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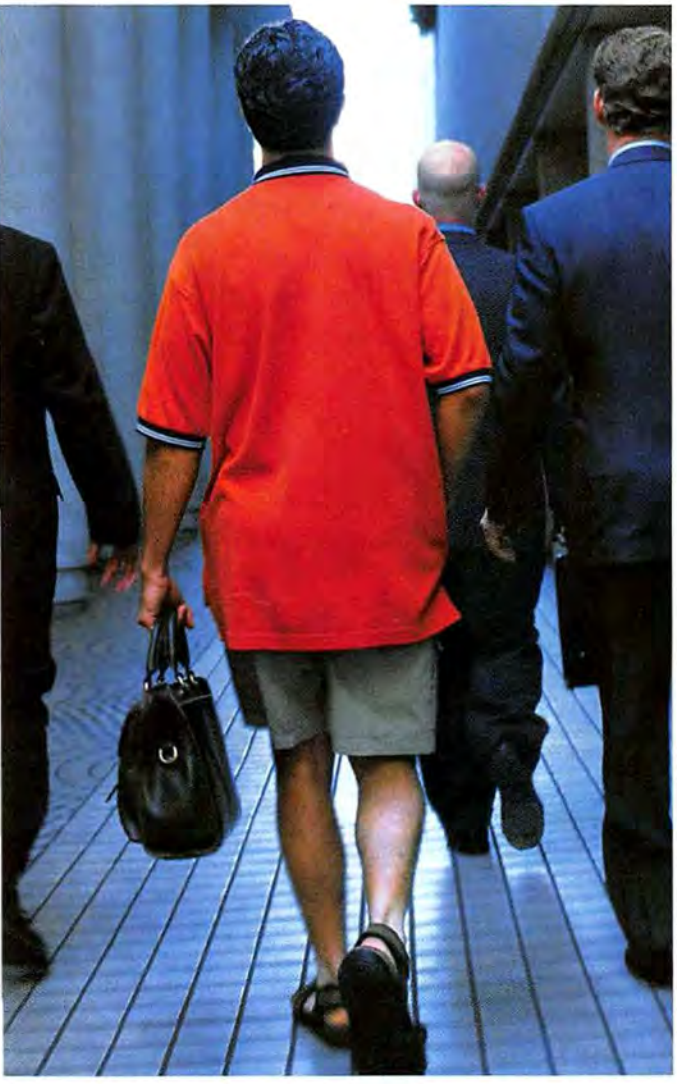

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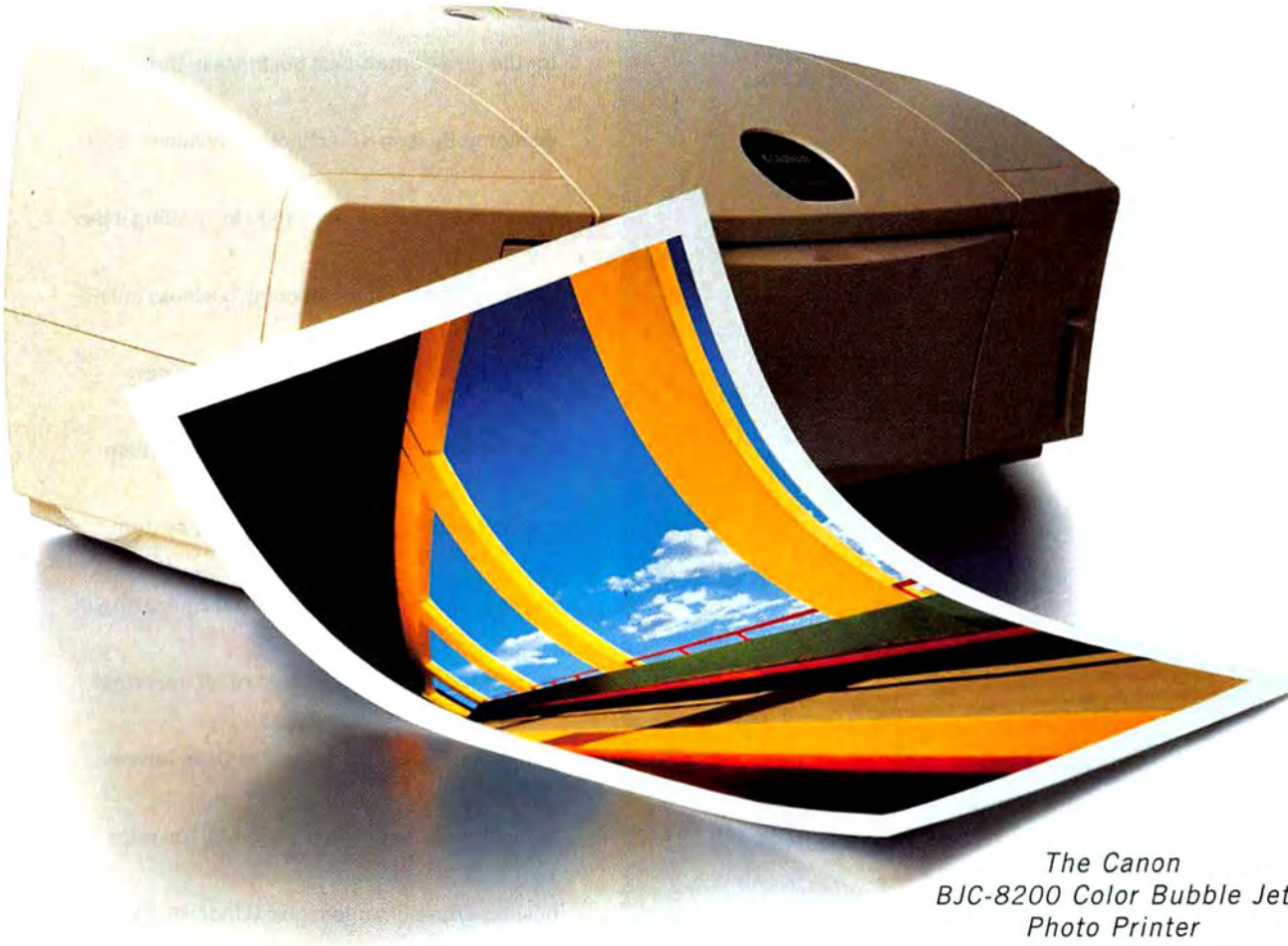

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COVER STORIES

99 DESTINATION WINDOWS 2000

online It's a new way to fly. Windows 2000 transcends its NT origins by offering conveniences from Windows 98 while retaining the NT line's relative imperviousness to crashes. So should you book a seat now or wait for a later flight? We help you decide, based on your hardware, software, and personal computing needs. Meanwhile, for people who already hold confirmed seating aboard Win 2000, we supply an overhead bin full of tips to optimize your upgrade.

Plus: Want the complete scoop on test flights? We detail how the new OS performed from takeoff to touchdown in comparison to Windows 98 and NT 4.0.

