Olympus D-500L come with software and connecting cables for downloading images to your PC, along with software that lets you archive, edit, and enhance your images. The Agfa also has a cable that enables you to view images on a TV.

With its large LCD viewfinder, the Agfa EPhoto 1280 holds the edge for ease of use—but at the expense of the more fine-tuned settings and options available with the Olympus D-500L.

Both cameras deliver images of outstanding quality, but folks who are accustomed to standard 35mm cameras will find the Olympus a more comfortable fit.

—Stan Miastkowski ▶

Agfa EPhoto 1280

PRO: Easy to use, point-and-shoot simplicity.

CON: No eye-level viewfinder.

VALUE: High-quality digital images with minimal fuss.

Bayer (Agfa Division)
201/440-2500
www.afgahome.com
List price: $899

READER SERVICE NO. 751

Olympus D-500L

PRO: Outstanding image quality, used like a standard SLR camera.

CON: Included SmartMedia card has limited storage.

VALUE: First SLR digital camera under $1000.

Olympus America Inc.
800/347-4027
www.olympus.com
Street price: $899

READER SERVICE NO. 752

QUICK TAKES

More Graphics Clout With PhotoImpact 4.0

ULEAD'S **PhotoImpact 4.0** with Web Extensions is a business-oriented image and video editing package that offers a capable set of tools for optimizing Web graphics. New features include extensive options for creating 3D text overlays for images, plus improved Web-button and background designers and a GIF animator. Ulead has also added a much-needed preview feature that shows how your PhotoImpact creations will look when viewed in different Web browsers. A new URL-aware album manages both local and Web-based images. PhotoImpact's interface is customizable for your level of expertise but is mainly designed for serious Web work. For a street price of $100, you get a powerful two-CD-ROM package with 3000 photos, 450 animations, an interactive tutorial, and a 300-page manual. Ulead Systems Inc.; 800/858-5323; www.ulead.com.

READER SERVICE NO. 753

—Stan Miastkowski

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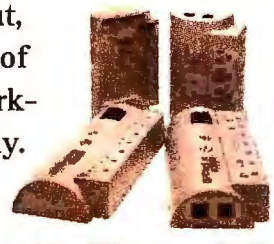

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LAN TIMES 1996

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- *NEW* 56K Capable** U.S.R. x2 WinModem
- Iomega Zip 100MB Internal Drive
- *NEW* MS Home Essentials 98 with Money 98; McAfee VirusScan
- MS Windows 95 and Internet Explorer
- *NEW* Dell Ergonomic Keyboard
- Microsoft IntelliMouse
- 3 Year Limited† Warranty with 1 Year On-site^ Service

PICTURED SYSTEM

$2499

Personal Lease: $114/Mo., 24 Mos.◊~
Order Code #501202

DELL DIMENSION XPS D233
233MHz PENTIUM II PROCESSOR FEATURING MMX TECHNOLOGY

- 32MB SDRAM Memory
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- Integrated Yamaha Wavetable Sound
- Altec Lansing ACS-90 Speakers
- *NEW* 56K Capable** U.S.R. x2 WinModem
- *NEW* MS Home Essentials 98 with Money 98; McAfee VirusScan
- MS Windows 95 and Internet Explorer
- Dell Quiet Key Keyboard
- Microsoft IntelliMouse
- 3 Year Limited† Warranty with 1 Year On-site^ Service

★ *Upgrade to 64MB SDRAM, add $149.*

$1999

Personal Lease: $92/Mo., 24 Mos.◊Ω
Order Code #501201

Sure, they disagree on the precise designation, but these authorities were unanimous about one thing: Dell's service and reliability. And why not? When it comes to their readers' surveys, we excel, scoring five "A" ratings in the six times *PC Magazine*'s reader survey has been given. And scoring "BEST" in *PC World*'s test of overall service and reliability. Then, not only did *Windows Magazine*'s reader survey rank us as "Excellent" for service and support, 92% of customers surveyed said they'd buy from Dell again. So for the peace of mind that can come from top tier service and reliability, look no further than Dell. We're certain you'll find something that agrees with you.

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Keycode #03342

MMX™ intel inside pentium® II processor

Pricing is not discountable. †For a complete copy of our Limited Warranties and Guarantees, please write Dell USA L.P., Attn: Warranties, One Dell Way, Round Rock, TX 78682. ^On-site service provided by a third-party provider. May not be available in certain remote areas. ~32X Max/14X Min. **x2 products are capable of 56Kbps downloads. Due to FCC rules that restrict power output, however, current download speeds are limited to 53Kbps. Upload speeds are limited to 33.6Kbps. Actual speeds may vary depending on line conditions. *Prices and specifications valid in the U.S. only and subject to change without notice. Articles reprinted with permission from 6/97 *PC World*, 7/97 *PC Magazine* and 8/97 *Windows Magazine*. Intel, the Intel Inside logo, Pentium and Pentium II are registered trademarks and MMX is a trademark of Intel Corporation. MS, Microsoft and Windows are registered trademarks of Microsoft Corporation. ©1997 Dell Computer Corporation. All rights reserved.

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Creative Labs' Budget 3D Board Falters in 2D

GRAPHICS CARD

GREAT PRICE, average overall performance: If you want to shell out only $129 for a board that handles both 2D and 3D graphics, you can get a nonupgradable version of Creative Labs' **Graphics Blaster Exxtreme,** which comes with 4MB of SGRAM and 3Dlabs' new Permedia 2 budget 3D chip.

But don't expect stellar performance at this bargain price. The shipping version of the Exxtreme I examined proved just adequate in our 2D tests (although it handled routine business applications without difficulty). It was also one of the slowest boards we've seen for dealing with multimedia applications.

When it comes to 3D, however, you'll almost get your money's worth—which isn't all that surprising since 3Dlabs is best known for its high-end 3D graphics chips. The Exxtreme was fast in our 3D tests; in general, the 3D games we played looked crisp, without any blockiness.

In two of our subjective game tests, the Exxtreme earned our top rating, though the board didn't handle the last game—Independence Day—nearly as well. The foreground was sharp, but the background kept flashing in lightninglike fashion, as in a severe electrical storm.

You can buy graphics boards with better 3D performance—the STB Velocity 128 with NVidia's Riva 128 chip, for example, is faster than the Exxtreme and provides even better-looking 3D in our subjective game tests. But the Velocity also costs $70 more.

The bottom line? If you stick to basic 2D tasks such as word processing, if you aren't planning to run any AVI video clips, and if you want to soar in after-hours gaming without spending a lot of money, the Graphics Blaster Exxtreme is a good alternative.

—JoAnne Robb

Graphics Blaster Exxtreme

PRO: Bargain price, above-average 3D graphics performance.

CON: Fair-to-middling 2D, downright slow in multimedia.

VALUE: A good deal for a combination 2D/3D board if you don't need top-quality 2D.

Creative Labs
800/998-1000
www.creativelabs.com
List price: $129 (nonupgradable with 4MB), $150 (upgradable with 4MB), $199 (upgradable with 8MB)

READER SERVICE NO. 754

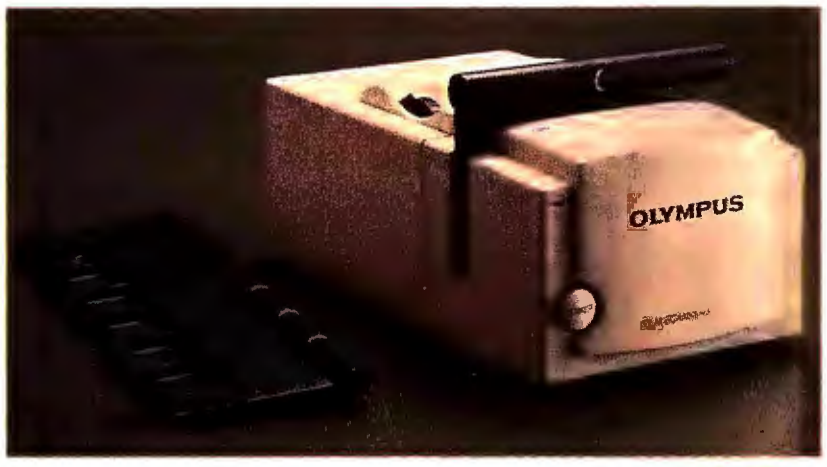
Olympus's High-Quality Slide Scanner

SCANNER

IT'S NO SECRET that scanning 35mm slides produces higher-quality images—with richer colors and more detail in shadows and highlights—than scanning photos. Slide scanners also provide higher optical resolutions than flatbed scanners with film transparency kits. But until recently even the cheapest slide scanners cost three or four times more than bargain-basement flatbed units.

Olympus America's $449 **ES-10 Film Scanner** reduces that price differential. This lightweight, shoe box–size slide scanner can digitize images from 35mm film positives and negatives; with an optional $199 adapter, it can also scan Advanced Photo System film. The ES-10 scans 24-bit images at up to 1770 dots per inch, so enlargements don't lose quality. For example, you can scan and print a slide as a 5.5-by-7-inch image.

The shipping version of the ES-10 I tested was a breeze to install via parallel port with a pass-through printer connector. The product comes with two media holders—one for mounted 35mm slides and another for 35mm negative strips up to 6 frames long—and competent software for image editing, cataloging, and slide shows. The TWAIN driver lets you control input resolution, exposure, color balance, and focus but not tonal range (shadows, midtones, and highlights) during a scan. Although most of the scans I produced looked fine, shots made in low light or deep shadows didn't scan as well as brightly lit compositions.



NO-SWEAT "BOARDLESS" SCANNER: The Olympus ES-10 is the first 35mm film scanner to offer a painless parallel port connection.

The ES-10 is an excellent choice for business and home users who want great-looking images for publications, presentations, and Web pages. Hewlett-Packard's competing $499 PhotoSmart Photo Scanner offers slightly better scanning specifications (30-bit color at up to 2400 dpi) and can also scan prints. But it requires installation of an adapter card, so it's more difficult to share with other PCs in an office or to take home for the weekend.

—Richard Jantz ▶

ES-10 Film Scanner

PRO: Inexpensive route to high-resolution images, simple parallel port connection.

CON: Can't control shadows, midtones, and highlights during scan.

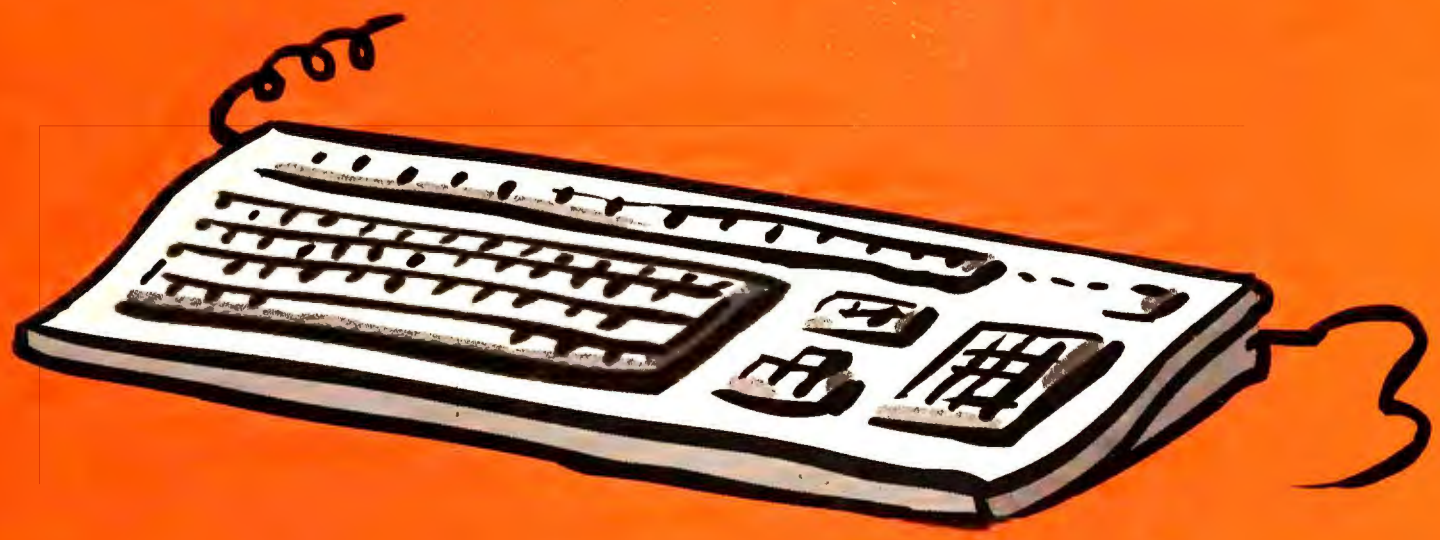
VALUE: Easiest slide scanner installation you'll find.

Olympus America Inc.
800/347-4027
www.olympus.com
Street price: $449

READER SERVICE NO. 755

RICOH
Image Communication

It doesn't look like a copier.



Well, guess what?

How many times a day do you see someone print out a document and then carry it over to the copier? If you had an Aficio system from Ricoh the answer would be zero. You can connect it to multiple workstations, giving everyone the additional flexibility they need.

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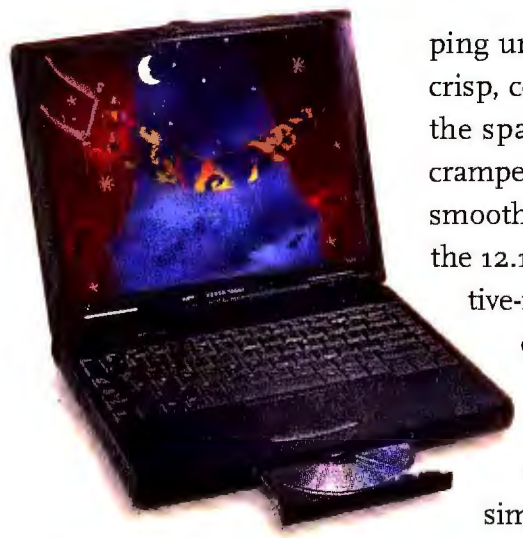
For more information about the Aficio series, contact 1-800-63-RICOH or visit our home page at www.ricoh-usa.com

Circle 204 on reader service card

NEC Versa's Bearable Lightness of Being

NOTEBOOK

IT'S CHEAP, good-looking, and thin. No, it's not your dream date—it's NEC's new **Versa 5060** multimedia notebook. Packed for the road with its 20X (maximum) CD-ROM drive, 1.44MB floppy drive, and AC adapter, the Versa 5060 tips the scales at just 7 pounds, compared to an average of close to 9 pounds for other Pentium MMX-166 portables. And if you like your notebook sandwich-thin, you'll appreciate the Versa's 1.5-inch thickness. While it's not a power user's dream, the Versa 5060's street price of $2799 is about $700 below what you'd shell out for a similarly configured portable from Compaq.



DECENT DEAL: The Versa 5060 costs just $2799.

The keyboard of our shipping unit had wide keys and crisp, comfortable action, but the spacebar was small and cramped. The touchpad had a smooth floating motion, and the 12.1-inch 800 by 600 active-matrix screen was adequate. The Versa's PC WorldBench score of 188 was about 5 percent below average for similarly configured notebooks, although you probably wouldn't notice the performance difference with most business applications.

Other drawbacks: The 5060 doesn't ship with a modem, and its software bundle is skimpy—there are no office suites or productivity applications. Finally, the 1.6GB hard disk is on the small side for this configuration.

Still, the Versa 5060 is a good deal for anyone who wants a light, skinny, full-size notebook at a good price.

—Mick Lockey

Versa 5060

PRO: Inexpensive, slim, lightweight.

CON: Below-average performance, no modem, small hard disk.

VALUE: Solid multimedia portable on a budget.

NEC Computer Systems
800/863-2669
www.necnow.com
Street price: $2799

READER SERVICE NO. 756

Amity CN: Mininotebook, Maxi Power

MININOTEBOOK

MITSUBISHI'S NEW **Amity CN** is cute. This mininotebook PC weighs a scant 2.4 pounds and is only 1.3 inches thick, but its 9.3-by-6.7-inch chassis houses a 133-MHz Pentium processor, 16MB of RAM, a 1.2GB hard drive, two Type II PC Card slots, Sound Blaster–compatible audio, an eraserhead pointing device, an external floppy drive, and just about all the features we've come to expect in a larger Windows 95 portable. This bantam beauty lists for $1995, about the price of a budget notebook. But unlike a regular notebook, the Amity can be toted with ease. And you can almoost type onb it.

PETITE PENTIUM-133: The $1995 Amity CN packs most Windows 95 features into a 2.4-pound form.

Because the Amity CN is so cute, I'm more forgiving of the flaws in its usability—for example, its short battery life. The shipping unit I examined worked for only about an hour before emitting that smoke detector–like beep warning me to sign off. An optional external lithium ion battery that clips to the back of the machine let me work several hours more but also made the Amity 1.6 pounds heavier. Even more annoying, when I plugged in the AC adapter, a red light below the screen flashed until the battery was recharged. And I could almost tyype on it.

The 7.5-inch Diamond Fine Passive LCD screen is best at 640 by 480 but can simulate higher resolutions with an included utility. However, there is no keystroke command to toggle between the LCD and an external display. And you cann almostt tyype on it.

The Amity CN's 83-key keyboard is certainly much better than that of the Toshiba Libretto, a similarly priced mininotebook. The Amity offers better pitch (space between keys) but will still cause problems if you have large fingers. The minuscule <Delete> key's unfortunate location above the <Backspace> key could lead to data loss for the unwary.

Still, the Amity CN represents an admirable advance in mini-PC technology. If you want a notebook that's a Weight Watchers graduate, this system is the way to go.

—Michael S. Lasky ▶

Amity CN

PRO: Full notebook power in a small, lightweight case.

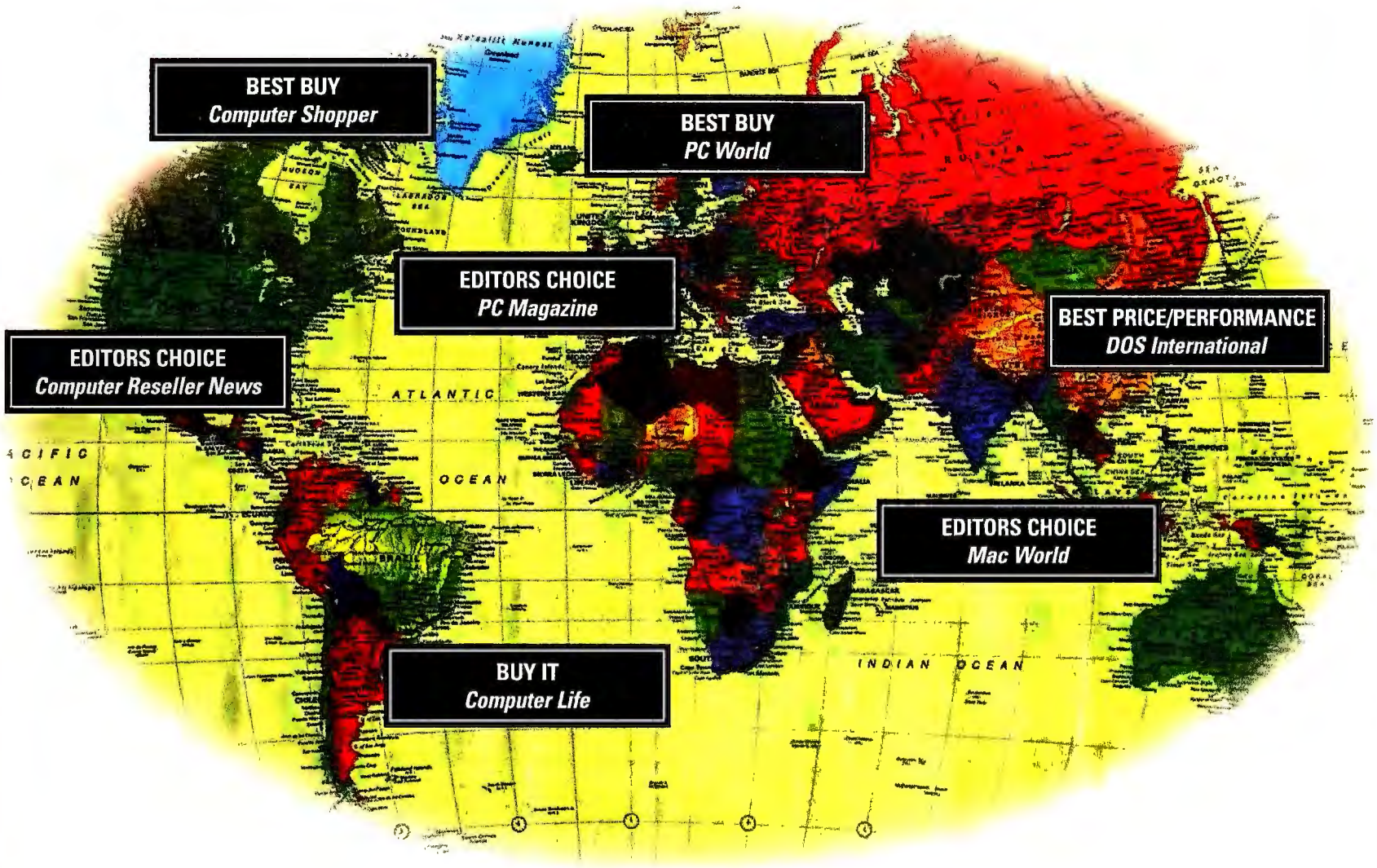
CON: Cramped keyboard can lead to frequent typos.

VALUE: A winner for users who need a PC with minimal bulk and weight.

Mitsubishi Electronics
888/445-5250
www.mitsubishi.com/mobile
List price: $1995

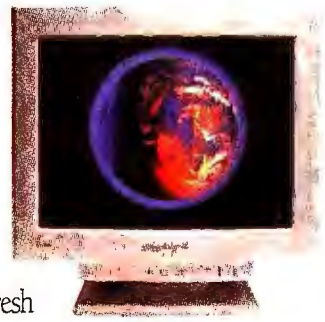
READER SERVICE NO. 757

THE BEST MONITORS ON THE PLANET, AT DOWN-TO-EARTH PRICES.



See For Yourself Why The Experts Choose iiyama.

Leading editors, tech authorities, and independent labs around the world have one thing in common: they consistently award iiyama's line of VisionMaster monitors such prestigious titles as Editors Choice, Best Price/Performance, and Expert Pick. In fact, they've done it 96 times. They've noted the line's sleek, compact designs, leaving more room on the desktop. They've commented on their high resolution and blazing fast refresh rates that make it easier than ever to work. They've raved about their easy-to-use on-screen controls. And they've praised iiyama's full 3-year parts and labor warranty – the best in the business. You'd think such high caliber products would merit equally high price tags.



$698 CSP
MT-9017E

Selected models from our complete product line				
Model/ Viewable Area	Dot Pitch Horiz. Scan	Max. Horiz. Scan Rate	Refresh Rate	ESP
21" MT-9021E (19.5" vis)	.30mm Aperture Grille	94 kHz	76 Hz (1600 x 1200)	$1,539
17" MT-9017E (16" vis)	.25mm Aperture Grille	92 kHz	72 Hz (1600 x 1200)	$698

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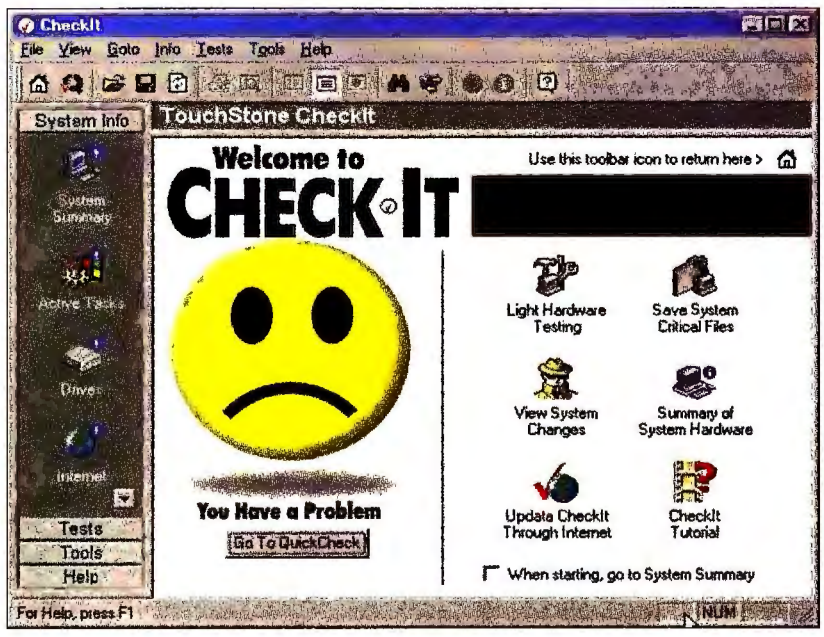
Circle 108 on reader service card

New CheckIt Doesn't Quite Check Out

DIAGNOSTICS

THE FIRST TIME I loaded my prerelease copy of **CheckIt 5.0 for Windows 95**—the latest version of Touchstone's well-established diagnostic program—I saw a frowney face on my screen, and the warning 'You have a problem'. But what was the problem? I had to look for it—not an arduous task, but one I shouldn't have had to tackle in the first place.

That's basically the story with CheckIt. If you need detailed diagnostics and you're technical enough to understand them, it's a good program. But everything is more difficult than it should be. For instance, if you set the toolbar to System Info (the default) and click the Drives icon, you get information about your hard drive. But there's no obvious way to get from there to a test. While my beta copy had no documentation or tutorial, you shouldn't need either for such basic navigation.



ACCEPT THE FROWN AS A FRIENDLY WARNING: Touchstone's CheckIt 5.0 makes every diagnostic step a challenge.

The diagnostics themselves are thorough and, for the most part, correct (I found one small inaccuracy). CheckIt's video tests are excellent, displaying screens designed to help you spot problems. But technical details are not always fully explained.

The CheckIt Professional Edition, which costs twice as much as the basic $50 version, comes with a year of online upgrades and PC-cillin Anti-Virus. If you often work with the insides of computers, CheckIt is worth the price—and the learning curve. For the average user, though, it's more trouble than it's worth.

—Lincoln Spector

CheckIt 5.0 for Windows 95

PRO: Very thorough diagnostics, especially for video.

CON: User interface is too difficult, technical details are not always explained.

VALUE: A good tool for the technically savvy.

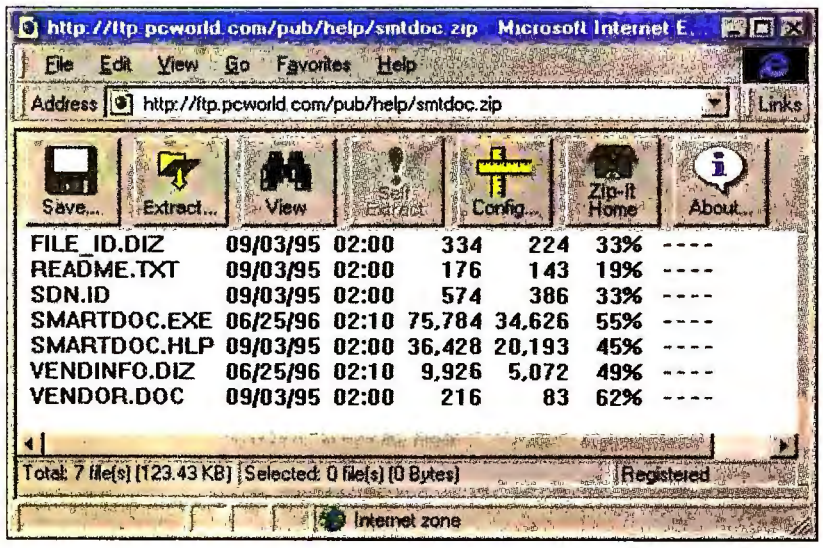
Touchstone Software Corp.
714/969-7746
www.touchstonesoftware.com
Street price: $50, Professional Edition $100

READER SERVICE NO. 758

Quarterdeck's Handy Web Unzipper

UTILITY

QUARTERDECK'S **Zip-It 4.0** isn't the only file-compression plug-in for Netscape Navigator or Microsoft Internet Explorer, but it handles the job better than any other. Click a .zip archive file in your browser, and this $40 utility downloads the archive, then displays a list of the compressed files in your browser window. You can view or uncompress individual files, or save the archive.



BROWSE YOUR ARCHIVE: Zip-It integrates with your Web browser to let you check out .zip files before saving them to your hard disk.

Otherwise, Zip-It 4.0 is an adequate but unexceptional compression utility. You can filter an archive's file list (so that, for instance, only .txt files are displayed) and look at more than one archive at a time. Drag-and-drop abilities are limited, though; you can compress a file by dragging it to an open Zip-It window, but not to a closed archive.

Zip-It's search feature can scan multiple archives, but only for names of compressed files or the archive's comment field. (You can, however, use standard wild card characters.) Now, if it could search for text within the compressed files, that would be something.

Still, if you need a .zip file manager and you download a lot of archives off the Web, Zip-It 4.0 is a worthy option.

—Lincoln Spector ▶

Zip-It 4.0

PRO: Terrific browser plug-in for downloading .zip files.

CON: Limited drag-and-drop and search functions.

VALUE: Great for managing Internet downloads.

Quarterdeck
800/683-6696
www.quarterdeck.com
Street price: $40

READER SERVICE NO. 759

Wouldn't it be great to have a full-time tech expert in your PC, alerting you to possible problems before they happen?

(Comforting thought, isn't it?) At Quantex, we've taken "support" to new heights. Working hand in hand with Intel and utilizing their LANDesk® Client Manager Technology (LDCM), we've made it possible for businesses of all sizes to monitor the health of their individual PCs. We've customized this technology to continuously check hardware conditions and visually warn users of potential problems. By catching a problem before it becomes a hazard, there's no costly downtime. No lost productivity. And no worries. To learn more about how our PC Health Monitoring and Support can help your business, visit our web site at www.quantex.com or call one of our system consultants.

MMX™ intel inside pentium® II PROCESSOR

We're getting down

Technology

Taking business to new heights

In today's fast-paced business world, the right tools are essential for keeping a competitive edge. Fortunately, we maintain strategic alliances with industry leaders like Intel and Microsoft which enable us to quickly bring the latest technology to our customers. Features such as the super-fast 300MHz Pentium® II processor take our business desktops to a higher level of computing. Enhancements like AGP graphics, Ultra-DMA hard drives, and PC Health Monitoring and Support based on LDCM dramatically boost our systems' performance and reliability. And, compatibility is never an issue with our line of Network-ready, 3COM-certified desktops. Need we say more? Simply put, if it's cutting edge, you'll find it at Quantex.

Reliability

Instilling a sense of security

When businesses choose Quantex, they benefit from the rock-solid reliability that comes with every high-end desktop we sell. Perfectly suited for the business environment, all of our solutions are customized to deliver top notch security and performance. With name-brand components and the stability of Microsoft's Windows NT operating system, reliability comes "built in." In fact, a recent customer survey conducted by *PC World* magazine (11/97) discovered that respondents rank Quantex at the top, with a rating of "**Good**" in the system reliability category.

Flexibility

Working within your budget

Quantex's commitment to business customers extends well beyond our competitive prices. Our flexible sales model lets you customize PCs to perfectly fit your needs, workspace and budget. We offer financing options such as leasing, that enable you to purchase the advanced technology you need at prices and terms you can afford. In addition, we offer various renewal and purchase options at the end of your lease term. You can also take advantage of the Quantex extended warranty program. Specifically created to protect PCs for up to 3 additional years, it brings added security to your investment.

to business

Support

Backing you 100% of the time

Quantex is proud to offer one of the most comprehensive service and support packages in the industry. From pre-sale consulting to post-sale assistance, we're behind you every step of the way. It all begins when our business consultants work with you to evaluate system needs and help you make an informed purchasing decision. And as expected, we fully back all products with a complete warranty and service program created specifically for business customers. Such thorough dedication on our part is clearly recognized by our customers. In a recent technical support survey, we scored a rating of "**Excellent**" for our ability to handle technical problems quickly and inexpensively.

Awards

Winning constant praise

Time and time again, our PCs come out on top. Just look at all of the awards we've received for product excellence. They include numerous "**Best Buy**", "**5 Star Excellence**", "**A-List**", "**Excellent Overall Ranking**", "**WinList**", "**Win 100**" and "**Buy It**" recommendations from some of the industry's most respected trade publications. In fact, in the past two months alone, *PC World* awarded 4 Quantex PCs the highly acclaimed "**Best Buy**" in the budget and power desktop categories. And *PC Magazine* (10/97) bestowed an "**Honorable Mention**" on our H-Series Notebooks. There's no doubt about it - professionals who really know PCs just can't help giving Quantex their seals of approval.

Would you buy again?

VENDOR	% WHO WOULD BUY THE SAME BRAND
Dell	92%
Quantex	**91%**
Hewlett-Packard	89%
IBM	89%
Micron	81%
Gateway	80%
Acer	74%
AST	74%
NEC	71%
AT& T	69%
Digital	69%
Toshiba	61%
Compaq	58%
Packard Bell	51%

Overall rankings

PC VENDOR	GRADE
Quantex	Excellent
Dell	
Hewlett-Packard	
IBM	
Compaq	Good
Gateway 2000	
Micron	
NEC	
Acer	Fair
AST	
Toshiba	
AT& T	Poor
Digital	
Packard Bell	

Windows Magazine, 8/97

Editor's choice

QP5/233 M-3

PC Magazine (U.K.) 12/97

Vendor rating

System Reliability - "good"

Support Quality/policies - "good/best"

PC World 11/97

Quantex

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In the office or on the road,

Get the job done...

At Quantex, we take great measures to ensure that our desktops meet all the high performance, reliability and security standards that today's business market demands. We build our desktops on a virtually "crashproof" NT platform, and include technology advanced enough to handle everything your business can throw at them. Bundled with tools to maximize efficiency, these desktops are guaranteed to take workgroup productivity to new heights. Create your very own web pages, evaluate your financial performance, and even generate exciting, professional-looking marketing materials- now, you're really in business.

The incorporation of Windows NT, Microsoft's recommended operating system for businesses of all sizes, brings increased scalability and multitasking capabilities to our line of business desktops. In addition, it enables you to run every 32-bit business and entertainment application up to 24% faster than Windows 95. Combine this with the ultra-fast performance of the Pentium® II proccessor, and these machines give you the power to move your business into the future. In addition, we back all of our desktops with the Quantex premier service package that includes a comprehensive warranty program, around the clock technical support, advanced PC Health Monitoring, On-Site service, and business consulting. In other words, we take our relationship with your business very seriously, so you'll never be left out in the cold.

QP6/300 SB-4 $2699
(featuring Pentium® II processor)

Business lease: $94/Mo.

- 300MHz Pentium® II Processor
- Intel 440LX PCI Chipset / DMI 2.0
- 2 Universal Serial Bus (USB) Ports
- 64MB SDRAM Memory / 512KB Pipeline Burst Cache
- 8.4GB Ultra-DMA HD / 3.5" 1.44MB Floppy Drive
- 128-bit "Riva 128" 3D AGP Graphics Card with 4MB SGRAM
- 17" Digital Monitor (16.1" viewable)
- K56flex protocol Fax/Modem
- 32X Max EIDE CD-ROM Drive
- ATX Case
- 104-Key Keyboard with MS IntelliMouse
- **MS Windows NT 4.0 Workstation**
- **MS Office '97 Small Business Edition**
- 3-year limited warranty, 24-hr./7-day Technical Support
- **Quantex PC Health Monitoring & Support based on LDCM**

QP6/233 SB-4(featuring Pentium® II Processor). .$2349
QP6/266 SB-4(featuring Pentium® II Processor). .$2499

Microsoft Office 97 Small Business Edition (SBE)

- Word 97
- Excel 97
- Outlook 97
- Publisher 97
- Small Business Financial Manager 97
- Automap Streets Plus

we give you the tools for success

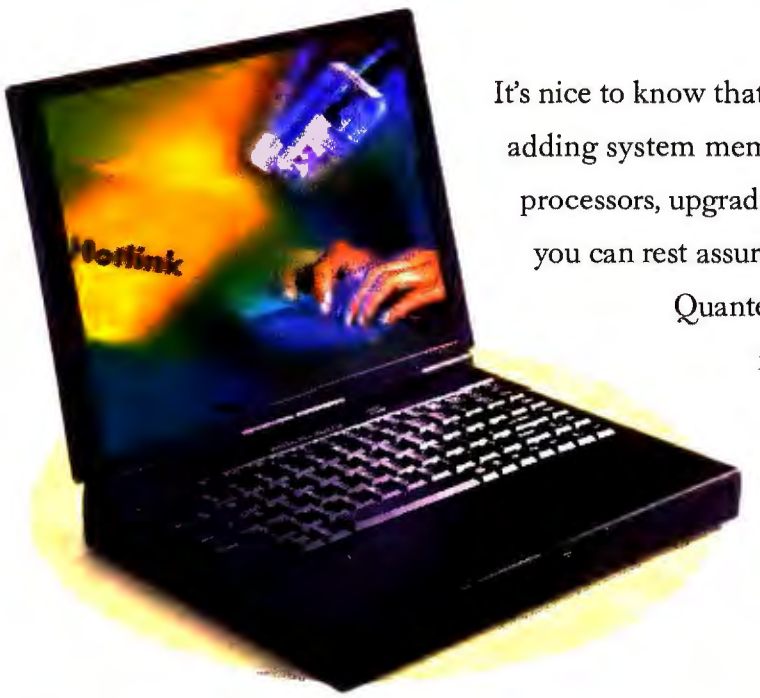
...or just take it with you!

If your business is looking for portable computing power, take a look at the new H-Series Notebooks. These slim, lightweight notebooks offer the perfect combination of performance, flexibility, and upgradability. Take command of your most intensive business applications with the unmatched processing speed of the 233MHz Pentium processor with MMX Technology. Enjoy the luxury of the huge 13.3" XGA Active Matrix display, 4GB Hard Drive, 56K PCMCIA modem, and 2 long-lasting smart Lithium-Ion batteries, all of which make our notebooks perfect for business on the go. Simultaneous access to all modular components including your CD-ROM, hard drive, and floppy drive, provides added functionality along with the ability to do things faster and more conveniently. Plus, we're giving you the perfect desktop replacement solution by including a mini-docking station with select notebook models.

Quantex H 1331 $4199

Business lease: $136/Mo.

- 233MHz Pentium® Processor w/MMX™ Technology
- Intel Mobile Module (I.M.M.) Architecture
- 13.3" XGA Active Matrix Display
- 64MB SDRAM(expandable to 144MB)
- 512KB Pipelined Burst Cache
- 4GB HD / 3.5" 1.44MB Modular Floppy Drive
- PCMCIA K56flex™ protocol Fax/Modem
- 20X Max Modular CD-ROM Drive
- PCI Bus with 128-bit graphics accelerator
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- 2nd Lithium Ion Battery
- Mini-Docking Station
- USB and Fast IR Ports
- Integrated Personal Touchpad
- MS Windows '95
- MS Office '97 SBE
- Carrying Case
- 24-hr./7-day Technical Support
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components



It's nice to know that as your business grows, so can your notebook. Whether you're adding system memory (max. 144MB), or anticipating future mobile Pentium processors, upgrading is not only possible, it's strikingly simple. And no matter what, you can rest assured your business will receive premium service and support from Quantex. From anywhere, access our 24-hour Technical Support Hotlines for friendly, knowledgable assistance. Your investment is also protected by a 3-year limited warranty on the processor and main memory, and 1-year parts and labor limited warranty on all other components. So why wait any longer to mobilize? Give us a call and let our system consultants help you find the perfect, portable business solution.

MMX™ intel inside pentium® II PROCESSOR

PC Magazine "Honorable Mention" (10/07/97)

"...a great choice if you want a 233MHz (Pentium processor w/MMX technology) notebook but don't want to break the bank in the process"

Windows Sources "Power User's Bargain" 11/97)

"All in all, Quantex's H-Series is an excellent entry into the power-user segment of the notebook market...it offers the best deal we've seen on a 13.3-inch XGA screen."

QUANTEX

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Dollar for dollar, Spec for spec, you won't find a better deal.

Business Desktops

QP6/266 SB-3
(featuring Pentium® II processor) **$2249**

Business lease: 78/Ma.

- 266MHz Pentium® II Processor
- Intel 440LX PCI Chipset / DMI 2.0
- 2 Universal Seriel Bus (USB) Ports
- 64MB SDRAM Memory / 512KB Secondary Cache
- 4.3GB Ultra DMA HD / 3.5" 1.44MB Floppy Drive
- 128-bit "Riva 128" 3D AGP Graphics Card with 4MB SGRAM
- 17" Digital Monitor (16" viewable)
- 3COM PCI Fast Etherlink XL10/100 Combo NIC
- 24X Max EIDE CD-RDM Drive
- ATX Case
- 104-Key Keyboard with MS Mouse
- MS Windows NT 4.0 Workstation
- 3-year limited warranty, 24-hr./7-day Technical Support
- Duantex PC Health Monitoring & Support based on LDCM

QP6/233 SB-3 (featuring Pentium® II Processor). .$2099
QP6/300 SB-3 (featuring Pentium® II Processor). .$2449

QP5/233 SB-2
(with MMX™ Technology) **$1799**

Business lease: 63/Ma.

- 233MHz Pentium® Processor with MMX Technology
- 2 Universal Serial Bus (USB) Ports / DMI 2.0
- 32MB EDO Memory / 512KB Pipeline Burst Cache
- 4.3GB Ultra DMA HD / 3.5" 1.44MB Floppy Drive
- STB Nitro 3D with 4MB SGRAM
- 17" Digital Monitor (16" viewable)
- K56flex protocol Fax/Modem
- 24X Max EIDE CD-RDM Drive
- Duantex Tower Case
- 104-Key Keyboard with MS IntelliMouse
- MS Windows 95 with MS Plus
- MS Office '97 Small Business Edition
- 3-year limited warranty, 24-hr./7-day Technical Support
- Quantex PC Health Monitoring & Support based on LDCM

QP5/166 SB-2 (with MMX™ Technology). .$1599
QP5/200 SB-2 (with MMX™ Technology). .$1699

QP5/166 SB-1
(with MMX™ Technology) **$1199**

Business lease: 42/Ma.

- 166MHz Pentium® Processor with MMX Technology
- 2 Universal Serial Bus (USB) Ports / OMI 2.0
- 16MB EDO Memory / 512KB Pipeline Burst Cache
- 2.1GB EIDE Mode 4 HD / 3.5" 1.44MB Floppy Drive
- STB Nitro 3D with 4MB SGRAM
- 15" Digital Monitor (14.0" viewable)
- 3COM PCI Fast Etherlink XL10/100 Combo NIC
- 24X Max EIDE CD-RDM Drive
- Duantex Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 95 with MS Plus
- 3-year limited warranty, 24-hr./7-day Technical Support
- Quantex PC Health Monitoring & Support based on LDCM

QP5/200 SB-1 (with MMX™ Technology). .$1299
QP5/233 SB-1 (with MMX™ Technology). .$1399

H-Series Notebooks

Options: Mini-Docking Station...$169.00 • 2nd Lithium Ion Battery...$169.00 • PCMCIA NIC...$129.00 • Deluxe Carrying case...$99.00

Quantex H 1330
(with MMX™ Technology) **$3599**

Business lease: 117/Ma.

- 233MHz Pentium® processor with MMX Technology
- Intel mobile Module (I.M.M.) Architecture
- 13.3" XGA Active Matrix Display
- 48MB SDRAM (expandable to 144MB) / 512KB Secondary Cache
- 3GB HD / 3.5" 1.44MB Modular Floppy Drive
- PCMCIA K56flex protocol Fax/Modem
- 20X Modular CD-RDM Drive
- PCI Bus with 128-bit graphics accelerator
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- USB and Fast IR Ports
- Integrated Personal Touchpad
- MS Windows 95
- Carrying Case

Quantex H 1211
(with MMX™ Technology) **$3099**

Business lease: 101/Ma.

- 233MHz Pentium® processor with MMX Technology
- Intel mobile Module (I.M.M.) Architecture
- 12.1" XGA Active Matrix Display
- 32MB SDRAM (expandable to 144MB) / 512KB Secondary Cache
- 3GB HD / 3.5" 1.44MB Modular Floppy Drive
- PCMCIA K56flex protocol Fax/Modem
- 20X Modular CD-RDM Drive
- PCI Bus with 128-bit graphics accelerator
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- USB and Fast IR Ports
- Integrated Personal Touchpad
- MS Windows 95
- Carrying Case

Quantex H 1210
(with MMX™ Technology) **$2799**

Business lease: 98/Ma.

- 200MHz Pentium® processor with MMX Technology
- Intel mobile Module (I.M.M.) Architecture
- 12.1" XGA Active Matrix Display
- 32MB SDRAM (expandable to 144MB) / 512KB Secondary Cache
- 2GB HD / 3.5" 1.44MB Modular Floppy Drive
- PCMCIA K56flex protocol Fax/Modem
- 20X Modular CD-RDM Drive
- PCI Bus with 128-bit graphics accelerator
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- USB and Fast IR Ports
- Integrated Personal Touchpad
- MS Windows 95
- Carrying Case

H 1210 w/166MHz Pentium processor w/MMX technology...$2599

Multimedia Systems

Software: Corel Office Suite • MS Money '97 • Compton's Interactive Encyclopedia • Key Master Maps • Body Works 6.0 • Amazon Trail II American Heritage Talking Dictionary • Internet the City • Compton's Reference Collection • Dr. Solomons Anti-Virus • ADL, CompuServe and Prodigy

QP6/300 M-4x
(featuring Pentium® II processor) **$2499**

Lease: 87/Ma.

- 300MHz Pentium® II Processor
- Intel 440LX PCI Chipset
- 2 Universal Serial Bus (USB) Ports
- 64MB SDRAM Memory / 512KB Secondary Cache
- 6.4GB Ultra DMA HD / 3.5" 1.44MB Floppy Drive
- Intel Video Phone Ready
- 3D Labs Permedia 2 AGP Graphics w/8MB SGRAM
- 17" Digital Monitor (16" viewable)
- K56flex protocol Fax/Modem w/Voice Mail and Speakerphone
- 32X Max EIDE CD-ROM Drive
- Ensoniq 32-Bit Wavetable Sound Card
- Altec-Lansing ACS-45 Speakers w/subwoofer
- ATX Case
- 104-Key Keyboard with MS Mouse
- MS Windows '95 with MS Plus!
- Value Multimedia Software Bundle
- 3-year limited warranty, 24-hr./7-day Technical Support
- Duantex PC Health Monitoring & Support based on LDCM

QP6/233 M-4x (featuring Pentium® II Processor). .$2199
QP6/266 M-4x (featuring Pentium® II Processor). .$2299

QP6/233 M-3x
(featuring Pentium® II processor) **$1999**

Business lease: 70/Ma.

- 233MHz Pentium® II Processor
- Intel 440LX PCI Chipset
- 2 Universal Serial Bus (USB) Ports
- 32MB SDRAM Memory / 512KB Secondary Cache
- 6.4GB Ultra DMA HD / 3.5" 1.44MB Floppy Drive
- Intel Video Phone Ready
- 64-bit 3D AGP Graphics w/4MB SGRAM
- 17" Digital Monitor (16" viewable)
- K56flex protocol Fax/Modem w/Voice Mail and Speakerphone
- 32X Max EIDE CD-ROM Drive
- Ensoniq 32-Bit Wavetable Sound Card
- Altec-Lansing ACS-45 Speakers w/subwoofer
- ATX Case
- 104-Key Keyboard with MS Mouse
- MS Windows '95 with MS Plus!
- Value Multimedia Software Bundle
- 3-year limited warranty, 24-hr./7-day Technical Support
- Duantex PC Health Monitoring & Support based on LDCM

QP6/266 M-3x (featuring Pentium® II Processor). .$2149
QP6/300 M-3x (featuring Pentium® II Processor). .$2349

QP5/166 M-2
(with MMX™ Technology) **$1549**

Business lease: 54/Ma.

- 166MHz Pentium® Processor with MMX Technology
- 2 Universal Serial Bus (USB) Ports
- 32MB EDO Memory / 512KB Pipelined Burst Cache
- 4.3GB EIDE Mode 4 HD / 3.5" 1.44MB Floppy Drive
- Intel Video Phone Ready
- STB Nitro 3D w/4MB SGRAM
- 17" Digital Monitor (16" viewable)
- K56flex protocol Fax/Modem w/Voice Mail and Speakerphone
- 24X Max EIDE CD-RDM Drive
- Ensoniq 32-Bit Wavetable Sound Card
- Altec-Lansing ACS-90 Speakers
- Duantex Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows '95 with MS Plus!
- Value Multimedia Software Bundle
- 3-year limited warranty, 24-hr./7-day Technical Support
- Duantex PC Health Monitoring & Support based on LDCM

QP5/200 M-2 (with MMX Technology). .$1649
QP5/233 M-2 (with MMX Technology). .$1749

MMX™ intel inside pentium® PROCESSOR

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ViaVoice Proves That Talk Can Be Cheap

DICTATION

BIG BLUE MAY have lost the race to be first with a natural-speech product for the desktop, but its entry's aggressive pricing point may help make up for lost time.

The $99 **ViaVoice** not only recognizes your words expertly as you say them, but it also works with Microsoft Word—one of the most widely used word processors around. ViaVoice's chief competitor, Dragon Systems' NaturallySpeaking, costs at least $170 for a version with Word support. Like NaturallySpeaking, ViaVoice also has its own word processor. Called SpeakPad, it both takes dictation and reads it back, a feature previously found only in much more expensive packages.

I found a shipping copy of ViaVoice as accurate as its competitor—it recognized 90 to 95 percent of what I said—but it lacked NaturallySpeaking's editing elegance. With the Dragon product it's easier to navigate and correct mistakes using speech alone. NaturallySpeaking also lets you execute commands from the menu bar, something you can't do with ViaVoice.

The IBM product's hardware requirements are also heftier. It needs a Pentium-166 or Pentium MMX-150 processor (compared to a P-133 for NaturallySpeaking), and it eats up over 100MB of hard disk space—40MB more than the Dragon package. I spent 3 hours training ViaVoice to recognize my regional accent; NaturallySpeaking needed only about 40 minutes.

Nevertheless, by cracking the $100 barrier ViaVoice has freed natural-speech dictation software from its historical niche—upscale professionals who don't want to type, and people who can't type because of repetitive strain or other physical problems—and made it affordable to the general typing-challenged population. IBM will help promote the product by including a version that works with WordPro 97 with every copy of Lotus Development's SmartSuite shipped in 1998.

—John P. Mello Jr.

ViaVoice

PRO: Inexpensive, works with Microsoft Word.

CON: Hefty system requirements, navigation could be easier.

VALUE: Excellent natural-speech recognition at an affordable price.

International Business Machines
800/426-3333
www.ibm.com/viavoice
Street price: $99

IBM's Joystick Mouse

POINTING DEVICE

IBM'S NEW **ScrollPoint Mouse** is distinguished by its "mouse stick"—a miniature joystick, located between the regular mouse buttons, that lets you move within a document without having to use the scroll bars. It works a little like the wheel on Microsoft's IntelliMouse and several other new mice, except the ScrollPoint lets you move horizontally as well as vertically, and it will keep scrolling as long as you tug on the stick.

ERASERHEAD: Notebook lovers might appreciate IBM's new ScrollPoint Mouse.

But except for the ability to move sideways, this nubby stick doesn't add much to a desktop PC—it originated, after all, as a compromise for mouse-deprived laptops. The mouse stick gives no tactile or auditory cues, it's too awkward for gaming, and gripping the device tightly enough to wiggle the stick makes clicking the buttons hard to avoid. The ScrollPoint Mouse also requires a PS/2 port.

The best thing about the ScrollPoint is the bundled Logitech MouseWare utility, which lets you program the buttons and the stick to double-click automatically, maximize or minimize applications, open the Start Menu, and more. The program isn't sold by itself, but it comes bundled in many other mouse packages.

You may find the ScrollPoint Mouse worth its $60 street price if you do a lot of horizontal scrolling—for example, through long spreadsheets. You may also like it if you're comfortable using IBM's ThinkPad, Toshiba's Satellite Pro, or other notebooks with eraserhead pointing devices. Otherwise, there are better—and less expensive—ergonomic choices.

—Dan Littman ▶

ScrollPoint Mouse

PRO: Scrolls sideways or up and down, has Logitech's MouseWare.

CON: Using the mouse stick can be tricky, requires PS/2 port.

VALUE: Should appeal to only a small subset of users.

IBM Consumer Division
800/426-7235
www.us.pc.ibm.com/ibmhome/scrollpoint/
Street price: $60

QUICK TAKES

Burn That Funky Music

WITH PRICES NOW below $500, CD-Recordable drives are ideal for backups and archiving. While the drives can also write audio discs, most CD-writing software lacks total support for the audio CD "Red Book" standard—essential for musicians and sound pros creating duplication masters.

Sonic Foundry's **CD Architect** is an audio CD specialist that supports most popular CD-R drives. You drag audio clips within a timeline display to specify their track order; sophisticated editing and processing commands enable fine-tuning. With a list price of $395, the program isn't for casual users, who should consider Adaptec's $99 Easy CD Creator. CD Architect is a professional tool and the best way to burn audio CD masters under both Windows 95 and NT. Sonic Foundry; 608/256-3133; www.sonicfoundry.com.

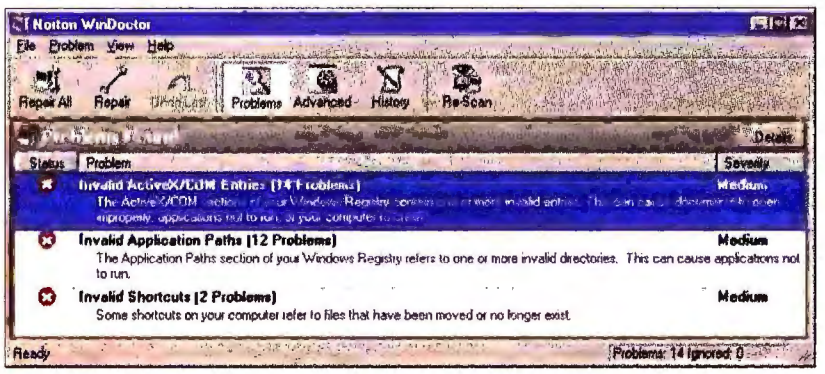
READER SERVICE NO. 760

—Jim Heid

Norton Utilities 3.0 Delivers Smarter PC Tools

U T I L I T Y

SINCE ITS 1982 debut, Symantec's Norton Utilities has become an essential software tool kit for monitoring and improving PC performance. Now, facing stiff competition from Helix's capable, feature-filled Nuts & Bolts, Symantec has extended and improved the latest version. **Norton Utilities 3.0 for Windows** maintains its stature as a comprehensive set of utilities for power users.



PROBLEM SOLVER: WinDoctor, a new feature of Norton Utilities 3.0, performs a comprehensive diagnosis of your PC.

In the prerelease version I examined, familiar components sported a cleaner, easier-to-interpret interface along with useful new features. For example, the Speed Disk defragmenter now optimizes the placement of files on your PC's hard disk based on how often they're used. Speed Disk didn't improve performance on my relatively new PC—which has a huge and mostly empty hard drive—but it should make a significant difference for older, more fragmented drives that are filled close to capacity. Norton's System Doctor can continuously monitor nearly 80 different conditions, yet it uses fewer resources than the previous edition, making it both more effective and less intrusive.

The formerly optional Norton CrashGuard is now an integral part of the program. Designed to let you recover from system crashes without having to reset your PC (and lose your work), CrashGuard 3.0 includes a new Anti-Freeze utility for dealing with complete lockups. Still, CrashGuard cannot always prevent a Windows 95 crash.

Also new to the package is WinDoctor, a wizard-based diagnostic utility that ferrets out problems with system files, applications, and the Windows Registry. WinDoctor found a raft of problems with my PC, then let me choose between automatic and manual fixes. You can also improve performance by tweaking various system parameters—compacting the Registry, for example, or optimizing the Windows 95 swap file. LiveUpdate Pro, a new feature that wasn't available in the prerelease software, promises to download updated hardware and software drivers from the Web automatically, much in the way that CyberMedia's Oil Change utility can do.

Overall, Norton Utilities 3.0 excels at optimizing your PC, as well as detecting and fixing a wide variety of problems. However, as with all serious utility packages, using Norton Utilities takes time and commitment—not to mention enough disk space for the complete installation, which consumes nearly 50MB.

At a $79 street price, Norton Utilities 3.0 doesn't have the array of features you get for $20 less with Nuts & Bolts (there's no encryption, for instance). But Norton Utilities tends to be more thorough in the tasks it does perform. Some examples: Norton monitors more system parameters, and unlike Nuts & Bolts, it factors file usage into its disk-optimization process and offers low-level diagnostics.

In short, Norton Utilities is still the package of choice for experienced users who want to keep close tabs on their PCs and do some serious performance tweaking.

—Stan Miastkowski ▶

Norton Utilities 3.0 for Windows 95

PRO: Excels at fine-tuning and optimizing PCs.

CON: Big and complex; fewer components than Nuts & Bolts.

VALUE: Still the leader in utility tool kits for serious users.

Symantec
800/441-7234
www.symantec.com
Street price: $79

READER SERVICE NO. 761

PACKED TOOL KIT: Norton Utilities 3.0 offers an improved interface as well as a more capable group of essential programs for power users.

QUICK TAKES

Share Your System

WANT TO LET SOMEONE else use your PC at the same time you do? It's possible with Concurrent Controls' $249 Applica U2—plus an extra monitor, mouse, and keyboard. The kit, which includes an ISA card, a 15-foot cable, and a small connector box, gives the second user a customizable Windows 95 environment and access to your modem, CD-ROMs, and applications. You can even surf the Web at the same time. You can't share sound features or work on a file simultaneously, but otherwise it's like having a second PC. Based on my tests, I'd recommend at least a Pentium-100 for best performance. Applica U2 isn't cheap, but it's an intriguing alternative to a second PC. Concurrent Controls Inc.; 800/487-2243; www.applica.com.

READER SERVICE NO. 762

—Shane Rau

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Bonnie Blair, Gold Medal Speed Skater

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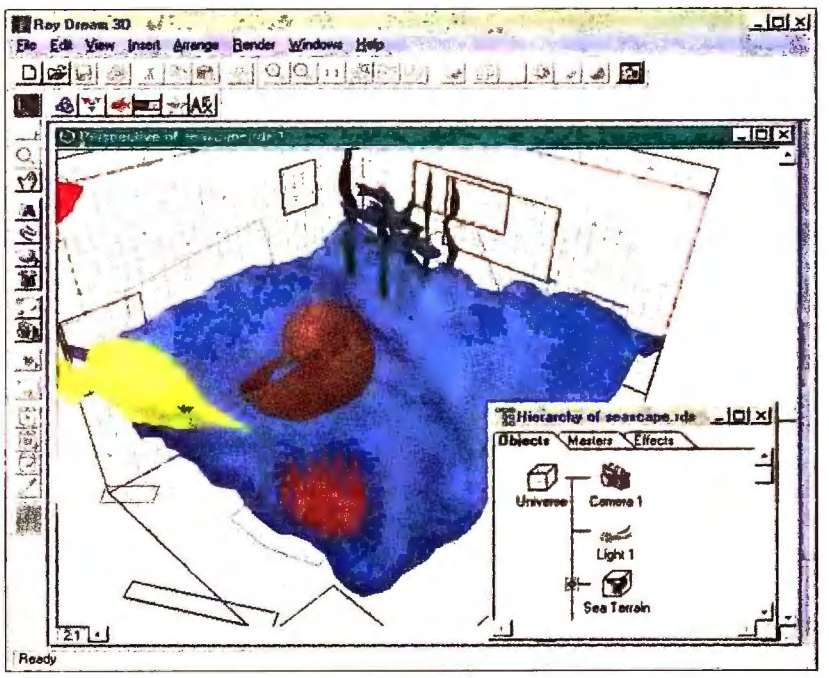
Circle 57 on reader service card

Ray Dream's Budget 3D Graphics Software

GRAPHICS

TRADITIONALLY, 3D graphics software has been geared to artists, animators, and computer game designers. **Ray Dream 3D,** a slimmed-down, $99 sibling of MetaCreations' respected $299 Ray Dream Studio 5.0, doesn't make this complex graphics specialty completely simple, but it's the most inexpensive way you'll find to get your feet wet. You'll pay $185 or more for a comparable package such as Realsoft's Real 3D.



SEE THE SEA IN 3D: Ray Dream 3D's library of objects helps you create simple scenes like this seascape for a breakthrough $99 price.

Packing both Windows and Macintosh versions onto one CD-ROM, Ray Dream 3D lets you create simple 3D images—a logo, a building interior, or an outdoors scene, for example—by using wizards and working with more than 700 editable 3D models. The drag-and-drop interface eliminates much (but not all) of the complexity of creating high-resolution color images. You can also build objects from scratch—or enhance the included models—but you'll definitely have to read the excellent user guide and walk through the tutorial first.

Once you've created your basic objects, Ray Dream 3D's modeling tools let you refine your image by painting them with colors and textures, arranging them, and "lighting" the scene to enhance realism. You can get amazingly lifelike results.

If you're looking for a low-cost entry into 3D graphics, Ray Dream 3D is for you. But don't expect to sit down and intuitively crank out 3D creations. Even this simplified program requires a significant investment in learning time.

—Joe Gomolski

Ray Dream 3D

PRO: Powerful graphics tool at a great price.

CON: Not always intuitive.

VALUE: First 3D graphics package priced for the entry level.

MetaCreations

800/846-0111

www.metacreations.com

List price: $99

READER SERVICE NO. 763

I Publish 2.0: A Handy All-Purpose Publisher

DESKTOP PUBLISHING

LAST SUMMER, I Publish 1.0 got high marks for its ability to churn out both printed and Web-based documents quickly. Not resting on its laurels, Design Intelligence has now delivered an upgrade that offers new layouts, more customization options, thumbnail views, and support for images digitized using TWAIN-compliant scanners.

The new **I Publish 2.0** comes with thousands of preset layouts for creating brochures, catalogs, reports, newsletters, fliers, and Web pages. You add the contents—words and pictures—and the software adjusts them to fit the chosen template. The result is professional-quality output for a modest $99. (The upgrade is free for owners of version 1.0.)

New Web-based services include I Publish live, an online publishing resource that gives you access to content from a host of providers, and I Press, a mail-order printing service that generates business cards, brochures, and so on from your I Publish files. However, you'll probably pay a bit more for the convenience of submitting your files online and having the printed documents delivered than if you used your local service bureau.

A couple of glaring weaknesses: The software works best with Microsoft Internet Explorer 3.0 or later (some of the drag-and-drop features don't work with Netscape Navigator). In addition, I Publish stores files in a proprietary format that prevents you from exporting them to some desktop publishing systems. (You can, however, import about 25 different types of files *into* the program.)

I Publish's structured approach seems limited compared to that of a desktop publishing application. Similarly, its Web-publishing capabilities are too rigid to replace HTML authoring tools. But if you're a business owner who doesn't employ a professional designer, this software can help you.

—Joe Gomolski ▶

I Publish 2.0

PRO: Moderately priced, easy to use, makes professional-looking print and Web-based business documents from templates.

CON: Limited without Internet Explorer, has proprietary file format, templates limit flexibility.

VALUE: Great for design novices who want to create presentations, reports, brochures, and Web pages.

Design Intelligence Inc.

888/278-2547

www.design-intelligence.com

List price: $99, download from company's Web site $89

READER SERVICE NO. 764

Her postcard spoke to him. Literally.

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Includes e-mail postcard, video phone, photo manipulation software and more.

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Now you are no longer a prisoner of those other clunky IT megasites.

The Web, as we all have come to know, will take whatev little time you have and squander it. If your efforts yield even a smidgen of relevant technology information, you're as lucky as a two time lottery winner.

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10 Hours

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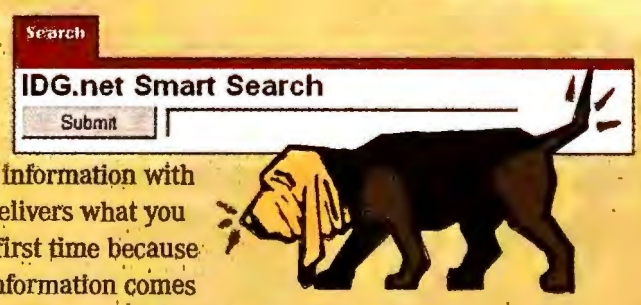

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Macworld
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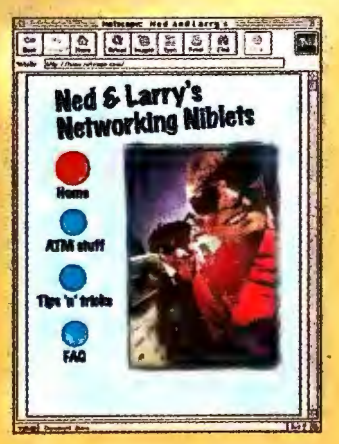

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Plan Your Business Future With Forecast Pro

FORECASTING

IF YOU NEED forecasts for your business but statistics aren't your strong point, **Forecast Pro 3.0** is the best package available. This $595 Windows program supplies the one feature you probably need most: It can pick the best forecasting method for your data.

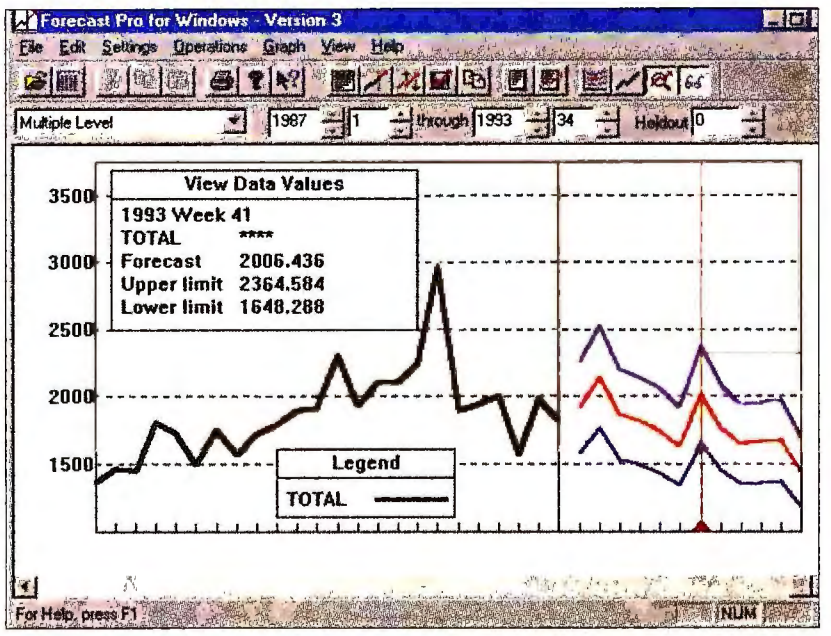
Techniques include all types of time-series analyses—moving averages, most variants of exponential smoothing, autoregression, dynamic regression, and special methods for assessing the impact of one-time events. You can either select one of these methods or let Forecast Pro choose the best one for your data files.

To bring you up to speed on forecasting methods, the manual does an excellent job of explaining basics and potential pitfalls. The more sophisticated XE version ($995) handles 100-series batches, multilevel forecasts, and Census X-11 analysis.

My few complaints about the prerelease copy of Forecast Pro I looked at mostly concern convenience. For instance, although the program reads and writes data files in most spreadsheet formats, links to Excel or 1-2-3 would be an improvement over manually reworking forecasts every time your worksheet data changes. Forecast Pro's graphics are certainly adequate from a statistical purist's point of view, but if you really want to wow 'em at a business meeting, you'll have to send your charts or forecast numbers to a presentation package.

These issues are minor. You buy forecasting programs to make forecasts, and Forecast Pro is both the friendliest and most accurate at this key task.

—Charles Seiter



JUST THE FACTS: Forecast Pro's time-series graphics provide clear error bounds, plus a window for cursor-based inspection of values.

Forecast Pro 3.0

PRO: Automatically selects the most appropriate forecast technique, batch mode can match data models to series.

CON: Ho-hum graphics, no automatic link to spreadsheet data.

VALUE: Best business forecasting package for nonstatisticians.

Business Forecast Systems
617/484-5050
ourworld.compuserve.com/homepages/ForecastPro
Street price: $595, XE version $995

READER SERVICE NO. 766

Presto 3.0: Quality OCR at a Bargain Price

OCR SOFTWARE

NEWSOFT's latest optical character recognition software packs most features offered by its better-known competitors—Caere's OmniPage Pro 8.0 and Xerox's TextBridge Pro 98—and adds at least one they don't.

Like OmniPage and TextBridge (see November's *New Products*), **Presto OCR Pro 3.0** moves formatted text into common applications, allows manual editing of zoning templates (used to identify areas to be converted), and can be trained to learn new symbols and nonroman alphabets. But Presto is the only one of these to offer network support: A server can receive scans from one PC, farm them out for OCR on client PCs, and compile the results—all automatically.

The shipping copy of Presto I examined munched a clean laser print with only one minor error, then processed a newspaper clipping with *no* errors. It even made sense of faxes. But it choked frequently on italics and found imaginary typos on a magazine page. Presto transferred the magazine's multicolumn layout intact to Microsoft Word. (It can also transfer to Excel, WordPerfect, and Word Pro.) But other document layouts didn't fare as well. Worse, to extract a usable table I first had to indicate rows and columns with Presto's line tool. The superficial manual provides scant guidance for such tasks.

Presto lists for $99.95, but most people will have to pay only the $49.95 "sidegrade" price—the cost to anybody who already owns an OCR package, even the limited versions bundled with virtually all scanners. That's less than the $79 TextBridge, and far cheaper than the $499 OmniPage (which has a sidegrade price of $129). Yet the only place Caere and Xerox soundly beat NewSoft is in documentation.

—Dan Littman

Presto OCR Pro 3.0

PRO: Abundant preparation and recognition tools, can distribute processing over a network, inexpensive.

CON: Weak documentation, working with tables can be trying.

VALUE: A bargain OCR upgrade.

NewSoft
800/436-4365
www.newsoftinc.com
List price: $99.95, upgrade from any OCR product $49.95

READER SERVICE NO. 765

For more information about a product, contact the manufacturer or circle the number on the reader service card. ■

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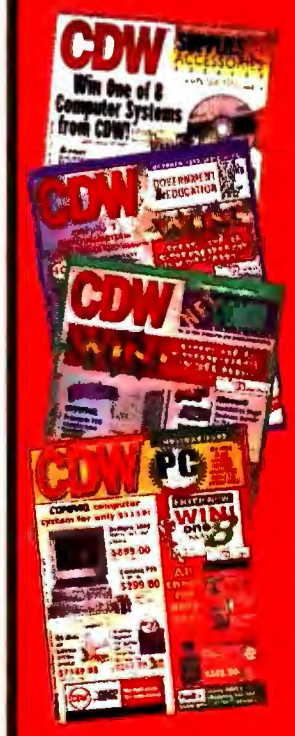

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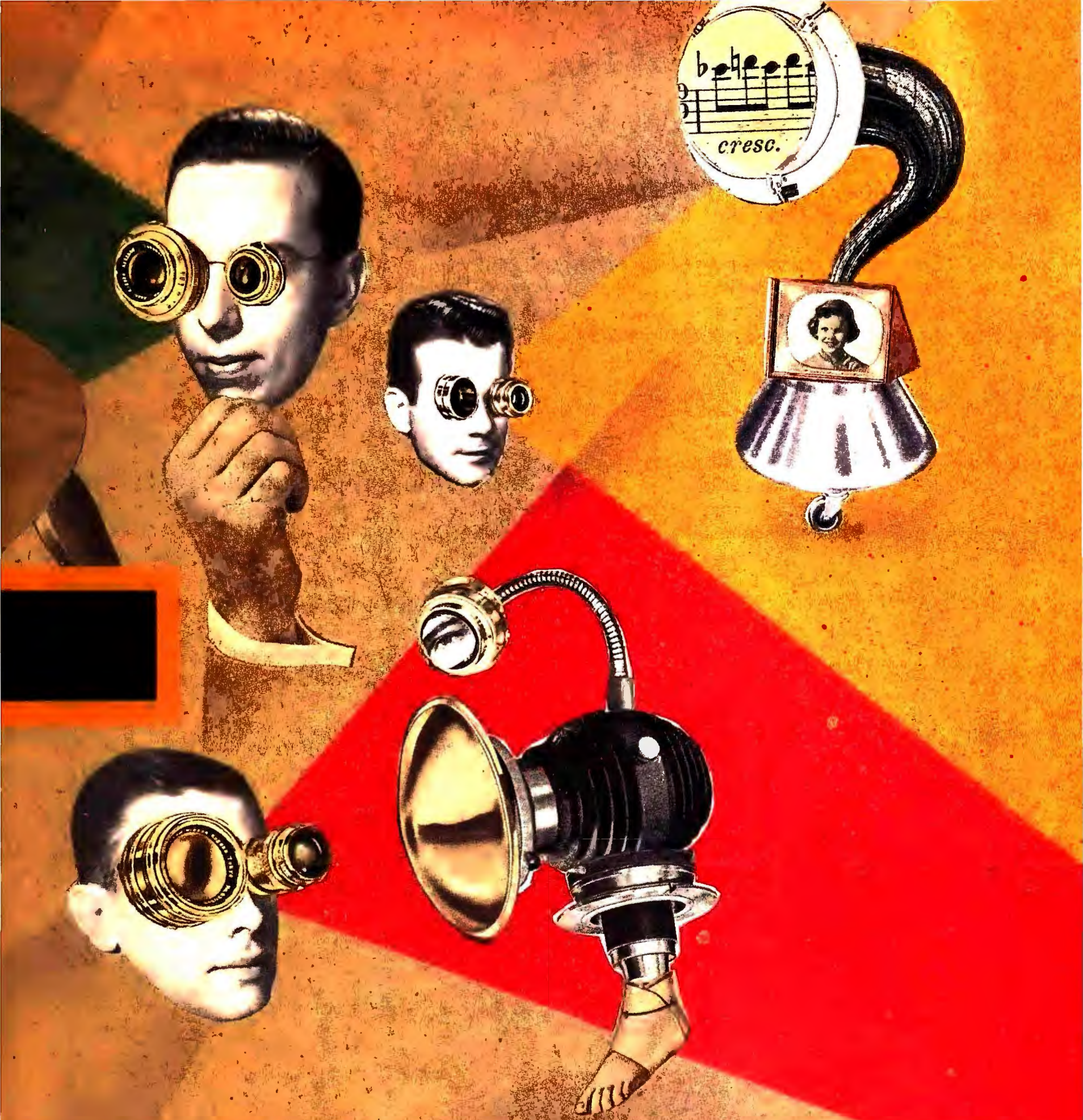
400-MHz CPUs, poster-size screens, PCs that finally understand speech—here's what your system will look like next year and beyond.

BY MIKE HOGAN

THE PC OF



ILLUSTRATIONS BY DAVID PLUNKERT

OMORROW

FUTURE SOFTWARE WHERE DO YOU WANT

"HAL!"

Beep, beep. "Yes, Dave."

"Play that Fiona Apple clip again, and repeat it three times."

Blee-eep, blip-bip. "I'm sorry, I can't do that, Dave. Module player.exe has caused a general protection fault in kernel.exe at address 0985: B564."

In the not-too-distant future, we'll all talk to our computers—just like Dave in the classic movie *2001: A Space Odyssey.* It remains to be seen whether they will listen any better than the murderous HAL 9000.

Arthur C. Clarke's pre-PC novel envisioned a future in which our every whim would be fulfilled—and our lives virtually controlled—by all-knowing, all-seeing mainframes. Thankfully, the years since then have proved that the future ain't what it used to be. The PC now handles many chores that once were the sole province of room-size computers. Still, we're a long way from machines that can see, hear, and open the pod-bay doors.

What will the PC be like in the year 2001? Or, for that matter, 12 months from now? Smaller, faster, smarter, and if you believe the software ads, friendlier. But will the PC be more reliable and customizable? Or will it continue to aggravate us with maintenance hassles, compatibility glitches, and an ever-spiraling rate of guaranteed obsolescence?

THE BIG CATS in the software industry have big dreams. The companies that make the software you use every day offer a thrilling vision of the future. But can they bring those dreams to the small screen?

Meet the Webtop. "By next year, you'll only see Windows occasionally," says Corel president and CEO Mike Cowpland. "Mostly you'll be living in a Web browser as the Webtop takes over from the desktop."

Cowpland describes a not-too-distant future where you plug into that big Webtop wherever you go. It'll know who you are, what apps you use, and how you like your interface to look. No more configuring your computer before you hit the road. And collaborating with colleagues will be easier, as everyone logs into one big network.

Your Personal Slave. At Microsoft, the dreams are even loftier. "Ever see the movie *2001*? With HAL? That's the Holy Grail of what we are working on," says Kevin Schofield, senior program manager, speech technology group. He sees a future where the PC not only transcribes your speech but actually understands what you say. And he predicts a future without applications. Forget your spreadsheet and your word processor—you'll just have, well, HAL.

The technology turns over so quickly that it's tough to keep up. So we turned to the experts for a closer look at the future of PC desktops, notebooks, and software. You'll find their predictions and warnings sprinkled throughout this article.

The verdict? Better buckle up—it looks like we're about to shift into warp speed. What lies ahead are even more pronounced advances in processors, storage,

The Desktop Computer in Ten Years

WHAT WILL YOUR PC look like in the next century? We asked Mark Weiser, chief technologist at Xerox's famed Palo Alto Research Center—birthplace of the graphical user interface—what to expect. This artist's conception is based on his answers.

1 CPUs: "PCs will move into the closet...or a closet in each office." Think gigabytes of RAM, terabytes of storage.

2 Displays: "Displays may be flexible, and you'll unfold them from your pocket."

3 Input: Voice recognition won't replace keyboards and mice. Why? Privacy. "A computer you can talk to will be a dead giveaway."

4 Connections: "You'll need lots of wires, but they'll be in the walls, the floor, the desk. What will go away is those annoying wires to the phone, the keyboard, and the mouse."

5 Paper: "Everything with a word on it—book spines, papers, business cards—will turn into a screen."

6 Internet: The pocket Net computer will let you log on anytime from anywhere.

INFOGRAPHIC: K. DANIEL CLARK; PHOTOGRAPH: WILLIAM MERCER MCLEOD, PHOTO RETOUCHING: JEFF BERLIN

TO GO TOMORROW?

Need to set up a meeting? Today you'd call up your scheduler, find some free time, send e-mail to everyone who needs to attend, wait for a response from each member. Repeat. But if Microsoft is successful, by 2001 all you'll have to do is tell your PC who you want to meet with, then let "HAL" sort out the tiresome details.

Miracle Cures. "The real issue" about software, laments Martin Reynolds, vice president of technology assessment at Dataquest in San Jose, California, "is could they please deliver something that works well today?"

It is the bane of every computer user's existence: software that requires more tinkering than an Italian sports car. But DLLs may go the way of DOS commands. According to Diana Murray, director of product improvement support technology at Microsoft, in five or ten years software will know when it's sick and what it will take to get well. Windows 98 will offer troubleshooting wizards that help sort out hardware conflicts, printing problems, modem glitches, and more. When you have a problem, a wizard will ask relevant questions to help you figure out what's going on. In future versions, the software will look for conflicts, make sure drivers are up to date, and when a fix is necessary, ask if you want to go online and get a patch. Later on, it will search for the medicine it needs with no intervention from you. Even later, software will watch what you are doing and step in when you're having trouble.

Get Real. Seamless Webtops, software that actually works when you need it, a personal slave in the computer, easy collaboration over the Internet. Sounds wonderful. But is there any chance all these dreams will become reality? Paul Saffo, a director at the Institute for the Future in Menlo Park, California, thinks it would take a miracle on a par with, say, the invention of the microchip—the device that started it all.

"The software industry...has to change fundamentally in the same way the microchip changed the design of circuits," he explains. According to Saffo, there simply aren't enough software developers on the planet to write the code necessary to make all these dreams happen—let alone build reliable applications.

Or as Reynolds puts it, "What about when the whole computer goes amuck and you have 300 appointments booked with everyone on the planet at exactly the same time?"

As a matter of fact, didn't they have a little trouble with HAL in *2001?* —**Christina Wood**

Paul Saffo, Director, Institute for the Future

...on the software industry:

"The software industry...has to change fundamentally in the same way the microchip changed the design of circuits."

displays, and all the supporting technologies needed to make the PC more personal still. At the heart of it all, of course, is an insatiable appetite for ever more processing power.

More Power

Andy Giveth and Bill Taketh Away

INTEL CHAIRMAN Andy Grove, along with Intel competitors AMD and Cyrix, keeps speeding up the basic PC at prices that continue to decline. Good thing, too, because Bill Gates and his minions are burning up the clock cycles even faster.

Intel has already shown a 350-MHz processor and expects to be shipping 400-MHz Pentiums by year-end, says Bob Colwell, Intel fellow and director, IA-32 Architecture in Hillborough, Oregon. AMD will match Intel step for step at a 25 percent price discount, says Dana Krelle, director of marketing for AMD computational products. Look for faster AMD K6 chips tuned to handle graphics better. (For more on the latest developments in CPUs, see "Processors Leap Ahead" in this month's *Top of the News.*)

It's just more proof that Moore's Law is holding strong. Back in 1965, Intel cofounder Gordon Moore predicted that processing power would double every 24 months. Today, Intel's Pentium II sports 7.5 million transistors. If the trend continues, Intel processors should contain 50 million to 100 million transistors in the first decade of the next century.

And the sky's the limit, says AMD's Krelle. "Silicon technology and architectural expertise have moved forward at a pace that allows performance to continue to expand. I don't think there will be any end—ever."

We'll need every clock cycle. Tomorrow's PCs juggle massive 3D graphics ▶

The Office in the Year 2007?

IF YOU THINK YOU'RE SURROUNDED by high-tech toys now, just wait. In the office of the future, technology will be everywhere—but largely invisible. These photos, taken at Future@Work in Seattle, show what the office of 2007 might look like. Here, a consortium of architects, designers, and high-tech firms like AT&T and Intel have created a workplace where wireless communications changes everything. No wires means no wall sockets—and in many cases, no walls. Shared, open space will be the rule, as shown here in the Village Green. Here you'll pull up a comfy chair, grab a cell phone and a computer, and start working. Need more privacy? Slip into a proto-cubicle or one of the creativity closets on the edge of the Green.

Belly Up to the Juice Bar

You'll find other creature comforts nearby, like the office juice bar. But you'll never get away from work entirely: Mobile PCs and phones will be within easy reach, while the gas plasma display on the wall pumps out the latest news from the HR department.

The Brains of the Operation

In this scenario, you can work wherever it suits you; your telephone extension and network connection follow wherever you may roam. And all the machines that make the office hum—from powerful network servers to systems that control ambient lighting and music—will be tucked away in a closet on each floor.

Most of the gear shown here is available today—at boutique prices. Future@Work believes that this equipment will become standard in every office. (For more information, see www.future-at-work.org.)

Old Cubicles Never Die...

...they just lose their partitions. Individual workstations won't disappear, but they'll feature movable dividers, so you can work alone or in groups. And while the office will probably never become paperless, your printouts will be stored in roll-away file cabinets, so they can follow you around the office.

Getting the Big Picture

Mobile workers will need new ways of sharing information. In this setting, the company intranet is projected onto a 3-by-8-foot section of the Village Green wall. Here you will find news and stock tickers, video windows, international clocks, maps, group calendars—virtually any information you'd want on your own desktop, if you could only fit it all.

e Village Green

The World Conference Room

Ultimately, the future of work is about communication and collaboration—whether you're working across the Green or across the globe. In the future, you won't have to be in the room to be in the meeting. Tools such as a combination electronic whiteboard and videoconferencing system will become a common element of every meeting room. ▶

and huge digital audio and video files as well as reams of high-bandwidth information coming down from the Web.

So just how much power is enough for such heavy demands? According to the Intel/Microsoft PC 98 System Design Guide, you should have at least a 200-MHz Pentium processor with MMX and 32MB of system memory.

By the time NT 5.0 arrives next year, a better model might be Hewlett-Packard's new Kayak XU computer, whose innovations include a pair of 300-MHz Pentium IIs, 128MB of RAM, and a fast new graphics bus. The price: a cool $6655. But, of course, expect that price tag to drift earthward as volume increases and hotter chips arrive.

Fatter Pipes

Get On the Bus

EVEN THE FASTEST processor can feel dog-slow if your PC's other subsystems and data pathways aren't up to speed. Intel and system vendors are attacking the throughput challenge by improving the buses your data moves through.

Intel's 440LX AGPset chip set introduces the Accelerated Graphics Port, a faster-than-PCI bus between your CPU and graphics coprocessor. AGP also links the graphics adapter to system memory for storing huge texture maps, used in 3D applications.

Bill Gates, chairman, Microsoft

...on the future of operating systems:

"In ten years there will be better input systems—handwriting, speech, visual recognition....As much as 90 percent of the operating-system code will go to these new capabilities. When we look back at today's personal computers, we'll say, 'Hey, these were the machines that couldn't listen, couldn't talk, couldn't see.'"

"AGP will just take over," says Jon Peddie, founder of *The Peddie Report* in Tiburon, California. "We're predicting that by the year 2000, all PC graphics will be in 3D, and of that, probably 70 percent or more will use AGP." But, Peddie adds, gamers will enjoy most of AGP's benefits. "The person using a word processor or spreadsheet will have no awareness of it."

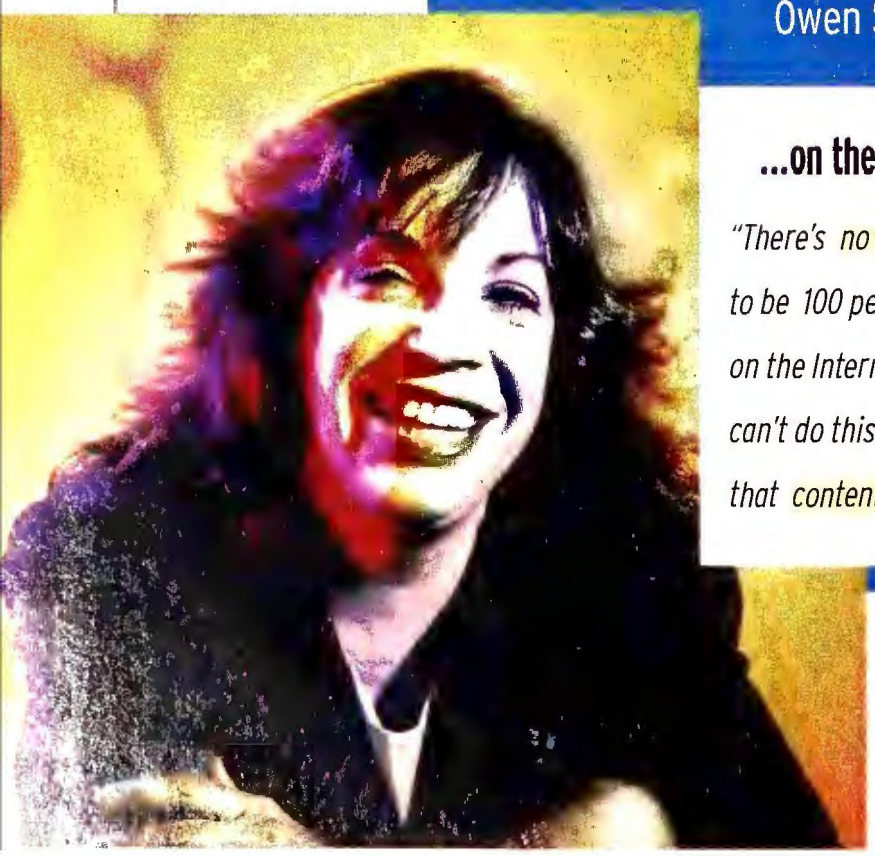
System vendors are already beginning to build AGP machines. However, *PC World*'s tests of AGP are mixed (see "AGP Graphics: A Bumpy Ride," December 1997).

AGP's true potential won't be realized until more apps build in support for it—maybe by the end of this year.

Donna Hoffman, Professor, Vanderbilt University's Owen School of Management

...on the future of free speech on the Net:

"There's no chance that any government will be able to be 100 percent successful in censoring content on the Internet....If there's one place that says 'You can't do this', there's always somewhere else where that content can be provided."



New system board chip sets due out later this year will also support faster system bus speeds—100 MHz, compared to today's typical system speed of 66 MHz. Boosting the bus speed lets your PC take advantage of faster memory types. And 100-MHz synchronous DRAM should start appearing by midyear, followed by Direct RDRAM in 1999. With better performance and a lower cost, both should quickly replace current memory types.

Faster Connections

Plug, Play, and Get Out of the Way

IN THE FUTURE, you'll connect more devices to your PC, which will exchange data with them at much higher speeds. That's because your parallel and serial ports are going the way of the pterodactyl. In their place you'll find the Universal Serial Bus and the IEEE 1394 high-speed serial interface, or *FireWire*.

USB transfers up to 12 megabits per second—about 100 times faster than most standard serial ports—while FireWire will start out at 100 to 400 mbps this year and rise to 1 gigabyte per second by the end of the decade. USB already connects low-bandwidth devices such as mice and scanners to new PCs. FireWire, due to appear in PCs later this year, will link to external DVD and CD-ROM players, digital video and still cameras, and eventually hard drives. Both should make it easier to add new devices to your system and reduce ▶

PHOTOGRAPH ABOVE: WILLIAM MERCER MCLEOD, PHOTO RETOUCHING: JEFF BERLIN

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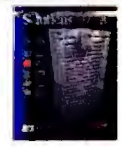

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Circle 45 on reader service card

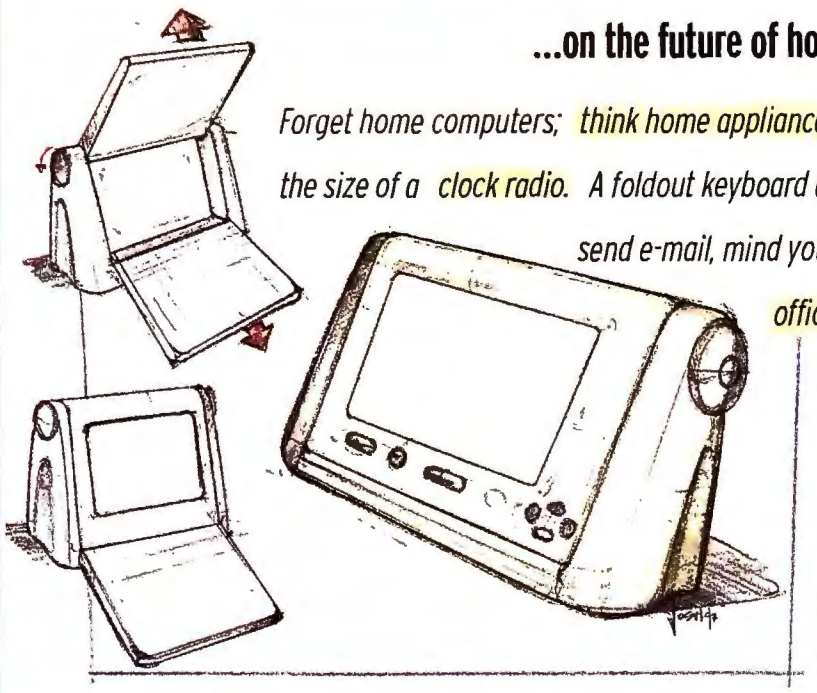
that snarl of wires sprouting from the back of your machine. But a lot depends on how peripherals vendors take advantage of these base technologies.

The first USB devices we tested didn't always work as advertised (see "Universal Serial Bus Flops in First Hands-On Tests," *Top of the News*, September). Once compatibility issues are ironed out, USB may connect your monitor, mouse, and keyboard to the PC. The enabling factor will be new drivers in Windows 98 and Windows NT.

Frogdesign, industrial design firm

...on the future of home PCs:

Forget home computers; think home appliances. This prototype PC is about the size of a clock radio. A foldout keyboard and LCD let you surf the Net, send e-mail, mind your finances, and more—from the office, the bedroom, or the kitchen.



Deeper Storage

New Disk Drives Will Speak Volumes

NATURALLY, you'll need not only more horsepower and faster pipes to handle tomorrow's big files and programs, but also a much larger space to store them. While we keep collecting new storage jargon—CD, DVD, Zip, LS-120, removable, rewritable—none of it takes the place of a traditional hard disk.

Like processor speeds, hard disk capacity has been growing at about 60 percent a year, while prices are morphing from about a buck a megabyte in 1994 to about a nickel a meg this year. How far can they go? The only limit on how many gigabytes disk drive makers can pack into a 3.5-inch drive now is how many you're willing to buy. And, of course, that's probably more than you realize.

"There's no such thing as too large a hard disk as long as we keep getting bigger and bigger bloatware," says storage guru Bob Katzive, a vice president of Disk/Trend in Mountain View, California. "Windows 2000 will probably ▶

MOBILE PCs ONE SIZE WON'T FIT ALL

THE FIRST PORTABLE computers were the size of sewing machines. Today's mobile machines can be as small as a traveler's sewing kit. These days you can choose from big-screen multimedia portables like IBM's ThinkPad to pocket-size organizers like the 3Com/U.S. Robotics PalmPilot, as well as all points in between. The portable you'll use tomorrow will depend on which feature you crave more—power or portability.

Live Long and Phosphor. Except for a new bigger-than-ThinkPad class of mega-notebooks, most mobile PCs will be lighter and offer longer battery life. Part of that will be due to Intel's power-stingy Tillamook processor and its successors, says International Data Corporation analyst Bruce Stephen.

Meanwhile, Sharp has come up with an active-matrix LCD that's not backlit and uses only one-seventh of the power of today's displays. It weighs just half as much and is a third the thickness of current LCDs.

A Movable Beast. Top-end multimedia machines will start to resemble Samsonite briefcases, with 15- and even 17-inch screens and 8GB hard drives, says Dataquest senior analyst Mike McGuire.

But that isn't what people want, warns Andrew Seybold, of the newsletter *Outlook on Communications and Computing*. "Intel and the hardware vendors are pushing people in that direction, rather than listening to what people are asking for."

The Executive Flier. Meanwhile, you'll begin to see a more popular class of ultraportable machines that feature a subnotebook footprint and run Windows CE. Executives and white-collar workers alike may prefer such ultra-ultraportables because they'll sport touch-type keyboards, backlit color screens, and lightweight price tags ranging between $700 and $1000.

The Far Side. "Fifteen years from now, we'll wear our computers," predicts John Peddie of *The Peddie Report*. "We'll communicate instantaneously anywhere in the world with anyone who's awake at that time, or even if they're not awake," he adds.

Your PC may be your hat. But it could also be your briefcase, TV, or toaster, says Peddie. The choice will be yours. —M. H.

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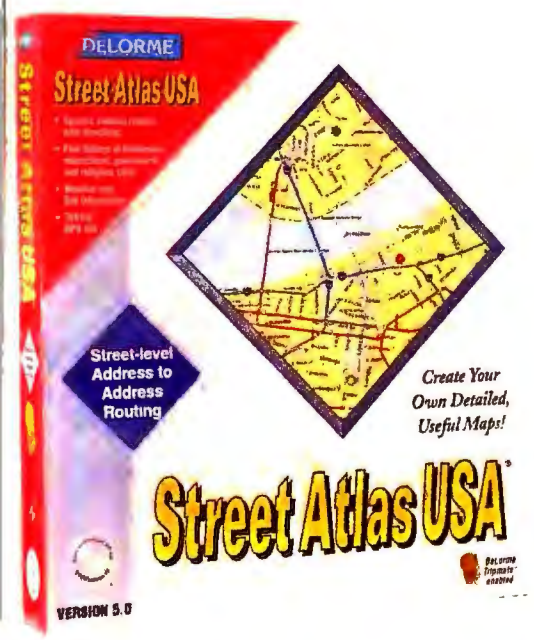

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take 18GB; Word'll probably take a gig."

Meanwhile, more-expensive storage alternatives will continue to decline in price and increase in popularity. While the 650MB CD-ROM has all but replaced the floppy for software distribution, it's been trumped by the 4.7GB Digital Versatile Disc. Though DVD has had a shaky start (see the review "DVD—Finally!" in this issue), Katzive predicts that DVD-ROM shipments will catch up to shipments of CD-ROMs by the year 2000.

By then, rewritable DVD-RAM drives could well knock off rewritable CDs as the portable medium of choice. But DVD-RAM is also facing its share of compatibility snafus. And it will be competing with higher-capacity versions of removable hard drives like the Iomega Jaz and super floppies like the Zip and LS-120—technologies all faster, cheaper, and more portable than DVD.

Prettier Pictures

What Tomorrow Will Look Like

WOULD YOU RATHER look at your data through a bulky 17-inch cathode ray tube or a crisp, colorful, slim 20-inch LCD?

One day you'll replace that big tube with a flat panel that hangs on the wall in front of you, or one that uses a small fraction of your desk area. LCD makers have long had prototypes of desktop active-matrix displays, the latest being a line of rear-projection LCDs of up to 20 inches from Sanyo Electric. These displays beat the pants off the traditional CRT in every area but one: price. When released this spring, versions of the Sanyo display will cost between $1600 and $8000, depending on their size.

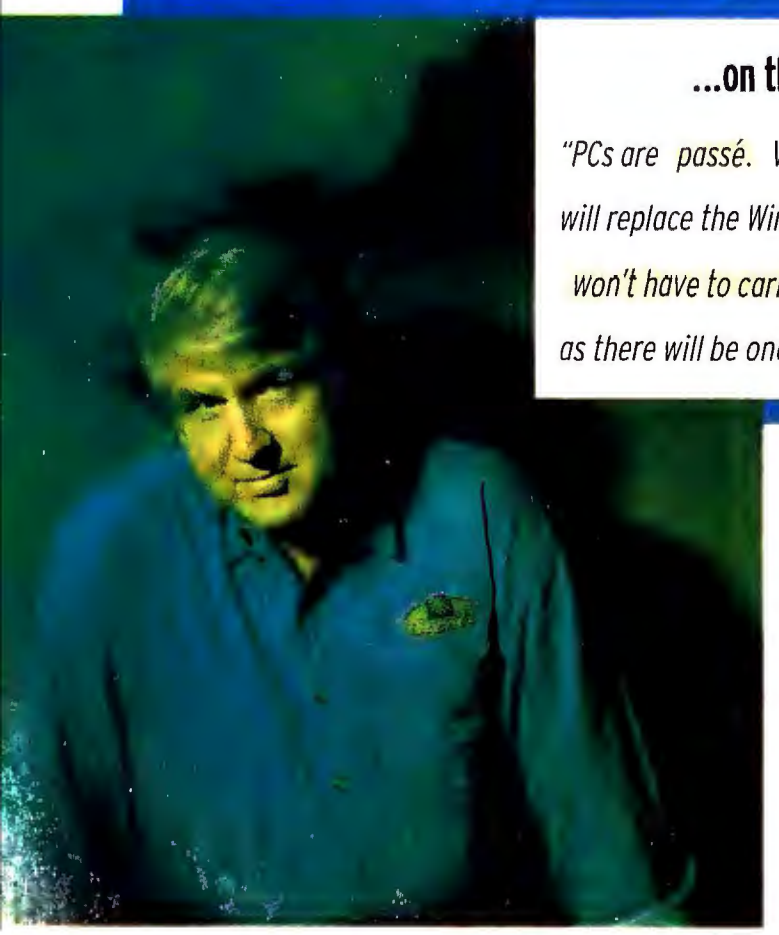
So don't expect to see an LCD on your wall in this century, says Frost & Sullivan information technology analyst Rufus Connell. However, he notes that almost every major monitor manufacturer has introduced a flat panel display, or plans to. Connell expects flat panel sales by the year 2000 to be about 20 times what they are today.

Dogbert, management guru

...on the future of the workplace:

"The cubicle of the future will continue shrinking until it's eventually about the size of your head. You'll wear it as a helmetlike device. That way, you can just stack up the employees in a bad part of town."

Dr. Robert M. (Bob) Metcalfe, inventor of Ethernet



...on the future of networking:

"PCs are passé. Various forms of network computers... will replace the Wintel clunkers we enjoy today....And you won't have to carry your computers so much anymore, as there will be one waiting for you where you're going."

Brave New Worlds

Where No PC Has Gone Before

SO WHY do we need all this horsepower when most of us just want to write a memo or crunch a budget? The answer in a word: interface—or, to be more precise—graphical user interface.

"We're looking for a more intelligent computer system, one that can be interacted with easily," Bill Gates told a recent Microsoft Professional Developers Conference. More powerful hardware will make possible PCs that see and hear, according to Gates. He predicts that within ten years, "every computer will have speech and linguistics built into it." Instead of typing or clicking, you'll tell your PC to launch this application or print that document. At the office, your e-mail message is just as likely to be a video clip.

Microsoft plans to spend at least $2.6 billion this year in research and development, a lot of it to help push this vision—and that's what Intel's MMX, AGP, and synchronous-memory initiatives have been about all along, adds Intel senior vice president Albert Yu.

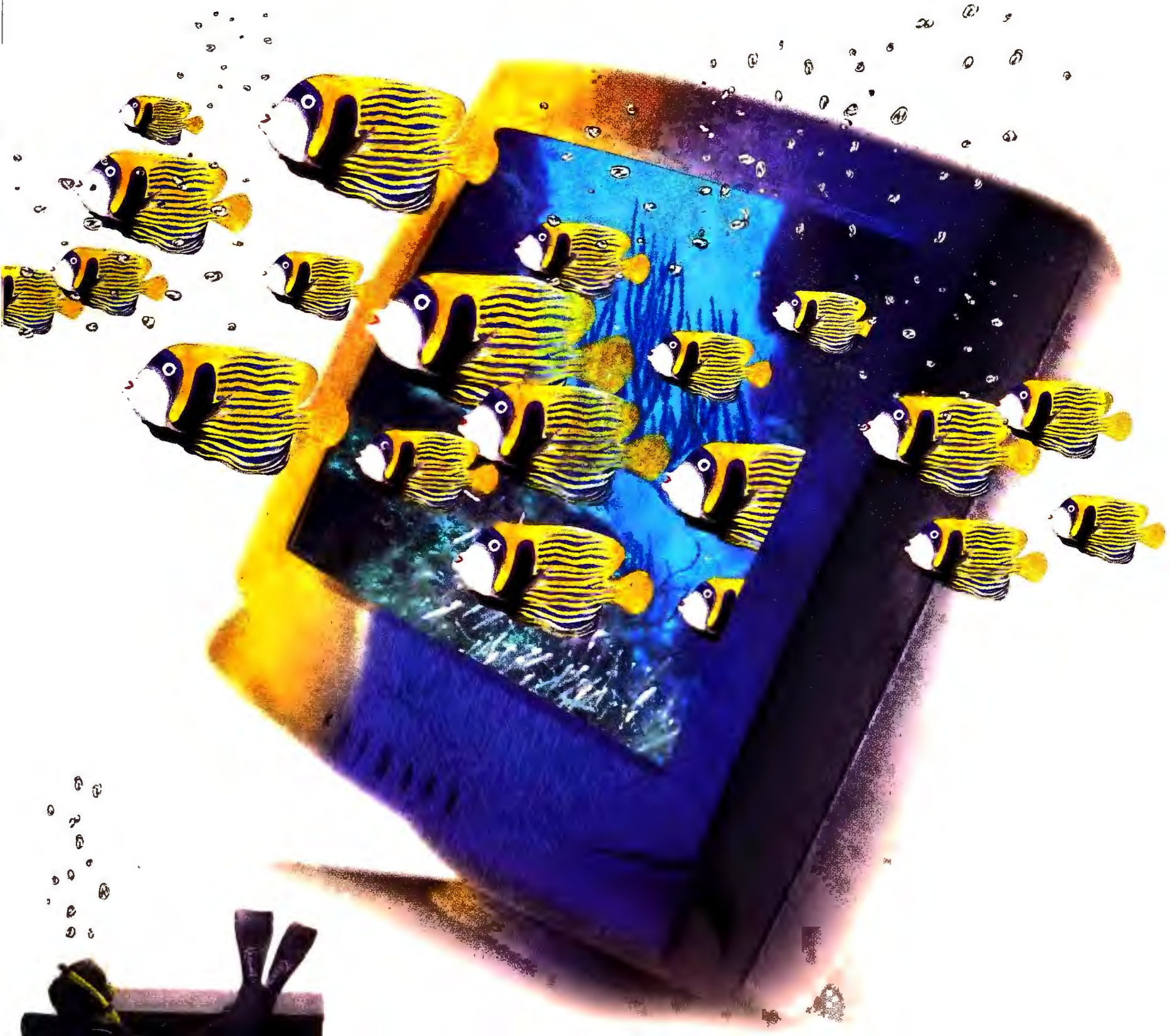
At the same time, USB and FireWire ports solve many of the bandwidth, power, and interrupt problems that so far have kept PC components locked into one box. In the future, you might achieve a truly small desktop footprint at work by just plugging into shared drives, cameras, scanners, and other devices, only as you need them.

At home it probably means that your PC takes control of the lights, temperature, and appliances in your personal pod. While there's always likely to be a central core for your PC, on a day-to-day basis you may be verbally interacting with little more than a richly graphic window.

Hopefully, this time you'll have a truly friendly digital servant; and when you bark, "Make me a cup of coffee, HAL," you'll hear only the mellifluous tones: "Sure, Dave, cream and sugar as usual?"

Mike Hogan is a regular contributor to PC World *and an avocado farmer in Fallbrook, California. Christina Wood is a* PC World *contributing editor. Writer Naomi Wise also contributed to this story.* ■

Seeing is Believing.



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"In PC World's MMX™ [technology] benchmark test, the NEC Direction SPL300 was fastest overall, thanks to its quick Number Nine Graphics Card with 8MB of WRAM."

PC World, Oct. 1997

[Shown with optional ACS-45 speakers with subwoofer, C700 17" monitor (16" viewable) and DirecPC satellite.]

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- **32MB SDRAM Memory**
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- Diamond Viper 4MB SGRAM AGP Video Card
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ISPs YOU CAN COUNT ON

Fed up with your Internet SERVICE PROVIDER?

PC World **TESTED** a dozen major competitors and **SURVEYED** over **6000 USERS** to find ISPs that'll keep you connected.

by Brad Grimes and Lewis Perdue

Bob Waickman | ISP USER

Bob Waickman is a virtual nomad. This retired customer service rep from Tallmadge, Ohio, has been cruising the Internet for over five years, and he's currently on his seventh Internet service provider. His travels started at CompuServe, passed through Prodigy and America Online, wound through PSINet, stopped over at Netcom, got waylaid at AT&T WorldNet, and ended up at IBM Internet Connection.

Whew. What does the weary Waickman have to say about his adventures? "There is no perfect ISP."

But Internet users like Waickman keep looking for one anyway. And why shouldn't they? The past year has been a trying time for ▶

ILLUSTRATIONS BY MARK MATCHO

PHOTOGRAPH: BRUCE ZAKE

AOL
SERVICE
WOW
19.95 mo.
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Netizens. Who can forget America Online's busy-signal debacle when it rolled out its $19.95 monthly flat fee? In April, Microsoft Network replaced its 9 mail servers with 18 new ones to solve e-mail problems. In July, a spammer clogged AT&T WorldNet's e-mail system and delayed delivery for several days. Even Waickman's newest ISP, IBM Internet Connection, took some lumps over e-mail problems.

So users are putting on their walking boots. According to a PC World Online survey of 6136 ISP users, 46 percent have been with their current provider for less than one year. That's not surprising. When you consider the prevalence of trial periods and low monthly rates, trying out one ISP after another can be as painless as switching among long-distance phone carriers. But the reasons for switching ISPs have more to do with good old-fashioned customer satisfaction than dime-a-minute rates.

"I left AOL because it was maddeningly slow," Waickman says. "PSINet's interface was too quirky. Netcom was basically a good service, but I didn't like the old browser. And with AT&T WorldNet, I kept getting page fault errors."

How are things now? "I've had some problems with IBM's news server," he says, "but overall it is among the best."

And the Winners Are...

THINK ABOUT WHAT YOU WANT from an ISP before signing up, and you're likely to find a good fit. Business users who don't care much for extras will love IBM Internet Connection. On the other hand, Concentric, EarthLink, and MindSpring are good picks for home surfers. IBM, EarthLink, and MindSpring also support 56-kilobits-per-second and ISDN connections—a plus if you're a telecommuter accessing the company's network.

OVERALL	PERFORMANCE[1]	SATISFACTION[2]
BEST	**BEST**	**BEST**
IBM Internet Connection	IBM Internet Connection Prodigy Internet	MindSpring (152)
GOOD	**GOOD**	**GOOD**
Concentric Network EarthLink Network MindSpring Sprint Internet Passport	Concentric Network EarthLink Network Sprint Internet Passport	Concentric Network (106) EarthLink Network (153) IBM Internet Connection (220) Sprint Internet Passport (33)
FAIR	**FAIR**	**FAIR**
AT&T WorldNet CompuServe Prodigy Internet	AT&T WorldNet Microsoft Network MindSpring Netcom	AT&T WorldNet (320) CompuServe (35)
POOR	**POOR**	**POOR**
MCI Internet Microsoft Network Netcom	CompuServe MCI Internet	MCI Internet (42) Netcom (267) Prodigy Internet (90)
WORST	**WORST**	**WORST**
America Online	America Online	America Online (321) Microsoft Network (147)

Companies are listed alphabetically within categories.

[1] Performance ratings based on tests by Inverse Network Technology and the PC World Test Center.

[2] Satisfaction ratings based on surveys filled out on PC World Online between July 22, 1997, and August 18, 1997. Numbers in parentheses indicate the total survey responses that resulted in each ISP's rating.

We'd have to agree. In our review of 12 national ISPs that offer dial-up accounts to individuals and small businesses, IBM Internet Connection ranks as the best provider, followed closely by Concentric Network, EarthLink Network, and MindSpring. At the other end of the scale are commercial online services America Online and Microsoft Network, and Internet-only providers MCI Internet and Netcom.

To derive our rankings, we signed up with all 12 ISPs, used the services, and made calls to their tech support. In addition to hands-on testing, we received performance data from Inverse Network Technology, an independent testing firm in Santa Clara, California, showing how fast and reliable each provider was. Finally, we received survey responses from 6136 Internet users about their ISPs. Individual performance and customer service ratings can be found in our performance rating and satisfaction rating charts (see "Some ISPs Are Faster Than Others" and "ISP Customers Sound Off"). Four more ISPs—FlashNet, GTE Internet Solutions, IDT, and SpryNet—are not reviewed here, but you can read about them at PC World Online (www.pcworld.com/jan98/isps).

THE BEST ARE STILL THE BEST

WHEN WE REVIEWED ISPs last February ("Best Routes to the Net: Top Internet Service Providers"), we recommended IBM Internet Connection and MindSpring. This year they're still among the top dogs.

IBM Internet Connection ranks best for performance and good for customer satisfaction, making it our overall leader. But the service seems to be aimed more at business users than at individual Web surfers. It doesn't offer many extras, such as a cool home page, and it doesn't give users free server space for posting their own Web pages.

MindSpring, on the other hand, gives its users the moon: good software, a home page with tons of useful links, space for users to publish their personal Web pages, and the best customer support around, according to our survey respondents.

But our tests show that MindSpring isn't as fast as other ISPs. It ranks near the bottom for actually getting through to the service. Part of the problem, according to MindSpring, is an old network of *POPs*

(points of presence) it acquired from PSINet. POPs are the servers that users dial in to to connect to the Net.

"Quite frankly, the quality of PSINet's dial-up POPs was not up to our standards," says Ed Douglas, MindSpring's director of product management. Because of this, many users have been switched to GridNet, a network provider that MindSpring partnered with last May because, Douglas says, it offers better performance.

In addition, MindSpring is developing its own POPs in New York City and California. Douglas says the new California POP will serve a purpose beyond improving performance. Because of MindSpring's rapid growth in the past year, the company has had to refuse new accounts in certain high-traffic areas. Most of these "blackouts" have occurred in California, and Douglas expects the new POP to remedy that situation.

GAUGING ISP PERFORMANCE

WHAT MAKES an ISP a good performer? According to our survey, 51 percent of users say it's a reliable connection and no busy signals. Another 39 percent say it's fast, reliable e-mail. So we partnered with Inverse, the leader in ISP testing. The testing firm made over 4600 calls to each provider, blanketing POPs all over the country. We looked at test results in ten areas that directly affect your online experience, from making (and keeping) the connection to downloading Web pages and transmitting e-mail messages.

As America Online knows, being able to get through is probably the most important measure of an ISP's performance. After all, who wants to hear a busy signal when you need to check your e-mail? Perhaps the hardest times to get through to an ISP are late afternoons and evenings, when the Net is clogged by people logging on from home.

CompuServe and IBM Internet Connection offered the best evening connect rates in Inverse's testing, making connections more than 93 percent of the time. The best ISP for getting through over an entire day was Microsoft Network.

Ed Douglas | DIRECTOR OF PRODUCT MANAGEMENT, MINDSPRING

Testing showed that connecting to MindSpring could be difficult—over 15 percent of calls encountered busy signals during the evening hours. But Inverse also had trouble getting through to AOL and MCI Internet in general.

Once you're logged on, you want to surf, whether it's for fun or business. But flipping through Web pages isn't as instant as switching TV channels. Minimizing the World Wide Wait means finding a provider with good *throughput*—that is, the amount of data the ISP can send to ▶

INTERNET SERVICE PROVIDERS FEATURES COMPARISON

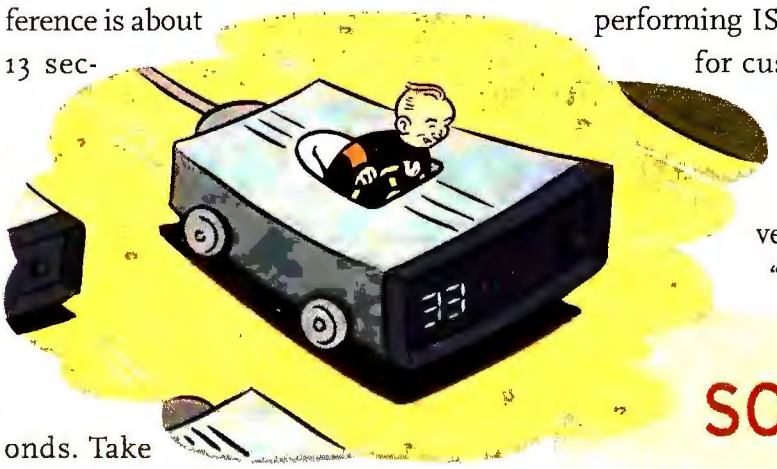
SERVICES	Start-up fee	30-day free trial period	Monthly fee for basic access/hours included	Monthly fee for unlimited access	Hourly charge for toll-free access	Approximate number of POPs	Free space available for Web pages	56-kbps protocols supported	ISDN support
America Online	none	●	$9.95/5	$19.95	$6	[1]	2MB [2]	x2	○
AT&T WorldNet	none	●	$4.95/3 [3]	$19.95	$6	265	none	x2 [4]	○
CompuServe	none	●	$9.95/5	$24.95	$6	502	5MB	x2 [4]	●
Concentric Network	$1	●	$7.95/5	$19.95	$5	146	5MB	x2, K56flex [4]	○
EarthLink Network	$25	○	[5]	$19.95	$4.80	1050	6MB	x2, K56flex	●
IBM Internet Connection	none	●	$4.95/3	$19.95	$6	1100	none	x2	●
MCI Internet	$4.95	●	$3/3	$19.95	$5.95	300	none	x2	●
Microsoft Network	none	●	$6.95/5	$19.95	n/a	800	none	K56flex	●
MindSpring	$25	●	$14.95/20	$19.95	$7.50	250	5MB	x2	●
Netcom	$25	○	[5]	$19.95	$4.90	336	1MB	x2	●
Prodigy Internet	none	●	$9.95/10	$19.95	$6	505	2MB	x2	○
Sprint Internet Passport	none	●	[6]	$19.95	$4.80	220	none	none	○

● Yes ○ No
n/a = not applicable

[1] Data not available; AOL has POPs in 555 cities.
[2] 2MB per screen name; 10MB per account.
[3] AT&T long-distance customers receive 5 hours.
[4] This ISP was testing its 56-kbps access numbers during our review.
[5] Offers only unlimited-access plans.
[6] Basic rate is $1.50 per hour.

your PC in a certain amount of time.

Our test results show that throughputs range from roughly 2 kilobytes per second at the high end to about 1.6 KBps at the low end. That might seem like a small range, but if you're talking about downloading a 100KB Web page, the difference is about 13 seconds. Take a moment to count that out, and it's easy to see which Internet service provider you'd rather be using.



The providers that did best at downloading Web pages include Sprint Internet Passport, CompuServe, Microsoft Network, and Prodigy Internet. Those at the bottom of the throughput rankings are AOL, AT&T, Concentric, EarthLink, MindSpring, and Netcom.

Besides Web surfing, you probably want to send e-mail—and you want it to arrive in a timely manner. We asked survey respondents what they considered a reasonable time for e-mail delivery. Over 74 percent said "under 5 minutes." So which provider gets it there that fast? Overall, EarthLink, IBM Internet Connection, and MindSpring get the best marks for sending and delivering e-mail in under 5 minutes, accomplishing the task 91 percent of the time or better. The major online services—America Online, CompuServe, and MSN—bring up the rear. AOL accomplished the job less than 40 percent of the time (ouch). Of course, Internet-only services aren't immune to slow e-mail: Sprint and MCI had troubles of their own. But as any ISP will say, you never know when a server will go down or a mad spammer will overload the system. So results may vary.

Prompt connections, fast downloads, and timely e-mail are a few of the criteria that factored into our performance ratings. For a look at how the ISPs performed in all our tests, check out the performance ratings chart on this page.

CUSTOMER IS ALWAYS RIGHT

EVERY ISP, no matter how fast and reliable, will have problems. Therefore good customer service and support is essential. Just because your provider is fast doesn't mean that it's customer-friendly. For example, Prodigy Internet—one of the best-performing ISPs—ranks below average for customer satisfaction. One reason for this might be that the company still needs to support an old version of its service.

"We're aware of the problems that stem from having two platforms and two products—Prodigy Classic and Prodigy Internet," says spokesperson Mike Darcy. "We're hiring more support people and providing more training." He says the improvements should be noticeable by the time you read this.

But even then, Prodigy will likely still be playing catch-up to MindSpring, which garnered the best mark for customer satisfaction in our online survey. In particular, of the MindSpring respondents who said they had contacted tech support with a problem, 87 percent said that the prob-

SOME ISPs Are FASTER Than Others

INTERNET SERVICE PROVIDER performance is fairly good, although not perfect. Overall, IBM Internet Connection and Prodigy Internet earned the highest marks for speed and reliability.

Testing was conducted from July 8 to 23, 1997, by Inverse Network Technology, an independent testing firm in Santa Clara, California. Using 17 Pentium-166 PCs equipped with 33.6-kbps modems, Inverse made calls to 42 different POPs for each ISP. POPs were chosen based on population density; in large metropolitan areas, several POPs were called. Each ISP received at least 4694 calls. Ratings are based on the test results. Listings within each rating tier (Best, Good, and so on) are alphabetical. Five stars is the best possible rating.

PERFORMANCE RATINGS	CONNECTING		
Internet Service Providers			
★★★★★ BEST ★★★★★			
IBM Internet Connection	★★★★	★★★★★	★★★★
Prodigy Internet	★★★★	★★★★	★★★
★★★★ GOOD ★★★★			
Concentric Network	★★★★	★★★★	★★★
EarthLink Network	★★★	★★★	★★★★★
Sprint Internet Passport	★★★	★★★	★★
★★★ FAIR ★★★			
AT&T WorldNet	★★★★	★★★★	★
Microsoft Network	★★★★★	★★★	★★★★
MindSpring	★★	★★	★★★★★
Netcom	★★★	★★★	★
★★ POOR ★★			
CompuServe	★★★★	★★★★★	★★
MCI Internet	★★	★★★	★★★★
★ WORST ★			
America Online	★	★	★★★★

[1] Inverse Network Technology did not perform e-mail tests for AOL, CompuServe, and MSN because these services use proprietary e-mail systems. Star ratings based on tests conducted by the PC

lem was resolved to their satisfaction.

Jeff Trant, a network manager and freelance consultant in Phenix City, Alabama, says he recommends MindSpring to his customers because of its tech support. "I have called them on four occasions, and each time I got the problem solved in a friendly, timely, and professional manner. They know their product well."

As you might expect, two services that have lots of users—AOL and MSN—seem to have trouble keeping up with customers' needs. Only 46 percent of MSN respondents said that their last tech support problem was resolved to their satisfaction, and 48 percent of AOL respondents said their problem was solved.

A key to choosing an ISP with the kind of support you want depends on how you like to get your support. About 65 percent of survey respondents said they like phone support. But a full 25 percent prefer to receive support over e-mail. And according to the survey, some ISPs are better at one method than the other.

AT&T and Sprint get the highest marks for phone responsiveness. All the Sprint respondents and 90 percent of AT&T respondents who have called the ISP's tech support said they got through to someone helpful in less than one hour.

Ideally, e-mail support should reach you in less than a day. IBM Internet Connection and MindSpring both seem adept at providing support in this manner, according to survey respondents (for details, see "ISP Customers Sound Off").

WHY AMERICA ONLINE?

OUR DATA SHOWS that AOL is slow and that its customers are dissatisfied. Even after the company added extra servers ▶

THE STAR SYSTEM

STARS CORRESPOND to ISPs' relative rankings in ten tests conducted by Inverse Network Technology and the PC World Test Center.

Getting Through
Percentage of successful call attempts to the Internet service provider. Five stars: above 95 percent. Four stars: 93 to 95 percent. Three stars: 90 to 92.9 percent. Two stars: 88 to 89.9 percent. One star: below 88 percent.

Getting Through at Night
Percentage of successful call attempts to the ISP between 6 p.m. and midnight, local time. Five stars: above 93 percent. Four stars: 90 to 93 percent. Three stars: 86 to 89.9 percent. Two stars: 80 to 85.9 percent. One star: below 80 percent.

Connecting at Top Speed
Average speed at which the modem connects to the ISP. Five stars: above 29,000 bits per second. Four stars: 28,300 to 29,000 bps. Three stars: 27,500 to 28,299 bps. Two stars: 26,700 to 27,499 bps. One star: below 26,700 bps.

Logging On
Average time it takes to log on to the Internet service provider's server. Five stars: less than 26 seconds. Four stars: 26 to 28.9 seconds. Three stars: 29 to 32.9 seconds. Two stars: 33 to 38 seconds. One star: more than 38 seconds.

Downloading Web Pages
Average throughput while downloading Web pages. Five stars: more than 2 kilobytes per second. Four stars: 1.85 to 2 KBps. Three stars: 1.75 to 1.84 KBps. Two stars: 1.65 to 1.74 KBps. One star: less than 1.65 KBps.

	THE WEB			E-MAIL		
★★★★★	★★★	★★	★★★★★	★★★★★	★★★★	★★★★
★★★	★★★★	★★★★	★★	★★★	★★★★	★★★★★
★★	★★	★★★	★★★★	★★★	★★★★★	★★★
★★★★	★★	★★	★★★★★	★★★★	★★★★	★★
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★★★★	★★★★	★★★★★	★[1]	★★[1]	★★★[1]	★[1]
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★★★	★★★'	★★★	★★★	★	★★★	★★
★	★	★★★	★[1]	★[1]	★[1]	★[1]

World Test Center using the same methodology employed by Inverse Network Technology.

Failing to Download Page
Percentage of times that a Web page failed to download, plus the percentage of times the connection timed out while waiting for a Web page to download. Five stars: less than 3.1 percent. Four stars: 3.1 to 5.9 percent. Three stars: 6 to 7.9 percent. Two stars: 8 to 10 percent. One star: more than 10 percent.

Delivering E-Mail on Time
Percentage of e-mails delivered to the sender's ISP in less than 5 minutes. Five stars: more than 95 percent. Four stars: 92 to 95 percent. Three stars: 85 to 91.9 percent. Two stars: 70 to 84.9 percent. One star: less than 70 percent.

Receiving E-Mail on Time
Percentage of e-mails received from the recipient's ISP in less than 5 minutes. Five stars: more than 93 percent. Four stars: 92 to 93 percent. Three stars: 89 to 91.9 percent. Two stars: 70 to 80 percent. One star: less than 70 percent.

Delivering Large E-Mail
Average throughput while delivering e-mail messages to the ISP. Five stars: more than 8 kilobytes per second. Four stars: 7 to 8 KBps. Three stars: 6 to 6.9 KBps. Two stars: 4.7 to 5.9 KBps. One star: less than 4 KBps.

Receiving Large E-Mail
Average throughput while receiving e-mail messages from the ISP. Five stars: more than 7 kilobytes per second. Four stars: 6 to 7 KBps. Three stars: 5 to 5.9 KBps. Two stars: 4 to 4.9 KBps. One star: less than 3.5 KBps.

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products are capable of 56 Kbps downloads however, due to FCC rules which restrict power output of service providers' modems, current download speeds are limited to 53 Kbps
y vary depending on line conditions. Uploads from end users to providers travel at 28.8 Kbps.
A- a local analog phone line compatible with x2 technology and an Internet provider with x2 service are required for these high speed downloads. See www.3com.com/x2 for details.
3 Offer [illegible] be claimed by 6/30/98.
4 $5[illegible] rebate, valid with purchase of Sportster® 56K modes 1783 1784, 1785, 1786, 1787 and 1789; Courier™ 56K models 1867, 1868 and 1869 only, purchased 7/1/97 through 1/17/98
See www.3com.com/x2delivers for details.
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to handle the high call volume, our test results show that getting through to AOL can be difficult.

What's more, AOL customers who responded to our survey complained in droves that getting help from the service was a terrible experience. Its rating for problem resolution was the worst, as was its rating for phone responsiveness, online help, and overall satisfaction with tech support.

So why all the AOL customers?

"I love AOL because it's very easy to use, which in a way has made me a bit lazy," says Arturo Espinoza, a student from New York City. "Content is easy to find, and there are e-mail features that you won't find anywhere else."

But Espinoza acknowledges AOL's problems. "I hate it because of all the busy signals," he says, "and I hate the commercialization. Almost every time I log on to AOL, I get stupid ads asking me to buy something I don't need."

Despite the fact that AOL sits at the bottom of our ratings, spokesperson Michael Gross says, "Our member retention rate continues to be very strong, and the company takes that to be an indication of consumer satisfaction." (Gross would not give us the retention rate.) In addition, he says that AOL's recent deal with WorldCom will allow it to triple its network capacity, and that the company is hiring additional workers in the call center. As for all the ads, Gross says they'll stay because the revenue helps keep prices down for users.

HIGH-SPEED ACCESS

BEYOND PERFORMANCE and customer satisfaction are the other features that Internet service providers offer. One of the most important for Web surfers is faster access, specifically with 56-kilobits-per-second modems.

But remember that not all 56-kbps connections are the same. There are two competing standards: x2 and K56flex. (A universal standard is in the works, but at press time it had not been ratified.) You

ISP Customers SOUND OFF

WHICH ISPS TAKE THE BEST CARE of their customers? Which are the most helpful when problems arise? We asked PC World Online users and members of the PC World Online Advisory Council what they think of their ISPs. MindSpring users rave, while IBM Internet Connection loyalists are also happy across the board.

Ratings are based on the feedback of 6136 respondents to PC World Online's ISP survey between July 22, 1997, and August 18, 1997. Listings within each rating tier (Best, Good, and so on) are alphabetical. Five stars is the best possible rating.

SATISFACTION RATINGS

Internet Service Providers						
★★★★★ BEST ★★★★★						
MindSpring	★★★★★	★★★★★	★★★★★	★★★★	★★★★★	★★★★
★★★★ GOOD ★★★★						
Concentric Network	★★★	★★★	★★★★★	★★★★	★★★	★★★★
EarthLink Network	★★★★	★★★★	★★★★★	★★★	★★★★	★★
IBM Internet Connection	★★★★★	★★★★★	★★★★	★★★★	★★★★★	★★★★
Sprint Internet Passport	★★★★	★★★★	★★★	★★★★★	★★	★★★
★★★ FAIR ★★★						
AT&T WorldNet	★★★	★★★	★★★★	★★★★★	★	★★★
CompuServe	★★★	★★★	★★★	★	★★★★	★★★★★
★★ POOR ★★						
MCI Internet	★★	★★	★★	★★★★	★	★
Netcom	★★	★★	★★	★★	★	★★★
Prodigy Internet	★★	★★	★★	★★	★★★	★★
★ WORST ★						
America Online	★	★	★	★	★★	★
Microsoft Network	★	★	★	★★	★★	★★

can't use an x2 modem to connect to a K56flex model, or vice versa. Therefore you need to make sure your 56-kbps modem's standard matches that of your ISP's 56-kbps modem.

Because of these competing standards, ISPs have been slow to upgrade their services. Eight providers offered 56-kbps support during our tests, and three more ISPs were testing their 56-kbps connections. IBM and Prodigy had the most 56-kbps access numbers (all of IBM's POPs were upgraded, while 150 of Prodigy's supported it). CompuServe and EarthLink Network are taking a different course, offering a toll-free number for 56-kbps access and charging around $5 per hour to use it.

On the other hand, Sprint doesn't offer 56-kbps access at all, but it won't say when it plans to do so.

So before you sign up with a new ISP, make sure it provides 56-kbps access. And don't settle for a polite yes from the customer service rep: Tell the person where you live and ask if you can get 56-kbps access in your area.

If you want to avoid the 56-kbps debate, there's always Integrated Services Digital Network, better known as ISDN. It can potentially give you connect speeds ranging from 64 to 128 kbps, but you can't get ISDN lines just anywhere in the country. And where you can get them, prices for the modem, installation, and monthly phone connection can be staggering. On top of that, ISPs that offer ISDN support usually charge you extra for the high-speed access.

Of the ISPs in our review that support ISDN, MindSpring has the most reasonable pricing. A 64-kbps connection is free, and a 128-kbps connection costs $1 per hour. In contrast, IBM Internet Connection charges $6 per hour for 64 kbps and $12 for 128 kbps. Some ISPs, including EarthLink and Netcom, charge flat monthly rates for ISDN, while several others—America Online, AT&T WorldNet, Concentric Network, Prodigy Internet, and Sprint Internet Passport—don't support ISDN connections at all.

PASS THE ICING

EVEN IF YOU'VE found a provider that supports your high-speed modem, performs like a champ, and gives great support, there are other treats that serve as icing on the cake.

To make Web surfing easier and more enjoyable, you might want an ISP that gives you extra content. Services such as America Online and CompuServe have numerous forums, chat rooms, and other online goodies. Concentric, EarthLink, and MindSpring have built impressive sites that make for entertaining and helpful launchpads to the rest of the Web. Many Internet service providers allow you to customize their home page with news and links that are of interest to you.

If you want to have a personal Web page, you need an ISP that will give you room on its server. CompuServe, Concentric, and MindSpring offer 5MB of space, but almost half the providers in our review don't offer any space at all.

And finally, there's the software interface. Some ISPs take browsers like Microsoft Internet Explorer or Netscape Navigator and add features, such as Prodigy Internet's Toolbar. Others build an entire interface around the browser to make surfing the Web easier, like the MindSpring Desktop.

In the end, searching for the perfect ISP comes down to this: What's important to you? Reliable connections? Fast e-mail? Courteous support? Or just the icing on the cake? There's nothing wrong with wanting it all, and there's certainly nothing wrong with trying out ISPs until you find one that suits you.

America Online

THE TRAINING WHEELS NEVER COME OFF

PRO: Very easy to use, original content

CON: Slow, unresponsive support, spam city

Remember this the next time you get a free America Online disk in the mail: There are other ways to the Net. AOL may be easy to install and have loads of content, but it's a Web surfer's nightmare.

The proprietary browser, based on Internet Explorer, is maddeningly slow at opening Web pages (fortunately, you can replace it with plain old Internet Explorer). And during our hands-on testing, AOL's support staff never responded to our e-mail requests for help.

If you're still thinking of starting up with AOL, be warned: Junk e-mail is a fact of life on the service, and every session kicks off with a morass of advertisements for products and services. *America Online; 800/827-6364; www.aol.com*

READER SERVICE NO. 640

AT&T WorldNet

PLAIN VANILLA AT HÄAGEN-DAZS PRICES

PRO: Reliable, good Web access

CON: Limited 56-kbps access, no free Web pages

With WorldNet, bandwidth junkies are out of luck because there's no ISDN and limited 56-kbps support; Web publishers have to dish out $1.95 a month for a measly 2MB of server space; frequent ▶

THE STAR SYSTEM

STARS CORRESPOND to relative rankings generated from raw scores in each category.

ISP Satisfaction

Percentage of survey respondents who said they are satisfied with their ISP. Five stars: more than 88 percent. Four stars: 78 to 88 percent. Three stars: 72 to 77 percent. Two stars: 63 to 71 percent. One star: less than 63 percent.

Satisfaction With Support

Percentage of respondents who said they are satisfied with tech support. Five stars: more than 88 percent. Four stars: 81 to 88 percent. Three stars: 70 to 80 percent. Two stars: 59 to 69 percent. One star: less than 59 percent.

Problem Resolution

Percentage of respondents who said their most recent technical support problem was resolved to their satisfaction. Five stars: more than 70 percent. Four stars: 65 to 70 percent. Three stars: 61 to 64 percent. Two stars: 50 to 60 percent. One star: less than 50 percent.

Phone Responsiveness

Percentage of respondents who said it took less than one hour to reach a person over the phone who could help them. Five stars: more than 72 percent. Four stars: 68 to 72 percent. Three stars: 58 to 67 percent. Two stars: 49 to 57 percent. One star: less than 49 percent.

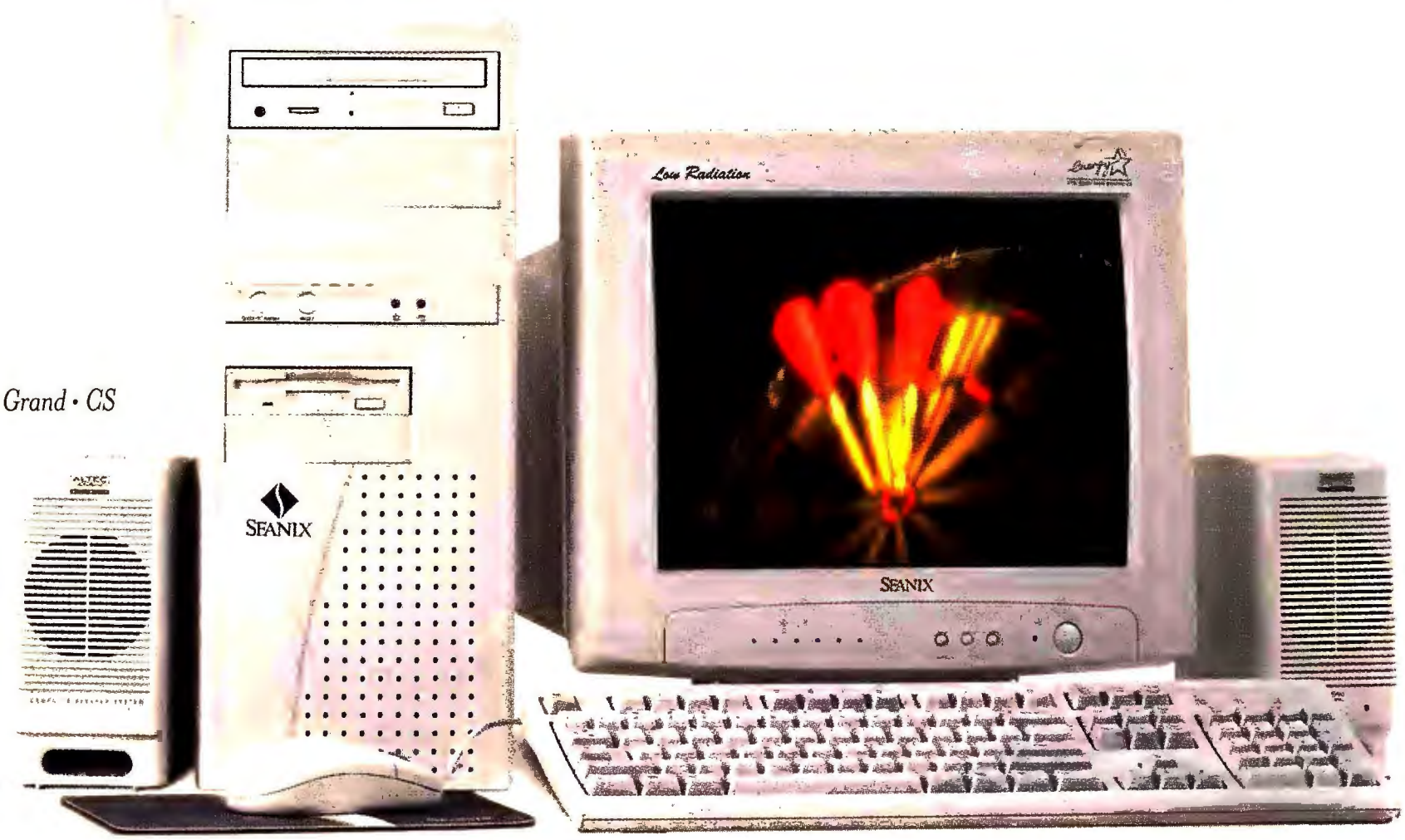
E-Mail Responsiveness

Percentage of respondents who said it took less than one day to receive an e-mail response to a technical question. Five stars: more than 48 percent. Four stars: 39 to 48 percent. Three stars: 34 to 38 percent. Two stars: 29 to 33 percent. One star: less than 29 percent.

Online Help

Percentage of respondents using FAQs who said they received an answer to their question. Five stars: more than 78 percent. Four stars: 70 to 78 percent. Three stars: 60 to 69 percent. Two stars: 50 to 59 percent. One star: less than 50 percent.

At Seanix we hit it



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Intel 200MHz Pentium Pracessor with MMX Technalagy
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10/100 Ethernet Adapter Onbaard
Intel LANDesk Client Monoger
DMI 2.0 Compliont
Hordwore Monitoring
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Intel 233MHz Pentium II Pracessor
512KB Internal Cache
32MB SDRAM DIMM Memary
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17" Seanix Manitor, .28mm (15.8" v.i.s.)
24X/12X CD ROM Drive
10/100 Ethernet Adapter
Intel LANDesk Client Manager
DMI 2.0 Compliont
Hordwore Monitoring
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CS Power2 266
Intel 266MHz Pentium II Pracessar
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64MB SDRAM DIMM Memory
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Rivo 128 4MB 3D AGP, 128-Bit Video
17" Seanix Manitar, .28mm (15.8" v.i.s.)
24X/12X CD ROM Drive
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Ensaniq® AudiaPCI™ Wavetable & Micraphane
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13.3 XGA Active Matrix TFT Calar Display
32MB EDO SODIMM Memary
3.0GB Hord Drive
128-Bit Graphics Acceleratar
20/12X CD ROM/Swappoble 3.5 Diskette Drive
16-Bit Saund Blaster® Campatiable, 3D Spatializer
2 Integrated Sterea Speakers & Microphane
Volume Cantral, Sterea-In, Micraphane-In & Headphane Ports
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Circle 226 on reader service card

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travelers pay 10 cents per minute to use a toll-free access number (that's up to 25 percent more than some others charge); and content-hungry surfers will be disappointed by WorldNet's uninspiring members-only Web pages.

On the other hand, what AT&T does, it does fairly well. It provides a basic, reliable connection. It will even forward your e-mail for 60 days if you move to a new ISP—a generous offer. If you need tech support, give AT&T a call. It responds better over the phone than through e-mail—big surprise. *AT&T WorldNet; 800/967-5363; www.att.com/worldnet*

READER SERVICE NO. 641

CompuServe

OLD DOG, NEW TRICKS

PRO: Great forums, prompt e-mail support

CON: Uneven performance, poor phone support

As we went to press, AOL was in the process of acquiring all of CompuServe's customers. A CompuServe spokesperson said the service would continue to exist—it would merely be run by AOL. "After all," he said, "2.9 million people chose CompuServe over AOL for a reason."

The most important reason may be CompuServe's wealth of online forums. A few of our favorite reasons include 5MB of server space for personal Web pages and a 4-hour e-mail support response policy (and they mean it).

The downside? There's a limited number of 56-kbps access numbers, and connecting requires a toll-free access number that costs $6 per hour. CompuServe's performance is poor (although getting through during peak hours is relatively easy). But overall, CompuServe has improved over the last year. *CompuServe; 800/848-8990; www.compuserve.com*

READER SERVICE NO. 642

Concentric Network

ALL THINGS TO ALL USERS

PRO: Fast, easy to use, good support

CON: No ISDN connections

Since our last review, Concentric has improved a lot. One reason could be its use of "super-POPs"—single POPs that serve many phone exchanges. It was the only ISP we tested with a local number for our reviewer in Sonoma, California.

Stir in a nice selection of forums, chat rooms, and links and you have a friendly, full-service ISP. You can set up a personalized front page, and visit a gaming site with 20 hours of play time. One Concentric feature in particular will appeal to small businesses: The ISP has simplified the task of registering a domain name. Just fill in an electronic form, and Concentric takes care of the rest. About the only thing this ISP lacks is high-speed access. While ISDN support is not available, 56-kbps modem support was in a trial phase during our review. *Concentric Network; 800/745-2747; www.concentric.net*

READER SERVICE NO. 643

EarthLink Network

PLAY GAMES, SURF FREE

PRO: Fun to use, ISDN and 56-kbps support

CON: Slow with Web pages, $25 start-up fee

Users tell us they are happy with EarthLink, but actually getting someone on the phone can be hard. Maybe the staff is busy playing games in the Arena, a gaming area where EarthLink members can get a rebate of their monthly fee just for playing (and paying for) 35 hours a month.

Despite the wayward staff, EarthLink is great to use. We saw an early version of its TotalAccess 2.0 software that makes getting started and navigating the Web a snap. You'll find links galore at EarthLink's site, plus a personalized "start" page with news, weather, stock quotes, and more. Server space for personal Web pages has been expanded to 6MB, and EarthLink gives you a nice utility that tells you how much of your space is used.

If you have an x2 or K56flex modem, you can speed things up for an extra $4.95 per hour. However you do it, EarthLink makes the Web fun. *EarthLink Network; 800/395-8425; www.earthlink.net*

READER SERVICE NO. 644

WELCOME HOME: Concentric Network has one of the friendliest home pages around.

JUNK MAIL, ANYONE? America Online customers have to endure a wave of special offers whenever they log on.

IBM Internet Connection

QUICKER THAN CHESS, BUT DULLER

PRO: Fast access, easy setup, good support

CON: Uninspired site, no personal Web pages

IBM Internet Connection is fast and reliable, but it's also as straitlaced as an ISP can be. Which brings us to this tip: IBM's slant toward no-nonsense business users who log on during the day means that home users will have an easier time getting through at night (peak time for most ISPs). And if you want more speed, the provider offers 56-kbps and ISDN access in most cities.

But if you want a warm and fuzzy ISP, this may not be best. For one thing, IBM still doesn't offer space for personal Web pages (after much delay, IBM started offering Web hosting for small businesses at $30 per month). And the Web site is bare-bones. IBM even discontinued Today's Feature, an often amusing daily column that highlighted interesting Web sites. But maybe you don't care. If all you want is speed and reliability, this ISP is the best. *IBM Internet Connection; 800/821-4612; www.ibm.net* ▶

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Circle 246 on reader service card

THINK Globally, ACCESS Locally

NATIONAL INTERNET service providers may get all the ink, but for many people the best Net connection is often a neighborhood ISP.

Take John Stephens, president of Media Pulse, a small St. Louis company that tracks television coverage for public relations firms and corporate clients.

"Like most small businesses," Stephens says, "we wanted the same sort of reliable electronic-mail solution that big businesses no longer think twice about."

Stephens says his company started out using America Online, but when the cheery "You have mail!" voice was replaced by a drone of busy signals, Media Pulse's inability to send vital information to its clients became a serious problem.

Stephens turned to Southwestern Bell (www.swbell.net), which had just entered the ISP business. "They came in and coordinated everything for us," he says. Media Pulse is now connected over an ISDN line.

HOUSE CALLS

REGIONAL ISPs, which might serve several states, and local ISPs, which usually serve communities, frequently offer better service than their national counterparts. They often provide local news and information, special offers from local businesses, and frills that national ISPs sometimes do without—like Web page hosting. And because they serve fewer users than national ISPs do, they can give their customers extra attention.

Diane Cabell, of Medford, Massachusetts, says that she usually has a question for technical support about once a week. Her local provider, Complete Internet Access (www.thecia.net), is up to the challenge—and then some. "They have actually come to my house to run diagnostics," Cabell says.

Using a regional ISP doesn't mean you'll have to sacrifice good performance. In tests conducted by Inverse Network Technology, regional ISPs performed better as a whole than their national counterparts. Pacific Bell Internet (www.pacbell.net), which serves California, scored well enough to rank it above IBM Internet Connection, our top-rated national ISP. For East Coast users, Erol's Internet (www.erols.com) serves the mid-Atlantic states in style.

Diane Cabell | ISP USER

And if that's not enough, regionals also scored pretty well in our customer survey. In fact, Erol's users are even more satisfied than MindSpring's.

But not all regional ISPs can beat the nationals. Bell South (www.bellsouth.net), for instance, is no easier to get through to than national ISPs like Netcom and Sprint Internet Passport, which rated poorly for connecting.

Local ISPs can also have their downsides. In a volatile market, smaller providers are more likely to shut their doors. For a business user, that can mean losing valuable time while finding a new ISP, not to mention reprinting all those business cards with new e-mail addresses. In addition, small ISPs with large followings may actually provide *less* service if their resources are overextended.

Maralyn Henry, a project manager at a computer training company in Raleigh, North Carolina, switched from her local provider, Sunbelt.net, because she could never get answers from its help desk. "They always liked to fix the blame on the hardware or other software I was using," Henry says. "Problems continued to escalate, so I finally signed up with Concentric Network."

REGIONAL OR NATIONAL?

SHOULD YOU GO WITH a regional or local ISP, or with one of the nationals? That depends largely on your needs. If you travel a lot, a national ISP will have more access numbers around the country. Because of their size and resources, national ISPs are also more active in upgrading their networks, installing faster modems, and creating easier-to-use software.

But if you live in the boondocks and don't want to make a long-distance call to connect to your ISP, a local provider may be your best bet. Perhaps you like the idea of logging on to the Web and getting local news, features, and other information about your area on your front page. Or maybe you just like the idea of being a big fish in a small pond—where you don't always have to share your ISP's resources with thousands of other surfers.

Ultimately, you'll need to shop around, ask questions, and kick some tires. And don't be afraid to change ISPs if your first choice turns out to be a lemon. —L. P.

MCI Internet

CLUELESS IN CYBERSPACE

PRO: Comes with PointCast software

CON: No personal Web pages, bad service

MCI still appears to have problems fulfilling orders for its installation CD-ROM. For the second year in a row, we had to jump through hoops—phone recordings and long waits on hold—to get a disc.

MCI Internet customers responding to our survey don't seem to have problems getting their questions answered over the phone, but they don't like much else about the service. In addition, the ISP's performance was poor, especially in making a connection or using e-mail. What's more, MCI Internet doesn't offer personal Web pages. Its home page looks useful, but it's little more than a few links. C'mon, MCI—give a little. *MCI Internet; 800/550-0927; www.mci200.com*

READER SERVICE NO. 645

Microsoft Network

PRIME-TIME TV AT WEB SPEED

PRO: Good connections, ISDN access

CON: No personal Web pages, bad support

MSN's members tell us they're unhappy with the service. We see their point: We had a hard time loading the software; tech support—a toll call—gave up on our problem after two hours; and once we were online we found the chat rooms to be thinly populated. MSN's TV-style "pro- ▶

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grams" are often vapid and slow, and there is no space for personal Web pages.

But we see a ray of hope: MSN performed well in Inverse's test suite. And although e-mail moved slowly in our tests at the PC World Test Center, Microsoft was in the middle of upgrading its mail system to help speed things up. We also got a glimpse of MSN 2.5, the newest version of the service, which should be out now. The setup routine is much improved and there are several features to make browsing easier. Managing e-mail with Outlook Express is particularly easy. MSN even took a trick from AOL: buddy lists, which automatically find your friends when they're online.

If there's one company that does not like to be number two (or last), it's Microsoft, so maybe the company will cure what's ailing MSN. *Microsoft Network; 800/373-3676; www.msn.com*

READER SERVICE NO. 646

LET THE GAMES BEGIN. At EarthLink you can lose yourself in the Arena, a gaming site.

MindSpring

GROWING PAINS

PRO: Great software, excellent service

CON: Blacked out in some areas, $25 start-up fee

MindSpring is the only ISP to grab a best rating for satisfaction, so it's not surprising that it has been growing rapidly. In fact, during our testing the company was not accepting new accounts in several cities because the traffic was so heavy. The overload, plus some slow POPs, drags down the ISP's performance ratings. But that doesn't seem to bother many users.

We got an early look at MindSpring's new software, which features the MindSpring Desktop for organizing links and other information. You can also set it up to automatically receive news, stock quotes, and more. MindSpring is starting to provide 56-kbps modem support using the x2 protocol in select cities. If the new POPs alleviate its performance issues, MindSpring could become the no-brainer choice for Net service. *MindSpring; 800/719-4660; www.mindspring.com*

READER SERVICE NO. 647

Netcom

FAST ACCESS, EXTRA COSTS

PRO: ISDN and 56-kbps access

CON: Long hold times, $25 start-up fee

Ka-ching! Netcom's start-up fee is $25, ISDN access runs $29.95 a month plus a $50 setup fee (many providers charge for ISDN access), and you have to pay an extra $5 a month for 56-kbps access. And according to our test data, Netcom's performance is merely fair.

Service? Well, we're still waiting for our start-up disk to arrive by mail (thank goodness they're available at our local Virgin Megastore), and we spent more time on hold with Netcom than with any other ISP. Netcom's Web page hosting is a thanks-for-nothing deal: You can post a page, but it had better fit in a measly 1MB.

To its credit, Netcom has replaced the old NetCruiser browser with a customized version of Internet Explorer or Netscape Navigator, but the ISP has gone downhill in most other areas. *Netcom; 800/638-2661; www.netcom.com*

READER SERVICE NO. 648

Prodigy Internet

THIS NEW COKE IS BETTER THAN CLASSIC

PRO: Loads of content, great performance

CON: No ISDN support

Having shaken off the old Prodigy interface, Prodigy Internet ranks near the top in performance. However, it ranks poorly for satisfaction—partly because our ratings include feedback from users of what is now called Prodigy Classic who are apparently unhappy with the old service.

Prodigy Internet has excellent content, and it features the Prodigy Toolbar, which helps you navigate the Web. It has widespread support for x2-based 56-kbps modems, but ISDN users are out of luck.

SATISFYING: MindSpring, with its useful home page, keeps its customers happy.

Overall, though, Prodigy Internet is a huge improvement. *Prodigy Internet; 800/776-3446; www.prodigy.com*

READER SERVICE NO. 649

Sprint Internet Passport

GIVE CANDICE BERGEN SOME CREDIT

PRO: Fast, nice chat rooms, good support

CON: No personal Web pages, no 56-kbps access

Sprint has turned out a fast, reliable Internet service provider. It doesn't have some of the frills you might want—Web page space, 56-kbps modem support, ISDN access—but it gets you where you want to go. And look: Toll-free access is actually *less* than a dime a minute.

If there are improvements to be made, they have to do with connecting at top speed and delivering e-mail on time. And the setup software, while intuitive, ran willy-nilly over our system, overwriting files and installing a version of Navigator that would work only with Sprint's e-mail address. If that sounds pushy, remember that "Murphy Brown" is the company's spokesperson. *Sprint Internet Passport; 800/747-9428; www.sprint.com*

READER SERVICE NO. 650

For more information, visit PC World Online at www.pcworld.com/jan98/isps. Brad Grimes is a PC World *senior associate editor. Lewis Perdue is a freelance author in Sonoma, California. Testing by Jeff Kuta and Elliott Kirschling of the PC World Test Center.*

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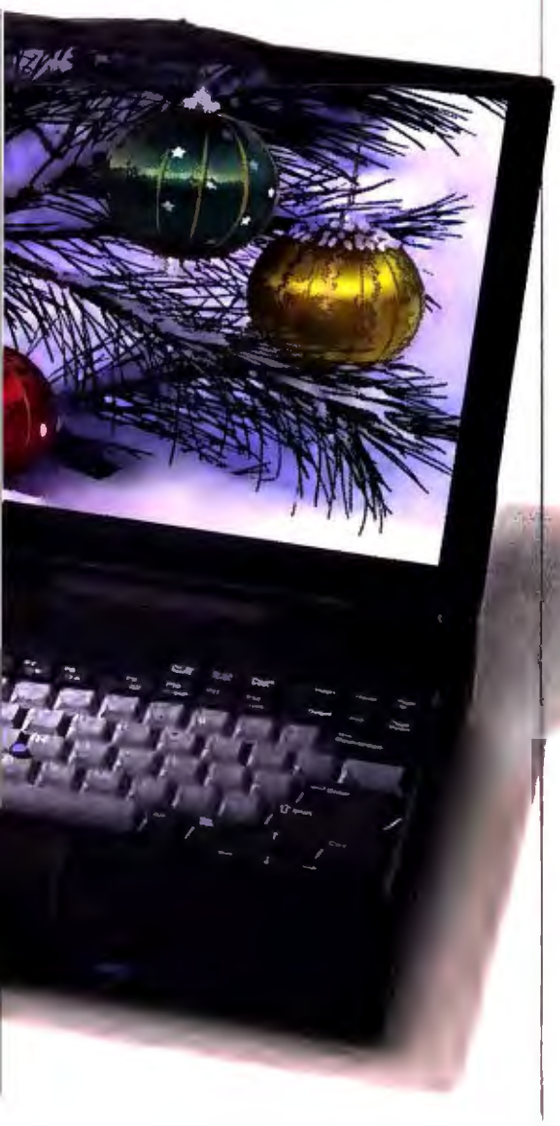

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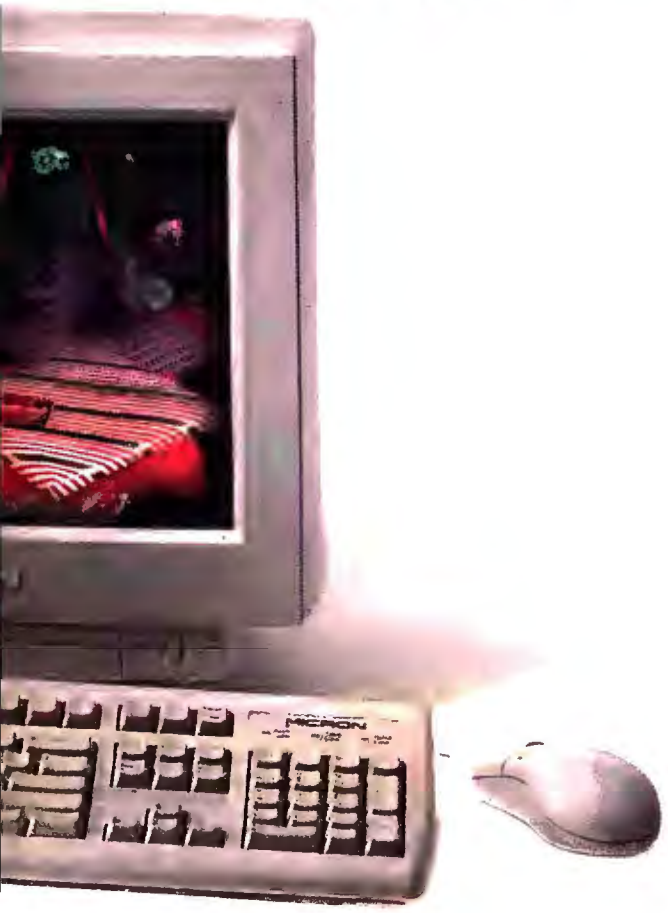

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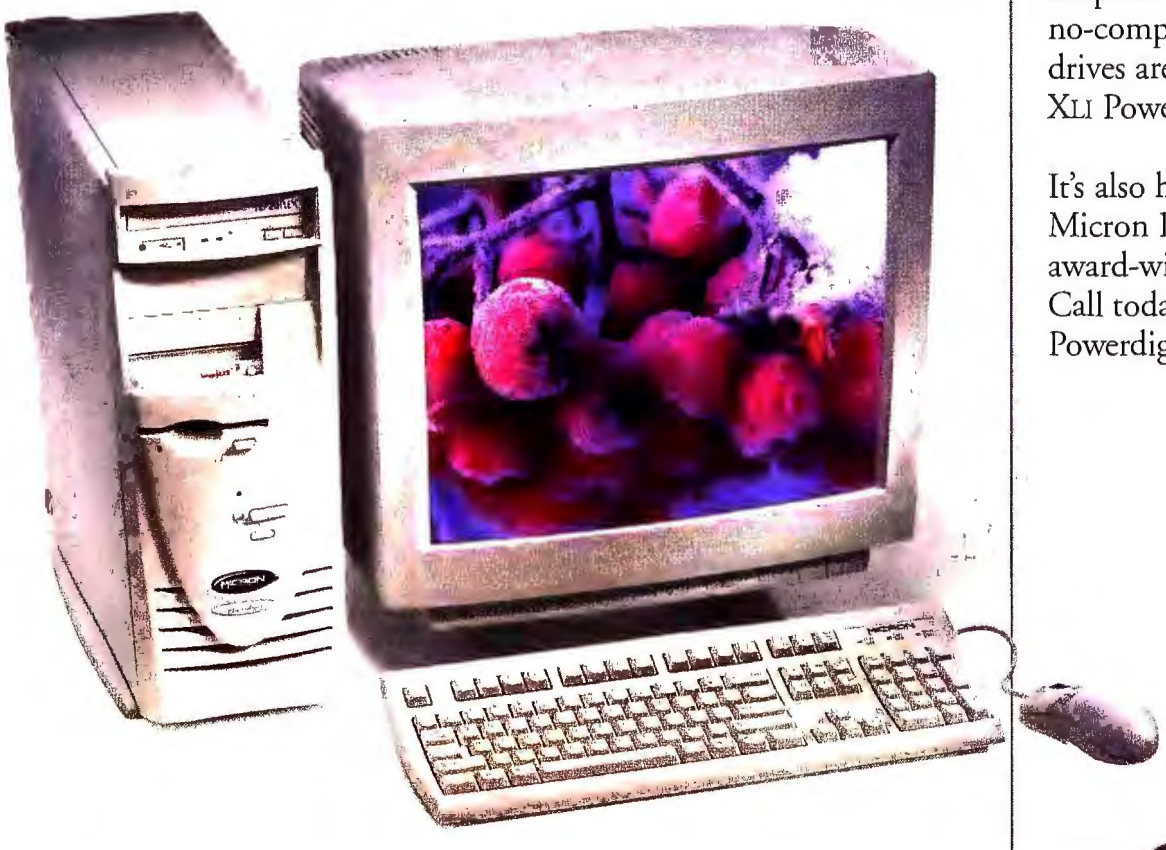

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5-year/3 year Micron Power limited warranty

Millennia XKU 266

Intel 266MHz Pentium II processor (features MMX technology)
64MB SDRAM
6.4GB Ultra ATA hard drive
17" Micron 700FGx, .26dp (16" display)

$2,599
Bus. Lease $89/mo.

Millennia XKU 300

Intel 300MHz Pentium II processor (features MMX technology)
128MB SDRAM
8.4GB Ultra ATA hard drive
17" Micron 700FGx, .26dp (16" display)

$3,099
Bus. Lease $106/mo.

Fusion 3D Option Pak

DVD-ROM, **DVD software
E4 Cool DVD PCI decoder card: 6 channel AC-3 to 2 channel out capability, SPDIF output (digital audio out)
AWE 64 ISA sound card
Cambridge SoundWorks/MicroWorks - 2 speaker satellite with subwoofer stereo system
Monster 3D graphics card with 4MB memory***
Fusion 3D game pak: Mech Warrior 2: Mercenaries D3D version, AH-64D Longbow, U.S. Navy Fighters '97, Command & Conquer, Formula 1 D3D Edition
MS Sidewinder™ Pro Joystick

MME add $699
XKU add $549

*Maximum transmission speed of up to 56Kbps when downloading data and 33.6Kbps when uploading. However, actual performance is dependent upon numerous factors and observed transfer rates may be less than the maximum potentials.
**The CD ROM drive will be removed upon the purchase of the DVD upgrade
***Available only on Millennia MME system

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Portable Solutions

Micron TransPort™ VLX

166MHz Intel Pentium processor with MMX technology
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PCI bus with 128-bit graphics accelerator
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Zoomed video-ready
Touchpad pointing device
Microphone and 16-bit stereo sound
2-way infrared port
Microsoft Windows 95 and MS Plus!
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Micron Executive™ desktop package: matching black 17" monitor (15.8" display), mouse, mousepad and keyboard (can be used with or without MicronDock. Available on XKE models only.)	$599
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Micron TransPort XKE

STANDARD FEATURES
512KB pipeline burst cache
128-bit, 2MB DRAM graphics
20X modular CD-ROM drive with AutoPlay™ technology
Pick-a-Point dual pointing devices
Microphone and 16-bit stereo sound
Integrated 33.6 Kbps modem (upgradable to 56Kbps), full duplex, CardBus- and Zoomed Video ready
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Management and Executive Travel software pak
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Dragon System NaturallySpeaking Personal voice recognition software
Custom nylon carrying case
Microsoft Windows 95 and MS Plus!
Microsoft Office 97 Small Business Edition
5-year/3-year Micron Power limited warranty

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32MB EDO RAM
1.6GB removable hard drive
12.1" TFT SVGA display

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Micron TransPort XKE 200

200MHz Mobile Intel Pentium processor with MMX technology
48MB EDO RAM
2.1GB removable hard drive
13.3" TFT XGA display

$4,199
Bus. Lease $133/mo.

Micron TransPort XKE 233

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Intel LANDesk® Server Manager 2.8
NOS Support (3 incident resolutions/1st year), 7x24

STANDARD FEATURES
Single or dual Intel Pentium® II processors
512KB integrated cache in SEC package
ECC SDRAM option (4 DIMM slots)
5 expansion slots: 4 PCI, 1 ISA
Integrated Adaptec PCI Ultra Wide SCSI-3 controller
Integrated Intel EtherExpress™ Pro 100 controller
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Dedicated server technical support, 7x24
5-year/3-year Micron Power℠ limited warranty
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Intel 300MHz Pentium II processor
ECC Level 2 cache on processor
64MB ECC SDRAM
4GB Ultra-Wide SCSI-3 hard drive
Microsoft Windows NT Server 4.0 (10-user license)
NOS Support (3 incident resolutions/1st year), 7x24

STANDARD FEATURES
Single or dual Intel Pentium II processors
512KB integrated cache in SEC package
Memory: ECC EDO or ECC SDRAM option
9 expansion slots: 6 PCI, 2 ISA, 1 shared ISA/PCI
Dual integrated Symbios Ultra-Wide SCSI-3 controller
Integrated Symbios Narrow SCSI controllers
Embedded RAID Upgrade option
I_2O ready via embedded Intel i960-RD
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1-year next-business-day on-site service***

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512KB pipeline burst cache, flash BIOS, DMI 2.0
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16X EIDE variable speed CD-ROM drive
S3 ViRGE graphics accelerator, 2MB EDO RAM
Microsoft Mouse
Microsoft Windows® 95
5-year/3-year Micron Power limited warranty

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Bus. Lease $49/mo.

ClientPro MRE

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64MB SDRAM
2.1GB Ultra ATA SMART EIDE hard drive
15" Micron 500Lx, .28dp (13.7" display)

512KB pipeline burst cache, flash BIOS, DMI 2.0
Network Adapter with Wake On LAN technology
16X EIDE variable speed CD-ROM drive
S3 ViRGE graphics accelerator, 2MB EDO RAM
Intel LANDesk Client Manager
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Microsoft IntelliMouse
Microsoft Windows 95
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Bus. Lease $59/mo.

ClientPro XLU

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16X EIDE variable speed CD-ROM drive
PCI 64-bit 3D video, MPEG, 4MB EDO RAM
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Microsoft Windows NT Workstation
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Call our sales team today! Left to right: Felice, Brian, Fred, Justin, Bruce and Ron.