100 Your Ticket to a Hassle-Free Upgrade

122 Tips for New Arrivals

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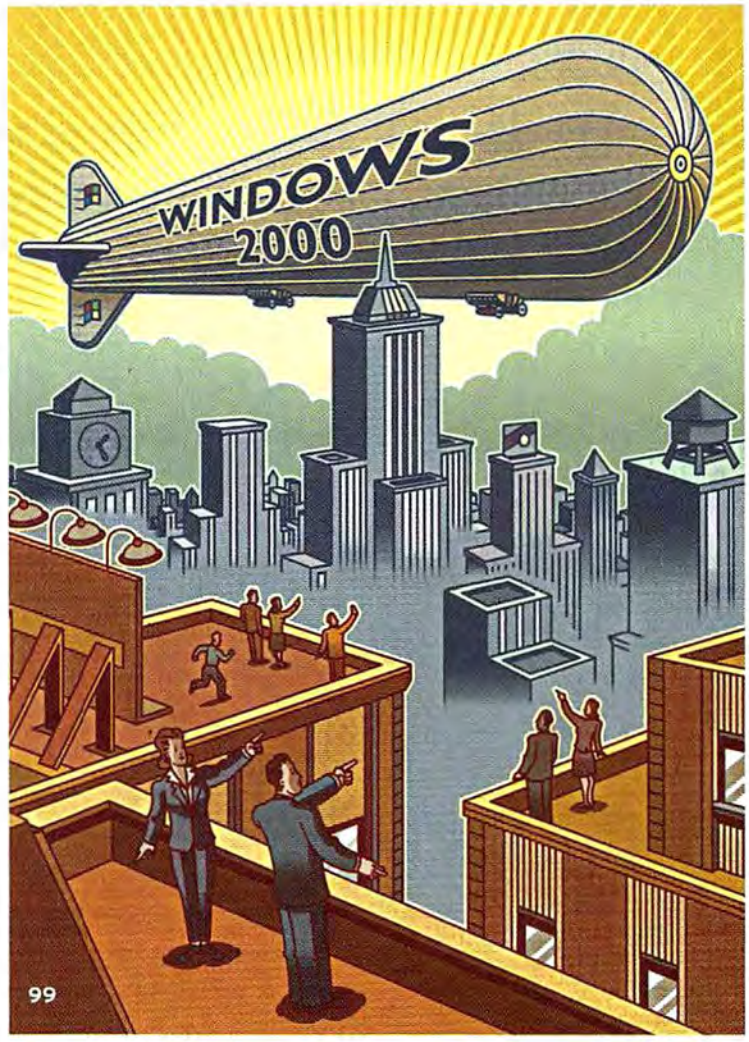

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REVIEW For versatile storage, think CD-Rewritable drives—prices are down and speed is up. CD-RWs let you record multimedia discs, archive MP3 files, and back up critical files. We rate 13 drives, beguilingly priced at $160 to $399.

173 IS FLAT WHERE IT'S AT?

REVIEW We looked at 23 of the latest 19-inch monitors—many of them with attractive, space-saving flat screens—and identified the 10 best. The good news: As displays get bigger and better, they occupy less of your desk and demand less of your wallet.

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191 PUT YOUR MONEY WHERE YOUR MOUSE IS

Next in line, please! New online banking services let you access everything but the warm-blooded teller. But watch out for pitfalls among the conveniences. We explain how to choose a bank, pay bills, and get a loan—and what to do if things unexpectedly go awry.

ICONS: JEFFREY PELO

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HOW-TO Here's how to dial up, log on, and get things done online, no matter where you are.
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REVIEW We test 10X DVD-ROM drives from Aopen and Pioneer and evaluate whether the extra speed boost is worth the jump in price.
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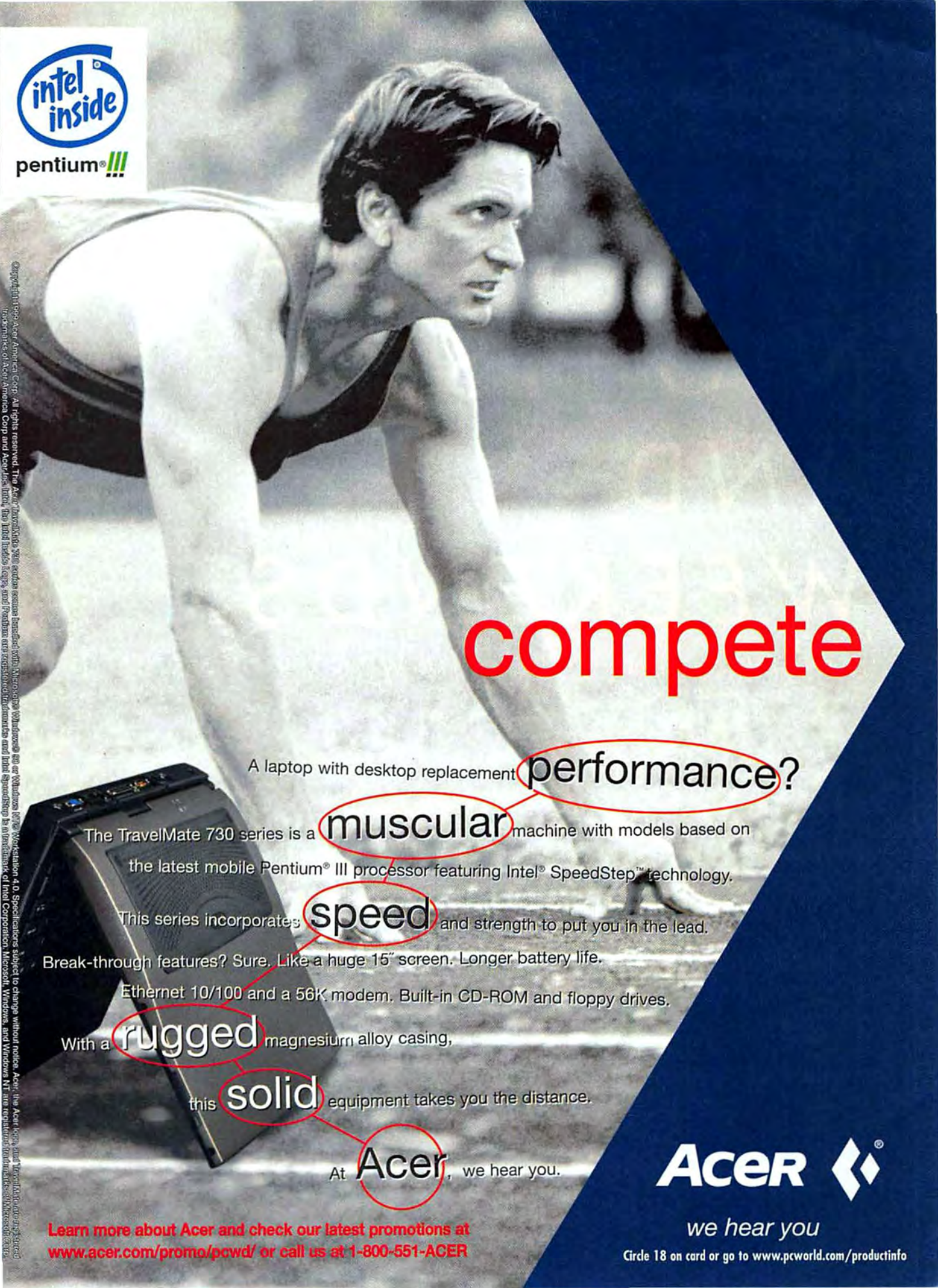