Other Systems Options

Multimedia Options

32 voice wavetable stereo sound card	$59
32 voice wavetable stereo sound card with 2MB RAM[1]	$99
Advent AV270 Powered Partners stereo speakers	$79
Advent AV370 Powered Partners stereo speakers with subwoofer	$199
Microsoft SideWinder™ 3D Pro joystick	$59
Microsoft SideWinder gamepad	$39

Storage/Media Options

Adaptec 2940U Ultra SCSI Fast-20 controller (upgrade from system with standard Ultra SCSI Fast-20 controller)	$100
Plextor 12/20 Plex 3MB/sec SCSI internal CD-ROM drive[1] (upgrade from system with standard EIDE CD-ROM drive)	$100
Iomega Jaz SCSI drive with 1GB removable cartridge[1]	$299
Iomega Zip IDE drive with 100MB removable cartridge	$99
Iomega 6-pack of 100MB Zip cartridges	$99
Sony 4/8GB SCSI DDS-2 tape backup drive with tape and software[1]	$899
Seagate TR4 IDE 4/8GB tape backup with tape and software	$239
Seagate TR4 SCSI 4/8GB tape backup with tape and software	$279
Cheyenne ARCserver with InocuLAN	$499

Display/Video Options

17" Hitachi SuperScan CM630 (15.9" display) .26dp color monitor[2]	$100
19" Hitachi SuperScan CM751 (18" display) .26dp color monitor[2]	$300
21" Hitachi SuperScan CM801 (20.0" display) .26dp color monitor[2]	$650
Number Nine Imagine 128 series II video card, 4MB VRAM	$299
Number Nine Imagine 128 series II video card, 8MB VRAM	$549

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HP DeskJet 692C	$269
HP DeskJet 890Cxi	$429
HP LaserJet 6Lxi	$399
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Lexmark 7200 Color Jetprinter	$399
Lexmark Optra E+ Laser printer	$399
Epson Stylus Color 600	$269
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Canon BJC - 80	$299
Canon BJC -250	$149
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4-hour response[6] on-site service coverage[4] (24 hours, 7 days per week), 3 year	$998

Other service options may be available, ask your system consultant

Extended Desktop Service Options

Optional 1st year on-site service[3] coverage included	
2nd year on-site service[4] coverage	$79
2nd and 3rd year on-site service[4] coverage	$99

Other service options may be available, ask your system consultant

Software Options

Small Business Essentials. QuickBooks, Visio, Norton AntiVirus, Astound, Focal Point, American Yellow Pages	$179
CorelDRAW 7 (full retail version)	$299
Corel WebMaster Suite (full retail version)	$99

Network Options

3Com 3C509B Etherlink III ISA combo network adapter	$79
3Com 3C905 EtherlinkXL PCI combo network adapter	$99
3Com OfficeConnect Hub 8/TCP	$149
3Com OfficeConnect Switch 140	$969

Other Options

APC Per7T surge suppressor	$39
APC Pro7T surge suppressor	$59
Microsoft Natural Keyboard (upgrade from standard keyboard)	$49

[1] Requires SCSI host adapter
[2] Upgrade from systems with standard Micron 17" 17FGx color monitor
[3] 1st year on-site service is available in the United States and in limited areas in Canada from third-party service provider per customer's agreement with provider
[4] 2nd year and 2nd and 3rd year offerings are available in the United States only. Extended services, if purchased after system shipment may have a higher cost.
[5] Service will be scheduled whenever possible, for the next business day after parts are received by the customer
[6] Available in certain locations, ask your system consultant for details
Some options and accessories available with system purchase only

*Maximum transmission speed of up to 56Kbps when downloading data and 33.6Kbps when uploading. However, actual performance is dependent upon numerous factors and observed transfer rates may be less than the maximum potentials.

[1] Available only on Millennia systems with Microsoft Windows 95

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Photo Editing

ELECTRONIC images are everywhere. Thanks to the popularity of digital cameras, desktop scanners, and the Internet, it's simpler than ever to snap, scan, and download pixel-based pictures and store them on your PC. But now that you have them, do you know what to do with them?

Whatever a photo's final destination—a presentation, newsletter, or Web page—chances are you'll want to run it through a photo editing program first. You might need to correct an overexposure, or maybe you want to add a cool special effect, such as stretching a Volkswagen so it looks like a limo. Until recently, that meant you had to turn to an expensive and tough-to-learn image editing application like Adobe Photoshop—or hire someone to do the work for you.

BY RICHARD JANTZ

PHOTOGRAPHS BY GILES HANCOCK

for the Masses

A picture is worth a thousand words. But is it worth hassling with photo editing software? We tried eight packages, and what do you know: Digital photo editing is cheap, easy, and fun.

That's all changed with today's low-cost photo editing software. Geared toward casual and business users who haven't the time, money, or patience to learn a big, complicated package, these programs promise to let novices alter pictures just like the pros do—for $55 or less. Does that photo of your company's president have a bad case of red-eye? Click a button and it's gone. Want to create composite pictures or add knockout special effects for a presentation? It's easy.

We reviewed eight image editors priced from about $40 to $55 and found that several use step-by-step guides to make even some of the most difficult photo editing chores a snap. Some come with extra tools for preparing photos for the Web, such as color optimization for a specific browser. But beware: Despite their almost identical prices, these packages differ widely in ease of use. For instance, the most visually appealing program here, MetaCreations' Kai's Photo Soap, was also the hardest to figure out.

Based on their photo retouching and creative tools, Web graphics savvy, and ease of use, we picked two Best Buys: Adobe PhotoDeluxe 2.0 and Micrografx PhotoMagic 6.0.

Note that you'll probably be happiest using an image editor on an MMX-equipped or fast non-MMX PC. On our Pentium-200 with 64MB of RAM, files opened and closed snappily, special effects were applied instantly, and we could quickly zoom in and out of images. But when we ran the same operations on a Pentium-90 with 16MB of RAM, they were achingly lethargic.

You'll need an **MMX**-equipped or a very **fast** non-MMX **PC** to use a **photo** editor. Otherwise, operations take **too long.**

SMART PHOTO TRICKS

ONE OF THE MOST appealing aspects of buying a photo editor is getting your hands on its special effects (also called *filters*). Few people can resist blurring, pinching, embossing, or solarizing their photos, just to see what they can come up with (see "Special Effects: From Boring to Fantastic"). Most of the packages reviewed offer a big enough arsenal of effects to keep you busy experimenting for a long time. PhotoDeluxe, which comes with just about every filter included with its full-featured Photoshop sibling, has the most impressive collection of special effects.

What else should you look for? Predesigned templates—for cards, invitations, certificates, borders, and backgrounds—make it easy to produce professional-looking pages quickly. Microsoft Picture It 2.0 has the biggest and best collection of templates, while SoftKey's PhotoFinish comes with the best stock photos.

If you're working with lots of images, you'll also want a program that automatically creates a database of thumbnails (miniature pictures) that you can annotate with captions. Later, you can search for pictures based on the labels you've given them. Picture It and MGI PhotoSuite 8.05 tie for the best image management.

WEB PICTURES

NO PACKAGE here gives you as many tools for preparing photos for the Web as do specialized programs like Micrografx's Webtricity. However, PhotoMagic and PhotoDeluxe are the best choices for accomplishing the basics. Both can save images to three of the most common Web graphics formats: GIF, JPEG, and PNG. They also support transparent GIF, which lets you treat an object—say, someone's head—as a cutout, so it shows up on your Web page without the background.

In PhotoDeluxe's favor, it alone can save to both interlaced GIF and progressive JPEG file formats, making Web surfing more convenient by bringing in a low-resolution photo and then sharpening it (rather than scrolling it in piecemeal).

But PhotoMagic goes further. It comes with Netscape Navigator and Microsoft Internet Explorer color palettes to ensure that your images will look good when viewed in either browser. PhotoMagic is also the only choice here if you want to create image maps (complete with links) and HTML-formatted pages with embedded graphics.

POPULAR BUNDLE

DID YOU JUST BUY an office suite, a digital camera, or a scanner? Then you may already have a "lite" version of a photo editor—they're popular as bundled programs these days. If not, it's probably time to purchase one of the low-cost packages reviewed here. The best ones are easy and fun to use, and there's no quicker way to spiff up digital photos to impress your colleagues, customers, friends, and relatives. ▶

Best Buys

FOR THE BEST combination of tools and features aimed at both novices and advanced users, Adobe's $49 **PhotoDeluxe 2.0** can't be beat. Its guided-activities interface is perfect for new users, while its advanced features let veterans work faster by using pull-down menus, floating tool palettes, and multiple windows. It's also able to save pictures in a large number of Web file formats. If you want a low-cost package that gives you more than just a good photo editor, Micrografx's **PhotoMagic 6.0** is an excellent choice. It's part of a bundled suite, the $49.95 Windows Draw 6.0 Premier Edition Print Studio, which also includes modules for drawing, media management, and 3D and Web graphics. On its own, PhotoMagic doesn't provide as many guided activities as PhotoDeluxe or Microsoft's Picture It, but the complete suite has a broader range of graphics capabilities than all the other photo editors we reviewed.

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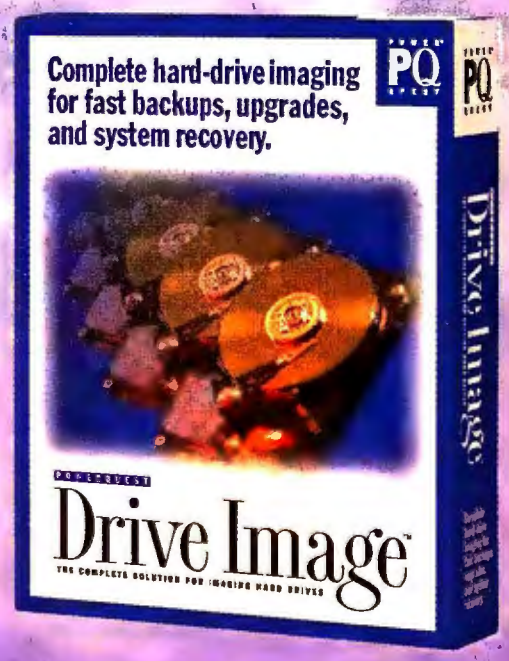

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FROM THE MAKERS OF PARTITIONMAGIC®

POWER® PQ QUEST

Circle 193 on reader service card

Adobe PhotoDeluxe 2.0

PRO: Customizable and easy-to-grasp interface, excellent help, versatile Web graphics, great expandability with Adobe plug-ins
CON: Limited undo, mediocre text tool

Adobe PhotoDeluxe 2.0 is flat-out the best all-around photo editor for the average business user for two reasons: It's strikingly easy to comprehend and use, and it's pleasingly customizable. The first advantage makes the $49 PhotoDeluxe a top choice for novices and occasional users; the second makes it a more productive tool for workaday veterans.

FLOATING PALETTES for selecting objects and controlling layers make collages easy in Adobe PhotoDeluxe 2.0.

Six self-explanatory buttons (such as Get Photo and Send) provide easy access to PhotoDeluxe's tools. Each button opens a well-organized series of tabs that guide you through assorted activities, from simple touch-up work like removing scratches, to a potpourri of special effects that you can quickly preview or undo. The program comes with a good-looking selection of ready-made templates (cards, stationery, covers, and frames), although its business document templates are limited.

Once you've learned PhotoDeluxe's basics, you can skip the steps under the main buttons and customize the interface to work faster. For instance, you can switch to long menus so that you can go directly to just about any feature in the program.

PhotoDeluxe deftly performs basic image adjustments, like correcting red-eye, as well as more complicated ones. You can easily create a composite image, for instance, thanks to flexible object selection tools and multiple layers. The time-saving Smart Select feature automatically traces an object as you move your cursor around the edges.

PhotoDeluxe isn't perfect. Because it's limited to a single undo or redo, you'll have to get by with the Revert to Last Saved command if you're unhappy with multiple changes you've just made to a photo. You can't place text on a curve or apply special effects to it, as you can in several other packages we reviewed. And as much as we liked its EasyPhoto file manager, it doesn't let you annotate or search for pictures—you're stuck scrolling through the "filmstrip" to find them.

On the other hand, PhotoDeluxe is the second-best package here for Web work (after PhotoMagic). It supports the largest number of Web file formats and offers lots of choices for handling color.

Adobe set the standard for professional-level photo applications with its full-featured Photoshop package. Now its PhotoDeluxe 2.0 is arguably the best entry-level photo editor. *Adobe Systems; 800/833-6687; www.adobe.com*

READER SERVICE NO. 651

MetaCreations Kai's Photo Soap 1.0

PRO: Beautiful interface, powerful editing tools and special effects
CON: No helpers, hard to use, doesn't let you cut and paste

MetaCreations has a knack for developing innovative graphics programs that look great but baffle everyone. Kai's Photo Soap, its latest creation, is no exception.

Photo Soap replaces the standard Windows 95 features—drop-down menus, toolbars, and dialog boxes—with full-screen "rooms" where you manage various editing tasks. For instance, you go to the Prep room to crop and rotate photos. Depending on the room, sometimes you work with brushes, pencils, and erasers; other times you use buttons, sliders, and gadgets. It's in this realm that Photo Soap makes further radical departures from the competition. First, rather than offer you specific effects to choose from, Photo Soap applies a myriad of effects and colors (mostly the latter) as you move its sliders. Also, it applies effects to the different *tones* in a picture. The result? Unpredictable—but amazingly varied—effects.

Even stranger, there's no way to cut and paste objects between pictures in Kai's Photo Soap. This seems like a big omission in a package that's supposed to be for beginners, who generally love doing that sort of thing.

KAI'S PHOTO SOAP is a stunningly attractive program, but its unlabeled sliders, buttons, brushes, and other icon-based tools are daunting.

If you're not afraid to knock around in a confusing program that comes with no wizards and little documentation, you may relish Photo Soap's novel approach and effects. But if you just want to crop a head shot or drop a photo into a ready-made template, keep looking. *MetaCreations Corp.; 800/846-0111; www.metacreations.com*

READER SERVICE NO. 652

YOUR **brain**

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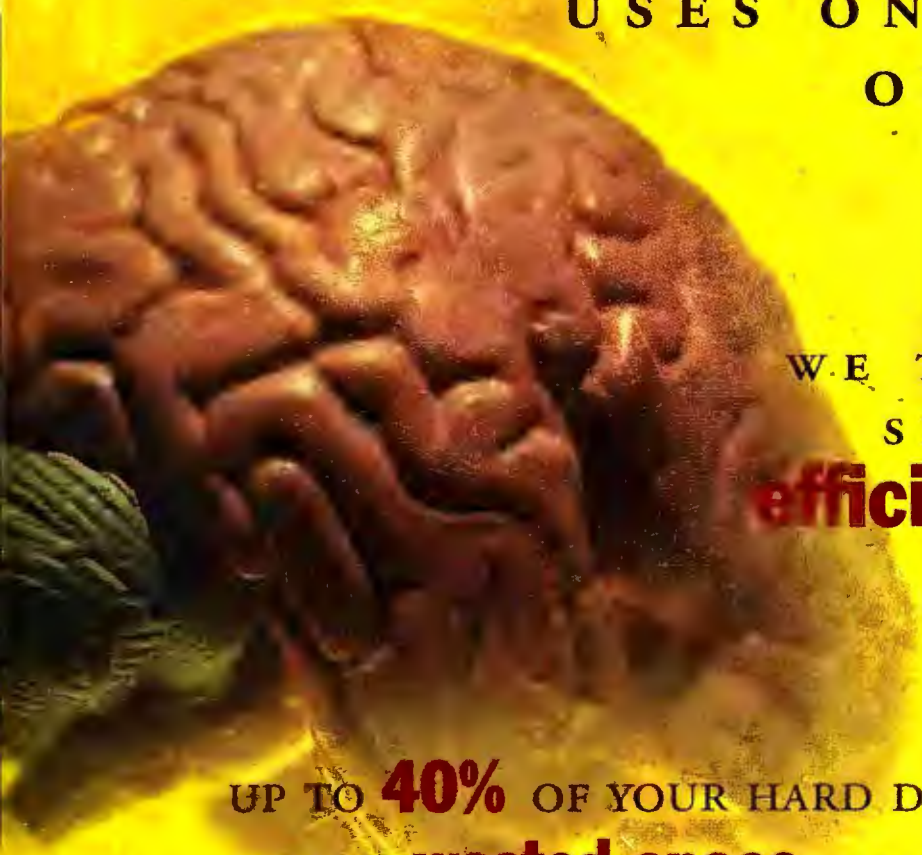

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POWER® PQ QUEST

Circle 191 on reader service card

LivePix 1.1

PRO: Easy to use, lots of ready-made projects, unlimited undo

CON: Minimal retouching tools, no automated corrections or jazzy special effects filters

LIVEPIX IS basic except for its collage tools, which are some of the best here. You can easily blend pasted objects into the background.

The LivePix Company's LivePix 1.1 has a couple of things going for it: It's simple, and it allows you to undo an unlimited number of changes—always a nice plus in a creative program. However, several other packages in this roundup are just as easy to use and have a lot more to offer.

Rather than step you through photo edits or automatically enhance pictures for you—as PhotoDeluxe and other helpful editors do—LivePix keeps things simple by offering a few spare menus, some rudimentary tools, and a barrel of crafts-oriented templates and stock photos. The retouching features are limited to brightness, ▶

PHOTO EDITING FEATURES

FEATURES	Adobe PhotoDeluxe 2.0*	MetaCreations Kai's Photo Soap 1.0	LivePix 1.1	MGI PhotoSuite 8.05	Micrografx PhotoMagic 6.0*[1]	Microsoft Picture It 2.0	SoftKey PhotoFinish 4.0	Presto Image Folio 3.0[2]
List price	$49	$49.95	$49.95	$49.95	$49.95	$55	$39.95	$39.95
Required disk space (MB)	45	20	40	38	55	90	10	100
MMX support	yes	yes	no	yes	yes	yes	no	no
Interface								
Wizards	4	n/a	2	3	3	4	1	1
Templates	3	1	3	2	2[3]	4	n/a	1
Undo and redo	2	3	4	2	2	2	4	2
Retouching tools								
Automation	4	n/a	n/a	n/a	3	4	2	n/a
Contrast and brightness	3	4	3	3	4	3	4	4
Paint tools	2	4	n/a	2	4	3	4	3
Red-eye removal	4	3	2	2	3	4	1	1
Scratch removal	4	3	n/a	2	3	4	3	2
Creative effects								
Rotate, stretch	4	3	3	1	2	3	3	3
Special effects	4	4	n/a	3	4	3	4	2
Text tool	2	2	4	2	4	4	1	2
Compositing	4	n/a	3	n/a	4	3	1	1
Image management								
Image organizer	3	2	3	4	2[3]	4	n/a	2[4]
File formats support	4	2	2	3	4	4	1	2
Printing options	2	1	3	4	2	2	2	3
Web graphics								
JPEG support	4	1	2	3	3	2	1	1
GIF support	4	n/a	2	3	4	2	n/a	n/a
PNG support	2	n/a	n/a	n/a	2	2	n/a	n/a
Color optimization	3	n/a	n/a	2	4	n/a	2	2
Image map	n/a	n/a	n/a	n/a	3	n/a	n/a	n/a
Export photos to HTML	n/a	n/a	n/a	3	3[4]	n/a	n/a	n/a
Help								
Tutorials and demos	3	1	3	2	3	3	n/a	n/a
Documentation	2	1	2	2	2	3	2	2
Vendor support policies	4	2	3	3	3	4	2	2

*Best Buy 4= excellent, 3 = very good, 2 = average, 1 = below average, n/a = not available

[1] Comes as a bundled application in Windows Draw 6.0 Premier Edition Print Studio ($49.95).
[2] Comes as a bundled application in Presto Print Suite ($39.95).
[3] Feature is also available elsewhere in suite; score is for photo editing program only.
[4] Feature is available in suite, but not in photo editor.

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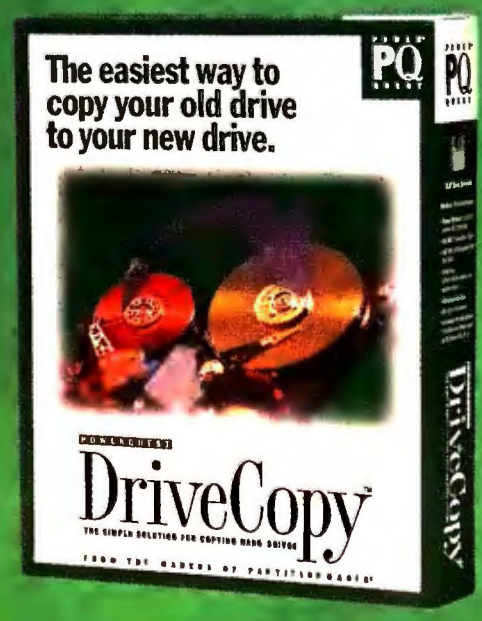

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contrast, and color saturation controls, with a tool thrown in for red-eye removal.

LivePix's creative effects are a mixed bag. It can do the basics—rotate, stretch, skew—plus a few extras, like filling text with an image. But you won't find a lot of jazzy special effects filters here.

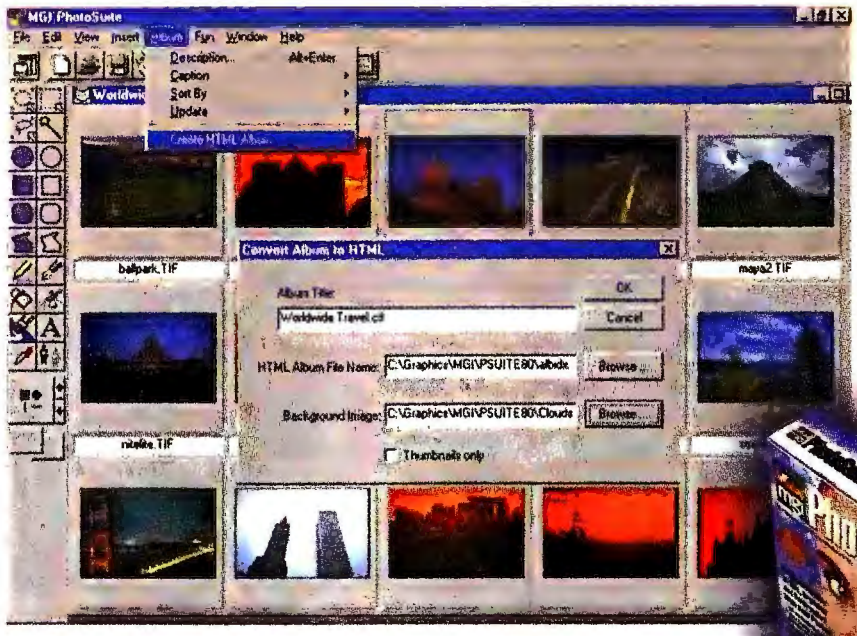


Photo collages are LivePix's forte. You can outline an element in one window, cut and paste it into another, and then manipulate and blend each object into the picture. We also liked some of the special printing options the program comes with, including the ability to center, enlarge, and repeat images.

CREATE YOUR own Web photo album in MGI PhotoSuite: One command converts pictures into an HTML page of JPEG thumbnails with links to full-size, annotated images.

LivePix is not a bad photo editor; we found it fairly easy to use, and we got good results with the tools it offers. But if you're going to spend about $50, you may as well get the most you can buy—and that would be PhotoDeluxe, PhotoMagic, or Picture It. *The LivePix Company; 800/727-1621; www.livepix.com*

READER SERVICE NO. 653

MGI PhotoSuite 8.05

PRO: Ready-to-use templates, good image management, interesting Web tools

CON: No automated corrections, limited undo, doesn't support layers

It's not the best choice for beginners, but MGI Software's $49.95 PhotoSuite 8.05 is a competent photo editor with an able assortment of retouching tools in addition to creative effects, plus above-average image management. Its one big drawback is that it doesn't support layers or objects, so editing parts of an image is almost impossible. One nice feature: You can convert thumbnails into an HTML page of JPEG images in one step. Sophisticated Web-page design it ain't, but it's a fast way to create a home page.

Besides a few home-project tutorials on how to drop photos into card and poster templates, you're on your own in PhotoSuite. Unlike with PhotoDeluxe, there are no pop-up cue cards or ▶

Special Effects: From Boring to Fantastic

WHEN IS A BOWL OF FRUIT (right) not just a bowl of fruit? When it's crackled, swirled, outlined, chalked, and pointillized by an image editing program. You can find many of the same special effects in several of the packages we reviewed, but one of our Best Buys, Adobe PhotoDeluxe, stood out for the largest number of effects. Here are a few:

1 The Crackle effect makes pictures looks as though they've been painted over a textured wall.

2 The unique Chalk & Charcoal effect can in fact give your picture the look of clouds.

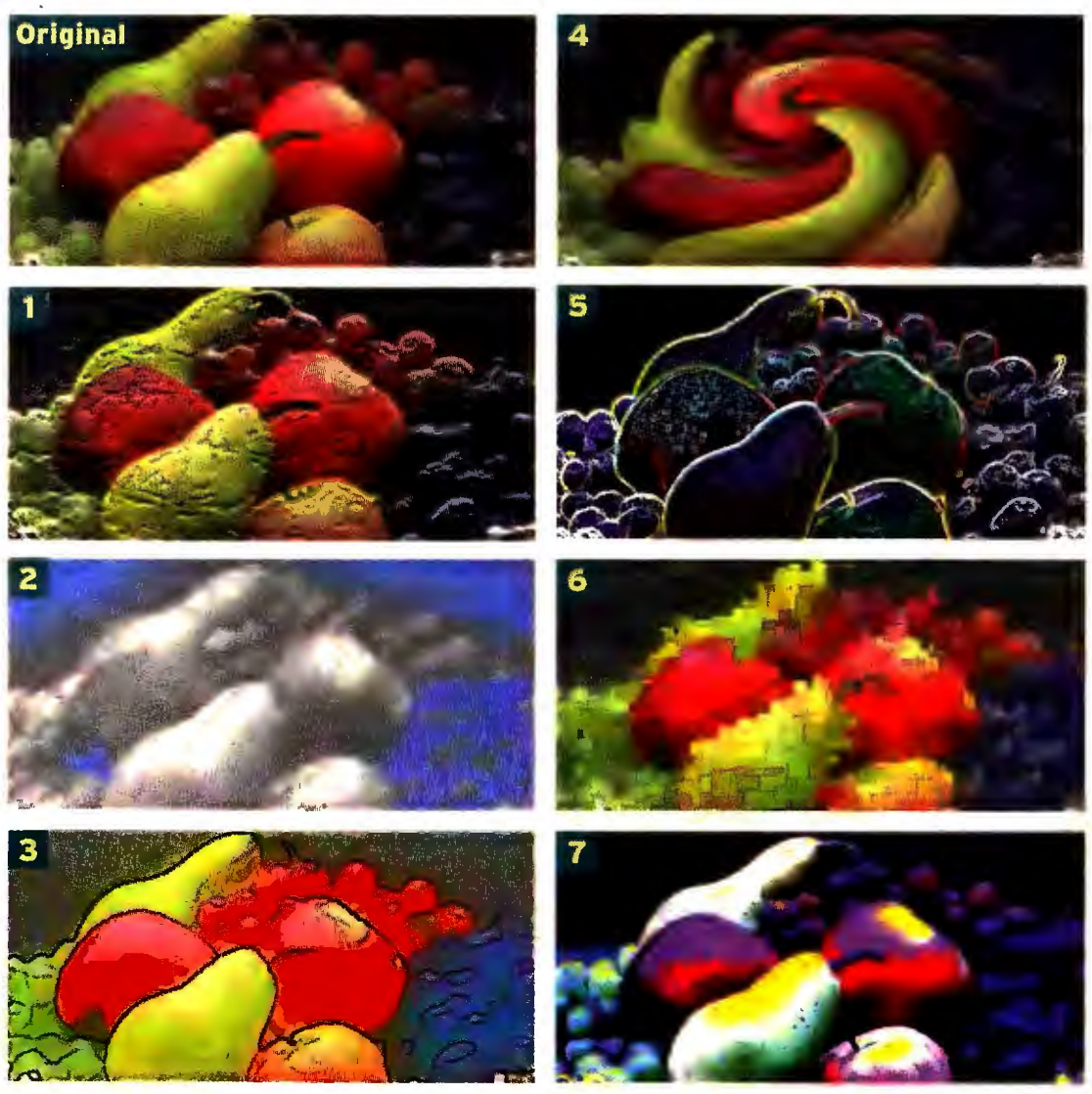
3 You can get a Peter Max-sixties effect with the Watercolor filter in PhotoMagic, our other Best Buy.

4 Swirl is PhotoSuite's variation on a common effect found in lots of image editors.

5 So is PhotoFinish's Outline.

6 And Picture It's Mosaic is another.

7 Kai's Photo Soap doesn't offer any named filters, but you can get some interesting effects by puttering around with its sliders. Unlike the other programs here, Photo Soap lets you apply effects and colors to different tones in a picture.



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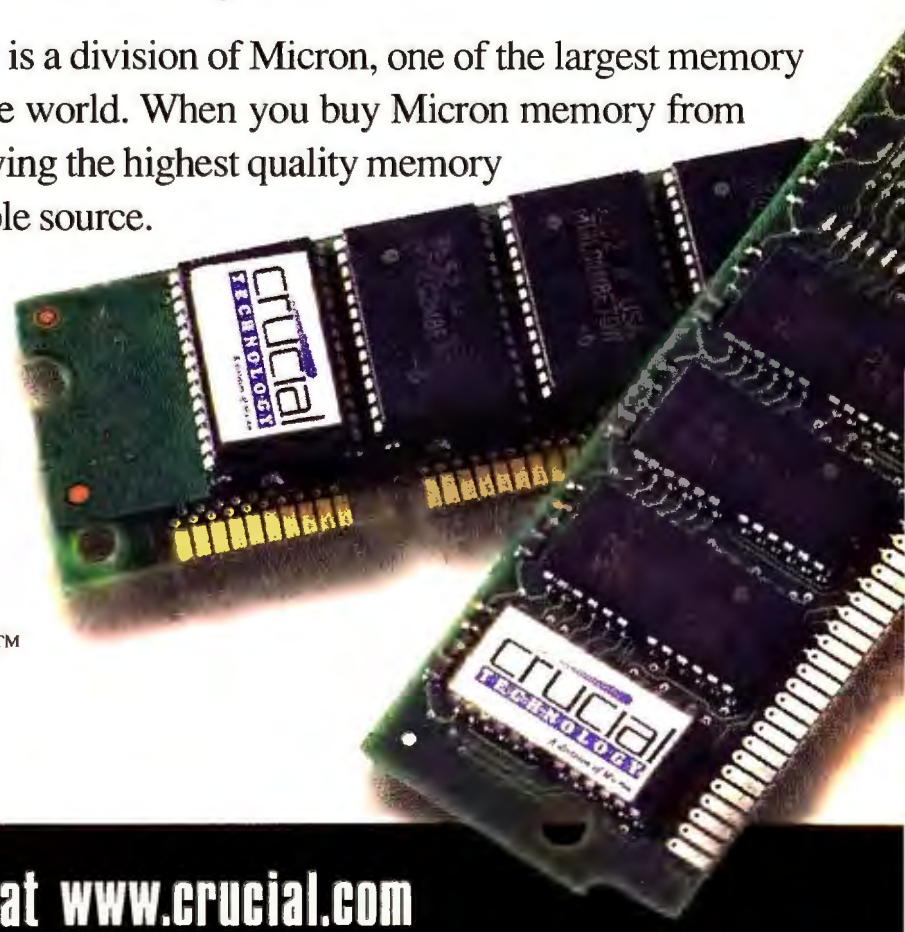

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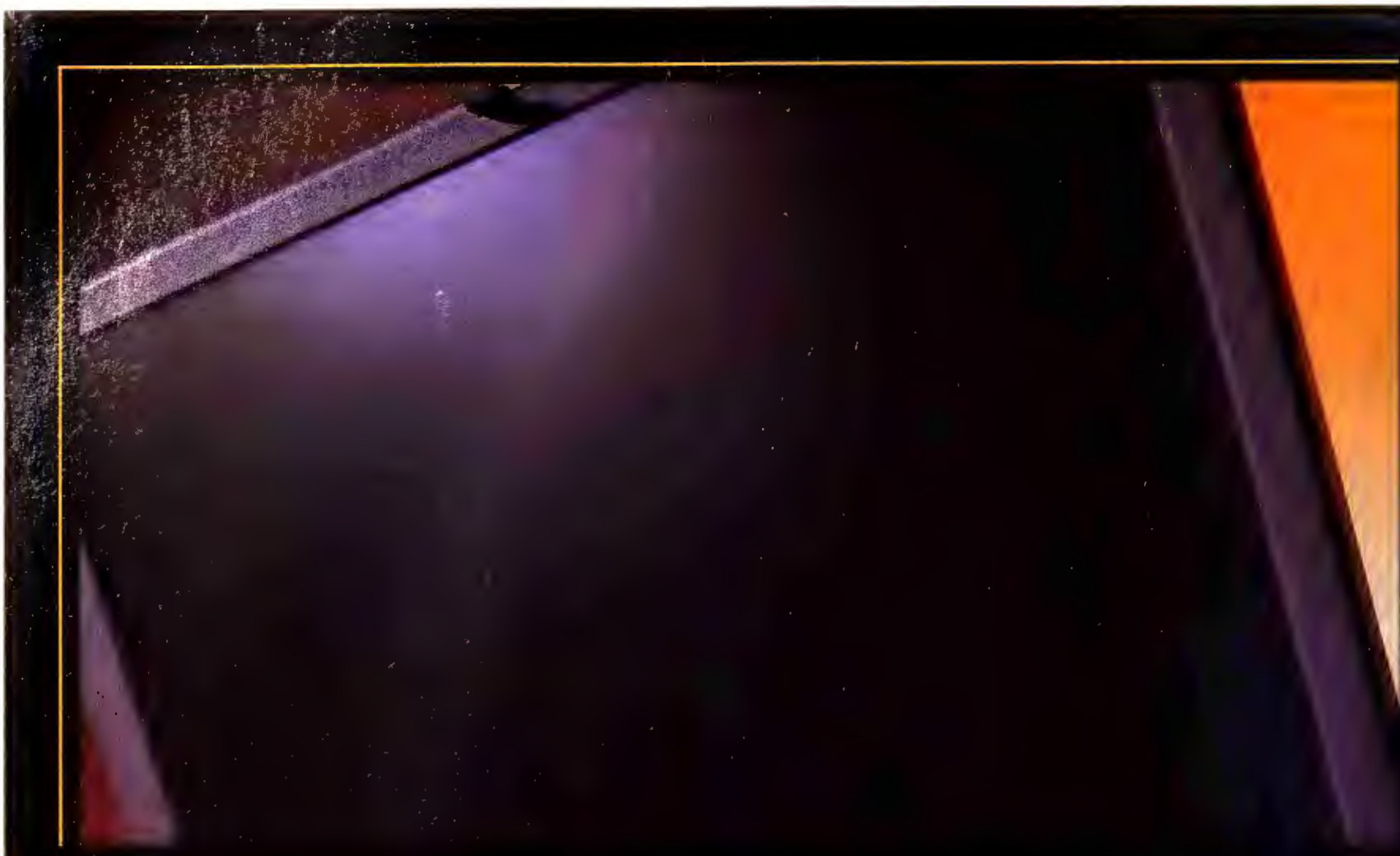

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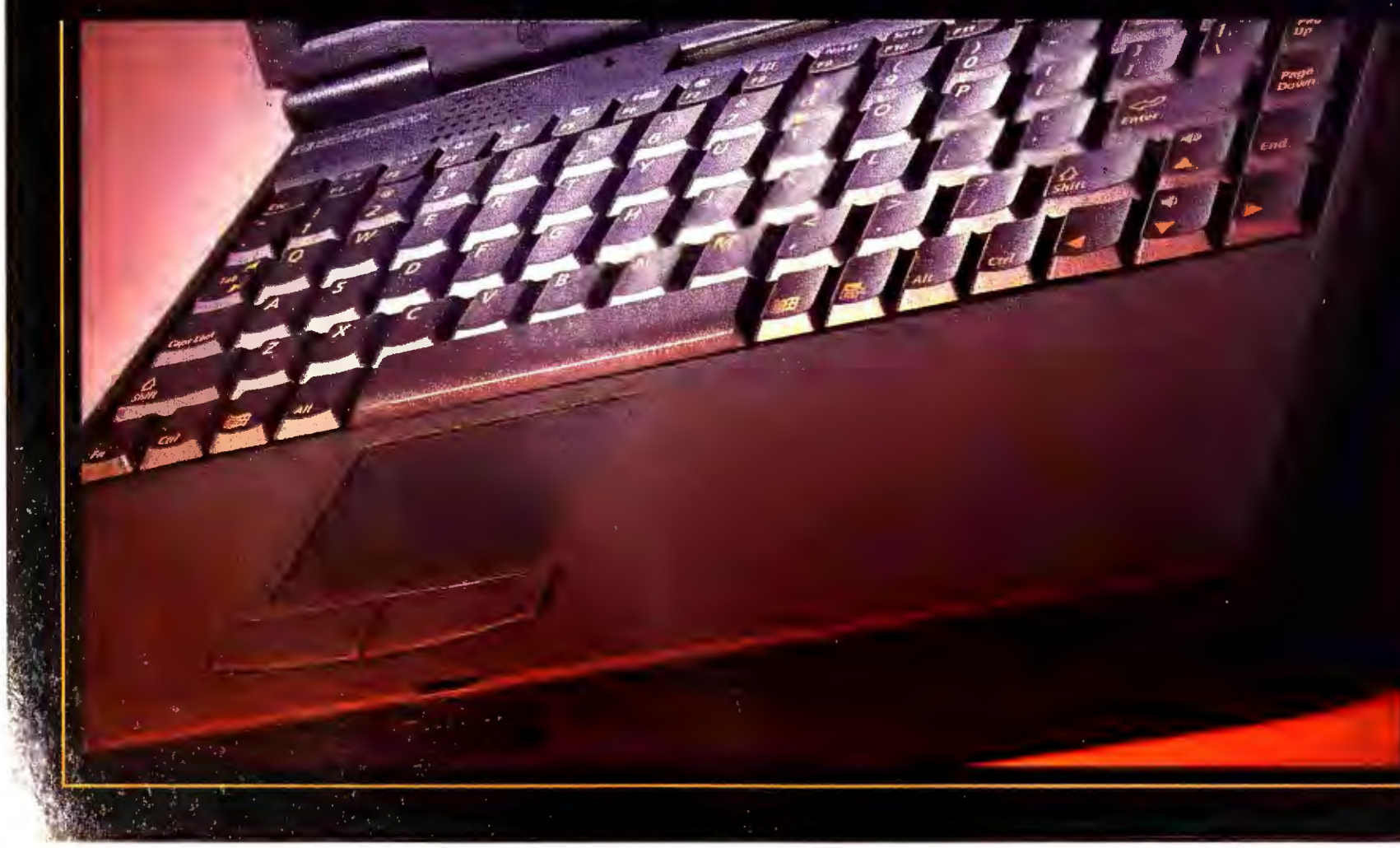

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step-by-step guides to using tools like Clone. PhotoSuite can't automatically correct color, contrast, or brightness—you must figure it out with the help screens and manuals (which are fairly good).

We had no trouble using the plentiful special effects and "lens" filters (like Sepia, Antique, and Fog) to jazz up photos. Unlike most other packages, PhotoSuite lets you annotate and search thumbnails, so keeping track of your images is much easier. But composites are tough to pull off, because PhotoSuite doesn't support multilayered or multiobject images. Once you drop an object from one photo to another, all elements are merged into one flattened image. To change text or an object, you must use the Revert to Saved command and repeat steps.

MGI says the next version of PhotoSuite, due out in early January, will correct many of these drawbacks. In the meantime, it's a fine program if you don't care about creating collages. *MGI Software Corp.; 888/644-7638; www.mgisoft.com*

READER SERVICE NO. 654

Micrografx PhotoMagic 6.0

PRO: Helpful wizards, powerful creative tools, strong composite features, good Web smarts

CON: Lacks automated corrections and unlimited undo

Like NewSoft's Presto Image Folio, PhotoMagic 6.0 is available only as part of a suite. It comes in Micrografx's Windows Draw 6.0 Premier Edition Print Studio, which also includes drawing, 3D graphics, and image management applications, all for $49.95. That's $10 more than Presto Print Suite, which includes Presto Image Folio, but it's still a nicer deal. PhotoMagic 6.0 is simply the better image editor, and combined with all the other applications in the suite, it's the blue-light special of this bunch.

PhotoMagic's wizards, tutorials, browsers, and predefined macros can save photo neophytes time and guesswork. For instance, we used wizards to remove red-eye, create drop shadows, and adjust brightness. However, these aids aren't quite as smart as PhotoDeluxe's automated tricks. For the most part, you'll be on your own and will need to spend some time learning how to use this full-featured program.

PhotoMagic's terrific retouching and creative tools go far beyond the basics. For example, an array of customizable retouching brushes is available for lightening, darkening, sharpening, and smoothing individual parts of a photo—such as a person's eyes or face—without affecting the rest of the image. We also liked PhotoMagic's Effects Browser, which makes it easy to preview dozens of special effects on a picture before applying them—an important plus, because the program lacks unlimited undo.

MICROGRAFX'S PhotoMagic does the best job of preparing photos for the Web. It can make backgrounds transparent so images blend into a page, and its Web browser palettes help get colors just right.

PhotoMagic alone also doesn't offer templates, heavy-duty image management, or Web page production—but those features are in the suite. For instance, you can use Windows Draw to choose a project template, such as a business site, and switch to PhotoMagic to work on photo designs, including image maps with links to other pages.

Whether you need a general-purpose graphics package or a photo editor for your business or home, the Windows Draw 6.0 Premier Edition Print Studio suite, featuring PhotoMagic 6.0, delivers more punch than any of the other products. *Micrografx; 800/671-0144; www.micrografx.com*

READER SERVICE NO. 655

Microsoft Picture It 2.0

PRO: Inviting interface, excellent guided activities and templates, automated features, strong image management, easy collages, great text tool

CON: Web graphics could be better, no unlimited undo

With a beautifully simple interface, extensive step-by-step help, and a wide selection of ready-made templates for cards, calendars, fliers, and other photo-based documents, Microsoft's $55 Picture It is the most idiot-proof product here. It has a wonderful assortment of photo retouching and creative tools, and it comes with outstanding annotation and search features for managing images.

MICROSOFT'S PICTURE IT makes building a collage easy. To change the back-to-front order of objects, you simply drag a thumbnail up or down in the "stack" (right).

Picture It's unique interface consists of task-oriented tabs (such as Get Picture and Special Effects) on the left side of the screen, and a work area on the right. Select a task, and Picture It provides the tools you need, along with numbered ▶

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instructions. Photo editing doesn't get much easier than this.

The Smart Task buttons are Picture It's strongest features: They automatically correct red-eye, tint, and brightness and contrast with a single click. Picture It also streamlines the job of creating photo composites by treating each element you place as a separate, selectable object. We were also impressed with Picture It's customizable paint tools and fancy text tricks, including the ability to place text on a curve.

There's no unlimited undo in Picture It, but you can often cancel a series of actions when using the step-by-step wizards. The program's only other limitation is in its Web tools: You can save files only in GIF and JPEG formats. *Microsoft Corp.; 800/426-9400; www.microsoft.com/pictureit/*

READER SERVICE NO. 656

What the Pros Use

WHILE MOST NOVICES want inexpensive, easy-to-use image editors, people who make their living tweaking pictures prefer the big guns in photo editing—packages like Adobe Photoshop, Micrografx Picture Publisher, Corel Photo-Paint 7.0 Plus, Macromedia XRes 3.0, MetaCreations' (formerly Fractal Design's) Painter 5.0, Wright Image 1.0, and Ron Scott's QFX 6.0. These programs can cost ten times as much as a $50 application like Adobe PhotoDeluxe, and they are harder to grasp and harder to use once you do learn them. What do they give you in return? The ability to do a lot more with your photos, both in creating them and in preparing them for publication.

BUCKETFUL OF EFFECTS

FOR INSTANCE, the $550 Photoshop 4.0, the latest version of a longtime favorite among professionals, comes with over 95 special-effects filters—almost twice as many as in Adobe's junior PhotoDeluxe (which in turn offers many more effects than most low-cost packages).

Higher-end products also offer more options for collages. Photoshop's Bézier-based selection tools, for example, let you draw precise and complex paths (referred to as "clipping paths" and "clipping groups") around objects. After you've placed objects on layers, the program's definable guides and grids with snap-to features make it easier to align them. Products like Photoshop also usually include options for automating repetitive tasks, so it's easier to prepare lots of photos on a deadline. For instance, you can save and reuse different settings for color corrections and separations.

Low-end photo editors are primarily designed for working with standard RGB color images. In contrast, full-featured programs like Photoshop support the CIE LAB and CMYK color models and several color-printing systems (DIC, Focoltone, Pantone, Toyo, and TruMatch), giving experts plenty of options for production. If you need to produce professional color separations for a magazine, for instance, you'll want to edit in CMYK (four-color process).

WITH PHOTOSHOP'S Actions palette, you can record your editing steps and play them back as batches of images, saving time and effort.

FOR THE ARTIST IN YOU

IS DIGITAL PAINTING your bag? PhotoPaint 7.0 Plus, XRes 3.0, and Painter 5.0 all provide you with a much broader selection of paint tools than you can find anywhere else. For example, their various "brush" styles—which include charcoal, crayon, felt-tip pen, oil, watercolor, and pen and ink—go beyond those of most lower-end packages out there and even surpass Photoshop's brush tools.

SoftKey PhotoFinish 4.0

PRO: Automated corrections, easy special effects, versatile paint tools, multilevel undo/redo, support for plug-ins, good stock photos

CON: No guided activities or ready-made templates, no thumbnails, no GIF support, collages are challenging

PhotoFinish 4.0 strikes a practical balance between automated features, for those in a hurry, and creative options, for those who want to dabble. It's a little more basic in some respects and harder to learn than the best programs here, but at $39.95 it's $10 cheaper and comes with plenty of sharp special effects plus paint tools that ▶

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Picture Publisher 7.0 $100 street; Micrografx, 888/216-9281, www.micrografx.com

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Wright Image 1.0 $380 street; Wright Technologies, 888/261-2261, www.wrightna.com

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amateurs will greatly appreciate.

Aside from Auto Enhance, which can optimize brightness, contrast, and saturation automatically and handles cropping, straightening, and sharpening, PhotoFinish doesn't have many shortcuts or handholding features. There's a fine collection of professional stock photos—the best among the packages we looked at here—but no demos, tutorials, or templates. We had to consult the on-screen help and user guide quite a bit, especially when creating a photo composite, a complicated process because PhotoFinish doesn't support objects or layers. Even common tasks such as correcting red-eye require more manual labor than in a program like PhotoDeluxe.

THE ONE-STOP Effects dialog box in SoftKey's PhotoFinish lets you preview how various effects will alter a photo. To fine-tune, use buttons or click a thumbnail.

Nonartists will probably be intimidated by the sheer wealth of options available with PhotoFinish. Select a paintbrush, for example, and the Options bar gives you any number of choices for brush type (Soft, Neon, Rainbow, Two-Tone, and many others), size, shape, transparency, paper texture, and more. PhotoFinish's saving grace is the Effects dialog box, an efficient one-stop location where you can preview virtually every adjustment and special effect the package has to offer. PhotoFinish is also the only program besides LivePix that allows unlimited undos and redos—a big plus that makes it easy to change and correct mistakes.

PhotoFinish isn't a great choice if you want a simple way to manage lots of images. It's the only program here that can't create thumbnails, so you're left to group and manage pictures your own way. It's even worse for would-be Web authors: It does some color optimization, but that's about all. It can't even save photos in GIF, one of the most common Web file formats of all.

Nevertheless, PhotoFinish can competently handle a variety of image editing tasks. It's also one of the few photo editors to accept plug-in modules, which let you add features such as special-effects filters. Just expect to spend some time getting up to speed. *SoftKey Int'l/The Learning Co.; 800/227-5609; www.learningco.com*

READER SERVICE NO. 657

NewSoft Presto Image Folio 3.0

PRO: Versatile tool set, comes in a suite with other graphics applications

CON: Hard to use, no guided activities or special-effects preview, limited undo

Presto Image Folio comes in NewSoft's Presto Print Suite, which also bundles templates, print and photo album applications, a document manager, and Kai's Power Goo—another little photo editor that's useful mostly for distorting images. Image Folio has some advanced features, but it's not easy to use. So unless you like challenges or are interested in the other applications in Presto Print Suite, you should probably pass on this one.

Image Folio does come with a nice variety of retouching and creative tools, including customizable brushes similar to PhotoMagic's. For example, you can use a touch-up brush to brighten, darken, blur, sharpen, and change the hue in part of a photo.

But learning Image Folio can be daunting. There are no guided activities, wizards, tutorials, pop-up help, or even help buttons in the dialog boxes. To complete our tests, we had to rely on trial and error as much as on the user guide and on-screen help. Simple jobs like removing red-eye were harder than they should have been. We couldn't preview special effects before applying them, and the program's lack of multilevel undo was one more setback.

PRESTO IMAGE FOLIO'S unique Paste Behind command makes up somewhat for the program's inability to do layers, a must-have feature for easy photo collages.

Also missing from the package is the ability to use multiple objects or layers to build collages. But we did appreciate the unique Paste Behind command, which allows you to paste an element from one photo behind a selected object in another image. The useful Composite Control option lets you choose an object's transparency, edge feathering, and direction of fading. NewSoft says that the next version of Image Folio, which is due out by the end of February, will provide better help and automation features. *NewSoft Inc.; 800/436-4365; www.newsoftinc.com*

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Richard Jantz is a freelance writer based in Kensington, California.

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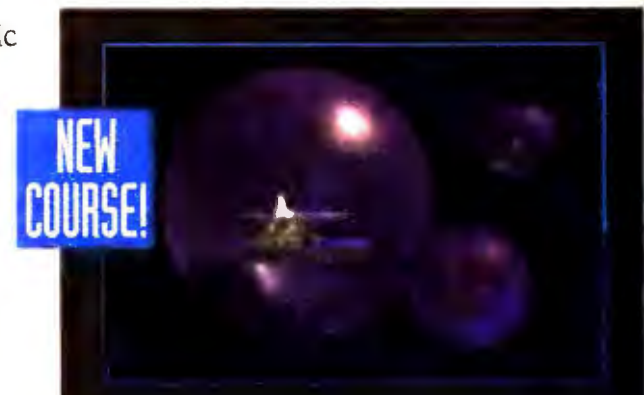

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DVD

YOU'VE HEARD the hype about Digital Versatile Disc, the high-density standard that can hold up to 17GB of data on a two-sided disc. You've read about how DVD will change the face of multimedia and deliver theater-quality video and surround sound to the desktop. It will even eliminate the annoyance of swapping discs. In fact, you've been hearing it for over a year now. So where are these miracle ▶

BY DEAN ANDREWS

FINALLY!

Despite fits and starts, the first truly compatible DVD-ROM drives deliver. Too bad DVD software is still hard to find.

PHOTO ILLUSTRATIONS: TOM COLLICOTT

BEST BUY

SURPRISINGLY, our application benchmarks and hands-on evaluations showed that DVD-1 and DVD-2 kits provide very similar performance. All these kits provide awe-inspiring video and audio playback, and can read vast stores of data from DVD-ROMs able to pack 4.7GB on one side. Still, compatibility with CD-Recordable and CD-Rewritable media make DVD-2 kits the superior buy, and the Creative Labs PC-DVD Encore kit is the best of the bunch. The Encore edged out all other kits in our performance tests, and it's the only DVD-2 drive that provides both a trouble-free analog video connection and Dolby AC-3 audio hardware.

drives, and what has happened to all the amazing games, titles, and movies we were supposed to be seeing by now? Believe it or not, the long wait for DVD is finally coming to an end.

The latest wave of DVD-ROM drives and upgrade kits feature so-called second-generation technology. These DVD-2 products solve nagging problems that plague early kits, including their inability to read CD-Recordable or CD-Rewritable media, which are becoming popular as drive prices fall. The new kits also feature enhanced video quality, and while our tests show that DVD-2 drives still lag behind the fastest CD-ROM drives in overall performance, they improve somewhat the speed and quickness of DVD-1 products. Of course, the new drives can read DVD movies intended for consumer DVD players, though DVD-ROMs will not be readable by TV-based players. You'll find a wide range of prices for these products, from a stiff $799 for Hi-Val's package to $350 for Diamond Multimedia's kit.

More than just a high-capacity CD-ROM drive, these kits soup up your PC's sound and video capabilities.

READY FOR PRIME TIME

THE UPDATE HAS convinced some big PC vendors. "For us it was all about visual quality and compatibility," says Brian Zucker, manager of Dimension systems engineering at Dell Computer. "The lack of the ability to read all CD-ROM formats was a concern for us, and that's why we stayed away from it."

DVD can put some serious fun into your PC. Our hands-on look at five DVD-ROM upgrade kits prove that the technology marks a milestone in PC-based entertainment. More than just a high-capacity CD-ROM drive, DVD-ROM kits soup up your PC's sound and video capabilities for electrifying movies, games, and home entertainment titles.

The enormous capacity of DVDs also means that all applications will benefit, allowing them to pack more raw data and carry a wider selection of useful templates and engaging, multimedia-driven help and tutorials. True to its home theater roots, DVD is ushering in a slew of feature-length movie titles (over 500 at last count), while DVD-based games will boast high-resolution MPEG-2 video, immersive Dolby AC-3 Surround Sound audio, and powerful 3D graphics.

Before you get too excited, be prepared for some disappointments. Buyers must contend with a confusing mix of first- and second-generation DVD-ROM kits that will be on store shelves through early 1998, as vendors transition to the DVD-2 technology. And DVD-ROM kits are no cakewalk to install—in fact, these products have many components and may cause conflicts with graphics hardware. The selection of DVD-optimized software

will be thin until the middle of next year, which means the real promise of DVD-ROM is still some months off.

THE MANY FACES OF DVD

DVD IS ACTUALLY many things wrapped in a single package, addressing everything from high-density storage needs to theater-quality video and audio playback. The voluminous capacity of DVD-ROMs is enough to change the way software is written. Where CD-ROMs top out at 650MB, current DVD-ROM media can store 4.7GB of data on a side, an increase of more than seven times. Future DVD-ROM media will be able to store data on both sides of the disc, and use dual-layer media to let existing DVD-ROM drives read a total of four levels of data-storing material on the two sides. The result: An impressive 17GB of storage that is nearly 27 times the amount that today's CD-ROMs can hold.

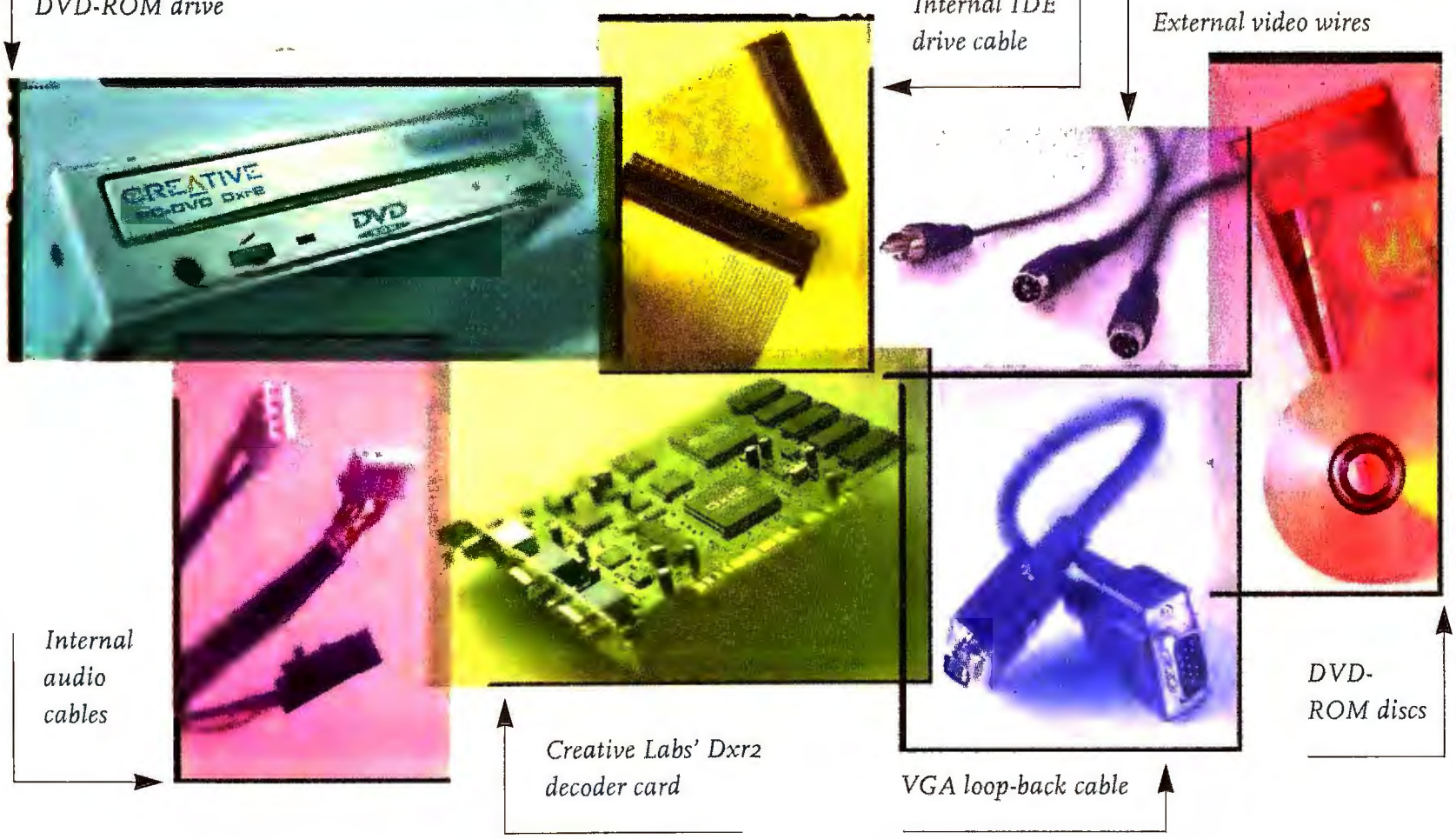
Among the first to take full advantage of the new media is DK Multimedia. In the first half of 1998, the company expects to release its Eye Witness World Atlas, an interactive geographic map tailored for DVD-ROM drives. "We have a terrain database of the entire earth's surface—everything—at 1-kilometer intervals," explains Chuck Wills, U.S. publishing manager for DK Multimedia. "This atlas will allow users to do a fly-through of the entire earth's surface. There will be MPEG-2 video on it, plus a ton of reference information. You just can't do this kind of thing with this level of detail on CD-ROM."

DVD-ROM's high-resolution MPEG-2 video surpasses the quality of consumer LaserDisc movies.

There's much more to DVD than lots of storage. The new media also ups the ante for PC-based video by introducing MPEG-2 compressed video playback, which is visibly superior to that of its precursor, MPEG-1. MPEG-2 video displays at a resolution of 720 by 480 pixels, more than four times the 325 by 240 resolution of MPEG-1. By contrast, MPEG-1 is limited to just 150 kilobits per second, to allow MPEG-1 video playback from even the oldest CD-ROM drives. The result? Compared to MPEG-1 video, which looks on screen like a poor-quality VHS video, MPEG-2 surpasses the quality of LaserDiscs, the current high-end standard for consumer home video. Buyers can expect high-quality video to appear in everything from PC-based games and reference titles to the help systems of applications such as Intuit's Quicken personal finance software.

DVD-ROM upgrade kits also improve your PC's audio handling. If you connect your DVD-ROM-equipped PC to a theater-quality surround-sound audio setup consisting of five speakers plus a sub- ▶

INSIDE A DVD-ROM KIT



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woofer, you'll get the full impact of DVD-ROM's Dolby AC-3 audio (see "The DVD Experience" for a first-person testimonial). Even if you're like most PC users and rely on a couple of standard desktop speakers, you'll still enjoy engaging audio. These products convert the AC-3 audio signal into PC-based "3D audio" output, which mimics the effect of sound coming from all around the user's position using a two-speaker setup.

PUT TO THE TEST

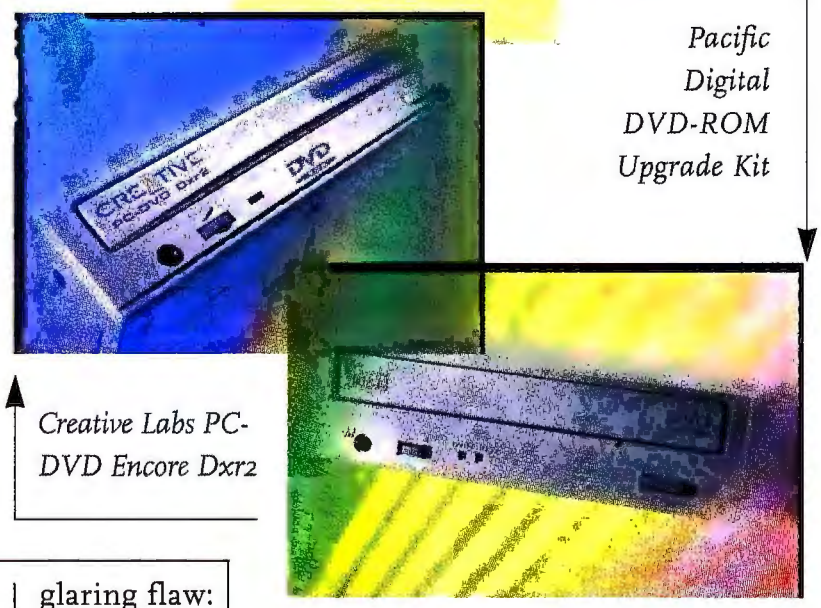
TO SEE IF THE technology delivers, we rounded up five DVD-ROM upgrade kits. At the time of our testing, only two DVD-2 drives were available: the Creative Labs PC-DVD Encore Dxr2 and Pacific Digital DVD-ROM Upgrade Kit. We compared these two against a pair of DVD-1 kits: the Hi-Val DVD PC to TV Entertainment Solution and the Diamond Multimedia Maximum DVD Kit. We also tested one hybrid product—a preproduction version of the Sony DDU100E/H DVD-ROM drive—that provides DVD-1 performance with CD-R compatibility.

We installed all the DVD-ROM kits in a 200-MHz Pentium MMX PC from Gateway 2000 and put them through a series of speed, video, audio, and compatibility tests. For our timed speed tests, we used both CD-ROM– and DVD-ROM–based applications. To assess the video and audio capabilities, we tried each kit with a pair of midrange speakers attached to our PC, and with a high-end, six-speaker surround-sound set from Altec Lansing. We played a selection of music videos and viewed DVD movie titles on both 15- and 21-inch PC monitors, as well as on a large-screen television set.

Until recently, DVD-ROM drives suffered from a glaring flaw: Unlike current CD-ROM drives, they could not read CD-Recordable or CD-Rewritable media. Neither of the DVD-1 kits we reviewed can read either of these media, a blind spot that may frustrate owners down the road.

DVD-2 kits—including the two we reviewed—fix this compatibility problem. In our tests, both the Creative Labs PC-DVD Encore and Pacific Digital DVD-ROM Upgrade Kit were able to read CD-R media, as was the hybrid Sony DDU-100E/H kit. What's the problem with DVD-1 drives? To read high-density DVD-ROM media, DVD-ROM drives use a red laser instead of the yellow laser CD-ROM drives use. But red lasers don't work with CD-R media, which is tinted green instead of silver, the color of CD-ROM and DVD-ROM media. That's because green absorbs too much of the red light for it to reflect properly. DVD-2 drives solve this problem by using a second, yellow laser to read CD-R, CD-RW, and other CD-formatted media.

DVD-2



Pacific Digital DVD-ROM Upgrade Kit

Creative Labs PC-DVD Encore Dxr2

NOT SO FAST

COMPATIBILITY'S fine, but when we tested these drives using real-world applications, we failed to see a consistent performance advantage for second-generation DVD-ROM drives. An extended search in the DVD-ROM version of PowerFinder's PhoneDisc address and telephone-number database turned up nearly identical results for all the drives, while a DVD-ROM game installation showed a modest 5 percent advantage for the two DVD-2 products. Only in a file-copy test did DVD-2 drives noticeably outpace DVD-1 products, moving a 100MB file from disc to hard disk about 30 percent faster on average. Our conclusion: While DVD-2 drives spin faster than older models, many software applications are not yet optimized to take advantage of their faster rotation.

Until DVD titles show up in force, DVD-ROM drives will spend most of their time spinning CD-ROMs. We ran all the

DVD-ROM KITS

FEATURES COMPARISON

PRODUCTS	Street price (10/3/97)	BASICS: Technology	BASICS: DVD-ROM/CD-ROM access time (ms)	BASICS: DVD-ROM/CD-ROM transfer rate (kbps)	BASICS: CD-ROM maximum spin rate	BASICS: Internal buffer (KB)	MULTIMEDIA: Decoder card
Creative Labs PC-DVD Encore Dxr2 800/998-5227 www.soundblaster.com	$380	DVD-2	170/100	2700/3000	20X	512	Creative Dxr2
Diamond Multimedia Maximum DVD Kit 800/468-5846 www.diamondmm.com	$350	DVD-1	200/130	1350/1370	8X	256	Diamond DVD 2000
Hi-Val DVD PC to TV Entertainment Solution 714/953-3000 www.hival.com	$799	DVD-1	220/220	1350/1370	8X	256	Quadrant International CineMaster
Pacific Digital DVD-ROM Upgrade Kit 714/252-1111 www.pacificdigitalcorp.com	$379	DVD-2	210/130	2826/3000	20X	512	Quadrant International CineMaster
Sony DDU100E/H 800/352-7669 www.sony.com/storagebysony	$499	DVD-1[1]	220/160	1350/1200	8X	512	Sigma Designs RealMagic Hollywood

Best Buy ● Yes ○ No

[1]Hybrid drive with DVD-1 spin rate but with CD-R compatibility.

drives through our standard CD-ROM drive test suite and found that the DVD-2 drives do not significantly outrun their DVD-1 counterparts when reading CD-ROM media. The exception was our CD-ROM game installation, in which DVD-2 drives completed the test almost 8 percent faster than their DVD-1 counterparts.

None of the DVD-ROM drives could challenge the SCSI-based Plextor CD-ROM drive, which smoked the entire field. It was a closer race with the IDE-based Teac CD-ROM drive, though all the DVD-ROM drives trailed in the game-installation and Macromedia Director 3.0 random-seek tests.

If your current CD-ROM drive runs at 8X speed or slower, these DVD-ROM kits can successfully replace your CD-ROM drive. However, if you own a fast 16X or 24X IDE-based CD-ROM drive, you may find that the DVD-ROM drive provides performance on a par with that of your existing hardware. If you own a fast SCSI-based CD-ROM drive, though, you will probably take a performance hit if you decide to replace it with a DVD-ROM drive, whether it's DVD-1 or DVD-2.

THE DVD EXPERIENCE

FOR ABOUT $2500, I turned my Pentium MMX system into a home theater. I installed the Creative Labs PC-DVD Encore Dxr2 DVD-ROM kit ($380), which earned a Best Buy in our roundup, into my Dell Dimension XPS M200s PC. I hooked up a 21-inch Iiyama Vision Master Pro monitor ($1620) and Altec Lansing's six-unit ADA600 surround-sound speaker set ($500).

The effect was incredible. The clarity and crispness of the full-screen, MPEG-2 video surpassed anything I'd ever seen on CD-ROM or VHS tape. With DVD movies, I could switch to dubbed foreign-language sound-tracks, add subtitles (in several languages), or flip from full-screen to letterboxed views with a mouse click.

But it was the surround-sound speakers that really got me. I positioned six speakers—four at head level in the corners, one down low in front, and a sub-woofer on the floor—that produced sound so precise, it was creepy. Voices and sounds moved around the room in sync with the video. I also tried out a two-speaker set that produces the illusion of surround sound. Home users will enjoy the effect as sounds play all around them in game and multimedia titles. However, background sounds sometimes played more loudly than intended.

Author Dean Andrews at home.

MAJOR SURGERY

A DVD-ROM UPGRADE involves so many of your PC's critical systems, it's like a heart-lung transplant for your computer. If you don't carefully consider a particular kit's requirements, you might just find your PC "rejecting" the new parts.

DVD-ROM kits actually consist of a drive *and* a decoder add-in card *and* associated software. The decoder card can cause compatibility problems, because it must work closely with your existing graphics and sound cards.

To avoid headaches, carefully read the system requirements on the DVD-ROM upgrade kit you're considering. Expect to spend a good hour with your PC on the "operating table." You'll need to install the drive and the decoder card, and will probably need to attach and reroute cables ▶

		COMPATIBLE FORMATS					PORTS				SUPPORT	
Dolby AC-3 audio hardware decoding	Video loop-back cable	CD-Recordable	CD-Rewritable	Multi-session CD	DVD-Recordable	DVD-RAM	TV out	S-Video out	Composite video out	Dolby AC-3 audio out	Warranty for parts/labor (years)	Reader service number
●	●	●	●	●	○	○	●	●	●	●	1/1	768
●	●	○	○	○	○	○	●	●	●	●	1/1	769
●	○	○	○	●	○	○	●	●	●	●	1/1	770
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to and from your video card, sound card, and monitor. All the kits provide good documentation, but the best of the bunch were the photo-filled manuals that came with the Diamond Multimedia Maximum DVD Kit—which unfortunately is a DVD-1 unit.

The complications start with video. The decoder card that's included in DVD-ROM kits enables your PC to play the demanding MPEG-2–based video in DVD movies, reference titles, and games. The decoder card takes the MPEG-2 video stream from the DVD-ROM drive and turns it into uncompressed, high-resolution video. The decoder card then either sends this video data directly to your graphics card for display (a process known as *video inlay*) or adds it to the graphics signal after it has left the graphics card (called *video overlay*). Why should you care how your decoder card handles video? If it uses the second method, video overlay, you probably won't experience compatibility problems with your graphics card.

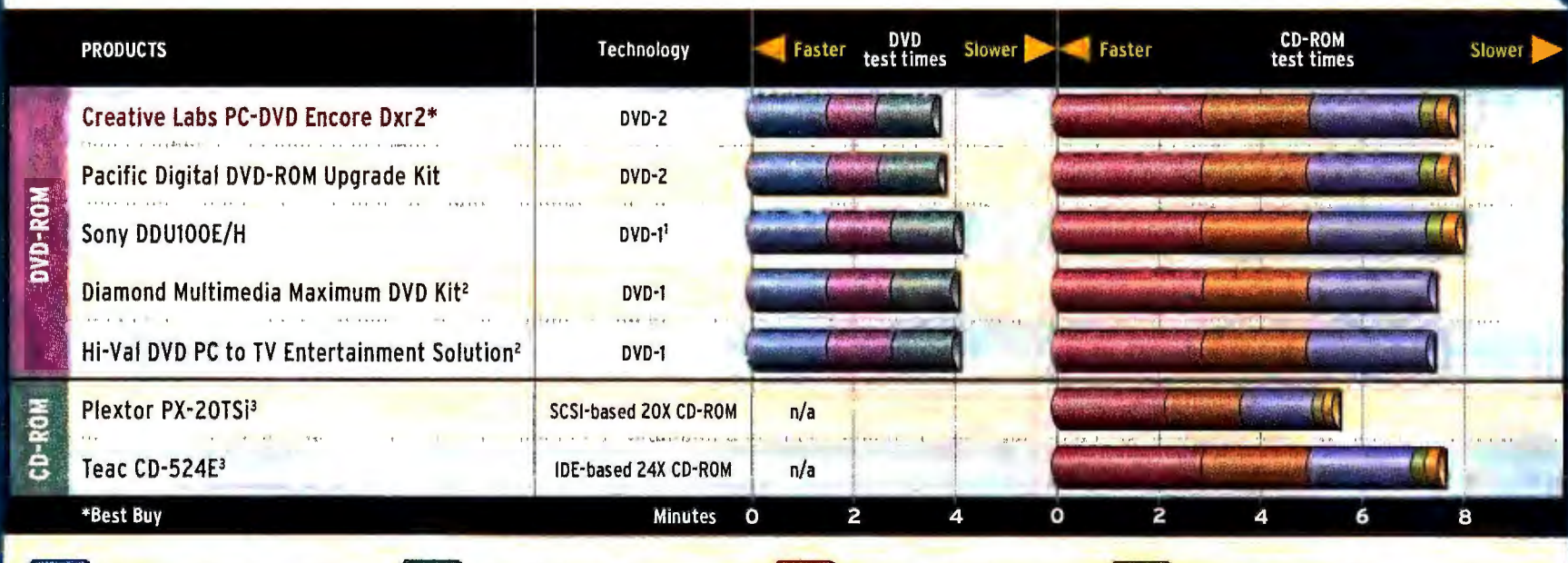
Three of the kits (from Diamond Multimedia, Creative Labs, and Sony) opt for the less problematic overlay method. They use an external cable, called a *loopback,* to connect the VGA output port of the graphics card to the VGA input port of the DVD decoder card. In this setup, the monitor is connected to the back of the decoder card instead of the graphics board. The MPEG-2 video stream is added only after the graphics signal—which is converted to an analog format that your monitor can understand—has left the graphics board. This approach makes no demands on your PC's graphics card, reducing the risk of incompatibility with the MPEG-2 video.

The other two kits—Hi-Val and Pacific Digital—come with the CineMaster decoder board from Quadrant International, which uses video inlay to push MPEG-2 video through the graphics board to the monitor. This direct connection to the graphics card requires support for something called *linear memory addressing,* support that is lacking in many graphics cards now on the market. We reviewed the CineMaster card's documentation, which was included with ▶

TEST REPORT

DVD-ROM Matches Speed of IDE CD-ROM

Tests show that buyers won't give up CD-ROM performance with new DVD-ROM drives.



[1]Hybrid drive that operates at DVD-1 spin rates, but reads CD-R discs.
[2]Unable to read CD-Recordable media used in Macromedia Director tests.
[3]Reference drive.
n/a = not applicable

HOW WE TEST All drives were installed in a Gateway 2000 G5-200 Pentium MMX-200 PC with 32MB of RAM. We performed application tests using both DVD-RDM and CD-RDM media. We timed an extended search in both the DVD-ROM and CD-ROM versions of PowerFinder's PhoneDisc application, and timed an application installation from both CD-ROM and DVD-ROM media. We also timed a 100MB file transfer from a DVD-ROM to the hard disk. Additional CD-ROM tests included a 100-photo slide show in Corel Photo CD, as well as our standard Macromedia Director 3.0–based random seek and sequential tests. All tests were run at 1024 by 768 resolution at 256 colors. To compare performance with CD-RDM media against existing CD-ROM drives, we also ran the CD-RDM tests using the SCSI-based Plextor PX-20TSi and the IDE-based Teac CD-524E CD-RDM drives. All tests designed and conducted by the PC World Test Center. All rights reserved.

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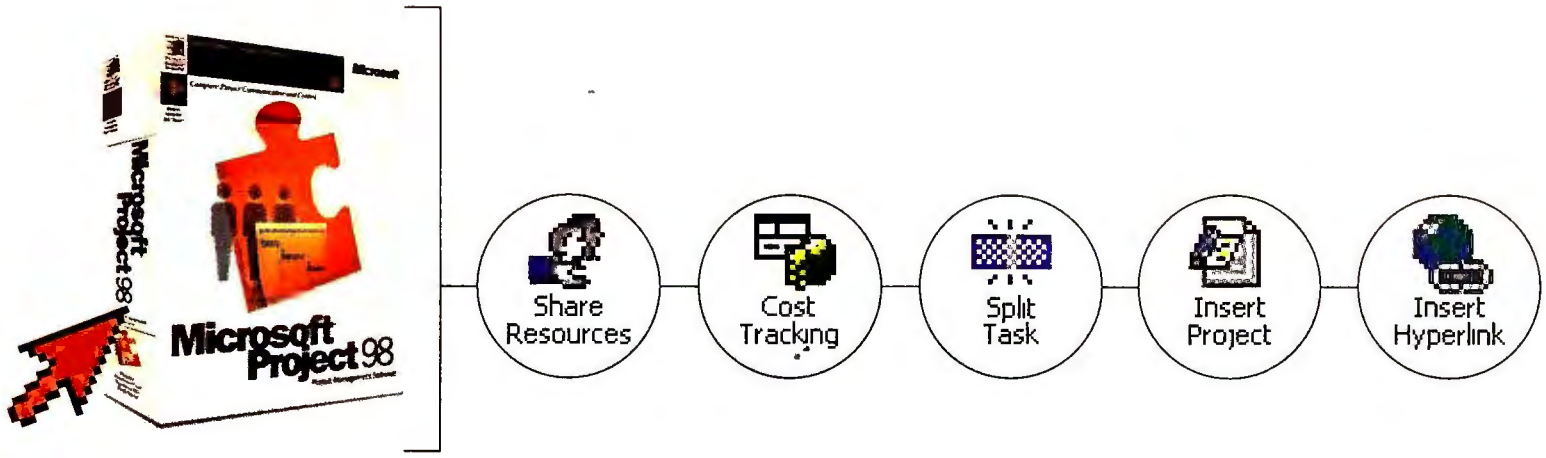

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both of these kits, and found that 11 graphics chips were approved for use with the decoder board. The Matrox Millennium II graphics card in our test systems, for example, worked smoothly with both video-inlay DVD-ROM kits.

If you purchase one of these kits and find that your graphics card is not compatible with the decoder card, check with your graphics card's manufacturer to see if updated drivers are available. The newer drivers may include the required linear memory addressing capability. Also, look in the back of the CineMaster booklet for troubleshooting tips on specific graphics chip sets. At worst, you may have to buy a new graphics card or even return your DVD-ROM kit.

Even if you successfully install a video-inlay–based kit—or get a video-inlay DVD-ROM as part of a new system—you might have compatibility problems later if you decide to upgrade your graphics card. But there's also good news: DVD-ROM vendors say they are working with graphics chip and board makers to ensure compatibility with video-inlay–based kits.

SOUNDS GOOD

DVD-ROM ALSO ADDS a new audio stream to the PC, in the form of Dolby's AC-3 Surround Sound embedded in DVD movie and game titles. Fortunately, compatibility with existing PC equipment is not an issue here. None of the kits we tested had a problem decoding the digital AC-3 signal for traditional analog speakers. They all provide a special "downmixed" decoding feature that lets your standard two-speaker setup produce 3D audio, so that sounds seem to emanate from all around the user. In our tests, the 3D effect was both noticeable and entertaining.

Unfortunately, adding DVD-ROM audio can produce cable clutter. After a DVD-ROM drive upgrade, your system must manage not only standard desktop and CD-ROM–based sound, but also DVD-ROM's digital AC-3 stream. The result: more wires and more audio-setup headaches. All the kits reviewed except the Sony use wires to connect the DVD-ROM decoder board to the existing sound card, allowing downmixed AC-3 audio to be sent to the standard line-out ports on your sound card. In some kits, however, you may also have to attach your speakers to the decoder board instead of your sound card in order to hear both regular audio and enhanced AC-3 audio. Follow your kit's documentation closely to make sure all the wires are properly set.

Creative Labs' on-screen remote control presents a familiar interface.

The Sony DDU100E/H preproduction unit we tested takes a different tack, using DVD-ROM player software to decode the AC-3 audio stream, rather than relying on hardware on the decoder board. Unfortunately, the software processing takes a major toll on your CPU. During playback of DVD movies on our Pentium MMX-200 system, we recorded an average CPU load of 42 percent when using the Sony kit, compared with averages ranging from 9 percent to 24 percent for all other kits. The lesson here: Without AC-3 audio hardware, games that employ MPEG-2 video and AC-3 audio may bog down your system, preventing it from producing fast frame rates and smooth action. Sony says the production version of its kit will include AC-3 audio hardware.

HYBRID

Sony DDU-100E/H

PC OR TV?

EVEN IF YOU don't plan to hook your PC up to a TV or high-end monitor and speakers right away, keep your options open by making sure your DVD-ROM kit comes with two things: S-Video and S/PDIF connectors. Every kit we reviewed here included an S-Video video-out port on the back of the decoder card. You'll also find a composite video port on each decoder card; however, this port produces less precise video output because it mixes all analog video into one signal. Either port type lets you run cables from your DVD-ROM player to the TV, though you can't place the two devices very far apart.

There is an alternative. The Hi-Val kit includes two separate radio transmitting units, one for the PC and one for a TV. These transmitters can operate over a distance of 300 feet, even through walls and ceilings, but to stop or pause the video we had to walk over to the PC. Hi-Val says a remote control will be added to a later version of its kit.

What about sound? All the kits except the Sony come with an S/PDIF (pronounced "speediff") jack in addition to a line-out connector that carries the two-channel version of AC-3 Surround Sound for two-speaker setups. The S/PDIF connector delivers the Dolby AC-3 Surround Sound signal to a home theater–style speaker set, such as the Altec Lansing ADA600 used in our tests. The RealMagic decoder board used in the Sony kit offered only the regular line-out audio feed. However, production units of this decoder board will include an S/PDIF jack, according to the vendor.

If you do decide to stretch the value of your new DVD-ROM drive by connecting it to your TV, you won't be sorry. When we played back movies and music videos on a large-screen television using a six-speaker set, we were blown away. There is simply no comparison with the 3D effects ▶

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REWRITABLE DVD: THE BATTLE CONTINUES

NO SOONER had the fight over DVD-ROM standards ended when a new battle broke out over DVD-RAM, the original rewritable version of DVD media. Over the summer, several drive manufacturers splintered off from the DVD Forum (formerly known as the DVD Consortium) to mint their own rewritable DVD specs. Now, three different schemes—DVD-RAM, DVD-Rewritable, and Multimedia Video File—face off in the marketplace. "It's complete confusion at this point," says Bob Katzive, vice president of research firm Disk/Trend. "Certainly if the professional community is confused, the customer will be too."

The DVD-RAM format was originally envisioned as a cartridge-encased disc able to store up to 2.6GB of data on a side. Hitachi has already built prototype DVD-RAM drives and expects to ship them in early 1998. However, supporters of the DVD-RW format contend that the cartridge media lacks compatibility, since existing DVD-ROM drives are not built to accept cartridges. And in fact, none of the proposed rewritable media are compatible with today's DVD-1 or DVD-2 drives. The DVD-RAM spec has since been revised to allow discs to be played and recorded without a cartridge.

The DVD-RW faction has proposed a 3GB disc that is visually identical to DVD-ROM and CD-ROM media. Users can expect to see DVD-RW drives in the second half of 1998. Meanwhile, NEC's MMVF format promises 5.2GB of data on each side, enough to store about two hours of video.

Compatibility is the overriding mission of the Optical Storage Technology Association, an industry trade organization that focuses specifically on rewritable and recordable media. "We're pushing for all media compatibility and interchange," says Ray Freeman, facilitator of OSTA. His group created the Universal Disk Format that the DVD Consortium selected for use in DVD-ROM in October 1996. OSTA has completed a scheme called Multi-Read, which mandates that new optical drives read the four principal CD formats. CD-RW and DVD-2 drive manufacturers have already adopted the Multi-Read spec. "We expect all rewritable DVD manufacturers to make the same commitment," notes Freeman.

SPEC SPAT Rewritable DVD schemes jockey for prominence.

SPECIFICATIONS	Sponsors	Capacity per side (GB)	Availability	Comments
DVD-RAM	DVD Forum	2.6	late 1997/ early 1998	Early momentum deflated by sponsor defections; spec since revised to allow for noncartridge media.
DVD-Rewritable	Sony, Philips, Hewlett-Packard	3	second half of 1998	First with a noncartridge-media design, this upstart standard has heavyweight backers.
Multimedia Video File	NEC	5.2	unknown	NEC goes it alone and isn't discussing details, but high-capacity media may sway others.

produced by two-speaker systems. On the other hand, when we tried to play DVD movies on our PC monitor, we noticed annoying jags in the video. That's caused when the interlaced video signal intended for TV is converted to the noninterlaced (or *progressive scan*) format required by PC monitors.

Those planning to mate their PCs and TVs need to be aware of a burgeoning standards war in the consumer video arena. A proposed DVD-like format called Divx will allow users to access disc content via a special code. The format lets a buyer take a disc home and have unlimited viewing for 48 hours, at which point he or she must use a special code—accessed via a credit card order through a modem built into the drive itself—to unlock the content for subsequent viewings. Divx support may become an important factor for those who want to play back rented movies on a DVD consumer player or DVD-ROM drive. Divx consumer players are expected in summer 1998.

When we played movies and music videos on a large-screen TV using a six-speaker set, we were blown away.

SOFTWARE MADNESS

UNFORTUNATELY, DVD-ROM hardware remains a step ahead of the software. Greg Berkin, Intel's DVD evangelist for home software, says that more than 100 PC applications and titles are under development; some should be available by the time you read this. That compares to about 500 DVD movies that are now available. Of the upcoming PC titles, Berkin says reference titles are the most numerous (29 in the works), followed by games (14) and interactive video adventures (11).

The good news is that DVD-ROM titles should emerge quickly. "I know of eight or nine dozen titles in the works," says Richard Doherty, director of Envisioneering, an industry analyst firm. "The number of PC DVD titles should be ten times larger than the total consumer player [movie] discs by the turn of the century."

DVD-ROM technology isn't done yet, but it is getting close. Cautious buyers may want to wait until summer 1998 for improvements in DVD-ROM kits, a greater selection of titles, and lower prices. But you probably won't regret it if you jump in now. These kits deliver a lot and should remain compatible with most of the discs released in the next few years.

online *Find related information at www.pcworld.com/jan98/dvd. Dean Andrews is a freelance writer and frequent contributor to* PC World *who lives in Boston, Massachusetts. Testing was conducted by Performance Analyst Jeffrey Kuta of the PC World Test Center.* ■

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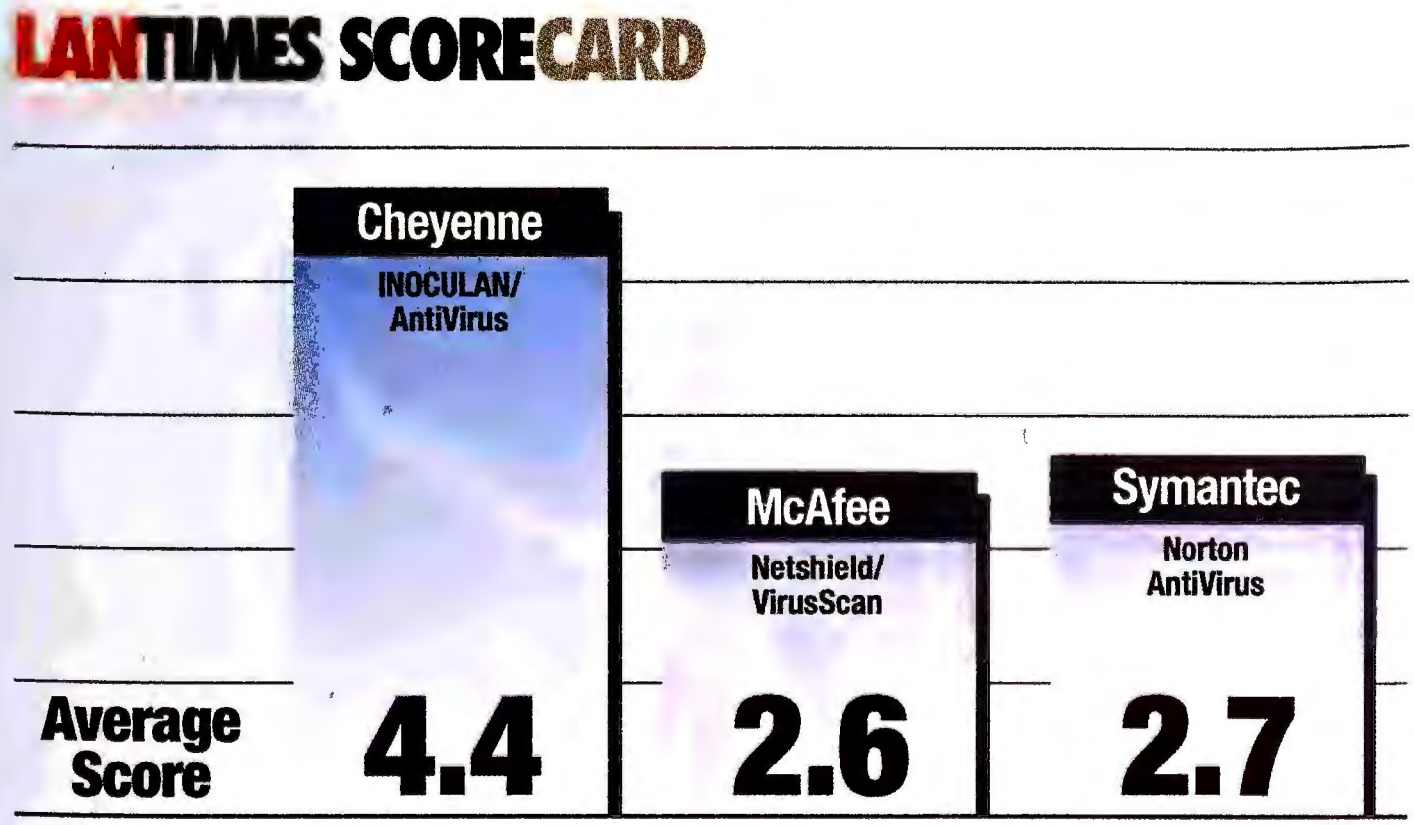

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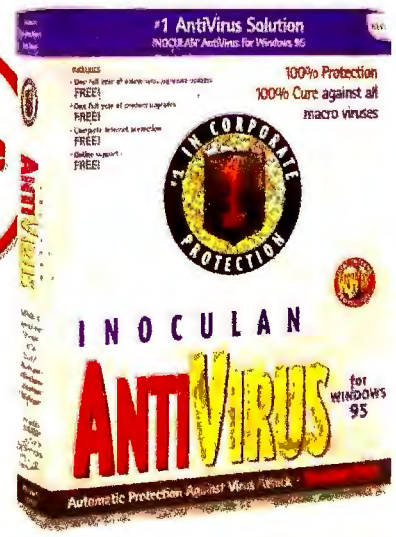

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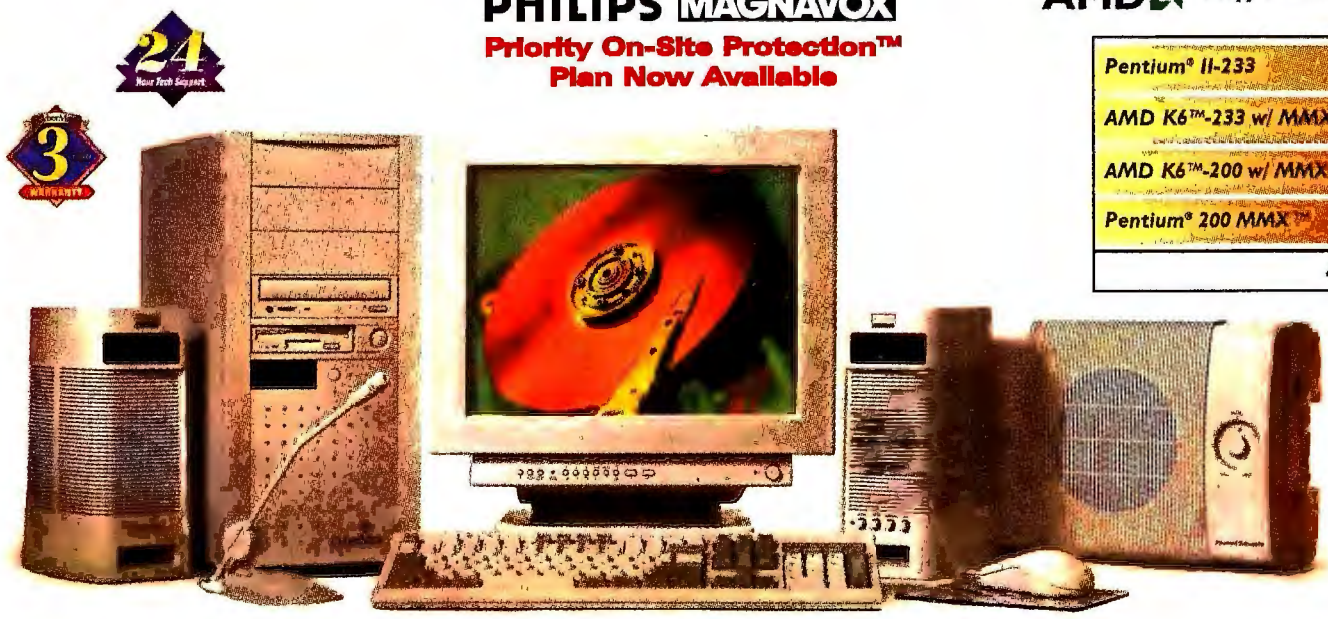

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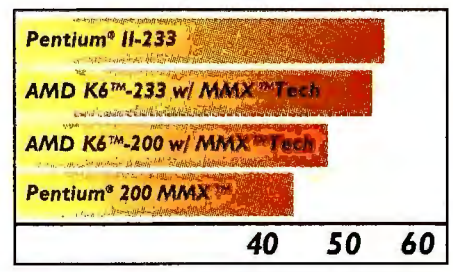

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- Symantec ACT!
- and many more

Compatible with:
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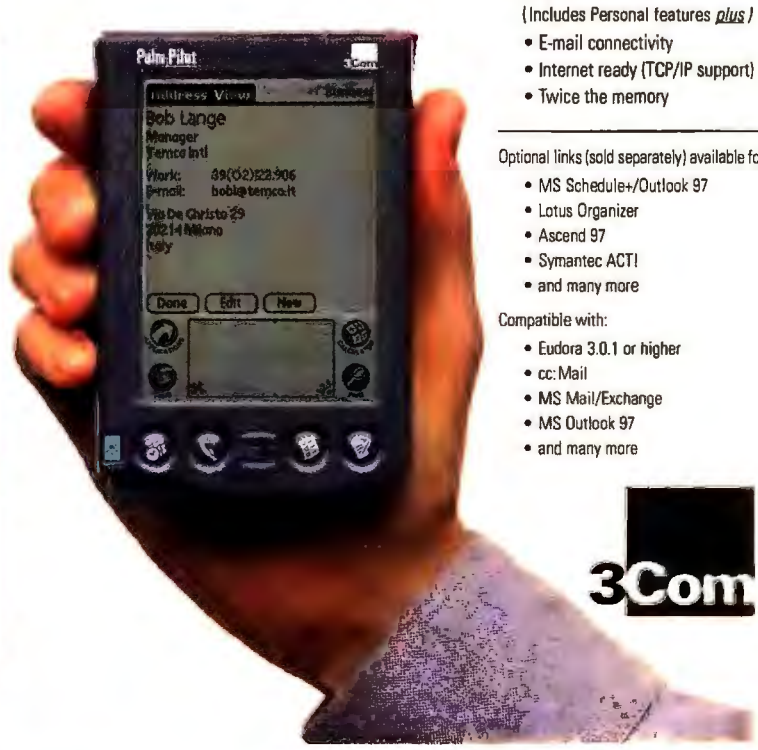
- MS Mail/Exchange
- MS Outlook 97
- and many more



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Circle 171 on reader service card

As your business does battle on the Web and your own intranet, you need the right front-line equipment. Here's how to choose your Web server.

By Mark Gibbs

Winning the Web Server Wars

IF YOU EXPECT to win the battle for customers on the Web, you'll have to fight for visibility. You need more than blow-them-away content—you also need an effective Web server. If your server is slow or prone to errors, your customers will click over to your competitors in a nanosecond.

Back on the home front, you need to conquer that new intranet challenge—that's ▶

ILLUSTRATION BRIAN CRONIN

right, the internal Web service that gives you better counterintelligence and lets you organize and mobilize your troops far more easily—*if* you can set it up properly while pinching every last penny.

In this briefing, we'll plan a campaign for both the Internet and your intranet—the server hardware and software—and we'll add up the costs for you. We're talking about the perfect Web server for all of *your* requirements.

ENLISTING FOR SERVICE

WHAT DOES A WEB server do? It stores and delivers documents in HTML and other formats. Web server software suites often add file transfer, e-mail, and newsgroup capabilities. On top of that, you can add support for order-taking applications, programs that grab data from your corporate databases, cute little Java applets, and just about any other service software dreamed up by the feverish minds of programmers—along with the tools for managing it all.

STANDARD SERVERS like Micron's Vetix LXI offer excellent price/performance for Web and intranet tasks.

Your choice of Web server software will depend on the intended audience for your Web site. Low-end products like Microsoft's free Personal Web Server are suitable for very small workgroups, while O'Reilly & Associates' WebSite Professional and Netscape Communications' FastTrack Server can easily service medium-size departmental and public sites. At the high end, products such as Apache, Netscape's Enterprise Server, Microsoft's Internet Information Server, and Novell's Web Server can handle high traffic volumes. For more details on these server packages, see the comparison chart in "Match Web Server Software to Your Mission" on page 214.

As for your choice of Web server hardware, there's a trade-off between performance and the depth of your pockets.

Web server performance is quite different from PC performance. Speed in serving HTML pages is determined primarily by three factors: input/output capabilities, available memory, and network interface speed.

I/O performance is determined by the power of the processor; the speed and width of the data paths between the processor, memory, and other devices; the speed of the storage system; and how well engineered the whole system is. A poor design, or a setup not optimized for a server, can quickly reduce the performance of even the best components.

Memory also makes a huge performance difference, since large amounts of it allow the Web server and disk driver subsystems to cache frequently used data for fast access. With memory so cheap, administrators often load Web servers with 128MB or more of memory.

Network interface speed is not determined just by the speed of the server's interface card. It's also limited by the slowest connection between the server and the client. Say your server is providing public Web services and is on an ethernet network (10 megabits per second) that's connected to the Internet via a router to a T1 line (which operates at 1.5 mbps). Top performance will be determined at best by the T1 connection and at worst by the slowest part of the rest of the network route to the client.

PHOTOGRAPHS: (TOP) KEN SMITH; (BOTTOM LEFT) DEBORAH DENKER; (BOTTOM RIGHT) KEVIN HORAN

Offering Service on the Internet....

THE VIRTUAL ENTREPRENEUR

NAME: Trevor Black

JOB TITLE: President of RegNet, online reseller of shareware, Santa Clarita, California

CRITICAL BUSINESS CONCERN: Electronic-commerce security. "The more we become like a vending machine, with no one around to look, the more fraud we get."

SERVER: Dell PowerEdge 2200 with PII-233, 256MB of memory, one 4GB drive, Windows NT Advanced Server, and Microsoft Internet Information Server

TOTAL SERVER COST: $5500 with software

WHAT IT DOES: Runs a Web storefront at www.swregnet.com, processing 200 credit card orders daily

SERVER LOCATION: Remote office in Utah

COMMENTS: "It is indeed running our business."

WOULD LIKE TO SEE: Better remote-control software for managing the server

WEB SERVERS

FEATURES COMPARISON

PLATFORMS	Street price as tested (11/5/97)	CPU/ maximum CPUs	RAM/ maximum RAM (MB)	Hard drive maximum/internal storage (GB)	Operating system	Web server software	Comments	Reader service number
GENERAL-PURPOSE SERVERS								
Dell PowerEdge 2200 800/590-7455 www.dell.com	$6262	two PII-266s/ two PII-300s	128/ 512	6/27	Windows NT Advanced Server 4.0	Microsoft Internet Information Server 3.0	Very powerful server expandable to two PII-300 processors.	735
Micron Vetix LXI 800/494-8905 www.micronpc.com	$5099	PPro-200/ two PPro-200s	64/ 1000	4/24	Windows NT Advanced Server 4.0	Microsoft Internet Information Server 3.0	Strong performance, expandable to 1GB of RAM.	736
INFORMATION APPLIANCES								
Compact Devices Twister 800/894-0519 www.devices.com	$1295	Intel 80186-40/ n/a	1/1	1.2/1.2	proprietary	proprietary	Inexpensive, slightly harder to set up and maintain than WebZerver.	737
Microtest WebZerver 602/952-6400 www.microtest.com	$1270	AMD 486-133/ n/a	8/8	2.1/2.1	Linux	Apache	Very good price and performance, very easy to manage.	738

n/a = not applicable

However, the performance of a powerful server is not wasted by a slow connection. The server's spare capacity can easily be absorbed by Web server back-end applications, such as those that process data from Web forms. The performance story is different here; raw processing power typically plays a much larger role.

Manageability and availability are other big concerns. You want to determine how well the server is working, get alerts when something goes wrong, and be able to control the server remotely.

To illustrate your choices in Web servers, we examined two typical Intel-based workgroup servers and two inexpensive *information appliances* tailored for intranet use (see the features chart above). All offered strong price/performance and bundled features.

SERIOUS SERVICE, CHEAP

THE CLASSIC COMMERCIAL Web server is a UNIX box with a hefty price tag. Such machines run most of the high-volume public sites, but they're under attack in smaller sites by an army of Intel-based servers, usually running Windows NT Advanced Server software.

We put two of these machines—Dell's PowerEdge 2200 and Micron's Vetix LXI, both running Microsoft's Internet Information Server 3.0—through basic training for Web service.

These systems are not designed specifically for that role. Rather, they are all-purpose servers designed for fast disk and network throughput. They do provide plenty of muscle for Web service at a surprisingly low price. With a 200-MHz Pentium Pro (upgradable to dual CPUs), 64MB of memory, and a single 4GB drive, the Micron configuration comes to about $5100. The Dell system features dual 266-MHz Pentium IIs, 128MB of memory, and three 2GB drives, with a price tag of $6262.

Both machines arrived with a ten- ▶

...and on the Intranet

NAME: Tony Bilyj

JOB TITLE: Chief of network management, Veterans Administration regional office, Chicago

CRITICAL BUSINESS CONCERN: Figuring better ways to deliver useful information to employees

SERVER: Compact Devices Twister with Intel 80186-40, 1MB of RAM, one 1.2GB drive, and proprietary operating system and Web server software

TOTAL SERVER COST: Testing beta of $1300 system

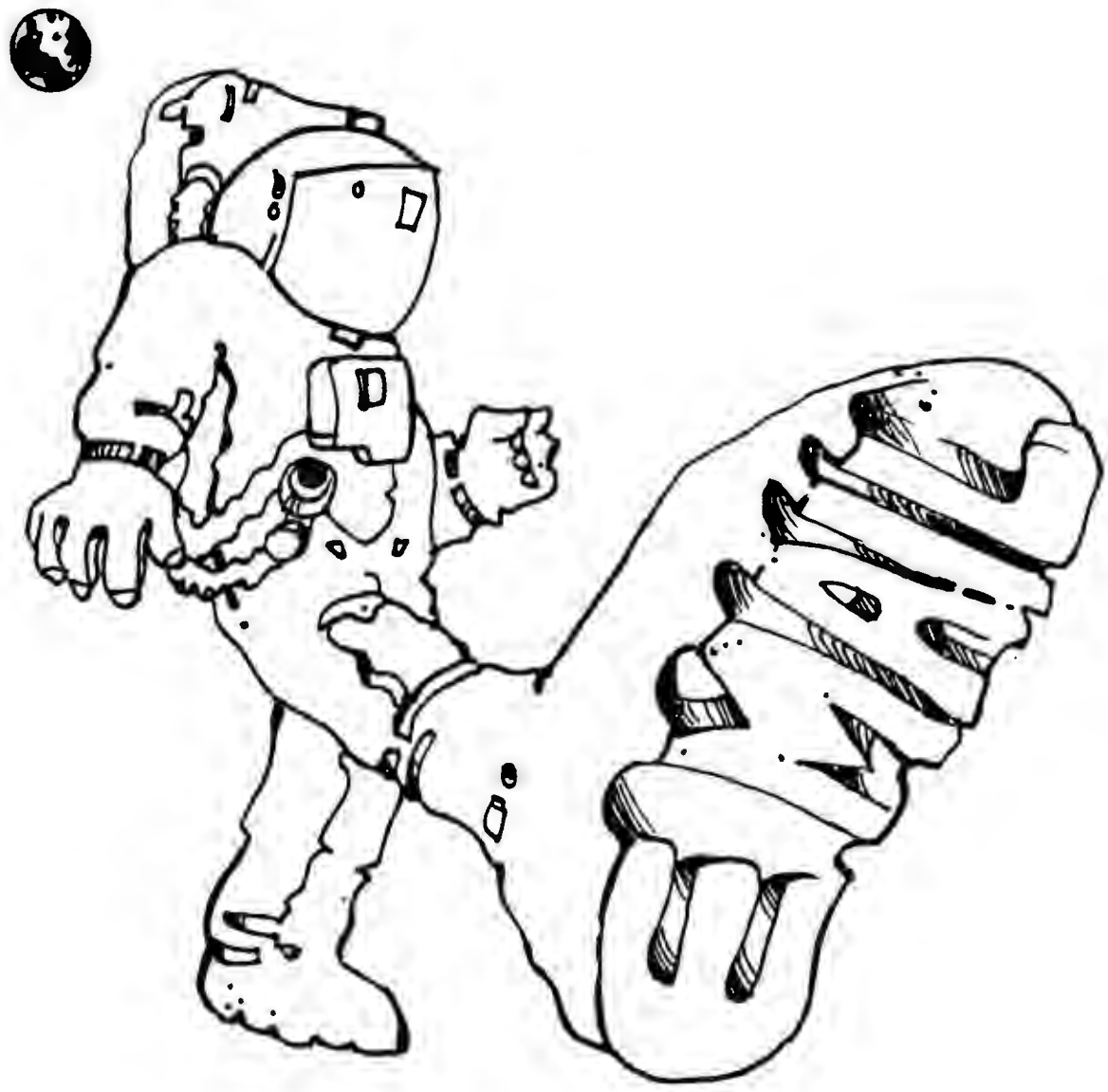
WHAT IT DOES: Delivers monthly newsletter, in-house reports, and other information to 270 employees

SERVER LOCATION: Down the hall

COMMENTS: "It's bulletproof—it just sits there and percolates and does what it's supposed to do."

WOULD LIKE TO SEE: Reports on the server's load and ways to scale up service when and if necessary

THE INFORMATION MANAGER



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that can still be easily optimized to your needs.
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threaded discussions and status tracking—that takes ordinary e-mail out of this world.
And puts a whole new world of productive tools within reach of any user, any browser, any platform,
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user license for Microsoft Windows NT Advanced Server 4.0, which was already installed. In both cases, the machine runs the setup routine on start-up with all the hardware options preconfigured. The setup is very easy to follow.

Installing Internet Information Server isn't difficult. But if you haven't dealt with Web server software before, you'll need to follow the instructions and read the help files carefully. Typically, IIS setup takes no more than 30 minutes.

We can't find much to differentiate these machines, assuming you get similar configurations. They're both very well engineered, and even their standard service contracts are similar (they're both fulfilled by Digital Equipment Corporation's service network). For each, you can add extras such as memory (going from 64MB to 512MB costs about $3800), more disk storage (about $1299 for a 9GB drive), and a second disk controller for RAID (Redundant Array of Inexpensive Disks) configurations (around $1500 for the controller with 32MB of memory). A second 200-MHz Pentium Pro for the Vetix costs around $1000.

You can create a hefty system with an equally hefty price tag quite easily. For ▶

Match Web Server Software to Your Mission

TODAY'S WEB SERVER software offers a lot of power, low prices, and an ever-growing list of add-on tools and capabilities.

When picking a package, your first concern is which operating system to use. If your company is committed to Windows NT, for example, you won't want a Novell NetWare–based system.

SPEED ISN'T ALL

DESPITE WHAT YOU hear, speed is probably not a big concern. Some servers are faster than others, but speedy hardware can compensate well for slower software.

Other considerations: Which added tools and applications come with the server software? Does it include management utilities, Web authoring tools, and enhanced options such as credit card validation services?

When it comes to management tools, server applications are generally similar. Adding extras to the system—such as file uploads/downloads and back-end applications—increases management overhead.

Security is a huge concern if you're going to transmit any personal information or perform financial transactions. All Web servers support Basic Authentication, which requires you to log on with a valid user name and password.

But what's critical is guarding the communications between the Web server and the user's browser. The dominant protocol for this task is the Secure Sockets Layer. Most commercial products support SSL version 2; its successor, the more sophisticated SSL version 3, is also common. Version 3 allows the server and the browser to authenticate each other, a process that is not widely used on commercial Web sites yet. The other alternative for transactional security is S-HTTP, a secured version of the Web's native HyperText Transfer Protocol.

WHICH APPLICATIONS WILL RUN?

IF YOU INTEND to run a back-end application, make sure your server can handle it. The most common way that such applications are accessed on a Web server is through the Common Gateway Interface. CGI adds significant overhead, however, so server vendors have developed new interfaces that improve performance considerably. (The most popular are Microsoft's ISAPI and Netscape's NSAPI.) In languages, Java support is becoming increasingly important on the Web and intranets. **–M. G.**

LEADING WEB SERVER SOFTWARE

PACKAGES	Street price (11/5/97)	Ease of use	Performance	Operating systems supported	Security	Applications supported	Reader service number
Apache 1.02 www.apache.org	free	poor	very good	UNIX, OS/2	none	CGI	739
Microsoft Internet Information Server 3.0 206/882-8080 www.microsoft.com	free [1]	good	very good	Windows NT Advanced Server	SSL 2, SSL 3, S-HTTP	CGI, ISAPI	740
Microsoft Personal Web Server 1.0a 206/882-8080 www.microsoft.com	free	very good	poor	Windows 95, Windows NT	none	none	741
Netscape Enterprise Server 3.0 415/528-2555 www.netscape.com	$995	good	very good	Windows NT Advanced Server, UNIX	SSL 2, SSL 3	CGI, NSAPI	742
Netscape FastTrack Server 3.0 415/528-2555 www.netscape.com	$295	good	good	Windows 95, Windows NT Advanced Server, UNIX	SSL 2, SSL 3	CGI, NSAPI	743
Novell Web Server 3.1 800/453-1267 www.novell.com	free [2]	good	very good	Novell NetWare	SSL 2, SSL 3	proprietary	744
O'Reilly & Associates WebSite Professional 2.0 800/998-9938 www.ora.com	$799	good	good	Windows 95, Windows NT Advanced Server	SSL 2, SSL 3, S-HTTP	proprietary	745

[1] Free, with Windows NT Advanced Server. [2] Free, with Novell IntranetWare.

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example, the PowerEdge 2200 with 512MB of memory, a second disk controller with 32MB of memory, three 9GB drives, and a ten-user Windows NT Advanced Server 4.0 license costs $12,370.

Although we didn't run formal performance benchmarks here at *PC World*, our allies at *Network World* did, using WorldBench for Servers 2.0's Web tests on almost identical PowerEdge and Vetix models. (These tests measure how long it takes to download representative Web pages under Novell IntranetWare and NT Advanced Server. They also examine Web searching under NT Advanced Server with OpenText's LiveLink Search.) The Vetix LXI ran in the middle of a pack of 16 workgroup servers tested over the past year. A PowerEdge, similar to the one we looked at but with only 64MB of memory, finished near the front of the pack, about 12 percent faster than the Vetix.

MICROTEST'S WEBZERVER is a tiny $1300 appliance that is designed for plug-and-play service on your intranet.

Such machines often serve small commercial Web sites. Beefed up with extra memory, storage, and the second processor, they provide good performance until you achieve huge traffic volume, in excess of around 1000 page retrievals per second. To put that figure in perspective, daily page retrievals would amount to more than 86 million—a level few sites approach. And these systems should handle any intranet chores except extreme loads such as enormous document management systems or many channels of streaming video.

INFORMATION APPLIANCES AT YOUR SERVICE

WHAT DOES A WEB SERVER have in common with a toaster? Nothing—unless it's one of the slick new information appliances custom-built to be a Web server. In that case, the server is supposed to be "plug and play," just like a toaster. You turn the thing on and it works and does what it is supposed to do—provide basic Web services on an intranet—reliably and cost-effectively.

This concept is not as far-fetched as it sounds. We looked at two of these devices—Compact Devices' Twister and Microtest's WebZerver—and found them not quite appliance-like yet, but darned close. Setup times are short, configuration is simple, and ongoing management needs are minimal. Performance is surprisingly good. And over the weeks that we tested them, they never failed or displayed a problem. ▶

Pick the Right Web Server Platform

TO FIND SUITABLE Web server software and hardware, look at the combination of your document-retrieval requirements (across the top) and your server application load requirements (down the left side). For estimating application load, consider an activity like processing forms: Handling one form per minute is a light load; one form per second is a heavy load.

SERVER APPLICATION LOAD	DOCUMENT RETRIEVAL RATE: Light (60 or fewer documents per minute)		Medium (fewer than 600 documents per minute)		Heavy (up to 6000 documents per second)	
	Software	Hardware	Software	Hardware	Software	Hardware
None to low	• Microsoft Internet Information Server • Microsoft Personal Web Server • Netscape FastTrack Server • O'Reilly WebSite Professional	• information appliance • Pentium-166 with 32MB of RAM	• Apache • Microsoft Internet Information Server • Netscape Enterprise Server • Netscape FastTrack Server • Novell Web Server • O'Reilly WebSite Professional	• Pentium-166 with 32MB of RAM • Pentium-200 with 64MB of RAM	• Apache • Microsoft Internet Information Server • Netscape Enterprise Server • Netscape FastTrack Server • Novell Web Server • O'Reilly WebSite Professional	• Pentium-166 with 32MB of RAM • Pentium-200 with 64MB of RAM • dual Pentium-200s with 128MB of RAM
Low to medium	• Apache • Microsoft Internet Information Server • Netscape Enterprise Server • Netscape FastTrack Server • Novell Web Server • O'Reilly WebSite Professional	• Pentium-166 with 32MB of RAM • Pentium-200 with 64MB of RAM	• Apache • Microsoft Internet Information Server • Netscape Enterprise Server • Netscape FastTrack Server • Novell Web Server • O'Reilly WebSite Professional	• Pentium-166 with 32MB of RAM • Pentium-200 with 64MB of RAM • dual Pentium-200s with 128MB of RAM	• Apache • Microsoft Internet Information Server • Netscape Enterprise Server • Novell Web Server	• Pentium-200 with 64MB of RAM • dual Pentium-200s with 128MB of RAM
Medium to high	• Apache • Microsoft Internet Information Server • Netscape Enterprise Server • Netscape FastTrack Server • Novell Web Server • O'Reilly WebSite Professional	• Pentium-166 with 32MB of RAM • Pentium-200 with 64MB of RAM • dual Pentium-200s with 128MB of RAM	• Apache • Microsoft Internet Information Server • Netscape Enterprise Server • Novell Web Server	• Pentium-200 with 64MB of RAM • dual Pentium-200s with 128MB of RAM	• Apache • Microsoft Internet Information Server • Netscape Enterprise Server • Novell Web Server	• Pentium-200 with 64MB of RAM • dual Pentium-200s with 128MB of RAM
High to very high	• Apache • Microsoft Internet Information Server • Netscape Enterprise Server • Novell Web Server	• Pentium-200 with 64MB of RAM • dual Pentium-200s with 128MB of RAM	• Apache • Microsoft Internet Information Server • Netscape Enterprise Server • Novell Web Server	• multiple servers	• Apache • Microsoft Internet Information Server • Netscape Enterprise Server • Novell Web Server	• multiple servers

PHOTOGRAPH: KEN SMITH

I work in two offices,

West and East Coast and I used to bring a lap top back and forth. The first one had the storage capacity of a walnut. The second one dropped off a table, and the third one got stolen at the airport. At three grand a pop it just wasn't working out. So I got two **SyJet™** portable drives from **SyQuest.** Now I just carry around a cartridge in my pocket, and best of all I don't spend my time in airports going, "Where's my bag?!" **Whether you're commuting "Coast to Coast" or "Office to Home" get THREE GIGS of removable hard disk space for as low as $299*— additional cartridges now cost just $79 each!**

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- *GUI on-screen menus*
- *Image panning*
- *3-year warranty*

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- *700 ANSI Lumens*
- *13 lbs. total weight*
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- *Power zoom/power focus*
- *Polarized Beam Splitter (PBS) optical system*
- *Long-life 120W Ultra High Power (UHP) lamp*
- *GUI on-screen menus*
- *2-year warranty*

MULTIMEDIA ProX TRUE SVGA – PLC-5500NA

- *True SVGA output (800x600)*
- *500 ANSI Lumens*
- *Under 16 lbs.*
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- *85% image uniformity*
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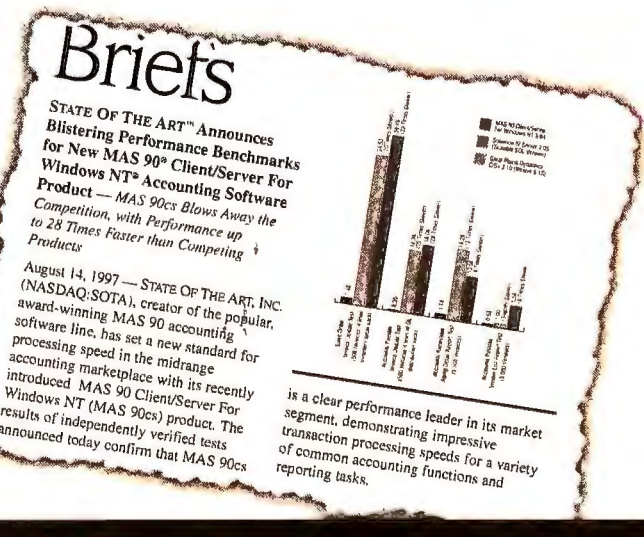

Briefs

STATE OF THE ART™ Announces Blistering Performance Benchmarks for New MAS 90® Client/Server For Windows NT® Accounting Software Product — *MAS 90cs Blows Away the Competition, with Performance up to 28 Times Faster than Competing Products*

August 14, 1997 — STATE OF THE ART, INC. (NASDAQ:SOTA), creator of the popular, award-winning MAS 90 accounting software line, has set a new standard for processing speed in the midrange accounting marketplace with its recently introduced MAS 90 Client/Server For Windows NT (MAS 90cs) product. The results of independently verified tests announced today confirm that MAS 90cs is a clear performance leader in its market segment, demonstrating impressive transaction processing speeds for a variety of common accounting functions and reporting tasks.

Announcements

STATE OF THE ART™ Scores Back-to-Back Wins for Technology Integration in Microsoft's® Industry Solution Awards for Accounting — *The only accounting software in its market space to support Microsoft technology exclusively, STATE OF THE ART's Version 2.0 of Acuity Financials™ and Acuity™ Projects accounting software are winners for middle-market accounting solutions.*

September 10, 1997 — Once again, Acuity Financials accounting software from STATE OF THE ART, INC. (NASDAQ:SOTA), took home the top award for Best Technology Integration at Microsoft's Industry Solution Awards (previously known as the Microsoft BackOffice™ Challenge) at the SoftEx, Accounting and Finance trade show here yesterday. Acuity Financials version 2.0 together with Acuity Visual Tools and Acuity Projects project accounting software outscored other finalists in a live case-study competition judged by an independent panel of industry experts. The prior version of Acuity Financials, 1.5, received the same honor at the Microsoft BackOffice Challenge at SoftEx Los Angeles in January 1997.

Scheduled to begin shipping later this month, Acuity Financials and Acuity Projects are members of Acuity Applications version 2.0, a family of business solutions that also includes Acuity Visual Tools, a Visual Basic®-based application development environment. Acuity Applications is designed exclusively

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PCWRLD0198

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YOU MANAGE THE WEBZERVER from any browser using a relatively simple utility.

They're also tiny (about the size of a hardback edition of *War and Peace*) and weigh less than 5 pounds.

Twister, which sells for about $1300 (street price), uses an Intel 80186 running a proprietary operating system, as well as software for Web and FTP file service, and various related applications written by Compact Devices. Because all the software is customized and highly optimized, the entire system uses only 1MB of memory (when was the last time you heard *that*?). Twister comes with a 1.2GB hard drive and a SCSI port that lets you add a second hard drive up to 2GB in size, an Iomega Zip drive, or any combination of up to seven SCSI devices. It includes either a 10BaseT or 10Base2 network interface.

The software bundle includes a selection of Web page templates, an FTP client for uploading documents to the server, the Claris Home Page authoring tool, and Net-It Software's Net-It Now document publishing utility. You configure and manage Twister through a Web browser. Its one disadvantage is that the included server-management utility is not very intuitive.

Microtest's WebZerver, which is street-priced at about $1270, is powered by a 133-MHz AMD 486-based processor and comes with 8MB of memory, a 2.1GB disk drive, and a SCSI port, so you can add up to seven more devices. The network interface is a 10BaseT or 10BaseTX connection. The operating system is Linux, the freeware UNIX clone, and the Web server software is a version of Apache. As with Twister, all WebZerver management and setup is done through a Web browser. And once in business, the device requires hardly any oversight.

Besides Web and FTP server software, Microtest throws in several add-ons, including multipage site templates, a search tool, a discussion group service, a site navigation tool, an FTP client, and Eazy Print, a version of Hummingbird Communications' DigitalPaper Maker that allows you to print directly from various Windows applications to create HTML documents.

Buy more powerful hardware than you think you need—in no time, you'll find whatever you have won't be enough.

In addition to these two offerings, Cisco Systems markets the Micro WebServer, a version of Twister with a Zip drive as its primary storage. And Data General has announced several Web server models. One is small enough to be embedded in a teddy bear, which the company has publicly demonstrated. (We are *not* making that up.)

CRAFTING YOUR BATTLE PLAN

OKAY, WE'VE SKETCHED out the options for low- to midrange Web servers, costing from about $1000 for an appliance to more than ten times that for a loaded general-purpose server. How do you pick the right one?

Performance: First ask how busy your server will be. Unless you're replacing an existing server, this is art rather than science, but try this approach.

To start off, come up with ballpark requirements for the rate of retrieving documents and the load placed on the server by other applications, if any.

For a public Web site, these are hard to estimate, since you won't know the application load until you've bought, installed, and configured the hardware and the site is up and running. An upgradable platform is a must. If you're sure you'll be wildly successful, start with powerful hardware.

Estimating requirements for an intranet should be easier because you know the number of users, but you also need to think about the workload they place on it. A hundred heavy users may equal 1000 casual ones.

Platform: Next, check out "Pick the Right Web Server Platform" on page 216 to find the software and minimum hardware system that can handle the document-retrieval rate and application load you expect. For estimating application load, consider an activity like processing data from forms. This typically involves some kind of error checking and then writing the data to a database. Handling one form per minute would be a light load, for example, while processing one form per second would be a heavy load.

Once you've picked your platform, consider the following issues:

Reliability: What would happen if your server went down?

If your entire company relies on a Web server, losing the server could affect business significantly. In a large corporation, you should plan on using multiple Web servers. In a smaller organization, it's a judgment call. You must juggle the cost of downtime, the question of who will fix the problem and when, and whether to buy high-reliability options such as hot-swappable disk drives.

Ease of setup: Setup for all the server hardware we looked at is pretty straightforward, and most of the popular server software is no harder to install. Installing the operating system is easy if you're already familiar with it. But if you've never installed Windows NT, for example, you'll have to allocate extra time for reading the documentation. UNIX is even more brutal for the uninitiated.

Ease of Web server setup: Web ▶

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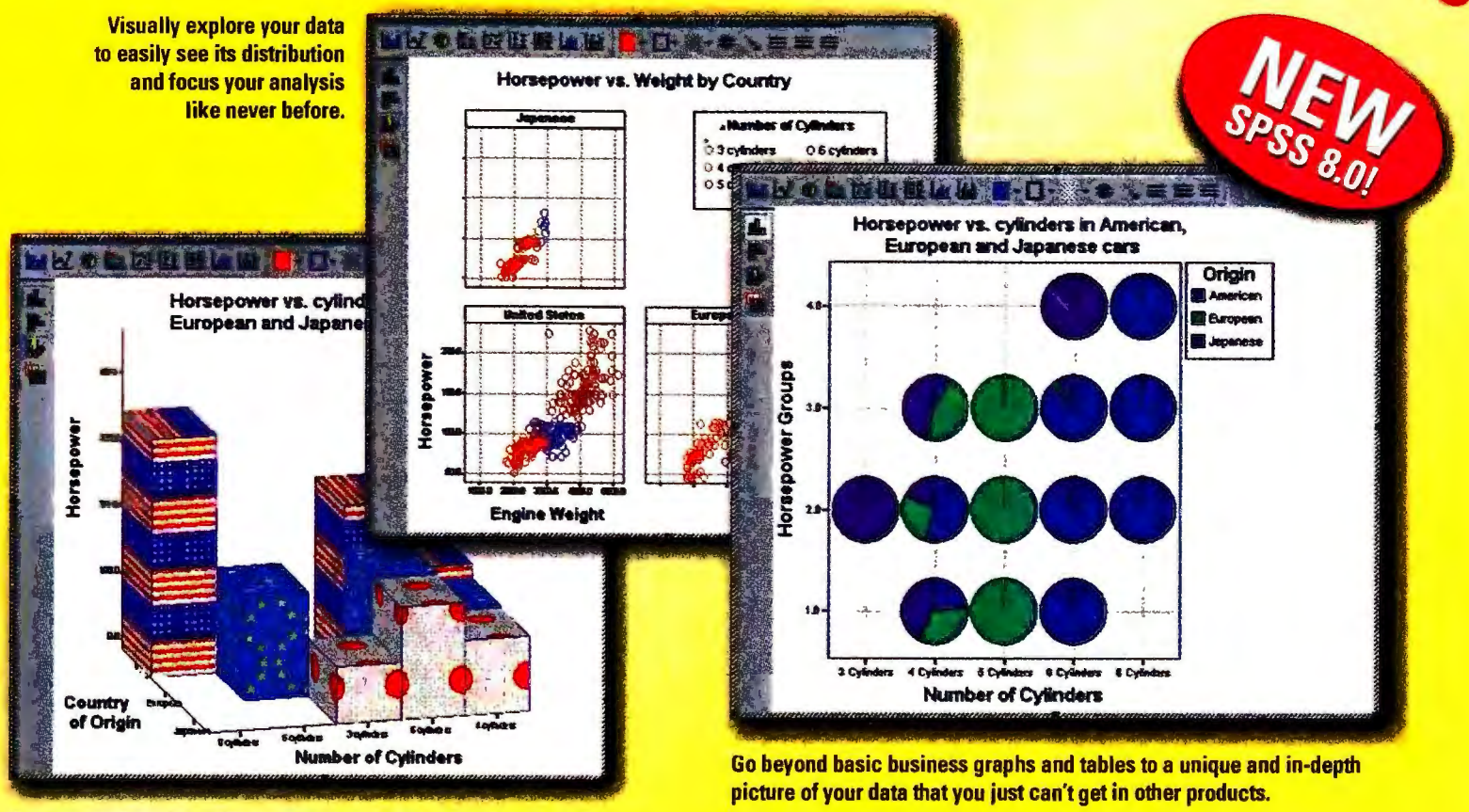

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server software presents a separate installation problem. Some low-end solutions like Microsoft Personal Web Server are very easy to install and require little knowledge to operate. Mainstream Web servers do require considerable technical knowledge to install and configure. Microsoft's IIS and O'Reilly's WebSite Professional are reasonably straightforward (again, as long as you understand Windows NT). Apache requires a solid understanding of UNIX.

Finally, if your budget allows it, buy more powerful hardware than you think you'll need. In no time, whatever level of service you have won't be enough. And winning this battle is one critical mission for your company.

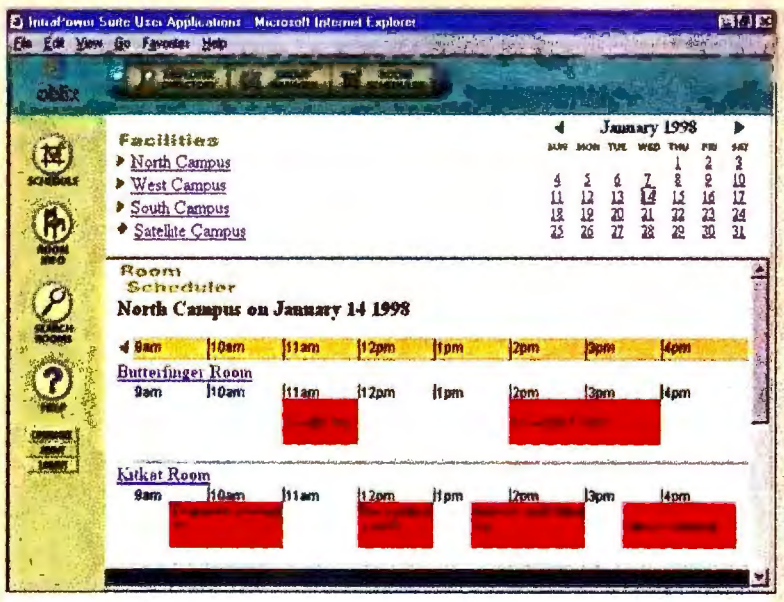
Good luck, and remember what Winston Churchill said: "No one can guarantee success in war, but only deserve it."

online *Find additional information at www.pcworld.com/jan98/webserv. Mark Gibbs is a contributing editor to* Network World. *Bill Lawrence manages computer operations at a Western utility.* ■

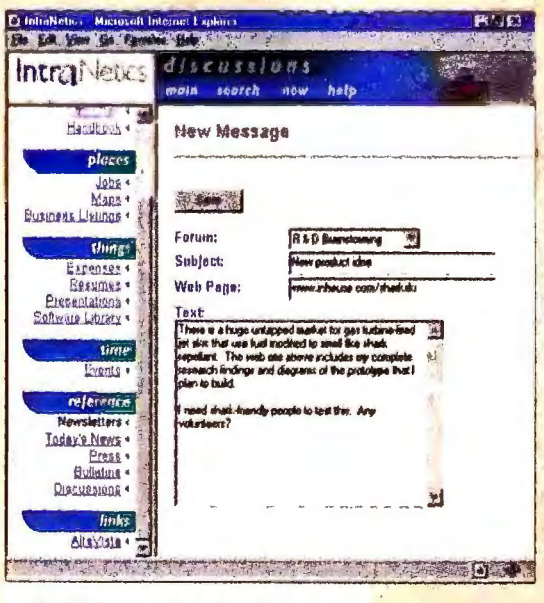
Instant Intranets: Just Add Hardware?

IF INTRANETS WERE toys, they'd come with a label saying "Considerable assembly required." Creating an intranet for your company is likely to be a manual affair. You need to be highly conversant in the intricacies of Web technologies, or sign up a Webmaster.

IntraNetics 97 from IntraNetics and Oblix's IntraPower Suite 2.0 automate this painful process. Both offer prepackaged versions of common intranet applications, with far friendlier interfaces than those of most Web apps. Either package lets you put your site up in a day or two, for less than you'd likely pay an outside consultant.



INTRAPOWER SUITE COMBINES a strong employee directory with extras like this meeting room scheduler.



INTRANETICS 97 PACKS a wealth of intranet applications, including this simple discussion forum.

Intranets usually begin life as internal information reservoirs. Right out of the box, IntraNetics 97 fills this bill. It allows you to create an instantly appealing and informative in-house site. It provides an employee directory, an organization chart, an online employee handbook, job- and résumé-posting software, a place to publish company bulletins and press releases, and an events calendar. It also cleverly leverages popular Internet information sources by letting you build links to them. There's also a basic discussion-forum application and a software library for popular files.

IntraPower Suite provides an employee directory built on Internet addressing standards, plus an organization-chart application, a contact manager, a meeting room scheduler, and a group-forum and file-sharing environment. The package isn't as well rounded as IntraNetics 97, but it uses Java to deliver new and improved Web-based interfaces. For example, the organization-chart program presents a graphical and browsable picture of your company's structure. As you pass the cursor over a name on the chart, a detail box pops up, showing additional information about the employee, including an e-mail address that you click to send a message. You can also click the employee's name to bring up a page that shows the employee's picture and background information.

SOME ASSEMBLY STILL REQUIRED

EXPECT POTHOLES in paving your in-house information highway. Both products, for example, need the latest browsers, and make it difficult for most companies to add user names.

IntraNetics 97 requires a Windows NT server and an SQL database. (Fortunately, setup is easy with its excellent documentation.) IntraPower Suite runs on either a Sun Solaris or Windows NT server.

If you need a wide assortment of applications, IntraNetics 97 is the best choice. Choose IntraPower Suite if your primary need is a powerful, standards-based employee directory. These two packages join Instinctive Technology's ERoom collaboration package (see December *New Products*) to prove that intranets finally can be bought rather than built.

—Bill Lawrence

• IntraNetics 97, $4995 per server (street), IntraNetics, 781/932-0960, www.intranetics.com

READER SERVICE NO. 746

• IntraPower Suite 2.0, about $20 per user (street), Oblix, 408/524-9700, www.oblix.com

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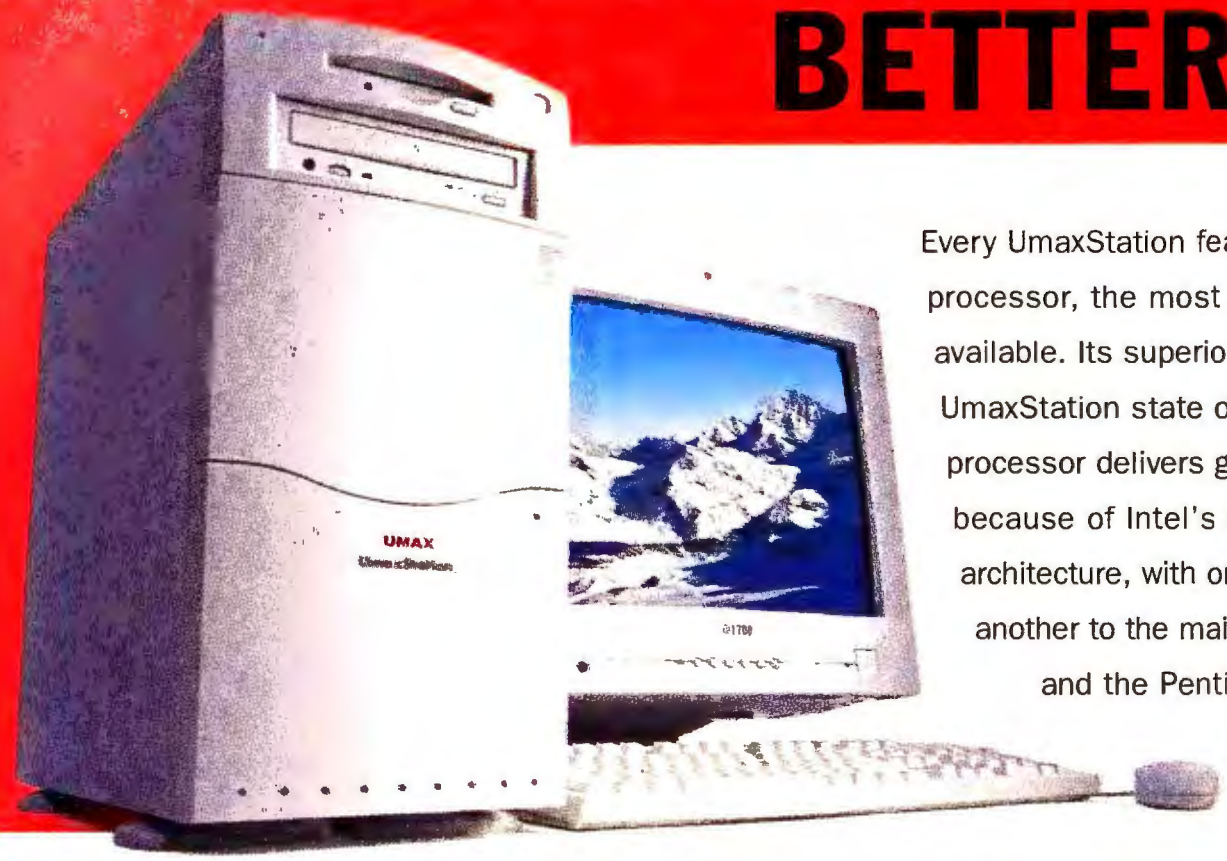

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Intel ASIDE

EDITED BY BRYAN HASTINGS
AND MICK LOCKEY

PENTIUM II-LEVEL power for $1399: The MicroFlex-P225J uses AMD's K6-233 processor.

YOU MAY NOTICE THAT that prices on fast, well-equipped PCs are coming down to earth, with a fourth of our budget desktops selling for under $1500. You may also notice that almost half the budget chart PCs—including two Best Buys—are *not* "Intel Inside." ▶

Yes, there is a connection. The simmering rivalry between CPU makers, the companies that manufacture the core intelligence of the PC, is heating to a boil, and PC shoppers are profiting. The main processor has traditionally been one of the PC's priciest components, and Intel has had the market almost all to itself for a decade. No longer. More of the smaller vendors such as CyberMax, Micro Express, and Polywell, are embracing non-Intel CPUs for the compelling performance they offer for their price. Some of these companies use both AMD and Cyrix chips in their PCs. In fact, all five of the under-$1500 PCs on the budget chart use either an AMD or a Cyrix processor. Even a big-name company like IBM is using alternative CPUs—look for upcoming reviews of the IBM K6-based Aptiva models. (IBM is manufacturing its own CPUs based on AMD's K6 specifications.)

Of the two non-Intel Best Buys, the MicroFlex-P225J is the most impressive. A new PC based on AMD's K6-233 chip, the P225J secures 3rd place due to its blazing speed and nice crop of components for a terrific $1399 price. Given its subpar manuals, however, the P225J is best for technically savvy users. Right on the heels of the P225J is CyberMax's PowerMax, which uses AMD's K6-166 CPU. It's slower than the P225J, but this nicely outfitted multimedia PC performs like an MMX-200 and sells for only $1299. The other new non-Intel system on the chart, Polywell's Poly K6233Mx, lands in 15th place. This very fast $1986 unit, with its easy-to-read manuals and clearly labeled ports, will appeal to novices.

Fewer non-Intel PCs compete on the power chart. Of the seven new systems there, only one is a non-Intel machine: Sys Technology's $2719 Performance 233M2, in eighth place. The 233M2 is an impressive PC for the price. It performs on par with a typical 266-MHz Pentium II PC, and comes with a great set of components, including a 6.4GB hard drive and an 8MB Number Nine Revolution 3D graphics card.

Of the remaining new power desktops, Unicent's $2399 Avanta T233, an attractive small- and home-office PC, is one to keep an eye on. Its performance lags the typical power system by about 10 percent but it's still plenty fast, and it's priced low for a fully configured minitower with a long five-year parts warranty. DirectWave also scores a place on our power chart with one of the cheapest and fastest Pentium II-300s we've ever had on the test bench. The $2999 MVP VX2-300 scored a whopping 272 on our PC WorldBench tests, matched only by Gateway 2000's G6-300OXL.

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THIS YEAR'S RESOLUTION: HP's LaserJet 4000 TN offers true 1200 dots per inch.

AMD, CYRIX MEAN BUSINESS

WHO SHOULD CONSIDER getting a system with an AMD or Cyrix processor? People who use their computers primarily for business stand to benefit the most. Our WorldBench tests, which consist mainly of productivity applications, show that Cyrix 6x86MX and AMD K6 systems are just as fast as many 266-MHz Pentium II PCs. (For people who rely heavily on MMX, however, such as serious gamers and Photoshop users, Pentium II is still the way to go for maximum performance.) And the heat on Intel will soon be turned up another notch. Centaur Technologies is readying its first WinChip processors for market to compete at the low end. By the time you read this, these 180-MHz and 200-MHz MMX–compatible chips should start appearing in sub-$1200 computers.

RATINGS GET A FACE-LIFT

YOU'LL NOTICE A CHANGE this month in the way we report ratings for desktop reliability and quality of support. In order to match the way we rate notebooks, we've switched from a five-tier rating scheme to a three-tier system: above average, average, and below average. We've also changed some of our weightings for desktop PCs to reflect market trends. With PC prices continuing to plummet and features taking on even more importance, we thought it was time to beef up the weighting we give features, raising it from 20 to 25 percent. To accommodate this change, we lowered the total weighting for reliability, quality of support, and support policies from 40 to 35 percent. Weightings for performance and price are unchanged.

GATEWAY GOES HOME

THE BIGGEST NEWS in the Top 10 Home PCs is Gateway 2000's new home-oriented version of the G6-300XL, which places third on the power desktops chart. The G6-300XL sports a 19-inch monitor, a sizable game and educational software bundle, and a combination DVD-ROM/CD-ROM drive that lets you watch DVD movies on your PC without having to buy a special player. The 300XL is the fastest home computer

we've tested, chalking up a PC WorldBench score of 270, and it's loaded with most goodies. Home users can also take comfort in Gateway's support. Policies include a three-year warranty and 24-hour service, and our reader survey indicates that customers have been very happy with the quality of Gateway's support. The 3000XL's drawback? A steep $3799 price.

Shopping for a new portable computer? We could hear notebook prices go *thud* this month. Four of the Top 10 Notebook PCs dropped by $250 or more, including a steep $539 price drop on Micron's fast and full-featured Transport XKE 166, and a whopping $704 drop on Transmonde's quick Vibrant 133T. Looking at monitors, Panasonic's new PanaFlat PF70, the first true flat-screen CRT we've reviewed, places fifth on our Top 10 Monitors chart. Its steep $849 price kept this 17-inch model from nabbing a Best Buy, but the PanaFlat has a beautifully sharp and easy-to-read display, in part because its flat screen is very glare resistant.

We also look at workgroup printers this month. HP's new LaserJet 4000 TN earns a Best Buy. It's the first 1200-dpi workgroup printer we've tested. In addition, it's exceptionally fast, cranking out nearly 13 text pages per minute. It sells for an attractive $1599.

Bryan Hastings is a senior associate editor and Mick Lockey an editorial assistant for PC World. *Assistant Editor Grace Aquino, Associate Editors Vince Bielski and Andrew Brandt, freelance writers Julie Campagna, Eric Hellweg, Jon Jacobi, and Dan Littman, and freelance research assistant Kyle Deise contributed to the Top 100. Testing for the Top 100 performed by Ulrike Diehlmann, Robert James, Elliott Kirschling, Jeff Kuta, and Mike Salayko.* *See page 14 for contact information.*

NEAR-BUDGET PENTIUM II-266. ProGen's $2349 Polaris delivers terrific performance.

YOUR GUIDE TO THE TOP 100

QUESTIONS ABOUT OUR CHARTS? The following section should answer most of them. If not, ask us; see page 14 for contact information.

How do the charts work? The Top 20 and Top 10 charts are evolving lists of the best PCs, monitors, modems, printers, and graphics boards we've tested. The Top 20 charts are divided by price. Power desktops cost $2250 or more; power notebooks cost $2750 or more. Every month we test the latest products in each category and compare them to the pool of items we've already reviewed. As new products earn places on the charts, those at the bottom drop off. Price cuts also cause chart changes.

Where do you get your prices? We estimate street prices based on vendor information and our own research, including surveys of retail outlets. We recheck all prices every month.

What does the overall rating mean? It's the sum of all our tests—both hands-on evaluations and automated speed tests. The scale is 1 to 100, so a product that scores in the 90s is generally considered exceptional, one in the 80s is among the best, one in the 70s is above average, and one that scores lower usually doesn't place.

What does the PC WorldBench score mean? It's a measure of how fast a PC is in relation to our baseline machine, a Dell P75t configured with 8MB of RAM, a 540MB hard drive, and no secondary cache. A PC that scores 200, for instance, is twice as fast as the baseline unit.

Where do the scores for reliability, support quality, and support policies come from? Reliability and support quality scores come from readers responding to Reliability and Service surveys. The policies score is based on vendor support policies (such as length of warranty for parts and labor, weekday toll-free support hours, and availability of weekend and online support).

What do all those word scores mean? Word scores for performance and price are based on a product's rating in relation to other products in its category. For example, a budget PC that is rated "expensive" is high priced only in relation to other budget PCs. Likewise, a power notebook rated "good" for performance is good only in relation to other power notebooks. Word scores for other categories, such as features, are relative to all desktops or all notebooks.

Where can I find the online version of the Top 100? Go to PC World Online (www.pcworld.com). There you'll find not only the current issue of *PC World* and reviews from back issues, but some extra features, including reviews not available in print. You can read full reviews of Top 10 products, for instance, by going directly to the URL provided in each Top 100 section.

Ever wish you could build a chart based on your own buying criteria? You can, with Buyer's Guide, our Web site's chart customizer (www.pcworld.com/hardware/t2010). Buyer's Guide combines your criteria with current *PC World* data and test results to generate customized Top 20s and Top 10s. For instance, if you want your chart to rank notebooks that have 120-MHz CPUs and 1.6GB hard drives, the guide's Personal Adviser will find and rank all machines that fit your specifications.

PC WORLD

TOP 20 POWER DESKTOPS

	SYSTEMS	Last month	Month tested	Street price (10/9/97)	CPU	Comments
1	Dell Dimension XPS D266 800/289-3355 www.dell.com	1	Nov 97	$2829	Pentium II-266	$250 price drop keeps fast PC in first place; 233 also good.
2	Dell OptiPlex GXa266 800/289-3355 www.dell.com	2	Nov 97	$2888	Pentium II-266	Quick, great design, ethernet, top reliability and support, no modem.
3	Gateway 2000 G6-300XL 800/846-2000 www.gateway.com	5	Nov 97	$3799	Pentium II-300	Ties for fastest-ever performance, great 19-inch monitor, terrific sound.
4	Micron Millennia XKU 300 888/634-8799 www.micronpc.com	7	Nov 97	$3789	Pentium II-300	$298 price drop boosts this speedster three places, great 19-inch monitor.
5	Quantex QP6/300SM-3X 800/896-4898 www.quantex.com	4	Dec 97	$2999	Pentium II-300	Very affordable PII-300, excellent support policies.
6	Unicent Avanta T233 800/308-3614 www.unicent.com	–	NEW	$2399	Pentium MMX-233	Great price on well-stocked SOHO system, comparatively slow.
7	DirectWave MVP VX2-300 800/882-8108 www.directwave.com	–	NEW	$2999	Pentium II-300	Ties Gateway for fastest, ties Quantex for cheapest PII-300 on chart.
8	Sys Technology Performance 233M2 800/613-9963 www.systechnology.com	–	NEW	$2719	Cx6x86MX-PR233	Fast corporate box, great features, tough to get through to support.
9	Micro X MXP 5060 PII-266 800/736-4276 www.microx.com	–	NEW	$2589	Pentium II-266	Low-cost SOHO PC, very fast, short support hours.
10	NMC Expert Pro II 800/800-4662 www.natmicro.com	11	Sept 97	$2595	Pentium II-266	Well priced; high-end graphics card; few extras, limited support hours.
11	Quantex QP6/266 WS-3x 800/896-4898 www.quantex.com	6	Oct 97	$2499	Pentium II-266	PII-266 comes with ethernet card and speakers, no modem.
12	Sys Technology Performance 233K6 800/613-9963 www.systechnology.com	9	Nov 97	$2702	AMD K6-233	Well-designed machine, had to leave many messages for support.
13	Gateway 2000 E-3100 PII-266 800/846-2000 www.gateway.com	8	Dec 97	$2889	Pentium II-266	Fast system, best support policies, no sound card or modem.
14	HP Brio 233 MMX 800/839-6854 www.hp.com	–	NEW	$2388	Pentium MMX-233	Nicely designed small-business PC, lots of on-screen help, custom keyboard.
15	ProGen Polaris PII-266 888/776-9595 www.progen.com	–	NEW	$2349	Pentium II-266	Fast, bargain minitower makes nice SOHO system; short support hours.
16	DTK Quin-57M/PM233 800/289-2385 www.dtkcomputer.com	10	Oct 97	$2361	Pentium MMX-233	$92 price drop on full-featured PC, support policies need improvement.
17	Netis Starburst 266 800/577-7526 www.netistech.com	14	Dec 97	$2390	Pentium II-266	Very low cost PII-266 system, no bells and whistles but covers all the basics.
18	IBM PC 300XL PII-266 800/426-2968 www.us.pc.ibm.com	–	Nov 97	$3785	Pentium II-266	Faster replacement for the PC 350 has fine design, locking cover.
19	Sys Technology Performance Pro 266A 800/613-9963 www.systechnology.com	12	Oct 97	$3106	Pentium II-266	$15 price shaved off fast minitower, great multimedia, support hard to reach.
20	IBM PC 300PL 800/426-2968 www.us.pc.ibm.com	–	NEW	$2425	Pentium MMX-200	So-so speed, only one free drive bay and 2MB of video RAM.

Best Buy See features chart, page 232; test report, page 234.

[1] For more information about all products in this table, circle reader service no. 908. [2] Insufficient data to give a rating.

A SLEW OF NEW MACHINES—seven in all—land on this month's chart, ranging from an inexpensive IBM Pentium MMX-200 to a very fast, cheap PII-300 from DirectWave. Sys Technology's new Cyrix-based Performance 233M2, the only new PC that doesn't use an Intel CPU, outperforms its AMD-based sibling farther down the chart. Among new power entries that missed the chart is CompUSA's debut PC, the American Pro AP300L-SE. This 300-MHz Pentium II minitower chalked up an excellent 264 WorldBench score, but it's a bit pricey at $3200. For more on the American Pro and other power desktops that missed the chart, visit PC World Online (www.pcworld.com/t20pcs).

SCORECARD

★ Overall rating	PC WorldBench score/performance	Features and design	Vendor's system reliability	Price	Vendor's support quality/policies	Reader service number
90	264/outstanding	outstanding	above average	average	above average/best	688
89	259/very good	outstanding	above average	average	above average/best	689
85	272/outstanding	outstanding	average	very expensive	above average/best	690
84	270/outstanding	very good	above average	very expensive	above average/best	691
83	269/outstanding	good	average	average	average/best	692
82	239/good	outstanding	[2]	very inexpensive	[2]/best	693
81	272/outstanding	good	[2]	average	[2]/best	694
81	259/very good	outstanding	[2]	average	[2]/good	695
80	257/very good	very good	[2]	inexpensive	[2]/good	696
80	260/very good	very good	[2]	inexpensive	[2]/fair	697
80	255/very good	good	average	inexpensive	average/best	698
80	251/good	outstanding	[2]	inexpensive	[2]/good	699
80	262/very good	satisfactory	average	average	above average/best	700
80	239/good	very good	average	very inexpensive	average/fair	701
80	265/outstanding	good	[2]	very inexpensive	[2]/fair	702
79	241/good	outstanding	[2]	very inexpensive	[2]/poor	703
78	257/very good	good	[2]	very inexpensive	[2]/fair	704
78	264/outstanding	very good	average	very expensive	average/good	–
77	264/outstanding	very good	[2]	average	[2]/good	705
77	230/satisfactory	good	average	inexpensive	average/good	–
Scorecard weightings ▶	Performance 25 percent	Features 25 [illegible]t	Reliability 15 percent	Price 15 percent	Quality/policies 10 percent each	

This Month's Best Buys

1 DELL DIMENSION XPS D266

PRO: Fast, fine design, readers in general are happy with Dell's support and system reliability

CON: Speakers a little bass-heavy

For the most part, the D266—priced $250 cheaper this month at $2829—is top-drawer. This high-end small- and home-office system comes with 64MB of SDRAM, an 8.4GB hard drive, a 12X–24X CD-ROM, and an internal 56-kbps Sportster modem. Even the Sound Blaster AWE64 sound board is first-rate, including a hardware wavetable and full-duplex capabilities.

The D266 uses Intel's advanced 440LX chip set and provides Accelerated Graphics Port support. The AGP systems we've tested, which include the DirectWave, Gateway, and Micron Pentium II-300 PCs on this month's power chart, are superb performers, but they don't run business applications much faster than similarly configured PCI-based systems. Nonetheless, more vendors are adopting AGP. We were less impressed with Dell's economy-model 1000LS 17-inch monitor, but it's a big improvement over the previous LS model. The Altec Lansing ACS 290 subwoofer-equipped speakers sounded bass-heavy and a bit muddy—audio aficionados should spend $49 more to get Dell's top speaker offering, the ACS 490.

Dell Dimension XPS D266

Despite the wealth of peripherals, this minitower has four empty drive bays and four free expansion slots. To top it all off, the system comes with Microsoft Office 97 Small Business Edition. Dell's support policies are among the best, including around-the-clock toll-free support, and free on-site service for the first year. Judging by reader feedback, Dell's support quality and the reliability of its PCs are both above average.

2 DELL OPTIPLEX GXA266

PRO: Great design, Trinitron monitor, ethernet, above-average reliability and support reputation

CON: No modem, skimpy software bundle

Dell's OptiPlex systems are aimed at networked corporate environments, where sensible design matters more than the latest technology, and the $2888 OptiPlex GXa266 generally holds to that course. Fortunately, the system's PC WorldBench score of 259 means you don't have to sacrifice performance to get its button-down stability. Dell says it puts all new OptiPlex PCs through an exhaustive battery of network compatibility tests.

Dell OptiPlex GXa266

This corporate workstation delivers a lot of features for the price. The GXa266 ▶

TOP 20 POWER DESKTOPS — STANDARD FEATURES

	SYSTEMS	CPU	RAM (MB)	Secondary cache (KB)	Hard drive (GB)	Graphics adapter	Video RAM (MB/type)	Monitor tube/ viewable diagonal (inches)	Screen pitch (mm)	CD-ROM drive speed
1	Dell Dimension XPS 0266*	Pentium II-266	64	512	8.4	STB Velocity 128 3D	4/SGRAM	17/15.9	.28	12X-24X
2	Dell OptiPlex GXa266*	Pentium II-266	32	512	3.2	integrated ATI 3D Rage Pro AGP	4/SGRAM	17/15.8	.26	12X-24X
3	Gateway 2000 G6-300XL*	Pentium II-300	64	512	8.4	STB Velocity 128	4/VRAM	19/18	.28	12X-24X
4	Micron Millennia XKU 300*	Pentium II-300	64	512	6.4	Diamond Viper 330	4/SGRAM	19/18	.22	12X-24X
5	Quantex QP6-300SM-3X*	Pentium II-300	64	512	6.4	Diamond Viper V330	4/EDO DRAM	17/16	.28	12X-24X
6	Unicent Avanta T233	Pentium MMX-233	64	512	6.4	Matrox Millennium II	4/WRAM	17/15.8	.26	12X-24X
7	DirectWave MVP VX2-300	Pentium II-300	64	512	7	Matrox Millennium II AGP	4/WRAM	17/16.1	.26	12X-24X
8	Sys Technology Performance 233M2	Cx6x86MX-PR233	32	512	6.4	Number Nine Revolution 3D	8/WRAM	17/15.9	.26	12X-24X
9	Micro X MXP 5060 PII-266	Pentium II-266	32	512	4.3	Matrox Millennium II	4/WRAM	17/16	.25	12X-24X
10	NMC Expert Pro II	Pentium II-266	64	512	5.1	Matrox Millennium II	4/WRAM	17/15.9	.28	12X-16X
11	Quantex QP6/266 WS-3x	Pentium II-266	32	512	4.3	Matrox Millennium	4/WRAM	17/16.1	.28	12X-16X
12	Sys Technology Performance 233K6	AMD K6-233	32	512	6.4	Number Nine Revolution 3D	8/WRAM	17/15.9	.26	12X-24X
13	Gateway 2000 E-3100 PII-266	Pentium II-266	64	512	4	ATI 3D Rage II+	4/SGRAM	17/15.9	.26	12X
14	HP Brio 233 MMX	Pentium MMX-233	32	512	6.2	Matrox Millennium II	4/WRAM	15/13.7	.28	12X-24X
15	ProGen Polaris PII-266	Pentium II-266	32	512	6.4	Number Nine Revolution 3D	8/WRAM	17/16	.27	12X-24X
16	OTK Quin-57M/PM233	Pentium MMX-233	64	512	2.1	Diamond Stealth 3D 3000	4/VRAM	17/15.8	.28	12X-16X
17	Netis Starburst 266	Pentium II-266	32	512	3.1	Matrox Millennium	4/WRAM	17/16.1	.25	12X
18	IBM PC 300XL PII-266	Pentium II-266	32	512	4.1	Matrox Millennium II	4/WRAM	17/15.7	.26	12X-16X
19	Sys Technology Performance Pro 266A	Pentium II-266	32	512	6.4	Number Nine Revolution 3D	8/WRAM	17/15.8	.26	12X-24X
20	IBM PC 300PL	Pentium MMX-200	32	512	4	integrated Matrox Mystique	2/SGRAM	17/15.6	.28	12X-24X

* Best Buy
[1] Downloads only, uploads at 33.6 kbps; uses 3Com/U.S. Robotics' x2 technology.
[2] Downloads only, uploads at 33.6 kbps; uses Rockwell-Lucent's K56flex technology.
[3] After one year, support drops to 11 hours on weekdays and 7 hours on Saturdays.
[4] Six years on CPU and main RAM, one to five years on other parts.

comes with a roomy minitower case and a 17-inch Dell Trinitron monitor, as well as a very comfortable keyboard. Other features include an ethernet adapter and good multimedia, in the form of Altec Lansing ACS 290 speakers that yield a strong but somewhat muddy bass. Software and modem, however, cost extra.

One of the coolest things about the GXa266 is its clever internal design. To get to the seven free slots, just remove the case and lift a lever—the entire circuit board holding the slots slides out.

The PC is backed by excellent support policies, including 24-hour phone help, and free on-site service for the first year. According to our readers, the quality of Dell's service and the reliability of its desktops and minitowers are above average.

3 GATEWAY 2000 G6-300XL

PRO: Blazingly fast, high-quality 19-inch monitor, great sound, very expandable

CON: Expensive

Looking for great pictures and sound on a sizzling-fast SOHO system? The 300XL fills that bill nicely. The crisp 19-inch EV900 monitor has a whopping 18-inch viewable area. Driving the EV900's wonderful picture is an AGP version of the STB Velocity 128. With a record-setting 272 PC WorldBench score, this Pentium II-300 computer is matched in speed only by DirectWave's MVP VX2-300. All this talent doesn't come cheap, however. The G6-300XL sells for a pricey $3799.

Gateway 2000 G6-300XL

Like most Gateway 2000 systems, the 300XL is well built. The full-size tower has plenty of elbowroom inside for repairs and upgrades, and it comes with ample free drive bays. Not that you'll need to expand storage right away—the 8.4GB drive should hold you for a while. An Ensoniq ESI370 Audio PCI card and Boston Acoustics speaker/subwoofer combo deliver quality good enough to please even audiophiles. Only one caveat: The Ensoniq card steals from main memory to store its wavetable: You can use either 2MB, 4MB, or 8MB tables. This problem isn't major considering the machine's 64MB of RAM, but with today's memory-

		EXPANDABILITY					CUSTOMER SUPPORT			
Modem speed (kbps)	Sound board	Case style	Max. RAM (MB)	Maximum secondary cache (KB)	Open RAM sockets	Open drive bays (ext./int.)	Open slots	Warranty for parts/labor (years)	Weekday toll-free support (hours)	Weekend support	Online support
56 [1]	Sound Blaster AWE64	minitower	384	512	2	3/1	4	3/1	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
–	integrated Crystal PnP Audio	minitower	384	512	2	2/1	7	3/1	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
56 [1]	Ensoniq ESI370 Audio PCI	tower	384	512	1	3/5	3	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
56 [1]	Sound Blaster AWE64	minitower	384	512	1	2/0	3	3/1	24	Sat., Sun.	BBS, CIS, WWW
56 [2]	integrated	minitower	192	512	1	3/3	4	3/1	24	Sat., Sun.	BBS, WWW
56 [1]	Ensoniq Audio PCI 9726	minitower	256	512	5	3/1	4	5/3	24	Sat., Sun.	BBS, WWW
56 [2]	Sound Blaster AWE64	tower	384	512	1	4/1	4	3/3	24 [3]	Sat., Sun. [3]	BBS, WWW
56 [1]	Sound Blaster 32 PnP CT3600	minitower	256	512	5	3/2	3	varies [4]/5	24 [5]	Sat., Sun. [5]	WWW
33.6	Ensoniq Audio PCI 9731	minitower	768	512	4	3/0	4	3/5	10	Sat.	BBS, WWW
33.6	Sound Blaster CT3600	minitower	384	512	4	1/1	4	3/3	9	–	WWW
–	OEM	minitower	256	512	2	3/3	5	3/1	24	Sat., Sun.	BBS, WWW
56 [1]	Sound Blaster AWE64	minitower	512	512	5	3/2	3	varies [4]/5	24 [5]	Sat., Sun. [5]	WWW
–	–	minitower	256	512	1	3/2	2	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
56 [1]	OEM AzTech 1008 PnP Audio	minitower	256	512	4	2/2	3	3/3	16 [6]	Sat.	AOL, CIS, WWW
56 [1]	OEM	minitower	1024	512	6	3/1	4	3/1	9	–	BBS, WWW
56 [1]	Sound Blaster AWE64	minitower	256	512	4	3/2	4	2/2	9	–	BBS, WWW
33.6	integrated	minitower	256	512	2	1/1	4	1/3	10	Sat.	BBS, WWW
–	Crystal PnP Audio	desktop	384	512	2	1/1	2	3/1	24 [7]	Sat., Sun.	AOL, BBS, CIS, WWW
33.6	Sound Blaster AWE64	minitower	768	512	4	3/2	4	varies [4]/5	24 [5]	Sat., Sun. [5]	WWW
–	Crystal CS4236B	desktop	384	512	2	1/0	4	3/1	24 [7]	Sat., Sun.	AOL, BBS, CIS, WWW

[5] After one year, support drops to 9 hours on weekdays, with no weekend support.
[6] Support costs $99 per year after three years.
[7] IBM charges for support after three years.

hogging programs, you may see a slight degradation in performance when a lot of applications are running.

The 300XL comes with Microsoft Office 97 Small Business Edition, Microsoft Encarta 97, and several games. Rounding out the system are a Telepath 56-kbps x2 modem and a 1X DVD drive that you can also use as a 12X–24X CD-ROM drive.

Gateway's above-average support package includes a three-year warranty on parts and labor, plus round-the-clock toll-free support. The illustrated documentation is thorough and well written, and plenty of help is available on Gateway's Web site. Based on our new survey results, Gateway systems are only average in reliability, but the quality of the company's support is among the best.

4 MICRON MILLENNIA XKU 300

PRO: Searing speed, high-quality 19-inch monitor, Zip drive, great speakers

CON: Very pricey

The Millennia XKU 300 is a SOHO dream box. This well-built system, with a breathtaking 270 WorldBench score, is one of the fastest PCs we've ever tested and comes with a luxurious set of components. But for the budget minded, this minitower will stay just a dream at its current $3789 price.

On the test bench, the Millennia XKU 300 scored just 2 points shy of the fastest machines we've ever tested, Gateway's G6-300XL and DirectWave's MVP VX2-300. Most users won't perceive any performance difference among the three. The XKU comes with a great 19-inch Hitachi monitor, which displays crisp text and good-looking graphics. You'll be able to step up to 1280 by 1024 resolution without straining your eyes.

Micron Millennia XKU 300

The built-in Zip drive is a convenient addition for backing up files and folders and transporting large amounts of data. You also get a big 6.4GB hard drive, a 12X–24X CD-ROM drive, and a fast 3Com/U.S. Robotics 56-kbps Sportster modem. The system also includes AGP graphics, although our current testing doesn't show that AGP has a clear edge over PCI graphics for business applications. ▶

The XKU is set up to entertain, with the popular Sound Blaster AWE64 card and a Cambridge SoundWorks system that boasts a subwoofer and satellite speakers and actually sounds better than many home stereos. People without IS support will also appreciate Micron's generous policies, which include 24-hour phone support. According to our new survey results, Micron is above average for both PC reliability and support quality.

5 QUANTEX QP6/300SM-3X

PRO: Very fast, affordable, great support policies

CON: Generic documentation

A combination of top-notch performance, an affordable $2999 price, and a decent feature set keeps the SM-3X a Best Buy for another month. This minitower sports a Pentium II-300 CPU and extras like a 56-kbps modem. All that, plus a blazing PC WorldBench rating of 269, Microsoft Office 97 Small Business Edition, and 24-hour toll-free help, make the 300SM-3X an alluring option for your small or home office.