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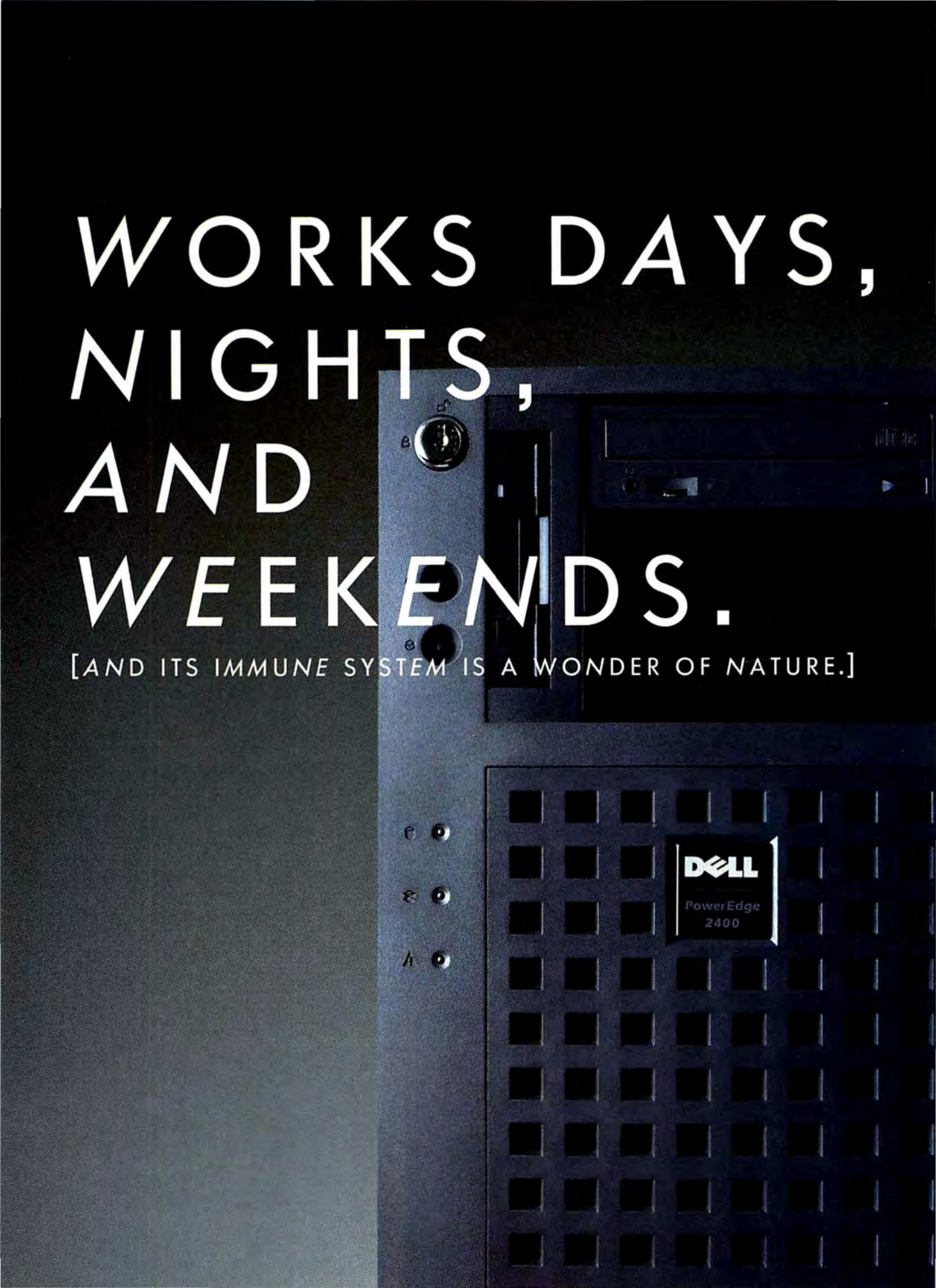

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In Memoriam: Luis Camus

UNLESS YOU'RE A CONNOISSEUR of mastheads, you've probably never seen the name Luis Camus. His work as *PC World*'s managing editor mostly took place behind the scenes. For once, we'd like to give Luis public recognition commensurate with his importance to this magazine, and to all of us. Luis lost his battle with cancer a few days before the turn of the millennium. He was only 38.

As Luis's colleagues and friends, we at *PC World* grieve along with Marty Maxwell, Luis's loving wife, knowing that her loss is even greater than our own.

Luis Camus
1961-1999

Managing editors have tough jobs and are often tough to deal with. Come what may, issue after issue, managing editors must get the magazine out the door on time. High pressure—both feeling it and applying it—come with the territory. As a barrel-chested, former power-lifting champion, Luis could have used his imposing physical presence to intimidate laggards. He chose to do just the opposite. Luis's gentle, buoyant spirit drove the editorial process better than any taskmaster ever could. He didn't have to *make* people do things because, once they knew Luis, they couldn't help *wanting* to do things for him. Luis inspired this feeling throughout his years at *PC World*.

—Phil Lemmons, editorial director

WHEN I STARTED as fact checker, I took Luis up on an offer to help me if I had any questions. It was weeks before I realized he was the managing editor. He never mentioned it. I think his warm response to me, a complete novice, says something about how available he made himself to everyone, how kind he was. He was a passionately good person.

—Nicole Stefanko, former editorial researcher

I MET LUIS at an editorial retreat several years ago. He was like the camp counselor all the kids love. He was always surrounded by people, and there was always laughter. You could talk to Luis for five minutes and feel like a consequential part of the magazine, even if you were a freelancer thousands of miles away.

—Judy Heim, contributing editor

WHEN WE HAD a mapping problem—deciding what ad or editorial pages should go where—Luis would drum his fingers and count out pages. He would mentally reposition entire magazine sections. Before long, he'd announce a solution that worked for everyone. Then he'd look over at me and say, "Thanks, Anne—great idea!"

—Anne Kandra
former assistant managing editor

LUIS HAD A READY answer when one writer complained about a minor problem. "Sheesh! When I was your age, I used to walk a mile to school barefoot in the snow to go work on a Mac Plus." Early in Luis's illness, the staff sent some cakes and cookies to his hospital room. He called our receptionist because he thought the bakery had mistakenly sent the order to him instead of to our offices. It's pure Luis to think that good things, including credit for a job well done, should go to someone else.

—Kimberly Stein, assistant managing editor

I LOVED WORKING with Luis. He and Marty once visited my studio and took their time looking at my sculptures. Luis pointed out the ones he liked most, and he asked if I would sculpt him with Marty some time. I wish I'd had the chance to. It would have been a great honor to try capturing Luis's incredible energy and immense spirit.

—Marlene Tobias, production artist

PEOPLE OUTSIDE of publishing don't always understand what a race it is for us. Luis was a kind of pace car here. He was always right there to steer for you before you hit the wall. If our profession has a guardian angel, it is surely someone just like Luis.