Quantex QP6/300SM-3X

It's rare to find a lightning-fast machine with 64MB of RAM, a 6.4GB hard drive, and a 56-kbps modem for less than ▶

TOP 20 POWER DESKTOPS

TEST REPORT

	SYSTEMS	CPU	RAM (MB)	Secondary cache (KB)	PC WorldBench score
1	Dell Dimension XPS D266*	Pentium II-266	64	512	264
2	Dell OptiPlex GXa266*	Pentium II-266	32	512	259
3	Gateway 2000 G6-300XL*	Pentium II-300	64	512	272
4	Micron Millennia XKU 300*	Pentium II-300	64	512	270
5	Quantex QP6-300SM-3X*	Pentium II-300	64	512	269
6	Unicent Avanta T233	Pentium MMX-233	64	512	239
7	DirectWave MVP VX2-300	Pentium II-300	64	512	272
8	Sys Technology Performance 233M2	Cx6x86MX-PR233	32	512	259
9	Micro X MXP 5060 PII-266	Pentium II-266	32	512	257
10	NMC Expert Pro II	Pentium II-266	64	512	260
11	Quantex QP6/266 WS-3x	Pentium II-266	32	512	255
12	Sys Technology Performance 233K6	AMD K6-233	32	512	251
13	Gateway 2000 E-3100 PII-266	Pentium II-266	64	512	262
14	HP Brio 233 MMX	Pentium MMX-233	32	512	239
15	ProGen Polaris PII-266	Pentium II-266	32	512	265
16	DTK Quin-57M/PM233	Pentium MMX-233	64	512	241
17	Netis Starburst 266	Pentium II-266	32	512	257
18	IBM PC 300XL PII-266	Pentium II-266	32	512	264
19	Sys Technology Performance Pro 266A	Pentium II-266	32	512	264
20	IBM PC 300PL	Pentium MMX-200	32	512	230

*Best Buy

Word 7.0 for Windows 95 · Excel 7.0 for Windows 95 · Picture Publisher 6.0 for Windows 95 · Paradox 5.0 for Windows · WordPerfect 6.1 for Windows · 1-2-3 release 5 for Windows

HOW WE TEST All systems are tested with PC WorldBench, PC World's application-based benchmark. A higher PC WorldBench score is better. All PCs have Windows 95, and video resolution is set to 800 by 600 in 256 colors. We run automated scripts on six popular business applications, performing common tasks such as spelling checks, scrolls, saves, sorts, and recalculations. The PC WorldBench score is a sum of the weighted result of each script: Word (25 percent), Excel (20 percent), Picture Publisher (15 percent), Paradox (15 percent), WordPerfect (15 percent), and 1-2-3 (10 percent). For more details on our benchmark and how we run it, see PC World Online (www.pcworld.com/testing).

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$3000. The system's Diamond Viper V330 AGP card uses the Reva 128 chip, one of the best 3D performers we've seen on non-AGP PCs and fast with business programs as well. The 17-inch MAG Innovision monitor has a clean, crisp display.

Quantex documentation is, as usual, a little disappointing. However, the company's support policies are among the best. In addition to 24-hour phone help, Quantex backs its systems with a three-year warranty on parts and one year on labor. Our survey suggests that readers are generally happy with the reliability of Quantex's PCs and the quality of its support.

New This Month

The following PCs made our power desktops chart for the first time this month. For brief reviews of previously tested PCs on the chart, visit our Web page (www.pcworld.com/t20pcs).

6 UNICENT AVANTA T233

PRO: Great price, good features, long warranty

CON: Relatively slow, documentation hard to read

If you're looking for a reasonably priced office PC, consider Unicent's $2399 minitower. This system comes loaded with nice features, a good software bundle, and great warranties. Only its speed keeps it from earning a Best Buy. This PMMX-233 is slow compared to the Pentium II-266 and -300 PCs that now make up most of the power chart.

Unicent Avanta T233

You get plenty for your money, including a Zip drive, a 6.4GB hard drive, a 56-kbps Sportster x2 voice modem with RapidComm software, and Microsoft Office 97 Professional. We got a snappy flicker-free picture with the 17-inch Princeton EO75 monitor and Millennium II graphics card. Our only multimedia complaint: The pair of Premier QX SW32 speakers lacked punch.

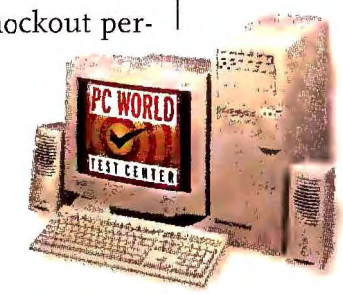
The PC's manuals are too technical for most novice users, but support is available around the clock. When we called anonymously, we reached helpful technicians. Unicent's warranty covers parts for five years and labor for three.

7 DIRECTWAVE MVP VX2-300

PRO: One of the fastest PCs we've tested

CON: Free 24-hour technical support limited to a year, difficult to get through to support reps

The $2999 VX2-300 is a knockout performer, tying Gateway's G6-300XL as the quickest system we've ever tested. It has a powerful combination of performance and features for its affordable price, but thin support holds it back.



DirectWave MVP VX2-300

DirectWave's support policies pale under scrutiny. The three-year warranty is generous, but round-the-clock support lasts only a year, after which it drops to 11 hours weekdays and 7 hours on Saturdays. We also found support tough to reach. We had to leave messages eight of the ten times we called and were put on hold for 20 minutes the two times we got through. Once we talked to reps, however, we found them friendly and helpful.

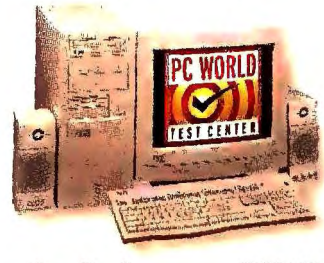
Apart from these shortcomings, the MVP VX2-300 is a very attractive machine. Graphics are stunning, thanks to the beautiful 17-inch monitor with .26 dot pitch, and the Matrox Millennium graphics card. The VX2-300 comes with a 56-kbps voice modem and Cheyenne Bitware software. But you'll have to pay extra for speakers and productivity applications.

8 SYS TECHNOLOGY PERFORMANCE 233M2

PRO: Fast, well configured, comfortable keyboard

CON: Meager support, lackluster documentation

If Intel is worried about the competition, it should be. More PC vendors such as Sys Technology are using both Cyrix and AMD processors, with impressive results. The $2719 Sys Performance 233M2 is a fast, well-rounded corporate workstation based on Cyrix's Cx6x86MX-PR233 processor. With a 259 PC WorldBench score, it keeps pace with most 266-MHz Pentium II systems. Why then isn't this system a Best Buy? We found the support lacking.



Sys Performance 233M2

IS managers will like the 233M2's configuration, including 32MB of SDRAM, a 6.4GB hard drive, a 56-kbps x2 modem, and a reasonably crisp 17-inch monitor. Many corporate systems don't need full-blown multimedia, so you could save money by omitting the speakers and opting for a lower-end video adapter than the supplied 8MB-equipped Number Nine Revolution 3D card. System managers will also appreciate this machine's painless upgradability, with its easy-off case and tidy interior. What may displease managers is Sys Tech's anemic support. The 233M2's documentation consists only of component manuals, and the main system board manual is generic to the product line. Also, round-the-clock toll-free support drops to only 9 hours per day, weekdays only, after the first year, and you start paying the toll charge. And our anonymous calls to support were discouraging—we always had to leave messages.

9 MICRO X MXP 5060 PII-266

PRO: Fast, good help line

CON: Poor documentation, short support hours

Micro X makes our chart for the first time with its $2589 MXP 5060 PII-266—a reasonably fast, fairly well appointed SOHO system. The MXP is not as decked out as some other PCs in the top half of the chart, but overall it's not a bad buy.

With a PC WorldBench score of 257, the MXP is a very good performer, keeping pace with the typical 266-MHz Pentium II. The software bundle isn't bad for small and home offices: Lotus SmartSuite 97—the next-best office suite after Microsoft Office—and Grolier's Encyclopedia. If you're worried about carpal tunnel syndrome, the bundled Microsoft Natural Keyboard may put your mind at ease. The split arrangement of the keys is supposed to match the natural angle at which people hold their arms and hands while typing, theoretically reducing the chance of developing repetitive strain injury. We quickly adjusted to it, but you may want to try it before you buy.

We liked the MXP's sound and graphics setups. The 4MB-equipped Mil- ▶

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lennium II graphics card and 17-inch Princeton monitor deliver crisp, colorful images, and you get a pair of Juster Multimedia Speakers with subwoofer, which deliver full-bodied audio. However, the MXP comes with only a 33.6-kbps modem, not a 56-kbps unit, and support could be better as well. Micro X throws in a scattering of overly technical manuals, and support hours are a bit brief—only 10 hours a day, Monday through Saturday. However, Micro X covers parts for three years and labor for five, and our anonymous calls to support turned up helpful reps.

Micro X MXP 5060 PII-266

14 HP BRIO 233 MMX

PRO: Great price, has the basics, looks good

CON: Small software bundle

HP's latest is an attractive, well-built PMMX-233 system with features geared for novices, and it's a terrific bargain at $2388. But this PC, intended for the small or home office, suffers from a paucity of business software. The only bundled business application is Microsoft Word 97.

The Brio has a quick-release case that makes accessing the interior a breeze. Well-labeled ports in the back make it easy to set up. Extra buttons on the keyboard let you set volume level, and user-configurable controls permit one-touch launch of applications. Its 239 PC WorldBench score isn't the best score among the PMMX-233s on the chart, but the Brio should be able to handle just about any business application on the market. If you want voice mail on your PC, you'll like the Sportster 56-kbps x2 voice modem and Cheyenne Quip voice-mail software. The manuals and support documentation included on the hard drive are complete and easy to read.

HP Brio 233 MMX

We have just a few complaints. The small 15-inch monitor is impractical for people who work frequently with large spreadsheets. And the floppy and CD-ROM drives' location near the base of the unit can make them hard to reach if you place the Brio under your desk.

No external speakers are provided, but you get a pair of stereo headphones with an attached microphone for phone calls. HP covers parts and labor for three years, and provides 16 hours of support every day except Sunday. HP makes you pay the toll charge, however, and free support ends after the third year.

15 PROGEN POLARIS PII-266

PRO: Blazing speed for the price, very sturdy

CON: Short support hours

Are you a technically savvy person with at least one eye on your budget, searching for a souped-up SOHO system? If you answered yes, the $2349 ProGen Polaris should qualify for your shopping list. If it had better manuals and longer support hours, this PC would sit higher on our chart.

ProGen Polaris PII-266

With a scorching 265 WorldBench score, this 266-MHz Pentium II minitower behaves more like a 300-MHz machine. The Polaris comes bundled with small-office tools such as a voice-enabled 56-kbps modem, QuickLink's voice/fax/data software, and Xoom Software's Home Office Suite of productivity apps, including a spreadsheet, a basic word processor, and a personal information manager.

High-end components contribute to the Polaris's heady performance, including 32MB of SDRAM and an 8MB Number Nine Revolution 3D adapter. The 17-inch Panasonic PanaSync monitor offered sharp, richly hued images at high resolutions. The multimedia setup isn't bad, either. The Polaris comes with a pair of MLi-170 speakers and subwoofer.

The Polaris's manuals are hard to read in places, and users who resort to support must do so on a limited schedule—reps are available only 9 hours per day, weekdays only. We have too few reader responses about ProGen PCs to report reliability or support ratings, but in our own anonymous calls to support, we had to play a lot of phone tag.

20 IBM PC 300PL

PRO: Inexpensive, good monitor, ethernet

CON: Poor audio, low-end video, no programs

IBM's new $2425 entry-level corporate desktop comes with plenty of built-in perks to make system managers happy. But it's basic—no applications, modem, or speakers. The system's IS perks include networking hardware and software and easy-access drive bays. Among its network utilities and applications are LANDesk, NetFinity, and IBM System View Agent, which help systems personnel manage PCs remotely. There is also an RJ-45 jack for twisted-pair ethernet connections. The case and the drives all secure with a lock and key.

The PC 300PL uses a multimedia-enhanced 200-MHz PMMX processor, but you won't mistake this chunky box for a multimedia PC. Audio is limited to a built-in mono speaker, and the sound card doesn't come with wavetables and has no MIDI/game port, so sound quality is generally mediocre. Video is provided by an integrated 2MB Matrox Mystique video chip. It's adequate for spreadsheets, but the PC 300PL didn't run 3D games very well. With this PC, there's almost no point in buying a nice 17-inch monitor like the one our test PC had.

IBM PC 300PL

The 300PL's performance in our business application tests was so-so; it scored only 230 on PC WorldBench. Support policies are good, including free on-site service for the first year and toll-free support around the clock. However, IBM starts charging for that support after three years. ▶

Beyond the Top 20: Online

We evaluated these systems along with the others, but they didn't score high enough to reach the Top 20 Power Desktops chart. For write-ups, see PC World Online (www.pcworld.com/t20pcs).

- **CompUSA American Pro AP300L-SE**
- **DTK Quin-73M/PM233**
- **Royal Computer Signature**

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	Model	(mm) SM/AG	Refresh Rate (Hz) @1600x1200	H-Scan (KHZ)	MSRP ($)
19"*	**TeleVideo SVP300**	**0.26**	**75**	**30-95**	**925**
	Princeton EO90	0.26	75	30-95	999
	Hitachi Elite 751	0.26	75	31-94	1149
	OptiQuest V95	0.26	75	30-95	1095
21"*	**TeleVideo SVP350**	**0.28**	**85**	**30-107**	**1539**
	Mitsubishi 91TXM	0.28	75	30-95	1649
	NEC P1150	0.28	75	31-94	1599
	IIYAMA Pro 21	0.30	75	30-94	1699

***Diagonal viewable area may vary.**

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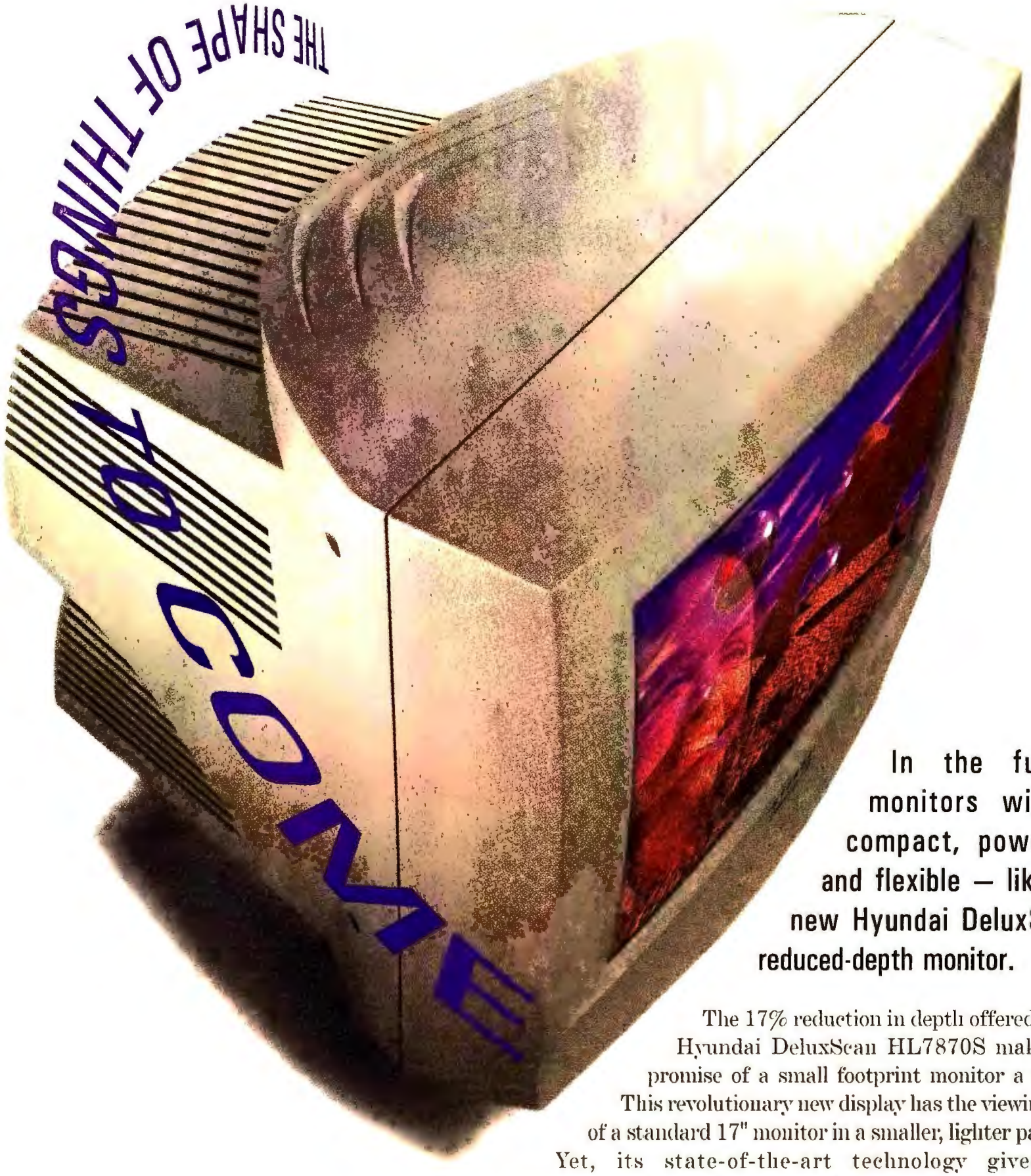

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15B	15"/13.7"	1024x768	Digital	.28	$249
17MS	17"/15.7"	1024x768	Digital	.39	$389
15G+	15"/13.7"	1280x1024	Digital On-Screen	.28	$299
17B+	17"/15.7"	1280x1024	Digital On-Screen	.28	$499
17S	17"/15.7"	1280x1024	Digital On-Screen	.27	$599

*Estimated street price 6/97. Dealer prices may vary. Does not include shipping and handling.

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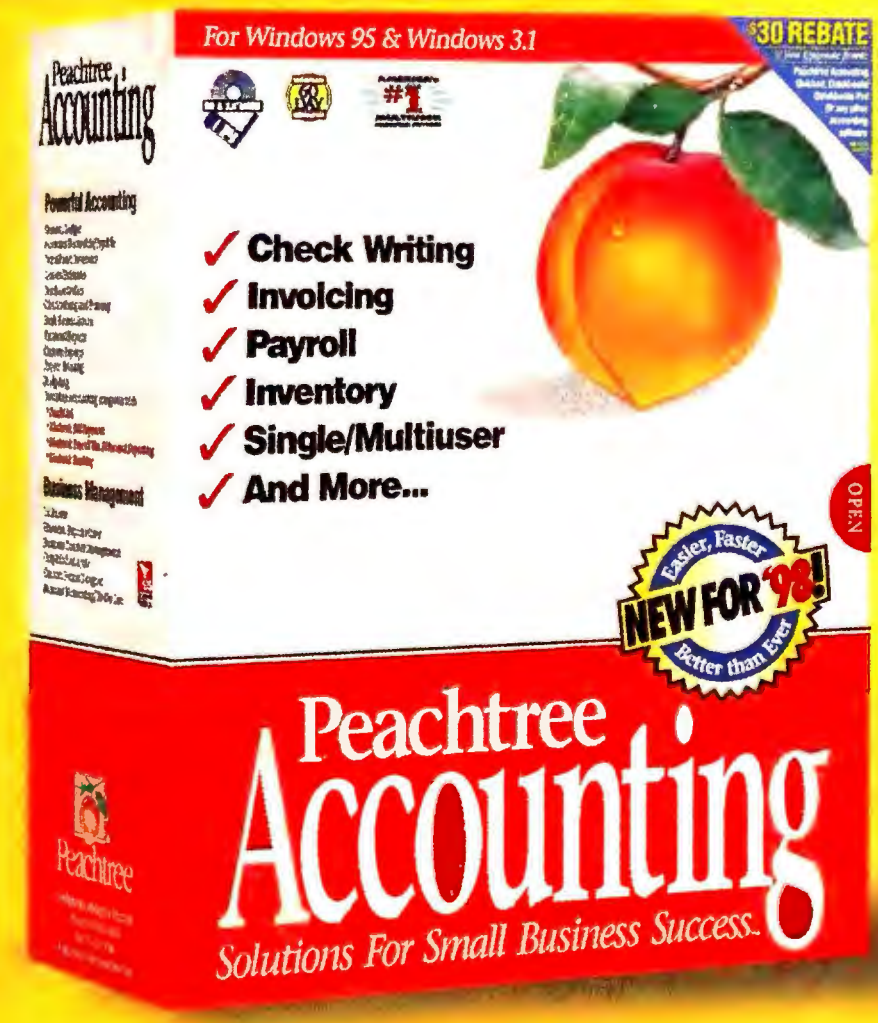

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PC WORLD

TOP 20 BUDGET DESKTOPS

	SYSTEMS	Last month	Month tested	Street price (10/9/97)	CPU	Comments
1	Dell Dimension M200a 800/289-3355 www.dell.com	1	June 97	$1699	Pentium MMX-200	$50 off quick, well-rounded PC with top reliability and support ratings.
2	Micro Express MicroFlex-P225J 800/989-9900 www.microexpress.net	–	NEW	$1399	AMD K6-233	Low price puts fast, full-featured system at the top.
3	CyberMax PowerMax 800/437-4596 www.cybmax.com	5	Sept 97	$1299	AMD K6-166	Fast, low-cost AMD K6 tower drops $50, comes with great support policies.
4	Quantex QP5/200 SM-1 800/896-4898 www.quantex.com	2	Oct 97	$1699	Pentium MMX-200	Fast multimedia PC, 56-kbps modem, excellent support policies.
5	Gateway 2000 GP5-233 800/846-2000 www.gateway.com	10	Sept 97	$2123	Pentium MMX-233	$65 trimmed from price of fast, full-multimedia system with 56-kbps modem.
6	Micron Millennia MME 888/634-8799 www.micronpc.com	–	NEW	$1909	Pentium MMX-200	Good budget SOHO box backed by excellent support.
7	Micro Express MicroFlex-K5/5166D 800/989-9900 www.microexpress.net	4	Aug 97	$1249	AMD K5-PR166	Generic PC has good video card, same great warranty as no. 2 Micro Express.
8	USA Flex Performer 800/872-3539 www.usaflex.com	15	Oct 97	$1899	Cx6x86MX-PR200	Fast system comes with 56-kbps modem, 17-inch monitor.
9	Dell OptiPlex Gn+233 800/289-3355 www.dell.com	7	Nov 97	$2182	Pentium MMX-233	Ethernet, best support, no free drive bays, not as fast as some PMMX-233s.
10	Kingdom Pinnacle 233V MMX 800/385-3436 www.kingdomcomputers.com	–	NEW	$1647	Pentium MMX-233	Well-rounded SOHO system with lots of room to upgrade.
11	Micro Express MicroFlex-MMX/2000D 800/989-9900 www.microexpress.net	14	July 97	$1599	Pentium MMX-200	$100 price drop on quick PMMX-200 with full multimedia, long warranty.
12	Micro Express MicroFlex-686/P200+LC 800/989-9900 www.microexpress.net	8	Aug 97	$1479	Cx6x86-PR200+	Fast Cyrix-based PC with multimedia, low cost, long warranty.
13	ProGen Atlas X 200 888/776-9595 www.progen.com	11	Aug 97	$1509	Pentium MMX-200	Fleet-footed PC has speaker with subwoofer, no weekend support.
14	Premio Apollo TX-200 800/677-6477 www.premiopc.com	–	Aug 97	$1587	Pentium MMX-200	Big $497 price slash puts system on chart, no weekend support.
15	Polywell Poly K6233Mx 800/999-1278 www.polywell.com	–	NEW	$1986	AMD K6-233	Comes with giant hard drive, tech support a little hard to reach.
16	Kingdom Pinnacle PV-200+ 800/385-3436 www.kingdomcomputers.com	13	Nov 97	$1247	Cx6x86-PR200+	Inexpensive PC now $50 cheaper, free surge suppressor, speed merely adequate.
17	Xi Computer Xi K200 Mtower 800/432-0486 www.xicomputer.com	–	Aug 97	$2099	AMD K6-200	$450 price cut lands fast former power system on budget chart, great software.
18	Multiwave P-200 MMX 800/234-3358 www.mwave.com	19	June 97	$1795	Pentium MMX-200	Well-appointed minitower, short warranty and technical support hours.
19	Compaq Deskpro 2000 Model 5200X/CDS 800/345-1518 www.compaq.com	–	Nov 97	$2158	Pentium MMX-200	First time on chart after $341 price drop, support quality could be better.
20	Sys Technology Performance 200K6 800/613-9963 www.systechnology.com	–	Aug 97	$1989	AMD K6-200	$37 price cut nudges fast, full-featured PC onto the chart.

Best Buy See features chart, page 244; test report, page 246.

[1] For more information about all products in this chart, circle reader service no. 909.

[2] Insufficient data to give a rating.

A FEW YEARS AGO, you had to spend at least $2000 for a decent PC. Now you can get one for considerably less: A quarter of the systems on the chart sell for under $1500. But there's more to a Best Buy than low price and high performance. Among the machines that didn't make the chart are TigerDirect's $1999 GTP266, by far the lowest-cost Pentium II-266 PC we've tested, and faster than any of the systems on the Top 20. But the support policies backing it are thin—a short one-year warranty, no toll-free number, only one year of free support—and we had an extremely difficult time getting through to technicians. For more about the GTP266 and other runners-up, check PC World Online (www.pcworld.com/t20pcs).

SCORECARD

★ Overall rating	Price	Features and design	Vendor's system reliability	PC WorldBench score/performance	Vendor's support quality/policies	Reader service number
85	average	very good	above average	219/good	above average/best	706
85	inexpensive	very good	[2]	249/very good	[2]/best	707
85	inexpensive	very good	[2]	223/good	[2]/best	708
84	average	very good	average	230/good	average/best	709
84	average	very good	average	240/very good	above average/best	710
83	average	very good	above average	220/good	above average/best	711
82	inexpensive	very good	[2]	208/satisfactory	[2]/best	712
81	average	outstanding	[2]	235/good	[2]/best	713
81	expensive	good	above average	233/good	above average/best	714
81	average	very good	[2]	237/very good	[2]/good	715
80	average	good	[2]	233/good	[2]/best	716
80	inexpensive	very good	[2]	217/good	[2]/best	717
79	inexpensive	very good	[2]	232/good	[2]/fair	718
79	average	very good	[2]	231/good	[2]/poor	719
79	average	very good	[2]	240/very good	[2]/good	720
78	inexpensive	very good	[2]	207/satisfactory	[2]/good	721
78	average	outstanding	[2]	227/good	[2]/good	722
77	average	very good	[2]	235/good	[2]/poor	723
77	expensive	good	average	222/good	average/best	724
76	average	very good	[2]	238/very good	[2]/good	725
Scorecard weightings	Price 25 percent	Features 25 percent	Reliability 15 percent	Performance 15 percent	Quality/policies 10 percent each	

This Month's Best Buys

1 DELL DIMENSION M200A

PRO: Inexpensive for a PMMX-200, 56-kbps x2 modem, excellent support

CON: Monitor could be sharper, short on RAM

We're seeing a lot of chart action from AMD- and Cyrix-based PCs, but Dell's Dimension M200a, based on the Pentium MMX-200 processor, hangs on to the top spot for another month. The M200a remains an outstanding choice, especially for the person who's left the corporate nest to go solo. It's rare to find a PC that covers all the bases nicely for such a low price. Aside from its 2MB of video RAM, which won't get you far with graphics-intensive applications, the M200a comes well stocked. The 12X–24X CD-ROM drive and the 56-kbps x2 modem are top of the line, and the bundled Microsoft Office 97 Small Business Edition is a good all-in-one suite. We recommend only two upgrades: First, get Dell's higher-quality 15-inch monitor, the 800LS Trinitron. It costs only $49 more than the included 15-inch LS monitor, which lacks sharpness. Second, spend $100 on another 16MB of RAM. The M200a performed well for a low-cost system, even with only 16MB of RAM, scoring 219 on PC WorldBench. But if you have more than a few programs open, you'll feel the pinch.

Dell Dimension M200a

Perhaps most important, Dell backs this PC with good support—a priority when you don't have an IS department to turn to for help. You'll appreciate the M200a's easy-to-read documentation, and Dell's support is available around the clock, although we sat a long time on hold when we called after-hours. According to readers, the quality of Dell's support and PC reliability are above average.

2 MICRO EXPRESS MICROFLEX-P225J

PRO: Terrific price, great performance

CON: Manual too technical, loud keyboard

The MicroFlex-P225J may not be much to look at, but it packs serious performance with its 233-MHz AMD K6 processor. The P225J's speed—fastest on the Budget Desktops Top 20—and a low price of $1399 helped this plain but well-supported minitower fly past systems from larger competitors like Compaq and Micron.

The MicroFlex-P225J comes with many standard components and a few cool ones, too. One of its best features is the video card, an ATI 3D Pro Turbo PC2TV, which you can also hook up to your television or another video source, such as a VCR or camcorder. And the P225J's wavetable-equipped Sound Blaster AWE64 ▶

MicroFlex-P225J

TOP 20 BUDGET DESKTOPS

STANDARD FEATURES

	SYSTEMS	CPU	RAM (MB)	Secondary cache (KB)	Hard drive (GB)	Graphics adapter	Video RAM (MB/type)	Monitor tube/ viewable diagonal (inches)	Screen pitch (mm)	CD-ROM drive speed
1	Dell Dimension M200a*	Pentium MMX-200	16	512	3.2	integrated	2/ORAM	15/13.8	.28	12X-24X
2	Micro Express MicroFlex-P225J*	AMD K6-233	32	512	3.1	ATI 3D Pro Turbo PC2TV	4/SGRAM	15/13.7	.28	12X-24X
3	CyberMax PowerMax*	AMD K6-166	32	512	3.2	Matrox Mystique 200	4/SGRAM	15/13.8	.28	12X-24X
4	Quantex QP5/200 SM-1*	Pentium MMX-200	32	512	3.2	Matrox Mystique 220	4/SGRAM	15/13.9	.28	12X-16X
5	Gateway 2000 GP5-233*	Pentium MMX-233	32	512	2	STB Virge 4MB 3D PCI	4/VRAM	17/16	.28	12X-24X
6	Micron Millennia MME	Pentium MMX-200	16	512	2.1	Diamond Stealth 3D 2000 Pro	4/EDO DRAM	15/13.6	.28	12X-24X
7	Micro Express MicroFlex-K5/5166D	AMD K5-PR166	32	512	2.1	ATI PC2TV	2/WRAM	15/13.8	.28	12X-16X
8	USA Flex Performer	Cx6x86MX-PR200	32	512	4.1	Matrox Millennium	4/WRAM	17/16.1	.28	12X-20X
9	Dell OptiPlex Gn+233	Pentium MMX-233	32	256	3.2	integrated S3 Trio 64 V2	2/VRAM	15/13.8	.25	12X-24X
10	Kingdom Pinnacle 233V MMX	Pentium MMX-233	32	512	3.3	Hercules Dynamite 128	2/MDRAM	15/13.6	.28	12X-24X
11	Micro Express MicroFlex-MMX/2000D	Pentium MMX-200	32	512	5	STB Velocity 3D	4/VRAM	17/15.8	.26	12X-16X
12	Micro Express MicroFlex-686/P200+LC	Cx6x86-PR200+	32	512	4	STB Velocity 3D	4/VRAM	17/15.8	.28	12X
13	ProGen Atlas X 200	Pentium MMX-200	32	512	3.2	Matrox Millennium	4/WRAM	17/15.8	.26	12X-16X
14	Premio Apollo TX-200	Pentium MMX-200	32	512	3.1	ATI 3D Pro Turbo PC2TV	4/SDRAM	15/14	.28	12X-16X
15	Polywell Poly K6233Mx	AMD K6-233	32	512	5.1	Diamond Stealth 3D 2000	4/EDO DRAM	17/15.6	.28	12X-24X
16	Kingdom Pinnacle PV-200+	Cx6x86-PR200+	16	512	2.6	Hercules Terminator 3D	2/DRAM	15/13.8	.28	12X-24X
17	Xi Computer Xi K200 Mtower	AMD K6-200	32	512	4.9	STB Nitro 3D	4/EDO DRAM	17/16	.26	12X-16X
18	Multiwave P-200 MMX	Pentium MMX-200	32	512	2.1	Matrox Millennium	4/WRAM	17/16	.26	12X
19	Compaq Deskpro 2000 Model 5200X/CDS	Pentium MMX-200	32	256	3.2	integrated	1/SGRAM	17/15.6	.28	12X-16X
20	Sys Technology Performance 200K6	AMD K6-200	32	512	3.2	Matrox Millennium II	4/WRAM	17/15.8	.26	12X-24X

* Best Buy ¹ Downloads only, uploads at 33.6 kbps; uses 3Com/U.S. Robotics' x2 technology. ² Downloads only, uploads at 33.6 kbps; uses Rockwell-Lucent's K56flex technology.

audio card sounded great in our tests.

Otherwise, the P225J is a bare-bones box that only a corporate buyer or a nerd could love. There is no software bundle at this price, and the manual is extremely complicated. No mollycoddling easy-open fasteners for the case, either: You have to remove four Phillips-head screws to get inside the no-frills, one-piece metal box. Also, you should seriously consider buying a keyboard other than the one we got with our test unit. It seemed to have unusually tall keys, and it made an annoyingly loud clacking sound when we typed.

Micro Express's support is a mixed bag. Its policies are among the best in the industry, including a long four-year warranty, free on-site service for the first year, a short two-day turnaround guarantee on factory repairs, and round-the-clock tech support. But getting through to support requires patience—we had to leave messages three of the five times we called. When we reached the reps, however, we found them courteous and helpful.

3 CYBERMAX POWERMAX

PRO: Inexpensive, fast, top support policies

CON: Documentation not integrated

AMD's K6 chip strikes again, this time inside the multimedia-wise CyberMax PowerMax, a Best Buy system for two months in a row. Multimedia enthusiasts and game players will want to take a hard look at this bargain-price tower built around the 166-MHz version of AMD's PMMX-comparable K6 processor. With a PC WorldBench score of 223, the PowerMax is a match for some Pentium MMX-200 systems, but it sells for just $1299.

CyberMax PowerMax

For snappy images, the PowerMax comes equipped with a Matrox Mystique 200 graphics card that has 4MB of SGRAM. We've often complained about Princeton's 17-inch monitors, but the company's 15-inch EO50 model that came with our test system provided a superior picture. CyberMax throws in a couple of 3D game titles, as well as Corel WordPerfect Suite 7, just in case you should need to be productive. The PowerMax includes Ensoniq's Audio

		EXPANDABILITY						CUSTOMER SUPPORT			
Modem speed (kbps)	Sound board	Case style	Max. RAM (MB)	Maximum secondary cache (KB)	Open RAM sockets	Open drive bays (ext./int.)	Open slots	Warranty for parts/labor (years)	Weekday toll-free support (hours)	Weekend support	Online support
56 [1]	Sound Blaster 16	minitower	64	512	1	3/1	6	3/1	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
56 [2]	Sound Blaster AWE64	minitower	256	512	2	3/0	3	4/4	24	Sat., Sun.	WWW
33.6	Ensoniq Audio PCI Wavetable	tower	384	512	5	3/2	5	3/1	24	Sat., Sun.	BBS, WWW
56 [2]	Ensoniq Audio S5016	minitower	256	512	4	3/2	5	3/1	24	Sat., Sun.	BBS, WWW
56 [1]	Ensoniq Audio PCI Wavetable	minitower	256	512	1	3/2	4	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
56 [1]	integrated	minitower	256	512	1	2/1	4	3/1	24	Sat., Sun.	BBS, CIS, WWW
33.6	Superior Sound32	minitower	128	512	4	3/2	3	4/4	24	Sat., Sun.	WWW
56 [1]	Ensoniq Audio PCI 971B	minitower	256	512	4	3/1	3	3/1	24	Sat., Sun.	BBS, WWW
–	Creative Labs Vibra 16	desktop	256	256	1	0/0	3	3/1	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
33.6	Ensoniq ES1370 Audio PCI	minitower	256	512	4	2/3	4	3/1	13	Sat.	WWW
33.6	Sound Blaster 32 IDE PnP	minitower	192	512	4	3/0	2	4/4	24	Sat., Sun.	WWW
33.6	Sound Blaster AWE64	minitower	512	512	2	2/3	3	4/4	24	Sat., Sun.	WWW
33.6	ProGen AWE32 PnP 3D	minitower	256	512	4	3/1	4	3/1	9	–	BBS, WWW
33.6	OEM 1B5 Series	minitower	256	512	5	0/4	4	3/2	9	–	BBS, WWW
33.6	OEM CS37W-3DIS/C	minitower	256	512	5	3/0	4	3/5	10	Sat.	BBS, WWW
33.6	Ensoniq Audio PCI	minitower	256	512	4	2/3	4	3/1	13	Sat.	WWW
33.6	Addonics Soundvision 510	minitower	128	512	7	4/1	4	3/3	10	Sat.	WWW
33.6	Ensoniq Soundscape Vivo	minitower	512	512	2	3/1	4	1/1	10	Sat.	BBS
33.6	integrated ESS ES1868	minitower	384	512	2	2/0	3	3/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
33.6	Sound Blaster AWE64	minitower	256	512	4	3/1	3	varies [3]/5	24	Sat., Sun.	WWW

[3] Six years on CPU and main RAM; one to five years on other parts.

PCI sound system and a couple of Altec Lansing ACS 45 speakers with subwoofer, which add considerable punch to your audio experience.

The rugged chassis leaves a substantial amount of room for expansion, with five free drive bays and five free expansion slots. For adding RAM, four SIMM sockets and one DIMM socket are free.

The user guide provides little information about the overall system, leaving you to rely on the component manuals. CyberMax's support policies are strong, however, with a three-year warranty on parts and one-year coverage for labor, round-the-clock technical support, Internet help pages, and one year of free on-site service. In our anonymous calls to support, reps were a little rushed but generally helpful.

4 QUANTEX QP5/200 SM-1

PRO: Fast and affordable, 24-hour support

CON: Generic manual

Looking for a fast, inexpensive small-office system? Quantex's $1699 QP5/200 SM-1 delivers better-than-average Pentium MMX-200 performance, scoring a commendable 230 on our PC WorldBench test suite.

The QP5/200 SM-1 offers rich features, especially for graphics. Inside, you'll find the Matrox Mystique 220, a high-end video adapter with 4MB of fast SGRAM. You also get Matrox's Rainbow Runner video capture software and TV Tuner module. The 15-inch MAG InnoVision monitor provides good image quality and easy-to-use controls. Audio is handled capably by an Ensoniq sound card and a pair of Altec Lansing ACS 45 speakers. The 56-kbps fax-modem, which uses the K56flex standard from Rockwell-Lucent, provides swift Internet downloads given optimum phone line conditions. Bundled software includes Microsoft Office 97 Small Business Edition and a nice selection of games.

Quantex QP5/200 SM-1

The QP5/200's case is sturdy and designed for easy expandability. The manual is serviceable but generic—it's the same one that comes with most Quantex PCs. Support is available around the clock. Our anonymous calls got responses within 5 minutes and found friendly, patient support staff. ▶

5 GATEWAY 2000 GP5-233

PRO: Fast and loaded, above-average support

CON: Poor display

Gateway 2000's GP5-233 has the makings of a stylish and affordable system for the small or home office. This Pentium MMX-233 minitower posted a PC WorldBench score of 240 yet costs just $2123 for a loaded multimedia configuration. The GP5-233 comes outfitted with a fast 12X–24X CD-ROM drive, an Ensoniq Audio PCI Wavetable sound card, a pair of speakers, and Microsoft Office 97 Small Business Edition. The 56-kbps Gateway 2000 Telepath x2 modem provides the potential for swift downloads, but be aware that it won't deliver any advantage over 33.6-kbps units unless your Internet service provider uses the matching 3Com/U.S. Robotics protocol. Your telephone lines also need to support x2.

Gateway 2000 GP5-233

The included 17-inch CrystalScan 700 display provides a generous 16-inch viewable area, but our test computer's monitor suffered from a less-than-sharp picture that bowed outward at the top and bottom. Gateway also provides a speedy STB Virge graphics ▶

TOP 20 BUDGET DESKTOPS

TEST REPORT

	SYSTEMS	CPU	RAM (MB)	Secondary cache (KB)	PC WorldBench score
1	Dell Dimension M200a*	Pentium MMX-200	16	512	219
2	Micro Express MicroFlex-P225J*	AMD K6-233	32	512	249
3	CyberMax PowerMax*	AMD K6-166	32	512	223
4	Quantex QP5/200 SM-1*	Pentium MMX-200	32	512	230
5	Gateway 2000 GP5-233*	Pentium MMX-233	32	512	240
6	Micron Millennia MME	Pentium MMX-200	16	512	220
7	Micro Express MicroFlex-K5/5166D	AMD K5-PR166	32	512	208
8	USA Flex Performer	Cx6x86MX-PR200	32	512	235
9	Dell OptiPlex Gn+233	Pentium MMX-233	32	256	233
10	Kingdom Pinnacle 233V MMX	Pentium MMX-233	32	512	237
11	Micro Express MicroFlex-MMX/2000D	Pentium MMX-200	32	512	233
12	Micro Express MicroFlex-686/P200+LC	Cx6x86-PR200+	32	512	217
13	ProGen Atlas X 200	Pentium MMX-200	32	512	232
14	Premio Apollo TX-200	Pentium MMX-200	32	512	231
15	Polywell Poly K6233Mx	AMD K6-233	32	512	240
16	Kingdom Pinnacle PV-200+	Cx6x86-PR200+	16	512	207
17	Xi Computer Xi K200 Mtower	AMD K6-200	32	512	227
18	Multiwave P-200 MMX	Pentium MMX-200	32	512	235
19	Compaq Deskpro 2000 Model 5200X/CDS	Pentium MMX-200	32	256	222
20	Sys Technology Performance 200K6	AMD K6-200	32	512	238

*Best Buy

Word 7.0 for Windows 95 · Picture Publisher 6.0 for Windows 95 · WordPerfect 6.1 for Windows

Excel 7.0 for Windows 95 · Paradox 5.0 for Windows · 1-2-3 release 5 for Windows

HOW WE TEST All systems are tested with PC WorldBench, PC World's application-based benchmark. A higher PC WorldBench score is better. All PCs have Windows 95, and video resolution is set to 800 by 600 in 256 colors. We run automated scripts on six popular business applications, performing common tasks such as spelling checks, scrolls, saves, sorts, and recalculations. The PC WorldBench score is a sum of the weighted result of each script: Word (25 percent), Excel (20 percent), Picture Publisher (15 percent), Paradox (15 percent), WordPerfect (15 percent), and 1-2-3 (10 percent). For more details on our benchmark and how we run it, see PC World Online (www.pcworld.com/testing).

These Pencils Have Been Sharpened By A DIAMONDTRON.

Sharpen your competitive edge with a DIAMONDTRON aperture grille monitor from Mitsubishi Electronics. Screen images come alive with razor-sharp focus and clarity. Bright, vivid colors with superb contrast. On-screen display system with intuitive front-panel controls. All in ergonomic, exceptionally compact enclosures, with a variety of models in the 17" (16.0" diagonal viewable image) and 21" (19.7" diagonal viewable image) size categories. Plus, Mitsubishi's reputation for quality and durability is backed by a 3-year warranty. Mitsubishi originated the award-winning DIAMONDTRON CRT technology, and continues to innovate rather than imitate. Experience the DIAMONDTRON difference by contacting Mitsubishi Electronics today.

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Circle 144 on reader service card

card with 4MB of VRAM and 3D acceleration for exciting game play.

The GP5-233 is nicely constructed, and the case shows little flex—although we were surprised to find that wires going from the sound card to the modem and CD-ROM drive had been left unconnected. Gateway includes a comfortable keyboard and Microsoft's IntelliPoint mouse, which has a small wheel between its buttons to let you scroll documents and Web pages with one finger.

Gateway's service and support are top-flight. Besides the three-year limited warranty on parts and labor, you get round-the-clock phone support and a year of free on-site service. In our fax-back surveys, Gateway scores a less-impressive average rating for system reliability.

New This Month

The following PCs made our Budget Desktops chart for the first time this month. For brief reviews of previously tested PCs on the chart, visit our Web page (www.pcworld.com/t20pcs).

6 MICRON MILLENNIA MME

PRO: Above-average support and reliability records, easily upgradable

CON: Short on RAM, lackluster sound

If you're ready to set up your home business and have a lean budget, make sure Micron's $1909 Millennia MME is on your shopping list. It's an affordable system that rates well in two areas critical for people without an IS department to turn to: reliability and support.

Our readers report that they are generally happy with the reliability of Micron PCs, and they give the company's support quality an above-average rating. The only reason that this PMMX-200 machine did not score higher is that it's a little shy on features.

Micron Millennia MME

For example, our MME came with only 16MB of RAM. It scored 220 in PC WorldBench—not bad for a budget system, but you'll feel it drag once you get a few applications running; we recommend at least 32MB. The 15-inch monitor displays crisp, lively video, thanks in large part to the 4MB Diamond Stealth 3D 2000 Pro graphics card. But the pair of Advent AV009 speakers lacks punch.

The Millennia MME comes with a few high-end features, however, such as a Zip drive, a 56-kbps x2 modem, and Microsoft Office Small Business Edition.

Micron's support policies are top-notch. The warranty covers parts for three years and labor for one, and technical phone support is available around the clock.

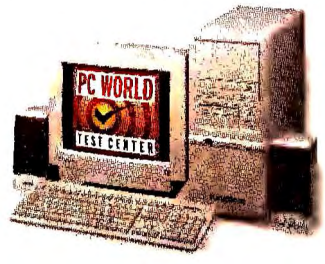
10 KINGDOM PINNACLE 233V MMX

PRO: Fast, has good documentation

CON: Keyboard feels a bit mushy

"Pinnacle" is an ambitious name for Kingdom's new Pentium MMX-233 computer, considering that this $1647 minitower doesn't come close to reaching any new heights. Even so, it's definitely a strong choice in a powerful system for the small or home office.

The 233V MMX is exceptionally fast for the price, scoring 237 on PC WorldBench, and it's got the essentials for a small-business PC. The bundled Lotus SmartSuite 97 package provides useful business applications, and the 3.3GB hard drive, the 15-inch monitor with a 2MB Hercules Dynamite 128 video card, and the 33.6-kbps modem are all standard office fare. The monitor has a bright, flicker-free display, but the MLi-170 speakers in our test PC emitted a tinny, shallow sound.



Kingdom Pinnacle 233V MMX

Getting under the hood of the Pinnacle is simple, and with four free slots and five free drive bays, there's lots of room to add new components. The manuals are easy to read and thorough. If you plan to do a lot of typing, however, consider getting a different keyboard. The bundled model, an Alps WB, had a spongy feel.

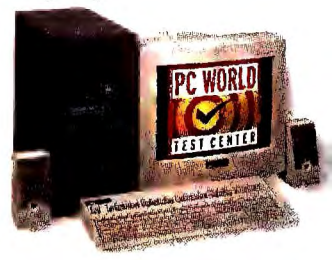
Kingdom's warranty covers parts for three years and labor for one. The first year includes free on-site service, and toll-free support is available 13 hours per weekday and Saturday. Our anonymous calls to support turned up good results—we got fast, accurate answers to our questions.

15 POLYWELL POLY K6233MX

PRO: Very good features and performance

CON: Support reps hard to reach

The latest Polywell PC is a powerhouse $1986 home-office minitower that won't power through your bank account. Wrapped up in the company's trademark smoky-blue case is a big 5.1GB hard drive, a boatload of software, and a 233-MHz, MMX-enhanced K6 processor that helped this machine score 240 on the PC WorldBench test suite, better than some Intel-based 233-MHz PCs on the chart.



Polywell Poly K6233MX

The Poly K6233Mx comes with a 12X–24X CD-ROM drive, a Cirrus Logic 33.6-kbps voice-enabled fax-modem, a wavetable-equipped sound card, and a pair of Quick Shot QS-826 speakers, which deliver decent sound. The Sampo Alpha Scan 17-inch monitor is driven by a 4MB Diamond Stealth 3D 2000 graphics card. We even liked the bundled Genius NetMouse, which has a third button located between the other two that allows you to scroll easily through the active window. The bundled programs include Works (an integrated package from Microsoft), plus Money, Encarta 97, Creative Writer, Magic School Bus, and Golf. The system also offers painless expandability, and the back of the machine is labeled for easy setup. The well-written manuals will appeal to computerphobes.

In our anonymous support calls, we left seven messages and received only two callbacks. When we spoke to the technicians, however, we found them to be pleasant and helpful. ▶

Beyond the Top 20: Online

We evaluated these systems along with the others, but they didn't score high enough to reach the Top 20 Budget Desktops chart. For write-ups, see PC World Online (www.pcworld.com/t20pcs).

- **CompUSA American A233-SE**
- **NEC PowerMate Enterprise**
- **TigerDirect GTP266**

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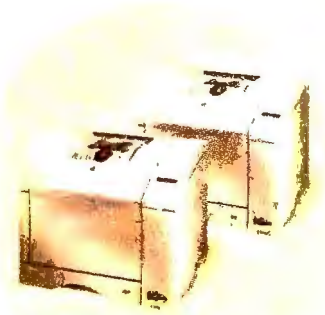

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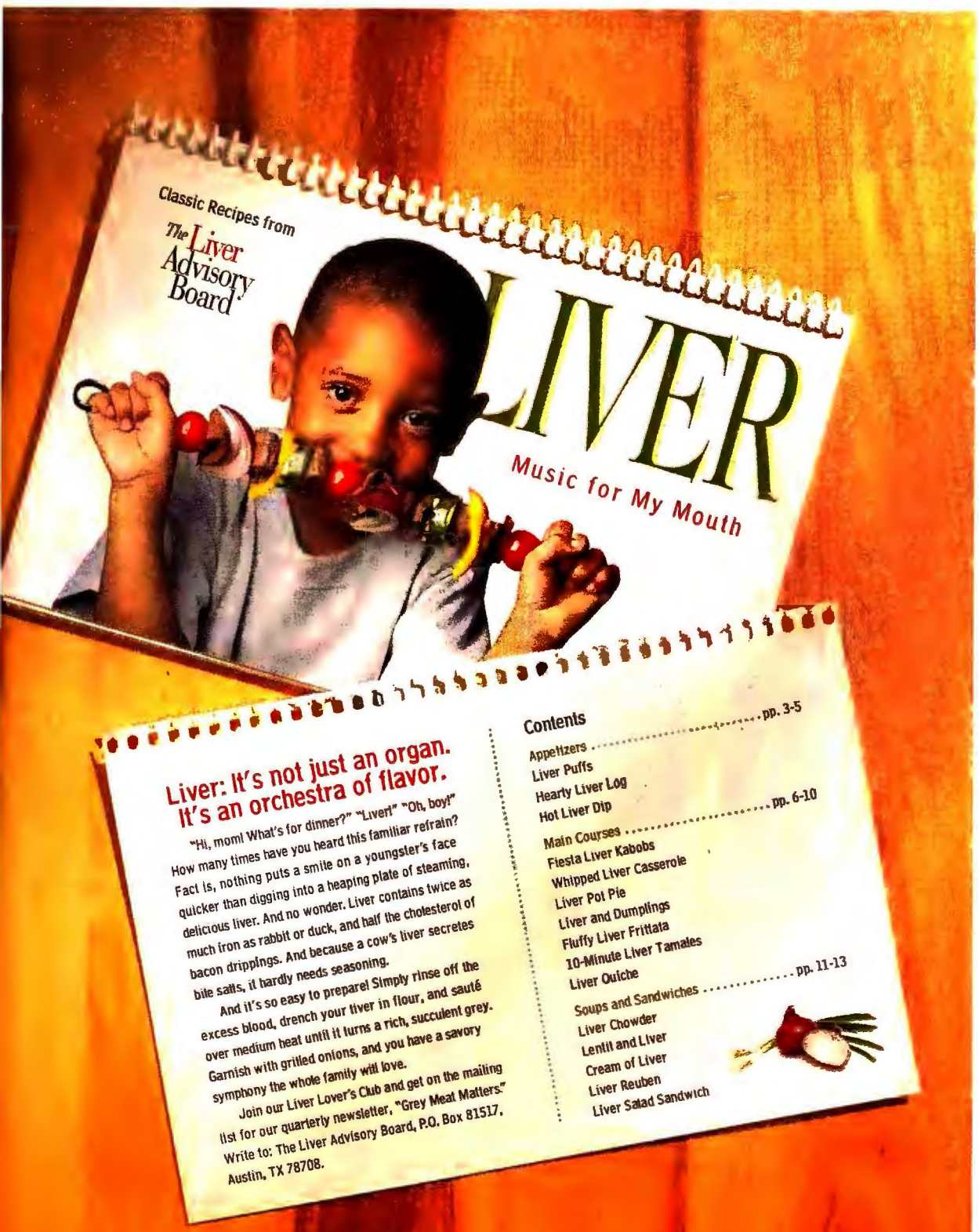

Not everybody has the same taste, but a beautifully printed document will put a smile on any face. That's why, when "America's Grey Meat" needed to dress up its image, a Color PageWorks™ laser printer was the perfect solution. Starting at about $37.50 a pound ($2,999*), it's a great way to stretch any printer budget.

Minolta's menu now offers a choice of two Color PageWorks laser printers. If your business needs general business color, the Color PageWorks printer is ideal. Or if you need enhanced photographic color, try the new Color PageWorks PS printer with true Adobe® PostScript.®

Both models feature excellent color output and include the Improve Your Image™ Collection CD with handy templates and much more to liven up everyday color documents. You'll be able to expand using industry standard memory and you'll find changing toner cartridges a cinch.

For over a decade, Minolta has led the industry in manufacturing quality laser printer engines. Now you'll find that same quality and reliability in Minolta's family of affordable color and monochrome laser printers. And Minolta backs that up with free on-site service for the first year.†

For more information, visit our Web site at www.minoltaprinters.com/pwd1. Or call us at 1-888-2MINOLTA, ext. 32. See for yourself what Minolta can do for your image.

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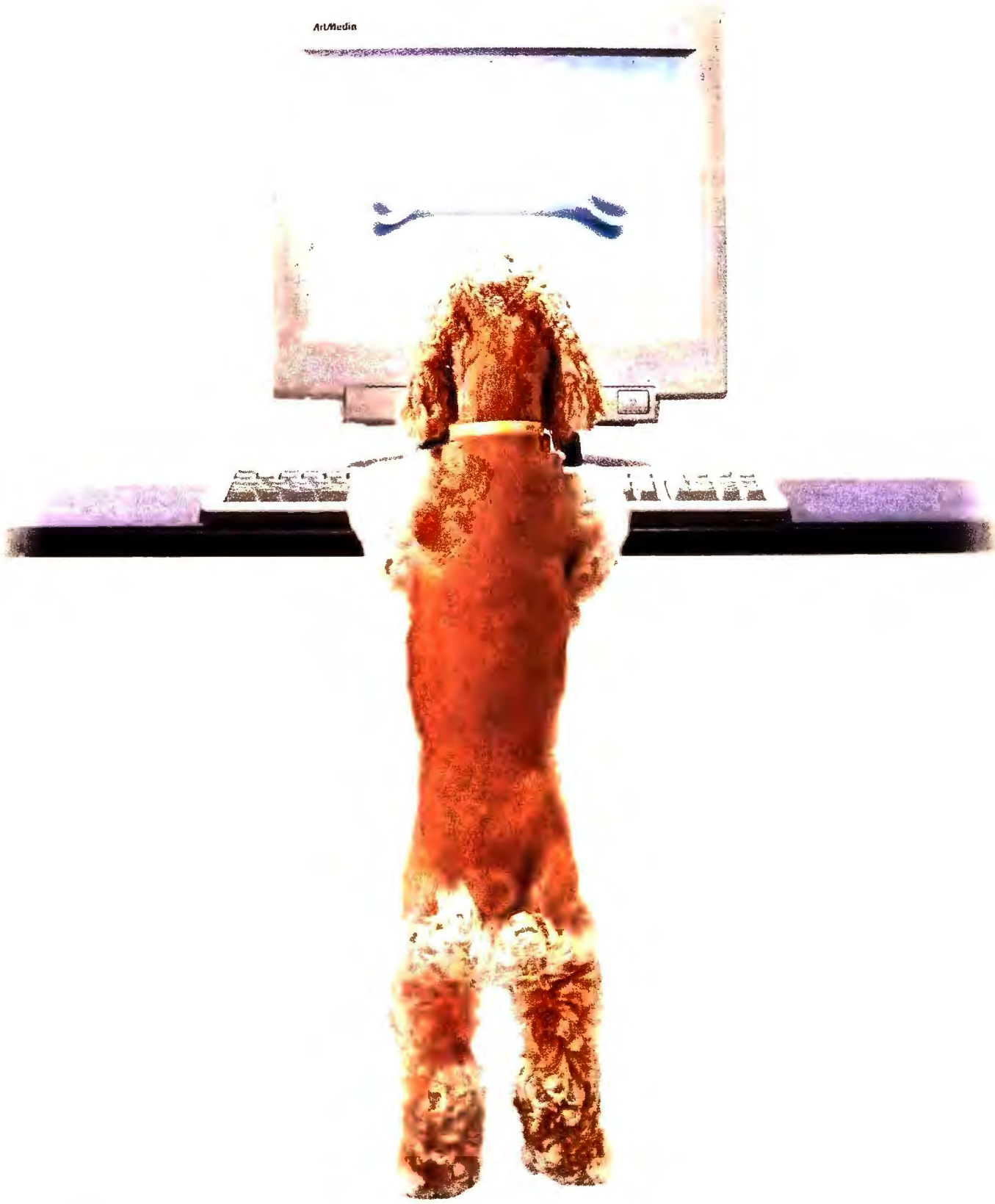
RUFF, WOOF, WOOF, ERRRRRRR, WOOF...
RUFF, WOOF, ERRRR, WOOF, WOOF...

ARTMEDIA'S 17" MONITOR. VOTED BEST 17" MONITOR.



THE EDITORS AT BYTE MAGAZINE HAVE SOMETHING TO BARK ABOUT. BYTE JUST VOTED ARTMEDIA'S 17" MONITOR THE BEST 17" MONITOR. MAYBE IT WAS OUR ADVANCED TRINITRON TECHNOLOGY, THE FLATTER SCREEN OR THE SUPER-FINE PITCH. OUR MONITORS OFFER SHARPER RESOLUTION, BETTER FOCUS,

LESS DISTORTION AND HIGHER BRIGHTNESS—BASICALLY, JUST A BETTER PICTURE! AND A SOUND INVESTMENT. SO IF YOU WANT THE BEST PROFESSIONAL MONITORS ON THE MARKET, LISTEN TO THE EXPERTS. THEY KNOW WHAT THEY ARE BARKING ABOUT.

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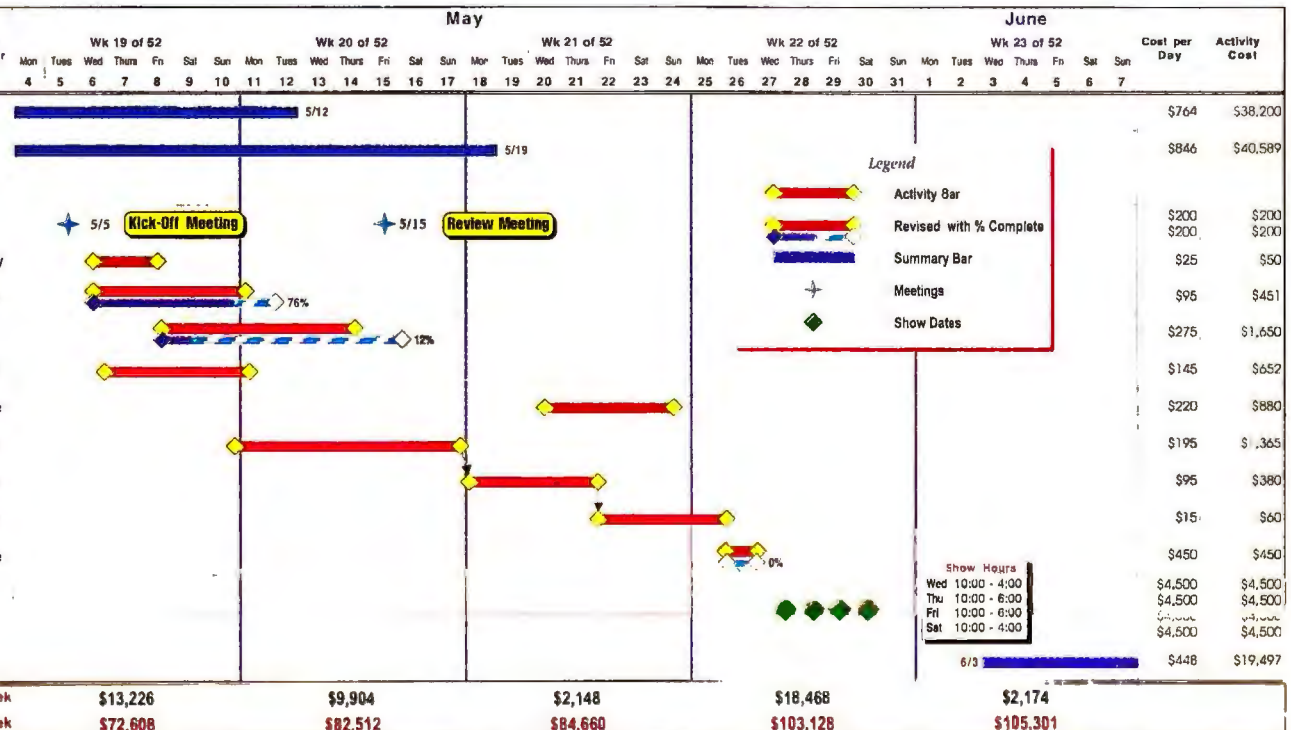
Trade Show Schedule

Page 1 of 1

Shows/Tasks	Start Date	Finish Date	Duration (Days)	Task Leader	Cost per Day	Activity Cost
Trade Show # 1...	3/23	5/12	50.00		$764	$38,200
Trade Show # 2...	4/1	5/19	48.00		$846	$40,589
Trade Show # 3						
Meetings	5/5 5/15				$200 $200	$200 $200
Travel Arrangements	5/6	5/8	2.00	Emily	$25	$50
Complete Show Docs.	5/6	5/11	4.75	Bob	$95	$451
Marketing Materials...	5/8	5/14	6.00		$275	$1,650
Press Release/Publicity	5/6	5/11	4.50	Nick	$145	$652
Presentation Rehearsals	5/20	5/24	4.00	Kate	$220	$880
Booth Modifications	5/10	5/17	7.00	Sam	$195	$1,365
Pack Materials	5/18	5/22	4.00	Sam	$95	$380
Ship Booth/Literature	5/22	5/26	4.00	Sam	$15	$60
Booth Set-up	5/26	5/27	1.00	Kate	$450	$450
Show Dates	5/27 5/28 5/29 5/30				$4,500 $4,500 $4,500	$4,500 $4,500 $4,500
Trade Show # 4...	6/3	7/16	43.50		$448	$19,497
Projected Spending per Week					$2,174	
Cummulative Projected Spending per Week					$105,301	



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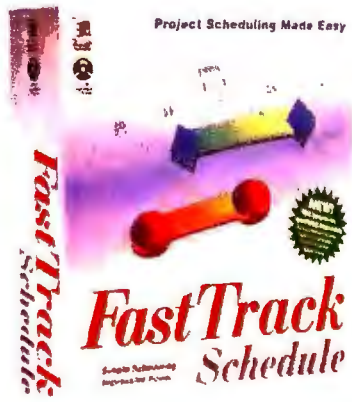

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Circle 14 on reader service card.

PC WORLD

TOP 10 NOTEBOOK PCs

	POWER NOTEBOOKS	Last month	Month tested	Street price (10/9/97)	CPU	Comments
1	Gateway 2000 Solo 2300XL 800/846-2000 www.gateway.com	1	Dec 97	$3749	Pentium MMX-233	$300 off, solidly built, extraordinary battery life, fastest on chart, 56-kbps modem.
2	Micron Transport XKE 166 800/634-8799 www.micronpc.com	4	Sept 97	$4610	Pentium MMX-166	$539 price drop on fast, fully loaded portable with 6-hour-plus battery life; still pricey.
3	Transmonde Vibrant 166Tmx 888/988-2883 www.transmonde.com	5	Sept 97	$3329	Pentium MMX-166	$391 price cut on sturdy notebook; support policies are thin.
4	Dell Inspiron 3000 M233XT 800/338-8542 www.dell.com	–	NEW	$3999	Pentium MMX-233	Terrific speed, great screen—an ideal presenter's unit; battery life adequate.
5	Dell Latitude CP M233ST 800/338-8542 www.dell.com	–	NEW	$4399	Pentium MMX-233	Blazing performance, lighter than its Latitude LM predecessors; not cheap.
	BUDGET NOTEBOOKS					
1	Gateway 2000 Solo 2300SE 800/846-2000 www.gateway.com	5	Nov 97	$2449	Pentium-133	Late-breaking $100 price drop, very fast for standard Pentium, ultralong battery life.
2	Transmonde Vibrant 133T 888/988-2883 www.transmonde.com	–	June 97	$2129	Pentium-133	$704 price slash puts Pentium-133 on budget chart; limited support hours.
3	Fujitsu LifeBook 435Dx 888/466-8434 www.fujitsu-pc.com	1	Oct 97	$1799	Pentium MMX-133	Low-priced, snappy PMMX-133; screen could be better.
4	CTX EzBook 750MS 800/888-9052 www.ctxintl.com	–	Aug 97	$1749	Pentium MMX-150	Low cost, reasonably fast; slow CD-ROM drive. 764MT is also a good value.
5	Toshiba Satellite 225CDS 800/334-3445 www.computers.toshiba	4	Nov 97	$1999	Pentium-133	Well designed, good keyboard; technical support free for only one year.

Best Buy See features chart, page 254.

[1] Includes computer, adapter, power cord, and floppy drive or CD-ROM drive.

[2] For more information about all products in this table, circle reader service no. 904.

TWO NEWCOMERS, Dell's Pentium MMX-233 Inspiron 3000 and Latitude CP M233ST, hit the notebooks chart, and vendors have been making major price cuts on other systems. Most previously reviewed portables on the chart cost less than they did a month ago, several by at least $300. Micron dropped the price on its Transport XKE 166 by a substantial $539; Transmonde's Vibrant 133T slashed a whopping $704. Battery life is also noteworthy: Four systems on the Top 10 ran for more than 6 hours in our tests, with the power Best Buy Gateway Solo 2300XL holding up for almost 9 hours.

POWER NOTEBOOKS

This Month's Best Buy

1 GATEWAY SOLO 2300XL

PRO: Breakneck speed, longest-lasting battery, good software bundle

CON: Subpar support rating, some users may find the keyboard keys a little slippery

Gateway 2000's latest Pentium MMX-233 notebook has nearly all the qualities we like in a laptop, including knockout speed, long battery life, and a great selection of software. A $300 price drop to a more palatable $3749 keeps it our Power Notebooks Best Buy for another month.

The Solo 2300XL delivered an exceptional PC WorldBench score of 244—the highest ever in our notebook charts. Surprisingly, along with its great performance comes long battery life: The Solo 2300XL's lithium ion cell lasted for almost 9 hours. This solidly built system also comes with a handsome collection of features, including a 3Com/U.S. Robotics 56-kbps PC Card modem; the large selection of software ranges from business applications like Microsoft Office 97 Small Business Edition to reference titles such as Microsoft Bookshelf. The built-in speakers produce clear, crisp sound, although the audio becomes distorted when you crank up the volume. Gateway also provides headphones, in case you want to listen to audio CDs or play CD-ROM games when your neighbors prefer quiet—on a red-eye flight, for example.

Gateway Solo 2300XL

The Solo is easy on the eyes and comfortable to type on. Its 12.1-inch active-matrix screen runs at 800 by 600 resolution and displays very bright, clear, color-rich images. It has a good-size keyboard and a responsive touchpad. However, we found the keys on the keyboard a little too flat and slippery.

SCORECARD

★ Overall rating	PC WorldBench score/ performance	Price	Vendor's system reliability	Features and design	Vendor's support quality/policies	Battery life (hours:min)/ rating	Traveling weight [1]	Reader service number [2]
89	244/outstanding	average	average	outstanding	below average/fair	8:51/outstanding	average	630
85	221/very good	expensive	above average	outstanding	[3]/fair	6:17/outstanding	heavy	631
84	218/very good	inexpensive	[3]	outstanding	[3]/poor	4:08/good	average	632
84	238/outstanding	average	average	very good	average/fair	3:33/good	average	633
84	241/outstanding	average	average	good	average/fair	4:38/good	light	634
Power scorecard weightings ▶	Performance 22 percent	Price 14 percent	Reliability 22 percent	Features 16 percent	Support 10 percent	Battery life 8 percent	Weight 8 percent	
84	196/very good	average	average	outstanding	below average/fair	7:32/outstanding	average	635
83	190/very good	average	[3]	very good	[3]/poor	6:19/outstanding	heavy	636
83	192/very good	very inexpensive	[3]	satisfactory	[3]/fair	3:42/good	average	637
82	198/very good	very inexpensive	[3]	limited	[3]/fair	4:21/good	average	638
80	165/very good	inexpensive	average	good	below average/fair	3:19/good	average	639
Budget scorecard weightings ▶	Performance 14 percent	Price 22 percent	Reliability 22 percent	Features 16 percent	Support 10 percent	Battery life 8 percent	Weight 8 percent	

[3] Insufficient data to give a rating.

Like all Gateway systems, this unit comes with a comprehensive manual that provides helpful, well-labeled photos and an index for quick reference. The company backs its notebooks with a one-year warranty on parts and labor. If you need technical support, Gateway's lines are open around the clock.

New This Month

The following PC made our Power Notebooks chart for the first time this month. For original reviews of previously tested PCs on the chart, visit our Web page (www.pcworld.com/t20pcs).

4 DELL INSPIRON 3000 M233XT

PRO: Ultrafast; luscious 13.3-inch screen with crisp text and color; fast CD-ROM drive

CON: Shortest battery life on chart, no modem

Dell recently introduced its Inspiron line of notebooks targeting small to medium-size businesses; the $3999 Inspiron 3000 M233XT is the top of the line. It's an excellent piece of work marred only by lack of a modem, so-so battery life, and poor sound. As with many notebooks, the M233XT's speakers produce tinny, weak audio. If you give multimedia presentations, you'll need to bring along some good external speakers. And if you want to compute across the country, bring an extra battery pack—the Inspiron lasted only 3 hours and 33 minutes in our battery rundown tests. While this is certainly acceptable battery life, all the other notebooks on the Power chart lasted for more than 4 hours on a charge.

Dell Inspiron 3000

In all other respects, this Pentium MMX-233 notebook is a powerful and capable machine, and it makes a terrific on-the-road presentation tool. Its brilliant and spacious 13.3-inch screen offers as much viewing area as most 15-inch desktop monitors, and the 2MB 128-bit NeoMagic video controller delivers crisp, color-rich images at 1024 by 768 resolution. The 2.1GB hard disk and fast 12X–20X CD-ROM drive provide quick access to large multimedia files. Speaking of fast, the M233XT logged an impressive score of 238 in our PC WorldBench test suite. It's one of the best-performing notebooks we've ever tested, and it keeps pace with most of the PMMX-233 desktops that we've reviewed.

We found the M233XT easy to use for a notebook. Although you may initially have trouble with the small backspace key, the keyboard has a snappy response, and the touchpad pointing device is well tuned. The sturdy, compact Inspiron 3000 M233XT weighs 7.6 pounds and comes bundled with Microsoft Office 97 Small Business Edition. You will have to pay extra, however, for presentation software like Microsoft PowerPoint.

According to reader feedback, Dell does an adequate job of building reliable notebooks and providing support for them. Policies aren't bad, either. The company's support lines are toll-free, and technicians are available around the clock, Saturdays and Sundays included. ▶

PHOTOGRAPHS: KEN SMITH

TOP 10 NOTEBOOK PCs

STANDARD FEATURES

	POWER NOTEBOOKS	CPU	Traveling weight (pounds)[1]	RAM (MB)	Hard drive (GB)	Color screen type	Screen diagonal (inches)	Screen resolution	Maximum screen colors	Battery type	Pointing device
1	Gateway 2000 Solo 2300XL*	Pentium MMX-233	7.8	32	2.1	active	12.1	800 x 600	65,536	lithium ion	touchpad
2	Micron Transport XKE 166	Pentium MMX-166	9.2	32	3.1	active	13.3	1024 x 768	65,536	lithium ion	touchpad, eraserhead
3	Transmonde Vibrant 166Tmx	Pentium MMX-166	8.2	48	3.1	active	12.1	800 x 600	65,536	NiMH	touchpad
4	Dell Inspiron 3000 M233XT	Pentium MMX-233	7.6	32	2.1	active	13.3	1024 x 768	16.8 million	lithium ion	touchpad
5	Dell Latitude CP M233ST	Pentium MMX-233	6.8	32	2.1	active	12.1	800 x 600	16.8 million	lithium ion	touchpad
	BUDGET NOTEBOOKS										
1	Gateway 2000 Solo 2300SE*	Pentium-133	7.8	32	2.1	dual-scan	12.1	800 x 600	65,536	lithium ion	touchpad
2	Transmonde Vibrant 133T	Pentium-133	9.6	32	1.4	active	12.1	800 x 600	65,536	NiMH	touchpad
3	Fujitsu LifeBook 435Dx	Pentium MMX-133	8.4	16	1.3	dual-scan	12.1	800 x 600	256	NiMH	touchpad
4	CTX EzBook 750MS	Pentium MMX-150	7.8	16	1.4	dual-scan	12.1	800 x 600	65,536	NiMH	touchpad
5	Toshiba Satellite 225CDS	Pentium-133	7.8	16	1.3	dual-scan	12.1	800 x 600	16.8 million	lithium ion	eraserhead

*Best Buy ● Yes ○ No [1] Includes computer, adapter, power cord, and floppy drive or CD-ROM drive. [2] Downloads only, uploads at 33.6 kbps; uses 3Com/U.S. Robotics' x2 technology.

5 DELL LATITUDE CP M233ST

PRO: Terrific performance, light weight, beautiful screen, good support

CON: No modem or software

The M233ST is the first notebook we've tested from Dell's new Latitude CP line, which replaces Dell's LM series of corporate portables. We liked what we found. The Latitude CP M233ST is a good choice if your priorities in a notebook are performance and portability. This Pentium MMX-233 notebook matches Gateway's Solo 9100XL as the second-fastest unit on the power chart; both are in the league of PMMX-233 desktops. The M233ST also makes a fine traveling companion. At 6.8 pounds, it's the lightest notebook on the power chart—almost a pound less than the next lightest, Dell's Inspiron.

Dell Latitude CP M233ST

So why isn't the M233ST higher on the chart? For one, it lacks a modem—an essential tool that a notebook as expensive as this $4399 unit should have. Ditto for software: The M233ST comes with only Windows 95 and a few utilities. Still, this Latitude's virtues far outweigh its vices. It hung in for more than 4.5 hours in our battery rundown tests, and you can install a second battery pack to double the work time. The 12.1-inch active-matrix screen is gorgeous, capable of true-color images at 800 by 600 resolution. You also get a top-of-the-line CD-ROM drive (12X–20X). If you want to use the notebook as a desktop replacement—and it has the power and graphics to fill that bill—you may want to go for the optional port replicator.

Dell's support policies are good, including round-the-clock toll-free support. For $99 a year you can get on-site service, an option most notebook vendors don't offer. Dell's notebook warranty covers parts and labor for one year—short, but standard for the industry. According to our reader survey, respondents are generally satisfied with Dell's support and the reliability of its notebooks.

BUDGET NOTEBOOKS

This Month's Best Buy

1 GATEWAY 2000 SOLO 2300SE

PRO: Exceptionally fast for a Pentium-133, outstanding battery life, 24-hour support

CON: Screen could be sharper

Gateway's Solo 2300SE was a Best Buy when we reviewed it in November. A late-breaking $100 price change returns this fast $2449 SOHO portable to the top of the chart this month. The price drop came too late to change its ranking in December, but it deserves a second look, thanks to an unmatched combination of strong performance, terrific battery life, and solid features in a reasonably priced notebook.

In our tests, the 2300SE yielded a very good PC WorldBench score of 196—the fastest ever for a P133 notebook and above average for the budget chart. The 2300SE squeezed over 7.5 hours of life from its lithium ion battery—the longest of any notebook on our Top 10 except for its power Best Buy sibling, the Solo 2300XL. There's plenty of room to store programs and files on the 2.1GB hard disk, and the 33.6-kbps PC Card modem will help you keep up with your e-mail while you're on a trip. The notebook's tinny built-in speakers won't tempt you to give up your Discman, and the 12.1-inch dual-scan screen's graphics and text, while surprisingly vivid, could be crisper. The 2300SE weighs 7.8 pounds and comes bundled with the Microsoft Works 95 integrated package; we would have preferred Microsoft Office 97 Small Business Edition.

The 2300SE is comfortable to use. We wish Gateway had textured the keys to make them less slippery, but their full size

CD-ROM drive speed	Modem speed (kbps)	Maximum RAM (MB)	Modular expansion bays	Bay for second battery	Optional docking station	Infrared port	Warranty for parts/labor (years)	Weekday toll-free support (hours)	Weekend support	Online support
		EXPANDABILITY					CUSTOMER SUPPORT			
10X	56 [2]	192	1	○	●	●	1/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
12X-20X	33.6	128	2	●	●	●	3/1	24	Sat., Sun.	BBS, CIS, WWW
10X	33.6	64	0	●	●	●	1/1	11	–	WWW
12X-20X	–	144	1	●	○	●	1/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
12X-20X	–	128	1	●	●	●	1/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
10X	56 [2]	192	1	●	●	●	1/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
8X	33.6	64	1	○	○	●	1/1	11	–	WWW
10X	–	80	1	●	●	●	1/1	24	Sat., Sun.	WWW
6X	–	72	2	○	●	●	1/1	9	–	WWW
10X	–	144	1	●	●	●	1/1	24	Sat., Sun.	BBS, CIS, WWW

helped us type without mistakes, and the touchpad also responded smoothly. This notebook is well built, with little flex in the case, screen panel, or port covers. An extra modular bay accepts either the floppy drive, the 10X CD-ROM drive, or an optional second battery.

As usual, Gateway supplies clear, comprehensive documentation for the 2300SE. The manual includes helpful, colorful diagrams and an index for quick reference. If you need more information than the docs provide, Gateway's toll-free support lines are open around the clock. The company backs this notebook with a one-year warranty on parts and labor.

Gateway Solo 2300SE

RUNNERS-UP

Beyond the Top 10

Six notebooks we tested this month did not make the charts. All of them, however, have features worth pointing out.

The $2999 PMMX-166 **Compaq Presario 1620**, like its predecessors, proves that a multimedia notebook PC doesn't have to sound like a $10 transistor radio. When we played several CDs on the 1620, the clear, full sound emanating from the relatively large speakers drew admiring comments from analysts in our test center. The CD-player control buttons on the keyboard made it easy to turn down the music and get back to work. We also appreciated Compaq's attention to detail; for example, the company made sure even the port covers are durable. We especially liked the fact that the notebook has both an internal CD-ROM drive and an internal floppy drive—no need to swap drive modules. All this takes a toll in portability, however. The Presario's bulk and substantial 9.2-pound traveling weight could make your sprints through the airport pretty onerous.

We also looked at two Hitachi VisionBook models—one power, one budget. Both missed the chart mainly because of their high prices. The **VisionBook Pro 7560** is a sturdy machine with a large 3.2GB hard drive and a big 13.3-inch screen. Its ports have protective covers, and the bays accommodate a 10X CD-ROM drive, a floppy drive, and a battery—any two at a time. Nonetheless, this PMMX-166 unit is very pricey at $4999. Likewise, the **VisionBook Plus 4150X** is expensive for what you get. It sells for $2499 yet posted only a lackluster PC WorldBench performance score of 168 and an equally unimpressive battery life—just over 2.75 hours.

The **Acer Extensa 670CDT** comes with a Pentium MMX-166 processor, 32MB of RAM, and 256K of secondary cache and recorded a solid PC WorldBench score of 201. It's reasonably priced at $3499 and offers nearly 6.5 hours of battery power—enough juice to play several rounds of computer golf on a cross-country flight. However, feedback from *PC World* readers indicates that Acer notebook reliability is a little lacking. You also have to pay extra for a modem—a standard feature on many notebook PCs these days.

Quantex has been making splash with its desktops; now the company is trying its hand at notebooks. Quantex's first portable to pass through our test center. the **H-1210**, chalked up an impressive PC WorldBench score of 206. A high $2700 price, however, helped keep the Pentium MMX-166 notebook off our budget chart.

MaxTech's $3245 **Green 753+**, an exceptionally fast machine for the price, chalked up an impressive 218 in our PC WorldBench tests. Its battery life, however, is an unimpressive 2 hours and 50 minutes, and tech support is available only 10 hours per day, weekdays only. Most of the notebooks hitting the charts these days come with around-the-clock support. ■

PC WORLD

TOP 10 HOME PCs

	POWER SYSTEMS	Last month	Month tested	Street price (10/9/97)	Comments
1	Dell Dimension XPS M233s 800/388-8542 www.dell.com	1	Sept 97	$2229	**PRO:** Reasonably priced and loaded with hardware, very fast, suitable as a powerful home office machine. **CON:** Very limited software bundle, so-so setup.
2	Gateway 2000 G6-233 800/846-2000 www.gateway.com	–	NEW	$2268	**PRO:** Reasonably priced for a Pentium II, superfast, wide range of family-oriented software and high-quality instruction titles. **CON:** So-so reliability rating.
3	Quantex QP6/233 M-3x 800/896-4898 www.quantex.com	–	NEW	$2099	**PRO:** Very reasonably priced for a Pentium II machine, fast, excellent setup. **CON:** So-so software bundle, lesser-known company.
4	Gateway 2000 G6-300XL 800/846-2000 www.gateway.com	–	NEW	$3699	**PRO:** Fastest home machine ever tested, substantial hardware bundle, large monitor, great for family fun and home office tasks. **CON:** Super, super expensive and so-so reliability rating.
5	Micron Millennia Mme with Fusion 3D 888/634-8799 www.micron.com	2	Oct 97	$2618	**PRO:** Very fast machine with a meaty configuration and a bunch of games, suitable for demanding home office applications and family entertainment. **CON:** On the pricey side.
	BUDGET SYSTEMS				
1	Gateway 2000 G5-166 800/846-2000 www.gateway.com	1	Nov 97	$1499	**PRO:** Very low bargain price, includes color printer, perfect for home office and family computing. **CON:** Lacks power for high-end multimedia titles, smallish monitor, so-so reliability rating.
2	Quantex QP5/233 M-2 800/869-4898 www.quantex.com	–	NEW	$1599	**PRO:** Excellent setup, superspeedy for budget machine, inexpensive. **CON:** Rather small monitor, limited software, lesser-known company.
3	Gateway 2000 G5-200M 800/846-2000 www.gateway.com	2	Nov 97	$1924	**PRO:** Fast machine comes with impressive hardware features. **CON:** Relatively expensive, so-so reliability rating.
4	HP Pavilion 3100 800/724-6631 www.hp.com/info/pchome1	3	Sept 97	$1298	**PRO:** Very low price, supereasy setup, great for basic computing needs. **CON:** Very small monitor, rather limited software, so-so support rating.
5	CyberMax PowerMax A16 233 800/437-4596 www.cybmax.com	4	Sept 97	$1749	**PRO:** Great price for fastest budget machine on chart. **CON:** Company is not as well known as others, system comes with older version of Corel WordPerfect Suite.

Best Buy

[1] Insufficient data to give a rating.

WHEN IT COMES TO PCs, faster is always better, and usually more expensive. But if blazing performance is what you're after, this month's Top 10 has some new systems that will meet your needs—even if you're on a budget. Power users will flip over Gateway's G6-300XL, the fastest home PC ever. And CyberMax's PowerMax offers near–Pentium II performance at a Pentium price.

With so many combinations of power, price, and features these days, are you wondering how much power you really need? Well, let me tell you.

Many home computing tasks, like surfing the Net, tracking personal finances, word processing, and even playing many games, don't require the scorching speed of a Pentium II processor. It takes a pretty large spreadsheet or database before you'll see the difference between a Pentium MMX and a Pentium II system.

On the other hand, if you *do* work with huge spreadsheets or if you're an adrenaline addict who lives for the latest incarnation of digital violence, there's just no substitute for speed. The power section of this month's Home PCs is where you'll find it.

Gateway 2000 G6-233

POWER SYSTEMS

FOR THE SECOND month in a row, Dell tops the power list with its Dimension XPS M233s. Backed by Dell's first-class reliability and support ratings, this Pentium MMX-233–based system offers a whole lot of PC for a very reasonable $2229.

If you're short on cash *and* you want to avoid dealing with obsolescence, check out Dell's 24-month consumer lease (800/388-8524). It lets you avoid capital depreciation and big cash outlays for the latest models. And after two years, you can trade in your aging PC and lease a meteoric new one. All this makes the M233s an excellent choice for the self-employed person or the small-business owner.

In second place is Gateway's new G6-233. Priced at $2268, this affordable Pentium II system gives you the speed you expect plus a few extras. Thanks to the fast CPU and meaty hardware, even the most demanding multimedia titles are fair game. And with its DVD-ROM drive and 17-inch monitor, the G6-233 is great for all kinds of video and full-length movies, and it doubles as a home office machine.

Want speed without dropping too much cash? Quantex's new QP6/233 M-3x can handle any business or family-oriented task you throw at it. Why did it make the Top 10? The M-3x's strength is its $2099 price—this Pentium II machine almost made our Top 10 Home PCs *budget* list.

SCORECARD

★ Overall rating	PC WorldBench score/rating	Price	Reliability/ support	Setup	Features	Reader service number
94	242/very good	inexpensive	above average/ above average	fair	Pentium MMX-233, 32MB of SDRAM, 4.3GB hard drive, BX-16X CD-ROM drive, 33.6-kilobits-per-second fax-modem, Iomega Zip drive, 17-inch monitor.	601
93	255/outstanding	average	average/ above average	outstanding	Pentium II-233, 32MB of RAM, 4GB hard drive, DVD-RDM drive, 56-kbps fax-modem, Iomega Zip drive, 17-inch monitor, 3D video card with 4MB of RAM.	602
89	248/very good	inexpensive	average/ average	outstanding	Pentium II-233, 32MB of RAM, 3.2GB hard drive, 12X-24X CD-ROM drive, 56-kbps fax-modem, 17-inch monitor.	603
89	270/outstanding	expensive	average/ above average	outstanding	Pentium II-3DD, 64MB of SDRAM, 6.4GB hard drive, DVD-ROM drive, 56-kbps fax-modem, 19-inch monitor, TV tuner.	604
88	241/very good	expensive	above average/ above average	good	Pentium MMX-233, 32MB of RAM, 3.1GB hard drive, 12X-24X CD-RDM drive, 56-kbps fax-modem, Iomega Zip drive, 17-inch monitor.	605
Power scorecard weightings ▶	Performance 30 percent	Price 15 percent	R/S 40 percent	Setup 5 percent	Features 10 percent	
94	218/satisfactory	inexpensive	average/ above average	outstanding	Pentium MMX-166, 16MB of SDRAM, 2GB hard drive, BX-16X CD-ROM drive, 56-kbps modem, 15-inch monitor, Canon BJC 250 color bubble jet printer.	606
90	237/very good	inexpensive	average/ average	outstanding	Pentium MMX-233, 32MB of RAM, 3.2GB hard drive, 12X-24X CD-ROM drive, 56-kbps fax-modem, 15-inch monitor, 3D video card with 4MB of RAM.	607
90	239/very good	expensive	average/ above average	outstanding	Pentium MMX-2DD, 32MB of RAM, 3.2GB hard drive, 12X-24X CD-ROM drive, 56-kbps fax-modem, 17-inch monitor.	608
87	172/satisfactory	very inexpensive	average/ average	outstanding	Pentium MMX-166, 16MB of SDRAM, 2GB hard drive, 8X-16X CD-ROM drive, 33.6-kbps fax-modem, 14-inch monitor.	609
80	244/very good	average	1/1	good	AMD K6-233, 32MB of RAM, 6GB hard drive, BX-16X CD-RDM drive, 56-kbps fax-modem, 17-inch monitor.	610
Budget scorecard weightings ▶	Performance 15 percent	Price 30 percent	R/S 40 percent	Setup 5 percent	Features 10 percent	All products: 902

If you just can't get muscle off your mind, watch out for Gateway's G6-300XL. This is the first Pentium II home PC we've seen that runs at 300 MHz and also the first to use an AGP-based video card. If $3699 is enough to make your nose bleed, take solace in the DVD-ROM drive, the 19-inch monitor, and the TV tuner.

Quantex QP5/233 M-2

Like Dell's number one Pentium MMX-233 system, Micron's Millennia Mme is fast and well equipped, but at $2618 it's more expensive. Though it's the slowest power PC on the chart, the fifth-place Mme is still fast for a PMMX-233 and can handle even the biggest spreadsheets.

BUDGET SYSTEMS

ONCE AGAIN, Gateway's G5-166 offers a solid value and retains ownership of the top of the chart. For a mere $1499 you get a PMMX-166–based PC *and* Canon's BJC 250 color printer. That's a bargain for the budding business or busy family with modest needs and a limited budget. The G5-166 is no multimedia monster, but it can manage most word processing, bookkeeping, and Internet surfing tasks.

Brand-new at number two is Quantex's fast, inexpensive QP5/233 M-2. With a WorldBench score of 237, it's only a hair slower than our Pentium MMX-233 power systems, but it has all the basics and costs only $1599. The downside? It comes with a 15-inch monitor, limited software, and not much else. But for the experienced user on a budget, it's a great platform for building a more elaborate PC.

Pushed down a notch to number three is the more expensive—and slightly faster—G5-200M from Gateway. This is a better choice than the G5-166 for the more demanding home office user who logs many hours in front of the PC.

Hewlett-Packard's dirt-cheap Pavilion 3100 also slips a notch to number four. But you can't beat the $1298 price for this lean machine with a Pentium MMX-166 processor and 14-inch monitor.

For $150 more than the cost of the second-place Quantex, you can get the fastest Top 10 budget PC. CyberMax's PowerMax A16 233 gets most of its power and a good deal of its economy from an AMD K6-233 CPU. The first home system to use this Pentium II rival, the PowerMax delivers near–Pentium II performance for only $1749.

So what's the catch? CyberMax is a small company, still relatively new. But reader ratings of its reliability and support have been good so far, and there's no reason to expect a change. And at $1749, the PowerMax could make your day.

—Kirk Steers

Kirk Steers is a contributing editor for PC World. *Testing performed by Ulrike Diehlmann of the PC World Test Center.* ■

Beyond the Top 10: Online

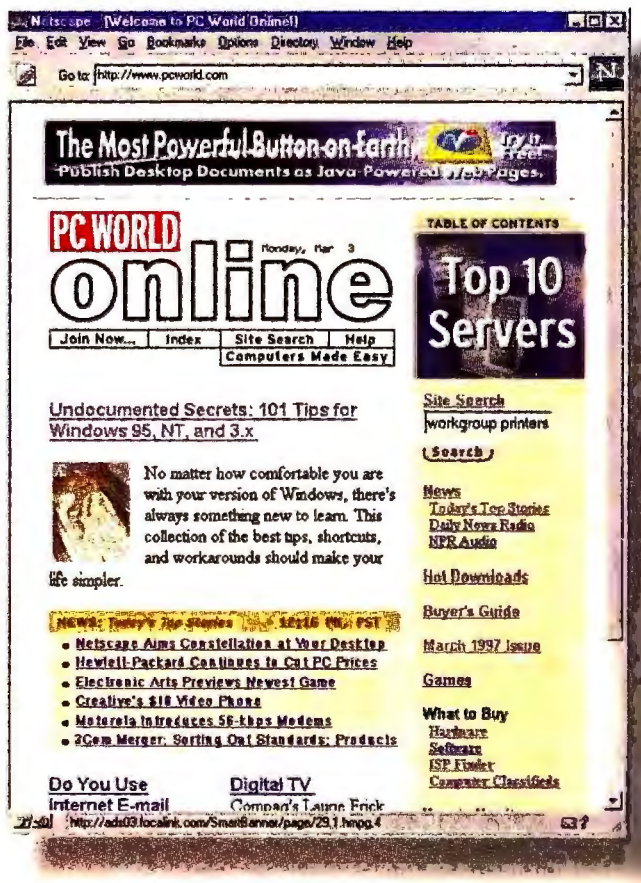
We evaluated the following system along with the others, but it didn't score high enough to reach the Top 10 Home PCs budget list. For a write-up, see PC World Online (www.pcworld.com/t10homepcs).

◆ **Acer Aspire 1240**

At 9:37am, he'll check PC World Online for expert advice on buying workgroup printers for his new division.

By noon, he'll fax the P.O.

Where did you get *your* information?



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PC WORLD

TOP 10 PRINTERS

	MONOCHROME WORKGROUP PRINTERS	Month tested	Street price (10/1/97)	Overall rating	Speed for plain text (ppm)	Speed for full-page graphics (ppm)	Comments	Reader service number
1	HP LaserJet 4000 TN 800/752-0900 www.hp.com	NEW	$1599	95	12.8	3	**FEATURES:** 17-ppm laser. Standard 8MB of RAM, 1200-by-1200-dpi resolution, 600 sheets input, 300 output. **PRO:** Fastest, great text quality, large paper capacity. **CON:** Clearing jams could be easier, graphics mediocre with default settings, most expensive monochrome.	611
2	Lexmark Optra S 1650 800/539-6275 www.lexmark.com	July 97	$1275	92	11.6	2.4	**FEATURES:** 16-ppm laser. Standard 4MB of RAM, 600-by-600-dpi resolution (also true 1200 by 1200 dpi), 250 sheets input and output. **PRO:** Extremely fast, easy to use, sharp print quality with crisp text, includes serial port. **CON:** Gray scales are subtle but a little coarse, documentation can be confusing.	612
3	Lexmark Optra S 1250 800/539-6275 www.lexmark.com	July 97	$1062	90	9.6	2.1	**FEATURES:** 12-ppm laser. Standard 4MB of RAM, 600-by-600-dpi resolution (also true 1200 by 1200 dpi), 250 sheets input and output. **PRO:** $63 price drop, fast, easy to use, very good print quality. **CON:** Fewer options than the Optra S 1650, manual sometimes confuses differences between models.	613
4	HP LaserJet 5M 800/752-0900 www.hp.com	July 97	$1539	85	9.6	1.9	**FEATURES:** 12-ppm laser. Standard 6MB of RAM, 600-by-600-dpi resolution, 250 sheets input and output. **PRO:** High print quality and good design; includes ethernet and LocalTalk, which few other workgroup printers have. **CON:** Expensive, slowest graphics speed on monochrome chart.	614
5	IBM Network Printer 12 800/358-6661 www.ibm.com	Mar 97	$999	85	8.9	2.4	**FEATURES:** 12-ppm laser. Standard 4MB of RAM; 600-by-600-dpi resolution, 250 sheets input, 270 output. **PRO:** Crisp text and gray scale printing, lowest price on monochrome chart, round-the-clock technical support. **CON:** Numerous manuals can be confusing, slowest text speed among these monochromes.	–
	COLOR WORKGROUP PRINTERS							
1	Epson Stylus Color 1520 800/463-7766 www.epson.com	Sept 97	$799	88	3.2	0.9	**FEATURES:** 6-ppm monochrome/5-ppm color ink jet. Standard 64KB of RAM, 1440-by-720-dpi monochrome/color resolutions, 100 sheets input, 35 output. **PRO:** Extremely inexpensive, gorgeous color quality. **CON:** Very slow text speed, meager paper capacity, needs special paper for best print quality.	–
2	Xerox DocuPrint C55mp Color Laser Printer 800/349-3769 www.xerox.com	Sept 97	$4500	87	8.1	0.5	**FEATURES:** 12-ppm monochrome/3-ppm color laser. Standard 30MB of RAM, 600-by-600-dpi monochrome/color resolutions, 250 sheets input, 150 output. **PRO:** Great output, fastest color laser text speed we've seen. **CON:** Expensive, power switch inconveniently located.	615
3	Minolta Color PageWorks 888-2264-6658 www.minoltaprinters.com	Nov 97	$2999	86	7.1	0.3	**FEATURES:** 12-ppm monochrome/3-ppm color laser. Standard 4MB of RAM, 600-by-600-dpi monochrome/color resolutions, 400 sheets input, 250 output. **PRO:** Inexpensive, good paper-handling features, clean text printing. **CON:** Print quality on images is a little grainy, slowest graphics speed on chart.	616
4	Lexmark Optra SC 1275 800/539-6275 www.lexmark.com	NEW	$4000	86	7.4	1	**FEATURES:** 12-ppm monochrome/3-ppm color laser. Standard 16MB of RAM, 600-by-600-dpi monochrome/color resolutions, 400 sheets input, 250 output. **PRO:** Fastest graphics, good text quality, many expansion options. **CON:** Blocky graphics and garish colors, complicated drivers.	617
5	Tektronix Phaser 560 800/835-6100 www.tek.com	retested this month	$3995	81	6.5	0.5	**FEATURES:** 14-ppm monochrome/4-ppm color laser. Standard 8MB of RAM, 600-by-600-dpi monochrome/color resolutions, 250 sheets input, 500 output. **PRO:** Great print quality, prints labels and envelopes in color. **CON:** Replacing fuser and drum is awkward.	618

Best Buy For expanded reviews, visit www.pcworld.com/t10printers. Windows 95-certified Plug and Play All products: 901

HOW WE TEST The overall rating for both monochrome and color workgroup printers is based on print quality (27 percent), price (20 percent), features and ease of use (20 percent), speed (15 percent), service and support (13 percent), and consumables (5 percent). For all ratings, higher is better. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

A SHAKE-UP'S AFOOT: Hewlett-Packard revamped its monochrome printer lines with its new LaserJet 4000 family. First out of that gate, the 4000 TN also finishes at the top of our chart. Thoroughly rebuilt, the new line is faster than the 5 series, prints at a higher resolution (1200 by 1200 dots per inch), and holds more paper (600 sheets). It comes in four configurations. We tested the 4000 TN, featuring two 250-sheet paper trays and ▶

a network card for $1599. The $1099 base-model 4000 has one 500-sheet tray and no network card. The 4000 N offers a network card and the same tray for $1399. Finally, the $1249 4000 T has two trays but no network card. All configurations include a 100-sheet auxiliary tray.

Epson's Stylus Color 1520 tops our color chart for the third time. This large-format ink jet prints text at a slow 3.2 pages per minute but turns out gorgeous color at 0.9 ppm, almost as fast as the speedy Lexmark discussed below. For just $799, you could buy several for the price of one color laser.

Meanwhile, Lexmark replaced its recently discontinued Optra C with the new Optra SC 1275, which uses the same good engine as the Minolta Color PageWorks (third this month and in November); however, the Lexmark's print quality and high price limit it to fourth place.

We retested the Tektronix Phaser 560, but it remains sluggish—it's second slowest at text and graphics. Though number five on our color chart (down from fourth in November), this pricey $3995 model still offers great print quality—clean type and excellent graphics detail.

HP MODERNIZES

IT'S NO SURPRISE when a new printer starts strong—vendors try to beat the status quo. HP's 4000 TN is much faster than the fourth-place LaserJet 5M, which costs almost as much. At 12.8 ppm, it prints text a third faster than the LaserJet 5M and over 1 ppm faster than the $1275 Optra S 1650 in second place. And it prints graphics at 3 ppm, quicker by half than the old HP and 20 percent speedier than its next-fastest competitors.

The new HP has many other good features, such as top-notch print quality and two special 1200-dpi modes, one of which (ProRes 1200) further improves output, though at half the speed. The control panel is easy to navigate, and HP's documentation explains it well. A straight paper path helps prevent paper jams and wrinkled pages. One unusual feature tests alternate paths, which might further reduce jams—especially with options like three input and two output trays, duplexer ($405.75), envelope feeder ($365), and extra 500-sheet tray ($365).

Minor criticisms: To clear some paper jams, you must first remove the toner cartridge. And HP relegated printer software info to on-screen help. Fortunately, the software is simple. And unless you buy the extra-cost envelope feeder, you can load only 10 envelopes at a time (both the Minolta Color PageWorks and the Tektronix Phaser 560 hold 15).

Other than HP dunking everyone else, this month saw only minor changes on our monochrome chart. A $63 price cut to $1062 pushed Lexmark's fast, easy-to-use Optra S 1250 ahead of IBM's Network Printer 12. And Okidata's Okipage 16n slipped off the chart.

OUR NEW MONOCHROME Best Buy, HP's LaserJet 4000 TN, offers strong print quality and performance for its high price.

NEXT-GEN COLOR

THE LATEST GENERATION of color laser printers is faster, better, and cheaper. This month, Lexmark's Optra SC 1275 pushes the last remaining early color laser, IBM's Network Color Printer, off the bottom of the chart. The IBM uses the same slow Canon engine as Lexmark's Optra C and other older printers from Apple, Canon, and Digital that ranked last year; with their weaker quality and awkward designs, we won't miss them.

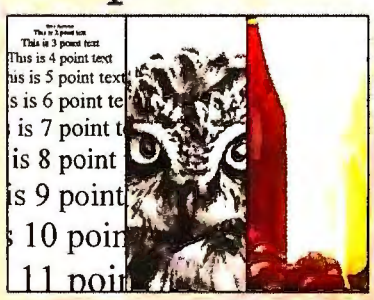
Two fine new-generation printers, Lexmark's Optra SC 1275 and Minolta's Color PageWorks, differ in important ways: The Lexmark prints graphics three times as fast, at 1 ppm, but it prints them with a gridlike texture and overbright colors; it's also faster on text. In other ways, the Lexmark closely resembles the Minolta: Built-in handles on both sides ease lifting (a godsend, given the unit's 77 pounds). Getting inside the printer is a simple matter. And it can print labels in color—something few lasers can manage—but it does not print envelopes at all.

Is the Lexmark worth $1000 more than the Minolta? Graphics speed is valuable, but graphics-focused offices could go directly to our number two choice, the Xerox DocuPrint C55mp. It's in the middle on graphics speed and fastest on text, produces color much better, and comes loaded with extras (such as a network card). It didn't top our chart because it costs $4500, more than any other printer this month. For details on this Xerox, see Top 10 Printers, September 1997.

—Dan Littman ■

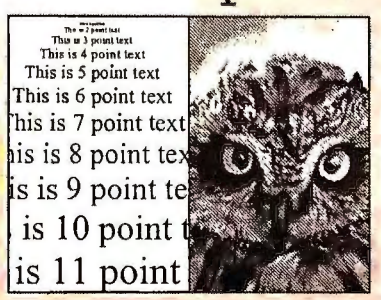
PRINT QUALITY SAMPLES

Top-Notch Text With Epson, HP, Lexmark



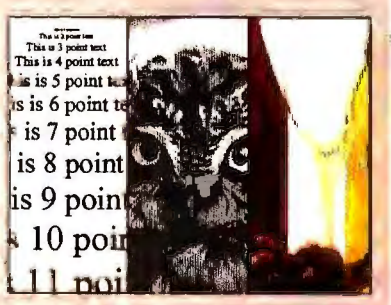
EPSON STYLUS COLOR 1520

Gorgeous color helps keep the Stylus Color 1520 at the top of our color chart. This inexpensive Best Buy also offers clear, clean text and smooth gray-scale images.



HP LASERJET 4000 TN

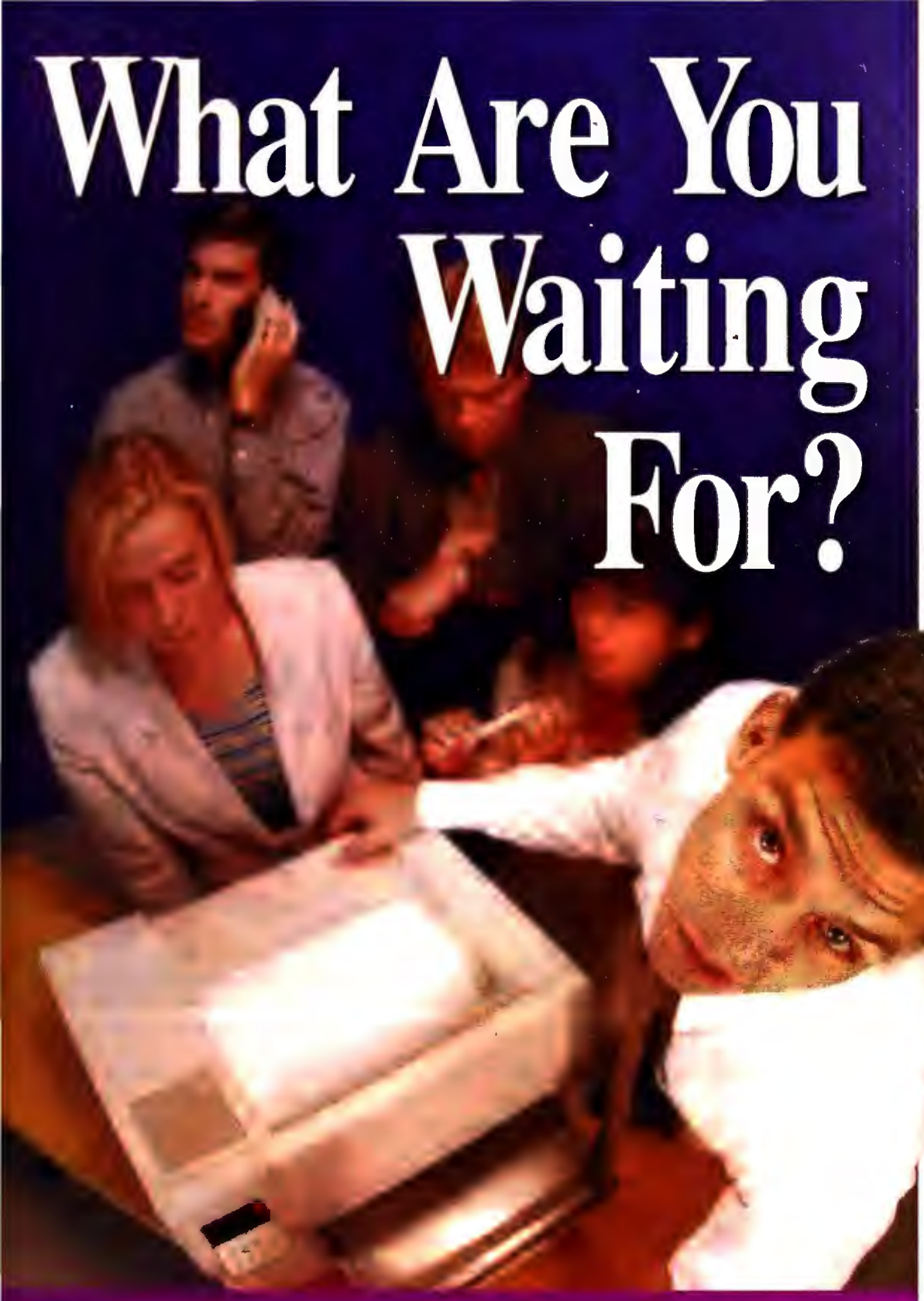
Though its default 1200-dpi mode produces blocky graphics, this HP's text is crisp. The ProRes 1200 mode on this Best Buy improves graphics greatly.



LEXMARK OPTRA SC 1275

We liked the sharp text of our number four choice, but its colors were glaring. Grays could also be better: They were dark, with an odd gridlike texture.

What Are You Waiting For?



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- Altec Lansing ACS-290 Speakers with Subwoofer
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- 8.4GB Ultra ATA Hard Drive (9.5ms)
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- *NEW* STB nVidia 4MB AGP Video Card
- *NEW* 32X Max^ Variable CD-ROM Drive
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- 6.4GB Ultra ATA Hard Drive (9.5ms)
- 1000TX Trinitron® Monitor (15.9" v.i.s., .26dp, 1280 x 1024 max. res.)
- *NEW* STB nVidia 4MB AGP Video Card
- *NEW* 32X Max^ Variable CD-ROM Drive

★ *Upgrade to an 8.4GB Ultra ATA Hard Drive (9.5ms), add $59.*

★ *Upgrade to a 1200HS Monitor (17.9" v.i.s., .26dp), add $199.*

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Common features listed above plus:
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- 6.4GB Ultra ATA Hard Drive (9.5ms)
- 1000LS Monitor (15.9" v.i.s.)
- *NEW* STB nVidia 4MB AGP Video Card
- *NEW* 32X Max^ Variable CD-ROM Drive

★ *Upgrade to 64MB SDRAM Memory, add $149.*

★ *Upgrade to a 1000TX Trinitron Monitor (15.9" v.i.s., .26dp, 1280 x 1024 max. res.), add $75.*

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Common features listed above plus:
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- 8.4GB Ultra ATA Hard Drive (9.5ms)
- *NEW* 1200HS Monitor (17.9" v.i.s., .26dp)
- *NEW* STB nVidia 4MB AGP Video Card
- DVD-ROM Drive and Decoder Card
- *NEW* Sound Blaster AWE64 Value Sound Card
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Common features listed above plus:
- 64MB SDRAM Memory
- 6.4GB Ultra ATA Hard Drive (9.5ms)
- 1000TX Trinitron Monitor (15.9" v.i.s., .26dp, 1280 x 1024 max. res.)
- *NEW* STB nVidia 4MB AGP Video Card
- DVD-ROM Drive and Decoder Card
- *NEW* Sound Blaster AWE64 Value Sound Card
- ACS-290 Speakers with Subwoofer
- Iomega Zip 100MB Internal Drive with One Cartridge
- Dell Quiet Keyboard

$2999

Personal Lease: $136/Mo., 24 Mos.◊Σ
Order Code #501203

NEW DELL DIMENSION XPS D266
266MHz PENTIUM II PROCESSOR
FEATURING MMX TECHNOLOGY

Common features listed above plus:
- 64MB SDRAM Memory
- 4.3GB Ultra ATA Hard Drive (9.5ms)
- 1000LS Monitor (15.9" v.i.s.)
- *NEW* STB nVidia 4MB AGP Video Card
- *NEW* 32X Max^ Variable CD-ROM Drive
- Integrated Yamaha Wavetable Sound
- Altec Lansing ACS-90 Speakers
- Iomega Zip 100MB Internal Drive with One Cartridge
- *NEW* Dell Ergonomic Keyboard

$2499

Personal Lease: $114/Mo., 24 Mos.◊∞
Order Code #501202

DELL DIMENSION XPS D233
233MHz PENTIUM II PROCESSOR
FEATURING MMX TECHNOLOGY

Common features listed above plus:
- 32MB SDRAM Memory
- 4.3GB Ultra ATA Hard Drive (9.5ms)
- 1000LS Monitor (15.9" v.i.s.)
- *NEW* STB nVidia 4MB AGP Video Card
- *NEW* 32X Max^ Variable CD-ROM Drive
- Integrated Yamaha Wavetable Sound
- Altec Lansing ACS-90 Speakers
- Dell Quiet Keyboard

★ *Upgrade to a 6.4GB Ultra ATA Hard Drive, add $59.*

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Personal Lease: $92/Mo., 24 Mos.◊π
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- Small Business Financial Mgr 97

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- Encarta 98 Encyclopedia
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- Works 4.5
- Greetings Workshop 2.0
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Microsoft Internet Explorer

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Common features: ◆ 512KB Integrated L2 ECC Cache ◆ Integrated PCI Ultra-Wide SCSI-3 Controller ◆ Intel Pro/100B PCI Ethernet Adapter ◆ Intel LANDesk® Server Manager v2.5x ◆ **3 Years Next-Business-Day On-site^Δ Service**

DELL POWEREDGE 2200 SERVER
300MHz PENTIUM II PROCESSOR
Dual Processor Capable, RAID Capable

Common features listed above plus:

- 128MB ECC EDO Memory
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- 24X Max§ Variable SCSI CD-ROM
- Microsoft Windows NT Server 4.0 (10 Client Access Licenses)
- 6 Expansion Slots: 3 PCI/3 EISA
- 6 Drive Bays: 3 External 5.25"/ 3 Internal 3.5"
- 7x24 Dedicated Server Hardware Technical Telephone Support

$4999

Business Lease◊: $177/Mo., 36 Mos.
Order Code #250104

DELL POWEREDGE 2200 SERVER
233MHz PENTIUM II PROCESSOR
Dual Processor Capable, RAID Capable

Common features listed above plus:

- 64MB ECC EDO Memory
- 4GB Ultra-Wide SCSI-3 Hard Drive (7200 rpm, 8ms)
- 24X Max§ Variable SCSI CD-ROM
- 6 Expansion Slots: 3 PCI/3 EISA
- 6 Drive Bays: 3 External 5.25"/ 3 Internal 3.5"
- 7x24 Dedicated Server Hardware Technical Telephone Support

★ *Upgrade to a 266MHz Pentium II Processor, add $300.*

$2999

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DELL INSPIRON 3000 M233XT
233MHz PENTIUM PROCESSOR
WITH MMX TECHNOLOGY

Common features listed above plus:

- 13.3" XGA Active Matrix TFT Display
- 32MB SDRAM (144MB Max)
- 512KB L2 Pipeline Burst Cache
- 2.1GB ATA Hard Drive
- 128-bit Graphics Accelerator with 65K Colors at 1024x768
- Zoom Video and USB Ports
- Stereo Speakers with 3D Surround Sound and Yamaha SW Wavetable
- Cardbus Ready/Fast IR 1.1
- 6.9 Pounds*

$3399

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Order Code #891202

DELL INSPIRON 3000 M200ST
200MHz PENTIUM PROCESSOR
WITH MMX TECHNOLOGY

Common features listed above plus:

- 12.1" SVGA Active Matrix TFT Display
- 32MB SDRAM (144MB Max)
- 512KB L2 Pipeline Burst Cache
- 2.1GB ATA Hard Drive
- 128-bit Graphics Accelerator with 16 Million Colors at 800x600
- Zoom Video and USB Ports
- Stereo Speakers with 3D Surround Sound and Yamaha SW Wavetable
- Cardbus Ready/Fast IR 1.1
- 6.4 Pounds*

$2799

Business Lease◊: $102/Mo., 36 Mos.
Order Code #891205

DELL INSPIRON 3000 M166ST
166MHz PENTIUM PROCESSOR
WITH MMX TECHNOLOGY

Common features listed above plus:

- 12.1" SVGA Active Matrix TFT Display
- 32MB SDRAM (144MB Max)
- 256KB L2 Pipeline Burst Cache
- 2.1GB ATA Hard Drive
- 128-bit Graphics Accelerator with 16 Million Colors at 800x600
- Zoom Video and USB Ports
- Stereo Speakers with 3D Surround Sound and Yamaha SW Wavetable
- Cardbus Ready/Fast IR 1.1
- 6.4 Pounds*

$2599

Business Lease◊: $95/Mo., 36 Mos.
Order Code #891206

DELL LATITUDE® LM M133ST
133MHz PENTIUM PROCESSOR
WITH MMX TECHNOLOGY

Common features listed above plus:

- 12.1" SVGA Active Matrix TFT Display
- 24MB EDO RAM (72MB Max)
- 256KB L2 Pipeline Burst Cache
- 2.1GB ATA Hard Drive
- 128-bit Graphics Accelerator with 65K Colors at 800x600
- Integrated 16-bit Stereo Sound
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- Under 7 Pounds *

★ *Upgrade to 40MB RAM, add $199.*

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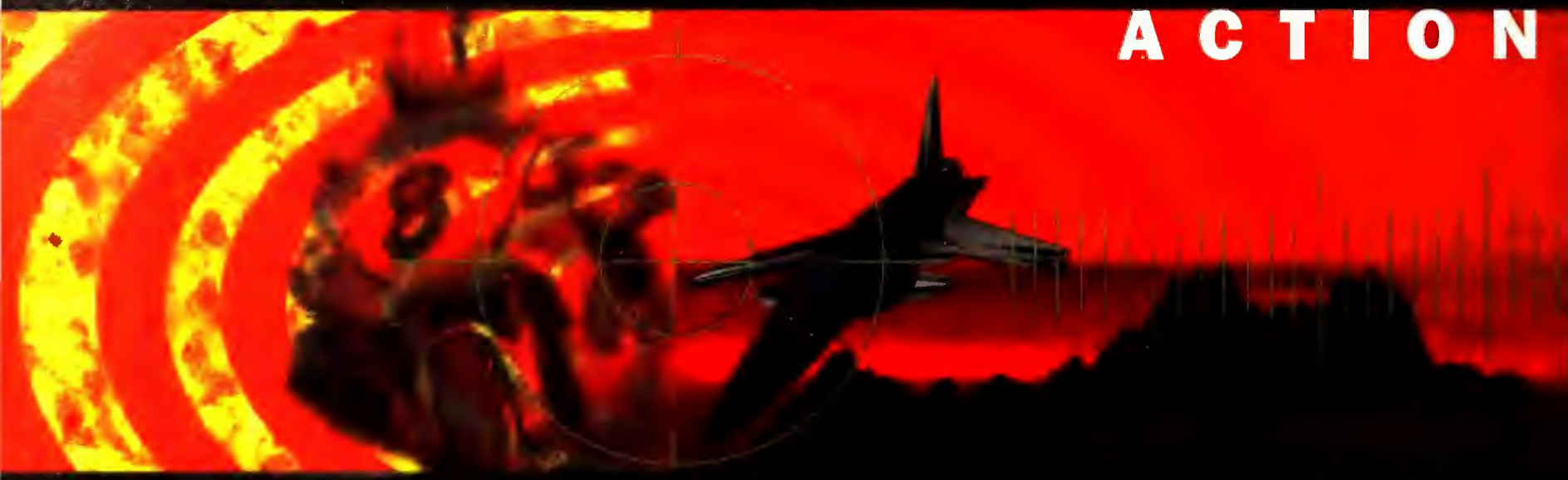

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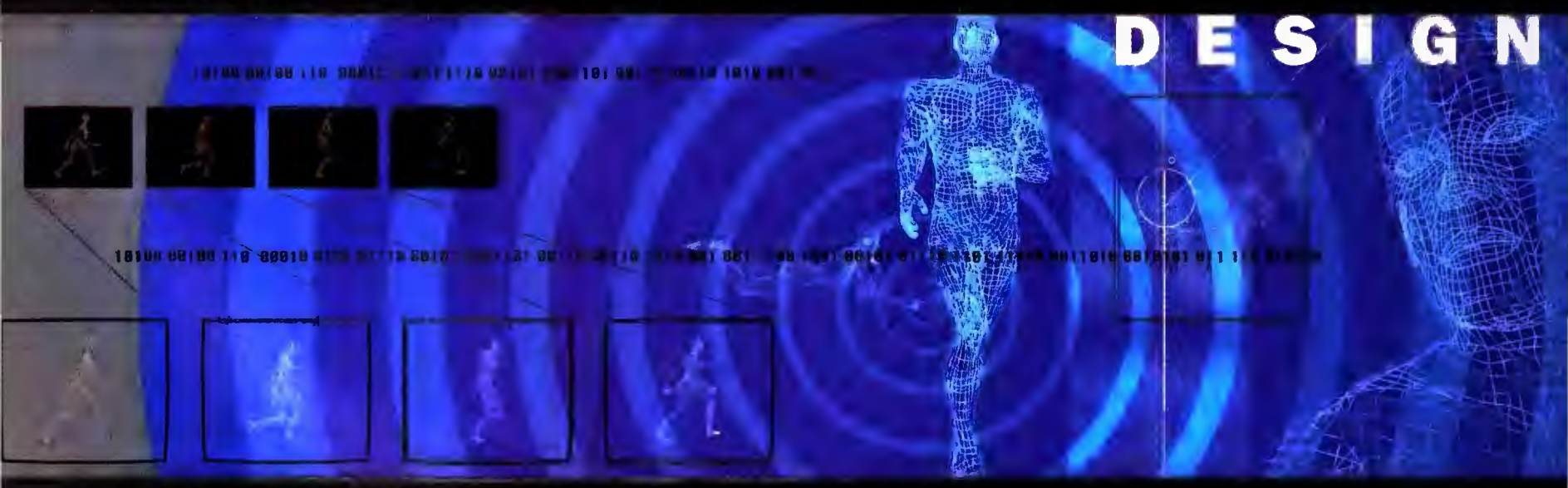

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powered by NVIDIA

3D WinBench '97 Performance

VELOCITY 128	252
Monster (3Dfx)	203
ATI XPERT@Play	143
Mystique 220	79.1
Millennium II	73.9

PC MAGAZINE EDITORS' CHOICE

MVP PCComputing

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PC WORLD

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Circle 200 on reader service card

PC WORLD

TOP 10 MONITORS

	17-INCH MONITORS	Month tested	Street price (10/15/97)	Overall rating	Quality of text/graphics	Comments	Reader service number
1	**Iiyama VisionMaster Pro 17** 800/394-4335 www.iiyama.com	Sept 97	$649	88	very good/ excellent	**FEATURES:** 15.9-inch viewable area, .25mm stripe pitch Diamondtron tube, up to 85-Hz refresh rate,[1] Plug and Play ready,[2] three-year warranty, 12-hour weekday toll-free support. **PRO:** $49 price drop, great graphics, ultracrisp text, easy to adjust. **CON:** Two faint lines visible across screen.	668
2 (TIED)	**Mitsubishi Diamond Pro 87TXM** 800/843-2515 www.mitsubishi-display.com	Sept 97	$719	87	very good/ very good	**FEATURES:** 15.7-inch viewable area, .25mm stripe pitch Diamondtron tube, up to 107-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 12-hour weekday toll-free support. **PRO:** $30 price drop, sharp picture, great controls, color-correction utility. **CON:** Two faint lines visible across screen.	669
2 (TIED)	**ViewSonic PT775** 800/888-8583 www.viewsonic.com	Sept 97	$749	87	very good/ excellent	**FEATURES:** 15.9-inch viewable area, .25mm stripe pitch Diamondtron tube, up to 119-Hz refresh rate,[1] Plug and Play ready,[2] TCO'92 compliant, three-year warranty, 11-hour weekday toll-free support. **PRO:** $100 price drop, crisp text, stunning graphics, color-correction software. **CON:** Two faint lines visible across screen.	670
4	**Samsung SyncMaster 700b** 800/933-4110 www.sosimple.com	Sept 97	$529	85	very good/ very good	**FEATURES:** 15.7-inch viewable area, .28mm dot pitch tube, up to 100-Hz refresh rate,[1] Plug and Play ready,[2] three-year warranty, 24-hour toll-free support. **PRO:** $170 price drop, attractively styled case, fine balanced display of text and graphics, basic controls very easy to adjust. **CON:** Cryptic menu icons.	671
5	**Panasonic PanaFlat PF70** 800/742-8086 www.panasonic.com	NEW	$849	82	very good/ excellent	**FEATURES:** 15.6-inch viewable area, .24mm slot pitch tube, up to 106-Hz refresh rate,[1] Plug and Play ready,[2] TCO'92 compliant, three-year warranty, 24-hour toll-free support. **PRO:** Impeccable focus, flat screen reduces reflection of ambient light. **CON:** Initial perception of bowed lines (goes away in a few days), expensive.	672
6	**KDS Visual Sensations VS-9** 800/237-9988 www.kdsusa.com	retested this month	$599	82	very good/ good	**FEATURES:** 15.7-inch viewable area, .26mm dot pitch tube, up to 120-Hz refresh rate,[1] Plug and Play ready,[2] three-year warranty, 11-hour weekday toll-free support. **PRO:** Attractive price, above-average text, intuitive controls. **CON:** No numerical calibrations for adjustments, menus available only in English.	673
7	**ViewSonic P775** 800/888-8583 www.viewsonic.com	NEW	$699	82	good/ good	**FEATURES:** 15.7-inch viewable area, .28mm dot pitch tube, up to 117-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 11-hour weekday toll-free support. **PRO:** Well-designed controls. **CON:** Unimpressive picture; for $50 more the number two PT775's Diamondtron tube is much sharper.	674
8	**IBM P70** 800/426-7255 www.pc.ibm.com/options	Sept 97	$799	80	very good/ very good	**FEATURES:** 15.9-inch viewable area, .25mm stripe pitch Trinitron tube, up to 85-Hz refresh rate,[1] Plug and Play ready,[2] TCO'92 compliant, three-year warranty, 24-hour toll-free support. **PRO:** $50 price drop, sharp image, easy on-screen menus, large viewable area. **CON:** Two faint lines visible across the screen, fairly pricey.	–
9	**Samsung SyncMaster 700p** 800/933-4110 www.sosimple.com	NEW	$789	80	very good/ very good	**FEATURES:** 15.3-inch viewable area, .26mm dot pitch tube, up to 105-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 24-hour toll-free support. **PRO:** Sharp styling, well-focused picture, easily adjustable, plain-English menus. **CON:** Cryptic menu icons, relatively small viewable area, fairly expensive.	675
10	**Princeton Graphic Systems E075** 800/747-6249 www.prgr.com	Sept 97	$599	80	good/ very good	**FEATURES:** 15.8-inch viewable area, .26mm dot pitch tube, up to 120-Hz refresh rate,[1] Plug and Play ready,[2] TCO'92 compliant, three-year warranty, 24-hour toll-free support (automated after 5 p.m.). **PRO:** Detailed, realistic graphics, $39 price drop. **CON:** Type is slightly ghosted, menu items hard to find.	676

Best Buy For expanded reviews, visit www.pcworld.com/t10monitors. All products: 906

[1] Highest refresh rate at 1024 by 768 resolution. [2] Plug and Play monitors and graphics cards can communicate bidirectionally. However, Windows 95 does not fully utilize monitor Plug and Play.
[3] Highest refresh rate at 1024 by 768 resolution.

HOW WE TEST Ten judges rate a monitor's text and graphics quality. We evaluate each unit on how well it displays typical business letters, a newsletter, spreadsheets, Web pages, and scanned images. The overall rating is based on text and graphics quality (25 percent each), features and ease of use (25 percent), price (20 percent), and service and support (5 percent). The best possible overall rating is 100. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

THREE BEST BUYS top the chart this month, led by Iiyama's VisionMaster Pro 17. A sharp $100 price drop earns ViewSonic's PT775 a number-two tie with Mitsubishi's Diamond Pro 87TXM. Of the new models, Panasonic's PanaFlat PF70 debuts at number five despite its $849 price—the highest on the chart. The PF70 uses a new flat-screen slot pitch tube to provide near-perfect focus. The flat screen also reduces the reflection of ambient light. ■

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Software Product of the Year.

WIN 100 WINDOWS MAGAZINE 1997

Windows Magazine
Summer 1997

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Circle 244 on reader service card

KDS

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KDS can make your dreams come true with Visual Sensations.™

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PC WORLD TOP 10 MONITORS
Nov., 1997

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PC WORLD

TOP 10 GRAPHICS BOARDS

	GRAPHICS BOARDS	Month tested	Street price (10/24/97)	Overall rating	PC WorldBench graphics score/ rating	3D rating	Multimedia rating	Comments	Reader service number
1	ATI 3D Pro Turbo PC2TV 905/882-2600 www.atitech.com	Oct 97	$219	98	189/ very good	good	outstanding	**FEATURES:** 8MB of SGRAM, 200-MHz RAMDAC, ATI Rage II chip, bundled software for 3D modeling, image editing, and VRML. **PRO:** Terrific multimedia performance, nice 3D, connects to TV. **CON:** Expensive, mediocre video playback, no toll-free support.	619
2	ATI Xpert@Work 905/882-2600 www.atitech.com	Dec 97	$169	97	191/ outstanding	good	good	**FEATURES:** 4MB of SGRAM (upgradable to BMB), 230-MHz RAMOAC, ATI Rage Pro chip, bundled photo editing and 3D modeling software. **PRO:** Fast all around, great utilities, connects to a TV, good price. **CON:** So-so 3D, no toll-free support.	620
3	STB Nitro 3D 800/234-4334 www.stb.com	Oec 97	$99	97	190/ outstanding	adequate	adequate	**FEATURES:** 4MB of EDO ORAM, 170-MHz RAMOAC, S3 Virge/VX chip, bundled 3D games. **PRO:** Tied for least expensive on chart, fast 20, toll-free support, lifetime warranty, excellent AVI video playback. **CON:** Below-average 3D game play.	621
4	Diamond Stealth 3D 3000 800/468-5846 www.diamondmm.com	retested this month	$170	96	191/ outstanding	adequate	very good	**FEATURES:** 4MB of VRAM, 220-MHz RAMDAC, S3 Virge/VX chip, bundled 3D game and 3D design software, multimedia encyclopedia. **PRO:** Fast 2D, 3D games look better with new drivers, perfect AVI video playback. **CON:** 3D still lags, no toll-free support.	622
5	ATI 3D Xpression+ PC2TV 905/882-2600 www.atitech.com	Oct 97	$115	95	190/ outstanding	adequate	adequate	**FEATURES:** 4MB of SGRAM, 170-MHz RAMDAC, ATI Rage II chip, bundled 3D games plus 3D software for modeling, image editing, and VRML. **PRO:** Good in 2D and 3D, nice bargain, connects to a TV. **CON:** Mediocre video playback, no toll-free support.	623
6	Hercules Terminator 3D/DX 800/532-0600 www.hercules.com	Oct 97	$109	95	189/ very good	adequate	very good	**FEATURES:** 4MB of EDO DRAM, 170-MHz RAMOAC, S3 Virge/DX chip, bundled 3D games. **PRO:** $40 price drop, quick in multimedia programs, excellent AVI video playback, toll-free support. **CON:** Subpar 3D quality overall, driver bug in Terracide game.	624
7	Diamond Stealth 3D 2000 Pro 800/468-5846 www.diamondmm.com	retested this month	$135	94	191/ outstanding	good	very good	**FEATURES:** 4MB of EOO ORAM, 170-MHz RAMDAC, S3 Virge/0X chip, bundled 3D game plus photo editing software and multimedia encyclopedia. **PRO:** Great 2D, inexpensive, new drivers improve look of 3O, connects to TV. **CON:** No toll-free support.	625
8	STB Velocity 3D 800/234-4334 www.stb.com	Dec 97	$199	93	189/ very good	poor	adequate	**FEATURES:** 4MB of EDO VRAM (upgradable to 8MB), 220-MHz RAMDAC, S3 Virge/VX chip, bundled games. **PRO:** Good 2D and AVI video playback, nice for graphics pros, toll-free support, lifetime warranty. **CON:** Poor rating on two 3D games, slow 3D.	626
9	STB Velocity 128 800/234-4334 www.stb.com	Nov 97	$199	93	189/ very good	very good	adequate	**FEATURES:** 4MB of SGRAM, 230-MHz RAMDAC, NVidia Riva 128 chip, bundled games and 30 image editing software. **PRO:** Excellent 3D quality and 2D performance, good game software. **CON:** Poor AVI video playback and low-res multimedia performance.	627
10	Matrox Mystique 220 800/361-1408 www.matrox.com/mga	Oct 97	$139	91	190/ outstanding	adequate	good	**FEATURES:** 4MB of SGRAM (upgradable to BMB), 220-MHz RAMDAC, Matrox MGA-1164SG chip, bundled 3D games and VRML software. **PRO:** Good price, fast, easy to install and use. **CON:** Oirect3D games look bad, no toll-free or weekend support.	628

Best Buy For expanded reviews, visit www.pcworld.com/t10graphics. All products: 903

HOW WE TEST We tested PCI boards under Windows 95 with PC WorldBench 1.0 at 800 by 600 and 16.8 million colors, at 1024 by 76B and 65,536 colors (reported here), and at 128D by 1D24 and 65,536 colors. The 3D rating is based on frame rates in our VRML and 3D game tests and on subjective ratings In three games. The multimedia rating is based on frame rates in our Macromedia Director and AVI playback tests and on timed scores in our PowerPoint multimedia presentation tests. Boards were tested in a Dell Dimension XPS P133c with 32MB of EDO ORAM and 256KB of pipeline-burst secondary cache. The overall rating is based on performance (40 percent), features (30 percent), price (20 percent), and support policies (10 percent). For all scores, higher is better. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

UPDATING THE DRIVER for your graphics card can pay off. Due to a driver bug, the two Diamond Stealth boards on our chart originally did a terrible job of playing the game Independence Day—it looked more like a black-and-white architectural drawing than a game. Retested with new drivers, both cards improved, especially the Stealth 3D 2000 Pro, which now also plays other games much more smoothly and crisply than before. ■

"The ALR Revolution 6x6 is a FIRST-RATE *server* that offers *more* SCALABILITY and *fault* TOLERANCE than most"

InfoWorld

With dual 300-MHz Pentium II processor support, server management and autorecovery technology built in, the ALR Revolution 2X offers big server features at a small price. We even offer an optional rack-mount kit!

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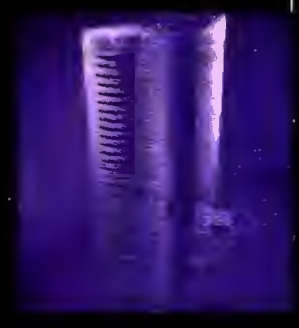

With the power of up to six Pentium® Pro chips and room for over 108-GB of storage, the ALR Revolution 6X6 is arguably the most advanced business server in the world. Redundant power supplies and ActiveCPR autorecovery technology make this an ideal platform for 7/24 environments.

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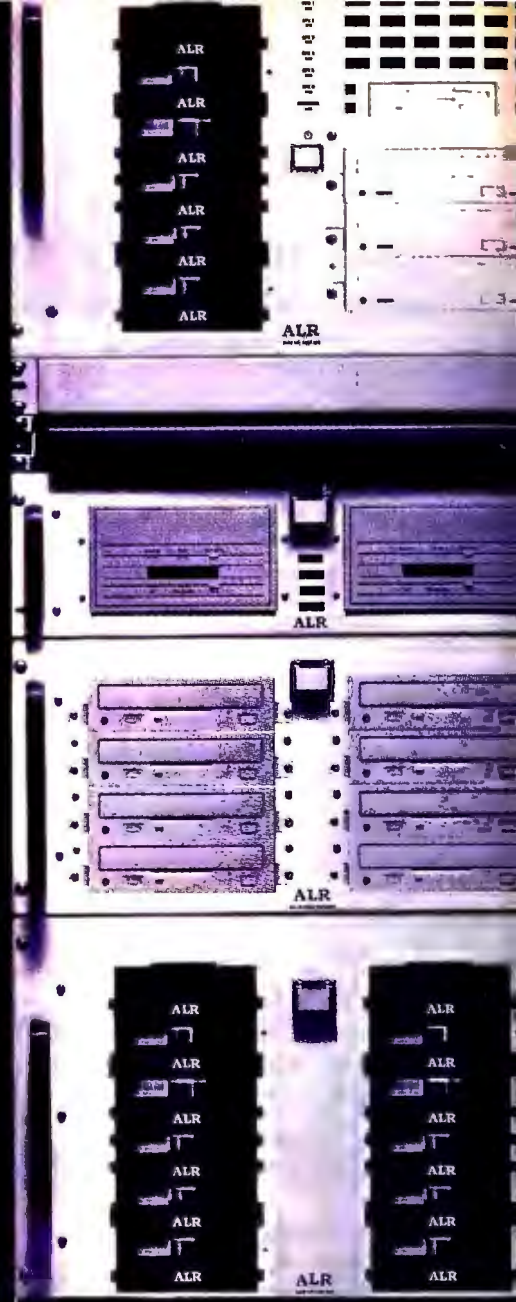

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Circle 9 on reader service card

TOP 10 MODEMS

	33.6-KBPS INTERNAL MODEMS	Month tested	Street price (10/17/97)	Overall rating	Average transfer time per MB (min:sec)	Comments	Reader service number
1	Hayes Optima 33.6 Internal Business Modem 800/377-4377 www.hayes.com	July 97	$189	81	2:31	**FEATURES:** 16-bit ISA card, flash ROM, 230.4-kbps PC-to-modem speed, distinctive ring, voice mail, callback, password protection, Caller ID, SmartCom Message Center LE fax/data software. **PRO:** Fast performer, cross-ship replacement. **CON:** No weekend support, long 8.5-inch card may block other PC components.	726
2	Zoom FaxModem V.34I Plus 800/631-3116 www.zoomtel.com	July 97	$69	80	2:38	**FEATURES:** 8-bit ISA card, MNP-10EC cellular protocol, 115.2-kbps PC-to-modem speed, distinctive ring, COMit and WinFax Lite fax/data software. **PRO:** Flawless installation, $10 price drop, good performer, cheapest modem on chart. **CON:** Lacks security features such as Caller ID and password access to modem.	727
3	3Com/U.S. Robotics Courier V.Everything With V.34 Internal 800/877-2677 www.3com.com	July 97	$215	80	2:44	**FEATURES:** 8-bit ISA card, flash ROM, 230.4-kbps PC-to-modem speed, distinctive ring, Caller ID, QuickLink II fax/data software. **PRO:** Thorough and accessible documentation, toll-free support, cross-ship replacement, great software includes remote access program. **CON:** Most expensive 33.6-kbps modem on chart.	728
4	ActionTec DeskTalk 33.6 800/797-7001 www.actiontec.com	Nov 97	$70	79	2:48	**FEATURES:** 16-bit ISA card, 115.2-kbps PC-to-modem speed, voice mail, speakerphone, microphone, audio cable, Cheyenne BitWare voice/fax/data software. **PRO:** Very inexpensive, $49 price drop puts it on chart. **CON:** Lackluster performer, no support on weekends, no security features such as Caller ID.	729
5	Viking 33.6 ISA Modem 800/845-8777 www.vikingcomponents.com	NEW	$78	79	2:58	**FEATURES:** 8-bit ISA card, MNP-10 cellular protocol, 115.2-kbps PC-to-modem speed, distinctive ring, voice mail, speakerphone, VoiceView, DSVD, callback, Caller ID, QuickLink Message Center fax/data software. **PRO:** Very affordable, nice features, 24-hour toll-free tech support. **CON:** Slowest 33.6-kbps modem on chart.	730
	56-KBPS INTERNAL MODEMS						
1	IBM 56K Modem Internet Kit 800/772-2227 www.pc.ibm.com/options	Nov 97	$149	80	2:39/3:17 [1]	**FEATURES:** x2 protocol, 8-bit ISA card, 115.2-kbps PC-to-modem speed, V.80, distinctive ring, voice mail, speakerphone, DSVD, Caller ID, QuickLink Message Center fax/data software. **PRO:** Feature-rich, round-the-clock support, very good software bundle. **CON:** Slowest 56-kbps download rate.	–
2	3Com/U.S. Robotics Courier V.Everything 56K Internal 800/877-2677 www.3com.com	Nov 97	$260	79	2:33/2:57 [1]	**FEATURES:** x2 protocol, 8-bit ISA card, 230.4-kbps PC-to-modem speed, distinctive ring, callback, Caller ID, RapidComm fax/data software. **PRO:** Fast performer, toll-free support, unconditional free upgrade to 56-kbps standard even if modem swap required. **CON:** Most expensive on chart, support available weekdays only.	731
3	Diamond Multimedia SupraExpress 56i Sp 800/727-8772 www.diamondmm.com	NEW	$139	78	2:48/3:04 [1]	**FEATURES:** K56flex protocol, 16-bit ISA card, 230.4-kbps PC-to-modem speed, V.80, distinctive ring, voice mail, speakerphone, Caller ID, microphone, audio cable, COMit and FaxTalk fax/data software. **PRO:** Loaded with features, long tech support hours, smooth installation. **CON:** Slowest 33.6-kbps transfer rate.	732
4	Zoom FaxModem 56K 800/631-3116 www.zoomtel.com	Nov 97	$119	77	2:35/3:08 [1]	**FEATURES:** K56flex protocol, 16-bit ISA card, MNP-10EC error control, 230.4-kbps PC-to-modem speed, V.80, WinFax Lite and COMit fax/data software. **PRO:** Generous support hours including Saturday, free upgrade to upcoming 56-kbps standard, $30 price drop. **CON:** Support call is on your dime, installation a little rough.	733
5	Shark Multimedia Leopard 56K 800/800-3321 www.sharkmm.com	NEW	$109	77	2:38/3:04 [1]	**FEATURES:** K56flex protocol, 16-bit ISA card, MNP-10 cellular protocols, 115.2-kbps PC-to-modem speed, V.80, distinctive ring, voice mail, speakerphone, VoiceView, ASVD, microphone, Caller ID, DialTone fax/data software. **PRO:** Good price and features, easy installation. **CON:** No support on weekends, no cross-ship replacement.	734

Best Buy | For expanded reviews, visit www.pcworld.com/t10modems. | [1] V.34 TAS transfers/56-kbps ISP downloads; see "How We Test." | All products: 910

HOW WE TEST We test 33.6-kbps modem-to-modem performance using a pair of identical modems on a Telecomm Analysis Systems simulated phone network. It sends a text file over 55 line conditions, and a mix of five files—graphics, text, program, and compressed files—over one line condition. For our 56-kbps tests, we call a local Internet service provider access number and transfer .jpg, .doc, and .zip files continuously over an 18-hour period. The times to transfer a megabyte of data are higher in the ISP test than in the TAS test because the files used in the former are less compressible. Results for the two tests are not comparable. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

THREE NEW INTERNAL modems make our list this month. Viking's 33.6 ISA Modem takes the number five spot on the 33.6-kbps chart thanks to its low price and good home and small-office features. However, it's the slowest of the bunch. Two new 56-kbps modems, Diamond's SupraExpress 56i Sp and Shark's Multimedia Leopard 56K, are affordable and come with a laundry list of features, but the SupraExpress has better support policies. ■

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- The expertise of System Consultants.
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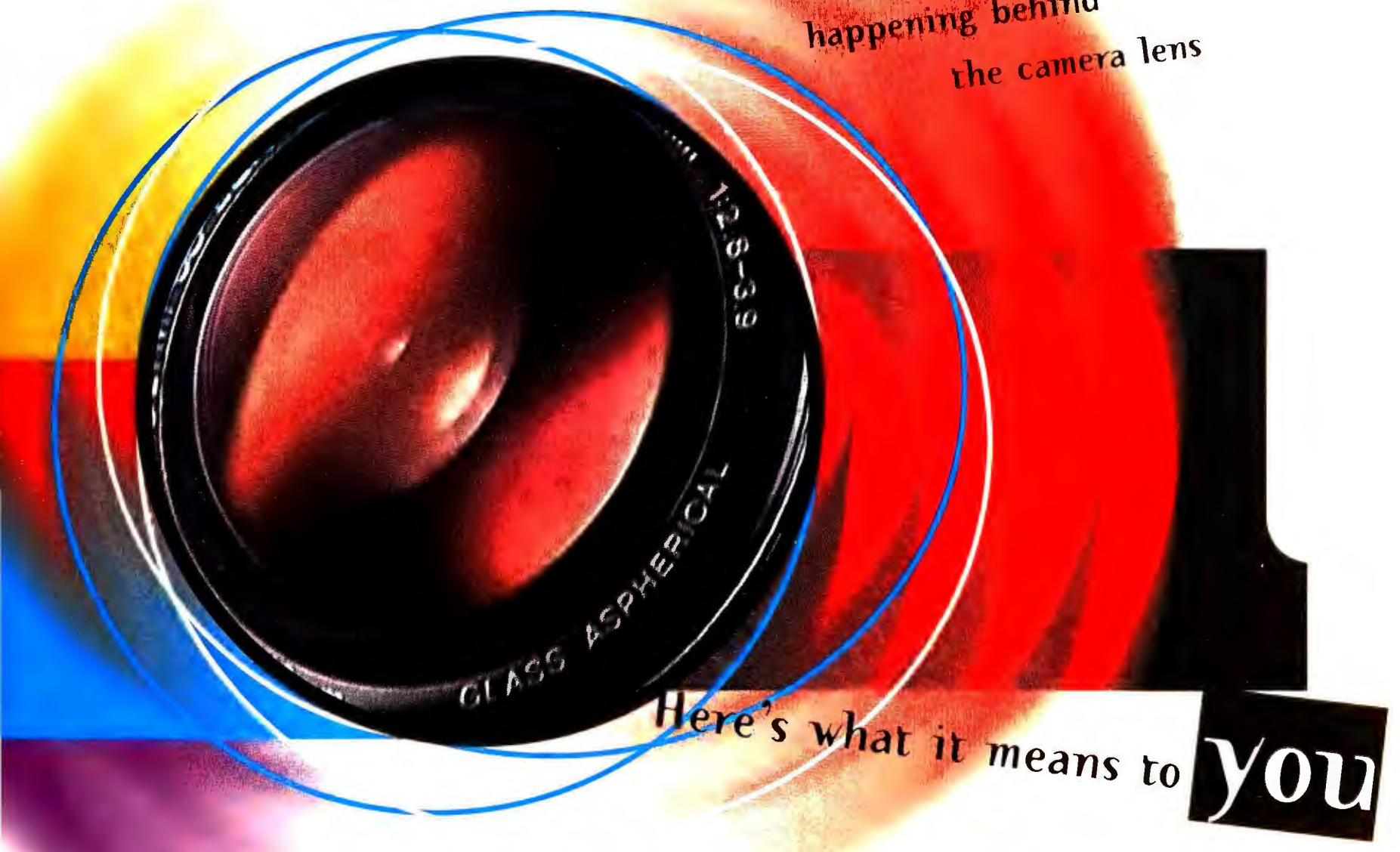


Here's what it means to you

Whether you take snapshots to preserve a memory, capture an instant in time or add impact to a business message, the way that you take pictures is about to improve dramatically.

With digital camera prices ranging between $250 and $1,200, business users, serious amateur and professional photographers can enjoy the convenience, immediacy and long-term savings of digital photography.

Outwardly, digital cameras look and work like their film-based cousins – the familiar point-and-shoot cameras or the traditional single-lens-reflex variety. In fact, that's one of their greatest attributes – there are no new techniques to learn. The biggest differences between digital and film-based cameras happen on the inside, where electronics instead of film captures and stores the image.

Picture perfect

Inside a digital camera, a chip acquires the image and stores it on a reusable memory module. The camera's memory keeps your image safe and intact for as long as you want it – even without battery power. You can erase or upload your pictures to a computer for editing, retouching or for longer term storage. Widespread support of standardized TWAIN drivers will make uploading images from the camera to the computer even easier. (TWAIN is the interface standard for open communication among peripherals.)

Want a way to display images that's easier still? Choose a camera with a video-out port. That further leverages the immediacy and flexibility of digital photography by allowing you to display your image on a TV or capture it on videotape.

You can print the image, post it on a Web site, use it in a business slide presentation or E-mail it to your daughter at college. In fact, you can do all the same things you can do with a picture from a traditional film camera and a whole lot more – including retouching.

Once the domain of mystics, photo editing and retouching rates as one of the truly great wonders of the digital world. Go ahead, change nature and add sunshine to a dreary day. Transform a frown to a smile, change a hairstyle or add in friends from another town or aliens from another galaxy.

You can also enhance the appearance of products for sale. Instantly add mature shrubs to the new house you're building, crop an image's background to eliminate distractions and overlay a colorful, eye-catching sales message. It's never been so easy or convenient as with the near magic of digital imaging.

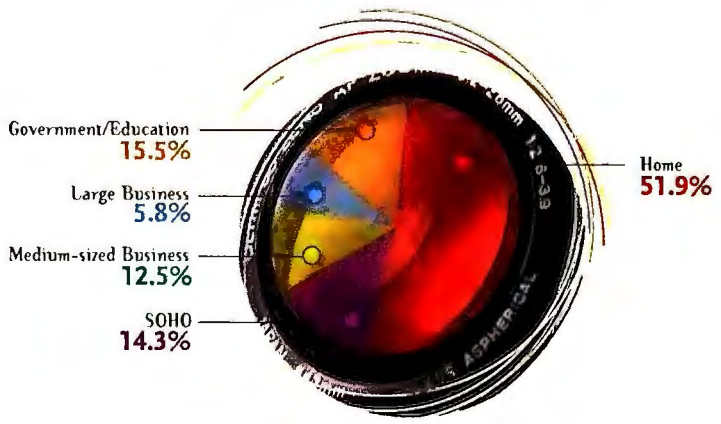
Falling *prices*, rising *capabilities*

In digital imaging, convenience goes well beyond the ease of acquiring and retouching images. For example, because your images develop themselves, you eliminate the need for and cost of photo finishers, as well as avoid having to drop off the film, then pick up the prints, or mail it to a processor, then wait days to find out which images are "keepers." Of course, if you want to add a film-based photo to your Web site or presentation, you first have to scan it into your PC.

More than ever before, the newest crop of digital cameras delivers ease of use as well as features that just three years ago would have cost more than $10,000. That's one reason for the technology's soaring popularity.

According to market research firm International Data Corp., based in Framingham, Mass., sales of digital cameras worldwide will soar from $866 million in 1996 to more than $4 billion in 2001. Technical factors driving this trend include lower camera prices, higher image resolution and technical advances in everything from lens glass quality to the new CMOS chips that will soon challenge CCD (charge coupled device) as the de facto image capture circuitry.

IDC estimates the number of digital cameras shipped in the United States will increase from the 1996 total of 800,00 to 3 million in 2001 for a worldwide total of 8 million units. That means good news for consumers, since the increased competition will spur additional features at lower prices.



U.S. Digital Camera Unit Shipments by User Segment

Total = 786,801 units
Source: International Data Corp.

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It works in construction.
The ePhoto 1280's 2" LCD screen gives you a sharp view of what you're shooting. Even in bright daylight conditions.

It works in law enforcement
ePhoto 1280's software makes it easy to collect the evidence, then display, archive, categorize and retrieve it.

It works in real estate.
ePhoto 1280's 3x swivel zoom lens lets you shoot from any angle to make that house look even better.

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More *Bytes* for the *Buck*

High-end digital cameras, once the exclusive realm of commercial photographers, have dropped enough in price to put them within reach of smaller, even one-person, photography shops. Consumers who purchase cameras in the $500 to $1,000 range get the same top-quality optics found on 35mm cameras, as well as high-resolution circuitry, deep color saturation, a zoom lens, macro mode and auto focus. In digital cameras that sell for $500 or more, LED screens provide through-the-lens viewing, similar to a single-lens-reflex camera. Optical viewfinders, featured on all digital cameras, work exactly the same as they do on 35mm format cameras.

Manufacturers and consumers agree that increased competition and consumer interest have stimulated research and development of both more efficient compression methods and improved and less costly CCD chips. Instead of film, a digital device uses a CCD, which is a thumbnail-sized, light-sensitive chip that mounts behind the lens to capture an image – much like the human retina.

The CCD must detect nuances of light, dark and color, a feat accomplished with minuscule RGB filters and complex interpolation algorithms. CCDs and their supporting analog-to-digital circuitry are singularly the most expensive component in the camera. As the CCD's capacity – measured in megapixels (millions of pixels) – and color accuracy increases, so does the cost, which explains why professional studio digital cameras used to cost $5,000 to $30,000. Digital camera manufacturers now offer a range of smaller, more affordable CCDs for use by novices and cost-conscious professionals.

Kingston Technology's 15Mbyte CompactFlash storage card and CompactFlash PC card adapter transfer digital information at 3Mbytes per second.

Within the past year, the quality once found only in those $5,000-and-up studio cameras now appears in cameras costing $800 to $1,200, making them the perfect choice for such business uses as acquiring images of real estate, products, personnel IDs and evidential records such as accident scenes.

Additionally, you can use these images to personalize presentations, freeing you from creating graphics or embedding canned ones.

If, instead, your needs extend to uses such as reduced-resolution photos suitable for a Web site, family gatherings or other social events, a point-and-shoot type digital camera with 640 x 480 resolution, standard 2.8 aperture and an optical viewfinder for about $500 will adequately meet your needs. Cost-conscious snapshooters have not been left behind either. Auto-focus digital cameras with 24-bit color and 240 x 320 resolution cost as little as $250.

Intel's Create & Share Camera Pack, including digital camera, communications and image editing software, lets users interact in real time with off-site participants.

So whatever your price range, business users and serious home users alike can have a complete desktop digital darkroom, complete with camera, editing software and one of the new crop of low-cost, photo-quality printers for as little as $700. ●

RDC300

Personal Digital Camera

The Digital Camera for Everyone

Digital photography means no more film and no more waiting to see your images.
With Ricoh's RDC-300 Personal Digital Camera, you can share pictures with family and friends instantly on your TV, computer, or through the Internet.

Simple point-and-shoot features let you capture vivid digital images that can be effortlessly transferred to your computer.

The Ricoh RDC-300 Personal Digital Camera lets you do more with your memories.

Monitor The Action

The convenient 1.8 inch LCD monitor flips up to let you frame and compose shots with greater precision. Instantly see what you've just shot, and play back your images immediately.

Flash Control

The RDC-300 makes digital photography more accessible to everyone. The camera's automatic flash is one more feature that makes taking the best shot easy. Let the camera's automatic light meter take over, or turn the flash off manually to take a low-light shot. You're in command.

Image Capacity Selection

The RDC-300 lets you decide how to best capture your images. Normal is the basic recording mode. Fine recording mode captures more data to put the emphasis on image quality and Economy mode uses less memory to let you capture up to 100 images. You choose the level of compression you want.

Powerful Features to Capture Perfect Pictures.

High Quality Image Capture

The key to the RDC-300's picture quality is its image capturing 350,000 square pixel CCD. An electronic shutter and full-frame image capture system allows 640 x 480 pixel images to be taken in a single click, ensuring that your objects have smooth outlines and that the focus is sharp, right to the edges of the frame.

Super Close-up Macro

The combination of the manual macro dial, the Ricoh lens, and the sensitive CCD allows you to focus on objects less than one inch away for fantastic close-ups. The LCD monitor helps you frame the subject accurately, opening up enormous potential for macro image capture.

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Buying *Guidelines*

Digital camera components explained

While plummeting prices and increasing sophistication contribute to the quantum leap in digital photography's popularity, innovation factors in too. Advances in technology offer a combination of convenience and features never available in film cameras. Despite the wide variety of features available, all you need is a passing familiarity with a camera's DNA to help you make a wise buying choice.

That choice will be based on a variety of features, but your satisfaction with digital cameras will begin with image quality. No matter how many conveniences and features you buy, no matter how little you pay, the camera must produce an image that meets your needs and expectations.

A quality image begins with a quality lens. Distortion-free, aspherical lenses that focus the image onto the camera's charge coupled device (CCD) are de rigeur in the industry's newest crop of cameras. Most $500-plus digital cameras now use the same multi-element lens sold with top-end film cameras.

Narrowing *resolution* gap

Once the picture passes through the lens, what resolution can the camera record? This is the one area where film cameras still enjoy an advantage. But the gap grows narrower. For example, the newest 1,280 x 1,064 cameras produce an image so sharp and with colors so rich that it rivals traditional point-and-shoot 35mm cameras.

As a general guide, digital cameras with image quality and clarity that begin to rival 35mm film cameras have resolutions ranging between 600 x 800 and 1,024 x 768, with .8 to 1.2 megapixels (millions of pixels) in billions of colors. Lower cost cameras, in the $250 to $500 range, offer about .3 to .5 megapixels in 16.7 million colors. By comparison, high end, non-mobile studio and portrait digital cameras capture 4 megapixels.

Using new production techniques, manufacturers can create CCDs that pack more light-gathering capacity and color sensitivity into a smaller package than ever before. In addition, a single multifunction VLSI chip, designed specifically for digital cameras, controls the CCD, LCD, image compression, memory utilization and I/O ports on a single chip. The benefit? Improved images from smaller, cheaper, lighter cameras.

Where portability matters, you may want to consider the newer CMOS-based cameras. They weigh mere ounces and fit in your shirt pocket, yet can produce a 640 x 480 resolution image with 24-bit color depth. As a relatively new technology, CMOS sensors are first starting to appear in cameras now and loom as a challenger for CCD, which promises to further reduce the cost and size of cameras.

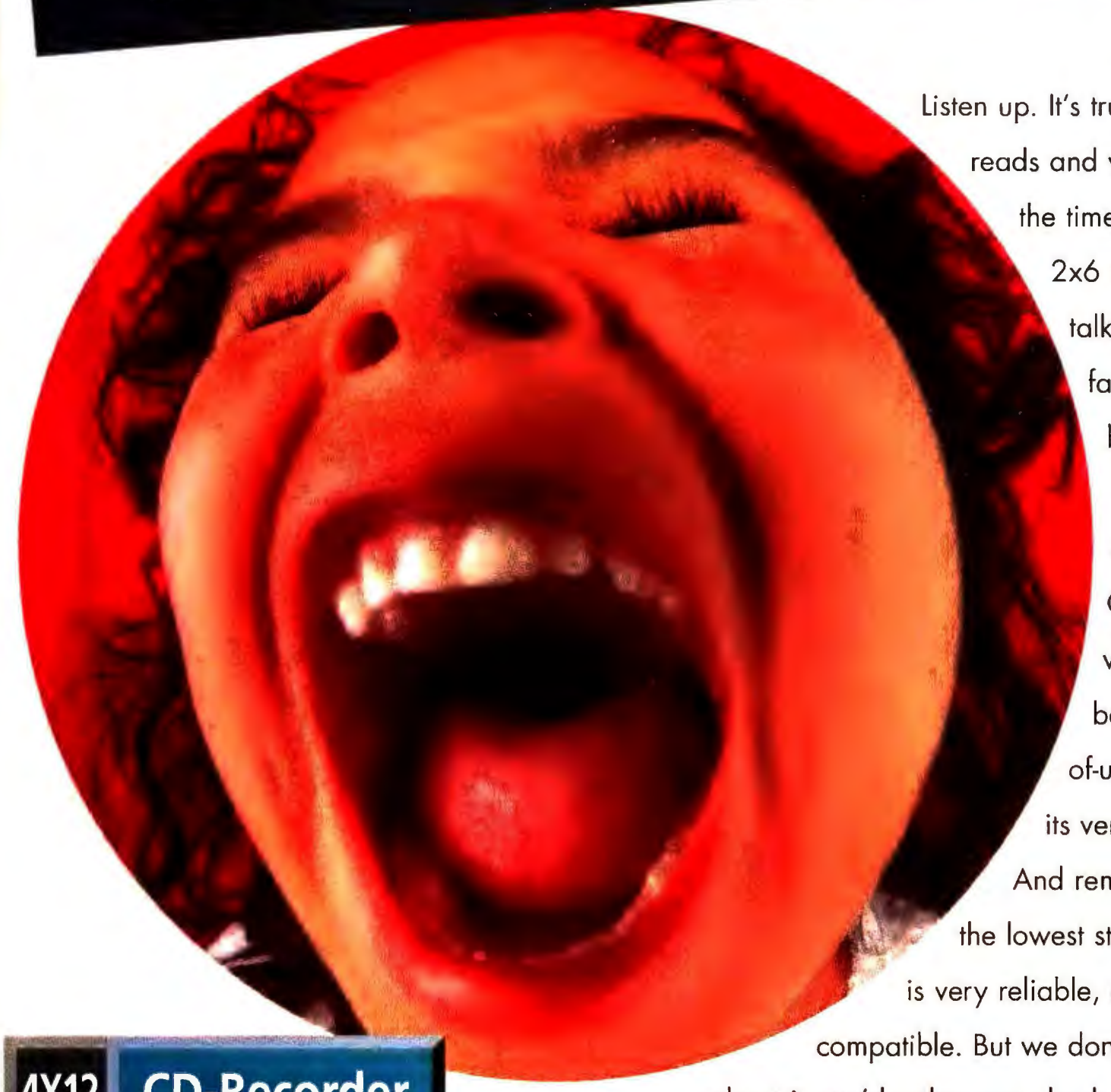
Editing, memory *advances*

When it comes to viewfinders, the LCD screen now available on most $500-plus digital cameras complements the optical viewfinder and enables you to both preview the photo you are about to take and sequentially review those you have just taken. Typically, the press of a button lets you cycle through the last few images on your LCD. This lets you edit and save the images you like and delete those you do not, thereby freeing memory space to take more pictures. New advances in LCD design, including active-matrix technology, provide a brighter, crisper image to help you see your photos as works in progress.

Exactly how many pictures can you take without having to return to your computer? Advances in storage and removable flash memory allow you to take as many as you like. Most new digital cameras store their images on postage-stamp sized, standardized flash memory cards that hold from 10 to 100 photos, with memory capacity ranging from 1 Mbyte to 15 Mbytes.

Once the card its full, just pop it out of the camera and replace it with a blank card, ready to store the next group of snapshots. Transferring the images from the removable media module into a PC is easier than ever – again, thanks to an industry innovation. Once full, the cards slip into special adapters that connect to your PC via serial cable, or slide directly into your desktop's floppy disk drive or laptop's PCMCIA slot. In high production environments, your partner can review the last card full of pictures while you frame your next series of shots. Photography is getting easier.

4X write, 12X read. Enough said.



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	FILM CAMERAS	VS.	DIGITAL CAMERAS	
Pros	Highest picture quality		Increased productivity	Pros
	Wide range of options, add-ons		Instant results	
	Very low cost cameras available		Extreme convenience	
	Does not require a computer		View/delete pictures immediately	
Cons	Costly and time-consuming processing and handling		No film, processing and associated costs	
	No opportunity to preview images		Less expensive in the long term	
	Scanner required for electronic distribution		Unlimited image capacity available now with removable flash memory cards	
			No need to scan and convert images (as in film-based media) for editing/retouching, adding to presentations, emailing, posting to the Web or displaying on TV.	
			Cameras not light sensitive	
			Initial purchase cost greater	Cons
			Images not as sharp as from film cameras	

A Digital Camera Sampler

TODAY MORE THAN A SCORE OF COMPANIES PRODUCE AND SELL DIGITAL CAMERAS FOR PERSONAL AND BUSINESS USE. HERE'S A SAMPLING OF CAMERAS AND THE FEATURES THEY PROVIDE:

Olympus recently introduced the D-500L and D-600L SLR models. Designed both for serious consumers and professional photographers whose projects demand high quality, both cameras feature 3X zoom lenses, high resolution (up to 1,280 x 1,024 with the D-600L) and accurate through-the-lens viewing.

Toshiba's PDR-2 – one of the first cameras to use CMOS image capture chips – weighs just over a third of a pound and connects directly into a PCMCIA adapter, which is required to use this camera. The camera's image transfer software displays images as thumbnails. You double click on them to load the images directly into your applications.

Minolta is showing its DimageV, which features a detachable lens on a tether to allow for shooting in very tight places – even around corners. It includes a 1.8-inch, active-matrix LCD. The DimageV also offers autofocus, zoom and macro modes. Switching between fine and standard resolution comes at the touch of a button.

Kodak's DC120 makes use of a low-compression Kodak Digital Camera (KDC) image format, with optional memory expansion available. The DC120 includes a three-speed zoom lens.

Epson offers an optional LCD viewfinder and lens speeds to 1/10,000 to capture action shots. A sliding door hides its computer ports, replacing the rubber plugs used in other cameras. The Photo PC 500 comes standard with a carrying case.

Intel's Create & Share™ Camera Pack provides an Intel digital camera, all-in-one PC communications and photo and video editing in a package that plugs into a Pentium-based PC. The pack enables users to make, enhance and organize snapshots that can be sent to others in print, on screen and on the Web.

Sponsored by: Agfa-Gevaert Group, Epson America, Inc., Intel Corp., Kingston Technology Co., Ricoh Co., Ltd., TEAC Corp

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Bundled software lets you upload presentation slides into the PhotoPC 600. Simply connect to any projector or TV to present.

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PC WORLD @HOME

Get Smart!

SO I WAS KILLING TIME at the **You Don't Know Jack** Web site, a supercool interactive trivia game show, when the announcer started insulting me. Evidently, this is part of the "charm" of the YDKJ Web show—when you get a question wrong, the smart-aleck host peppers you with quippy one-liners and general ridicule. So much for Netiquette.

The last straw came when Jack zinged me on the following, seemingly simple question:

If Gulliver's Travels *author Jonathan Swift used a search engine, which would it be?*

A. HotBot

B. Excite

C. Yahoo

D. Magellan

So I guessed *D*, figuring some sort of navigational anecdote. No dice. Not only did I lose $3000 in game money, Jack decided that a little sarcasm was called for, and informed me that parting gifts were waiting for me backstage.

Once again I lay mortally wounded at the foot of Jack's scathing "wit." I wanted revenge. The time had come to hit the books (or CD-ROMs or Web sites) and get smarter—fast. In an effort to do so, I sampled some of the better online and CD-ROM reference tools for the aspiring trivialist and general-knowledge seeker. These resources are a great way to get the straight dope, and get it quickly: They're interactive and fully searchable, and feature state-of-the-art multimedia bells and whistles.

Not to mention being able to get back at certain game-show announcers. Hit the road, Jack!

ILLUSTRATION: JEFF BERLIN

EDITED BY

Angela Freeman, Anne Kandra, and Scott Spanbauer

500 POUNDS ON TWO CDS

MULTIMEDIA CD-ROM encyclopedias frankly beat the pants off their print counterparts. Who wants to buy an $800, 500-pound, 22-volume bookshelf monster when you can get a $70, two-disc, unabridged multimedia title?

IBM **World Book 1998 Multimedia Encyclopedia** strikes a careful balance between depth of information, breadth of coverage, and flashy multimedia. The $70 Deluxe edition is as good as these things get—World Book has been making encyclopedias for 80 years or so, and these two CD-ROMs feature the unabridged content of the print edition.