—Kate Godfrey, assistant art director

LUIS WAS THE person you went to when you were on the verge of giving up. His rock-solid ethics and ability to get results without antagonizing anyone were inspiring. His warmth permeated everyone on this magazine. Everybody knew Luis was available to help in any crisis—big or small, personal or professional.

—Karen Silver, senior editor

ALTHOUGH LUIS was younger than me, talking to him was like chatting with an uncle. A few months after starting, I was ready to quit. I asked him to meet me discreetly outside the office. He really listened—and then said some very smart and supportive things. I'm still here, and I owe him big time.

—Bill Snyder, editor-in-chief, pcworld.com

LUIS RUMBLED around the office like a friendly, cheerful bear. He was one of those rare people who made everyone feel, not just comfortable, but happy to be around him.

—Tracey Capen, executive editor, reviews

I'LL REMEMBER Luis for his large spirit, easy laughter, and personal generosity. Without tipping his hand, he could often find out what people enjoyed and later surprise them with the perfectly chosen gift. Through such gestures, Luis will live on.

—Robert Kanes, creative director ■

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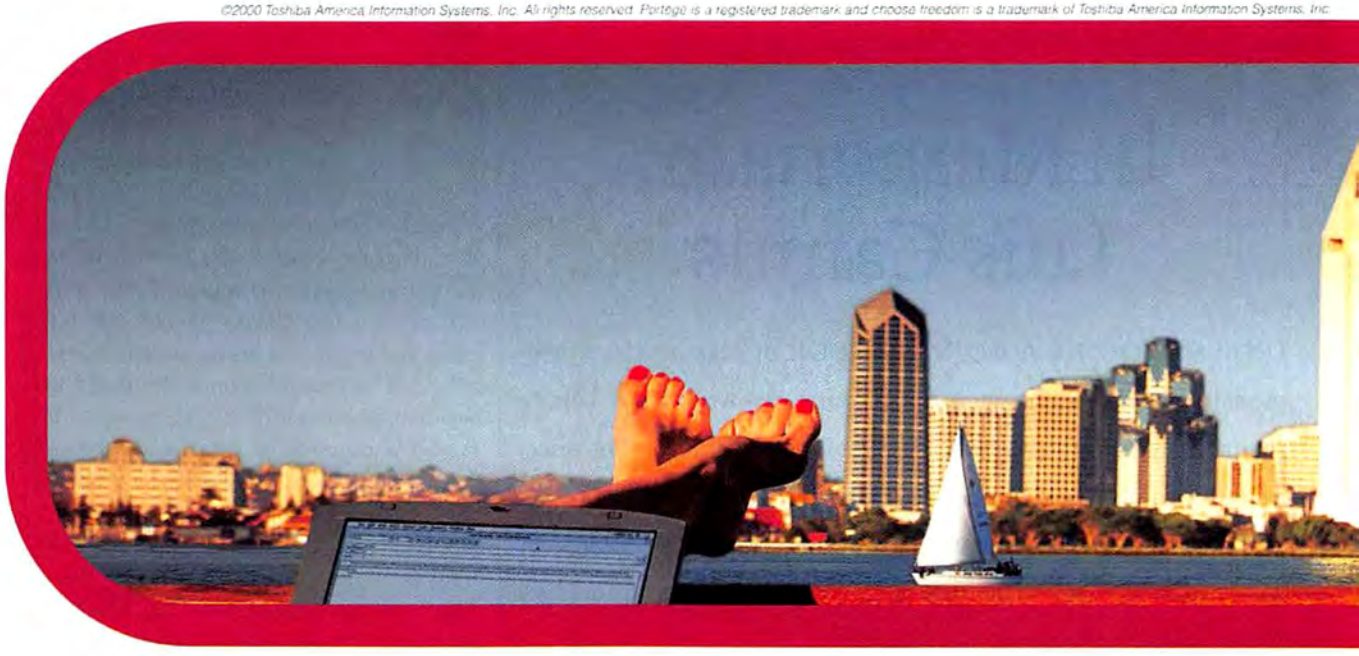

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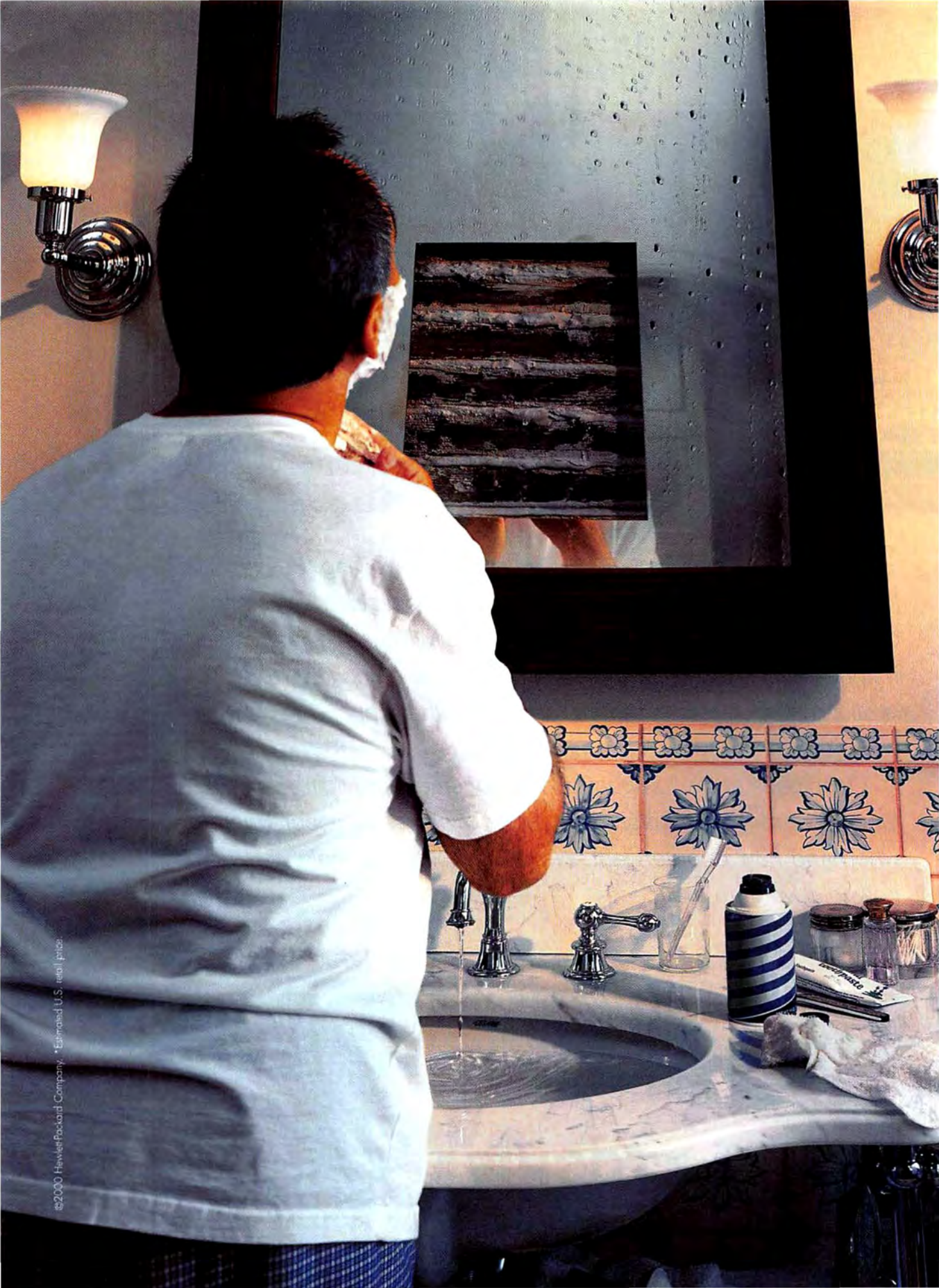
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YOUR TAKE ON: Computer fashion ◆ Password management ◆ Net commerce