But there's more. Besides the full text, photos, and illustrations of the print version, the discs also feature audio, video, interactive graphs and charts, and 360-degree "virtual tours" of famous places. Plus hundreds of maps, numerous links to Web sites, an unabridged dictionary, and even homework wizards for students (homework sure isn't what it used to be). Impressive, ain't it?

Well, yes and no. Contrary to their marketing copy, all the major encyclopedia titles offer essentially the same multimedia features. The real difference is in the interface. To get the most from these references, you need effective search tools—and that's where World Book stands out. You can search by article topic, of course, or you can browse by general subject or media type, or even via an interactive timeline.

I searched for an answer to Jack's question on Jonathan Swift, and was rewarded with a biographical article on Swift and a short synopsis of *Gulliver's Travels*. Turns out some of the strange outlanders Gulliver meets on his journeys are called Yahoos. See? I'm getting smarter already.

Overall, I'd recommend World Book as the best all-around reference source. ▶

It will make you feel smarter in minutes. Sort of like watching public television, only without the subscription drives.

Microsoft's $80 **Encarta 98 Encyclopedia Deluxe Edition** is another worthwhile choice, and if you're particularly fond of multimedia fireworks, Encarta is the undisputed king.

Encarta also features impressive online supplements; every entry gives you the option to go online for further research, and since Encarta works through your default browser, the transition is virtually seamless. As with World Book, the linked sites are handpicked by editorial staffers and tend to be more useful than what you'd get with a Web search engine.

EXPLORE THE WORLD: Encarta 98's slick multimedia interface offers 360-degree views of historical monuments.

For example, I used Encarta's online links to answer the *Gulliver's Travels* question that You Don't Know Jack zinged me on. I looked up Jonathan Swift in Encarta and clicked over to a university Web page on the eighteenth-century satirist.

Both Encarta and World Book offer standard versions of their CD-ROM encyclopedias for around $30 less than the Deluxe editions. Unless you really need that $30, invest in the Deluxe packages, which include free online updates and substantially better multimedia content.

BROADEN YOUR HORIZONS

THE SOBER TRIVIA enthusiast knows that breadth of knowledge is the key to sustained brilliance. The broadest reference resource available is, of course, the Internet itself. While search engines are surprisingly good at ferreting out a specific little prize (the lyrics to "Copacabana," say), you often need a more exacting tool for serious reference work.

One very useful online resource is **Electric Library**, a subscription-based Web service ($59 a year or $9.95 a month, with a 30-day free trial) that processes queries through an enormous database of newspapers, magazines, books, and photographs. Reference works include the entire Collier's Encyclopedia CD-ROM, Webster's dictionary and thesaurus, and two dozen or so fact-finding resources such as the World Almanac and Book of Facts 1997.

The Electric Library is surprisingly fast: I tried the Jonathan Swift query and immediately got 30 accurate returns including encyclopedia and biography entries, critical commentary, newspaper articles, illustrations, and even an NPR radio transcript of *Gulliver's Travels*. Returns can be sorted by relevance, size, date, or even reading level.

If you're looking for a quick-fix Internet solution, Microsoft recently posted **Encarta Online** (www.encarta.com) for free, unlimited use. Returns are never more than a paragraph or two, but this can be handy when you need an answer fast ("What's the capital city of Scotland?").

Another good (and free) Net resource is the newly revamped **WWWebster Dictionary and Thesaurus** site (www.m-w.com). Its definitions and synonyms are more extensive than anything you'd get from Microsoft Word's thesaurus function.

If you want to enjoy a broad knowledge base from the comfort of your own disk drive, check out the excellent **1998 Complete Reference Collection** from Compton's. For about $50, this single-disc, ten-volume suite includes an encyclopedia, a dictionary, a thesaurus, a medical guide, a writer's handbook, an almanac, a world-history guide, and an Internet directory. The entries are substantially shallower than those in a full-fledged encyclope- ▶

Scorecard

20th Century Trivia Challenge
Grade: **B-**; Price: $19.95 list; Sirtech; 800/447-1230; www.sir-tech.com
READER SERVICE NO. 679

The 1998 Complete Reference Collection
Grade: **B**; Price: $49.95 list; The Learning Company; 800/622-3390; www.learningco.com
READER SERVICE NO. 680

Electric Library
Grade: **A-**; Price: $59 per year or $9.95 per month, 30-day free trial available; Infonautics; 800/860-9227; www.elibrary.com
READER SERVICE NO. 681

Encarta 98 Encyclopedia Deluxe Edition
Grade: **B+**; Price: $80 street; Microsoft; 888/643-0136; www.encarta.com
READER SERVICE NO. 682

Encarta Online
Grade: **B**; Price: free; Microsoft; www.encarta.com
READER SERVICE NO. 683

Encyclopedia Britannica
Grade: **A-**; Price: two CDs $125 list; online version $8.50 per month or $85 per year, seven-day free trial available; Encyclopedia Britannica; 800/522-8656; www.britannica.com
READER SERVICE NO. 684

World Book 1998 Multimedia Encyclopedia Deluxe
Grade: **A**; Price: $70 street; IBM/World Book; 800/967-5325; www.worldbook.com
READER SERVICE NO. 685

WWWebster Dictionary and Thesaurus
Grade: **B**; Price: free; Merriam-Webster; www.m-w.com
READER SERVICE NO. 686

You Don't Know Jack (the Net Show)
Grade: **A**; Price: free; Bezerk; www.bezerk.com/netshow
READER SERVICE NO. 687

F Y I

BUSINESS AND pleasure—most home PC users partake in both, according to a recent study. The top home applications: word processing (76 percent of all home PC users) and games (74 percent). Other popular categories: education (53 percent), personal finance (50 percent), and spreadsheets (50 percent).

SOURCE: COMPUTER INTELLIGENCE

ILLUSTRATION: GREG CLARKE

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KM-511L	15" / 14.0"	1024 x 768	Digital	.28mm
KM-711L	17" / 15.8"	1280 x 1024	OSD	.28mm
Performance Series				
KM-520LP	15" / 14.0"	1280 x 1024	OSD	.28mm
KM-711S	17" / 15.8"	1600 x 1280	OSD	.26mm
* KM-761	17" / 16.1"	1600 x 1280	OSD	.25mm
KM-810	19" / 18.0"	1600 x 1280	OSD	.26mm
KM-835	20" / 19.0"	1600 x 1280	OSD	.28mm
KM-950	21" / 20.0"	1600 x 1280	OSD	.28mm

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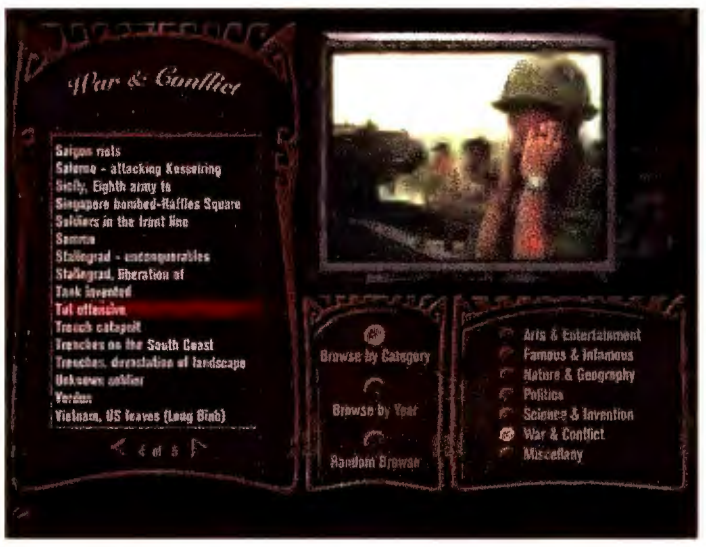
dia, but the integrated search features let you scan the volumes individually or all at once. I found this collection particularly useful for quick-and-dirty trivia work. See, YDKJ has a pause function, and I'm not above cheating a little by switching over to Compton's to look something up. You know what they say—it's not how you play the game, it's whether you win or lose.

OFF THE DEEP END

IF YOU NEED a reference resource that goes deep—really deep, way back, like a Reggie Jackson home run—nothing can touch the venerable **Encyclopedia Britannica.** Available either on CD-ROM (two CDs for $125) or with a subscription to the online service ($8.50 per month or $85 per year), Britannica buries the competition with its scope and depth.



TRIVIA OR HISTORY?: 20th Century Trivia Challenge chronicles the important events of this century.

Britannica isn't the place to go for multimedia whiz-bang goodies, though; Civil War maps are about as flashy as it gets. But if you're interested in something of Britannica's depth, I'd go with the online service rather than the CD-ROM set. Because it moves mostly text, the Web site is pretty speedy, even on a dial-up connection. Also, with the online service, you get updated information immediately.

Getting smarter doesn't have to be all grim and studious—it can actually be a lot of fun, and that's where **20th Century Trivia Challenge** from the British Pathe News service comes in. The Pathe news service has amassed a film archive of virtually every landmark event of this century, and thanks to QuickTime video technology, highlights of that archive can be viewed on your PC.

This $19.95, two-disc package lets you browse through more than 500 film clips by category (Personalities, War, and so on), or you can play the Trivia Challenge game itself, which offers 3000 or so twentieth-century pop-culture stumpers. The answers to the quiz questions are found in the clips themselves (you can have the fun of sorting through the film reels to find them). But be forewarned—the programming here isn't all it could be. The film clips often stalled and jumped on my Pentium-75 machine.

Still, 20th Century Trivia Challenge is an engaging visual-learning tool—and it's good practice for taking on those wiseacres at You Don't Know Jack. The Pathe news announcers, furthermore, lend a civilized air to the proceedings with their gracious British manner. That is to say, they won't make fun of you when you give the wrong answer. Hear that, Jack? Politeness still counts for something!

With my new reference tools in place, I've since returned to YDKJ many times and have enjoyed a marked improvement in performance. Then, last week, I was summarily dispatched in Trivial Pursuit by my 10th-grade nephew, who's been using computers since he could crawl.

These kids today—no respect.

—Glenn McDonald

Glenn McDonald is a staff editor for PC World Online. ■

F Y I

U.S. TEENS with PCs at home are more upbeat, have higher career goals, and get better grades than those without PCs, reports a new poll. Fortunately, most teens are wired at home. Nearly 80 percent of 15-to-17-year-olds live in a PC-equipped household, and 43 percent have Internet access at home.

SOURCE: DREXEL UNIVERSITY CENTER FOR EMPLOYMENT FUTURES

KEEPING UP

Rebate Roundup

SO POTENT IS the lure of the rebate, some of us will invest in a 32-cent stamp and a 5-cent envelope to get 50 cents back on a disposable razor. Fortunately, rebates on computer products tend to be more substantial. For a guide to current rebates on PC products, visit ComputerESP's rebate page (www.computeresp.com/idx/rebates.html). It can also direct you to other bargain sites.

Things Mom Never Taught Me

DON'T TELL MY MOTHER, but I still can't iron a dress shirt. Now my wrinkled look may be history, thanks to Learn2.com (www.learn2.com), an amazing group of tutorials on everyday living. Amusing, clear, and charmingly illustrated, the site's many "2torials" explain everything from effective ironing to opening a coconut. And if I ever need to tie a bow tie or improvise a diaper, I'll know where to go. Mom would be proud.

Flight Facts by Pager

HERE'S SOME GOOD travel news, unless you enjoy hanging out in airport lounges. If you've got an alphanumeric pager and make travel arrangements through Travelocity (www.travelocity.com), Travelocity can automatically page you about flight arrival and departure times, delays, and gate changes. The service is currently available for 11 airlines; more will be added in coming months.

Hot Spots for Bibliophiles

AMAZON.COM and Barnes & Noble may be duking it out for the title of biggest Internet bookseller, but sometimes you need a specialist. For out-of-print volumes, visit Advanced Book Exchange (www.abebooks.com). It instantly located an obscure tome I'd been trying to track down for years. If it's a British book you're after, try the Internet Bookshop (www.bookshop.co.uk). It's quicker and cheaper—although certainly less fun—than crossing the pond and shopping in person.

—Harry McCracken

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Databases and Other Natural Disasters

IT HAPPENED A FEW days after I got rid of WordStar and switched to WinWord. I'm talking about that big earthquake in Southern California a few years ago. Well, get ready for the floods, folks, I just dumped my database.

My job, my very techno-dweebish *existence*, involves working with high-tech equipment. So when I manage the Pasadena IBM Users Group's membership activities, I use a state-of-the-art program. At least it was, back in 1988.

I'm talking about FoxPro 2.01, an ancient database program. FoxPro has something most new computer users haven't experienced—a command line. You know, like a DOS C:> prompt? But FoxPro is even more minimalist. All you get is a big blank screen with a tiny dot in the corner. "Figure me out," it says. "I dare you." Once you get through the five-year learning curve, though, the program is utterly wonderful.

2000 REASONS TO SWITCH

IF FOXPRO IS SO GREAT, you're probably wondering, why did I switch? Well, a user group member called recently, complaining she hadn't received the monthly newsletter. "What's the deal?" she asked. "I renewed through 2001." The deal is that I'm in the same boat as the IRS: We're both sinking into the Year 2000 quagmire.

The problem is that old software, sometimes known euphemistically (or is that euthanistically?) as a legacy product, can't recognize dates beyond 1999. Type a year—say, '2006'—into FoxPro; it blithely changes it to '1906' and sticks its head into a bucket of bits.

Windows 95 can handle it, but lots of old programs won't know how to behave a few seconds after midnight on December 31, 1999. Fire up a few date-sensitive apps—a calendar or accounting program, for instance—then fill in a date field with '2001', and see if it's recognized.

> Once you get **through** the **five-year** learning curve, FoxPro is **utterly** wonderful.

For me, switching databases was as anxiety producing as giving up my morning cup of Starbucks dark roast. But the millennium is approaching and it had to be done. So I looked at two modern database programs and poured another cup of java (with a small *j*).

First, my secret to choosing software: I use the short-attention-span method. If I can't get a new program to do what I need in an hour or so, the party's over. And that's what led me to both Salsa for the Desktop and Lotus's Approach.

SPICY BUT PRICEY

AS STRANGE AS the name is, Wall Data's Salsa is a solid and unique program that doesn't act like a traditional database. From a Salsa starter kit—I used Contacts and Customers—I chose from fields suited to my business, dropping the items onto Salsa's desktop. Salsa then built the application—database, forms, relationships. The whole enchilada, so to speak.

Designing the database was a snap—actually fun—and modifying it wasn't difficult. But importing my existing database was tricky; it took me way too long to figure out how to do it. I also got impatient retrieving information from the database, and the $349 price tag is way too much dinero for me.

A SIMPLE APPROACH

ON THE OTHER HAND, when I tried the $85 Approach, I fell immediately in love. In 5 minutes flat I imported my entire 6000-name database into Approach. No fiddling required.

I also discovered a myriad of things I couldn't do easily in FoxPro. For example, I now have a serial number field, and every time I add a new record, the number is automatically bumped up by one.

Doing queries in Approach is amazingly quick and intuitive. What brought tears of gratitude to my eyes, though, was that it took me only 5 minutes to create buttons for each of my often-used queries. Really. Then I designed two forms—good-looking membership cards and a complicated list—in seconds, something that took an hour to accomplish in FoxPro.

Did I switch? You bet I did. And I should warn you: I'm now shopping around for a new spreadsheet program. Better batten down the hatches.

Lotus Approach

$85 street; Lotus; 800/343-5414, 617/577-8500; www2.lotus.com/approach.nsf

READER SERVICE NO. 677

Salsa for the Desktop

$349 list; Wall Data; 800/915-9255, 650/812-1600; www.walldata.com

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Contributing Editor Steve Bass is a licensed marriage and family therapist and president of the Pasadena IBM Users Group. *See page 14 for contact information.* ■

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HERE'S HOW

ANSWER LINE

Protect Your Computer From Interlopers

ALTHOUGH I SHARE A HOUSE WITH SEVERAL other people, I am the only one who owns a PC. Unfortunately, everybody else feels that they have the right to use it, and some of them are completely computer-illiterate. They don't know what they're doing, nor do they have any idea of how to undo what they've done. More than once I have found various items messed up on my computer, and no one in the house has admitted to doing it. I would like to be the only one who has access to Windows. How can I protect my computer from these freeloaders?

Name withheld by request

AS I MENTIONED in December 1997's *Answer Line* ("Sharing a Desktop in Windows 95"), Win 95 isn't a very secure operating system. But there are a few ways to keep other people—both at home and at work—off your PC.

First of all, if your PC has password protection built into its BIOS, you can block others from booting up at all. Go to your system's setup screen (you can probably get to it by pressing **<Delete>** before the PC starts to load Windows) and look for a Password option. After you create your password, make sure not to lose it.

If your BIOS doesn't provide any security, you can rename your win.com file. Shut down Windows, selecting the option *Restart the computer in MS-DOS mode.* At the DOS prompt (which will probably read 'C:\WINDOWS>'), type the command **ren win.com bill.com**. Then turn off your PC. When other people turn it on, they'll see only a DOS prompt and be told that an important file is missing. With luck, they'll be so scared they damaged your computer that they'll never touch it again. When you boot up you'll get the same thing, but of course you'll know that you can get to Windows just by using the DOS **bill** command.

Or you can simply take the power cable with you whenever you leave the house.

SWAPPING THE SWAP FILE: IS IT REALLY SAFE?

WHEN WINDOWS 95's swap file doesn't have enough room to grow, you'll experience slowdowns and even system crashes. One solution is to move the swap file to a roomier drive, as we suggested in "Let Your Swap File Roam" (*Answer Line,* August 1997). Readers who tried this, however, were scared off by Windows' ominous warning: 'You may not be able to restart your computer, or system performance may be degraded.'

Let me assure you that you really have nothing to worry about. Perhaps if you assigned the swap file to a drive and then removed that drive, Windows wouldn't start. And yes, you could slow Windows down by assigning the swap file to a slower drive than the default—but you could also speed it up by picking a faster drive. When I polled friends, *PC World* colleagues, and Internet newsgroups, I could not find one story of problems caused by a relocated swap file.

In fact, Brendan Pirie of Blacksburg, Virginia, recommends this trick for speeding up a new PC: Create an extra disk partition that's twice the size of your conventional RAM. That is, if your system has 32MB of memory, make the disk partition 64MB. Then move the swap file to the new partition, and set both the minimum and maximum sizes to the swap file size. Thus, the swap file remains a constant

By Lincoln Spector

ILLUSTRATION: JEFFREY PELO

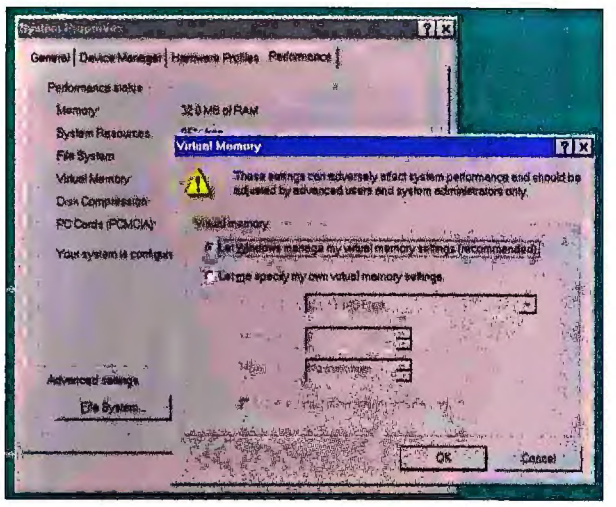

FIGURE 1: WINDOWS MAY say this is the default, but the swap file has been moved from C: to E:.

size and never gets fragmented, helping your system's performance.

And here's another needless concern we can thank Microsoft for: When you bring up Windows' Virtual Memory dialog box, you first choose between two radio buttons: 'Let Windows manage my virtual memory settings (recommended)' and 'Let me specify my own virtual memory settings'. The settings for the swap file's size and location are grayed out until you check the second option.

So you click this option, reassign your swap file to a different hard drive, click *OK*, and let Windows reboot your system. Then you go back to the Virtual Memory dialog box to check your new settings. But what's this? Once again the first option is selected, and all of your hard drive settings are grayed out!

Find Folks in Communicator

NEED TO FIND someone's e-mail address quickly? How about their telephone number? If you're using Netscape Communicator 4.*x*, you've got ultra-easy access to five online directories. Just select *Edit•Search Directory* for a convenient people-finding tool. All of the directories provide lists of Web sites where you can go looking for a contact, but it's quicker and easier to use this dialog box.

Just don't expect complete and accurate directories. When I conducted a search for myself, two of the directories listed current and outdated e-mail addresses, one gave me a new middle initial, one listed my phone number but said I didn't have an e-mail address, and one I couldn't reach at all.

Before you panic at the thought that Windows has blithely thrown out your changes, look again at those grayed-out settings. Windows is now displaying the hard drive you selected as the proper, Microsoft-managed choice (see **FIGURE 1**). It's just another way to keep customers confused and upset. (By the way, this harmless but annoying little display won't happen if you change the minimum or maximum swap file size.)

DO SCREEN SAVERS SAVE SCREENS?

I'M USING YOU AS a last resort for a very odd question. I use a scrolling marquee screen saver on my PC and want to know which is better for the monitor—a black background or a blue one? I don't want to burn in the screen, and I suspect that's more likely with a blue background. Am I right?

James Lainton, Bienfait, Saskatchewan

BACK IN THE DAYS of monochrome monitors, burn-in was a real problem. If a displayed image stayed on the screen too long without changing, a ghostly version of it would become a permanent part of the monitor's display. (You can still see this phenomenon on older automatic teller machines.)

But despite the claims of screen saver vendors, burn-in is no longer an issue with modern color monitors, and hasn't been for years. Even a hot pink background won't damage your screen.

CLOCK YOUR CD-ROM

IF I BUY A USED PC without any documentation, how can I find out the speed of its CD-ROM drive?

Gia Nguyen, Westchester, Illinois

THE ADVERTISED speed of a CD-ROM drive—6X, 16X, or what have you—is more a marketing tool than an accurate reflection of the device's performance. In theory, it means that the drive's throughput is *x* times faster than the 150 kilobytes per second managed by the first CD-ROM drives. In reality, the drive is probably slower than its rated speed.

Symantec's Norton Utilities 2.0 for Windows 95 or Helix's Nuts & Bolts can benchmark your CD-ROM drive, and with a simple calculation you can turn the numbers that either program gives you into a probable advertised speed. I also found one shareware program—SiSoft Sandra, from SiSoft Software—that can provide an actual speed. (Its CD-ROM test requires version 1.19 of the SiSoft package, which was in beta testing when I wrote this.) In informal testing on two PCs, all three packages produced reasonably close results.

Here's how to measure the speed of your CD-ROM drive with the Norton Utilities: Put the Norton disc in your CD-ROM drive and close all running programs. Then select *Start•Programs•Norton Utilities•System Information*, click the *Multimedia* tab, and click the *Benchmark* button. In the resulting message box, click *Continue*. Take a break while the benchmark runs. When you see the Benchmark for Multimedia dialog box, click the ▶

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CD-ROM tab. The number on the right compares your CD-ROM drive with the double-speed (2X) models that were part of the MPC Level 2 specification (see **FIGURE 2**). To get your drive's speed rating, multiply that number by 2.

If you use Nuts & Bolts, launch Discover Pro: Select *Start•Programs•Nuts & Bolts•Discover Pro*. Click the *Benchmarks* tab and select *Advanced•CD-ROM Benchmark•Run Benchmark*. The number you want is the Transfer Rate—the throughput in kilobytes per second—so divide that number by 150 to get your drive's speed.

If you don't have either of these commercial packages, you can download SiSoft Sandra from PC World Online or from www.city.ac.uk/~ax515/sandra.html. Once you've installed it, run the CD-ROM benchmark. You'll get a lot of numbers when it's finished; one of them, Drive Technology, is the number you want.

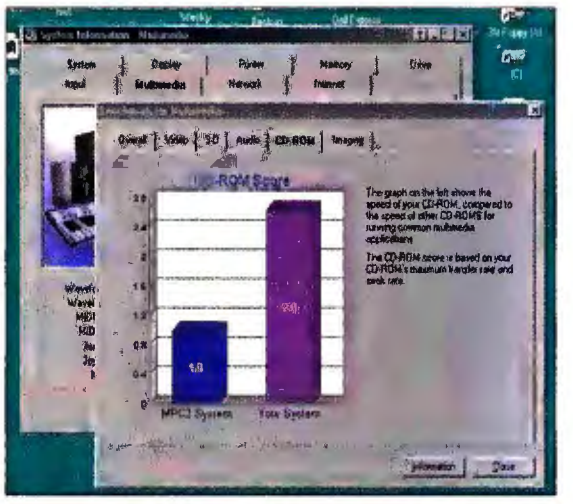

FIGURE 2: CHECK YOUR CD-ROM drive's speed with Norton's System Information.

START WITH A GOOD OUTLOOK

HOW DO I SPECIFY which part of Microsoft Outlook opens when I load the program? For example, instead of the e-mail in-box coming up, can I have Outlook open with the calendar?

Isaac Liu, Waco, Texas

YES, YOU CAN. Select *Tools•Options* and click the *General* tab. Near the bottom of the dialog box is a 'Startup in this folder' pull-down menu. Select *Calendar* (or any other folder you want to see at start-up), then click *OK*. The next time you load Outlook, it will start up where you want it.

ARE TWO BETTER THAN ONE?

I'M THINKING ABOUT getting a Pentium MMX-233 chip and putting it on a dual-processor motherboard with my old 166-MHz (non-MMX) CPU. Is this possible under Windows 95?

Joe Antrosio, Sequim, Washington

SORRY, WINDOWS 95 is a one-processor operating system. To take advantage of a two-processor motherboard, you'd have to upgrade to Windows NT. Also, motherboards that do support dual CPUs typically require the chips to be identical.

Find files from this article at www.fileworld.com and additional tips at www.pcworld.com/hereshow. Answer Line *welcomes your questions and pays $50 for published items. Lincoln Spector is a* PC World *contributing editor. See page 14 for contact information.* ■

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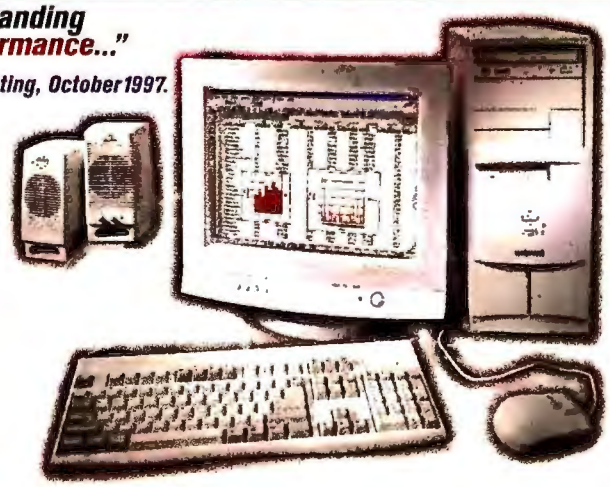

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Get fast access to files ◆ Put your PC on atomic time ◆ Unclutter Explorer windows

Stop Find Fast From Slowing You Down

IF YOU USE Microsoft Office 95 or Office 97, you may have noticed your PC becoming sluggish every couple of hours while the hard drive thrashes madly. What's going on?

Chances are it's Office's Find Fast utility doing its job. Find Fast builds indexes of all Office documents—those with extensions associated with Word, Excel, and so on—to rev up document searches in the suite's applications (such as those you can do when you click *Advanced* in an Open dialog box). To keep these indexes current, Find Fast updates them every 2 hours by default.

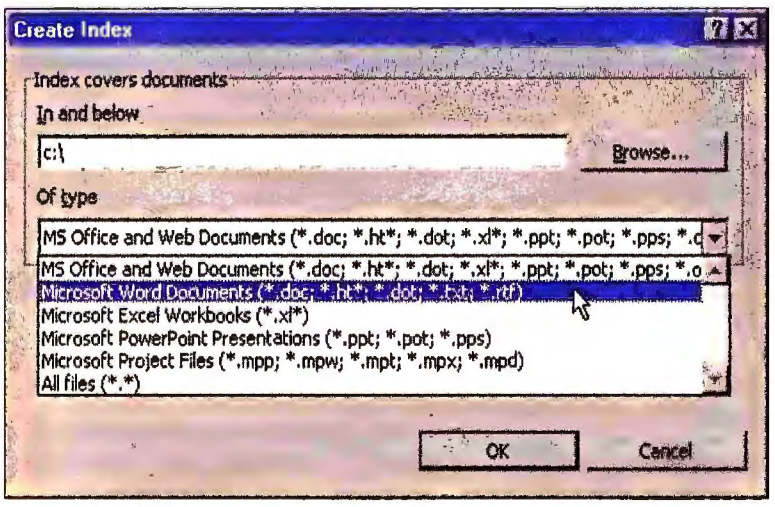

FIGURE 1: TAKE CHARGE OF FIND FAST by manually updating indexes instead of letting Microsoft Office interrupt your work.

If you do a lot of document searches or have a fast PC, this process may be tolerable. If not, I recommend one of these three strategies: Disable Find Fast entirely, manually update the indexes yourself when you're not busy, or change the update interval (Office 97 only).

To disable Find Fast completely, start by deleting the existing indexes. Choose *Start•Settings•Control Panel* and double-click the *Find Fast* icon. In the Find Fast window, choose *Index•Delete Index*. From the 'In and below' drop-down list, select an index and click *OK*. If the list has multiple indexes, repeat until you've deleted all of them. Then use Windows' Explorer to find and delete the Microsoft Office Find Fast Indexer Shortcut from your StartUp folder (look in Windows\Start Menu\Programs\StartUp).

If you're sure you'll never need Find Fast, you can run Office's setup and have it remove the utility completely.

To update the indexes manually, open the Find Fast window from Control Panel as explained above. Choose *Index•Create Index* to make a new index for a hard disk or folder. Type the path in the 'In and below' box, and select the file types you want indexed from the 'Of type' drop-down list (**FIGURE 1**). Make sure that *Continue to update automatically* is not checked, and click *OK*. To update existing indexes, choose *Index•Update Index*. Select an index from the 'In and below' drop-down list, be sure that *Continue to update automatically* is not checked, and click *OK*. Do this as often as you think necessary; for example, if you use the search feature infrequently, you might want to update the index right before a search.

If you use Office 97, you can let Find Fast work automatically but change its interval so it doesn't interrupt your peak work times. Open the Find Fast window from Control Panel as explained earlier. Choose *Index•Update Interval*. Type an interval in hours—for example, **168** tells Find Fast to update indexes once a week. (If you leave your PC turned on all the time, you could enter **24** some night when you're working late so you won't be around for most updates.) Click *OK*.

OPTIMIZE NETWORKING IN WINDOWS FOR WORKGROUPS

THESE DAYS MOST USERS of Windows for Workgroups 3.11 are connected to a network. Here are a few choice tips for keeping Windows networking in top shape.

1. Save time, not your screen. If you're sharing your disks, directories, or files with other people on the network, avoid using a screen saver. It can degrade performance for those using your shared resources. In Windows' Control Panel, double-click the *Desktop* icon. Under Screen Saver, choose *(None)* from the Name drop-down list, then click *OK*. If you must use a screen saver, choose one that makes minimal use of your CPU, such as Marquee.

2. Set your priorities. If you have a computer that is set up just as a file server or print server, adjust its performance priorities accordingly in Control Panel: Double-click the *Network* icon, then click the *Startup* button. Under Performance Priority, drag the slider toward *Resources Shared Fastest* if the system is used only as a file server.

If you sometimes use the computer or if it acts as a server for a locally connected printer, leave the slider somewhere in the middle so that the *Applications Run Fastest* option isn't neglected (**FIGURE 2**). That's because print servers must run Print Manager, which is an application. Click *OK* until you've closed all dialog boxes. Note that you can use the Performance Priority slider only on systems running in 386 Enhanced Mode. ▶

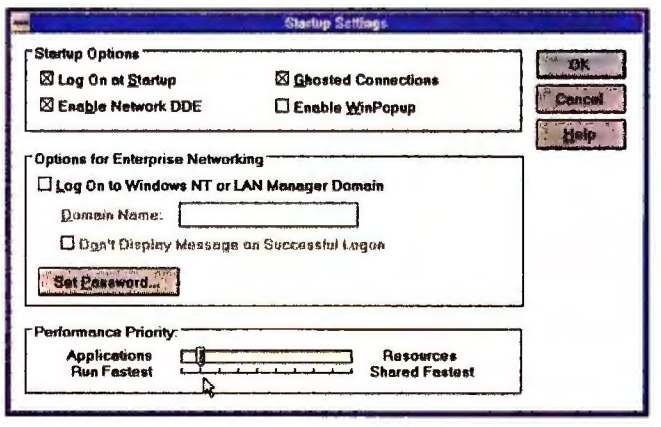

FIGURE 2: IMPROVE NETWORK performance in Windows for Workgroups by adjusting priorities.

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Five Tips for Keeping Folders at Your Fingertips

IF YOU KNOW the path to the folder you need, you may find that it's faster to open the folder with a little typing rather than clicking and scrolling and clicking again through Explorer windows. Here are five quick tips for faster folder navigation:

1. Press **<Ctrl>-<Esc>-R** (or choose *Start•Run*). Then type the path of the folder or file that you're looking for (**c:\jan98**, for example) and press **<Enter>**. If you include a file name in the path, Windows will open the file in its associated application.

2. Press **<Alt>-TG** (or choose *Tools•Go to*) in an Explorer window (the one that shows the file tree on the left) before typing the path you want.

3. Press the up and down arrow keys in either the Run or Go To Folder dialog box (or click the drop-down arrow) to navigate through recently opened folders.

If you used one of the two methods detailed above, you can save some keystrokes by checking to see whether a recently opened folder is already in the drop-down list. When you see the folder you want, press **<Enter>**.

4. Type **start** at a DOS prompt, then enter a space and the path of the folder you want to open—for example, **start c:\jan98**.

5. Type two backslashes (****) before the path name to open a folder on a networked computer—for instance, **\\shared\jan98**. If any part of the path contains spaces or long file names, enclose the entire path name in quotation marks.

3. Simply separate. Do you use Print Manager's separator page option to keep printouts organized by user? You can make printing go a bit faster by using the Simple separator page option instead of the standard one (which includes a Windows logo and takes longer to print). In Print Manager, choose *Options•Separator Pages* and select *Simple Separator Page*.

To save even more time—and plenty of paper—select *No Separator Page*. Then click *OK*.

4. Swap locally, not globally. Whether or not you're on a network, you should use a permanent swap file so Windows can use disk space when you run out of RAM, improving its performance.

To do this, double-click the *Enhanced* icon in Control Panel and click *Virtual Memory*. Then click *Change*, and in the New Swapfile Settings section, select *Permanent* from the Type drop-down list.

But whatever kind of swap file you select—permanent or temporary—don't choose a networked disk from the Drive drop-down list: You'll strangle performance on your own PC as well as on the networked computer.

5. Share and share alike—not! If the computer you're using never shares files or printers with other systems on the network, you can get more memory for your Windows applications by disabling file sharing and print sharing.

First, double-click the *Windows Setup* icon in Program Manager, and choose *Options•Change Network Settings*. Click the *Sharing* button, then uncheck the two boxes in the Sharing dialog box (**FIGURE 3**). Click *OK* twice to close all dialog boxes.

6. Don't give up the ghost. Make sure that you're using the Ghosted Connections option, which prevents your system from physically connecting to remote resources until you actually attempt to use them.

Enabling Ghosted Connections slows things down a tad when you go to use a remote resource (a network drive, for instance), but it greatly speeds start-up each time you go into Windows. In most cases, it's well worth the trade-off.

To make sure you're using this feature, double-click the *Network* icon in Control Panel and then click the *Startup* button. Make sure that *Ghosted Connections* is checked, and click *OK* twice to close all dialog boxes.

DRESS UP YOUR DISK ICONS

IT'S EASY TO customize the icons for Shortcuts and file types (see "Do-It-Yourself Icons," *Windows Tips*, October 1997), but giving a different custom icon to each of your drives isn't a feature that Microsoft planned on.

Well, you can add this feature yourself. The trick involves creating a custom autorun.inf file—the one that lets Windows 95 know which program to start automatically when a CD-ROM is inserted in the drive. Although this file is intended for CDs, you can also use it to customize drive icons.

Here's what to do. Choose *Start•Programs•Accessories• Notepad*. On the first line, type **[autorun]** and press **<Enter>**. On the next line, type **icon=** followed by the path to the file that contains the icon you want. For example, the line might read **icon=c: \windows\myicon.ico**.

You can also use an icon from any .dll or .exe file. There's only one catch: If the file contains more than one icon, you'll have to specify its number in the icon= line. To see which icons are available and determine the number for each, do ▶

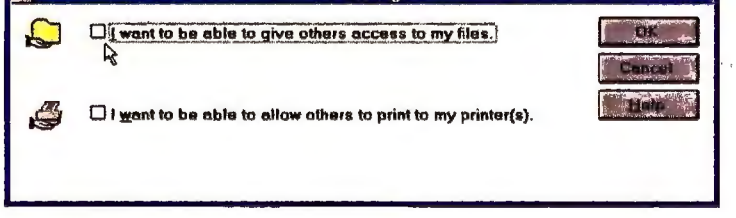

FIGURE 3: GET MORE MEMORY for your own applications by keeping other network users away from your files and printer.

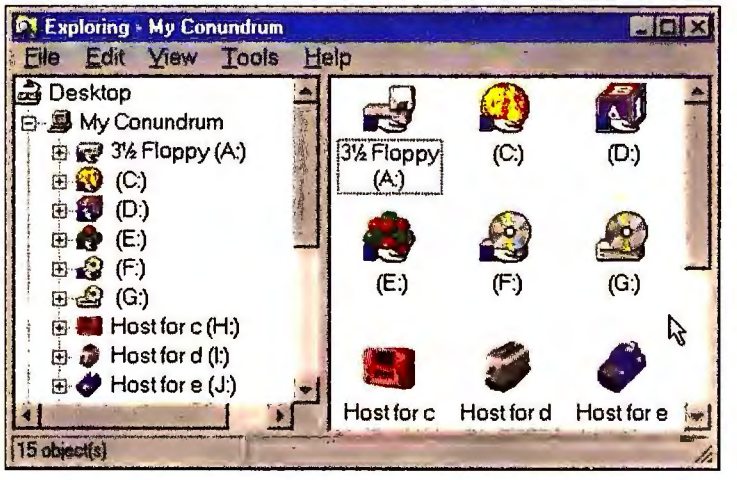

FIGURE 4: CUSTOMIZE THE ICONS FOR YOUR DRIVES by adding a small autorun.inf file to each.

ILLUSTRATION: JEFFREY PELO

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Max. Resolution	1,600 x 1,280	1,600 x 1,280	1,600 x 1,280	1,600 x 1,280	1,280 x 1,024	1,280 x 1,024	1,280 x 1,024	1,280 x 1,024	1,024 x 768	1,024 x 768
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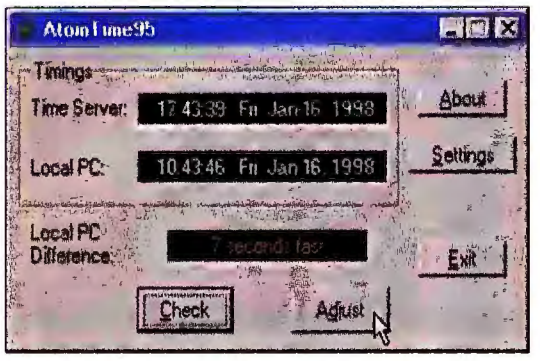


this: Right-click any Shortcut and choose *Properties*. Click the *Shortcut* tab and click *Change Icon*. For the file name, type the path and name of a file containing some icons—for instance, check out **c:\windows\system\shell32.dll** or **c:\windows\system\pifmgr.dll** (both files that come with Windows 95; your path may differ). Scroll through the available icons until you find one you like. Then find its number by counting its position from the left, with the first icon at the far left being 0. When you've found the icon you want and determined its number, click *Cancel* repeatedly to close all dialog boxes. Then return to Notepad and add the information. For example, if you chose the block icon in pifmgr.dll, your second line in Notepad should read **icon=c:\windows\system\pifmgr.dll,2** (your path may differ).

Now you'll have to save the file: Choose *File•Save As* and navigate to the root directory of any hard disk or partition. Under 'File name', type **"autorun.nf"**; include the quotation marks so that Notepad doesn't add a .txt extension. Then click *Save*.

The fastest way to repeat this process for multiple drives is simply to edit the icon= line to designate a different icon (if desired). Then choose *File•Save As* again, navigate to the root of a different drive, type **"autorun.inf"**, and click *Save* again.

To see your accomplishment, double-click *My Computer* and look at your drive icons (**FIGURE 4**). If any of the icons are still generic looking, you may have a typo in your icon= line. If you don't see your new icons right away, select a drive and press **<F5>** to refresh the window.

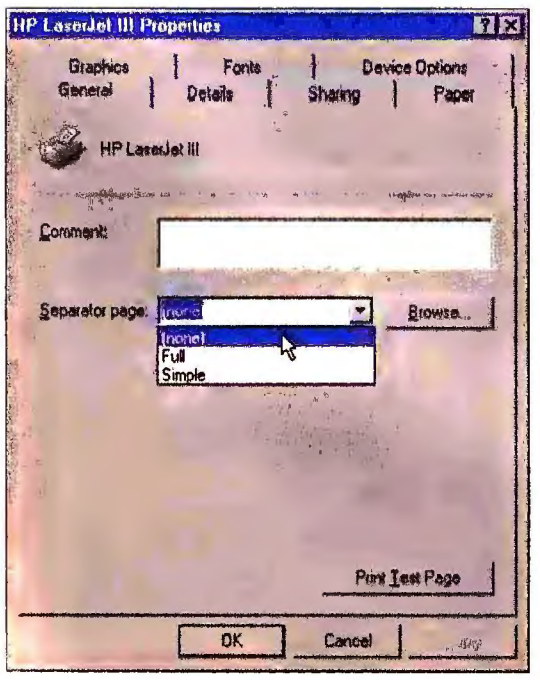


FIGURE 5: SAVE PAPER by instructing your printer not to print a separator page.

DON'T WASTE PRINTER PAPER

DOES YOUR PRINTER eject an identifying page along with every print job you send to it? If you don't need this feature, you can save a heap of paper by turning it off. Choose *Start•Settings•Printers*, right-click your printer's icon, and choose *Properties*. (If necessary, click the *General* tab to bring it to the front.) From the 'Separator page' drop-down list, choose *(none)*, as shown in **FIGURE 5**. Then click *OK*. You've just saved a little time and money.

If you still see a separator page, chances are it's originating from your network software rather than Windows. Consult your network documentation for a fix.

Find files from this article at www.fileworld.com. Windows Tips *welcomes your tips and questions and pays $50 for published items. Scott Dunn is a contributing editor for* PC World *and a principal author of* The PC Bible, 2nd Edition *(Peachpit Press, 1995, 800/283-9444).* *See page 14 for contact information.* ■

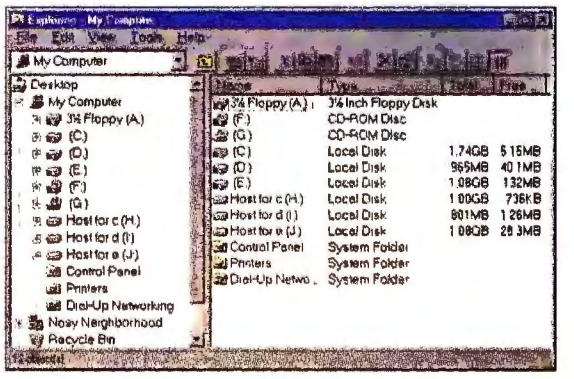
Simplify Explorer's Windows

PERHAPS I'M THE only person who doesn't want Windows Explorer to open with the default drive expanded in the left pane. I'd just like to see My Computer, the collapsed drives, and the few other objects (for example, Control Panel) that show up. In the default setup, the left pane is cluttered, usually with stuff I am not looking for. There must be a way to eliminate the clutter, but I haven't found it.

Kim Boriskin, Internet

YOU'RE NOT THE ONLY person who wants to see a nice, neat Explorer with everything collapsed, as shown in the figure below. Fortunately, the very thing you want is right at the tip of your pointer.

Just right-click the *My Computer* Shortcut on your desktop and choose *Explore* from the menu. The left pane will display all your local drives, mapped networked drives, Control Panel, Printers, Dial-Up Networking, and so on, all neatly collapsed and ready for you to click on the item you want.



You can also set things up so you get this view by double-clicking *My Computer*—no need to use the right-mouse menu: Open Explorer and choose *View•Options*. In the Options dialog box, click the *File Types* tab and select the *Folder* file type (not File Folder) from the 'Registered file types' list. Click *Edit*. In the Actions list, select *explore* and click *Set Default*. Click *Close* twice to close the dialog boxes.

The next time you double-click My Computer, you'll get the collapsed two-pane Explorer window you want. If you ever want a single pane, just right-click *My Computer* (or a folder) and choose *Open*.

To start this Explorer window from the Start Menu, just use the right mouse button to drag the *My Computer* icon to the folder of your choice inside the Start Menu subfolder in your Windows folder. When you release the mouse button, choose *Create Shortcut(s) Here*.

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Drop Zeros From Averages

I USE AN EXCEL WORKSHEET to track time billed by consultants, and then I use the Average function to calculate the average bill. However, I find that this calculation includes zero values. I need to compute the average bill but exclude those consultants who didn't work any hours. Is it possible to calculate the average of a range and ignore cells that contain a zero?

Bryan Davis, Evans, Louisiana

A SIMPLIFIED VERSION of Bryan's worksheet is shown in **FIGURE 1**. As you can see, the calculated average (cell D14) does indeed include values of zero. In this case, Excel's Average function returns 601 instead of the desired value of 751.25.

There are at least two ways to calculate the average of only the nonzero cells. First, you can modify the formulas in range D2:D11 so they return a blank or a text string instead of a zero, then calculate an average—the Average function ignores blank cells and text. For example, the following formula (in cell D2) returns a blank if B2*C2 returns zero:

=if(B2*C2=0,"",B2*C2)

If you'd rather display the zeros in column D, try the second approach, which uses the Countif function to return the number of cells that don't contain a zero. The following formula, entered in cell D14, computes the sum of the values in column D divided by the number of nonzero cells.

=sum(D2:D11)/countif(D2:D11,"<>0")

consultants.xls

	A	B	C	D	E
1	Consultant	Hours	Hourly Rate	Total	
2	Bill	35	$35.00	$1,225.00	
3	Tom	42	$30.00	$1,260.00	
4	Julie	0	$80.00	$0.00	
5	Inez	20	$42.00	$840.00	
6	Julio	0	$50.00	$0.00	
7	Peter	39	$25.00	$975.00	
8	Ralph	11	$25.00	$275.00	
9	Howard	4	$25.00	$100.00	
10	Robin	24	$35.00	$840.00	
11	Sally	9	$55.00	$495.00	
12					
13	Grand Total:			$6,010.00	
14	Average Expenditure:			$601.00	
15					

Sheet1

FIGURE 1: IGNORE ZEROS when finding an average—convert them to blanks, or use the Countif function.

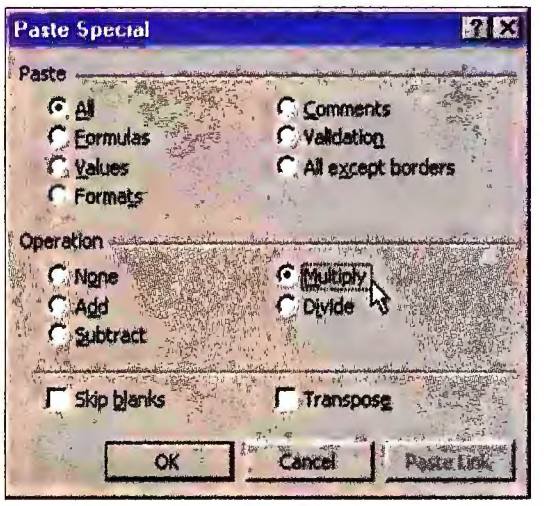

FIGURE 2: THE PASTE SPECIAL dialog box lets you update a value without a formula.

CHANGING VALUES WITHOUT USING FORMULAS

I MAINTAIN SEVERAL price lists in an Excel worksheet. Occasionally, I need to increase a group of prices by a fixed percentage. For example, I recently needed to increase the prices for a product line by 5 percent. I created formulas that did the calculations, and then I used the Edit•Paste Special command to replace the original values with the calculated results. Afterward, I deleted the formulas.

Is there a less cumbersome way to achieve the same result?

Tina Reynolds, Corvallis, Oregon

YOU BET THERE IS, and the solution also involves the Edit•Paste Special command.

Let's say you have a list of values in range A2:A100 that you want to increase by 5 percent. Follow these steps:

1. Enter **1.05** into any blank cell and select *Edit•Copy*.
2. Select the range you want to modify—in this case, A2:A100.
3. Choose *Edit•Paste Special*.
4. In the Paste Special dialog box, select the *Multiply* option (**FIGURE 2**) and click *OK*.
5. Delete the value you entered in step 1; it's no longer needed.

This operation multiplies the values in the selected range by 1.05, which is equivalent to increasing the values by 5 percent.

A BUG IN EXCEL?

COMMON SENSE TELLS me that squaring a negative value always produces a positive result. However, this does not appear to be the case in Excel. To see what I mean, look at the results of the following formulas. Does Excel have a bug?

Formula	Result
=-3^2	9
=0-3^2	-9

S. H. Chen, Palo Alto, California

NO, THIS IS NOT A BUG. And by the way, you'll get the same results in 1-2-3 and Quattro Pro. To understand the result of the second formula, you need to be aware of the order of precedence for mathematical operations in a formula (see **FIGURE 3**).

In your first example, the minus sign is a negation operator and has the highest precedence. In your second example, the minus sign is a subtraction operator and has a lower precedence than the exponentiation operator. Therefore, 3 is first squared, and the result is then subtracted from zero, giving a negative number.

To avoid unexpected results, always use parentheses to ensure that formula terms are evaluated in the order that you intend. Enclosing an expression in parentheses overrides the natural order of precedence. For your second example, you'll get the expected result if you change the formula to **=0+(-3^2)**.

Order	Operator	Description
1	–	negation
2	%	percentage
3	^	exponentiation
4	* and /	multiplication and division
5	+ and –	addition and subtraction

FIGURE 3: MATHEMATICAL OPERATIONS are performed in this order of precedence.

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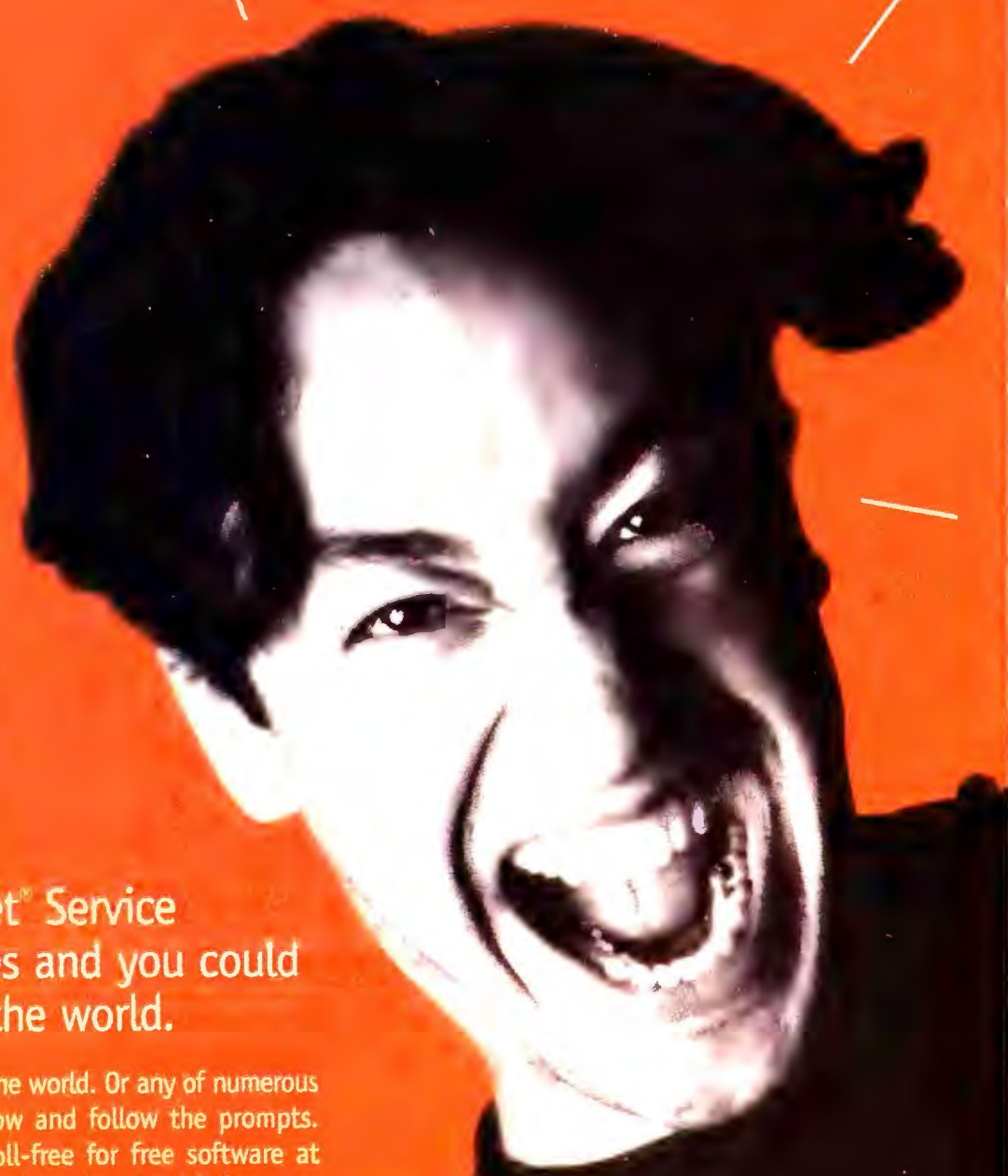

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Design complex layouts ◆ Unclutter toolbars ◆ Get a helping hand in WordPerfect

Adding Symbols Is About as Easy as π

ALL FONTS AVAILABLE in Windows applications contain numerous characters not available on your keyboard, including international characters, fractions, and proofreaders' marks. In addition, certain fonts, such as the Symbol font installed automatically with Windows, consist solely of specialized characters and symbols. Getting these characters into your document is fairly simple in most word processors. Here's a quick guide:

Word: In all versions of Word, follow these steps to insert symbols:

1. Place the cursor where you want the symbol to go, and select *Insert•Symbol.*
2. In the Symbol dialog box, click the *Font* drop-down list and select the font that contains the symbol you need. **Note:** To choose a character from the current font in your document, choose *(normal text)* in the list. To insert typographical and other common characters, click the *Special Characters* tab. (**FIGURE 1**).
3. Click on any character to view an enlarged image of it.
4. To insert a character, double-click it or click *Insert.*
5. Click *Close* to close the dialog box.
6. If you think you'll be using a character frequently, you can assign it a shortcut key combination. (Symbols on the Special Characters tab are already assigned shortcuts.) Click on the character, then click the *Shortcut Key* button. In the resulting dialog box, enter a keystroke combination. If the combination is already assigned to a function, you'll see that function displayed in the dialog box. **Hint:** Try **<Shift>-<Ctrl>-<Alt>-***letter* combinations—they aren't already assigned to Word functions. Once you've pressed the combination you want, click *Assign* to make it permanent.

WordPerfect: In all versions of WordPerfect, follow these three steps:

FIGURE 1: INSERT SPECIAL SYMBOLS and International characters by selecting them from Word's Symbol dialog box.

1. Place the cursor where you want the symbol to appear, and press **<Ctrl>-W.** (**Note:** You can use this keystroke in ▶

Create Fancy Page Layouts With Word 97's Custom Tables

NEWSLETTERS, BROCHURES, and advertising flyers with complex layouts are typically designed in sophisticated and expensive desktop publishing programs such as QuarkXPress or Adobe PageMaker. But you can get many of the same effects with Word 97's new table-drawing feature. Here are some ways to use this handy tool:

❶ Make the whole page a table. This technique works best if you treat the entire page as a table. First switch to a view of the whole page: Choose *View•Page Layout*, then select *View•Zoom•Whole Page.* Click the *Tables and Borders* icon on the standard toolbar, and then click and draw a single cell from the top left corner of the page down to the bottom right corner. The Tables and Borders toolbar will pop up when you do this. You can then draw other cells of any size within this main cell. You might want to switch back to a more convenient Zoom view after drawing the main cell.

❷ Create a space for a headline with a single cell. Click the *Pencil* icon on the Tables and Borders toolbar, then click and drag a new cell to the size you need. Type your headline in the cell, then highlight the text and apply formatting to suit your needs.

❸ Create a block of vertical text. An area of vertical text can add impact to documents like flyers. To do this, draw a narrow, vertical cell, then type your emphasis text in the new cell. To rotate the text, click in the cell, then click the *Change Text Direction* icon on the Tables and Borders toolbar repeatedly until you get the effect you want. Apply any desired formatting to the vertical text.

❹ Add borders and lines. Anywhere you place a cell or group of cells on your layout is a place you can add lines or borders. Click inside the cell, or click and drag to select multiple cells. Then click the arrow next to the *Borders* icon on the Tables and Borders toolbar and choose one of the options there. Control line style, thickness, and color with the other drop-down selections to the left of the *Borders* icon.

❺ Add background shading. You can further emphasize any text in a cell by adding color. Just click in the cell, then click the arrow next to the *Shading Color* icon on the Tables and Borders toolbar. Select a color or a shade of gray for a background.

❻ Add graphics. If you want to place clip art, charts, or other objects inside your cells, first select *Insert•Text Box* and click and drag the box to size. Then insert your graphic inside the box: Select *Insert•Picture•From File.*

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the Find and Replace and other dialog boxes to call up the Symbols dialog box.)
2. Click the *Character Set* or *Set* (if you have version 8) list, and select a set of characters. (**Note:** If you choose the ASCII or Multinational set, the symbol you select will appear in that font. Otherwise, it will appear in WordPerfect's own font.)
3. Click the symbol you want to insert, then click the *Insert* button, or click the *Insert and close* button to close the dialog box. You can also double-click the symbol to insert it and leave the dialog box open.

Word Pro 97: If you're using Lotus's latest word processor, follow these steps:
1. Place the cursor where you want the symbol to appear, and select *Text•Insert Other•Symbol.*
2. In the Insert Symbol dialog box, select the current document font or a symbolic font from the *Font* drop-down list.
3. Click the symbol you want to insert, then *Insert*, or double-click the symbol.
4. When you've finished, click *Done.* **Note:** If you've switched to a different font in the Insert Symbol dialog box, change back to your original font in Word Pro itself.

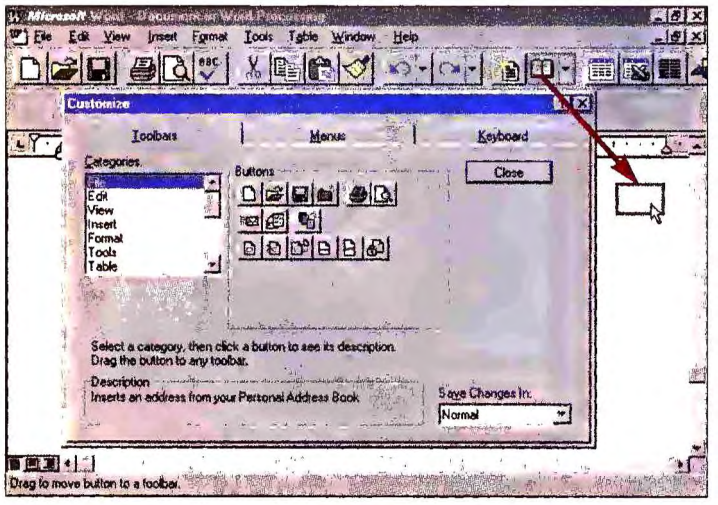

FIGURE 2: REMOVE UNUSED ICONS from Word's toolbars.

Word Pro 96: Word Pro versions prior to version 97 offer no built-in tools for inserting special characters and symbols. However, you can use the Windows Character Map for the same purpose:
1. Start Character Map by selecting *Start•Programs•Accessories•Character Map* (in Windows 95) or double-clicking the *Character Map* icon in the Accessories group (in Windows 3.*x*).
2. In Word Pro, place the cursor where you want the symbol to appear, then press <Alt>-<Tab> to switch to Character Map.
3. Select the current document's font from Character Map's Font list, or choose a symbolic font (Symbol or Wingdings, for example) that has the desired character.
4. Click and hold on any character to magnify it. Double-click to copy it into the 'Characters to copy' box. When you're done, click *Copy*, then press <Alt>-<Tab> again to switch back to Word Pro.
5. Select *Edit•Paste* or press <Ctrl>-V to paste the characters into your document. By default, they'll appear in the font you selected in step 3.
6. If you chose a character from a symbolic font, don't forget to switch back to the font you were using in the document before you start typing again.

SIMPLIFY WORD'S TOOLBARS

ODDS ARE THAT Word's toolbars contain plenty of icons you never use. So why not get rid of them?

Here's how to reduce toolbar clutter in Word 6 and later versions:
1. Make sure the toolbar you want to simplify is already on the screen. If it's not, right-click on any Word toolbar, then select the toolbar from the pop-up menu.
2. Select *Tools•Customize*, and in the Customize dialog box, click the *Toolbars* tab.
3. On the toolbar, *not* in the Customize dialog box, click the button that you want to remove, then drag it into the document window and drop it there, as in **FIGURE 2.**
4. You also have the option of rearranging a toolbar or dragging a button onto a different visible toolbar, as long as the Customize dialog box is still open.

WHERE DID IT GO IN WORDPERFECT 8?

IF YOU'VE RECENTLY upgraded to WordPerfect 8, you may be confused about changes in the program. Since many commands have moved to new menu locations, finding them can be tough.

To see a quick list of what's been moved, select *Help•Help Topics*, click the *Contents* tab, and double-click *What Is Different?* then *Where Did It Go?*

RELY ON FAMILIAR TOOLBARS IN WORDPERFECT 8

IF YOU CAN'T GET USED to the new toolbars in WordPerfect 8 or have to use the new version temporarily, you can switch to the toolbars and menus you're familiar with in previous versions.

Just right-click on the menu or on the main toolbar, and select the menu or toolbar for the version you prefer from the pop-up menu, as in the figure. **Note:** You'll temporarily lose access to some new features that are not available in the old toolbars and menus.

ADD ENTRIES TO WORD PRO'S SPELLING CHECKER

IN WORD PRO 96 and 97, you can always add a word to your standard user dictionary during a spelling check by clicking the *Add to User Dictionary* button. However, most people don't know that you can add words manually at any time. This method can be handy when, for example, you need to add a list of words and terminology for a specialized field. Just follow these simple steps:
1. Select *Edit•Check Spelling.*
2. Click *Options*, then *Edit Dictionary.*
3. Type the word you want to add, then click *Add.*
4. Repeat step 3 for each word.
5. Click *Save* to save your changes.
6. Click *OK* twice to close the dialog boxes and return to your document.

You can also remove words from the user dictionary if you make a mistake. To do this, follow steps 1 and 2 above, then scroll through the list of words or type the first letter of the word to speed things up. Click on the word to be removed, then click *Remove.* Be sure to click *Save* before leaving the dialog box.

Word Processing *welcomes your questions and tips and pays $50 for published items. Contributing Editor George Campbell is a contributor to* The PC Bible *(Peachpit Press, 1995, 800/283-9444).* *See page 14 for contact information.* ■

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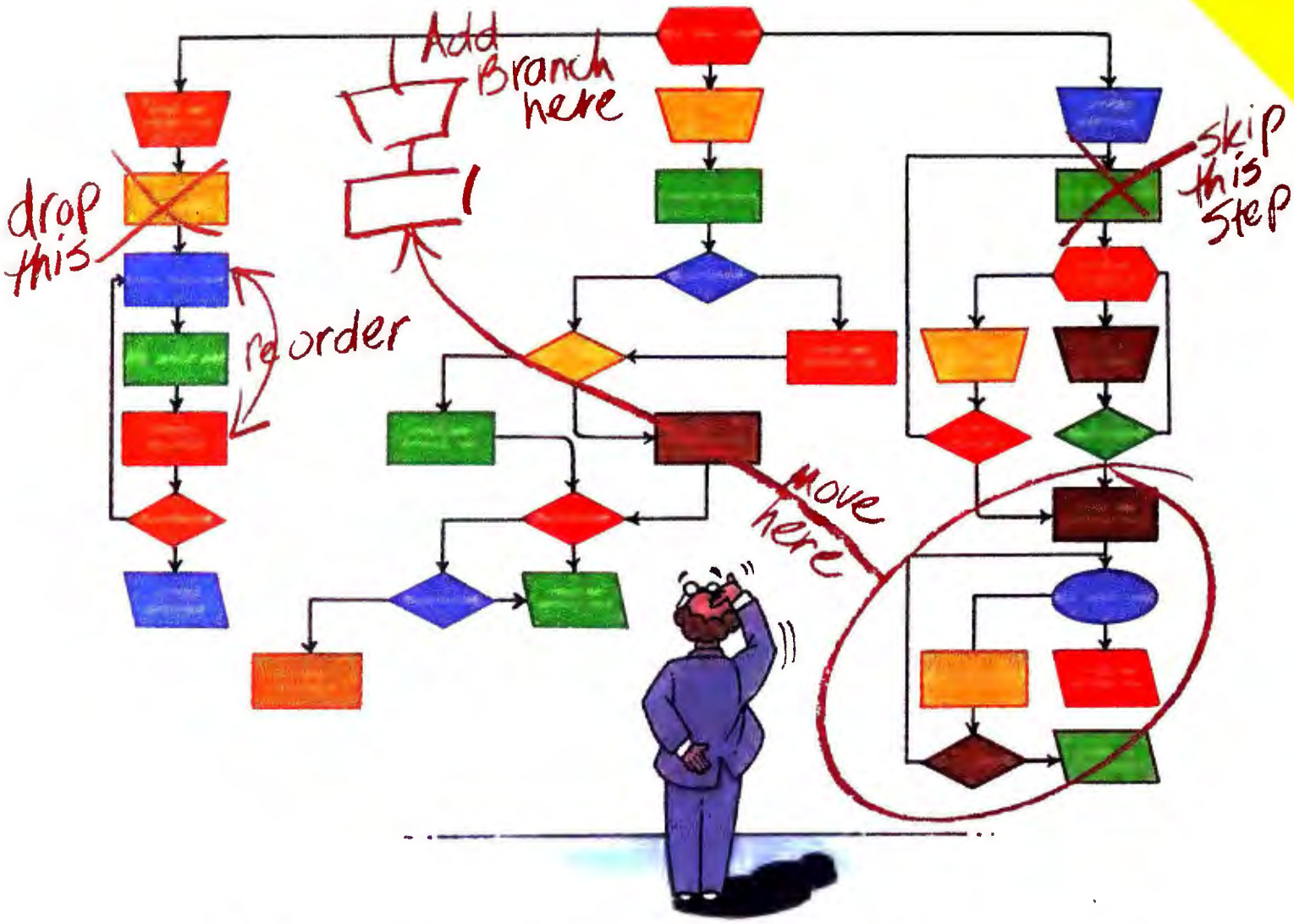

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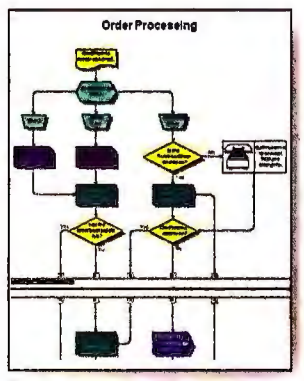

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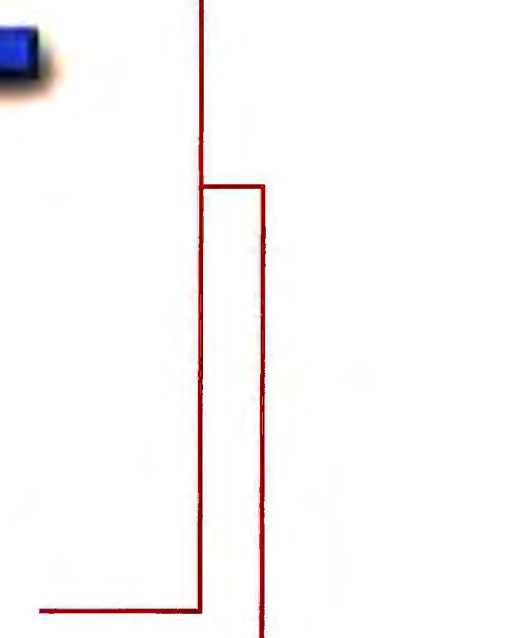

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Delete e-mail messages ◆ Get driving directions ◆ Avoid cable modem insecurity

Conquer AOL Annoyances With Free Dial-Up Utility

AMERICA ONLINE ALWAYS gets bigger, but it never gets less irritating. Now you can minimize your dial-up hassles with one of the niftiest AOL software add-ons to appear in a long time—Lou A. Moccia's AOL95 Redialer+ (see **FIGURE 1**).

This freeware utility will automatically redial AOL's number when busy signals buzz. It will enter your password and screen name. Once online, it will minimize the Welcome news window and dispel AOL's annoying and often incorrect reminders that you've been online too long with no activity. You can even set it to automatically answer instant messages that intrude at inconvenient times.

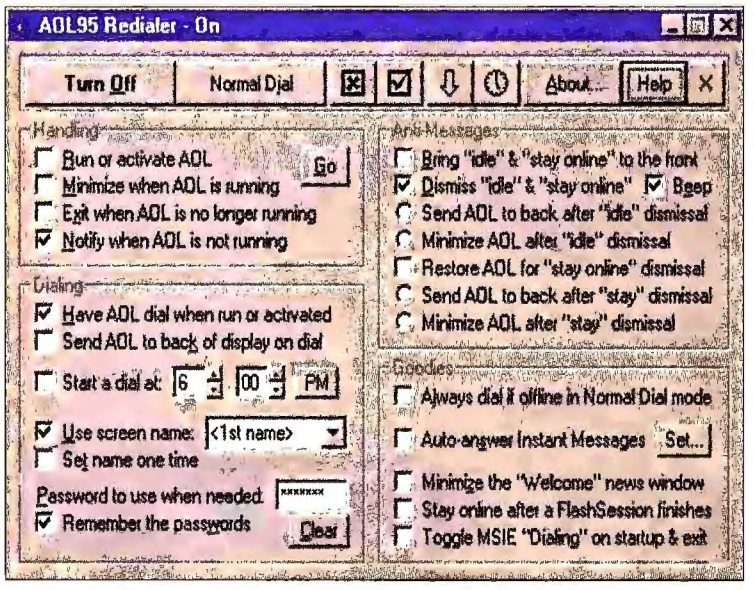

FIGURE 1: AOL95 REDIALER+ saves you connection hassles by automatically redialing America Online.

AOL95 Redialer+ works with AOL 3.0 and Windows 95. You can find the latest version of the utility on PC World Online.

SPEED TO SITES WITH WINDOWS 95'S RUN COMMAND

GEORGE COOK OF Jacksonville, Florida, writes that you can speed your way to Web and FTP sites by clicking Windows 95's *Start* button, then selecting the *Run* command. In the dialog box that appears, type the URL or the FTP address. (You can even type the subdirectory and name of the file you want to download, such as **ftp.microsoft.com/softlib/mslfiles/rptsampl.exe**.) Click *OK*. Windows 95 will dial your Internet service provider, load your browser—either Netscape's or Microsoft's—and head to the site.

PRINT SELECTED WEB PAGES WITH COMMUNICATOR

WHEN BOB SCHLICHT of Springfield, Virginia, wanted to print a small section of a Web site, he headed to the Print command in Netscape Communicator's File menu. But the choice there is either to print the entire site—which may span 30 pages or more—or to enter selected page numbers that rarely correspond to the actual Web pages.

The solution that Schlicht found is very simple: Select *Print Preview* from the File menu to check the numbers of the Web pages you want to print. When you're ready to print, type those page numbers (instead of the ones you might see on the site) in the Print dialog box (see **FIGURE 2**).

Unfortunately, Microsoft's Internet Explorer lacks a comparable feature.

TURN ANIMATION OR LOGOS INTO WINDOWS 95 WALLPAPER

IS THERE a way to take animated art from the Internet and turn it into moving wallpaper in Win 95?

John Green, Decatur, Alabama

THERE IS A WAY, and it's not hard, but you'll need Internet Explorer 4.0.

First, find an animated GIF file that you like. For a good selection of moving GIFs, head to The 1st Internet Gallery of GIF Animation (members.aol.com/royalef1/galframe.htm). Choices range from dragons to flying golf balls. When you find an animation you like, drop the artist a note and ask for permission to use it. (Most animation on the Internet is copyrighted.)

Once you have the artist's okay, save the graphic to disk by positioning your cursor on it, clicking the right mouse button, and clicking *Save Picture As*.

To turn the image into a desktop background, you have to create an HTML document for it. Your HTML coding can be as complex as any Web page (in fact, you can turn your own Web page into wallpaper) or as simple as this:

```
<html>
</body>
<center>
<body bgcolor=#ffd700>
<img src="carbucks.gif">
```

The name of the animation file in the above code is carbucks.gif. The background will be white; if you would like to make it black, add the line **<body bgcolor=#000000>**.

Create the HTML document by entering the coding into your word processor, and save it as a text-only file with an .htm extension. Save it in the same directory where the animated GIF is located.

To use this file as your desktop wallpaper, select *Start•Settings•Control Panel*, double-click the *Display* icon, make sure the *Background* tab is selected, and then click the *Browse* button. Head to the directory where your mini-HTML file and ▶

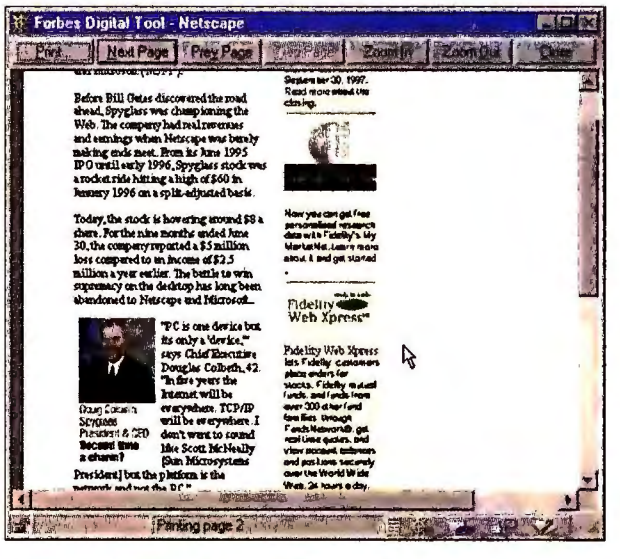

FIGURE 2: USE COMMUNICATOR'S Print Preview to print only the part of a Web site that you want.

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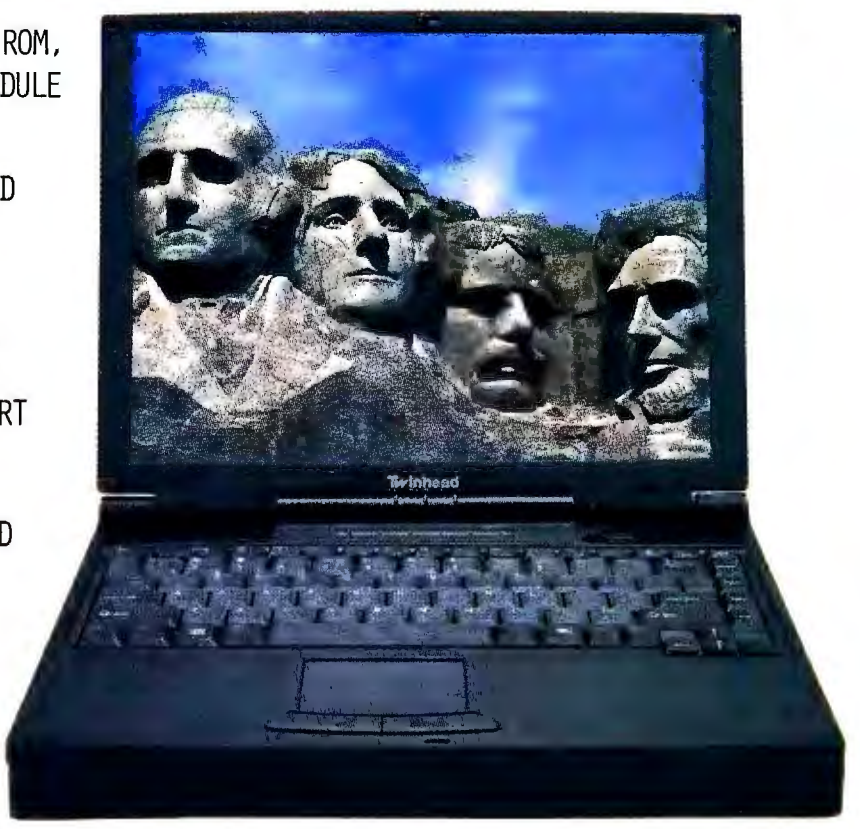

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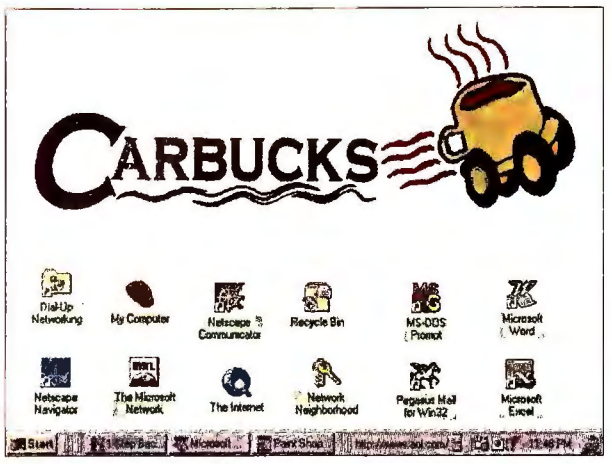

FIGURE 3: TURN YOUR COMPANY'S ANIMATED LOGO into wallpaper with some HTML coding.

animated GIF are located, select the HTML file, and click *OK* to accept it as your wallpaper.

You can also turn the company logo—animated or not—into desktop wallpaper. See **FIGURE 3** for sample results.

Or how about displaying your company's Web page as a background on all your employees' PCs? It's sure to coordinate with all those corporate-logo mouse pads.

EXPLORER INTERNET MAIL BONDAGE REDUX

LIM CHEE KEONG OF Singapore found out that deleting e-mail messages from the Deleted Items folder in Internet Explorer 3.*x*'s Internet Mail and News directory still doesn't get rid of them, despite what we said (see "Internet Mail Bondage," *Internet Tips,* August 1997). It actually only *hides* these messages.

To truly remove all the messages that you've deleted, you must compact Internet Explorer's Internet Mail folders: From the File menu, select *Folders•Compact all folders*. Not only will this purge unwanted mail, it will also recover lots of disk space.

FIND DRIVING DIRECTIONS WITH MAPBLAST

WORRIED THAT YOU'LL get lost on your way to a business meeting or give the wrong directions to visitors? Check out Vicinity's MapBlast (www.vicinity.com/mapblast/). Type your address, and MapBlast will draw a very helpful map that you can send by e-mail or even link to your home page. Type in a destination address, and MapBlast will give you the most direct route, assuming the destination is less than 1000 miles away (see **FIGURE 4**).

WHAT'S ON CABLE? YOUR PC

IF YOU'RE USING A CABLE MODEM and Windows 95, you could be leaving your PC open to other cable subscribers. Cable-based Internet access services, such as @Home Network and MediaOne, function as a private network. And cable system users who enable Windows 95's file sharing may be giving everyone in the neighborhood access to their hard disk.

The simplest solution is to turn off file sharing. Select *Start•Settings•Control Panel* and double-click the *Network* icon. In the Network dialog box, make sure that the *Configuration* tab is selected, click the *File and Print Sharing* button, and deselect both check boxes.

LAVISH WEB GRAPHICS MADE EASY

ONE OF THE BEST PROGRAMS for creating Web graphics is the $69 Paint Shop Pro shareware from Jasc (www.jasc.com; 800/622-2793, 612/930-9800).

There's a terrific guide to using it: *Creating Your Own Web Graphics with Paint Shop Pro,* by Andy Shafran and Dick Oliver ($34.99, Que, 1996, 800/716-0044). The book answers all the questions that newcomers to Web site creation most frequently ask. Readers learn how to create custom buttons and icons, how to build transparent and animated GIFs, and how to scan in photographs.

FIGURE 5: GIVE A COWORKER a virtual bouquet from the Internet Florist Association.

SEND VIRTUAL CARDS AND FLOWERS—FOR FREE

SENDING CARDS to friends and relatives is as simple as heading to a site like that of Parsons Technology (www.parsonstech.com/cstudio/cardshop/). Choose a greeting card design, add a message, and type in your recipient's e-mail address. That person will then receive a message saying that there's an electronic greeting card waiting on the Parsons site. The e-mail service is free.

The Internet Florist Association (www.virtualflorist.com) offers a similar service for people who want to send virtual flowers. Choose from a variety of arrangements ranging from the traditional roses (see **FIGURE 5**) to the otherworldly "Greetings from Roswell." An e-mail message will inform your recipient that they need only log on to the IFA's site to view the flowers and your greeting.

Of course, the IFA is hoping you'll buy a real bouquet instead. When I sent myself flowers using my husband's e-mail address at work as that of the sender, he received notification that I had sent myself cyberposies—and then he sent me the real thing.