SOFTWARE: IT'S US OR THEM

I AM DISGUSTED at how buggy, and even downright dirty, software has become. I have three virus scanners. When I recently started to upgrade my McAfee scanner from a CD, I got a message that to install the product, I simply must remove the other two scanners—no choice. Outraged, I complained to McAfee, which e-mailed me instructions on how to upgrade without losing my other virus scanners. But if this kind of hassle is the future of software, I will be doing fewer upgrades.

Bob Carpenter
Snohomish, Washington

DIGITAL CAMERAS OUT OF FOCUS

THE JANUARY article on digital cameras ["New Year's Resolutions"] was most interesting, but in your infographic comparing image quality ["Worth More Than a Thousand Pixels?"] I noticed something that has long bothered me. Your control photo has the subject well focused and the background blurry. The digital photos all have the subject out of focus and the background nicely clear. This has been a common and annoying experience for me, as well. If one is not fanatically careful to focus on the subject, the metering causes digital cameras to grab either the foreground or the background. One solution that has worked for me is to employ spot metering, a feature available on higher-priced cameras. This helps ensure focus on the desired subject, as well as proper exposure.

John Kanca, III
Middlebury, Connecticut

TWO DIFFERENT OPINIONS

IN YOUR JANUARY issue, I read two totally different reviews for a component of the same product, the Dell Dimension XPS T600. The component is the Altec Lansing ACS340 speaker system. On page 206 (*Top 10 Power PCs*), you say this speaker system was "merely adequate." But then on page 231 (*Top 15 Home PCs*), you say that the "Altec Lansing speakers and subwoofer generate rich, full sound." Which is it?

Susan Jones
Grapevine, Texas

Editor's response: *Most* of our reviewers consider the ACS340 to be an above-average sound system. While PC WorldBench 98 scores are the result of precise testing, our comments about peripherals reflect each reviewer's subjective opinion.
–Michelle Campanale-Surkan

WHAT ABOUT THE LICENSES?

IN JANUARY'S *Hardware Tips*, a reader asked about deleting files from computers that are given away. I feel Kirk Steers's response—implying that you could delete sensitive files but leave software intact—was incomplete.

Applications should also be removed, since giving away the copy on the hard drive would violate the software license.

It would be better to wipe the hard drive clean and reinstall a legitimate copy of the operating system. And if you really want to help the new recipients, download the latest sound and video drivers so they have machines ready to take on a second life.

Dan Bentch, Kansas City, Kansas

DON'T NEED NO STINKIN' COLORS

READING "Ultimate Buyer's Guide: Home PCs" (December), I was immediately struck by the authors' concern over the many beige computer cases. I may live to regret this remark, but I can't imagine why I would want a PC in any color but beige (i.e., invisible).

Since when did a PC become a fashion accessory? I can't wait until I have to ▶

HOT BUTTON

Does Microsoft Play Fair? Does Anyone?

IN THE MICROSOFT vs. Department of Justice battle, which your editorial discussed ["DOJ to Microsoft: Play Fair or Else!" *Up Front*, January], Microsoft has said it won't accept any solution that will not protect its intellectual property. What right does it have to make that statement? The company has a track record of sending its representatives to smaller firms to examine their new technologies. The smaller company reveals its methods, hoping to license to Microsoft or to sell outright. Microsoft then "reverse engineers" its own solution, effectively stealing the product from the true innovator.

That's where Internet Explorer, DoubleSpace, Video for Windows, and Microsoft Java came from. And yes, that's where Windows came from, too.

Maybe the real entrepreneurs that Microsoft shafted should all get together and consider filing a class-action lawsuit to recover lost profits, plus damages.

Marty Rubinstein, Sunrise, Florida

COME ON, EDITOR! I see ideas being stolen, and tossed back and forth, by literally every company in the software industry—even Apple. I would be willing to bet that every piece of software on the market has benefited from ideas that were found in a competitor's package.

Your editorial is simply old, worn-out anti-Microsoft propaganda.

I was a fanatic Mac graphics pro for 12 years, until I purchased my first Windows system two months ago. The machine rocks. It crashes far less, costs less, and has less expensive components and accessories. It has opened my eyes to the *real* world of computing options—more than are believable, thanks to Gates's monopoly.

I don't care how these companies do business and treat each other, or even if they live or die. I care what they are doing for me and what their products cost me. Go, Gates. Go get 'em!

Stan Johnson, Salt Lake City

ILLUSTRATION: JOHN CUNEO

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worry about the color of the Zip drive I add or whether I have coordinated cables.

What I really want is a beige box not quite the size of a software carton that is so infinitely upgradable as never to become obsolete. Then I can stick a geranium in front of it, and I won't have to worry about what the neighbors think of my taste in computers.

Dave Gliserman, Austin, Texas

JUGGLING PASSWORDS

REGARDING January's *Got a Problem* about managing multiple Passwords: I, too, have used PassKeeper to handle my password files. But as I began to add more and more entries, I looked for a way to print the list, in case the program died. I contacted the program's author, but ▶

CORRECTIONS AND CLARIFICATIONS

CONTRARY TO A statement in January's *New Products* review of Oki Data's OkiColor 8 and IBM's Infoprint Color 8 printers, power-save mode can be—and in fact was—disabled, as is customary in our tests. However, an unusual design feature in both printers shuts down the fuser heater if a print job is completed and no other jobs are in the queue. This enables the printer to cool off more quickly but also results in a longer warm-up period—and the relatively slow printing speeds described in the article.

In addition, the review should have stated that the OkiColor 8 was tested with 64MB of memory in PCL mode, while the IBM was tested with 32MB of memory in PostScript mode, which is generally slower than PCL. Finally, the warranty for the InfoPrint Color 8's print head is for one year, not a lifetime, as stated in the review. So Oki Data's five-year warranty is significantly longer.

In January's Special Report, "Choose an ISP for Your Business," the chart on page 186 should have stated that PSINet does offer single, non-networked (dial-up) access for small- to midsize businesses in conjunction with other entry-level services.

In "When Good Data Goes Bad" (January), we should have stated that PowerQuest's Lost & Found data recovery program can in fact be used more than once, though only on the same system.

PC World regrets the errors.

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he said that there is no print capability.

Another drawback: PassKeeper is limited to 128 entries. The author suggested putting a copy of the program in another directory to add more entries. But this requires multiple searches to find where you've entered a password.

Since I'm also a Palm user, I searched on PalmGear and found a program for $27.50 called TopSecret, with Palm *and* desktop versions, plus a conduit for syncing the two. After trying the program for 5 minutes, I bought it from the author's Web site (www.ClikLite.com).

Mark McManus
Winston-Salem, North Carolina

ON THE COVER

ON THE JANUARY cover, you show some very cool-looking computer components, but when I searched the issue for the two devices pictured on the cover's right-hand side, I couldn't find them!

I like your magazine, but this seems a little bit like teasing just to get people to buy it, and *that* I don't like.

Charles McKinley, Sierra Vista, Arizona

Art department's response: The devices on the cover simply illustrate the futuristic ideas implied by the headline "Your Next PC," and we decided they did not require specific discussion. The butterfly-shaped gadget on the lower right is a Lexmark prototype of a new keypad input device with black keys for your fingers on each wing. The cylindrical case above it is a design prototype by Fiori Product Development. Credits for the cover photos in the *Table of Contents* mention Fiori and Lexmark.

–Tim J Luddy, Associate Art Director

NET COMMERCE STANDARDS

THANKS FOR discussing the Standard for Internet Commerce code (something I've rarely seen covered elsewhere) in your December editorial [*Up Front*, "E-Shoppers of the World, Unite!"].

My biggest concern is that a selling or offering party should *explicitly* describe the product with the identifier used by the manufacturer (like the ISBN of a book), plus its details, packaging, and contents. In my experience, too many Web auction sites (and many resellers) give an unusable list of details for a computer part or software and miss the essentials—sometimes even the product's name, manufacturer, and dimensions!

I have almost had it with online sellers. Just when I seem to know exactly what I'm getting, one of them manages to screw it up by varying something that I never knew could be varied, thereby providing something other than what I thought I had specified.

Chris Dagnon, Madison, Wisconsin

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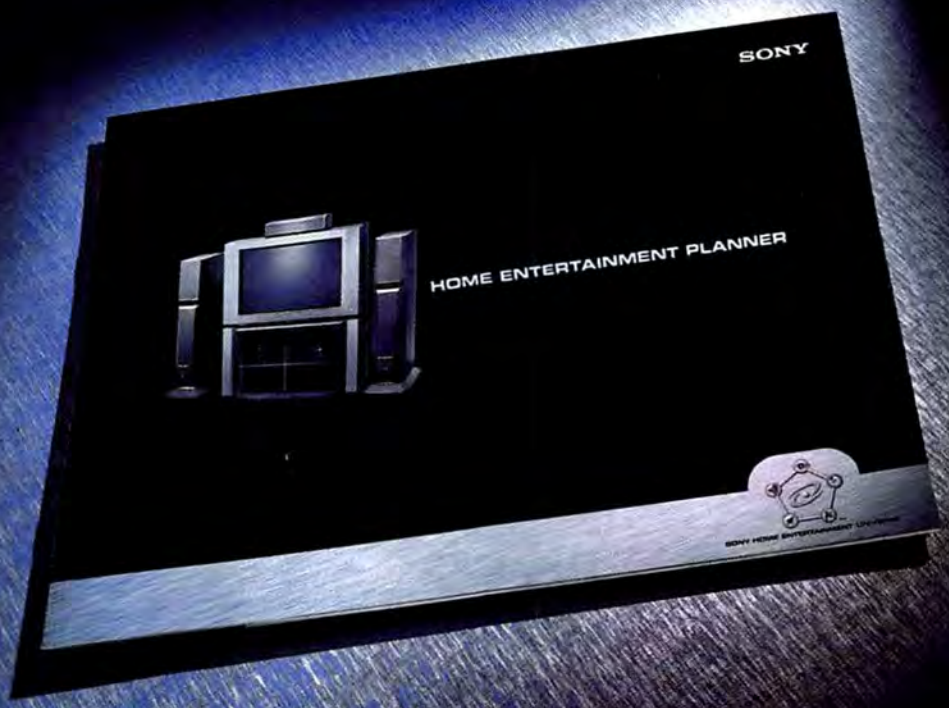

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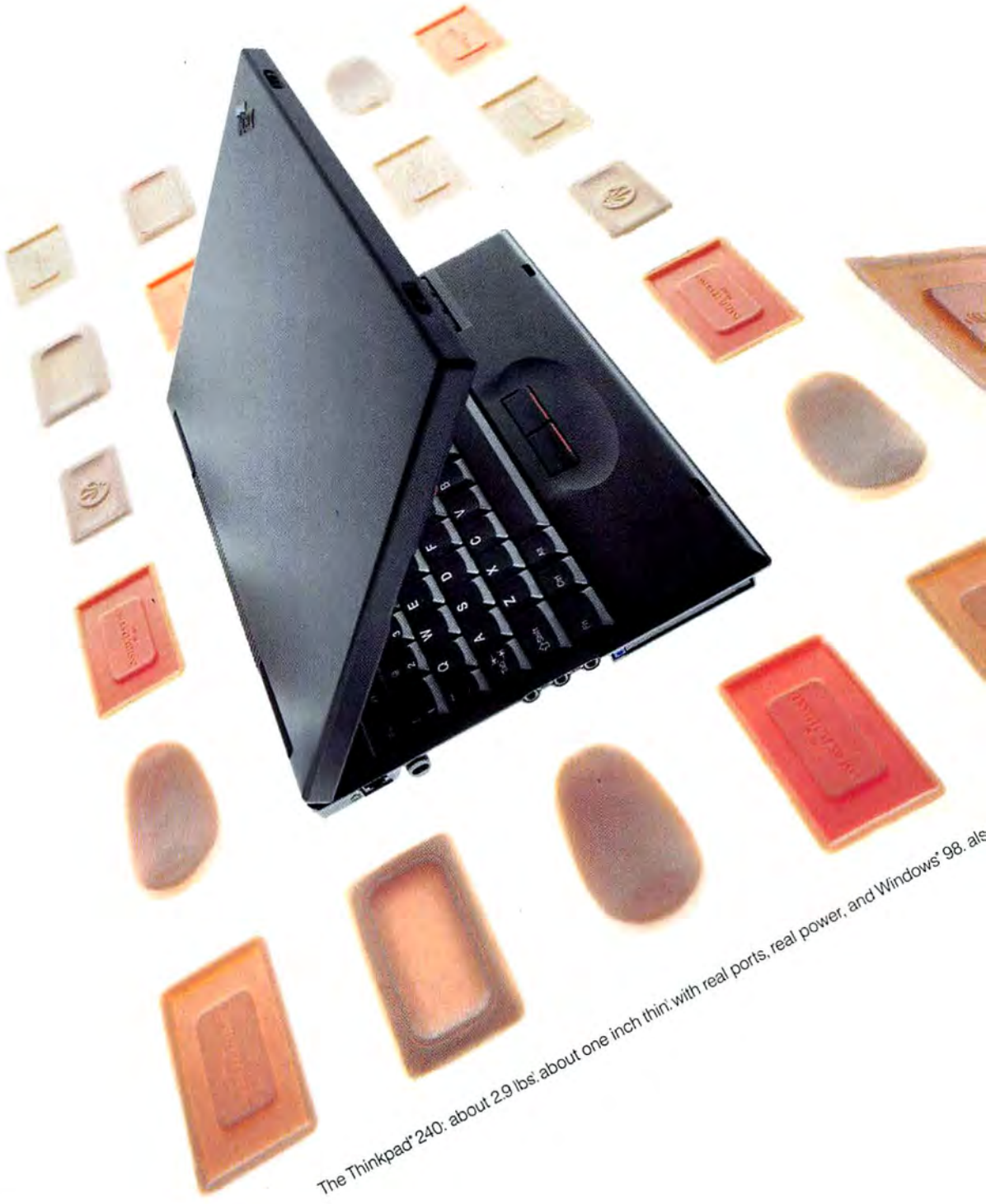

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Who's Watching You on the Web?