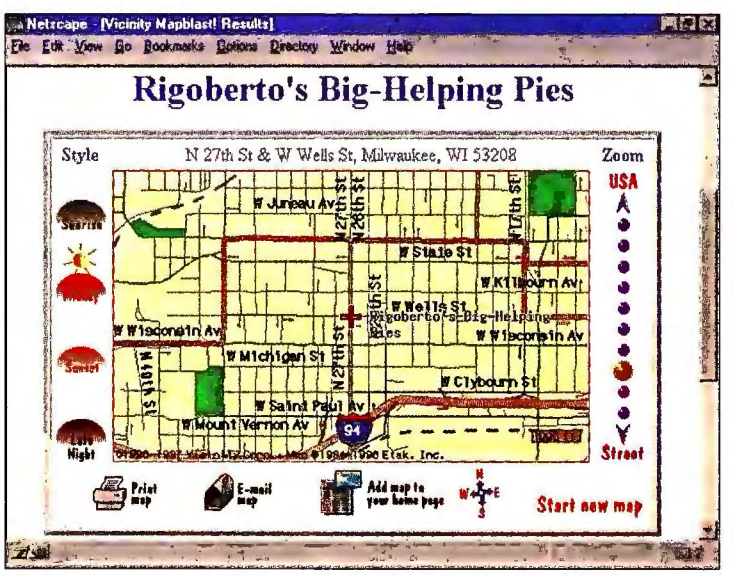

FIGURE 4: E-MAIL YOUR CUSTOMERS a MapBlast map or instructions showing how to get to your business.

Find files from this article on PC World Online at www.fileworld.com. Internet Tips *welcomes your questions and tips and pays $50 for published items. Contributing Editor Judy Heim is a co-author of* The Quilter's Computer Companion *(No Starch Press, 1997, 800/420-7240).* *See page 14 for contact information.* ■

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Choose the right surge protector ◆ Troubleshoot notebook power-saving problems

End PC Power Struggles

YOUR PC IS A finicky eater. It lives on a constant diet of electricity—precisely regulated direct-current power. Disturb the flow in the slightest and you've got a cranky computer, with pesky intermittent errors, shortened battery life, and even system crashes. Here's what you need to know about power supplies, surge protectors, and notebook batteries.

PC ELECTRICITY 101

COMPUTERS OPERATE on *direct current*—better known as *DC*—the current produced by batteries. A DC current (measured in *amperes,* or *amps*) flows through your computer like water through a pipe. It's driven by a constant force, or voltage, that's measured in *volts.*

Unfortunately, your computer can't get constant-voltage direct current from a wall socket, which offers only alternating current, or AC. Unlike the well-behaved DC, AC fluctuates between positive and negative values at a frequency of 60 cycles per second. Converting the fluctuating AC into constant DC is the job of your computer's power supply.

If your PC's CPU is its brain, then its heart is the power supply. The power supply takes in the 110-volt alternating current from your wall socket and pumps out 3.3V, 5V, and 12V direct current that powers the PC's motherboard and drives. In desktops, the power supply is a metal box mounted above or next to the motherboard. In most notebooks, it's an external device that doubles as a battery charger.

A power supply is maintenance-free; about all you'll ever have to do with it is clear the vent for its built-in fan. But power supplies do fail, sometimes slowly, and need to be replaced. Here (and in FIGURE 1) are a few things to look for:

- The built-in fan can break. If you don't hear the fan's reassuring whir, turn off your PC immediately.
- Sometimes small voltage swings can make the PC's fast and power-hungry memory misfire, producing intermittent memory-error messages. However, these can also be caused by fluctuations in external power. If you are consistently getting memory-error messages, the problem likely lies with the memory itself. But if the messages appear somewhat randomly, your power supply could be the culprit.
- If your PC's screen is blank but you hear components running, the power supply may not be working correctly. Most power supplies run an internal test on start-up to verify that proper voltages have been established. Once this is confirmed, a special signal is sent to the motherboard. If the signal is interrupted, processing on the motherboard stops, but hard disks and fans keep running.
- Error messages and other difficulties during your PC's initial power-up that don't recur on subsequent warm restarts may also indicate power supply trouble. These problems indicate that the signal is being sent to the motherboard before the power supply voltages have stabilized.
- If you activate your PC's power switch and nothing happens, the power supply is probably dead. But check that it's plugged in and that your surge protector isn't turned off.

REPLACING POWER SUPPLIES

FORTUNATELY, MOST power supplies live longer than the PCs they power. But if your supply does fail, you can pick up a new one at a good computer store for about $40 to $70.

The hardest part about replacing your power supply is finding one that fits. Many PCs use power supplies that conform to a common motherboard form factor such as ATX, AT, or Baby AT. Look at your system manual or check with the vendor, and be aware that certain suppliers sometimes tweak the form factor.

Make sure your new power supply has enough connectors for attaching to hard disks, floppy and CD-ROM drives, and other components. Your best bet is to remove the old power supply and carefully compare it to any new supply before making a purchase.

Swapping power supplies is easy. First, unplug the computer. Make a detailed drawing of which connectors go where—especially on the motherboard—and disconnect. Undo the four screws on the outside of the case that secure the power supply. Gently lift it out. To install the new supply, reverse the process.

GRABBING EXTRA POWER

MOST PCS SOLD today come with at least a 200-watt power supply—plenty of capacity for an average configuration. But the supplies in many older systems, and especially in low-cost clones, may not be powerful enough to support additional demands. So before adding any extra component to your system, make sure your power supply can handle it.

First, find your power supply's maximum wattage capacity. It should be written on the outside of the supply case or in your system documentation.

Compare this number to your PC's power needs by adding up the individual wattage requirements of each component (including any new devices you wish ▶

When Good Power Supplies Go Bad

- Fan stops running.
- Intermittent memory-error messages.
- Intermittent error messages on start-up.
- Hard drive operates but nothing appears on screen.
- Nothing happens when power is turned on.

FIGURE 1: WATCH FOR THESE SIGNS of possible problems with your power supply.

ILLUSTRATIONS: JEFFREY PELO

Trying to get your head around AGP?

POWERED BY RAGE PRO 3D GRAPHICS

ATI has long been leading the way in 3D chip and board manufacturing - delivering break-through technology to top OEMs including IBM, DELL, SONY, Gateway, ACER and NEC. So, when Intel launched AGP, who else would you expect to be leading the way with fully-implemented AGP solutions except ATI?

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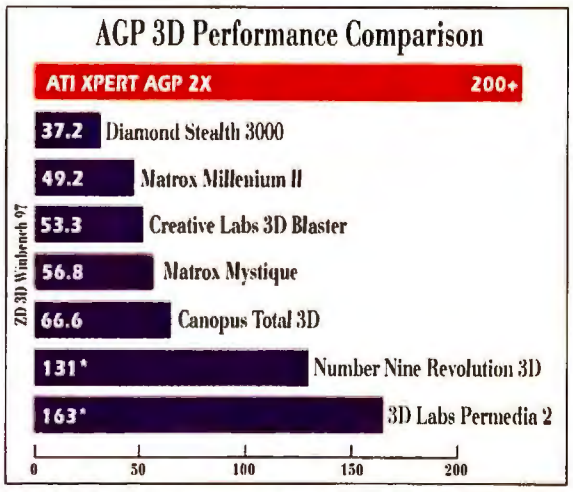

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Watts It Take?

Component	Power usage (watts)
CD-ROM drive	25
Motherboard	25
Hard disk	20
8MB DRAM SIMM	18
Graphics board	15
Tape drive	15
Add-in card	10
Network adapter	10
4MB DRAM SIMM	7
16MB EDO SIMM	7
Zip drive	7
8MB EDO SIMM	4
Floppy drive	3

FIGURE 2: HERE ARE AVERAGE power requirements for selected components.

to add). Look under the technical specifications in your PC's manual or in the documentation for the peripheral. If you can't find the wattage numbers for a component, look for the voltage and amperage, then calculate the power usage in watts by multiplying volts times amps.

You can also call or go to the Web site of your PC's manufacturer—or better yet, the maker of the component—to get the wattage numbers. If even that doesn't help, make your own estimates. **FIGURE 2** lists typical power needs for selected components.

After adding up all the component wattages, increase that number by 20 percent. Too much capacity is better than not enough. Also, you need a little extra power during start-up.

SURGE AND RESCUE

SUDDEN SPIKES or surges in the AC voltage caused by lightning can literally burn up your PC's delicate circuitry. To protect your system, you need a surge protector. A good one will cost at least $45. To find it, look for two things.

First, make sure it has an indicator to warn of exposure to excessive voltages. Most metal oxide varistors—the mainstream surge-protector type—can lose their ability to protect after absorbing a single high-voltage surge. An indicator will tell you that the device is suspect and should probably be changed. And second, make sure it meets the rigorous Underwriters Laboratories UL1449 standard.

Even if you are protected from a surge, you still may lose vital files if the surge is followed by a power outage or brownout. To keep your PC running for another 10 minutes so you can shut it down properly, get an uninterruptible power supply—basically just a large package of batteries. The $129 Pulsar ES 2+ from MGE UPS Systems (800/523-0142, www.mgeups.com) is a good desktop UPS that can automatically shut down applications.

BEEF UP YOUR NOTEBOOK BATTERY

NOWHERE IS POWER management as critical as in notebooks. Here's a rundown on current notebook battery types:

Nickel cadmium. NiCds are very common in older notebooks. Most but not all NiCds suffer from a "memory effect" that can reduce their storage capacity when they are only partially discharged, not used for a short time, and eventually recharged. The cure: Completely discharge the battery and then immediately recharge it. This should be done with the battery installed in the notebook.

How Notebooks Handle Power

APM mode	Means...	Use this mode on the plane while you are...
Full-on	no power savings.	midcontinent, working like mad.
Standby	many devices off, session data in memory, quick return to full operation.	stretching your legs in the cabin.
Suspend	most devices off, session data in memory, slow return to full operation.	sneaking into first class for a meal.
Sleep	memory off, session data on disk, very slow return to full operation.	sneaking into first class for a nap.
Full-off	power off completely, must reboot to start up.	getting caught in first class.

FIGURE 3: USE THE RIGHT APM power-saving mode at the right time.

Nickel-metal hydride. NiMH batteries provide slightly better performance than NiCds, lack the memory problems, and are common in newer budget notebooks.

Lithium ion. The notebook battery type of choice, lithium ion outperforms NiMH, is no heavier, and is found in most newer power notebooks.

No battery, of course, lasts as long as you'd like. Notebooks offer a bewildering choice of power-saving modes that may be activated by keystrokes, through the system setup program, or—if the notebook supports Advanced Power Management—through software.

APM defines five states of operation ranging from full-on to full-off (see **FIGURE 3**). The deeper your computer sleeps, the longer it takes to resume full operation. But each vendor implements APM in its own way—which often leads to incompatibilities and conflicts with Windows.

If you've noticed a sharp decline in battery life since you installed Windows 95 on your APM-enabled laptop, or if you're experiencing other problems, try this fix: Select *Start•Settings•Control Panel•System•Device Manager.* Go to the bottom of the device list and click *System Devices.* Select *Advanced Power Management* and then select *Properties.* Check the top box, *Force APM 1.0 Mode.*

The same screen offers possible solutions for two other potential APM bugs:

Disable Intel SL support. This fixes startup problems in some machines that use power-saving functions originally built into Intel's 486SL chip set.

Disable power-status polling. This stops Windows 95 from asking APM for battery status checks—which on some PCs can lead to a random system shutdown.

Hardware Tips *welcomes your questions and pays $50 for published items. Kirk Steers is a* PC World *contributing editor.* *See page 14 for contact information.* ■

ILLUSTRATION: JEFFREY BELO

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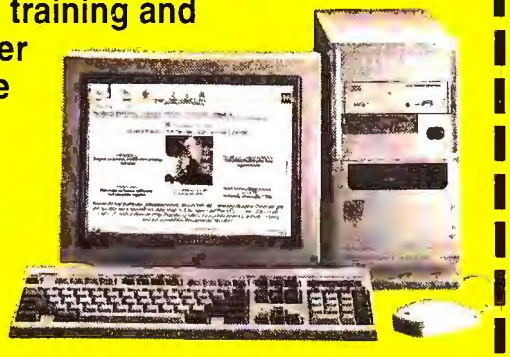

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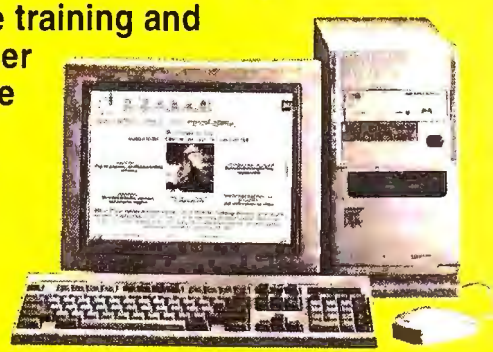

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Install a Personal Scanner

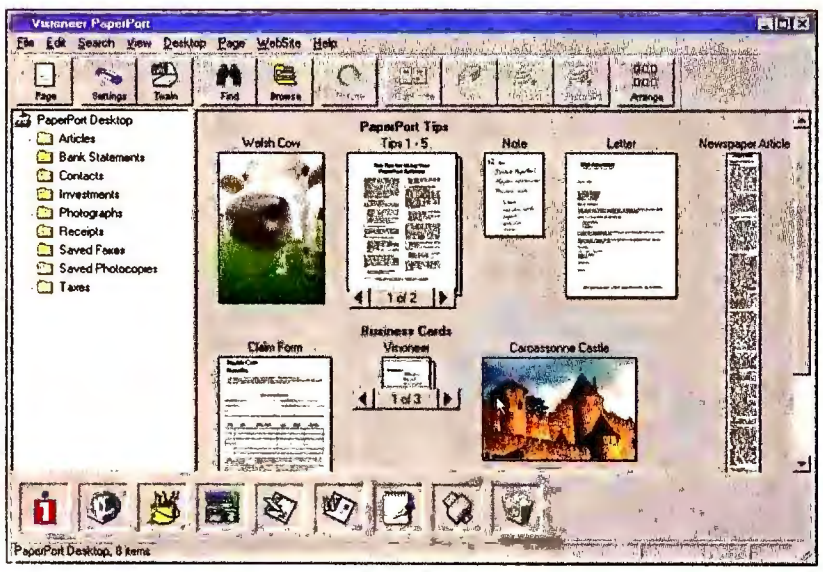
NOT SO LONG ago, only graph-ics professionals and document management devotees used scanners, and these products seemed about as cheap and friendly as X-ray machines. Today, most desktop scanners are affordable and easy to use, and they're flooding into businesses and homes across the country.

Scanners can do lots more than simply scan photographs into your PC, although that's still their most popular function. For example, you can team them up with a printer to do low-volume photocopying, hook them up to a fax-modem to handle low-volume faxes, use optical character recognition software to turn printed pages into editable documents, and store and index valuable documents such as receipts or tax forms. Most scanners come with a wide range of software for applications like these.

Scanners come in a variety of models, specifications, and pricing. The basic types are *flatbed* and *sheetfed*.

Flatbed scanners take up lots of space but are the most versatile; their flip-up covers and flat scanning surface let you scan large or bulky items such as books or

PARALLEL-PORT SCANNER

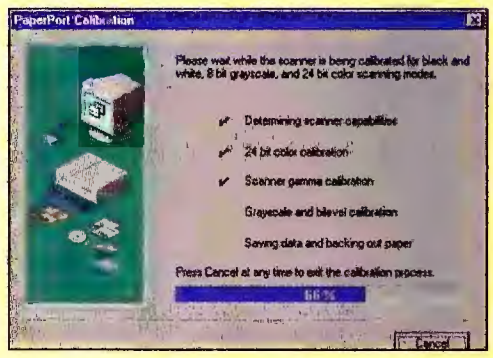


1 Connect the scanner. If you haven't connected any other devices to the back of your PC, simply plug in the scanner. If you've got a local printer, unplug the printer cable from the parallel port, and plug the cable from the scanner into the port. Then plug your printer cable into the printer connector (also called the parallel pass-through port) that's on the scanner or into a central connection box (as with the Visioneer PaperPort Strobe shown here). Follow the same procedure for other parallel-port devices, such as Zip drives.

If there's a shipping lock on the scanner, unlock it. Hook up AC power.

2 Install the software. Turn on the scanner and then your PC. Enter your setup program (the procedure varies by PC maker) and then Windows 95's Device Manager to make sure that your parallel port is set to ECP and/or EPP. (For complete directions, open the help file Admin\Reskit\Helpfile\Win95rk.hlp on the Windows 95 CD-ROM. Type extended in the index.) If your setup lacks the ECP and EPP options, you can still use the scanner, but it will work more slowly. Exit setup and restart your PC.

In Windows, install the software that came with the scanner. Restart your PC if necessary. Then run the scanner's calibration program.



3 Start scanning. Test the scanner and its accompanying software to make sure everything is working correctly.

If you have problems, shut down your PC and double-check all the connectors. Make sure that the scanner's plugged in and turned on before starting your PC. If problems persist, call your scanner maker's technical support line.

PHOTOGRAPHS: KEVIN CANDLAND

mounted photographs. Sheetfed scanners are small and handy—some even tuck away in the space between your keyboard and monitor. But most handle only standard paper and photos.

Scanners also differ in resolution, which is measured in dots per inch. Ads often tout ultrahigh resolutions such as 2400 or 4800 dpi, but that's a theoretical number using software that makes a best guess about the image. The important figure is the *optical* resolution, which is what the scanner actually delivers to your PC. Most desktop scanners scan at 300 by 600 dpi—a good match for the needs of a majority of users, and the maximum resolution that many printers can handle.

You also have a choice of 24-bit or 30-bit color support. Typically, 30-bit models produce slightly better results but aren't worth paying a premium.

Additionally, scanners come in both SCSI and parallel (printer-port) versions. SCSI scanners offer better performance but usually cost considerably more and are far more difficult to install.

Prices have plummeted in the past year. You can find a budget scanner for as little as $100, and prices generally range from about $200 to $1500 and up. Today's sweet spot is just under $300, which buys such units as the Hewlett-Packard (www.hp.com) ScanJet 5pse flatbed scanner or Visioneer's (www.visioneer.com) compact PaperPort Strobe sheetfed scanner, both shown here. Other popular scanner makers include Agfa (www.agfa.com), Epson (www.epson.com/northamerica.html), Microtek (www.microtekusa.com), Mustek (www.mustek.com), and Umax (www.umax.com).

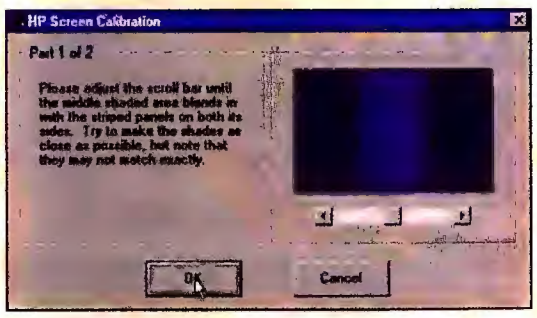
Here's how to install your new scanner.

Stan Miastkowski is a PC World *contributing editor.* ■

FLATBED SCSI SCANNER

1 Install the software. Check the manual to see whether you install software or hardware first; the HP ScanJet 5pse SCSI Scanner here starts with software.

Follow the directions to install the software that came with your scanner. Usually you must specify whether you're using a SCSI interface card that's already installed in your PC or a SCSI card that came with the scanner. Most scanners also require you to run a calibration program.



2 Install the SCSI card and hook up the scanner. Shut down Windows and turn off your PC. If your system already has a SCSI card, skip to the next paragraph. Otherwise, remove the cover, and install the SCSI card that came with your scanner. Most cards don't require any special settings, but some have jumpers or switches. Read the manual carefully.

Connect the SCSI cable between your PC and the scanner. Most SCSI scanners have two identical connectors so that you can daisy-chain additional SCSI devices through the scanner. Occasionally it matters which connector you use.

SCSI devices must be terminated. Some scanners make you set a switch or use a special termination plug on the free SCSI connector. Again, check the manual.

Finally, each SCSI device needs to have a unique ID number, usually set on the scanner using a rotary switch. If the scanner is your only SCSI device, leave its ID set to the factory default. If your PC has other SCSI devices, make sure that the scanner ID doesn't conflict with them. (To see what SCSI IDs—if any—your PC is using, watch the screen for listings when you start up your system.)

Most flatbed scanners ship with a sliding lever or screw to lock components. Unlock this!

3 Test and start scanning. Turn on the scanner before turning on your PC (as you would with any external SCSI device).

If you installed a new SCSI card, Windows 95 should detect it and install the correct software. You may be asked for your original Windows 95 CD-ROM or the software that came with your scanner.

If the scanner came with test software, run it to make sure that everything is working properly. Then, if all is well, go ahead and try out the scanning application.

Problems? Shut down your PC and double-check all connectors.

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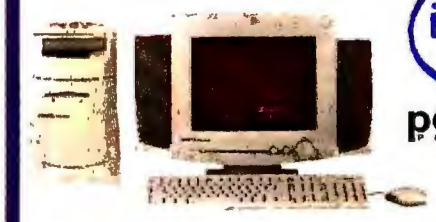

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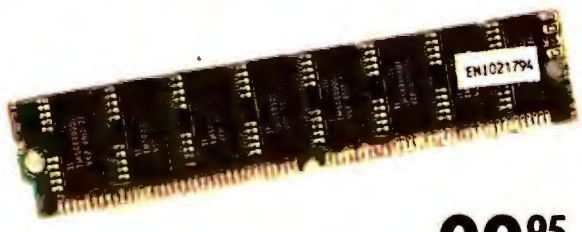

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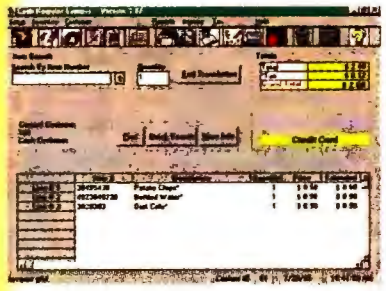

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Netserver LXE	Pent Pro 200	64M	no-HD	4X		6 Hotswap Bays	9190
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EZ364D-K	P166MMX	12.1"D	40M	2.0G	16X		2219
EZ354T-K	P150MMX	12.1"Tx	40M	2.0G	16X		2534
EZ364T-K	P166MMX	12.1"Tx	40M	2.0G	16X		2629

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Lifebook 735DX	P133MMX	12.1"D	16M	1.6G	20X	56K	1879
Lifebook 535TX	P133MMX	12.1"T	16M	2.0G	20X	33.6	2324
Lifebook 765TX	P166MMX	12.1"T	32M	3.2G	20X	56K	3599
Lifebook 585TX	P233MMX	12.1"Tx	32M	4.0G	20X	33.6	4529

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Thinkpad 765D	P166MMX	13.3"Tx	32M	3.0G	8X	33.6	4799
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#94064	1550DM	133MHz	16MB	1.4GB	10X	12.1" TFT	7.35	$2,399	$96
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NEC Versa, M, P, E, V, 4000 – 4MB #DP-410-4001 9
Compaq Armada 4100, 4110, 4110D, 4120T, 4125D 4130T, 4131T – 16M8 Kit #217915-001 69
Compaq 1M8 Video #213922-001 19
512x36-70ns / 512x36-80ns / 512x32-70ns – 2MB 14

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DIMMS (168 pin)

SDRAM – INDUSTRY STANDARD, DELL & GATEWAY

		x64	x72 ECC
3.3V	8Meg	49.00	—
3.3V	16Meg	71.00	85.00
3.3V	32Meg	139.00	169.00
3.3V	64Meg	319.00	389.00
3.3V	128Meg	699.00	759.00
3.3V	256Meg	Call	—

APPLE

1 x 64	8Meg	42.00
2 x 64	16Meg	74.00
4 x 64	32Meg	129.00
8 x 64	64Meg	239.00
16 x 64	128Meg	739.00

INDUSTRY STANDARD DIMMS

	16Mg	32Mg	64Mg	128Mg	256Mg
Unbuffered					
3.3V ECC, EDO	69	150	329	739	—
3.3V EDO	69	129	259	—	—
5.0V EDO	74	139	269	719	—
5.0V FPM	74	129	239	739	—
Buffered					
3.3V ECC, EDO	99	159	329	739	1539
3.3V ECC, FPM	99	164	339	749	1539
5.0V ECC, FPM	99	159	489	875	2059

ECC SIMMS

Pentium Pro 72 Pin (install in pairs) / SIMMS

8Meg ..... 40.00 — 64Meg 399.00
16Meg ..... 80.00 — 128Meg ..... Call
32Meg 160.00

CACHE MEMORY

- *512K (IBM Part # 92G7336) – $59.00 works with PC750, PC750, Aptiva C+ Series*
- *256K (160 pin) Pipeline Burst Cache Module $22.00 (Coast Calp)*
- *512K (168 pin) Pipeline Burst Cache Module $39.00 (Coast Calp)*
- *256K (160 pin) Async Cache Module – $59.00 compatible with IBM Aptiva A&M Series*
- *256K (168pin) Async Coast Module – $29.00*

	12NS	15NS	20NS	25NS
32Kx8	9.00	4.50	4.25	4.00
64Kx1	–	11.00	–	–
64Kx8	–	15.00 (5V)	–	–
128Kx8	–	29.50	26.00	24.00

72 PIN SIMMS (FPM, EDO)

	60NS	70NS	80NS
1 x 32 4 mg	17	17	17
2 x 32 8 mg	34	34	34
4 x 32 16 mg	55	55	55
8 x 32 32 mg	104	104	104
16 x 32 64 mg	299	299	299
1 x 32 4 mg EDO	17	17	17
2 x 32 8 mg EDO	32	32	32
4 x 32 16 mg EDO	55	55	55
8 x 32 32 mg EDO	109	109	109
16x32 64 mg EDO	289	289	289
256 x 36	14	–	
512 x 36	19	–	
256 x 32	9	–	
512 x 32	19	–	
1 x 36 4 mg	24	24	24
2 x 36 8 mg	48	48	48
4 x 36 16 mg	64	64	64
8 x 36 32 mg	123	123	123
16 x 36 64 mg	325	325	325

SIMM MODULES

(Add $5.00 for SIPP)	60NS	70NS	80NS
1Meg x 3 (3 chip)	9.00	9.00	9.00
1Meg x 9 (9 chip)	12.00	12.00	12.00
4Meg x 3 (3 chip)	19.00	19.00	19.00
4Meg x 9 (9 chip)	24.00	24.00	24.00
16Meg x 9 (9 chip)	119.00	110.00	119.00

Individual D-RAM Chips

	40NS	50NS	60NS	70NS	80NS
1Megx1	–	–	5.00	4.00	2.00
1Megx4	–	–	19.00	18.00	17.00
1Megx4 (Zip Pk)	–	–	12.00	11.00	10.00
256x4(Page Dip)	–	–	7.25	6.75	6.50
256x4(Page Zip)	–	–	9.25	9.00	8.95
256x4(Video Zip)	–	–	–	10.95	9.95
256x8(SOJ)	–	–	12.00	11.00	–
256x16 SOJ	34.00	29.00	29.00	19.00	–
256x16 SOJ Edo	–	–	29.00	–	–
256x16 Video Zip	–	–	–	29.00	–

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Matrox Millennium	2Meg/4Meg/8Meg WRAM	69/139/189
Matrox Millennium II	8Meg/12Meg	Call
Matrox Mystique	2Meg SGRAM	59
ATI 3D Pro Turbo	2Meg/4Meg	89, 179
ATI Xclaim 3D	4Meg SGRAM	179
ATI 3D Xpression	2Meg SDRAM	79
Apple PowerMac 4400	2Meg/4Meg	89/139
NEC Powermate Pro 150, 220	2Meg,/6Meg WRAM	129, 259
HP Vectra XV/6, VT/6, VA, XA	2Meg/6Meg WRAM	129, 259
Compaq 1Meg Video 213922-001	1Meg	69
Compaq Deskpro 2000, 4000, 6000	2Meg/6Meg WRAM	129/299

Many More Please Call

GATEWAY MEMORY

Dest. 8ig Screen D5 – SDRAM	8Meg/16Meg/32Meg/64Meg	49/89/159/359
Dest. 8ig Screen D6 – EDD (pairs)	4Meg/8Meg/16Meg/32Meg	22/38/59/109
Family PC w/MMX – SDRAM	8Meg/16Meg/32Meg/64Meg	49/89/159/359
G5-166, 200 Prof. System – SDRAM	8Meg/16Meg/32Meg/64Meg	49/89/159/359
G5-166M, 200M MMedia System – SDRAM	8Meg/16Meg/32Meg/64Meg	49/89/159/359
G6-200 Prof. System – SDRAM	16Meg/32Meg	89/159
G6-Prof, M MMedia System – EDD	4Meg/8Meg/16Meg/32Meg	24/44/68/139
Multimedia G-5 Systems – SDRAM	8Meg/16Meg/32Meg/64Meg	49/89/159/359
Prof. P-5 Series – SDRAM	8Meg/16Meg/32Meg/64Meg	49/89/159/359

We Carry All GATEWAY Memory

NEC MEMORY

Ready 5010, 7010, 7020, 9010, 9022 / Ready 9510, 9520, 9522, 9530, 9532 / Ready 7022 (EDO)
Image P60, P90, D, P100E
(Pairs) 4Meg/8Meg/16Meg/32Meg — 22/38/66/129 — *We Carry All NEC Memory*

HEWLETT PACKARD MEMORY

Netserver 4/66LC-5/133LC (pairs)	4Meg/8Meg/16Meg/32Meg	22/42/59/119
Netserver LE 486SX33 – 486DX266	4Meg/8Meg/16Meg/32Meg	22/42/59/119
Netserver LH Plus 5/133, 5/166 (EDD, ECC)	16Meg/32Meg/64Meg/128Meg	99/189/409/875
Netserver 4/33LM – 5/100LM (pairs)	4Meg/8Meg/16Meg/32Meg	22/42/59/119
Netserver 5/75LS – 5/133 LS4 (pairs)	4Meg/8Meg/16Meg/32Meg	22/42/59/119
Pavilion 5010-7170 (pairs)	4Meg/8Meg/16Meg/32Meg	22/42/59/119
Vectra 500 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	22/42/59/119
Vectra VA 6/180, 6/200 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	22/42/59/119
Vectra VE2 5/75 – 5/133 (EDO, pairs)	4Meg/8Meg/16Meg/32Meg	22/42/59/119
Vectra XA 6/180, 6/200 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	22/42/59/119
Vectra XM4 Series	4Meg/8Meg/16Meg/32Meg	22/42/59/119

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IBM APTIVA, PC, P/S1 & P/S2

Aptiva 300, 500 Series	4Meg/8Meg/16Meg/32Meg	20/39/59/129
Aptiva 700 Series (pairs)	4Meg/8Meg/16Meg/32Meg	20/39/59/129
Aptiva A Series (pairs)	4Meg/8Meg/16Meg/32Meg	20/39/59/129
Aptiva C Series (EDO, pairs)	4Meg/8Meg/16Meg/32Meg	20/39/59/129
Aptiva M Series	4Meg/8Meg/16Meg/32Meg	20/39/59/129
PC 300 Models 6571-6576	4Meg/8Meg/16Meg/32Meg	20/39/59/129
PC 300 Model 6577 (EDO, pairs)	4Meg/8Meg/16Meg/32Meg	20/39/59/129
PC 340 (EDO, pairs)	4Meg/8Meg/16Meg/32Meg	20/39/59/129
PC 350 Models 6581-6585	4Meg/8Meg/16Meg/32Meg	20/39/59/129
PC 350 Model 6586 (pairs)	4Meg/8Meg/16Meg/32Meg	20/39/59/129
PC 350 Model 6587 (EDO, pairs)	4Meg/8Meg/16Meg/32Meg	20/39/59/129
PC 360	4Meg/8Meg/16Meg/32Meg	28/54/69/139
PC 730 Models 6875-6876 (pairs)	4Meg/8Meg/16Meg/32Meg	28/54/69/139
PC 730 Model 6877 (EDO, pairs)	4Meg/8Meg/16Meg/32Meg	20/39/59/129
PC 750 Models 6885 6886 (pairs)	4Meg/8Meg/16Meg/32Meg	28/54/69/139
PC 750 Model 6887 (EDO, pairs)	4Meg/8Meg/16Meg/32Meg	20/39/59/129
PC Server 310 (pairs)	4Meg/8Meg/16Meg/32Meg	28/54/69/139
PC Server 500 (ECC, pairs)	4Meg/8Meg/16Meg/32Meg	59/79/119/249
P/S 1, 30 Pin Simms	1/Meg/4Meg	12/34
P/S 1, 72 Pin Simms	4Meg/8Meg/16Meg/32Meg	28/54/69/139
P/S 2, 55SX, 65SX	4Meg	39
P/S 2, 53, 53LS, 56, 57	4Meg/8Meg	39/69
P/S 2, 95XP (ECC, pairs)	4Meg/8Meg	49/79
P/S 2 Server, 95, 195, 295 (ECC, pairs)	4Meg/8Meg/16Meg/32Meg	59/79/119/249

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IBM NOTEBOOK & LAPTOP MEMORY

MODEL	AMT. UPGRADED	MEMORY PRICE	BATTERY PRICE
Thinkpad 340, 345, 355, 360, C, CE	*4Meg/8Meg/16Meg/32Meg*	*49/89/99/199*	*129.00*
Thinkpad 365, CS, CD, E, ED	*4Meg/16Meg*	*79/99*	*129.00*
Thinkpad 365X, 365XD	*6Meg/16Meg/32Meg*	*49/84/159*	*129.00*
Thinkpad 380, 380D, 385D	*4Meg/8Meg/16Meg/32Meg*	*49/89/99/199*	*129.00*
Thinkpad 500, *510CS*	4Meg/8Meg/16Meg	49/69/99	*169.00*
Thinkpad 550, 560E	8Meg/16Meg/32Meg/64Meg	49/84/159/339	
Thinkpad 700, 720, 756, CL575X	*4Meg/8Meg/16Meg/32Meg*	*39/79/159/266*	*179.00*
Thinkpad 701, 701C, 701CS	*4Meg/8Meg/16Meg/32Meg*	*39/49/84/189*	*109.00*
Thinkpad 730T, TE	*4Meg/8Meg/16Meg/32Meg*	*49/69/99/189*	*110.00*
Thinkpad 755C, CV, CD, CS	*4Meg/8Meg/16Meg/32Meg*	*49/89/99/198*	*159.00*
Thinkpad 760C, CD, L, LD	*8Meg/16Meg/32Meg*	*49/99/189*	*159.00*
Thinkpad 760E, ED, EL, ELD	*6Meg/16Meg/32Meg*	*49/84/159*	*159.00*
Thinkpad 760XD, 760XL	*6Meg/16Meg/32Meg/64Meg*	*49/84/159/339*	*159/269*
Thinkpad 765D, 765L	*6Meg/16Meg/32Meg/64Meg*	*49/84/159/339*	*159/269*
Thinkpad 770 (SDRAM)	16Meg/32Meg/64Meg	149/319/649	

COMPAQ MEMORY MODULES

Deskpro 486/25, 33L, 50L	2Meg/8Meg/32Meg	29/79/199
Deskpro 3/25i, 33i, 4/25iS, 66i	2Meg/4Meg/8Meg	19/39/69/89
Deskpro 386, 486 W Series	2Meg/4Meg/8Meg	29/39/69
Deskpro M Series Expansion Board	OK (no memory)	119.00
Deskpro 450, 4100, 575, 590, 5100, 5133	4Meg/8Meg/16Meg/32Meg	22/39/59/119
Deskpro 575, 5120, 5133, 5150, 5160 (EDO, pairs)	4Meg/8Meg/16Meg/32Meg	22/39/59/119
Deskpro 2000, 4000, 6000 Series (EDO, pairs)	4Meg/8Meg/16Meg/32Meg	22/39/59/119
Deskpro 5/60M, 5/66M, XE560 (quads)	2Meg/4Meg/8Meg/16Meg/32Meg	19/28/54/69/139
Deskpro XL (pairs)	4Meg/8Meg/16Meg/32Meg	28/54/69/139
Deskpro XL 6150, 6200 (ECC, pairs)	8Meg/16Meg/32Meg/64Meg, 128Meg	Call
Deskpro 2000, Presario 4112, 4122, 4712, 4716, 5526, 5528	1Meg Video	39
Presario 5536, 9232, 9234, 9240, 9250, 9260, 9642, 9660	1Meg Video	39
Presario 510, 520, 524, 660, 720, 724, 860	4Meg/8Meg/16Meg/32Meg	22/39/59/119
Presario 920, 924, 954, 974, 978, 992	4Meg/8Meg/16Meg/32Meg	22/39/59/119
Presario 833, 850, 860, 866	4Meg/8Meg/16Meg/32Meg	39/54/119/239
Presario 7128, 7130, 7152	4Meg/8Meg/16Meg/32Meg	22/39/59/119
Presario 7170, 7180, 9536, 9546, 9548, 9564 (pairs)	4Meg/8Meg/16Meg/32Meg	22/39/59/119
Presario 9232, 9234, 9240, 9250, 9642, 9660 (pairs)	4Meg/8Meg/16Meg/32Meg	22/39/59/119
Proliant 1000 5/50, 2000, R, 4000, R (quads)	4Meg/8Meg/16Meg/32Meg	19/28/54/69
Proliant 1500, 1500R (pairs)	4Meg/8Meg/16Meg/32Meg	39/54/79/189
Proliant 4500, 4500R (quads)	4Meg/8Meg/16Meg/32Meg/64Meg	39/64/119/239/599
Proliant 5000, 5000R (pairs)	32Meg/64Meg/128Meg/256Meg	Call
Prolinea 4/25S, 4/33, 4/66	2Meg/4Meg/8Meg	29/39/69
Prolinea (enhanced), MT	4Meg/8Meg/16Meg/32Meg	22/39/59/119
Prolinea 575, 590, 5100, 5120, 5133 (pairs)	4Meg/8Meg/16Meg/32Meg	22/39/59/119
Prolinea 5100, 5120, 5133, 5150, 5166 (EDO pairs)	4Meg/8Meg/16Meg/32Meg	22/39/59/119
Prolinea 575E, 100E, 120E, 575MX (pairs)	4Meg/8Meg/16Meg/32Meg	22/39/59/119
Prolinea 590MX, 5120MX (pairs)	4Meg/8Meg/16Meg/32Meg	22/39/59/119
Prolinea 6150E, 6180E (pairs)	16Meg/32Meg/64Meg	39/59/119
Prosignia 300 5/75, 5/90, 5/120, 5/150 (pairs)	4Meg/8Meg/16Meg/32Meg	28/54/69/139
Prosignia 500 5/90, 5/120, 5/150 (pairs)	4Meg/8Meg/16Meg/32Meg	28/54/69/139

COMPAQ NOTEBOOK/LAPTOP MEMORY

MODEL	AMT. UPGRADED	MEMORY PRICE	BATTERY PRICE
Armada 1166, 1120T, 1120, 1125	*6Meg/16Meg/32Meg/64Meg*	*49/89/169/349*	*119.00*
Armada 1130, 1130T (pairs)	*4Meg/8Meg/16Meg*	*44/60/99*	*119.00*
Armada 1S100M, 1S200M, 1550DMT	16Meg/32Meg/64Meg	89/169/349	
Armada 4100, 4110, D, 4120, T, 4130T (pairs)	4Meg/8Meg/16Meg	39/59/119	
Armada 7710MT, 7730MT, 7750DMT	16Meg/32Meg/64Meg	89/169/349	
Concerto 4/25, 433	*4Meg/8Meg/16Meg*	*44/89/99*	*139.00*
Contura 4/25, 4/25C, 4/25CX	*4Meg/8Meg/16Meg*	*44/69/99*	*109.00*
Contura 400C, 400CX, 410C, 419CX	*4Meg/8Meg/16Meg*	*44/89/99*	*109.00*
Contura 420C, 420CX, 430C, 430CX	*4Meg/8Meg/16Meg/24Meg*	*44/69/99/169*	*109.00*
Contura Aero	*4Meg/8Meg/16Meg*	*39/69/99*	*109.00*
LTE 5600, 5100, 5200, 5300	*8Meg/16Meg/32Meg/64Meg Kit*	*29/69/169/359*	*139.00*
LTE Elite 440C, CX, 4/75CX	*4Meg/8Meg/16Meg/24Meg*	*39/69/109/189*	*139.00*
LTE Lite 425	*4Meg/8Meg/16Meg*	*49/79/136*	*195.00*
Presario 1000, 1616, 1620, 1636, 1676, 1686	*8Meg/16Meg/32Meg*	*49/89/169*	*119.00*
Presario 1207, 1210, 1610	16Meg/32Meg/64Meg	89/189/369	

DELL MEMORY

Dimension XPS M166S, M2090, P133s, 166s, 200s, P133v, 166v, 200v	8Meg/16Meg/32Meg	49/79/169
Dimension XPS P60, P75, P90, P100 (pairs)	4Meg/8Meg/16Meg/32Meg	20/38/59/119
Dimension XPS P100c, 120c, 133c, 166c, XPS P75T, 100T (pairs) FPM or EDO	4Meg/8Meg/16Meg/32Meg	20/38/59/119
Dimension XPS Pro 150, Pro 200 (quads)	4Meg/8Meg/16Meg/32Meg	28/48/69/129
Dimension XPS Pro 150n, 180n, 200n (Edo pairs)	4Meg/8Meg/16Meg/32Meg	20/38/59/119
Optiplex GL, GM, GMT (Edo pairs)	4Meg/8Meg/16Meg/32Meg	20/38/59/119
Optiplex GS, GXL, GXM, GXMT (Edo pairs)	4Meg/8Meg/16Meg/32Meg	20/38/59/119
Optiplex GXI, GXpro, 6180, 6200 (Edo, Ecc)	16Meg/32Meg/64Meg/128Meg	99/179/399/799
PowerEdge 2100, 4100 (Edo, Ecc)	16Meg/32Meg/64Meg/128Meg/256Meg	99/179/399/799/1799

LASER PRINTER MEMORY UPGRADES

AMOUNT UPGRADED	DK 8a	2S6a	1	2	3	3.5	4	5	6	8	16	32
Brother 630, 631, 641, 645	–	–	39	59	–	–	–	–	–	–	–	–
Canon LBP 430	–	–	19	–	–	–	49	–	–	–	–	–
Canon LBP 860, 1260	–	–	–	19	–	–	49	–	–	59	79	139
Epson Action Laser 1100, 1600	–	–	19	29	–	–	49	–	–	69	89	–
Epson Action Laser II	–	–	74	–	123	–	–	180	–	–	–	–
Epson 8000, 1800, 4000, 4100, 4300	–	–	74	–	123	–	–	180	–	–	–	–
Epson 1000, 1500, 5000, 5200	–	–	–	49	–	–	98	–	–	–	–	–
HP 2, 2D–	–	–	–	59	–	–	79	–	–	–	–	–
HP 3, 3D, 3P, 2P+	–	–	–	*59*	–	–	*89*	–	–	–	–	–
HP 4, 4M, 4Si, 4SiMX	–	–	–	19	–	–	39	–	–	69	–	–
HP 4L	–	–	29	–	–	–	–	–	–	–	–	–
HP 4MP, 4P	–	–	9	19	–	–	34	–	–	59	–	–
HP 4+, 4M+, 4V, 4MV	–	–	9	19	–	–	34	–	–	59	79	139
HP 5, 5M, 5MP, 5N, 5P, 5Si, 5MX	–	–	9	19	–	–	34	–	–	59	79	139
HP 5L, 6L	–	–	–	–	–	–	49	–	–	99	–	–
HP 6MP, 6P	–	–	9	19	–	–	34	–	–	59	79	139
HP Design Jet 200, 220	–	–	–	–	–	–	39	–	–	69	–	–
HP Design Jet 230, 250C	–	–	–	–	–	–	39	–	–	69	89	149
HP Design Jet 330, 350C	–	–	–	–	–	–	39	–	–	69	89	149
HP Design Jet 600, 650C	–	–	–	–	–	–	39	–	–	69	–	–
HP Design Jet 650C PS	–	–	–	–	–	–	39	–	–	69	89	149
HP Design Jet 700, 750C, Plus, 755	–	–	–	–	–	–	39	–	–	69	89	149
HP Deskjet 500, 500C, 510, 550,560	–	29	–	–	–	–	–	–	–	–	–	–
HP Deskjet 1200C, 1200CPS, 1600C,1600CM	–	–	–	–	–	–	39	–	–	69	–	–
IBM Laser 4019, 4019E	–	–	–	–	–	109	–	–	–	–	–	–
IBM Laser 4029, 4037	–	–	–	–	–	–	49	–	–	–	–	–
IBM Laser 4039, 4079	–	–	–	*39*	–	–	*69*	–	–	*99*	–	–
Lexmark, Optra L, LX, R, RX	–	–	–	–	–	–	39	–	–	59	89	149
Lexmark Valuewriter 300,600	–	–	29	39	–	–	69	–	–	–	–	–
Lexmark Winwriter 200, 400, 600	–	–	29	39	–	–	69	–	–	–	–	–
Lexmark S Series	–	–	–	–	–	–	–	–	–	–	–	149
NEC 90, 290	–	–	–	89	–	–	–	–	–	–	–	–
NEC 95, 97	–	–	–	59	–	–	–	–	–	–	–	–
Oki 400E, 400EX, 410E, 410EX	–	–	67	89	169	–	189	–	–	–	–	–
Oki 810E, EX, 600E, EX, 610E, EX	–	–	29	79	–	–	119	–	–	149	229	–
Panasonic 4420/4450I	–	–	–	79	–	–	109	–	–	–	–	–
Panasonic 4410/4430	–	–	–	*59*	–	–	*99*	–	–	–	–	–
Panasonic 4450	–	–	89	–	–	–	–	–	–	–	–	–
Panasonic 4400/5400	–	–	49	69	–	–	109	–	–	–	–	–
Panasonic 4440, 5410	–	–	69	–	–	–	109	–	–	–	–	–
Panasonic 6500	–	–	14	14	–	–	49	–	–	–	–	–
Sharp 9400, 9460, 9600, 9700E	–	–	49	69	–	–	119	–	–	–	–	–
Sharp 9500, E, H, 9700, H	–	–	49	–	–	–	236	–	–	–	–	–

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Compaq LTe 5000 Series	139	TI 4000E	100
Epson Action Note 600, 660	119	Toshiba 400, 405, 410, 415, 420, 425, 430 (NIMH)	219
Epson Action Note 800, 866, 880, 910	119	Toshiba 100, 105, 110, 115, 200, 205	105
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IBM Thinkpad 750, 755	179	Toshiba T4500, T4600	159
IBM Thinkpad 755 C0, CE, CV, CX	179	Winbook XPC, XP, XP5	119
NEC Versa 2400, 2405, 2430, 2435	159		

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MODEL	AMT. UPGRADED	MEMORY PRICE	BATTERY PRICE
Libretto 50CT	8Meg/16Meg	69/118	
Tecra 500CDT, CS, 510CDS, CDT	*8Meg/16Meg/32Meg/48Meg/128Meg*	*49/89/169/289/689*	*259.00*
Tecra 520CDT, 530CDT	*8Meg/16Meg/32Meg/48Meg/128Meg*	*49/89/169/289/689*	*259.00*
Tecra 700CS, 790CT ($DRAM)	*8Meg/16Meg/32Meg*	*69/109/209*	*279.00*
Tecra 710CDT, 720CDT, 730CDT	*8Meg/16Meg/32Meg/64Meg/128Meg*	*49/89/169/359/689*	*279.00*
Tecra 730XCDT, 740CDT	*8Meg/16Meg/32Meg/64Meg/128Meg*	*49/89/169/359/689*	*279.00*
T2000SXE	*8Meg*	*94*	*179.00*
T2100 Series	*4Meg/8Meg/16Meg/24 Meg*	*29/49/99/159*	*119.00*
T1900, T4500, T4600, T4700, T4900 All Models	*4Meg/8Meg/16Meg/32Meg*	*39/64/109/189*	*109.00*
T2400, T3400, T3400CT, T3600	*8Meg/16Meg*	*49/89*	*119.00*
Satellite 1900CS, 1905CS 110CS, 110CT, 115CS	*8Meg/16Meg/32Meg*	*59/99/169*	*119.00*
Satellite 2000CS, 2005CS Series	*8Meg/16Meg/32Meg*	*59/99/189*	*119.00*
Satellite 2200CS	8Meg/16Meg/32Meg/48Meg/128Meg	49/89/169/289/689	
Satellite T460 Series, T600 Series	*6Meg/16Meg/32Meg*	*59/99/169*	*229.00*
Satelide Pro 440, 460	8Meg/16Meg/32Meg/48Meg/128Meg	49/89/169/289/689	
Portege 300	16Meg/32Meg	99/199	
Portege 650CT, 660CT	*6Meg/16Meg/32Meg/64Meg*	*49/89/169/359*	*265.00*

NOTEBOOK, LAPTOP MEMORY

MODEL	AMT. UPGRADED	MEMORY PRICE	BATTERY PRICE
ACERNote 730C, 735C, 760C, 760CX, 780CX	*4Meg/8Meg*	*49/89*	*129.00*
ACERNote 763, 765, 782, 784, 786	4Meg/8Meg/16Meg	29/59/89	
ACERNote Light 350, 352, 355	*4Meg/8Meg/16Meg*	*29/59/89*	*179.00*
ACERNote Light 356, 356, 359, 361 (pairs) edo	*4Meg/8Meg/16Meg*	*39/59/99*	*179.00*
ACERNote Nuovo 971, 972, 372, 373, 374	8Meg/16Meg/32Meg	49/99/179	
ACERNote Pro 950, 954, 955, 957, 959 (pairs)	4Meg/8Meg/16Meg	39/59/99	
Ambra 5N Series	*4Meg/16Meg*	*49/119*	*120.00*
Ambra N-75, N-190	*4Meg/8Meg/16Meg*	*49/79/119*	*139.00*
AST Ascentia A41, A42	*6Meg/16Meg/32Meg/64Meg*	*49/89/189/369*	*179.00*
AST Ascentia P30, P50	8Meg/16Meg/32Meg	69/109/199	
AST Ascentia J10, J30, J50 (pairs)	*6Meg/16Meg/32Meg/40Meg*	*39/59/109/169*	*169.00*
AST Ascentia 800N, 810N, 900N, 910N	*6Meg/16Meg*	*69/109* *129.00, 195.00*	
AST Ascentia 950N	*6Meg/16Meg*	*69/109*	*199.00*
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AT&T Globalyst 136, 200, 250	*4Meg/8Meg/16Meg*	*49/89/109*	*139.00*
Austin DX4, DX2, SX2, SX Series	*4Meg/16Meg*	*69/159*	*159.00*
Austin Edge C0 P-133 edo	8Meg/16Meg/32Meg	69/109/199	
Austin Edge Duet (pairs) edo	8Meg/16Meg	49/89	
Canon 1100, 300P (pairs)	*4Meg/8Meg/16Meg*	*39/59/99*	*129.00*
Canon Innova Book 150, 175	*4Meg/16Meg*	*49/139*	*129.00*
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Canon Innova Book 480, 490 edo	*6Meg/16Meg*	*49/89*	*139.00*
CTX EZ Book *500*, 600, 700 Pent, Series	4Meg/8Meg/16Meg	29/49/89	*149.00*
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DEC HiNote VP 5100, 5120	*6Meg/16Meg/32Meg/64Meg*	*49/89/179/379*	*129.00*
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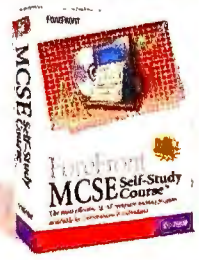

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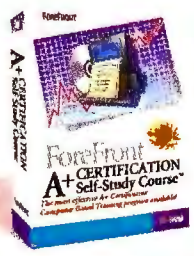

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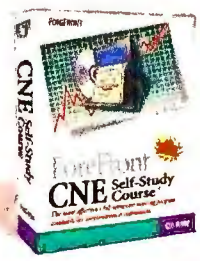

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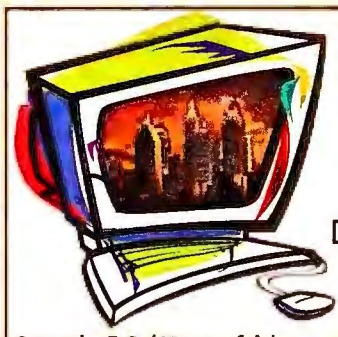

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Advantage Pro 486 SX33,SX25	4Meg-8Meg-16Meg-32Meg	30-55-95-175
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Bravo MS, 5100,133,166 (EDD,pairs)	4Meg-8Meg-16Meg-32Meg	30-55-95-175
Bravo MS-T 8150 (pairs)	4Meg-8Meg-16Meg-32Meg	30-55-95-175
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Premmia LX P-60, MX 4-66 P75	4Meg-8Meg-16Meg-32Meg	30-55-95-175

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Aptiva 300,500 Series, 700 Series (pairs)	4Meg-8Meg-16Meg-32Meg	30-55-95-185
Aptiva A Series (pairs), C Series (EOD,pairs)	4Meg-8Meg-16Meg-32Meg	30-55-95-185
Aptiva M Series	4Meg-8Meg-16Meg-32Meg	30-55-95-185
PC 330 Models 8571-6578, 6577 (EOD,pairs)	4Meg-8Meg-16Meg-32Meg	30-55-95-185
PC 340 (EOD,pairs)	4Meg-8Meg-16Meg-32Meg	30-55-95-185
PC 350 Models 6581-8585, 8586 (pairs)	4Meg-8Meg-16Meg-32Meg	30-55-95-185
PC 350 Model 6587 (EOD ... pairs)	4Meg-8Meg-16Meg-32Meg	30-55-95-185
PC 360	4Meg-8Meg-16Meg-32Meg	30-55-95-185
PC 730 Models 5875 6878 (pairs)	4Meg-8Meg-16Meg-32Meg	30-50-90-170
PC 730 Model 8877, 8887 (EOD, pairs)	4Meg-8Meg-16Meg-32Meg	30-50-90-170
PC 750 Models 6885-6886 (pairs)	4Meg-8Meg-16Meg-32Meg	30-50-90-170
PC Server 310 (pairs)	4Meg-8Meg-16Meg-32Meg	30-50-90-170
PC Server 500 (ECC,pairs)	4Meg-8Meg-16Meg-32Meg	55-90-165-295
P-S 1,30 Pin Simms	1-Meg-4Meg	15-30
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P-S 2,95XP (ECC,pairs)	4Meg-8Meg-16Meg-32Meg	55-90-165-295
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Thinkpad 300	2Meg-8Meg	5-140
PS2 L40SX	2Meg-4Meg-8Meg	40-50-99
PS2 NOTE 182/2141N82	2Meg-4Meg-8Meg	40-50-99
PS2 N33 SX	2Meg-4Meg	40-50
Thinkpad 820, 850 Power Series	4 Meg-8Meg-16Meg-32Meg	99-145-175-318
Thinkpad 345,355 C, CE	4 Meg-8Meg-16Meg	60-90-125
Thinkpad 340	4 Meg-8Meg	40-80
Thinkpad 365C,CS,CD,E,ED	4Meg-16Meg	40-120
Thinkpad 365X,385XD	8Meg-16Meg-32Meg	65-120-265
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Thinkpad 510CS	8Meg-16Meg-32Meg	65-85-135
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Thinkpad 701,701C	4Meg-8Meg-16Meg-32Meg	CALL
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Thinkpad 750, C, CS, P	4Meg-8Meg-16Meg-32Meg	99-145-175-320
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Deskpro M Series Expansion Board	DK (no memory)	110
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Deskpro 575,5120,5133,5150,5160 (EOD,pairs)	4Meg-8Meg-16Meg-32Meg	30-69-120-210
Deskpro 2000,4000,6000 Series EOD,pairs)	4Meg-8Meg-16Meg-32Meg	30-50-90-169
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Armada 1130, 1130T, 1500	8Meg-16Meg-32Meg	69-120-269
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Contura 4-25,C,CX	4Meg-8Meg-16Meg	45-75-120
Contura 3/20, 3/25, 3/25C	4Meg-8Meg	55-90
Contura 400C,400CX,410C,410CX	4Meg-8Meg-16Meg	80-85-135
Contura 420C,420CX,430C,430CX	4Meg-8Meg-16Meg-32Meg	60-85-135-199
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ACERNote 760, 763, 765, 782, 784, 786	4Meg-8Meg-16Meg	45-70-115
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ACERNote Light 350P, 510, 810, 372, 373, 374	8Meg-16Meg-32Meg	69-120-265
ACERNote 970CX, 370/C370CX	4Meg-8Meg-16Meg	40-65-115
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AST Ascentra P30, P50	8Meg-16Meg-32Meg	75-145-299
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Epson ActionNote 700, 700C, 700CX	4Meg-8Meg-16Meg	55-85
Epson ActionNote 880, 866C, 890	4Meg-8Meg-16Meg	45-75-165
Epson ActionNote 4LC-25, 4LC-33, 4SLC-2-50, 400	2Meg	60
Everex Tempo LX, LX20 Carrier	2Meg	65
Everex StepNote 486	4Meg-8Meg	40-115
Fujitsu Lifebook 435, Milan, Montego	8Meg-16Meg-32Meg	85-125-265
FMV, 8/blo 400 Series	4Meg-8Meg-16Meg	40-70-120
Gateway 2000 Colorbook 4-33	4Meg-16Meg	65-115
Gateway 2000 Nomad 425 DXL-SXL	4Meg-16Meg	65-115-755
Gateway 2000 486 Handbook or Liberty	4Meg-16Meg	55-155
Hitachi C Series	8Meg-16Meg-32 Meg	80-145-325
Hitachi E Series	8Meg-16Meg	65-145
Hitachi M-Series	8Meg-16Meg	100-150
HP Omnibook 300, 480 425	4Meg	70
HP Omnibook 430	4Meg	69
HP Omnibook 530, 600 4Meg-8Meg-12Meg		60-85-115
HP Omnibook 800CS, CT 8Meg-16Meg-32Meg		85-145-299
HP Omnibook 430	4Meg	69
HP Omnibook 4000 4Meg-8Meg-16Meg		65-89-129
HP Omnibook 5000 8Meg-16Meg-32Meg		85-135-225
HP Omnibook 6000 4Meg-8Meg		65-110
HP Omnibook 800CS, CT 8Meg-16Meg-32Meg		85-145-299
HP Palmtop 200LX 4Meg-8Meg-12Meg-16Meg-20Meg		125-169-210-255-299
Leading Edge Aviva 2000	4Meg-16Meg	65-175
Leemark SE10	4Meg	65
Magnavox Metalis	4Meg	115
Micron Transport Pentium 8Meg-16Meg		115-215
Midwest Micro Elite, Soundbook, Soundbook CD 4Meg-8Meg-16Meg		75-115-195
Midwest Micro Elite or Soundbook Plus, Soundbook II IIP 4Meg-8Meg-16Meg		75-115-195
NCR Safari 3100, 3181 4Meg-8Meg-16 Meg		65-115-195
NEC ProSpeed 486	4Meg	40
NEC Ultralite Versa, E, V, MP 4Meg-8Meg-16Meg-32Meg		85-119-155-265
NEC Versa S, Versa 2000 & 2000D 500 4Meg-8Meg-16Meg		40-65-115
NEC Versa 2530	8Meg-16Meg	60-115
NEC Versa 2600	32Meg	64
NEC Versa 3000, 4050-4080 4Meg-8Meg-16Meg-32Meg		85-119-155-265
NEC Versa 6000 8Meg-16Meg-32Meg-64 Meg		90-145-245-495
NEC Versa 6200 16Meg-32Meg-64 Meg		119-280-552
Olivetti Quaderno 575-P1335 (pairs) 4Meg-8Meg-16Meg		35-60-105
Packard Bell Statesman 2Meg-8Meg		40-60
Panasonic CF-VgT, CF-V461 4Meg-8 Meg-16Meg		80-105-155
Panasonic CF-560, CFV21PSX 4Meg-16Meg		65-115
Samsung Sens 500 Series 8Meg-16Meg-32Meg		65-120-265
Samsung Sens 810 8Meg-16Meg		65
Senyo 7-16 N8 2Meg		85
Sharp 400 Series 8Meg-16Meg-32Meg		80-130-255
Sharp 3530 3070 8Meg-16Meg		75-145
Sharp 6781 6881, 8785 8700, 6800 6741 2Meg-4Meg		45-60
Sharp 8150, 8650, 8660 7700 7760 4Meg-16Meg		60-130
Sharp 8700, 8830, 8900 4Meg-8Meg-16Meg		85-140
Sharp 3010 3020 3050, 3060 4Meg-8Meg-16Meg		40-65-115
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Shyad 9000 (pairs) 4Meg-8Meg-16Meg		40-65-115
TI Travel Mate 3000 2Meg		50
TI 4000 4000E, 4000M 4Meg-16Meg		140-715
TI 5000 5100, 5300 8Meg-16Meg-32Meg		80-85-130
TI 6020, 6030, 6050, 6160 8Meg-16Meg-32Meg		85-120-310
TI Extensa 450 4501, 455, 4551, 570 4Meg-8Meg-16Meg		40-65-115
TI Extensa 550, 555, 560, 560 (pairs) 4Meg-8Meg-16Meg		65-115-310
TI Extensa 600 Series, 900 Series 8Meg-16Meg-32Meg		65-120-310
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Winbook FX 8Meg-16Meg		80-145
Zenith Mester Sport SL, SLE 600, 820 625NL 2Meg		45
Zenith Z-Note 425LN, LNC LNP 4Meg		70
Zenith Z-Note MX 4Meg-8Meg-16Meg		60-90-150
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Zenith Z-Note Flex 486 Flex Pentium 4Meg-8Meg-16Meg		40-69-119
Zenith Z-Star 4-33 2Meg-4Meg		40-70
Zenith Z-Star EX 4Meg-8Meg-16Meg		40-65-115

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MODEL	MODULE/KITS	PRICE
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PowerEdge XE Pentium (all mdls)	16-32-64MB	120-210-425
DimniPlex 560/ME,566/ME 590/ME		
PowerEdge XE 450,466 433,433i	8-16-32-64MB	30-45-90-180
DimniPlex ME Series		
System 433TE, System 425TE	8-16MB	80-145
OptiPlex DGX Series (Pentium)	8-16-32-64MB	70-120-210-425
OptiPlex G & GX Series (Pentium)	8-16-32-64MB	60-115-230-420
Low Profile Power Desktop (all)	4-16MB	30-120
Power Desktop (all models)		
OptiPlex 4100d 466/e,466/e 433/d	4-16MB	30-90
OptiPlex V Series (all models)		
Performance T, L, M (all models)		
Dimension & Dimension XPS Series	4-8-16-32MB	25-39-69-129
(Pentium) * Installed in pairs	4-8-16MB EOD	20-35-65

DELL NOTEBOOK MEMORY

Latitude XPi (Pent), XP (486)	4-8-16MB	40-70-120
Latitude LX (486)	4-8-16MB	55-95-130
Latitude 433m,mc,450mc, mcx	4-8-16MB	55-95-130
Latitude 433i, 433cx, 433mx	4-16MB	55-115

DIGITAL DESKTOP MEMORY

DECpc MT,MTE(all models)	4-16MB	40-115
Prioris MTE (all models)		
DECpc LPi,LPx,LPx+(all models)		
Venturis Series (Pent)	4-8-16-32MB	30-55-85-185
* Installed in pairs		
Celebris Series (Pentium)	4-8-16-32MB	30-55-95-185
* Installed in pairs		
Celebris XL Series (Pentium)	8-16-32-64MB	Call
Celebris GL & GLST Series	4-8-16-32MB EOD	20-35-65-125
(Pentium)* Installed pairs	EOD	
Venturis 360,4100,466 450d2 433	4-8-16-32MB	30-55-95-185

DIGITAL NOTEBOOK MEMORY

HiNote VP (Pentium)	8-16-32-64MB EOD	69-125-250
HiNote Ultra II (Pentium)	4-8-16-32MB	40-70-120
HiNote Ultra (all models)	4-8-16-32MB	40-70-120
HiNote 486 0X4/75,DX2/50 SX/33	4-8-16-32MB	40-70-120
HiNote VP (Pentium)	8MB EOD	160

GATEWAY DESKTOP MEMORY

Destination Big Screen PC's	4-8-16-32MBEDO	20-35-65-125
P5-75,120,166,166XL,133,150		
Family PC, P5-75,100,120,133		

HEWLETT PACKARD MEMORY

Pavilion Series (Pentium)	4-8-16-32MBEDO	30-55-95-185
* Installed in pairs		
NetServer LF, LM, LM2, LC	4-8-16-32MBEDO	40-65-110-200
Vectra XP/60,VL2 Pent, Vectra		
NetServer LE Series 4860X/33	4-8-16-32MBEDO	40-65-110-200
4865X/53, 4860X/66		
NetServer 4/33 LM		
Vectra VE/4 & XM3 Series	4-8-16-32MBEDO	30-50-90-175
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Vectra VE5,VL4 & XM4 Series	4-8-16-32MBEDO	20-35-65-125
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Vectra M2,N2,XM2 (all models)	4-8-16-32MB	30-55-95-165
Vectra VL2 486 (all models)		
Vectra EM, ST Series (all models)	4-8-16MB	35-65-120
Vectra PC (all models)	512MB VRAM Kit 8MB	45-65
Vectra 486 PC,	4-8MB Models	35-65
Vectra 486/33T, 486/25T	512MB VRAM Kit, 4-8MB	40-35-65
Vectra N, M, NI (all models)	4-8-16-32MB	36-65-120
Vectra 486/66VL, 33VL, 25VL	4-8-16-32MB	36-65-120

MICRON DESKTOP MEMORY

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P133 P266 PowerServer SMP		
4100 PCI Megnum		
P150PCI Millenia P166PCI Millenia Plus	4-8-16-32MB	20-35-65-125
P75, P100 PowerStation		
P100 Home MPC, P150 Home MPC Pro		

NEC DESKTOP MEMORY

Image Pentium (all models)	4-8-16-32MB	25-39-69-129
Image 4100m 4100s,466xe 450s,433es		
PowerMate Express/II (all models)		
PowerMate Express 486/50 r 66r &	16MB	40-110
PowerMate Express 466SX/25 e		
PowerMate Express 486/33e 66e		
PowerMate V Series (486 & Pent.)	4-8-16-32MB	40-65-110-220
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Power Mate Express 486/50e	4-16MB	40-110
Power Mate Express 486SX/20e 25e		
ImSage 466, 433r 425	4-16MB	40-130
PowerMate 4775s, 433as,425as		
Ready 466as, 433as,425as		
PowerMate P60D P60M	4-8-16-32MB	40-65-110-220
Ready P60M 433, 425		
PowerMate 4100M, 466M, 466D		
PowerMate 466M		
Ready 4100M, 466m, 466D 4330		
PowerMate 425, 433, 466	4-16MB	40-140

NEC NOTEBOOK MEMORY

UltraLite SL/25C UltraLite III	2-4-8MB	85-125-199
UltraLite SL/20, UltraLite SL/20P	2-8MB	95-199
Versa M, P, V (all models)	4-8-16-32MB	85-119-155-265
Versa 4000 4050C,4080,4090		
Versa S (all models), 500, 550	4-8-16MB	40-75-115
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ST32531A	2.5GB	12MS	IDE	170
ST36450A	6.4GB	9.5MS	IDE	340
ULTRA IDE DRIVES				**INT**
ST32122A	2.1GB	12MS	IDE	175
ST33232A	3.2GB	12MS	IDE	195
ST34342A	4.3GB	12MS	IDE	250
ST36451A	6.4GB	9.5MS	IDE	345
ULTRA SCSI DRIVES				
ST52160N	2.1GB	11MS	USCSI	225
ST32272N	2.1GB	8MS	USCSI	365
ST34572N	4.5GB	8MS	USCSI	575
ST34501N	4.5GB	7.5MS	USCSI	665
ST19171N	9.1GB	8MS	USCSI	935
ST19101N	9.1GB	8MS	USCSI	1075
ST423451N	23.2GB	13MS	USCSI	1795
ULTRA WIDE SCSI DRIVES				
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ST34572W	4.5GB	8MS	UWIDE	615
ST34501W	4.5GB	7.5MS	UWIDE	695
ST19171W	9.1GB	8MS	UWIDE	955
ST19101W	9.1GB	8MS	UWIDE	1100
ST423451W	23.2GB	13MS	UWIDE	1855
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ST34501WD	4.5GB	7.5MS	UWIDE DIFF	755
ST19171WD	9.1GB	8MS	UWIDE DIFF	1025
ST423451WD	23.2GB	13MS	UWIDE DIFF	1895
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MC4345W	4.5GB	7.9MS	U-WIDE	535
MC3391W	9.1GB	8.5MS	U-WIDE	875
ULTRA WIDE SCSI-AV GOLD DRIVES				
MC4345WAV	4.5GB	7.9MS	U-WIDE-AV	590
MC3391WAV	9.1GB	8.5MS	U-WIDE-AV	935

Maxtor

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MB21DDA	2.1GB	11MS	IDE	185
MB2560A	2.5GB	10MS	IDE	200
MB3201A	3.2GB	11MS	IDE	215
MB4320A	4.4GB	11MS	IDE	280
MB5120A	5.1GB	10MS	IDE	350
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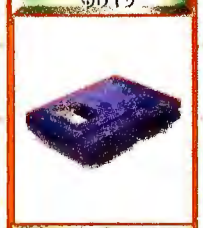

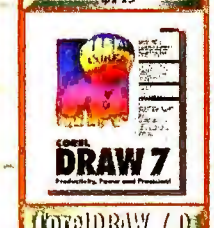

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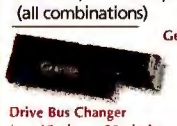

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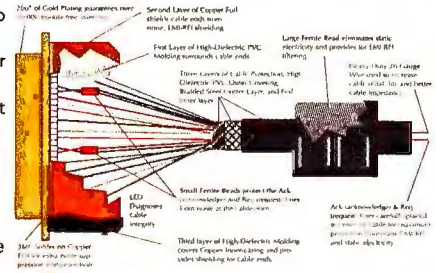

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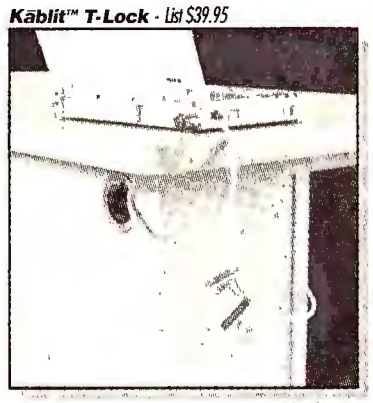

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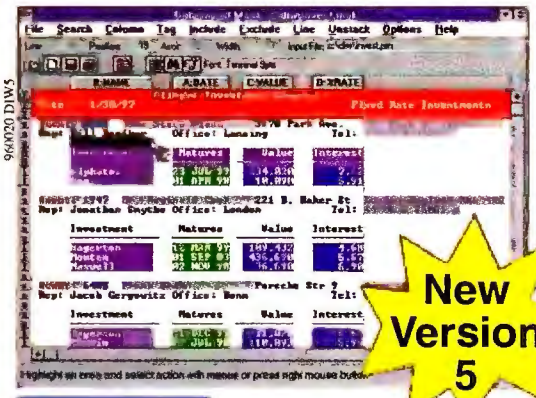

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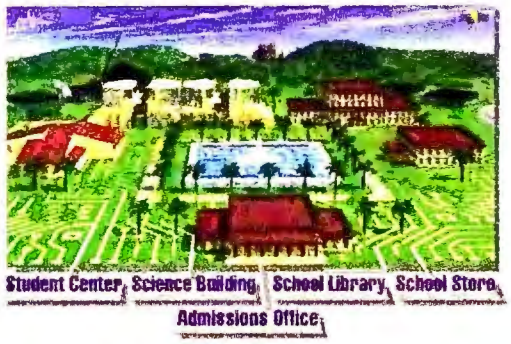

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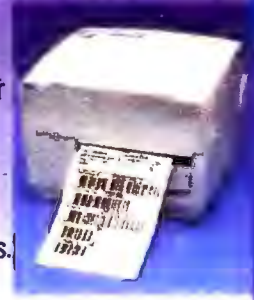

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952 Notebook computers
953 Windows 95 software
954 Monitors and video boards
955 Accounting software
956 Graphics software
957 Network/sharing products
958 Printers
959 Multimedia products
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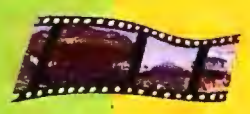

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The Future of PCs? Don't Ask Me

HERE'S WHAT I PREDICT about the future of computerdom: Hardware will continue to get faster, more powerful, cheaper. Software will continue to be a pain. And that's as far as I'm willing to go. Making predictions about technology is a sucker's game.

The greatest example of something no one could predict is the stunning growth of the Internet. Just about nobody saw it coming, including me. From the vantage point of, say, 1993, it looked like an impossible dream. Who but dweebs weaned on UNIX would actually want to tangle with things as maddening as anonymous FTP and Telnet and VT-100 emulation, not to mention Gopher and Archie and Veronica? Who could have guessed how radically the situation would change, once somebody figured out a way to make the whole thing simple by developing a protocol called HTML and enabling point-and-click interfaces and graphical Web browsers?

Ultimately, the limiting factor for the future isn't hardware or software; it's creativity.

Even things that look big don't always turn out that way. Two years ago, DVD-ROM looked like it would be everywhere by now. Wrong. DVD got mired in competitive formats, copy protection, and regional turf defense. After all that, its prospects became so iffy that software development oozed to a halt. It'll probably catch on, just as CD-ROM eventually did, but people as astute as Bill Gates wildly overestimated how fast that format would become commonplace.

IT'S HARD TO PREDICT

GIVE A GOOD DEMO, particularly when the actual product is years from shipping, and pundits will fall all over each other to announce the face of the future. If a few glitches seem painfully obvious, just assure the gullible that everything will be fixed by the time the product is released, honest.

A few years back, the "experts" claimed we'd all be using pen-based computers by now. Forget the fact that handwriting recognition was a long way from being usable; the pen-based systems of the day were so slow, they couldn't keep up with your scrawl. Pens eventually became part of niche-market devices like the PalmPilot, but many dollars were lost on early pen-based bets.

Remember "video on demand"? Its proponents claimed you'd be able to click your remote control and have any movie ever made delivered to your home through optical fiber. Hardware demonstrations hinted that the technology might have worked, but it never got the chance. Nobody came up with a business plan that remotely justified the investment it would need.

REALITY IS VIRTUAL

IF YOU READ any hip computing journal of 1993, you might have believed that everyone in the United States would soon be grooving on some kind of virtual reality simulator. It sounded pretty good—till you tried it. Turned out you got a more realistic experience by watching TV than by donning goggles and feeling woozy while exploring a virtual world of chunky, garish polygons. About the only remnant of the VR craze is the force-feedback joystick.

Remember intelligent agents? Those futuristic applets were supposed to order tickets and book hotel rooms with the savvy of the best travel agents. People still talk about them, but to this day nobody's actually seen one in the wild.

And nobody goes back a year (or five or ten) to match pundits' predictions with what actually happened. The venerable Esther Dyson once touted products like Javelin, Lightyear, and Ize as if they would dominate the future of computing. Ever heard of them? I didn't think so.

The problem with predicting anything more than gross trends is the complexity of the real world. Extending current growth curves to infinity rarely works—something always comes along to change the curves. Pundits often ignore things like competition that can turn their predictions to dust.

Ultimately, the limiting factor for the future isn't hardware or software; it's creativity. As the burgeoning Internet start-ups show, plenty of ideas are out there, but most will turn out to be bad ones. Earthshaking ideas like HTML and Web browsers are impossible to predict because of their very originality. That's why I stay away from the business of prediction.

PC World *contributing editor Stephen Manes is a columnist for the* New York Times *and half of the* Digital Duo, *a new technology program on public television stations.* ■

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Common features: ◆ Mini-Tower Model ◆ 512KB L2 Cache ◆ *NEW* 56K Capable** U.S.R x2 WinModem ◆ Microsoft Home Essentials 98 with Money 98 ◆ McAfee VirusScan ◆ Microsoft Windows 95 ◆ Microsoft Internet Explorer ◆ MS IntelliMouse® ◆ 3 Year Limited Warranty† with 1 Year On-site^ Service
Upgrades: ◆ Iomega Zip 100MB Internal Drive with One Cartridge, add $99 ◆ APC Back-UPS 420 PnP, add $219 ◆ HP DeskJet 722C, add $349

NEW DELL DIMENSION XPS D300
300MHz PENTIUM II PROCESSOR
FEATURING MMX TECHNOLOGY

Common features listed above plus:
- 64MB SDRAM Memory
- 8.4GB Ultra ATA Hard Drive (9.5ms)
- *NEW* 1200HS Monitor (17.9" v.i.s., .26dp)
- *NEW* STB nVidia 4MB AGP Video Card
- DVD-ROM Drive and Decoder Card
- *NEW* Sound Blaster AWE64 Value Sound Card
- *NEW* Altec Lansing ACS-495 Full Dolby Surround Sound Speakers with Subwoofer
- *NEW* Dell Ergonomic Keyboard

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FEATURING MMX TECHNOLOGY

Common features listed above plus.
- 64MB SDRAM Memory
- 6.4GB Ultra ATA Hard Drive (9.5ms)
- 1000TX Trinitron Monitor (15.9" v.i.s., .26dp, 1280x1024 max. res.)
- *NEW* STB nVidia 4MB AGP Video Card
- DVD-ROM Drive and Decoder Card
- *NEW* Sound Blaster AWE64 Value Sound Card
- ACS-290 Speakers with Subwoofer
- Iomega Zip 100MB Internal Drive with One Cartridge
- Dell Quiet Keyboard

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Personal Lease: $136/Mo., 24 Mos.◊Σ
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266MHz PENTIUM II PROCESSOR
FEATURING MMX TECHNOLOGY

Common features listed above plus.
- 64MB SDRAM Memory
- 4.3GB Ultra ATA Hard Drive (9.5ms)
- 1000LS Monitor (15.9" v.i.s.)
- *NEW* STB nVidia 4MB AGP Video Card
- *NEW* 32X Max^ Variable CD-ROM Drive
- Integrated Yamaha Wavetable Sound
- Altec Lansing ACS-90 Speakers
- Iomega Zip 100MB Internal Drive with One Cartridge
- *NEW* Dell Ergonomic Keyboard

$2499

Personal Lease: $114/Mo., 24 Mos.◊∞
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233MHz PENTIUM II PROCESSOR
FEATURING MMX TECHNOLOGY

Common features listed above plus.
- 32MB SDRAM Memory
- 4.3GB Ultra ATA Hard Drive (9.5ms)
- 1000LS Monitor (15.9" v.i.s.)
- *NEW* STB nVidia 4MB AGP Video Card
- *NEW* 32X Max^ Variable CD-ROM Drive
- Integrated Yamaha Wavetable Sound
- Altec Lansing ACS-90 Speakers
- Dell Quiet Keyboard
- ★ *Upgrade to a 6.4GB Ultra ATA Hard Drive, add $59.*

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- Word 97
- Excel 97
- Publisher 97
- Outlook 97
- Automap Streets Plus
- Small Business Financial Mgr 97

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- Encarta 98 Encyclopedia
- Money 98
- Works 4.5
- Greetings Workshop 2.0
- Puzzle Collection

Microsoft Internet Explorer

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Dual Processor Capable

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- 12X SCSI CD-ROM Drive
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300MHz PENTIUM II PROCESSOR
Dual Processor Capable, RAID Capable

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- 6 Drive Bays: 3 External 5.25"/ 3 Internal 3.5"
- 7x24 Dedicated Server Hardware Technical Telephone Support

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233MHz PENTIUM II PROCESSOR
Dual Processor Capable, RAID Capable

Common features listed above plus:

- 64MB ECC EDO Memory
- 4GB Ultra-Wide SCSI-3 Hard Drive (7200 rpm, 8ms)
- 24X Max§ Variable SCSI CD-ROM
- 6 Expansion Slots: 3 PCI/3 EISA
- 6 Drive Bays: 3 External 5.25"/ 3 Internal 3.5"
- 7x24 Dedicated Server Hardware Technical Telephone Support

★ *Upgrade to a 266MHz Pentium II Processor, add $300.*

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233MHz PENTIUM PROCESSOR
WITH MMX TECHNOLOGY

Common features listed above plus:

- 13.3" XGA Active Matrix TFT Display
- 32MB SDRAM (144MB Max)
- 512KB L2 Pipeline Burst Cache
- 2.1GB ATA Hard Drive
- 128-bit Graphics Accelerator with 65K Colors at 1024x768
- Zoom Video and USB Ports
- Stereo Speakers with 3D Surround Sound and Yamaha SW Wavetable
- Cardbus Ready/Fast IR 1.1
- 6.9 Pounds*

★ *Upgrade to 64MB SDRAM, add $299.*

$3399

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WITH MMX TECHNOLOGY

Common features listed above plus:

- 12.1" SVGA Active Matrix TFT Display
- 32MB SDRAM (144MB Max)
- 512KB L2 Pipeline Burst Cache
- 2.1GB ATA Hard Drive
- 128-bit Graphics Accelerator with 16 Million Colors at 800x600
- Zoom Video and USB Ports
- Stereo Speakers with 3D Surround Sound and Yamaha SW Wavetable
- Cardbus Ready/Fast IR 1.1
- 6.4 Pounds*

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WITH MMX TECHNOLOGY

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- 12.1" SVGA Active Matrix TFT Display
- 32MB SDRAM (144MB Max)
- 256KB L2 Pipeline Burst Cache
- 2.1GB ATA Hard Drive
- 128-bit Graphics Accelerator with 16 Million Colors at 800x600
- Zoom Video and USB Ports
- Stereo Speakers with 3D Surround Sound and Yamaha SW Wavetable
- Cardbus Ready/Fast IR 1.1
- 6.4 Pounds*

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Business Lease◊: $95/Mo., 36 Mos.
Order Code #891206

DELL LATITUDE® LM M133ST
133MHz PENTIUM PROCESSOR
WITH MMX TECHNOLOGY

Common features listed above plus:

- 12.1" SVGA Active Matrix TFT Display
- 24MB EDO RAM (72MB Max)
- 256KB L2 Pipeline Burst Cache
- 2.1GB ATA Hard Drive
- 128-bit Graphics Accelerator with 65K Colors at 800x600
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- Mini-Tower Model
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- 512KB Integrated L2 Cache
- ★ ***NEW*** **6.4GB Ultra ATA Hard Drive (9.5ms)**
- 1000LS Monitor (15.9" v.i.s.)
- ★ ***NEW*** **STB nVidia 4MB AGP Video Card**
- ★ ***NEW*** **32X Max^ Variable CD-ROM Drive**
- ★Integrated Yamaha Wavetable Sound
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- Microsoft® Office 97 Small Business Edition plus Bookshelf; McAfee VirusScan
- MS® Windows® 95/Internet Explorer
- Microsoft IntelliMouse®
- 3 Year Limited Warranty† with 1 Year On-site^Δ^ Service
- ★Upgrade to a 56K Capable** U.S. Robotics x2 WinModem, add $79.
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