Marketing companies you've never heard of are tracking your online activities.

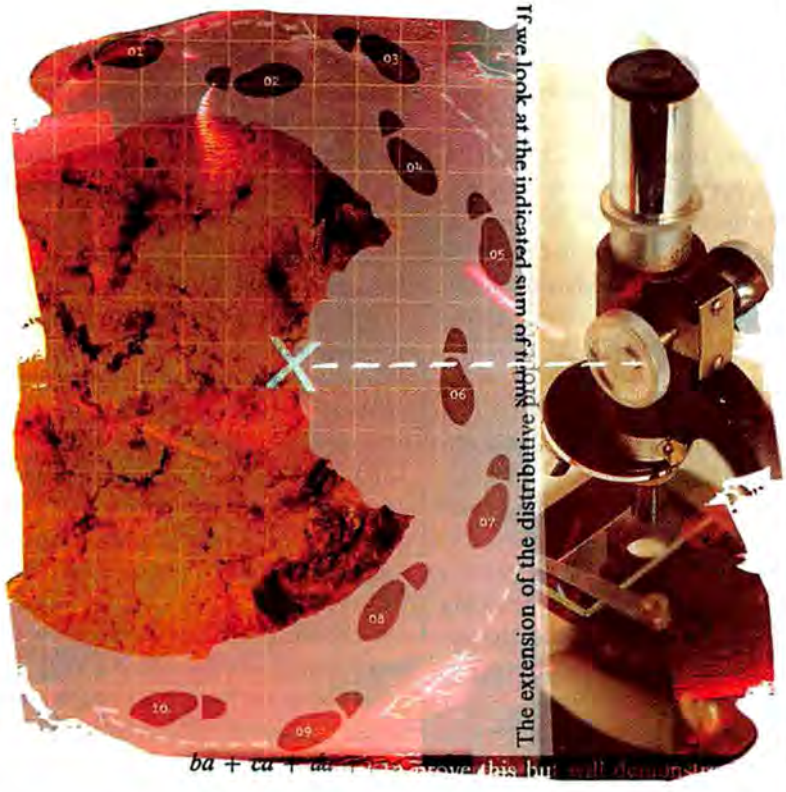

ILLUSTRATION: STUART BRADFORD

THINK BACK. WHERE DID YOU go when you logged on to the Internet last night? What Web sites did you visit last month? Last year? If you're like me, you couldn't begin to compile an accurate list of recent online wanderings—let alone a summary of sites you visited months ago. But unless you've taken extraordinary measures to protect your privacy, chances are at least one company (and probably more) has a pretty good accounting of your surfing habits.

Most experienced Web goers (and even many newcomers) know about cookies—little files that Web sites store on your computer's hard drive to identify you as a distinct visitor. A Web site may use cookies to keep track of items in an online shopping cart, to simplify the log-in process, or to provide customized news, weather, and sports information based on your stated interests. In theory, a cookie only transmits information back to the Web site that put it there and can't be accessed by other parties.

But a few influential Internet advertising companies have overcome this limitation by dispatching their own cookies whenever you visit a site that displays their banner ads. These companies use cookies to create fairly sophisticated profiles of visitors' online habits—often without the visitors' knowledge and usually without their consent. And they can use these profiles to target people with commercial solicitations in the form of banner ads and (in some cases) e-mail messages that clutter their in-boxes.

Here's an outline of how online profiling works: Let's say I'm looking for a first-edition copy from the wildly popular *Harry Potter* book series. I go to AltaVista and search for sites that sell rare books. By storing a snapshot of my search, the company that has placed the ever-present banner ad at the top of AltaVista's page—in this case, DoubleClick—has taken the first step in building a profile of my surfing habits. From this point on (until I change browsers, buy a new computer, or delete my cookies file), DoubleClick can track my browser's activity across all sites on which it handles banner ad placement.

And since DoubleClick controls some 60 percent of the banner ad market, the company has a long reach and extensive information on consumers. Every time I enter a new search term on AltaVista, check my investment portfolio at Quicken.com, compare fares at Travelocity.com, or visit any of the DoubleClick Network's hundreds of client sites (including PC World Online), this profiling powerhouse collects more data about where I go and what I do online.

TARGETED PITCHES

THESE PROFILES influence the advertising—and in some cases the content—we see online. Mike Griffiths, chief technology officer for MatchLogic, a DoubleClick competitor, explains it this way: "The browser finds the MatchLogic cookie and sends it along with a request for a banner ad. We match that cookie with what's in our system and—depending on demographic and geographic information—we select and return the right banner to the user." ▶

Advertisers love online profiling, since it enables them to direct pitches at the people likeliest to be interested in their products and services. No doubt many consumers agree—if Web banner ads are a fact of life, why not make them as relevant to my wants and needs as possible?

It's a compelling argument, but it also raises some extremely important questions. Don't I have the right to know who's compiling information about me? How do I know these profiles won't be used for purposes other than advertising and marketing? And what happens when a profiling company makes the connection between Browser X and Roberta Furger? Have I lost all hope of online anonymity?

Online profiling companies are quick to emphasize that cookies alone don't provide them with personally identifiable information, such as my name and e-mail address. Information about my online activities (and perhaps my gender, marital status, key interests, and so forth) is associated with a particular copy of Internet Explorer, Netscape Navigator, or another browser installed on my PC, not with the name Roberta Furger.

If you find this distinction trivial, you're not alone. Many privacy advocates argue that whether online profiling companies have our names is almost irrelevant. "Just because information isn't personally identifiable doesn't mean it isn't about you," says Deirdre Mulligan, staff counsel at the Center for Democracy and Technology in Washington, D.C. "It's tied to your identity; it's just not tied to your name."

In fact, if an Internet advertising company wants to tie your profile with your name, it can do so fairly easily. At DoubleClick's Netdeals.com, for example, consumers are enticed to register to win a cruise or $1 million just by entering their name, age, and street and e-mail addresses. At the bottom of the entry form, a seemingly innocuous question asks users if they would like to receive "valuable offers" by e-mail. Consumers who answer "yes" effectively consent to adding their name and e-mail address to the sponsor's direct-marketing database. Surprise! (See *Bugs and Fixes*, page 49, for news of a browser loophole companies could use to do the same thing even more subtly.)

Once it has a consumer's name and e-mail address, DoubleClick can associate these with anonymous profiles it has generated through cookies—and it has publicly acknowledged its intention to do so. Through sites like NetDeals and the acquisition of companies like market researcher Abacus Direct, which maintains sales information for some 1500 merchants, DoubleClick is building a huge database of consumer interests, buying patterns, income levels, and more. It plans to rent this database to client companies, allowing them to broadcast advertising e-mails to recipients whose surfing habits fit a desired profile.

Many privacy advocates argue that whether online profiling companies have our names is almost irrelevant.

PROFILING BROUHAHA

BECAUSE DOUBLECLICK and Abacus can link anonymous profiling data with specific e-mail addresses, privacy groups petitioned the Federal Trade Commission to block their merger. Though the petition failed, concerns about online profiling haven't fallen on deaf ears. Last November the FTC and the Commerce Department held a workshop on the practice for industry representatives, legal experts, and consumer and privacy groups.

At the workshop, online advertisers announced their Network Advertising Initiative, a coalition of key industry players developing privacy guidelines for profiling. "The important thing is that consumers are clear on what's happening and that they have choices about whether to participate or not," says Jonathan Shapiro, senior vice president of DoubleClick/Abacus Online. Shapiro adds that DoubleClick has committed not to track sensitive information like medical data, sexual preferences, and activities related to children.

But few Web surfers visit the corporate sites of profiling companies, where opt-out features and detailed privacy policies are posted. Instead, the popular sites with which these companies partner—Autobytel.com, CNN, Travelocity, and many, many others—should include discussions of profiling in their privacy policies and links to the corporate Web sites of the profiling companies they use. Currently, these sites provide no such information.

TAKE ACTION

ULTIMATELY, IT'S your responsibility to understand profiling and decide what information you're willing to share. Be very cautious about Web sweepstakes. Read the fine print and make sure that you know how the data you provide will be used. Check with Junkbusters (www.junkbusters.com) and CDT (www.cdt.org) for extensive information about online profiling and privacy. Junkbusters also includes information about software tools that let consumers surf the Web more or less anonymously. (You can find our tips for maintaining privacy on the Web at www.pcworld.com/jul99/web_privacy.) You're also well advised to read the privacy statements on the corporate sites of Web advertising companies like DoubleClick (www.doubleclick.com), Engage (www.engage.com), and MatchLogic (www.matchlogic.com). You can opt out of the companies' databases if you don't like how they use data about you. From then on, they won't track your browser activity, and you won't receive targeted ads.

Both Netscape Navigator and Internet Explorer accept all cookies by default. At a minimum, consider customizing your browser to notify you of cookie requests. You can also turn off cookies completely, but this may prevent you from accessing some sites at all.

It's hard to imagine anything more personal than information about our buying habits, our interests, and ourselves. Some consumers like the targeted marketing and special offers that come with online profiling. Others find the practice invasive, even frightening.

Either way, the decision to share that data should be yours to make.

Roberta Furger is a PC World *contributing editor.* ■

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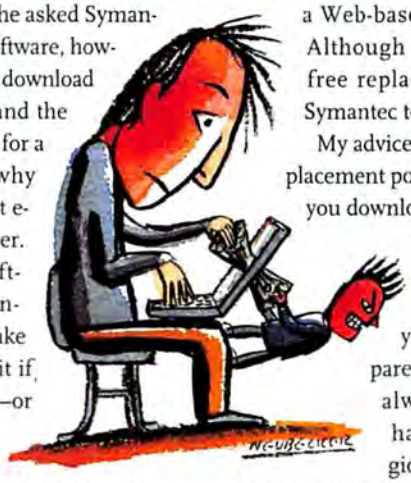
Downloaded Software: Save That Receipt

WHEN BOB BIEBER of Bradenton, Florida, upgraded to Norton AntiVirus version 5.0, he saved himself a trip to the store by purchasing and downloading the software from Symantec's Web site. His only concern was that he couldn't save the upgrade to a floppy disk for safekeeping.

But Symantec assured him that he could download the software and virus signature updates again if he needed to.

Six months later, Bieber's PC crashed and—you guessed it— he had to reformat his hard drive. When he asked Symantec for replacement software, however, he wasn't able to download the files he needed, and the company wanted $20 for a CD-ROM. "This is why many of us don't trust e-commerce," says Bieber.



When you buy software as a Web download, how can you make sure you'll still have it if your hard drive fails—or if you buy a new PC? Ideally, the process is relatively painless. Online software vendors give you a confirmation number for your purchase; if you later need a new copy of the software, you can download again and use this number to activate it.

Replacement policies aren't always clear, however; and it isn't always apparent where to turn if you have a problem. For example, Symantec's download section is actually operated by Beyond.com, a Web-based software reseller. Although Beyond.com offers free replacement downloads, Symantec told Bieber otherwise.

My advice? Read return and replacement policies carefully before you download, and save the confirmation number after your purchase. If you later decide you want a CD, be prepared to pay for it. And as always, back up your hard drive with religious zeal.

As for Bob Bieber, Symantec admits that he should have been able to download a replacement copy of his software. The company apologized and sent him a free CD-ROM of Norton Anti-Virus 2000, along with a year of free virus upgrades.

ILLUSTRATION: ROBERT NEUBECKER

Heads Up...

Free PCs No Longer: Free-PC, the company that gave PCs and Internet service to consumers willing to endure on-screen advertising, will merge with low-cost PC vendor EMachines. The free PC offer will end, but EMachines plans to use Free-PC's ad technology in its own system. Owners of Free-PC systems should be unaffected by the merger... **AOL to Users: Are You Sure?** Several readers have written to complain that America Online forced them to restate their preferences to avoid receiving unwanted marketing promotions. Subscribers who'd already opted out of the promotions got an e-mail from AOL asking them to reiterate the request. AOL's terms of service require users to renew their preferences annually, but as one disgruntled reader said, "Preferences do not expire."... **RAM Update:** I'm still hearing from Dell customers who bought Dimension XPS M200 PCs advertised as upgradable to 128MB and then discovered that this upgrade won't boost performance and may actually hurt it. (See www.pcworld.com/nov99/oys.) Dell's response: The problem stems from the design of the Intel Pentium VX chip set and affects systems from all vendors, so customers shouldn't expect restitution. (For more information, see www.pcworld.com/jan00/ram.)

LETTER OF THE MONTH

I PURCHASED AIRLINE tickets from Microsoft Expedia's Web site on October 6 for travel on October 22. When the tickets didn't arrive by October 13, I began telephoning and e-mailing Expedia and was told the tickets were on their way. The Expedia tickets still hadn't arrived on the day of my flight, so I had to purchase new ones. Expedia's response to my refund requests: "You'll have to obtain a refund from the airline."

—*Scott B. Ehrlich, San Diego*

***On Your Side* responds:** Expedia product manager Suzi Levine says that Ehrlich's tickets were issued on time but apparently got lost in the mail. Expedia has reimbursed Ehrlich, and it now provides free overnight replacements to customers who haven't received tickets on time. Still, Levine says it's best to use e-tickets whenever possible. If you order paper tickets online, check the missing ticket policy first—some require you to pay the airline's replacement fee of about $70. ■

GOTTEN A RAW DEAL?

Or a great one? E-mail the details to onyourside@pcworld.com. We'll investigate complaints and publish items of the broadest interest. Anne Kandra is a contributing editor for PC World.

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Protect Your E-Mail From Prying Eyes

PROBLEM *You worry that your personal and business e-mail might be vulnerable to snooping.*

SOLUTION *Encrypt your sensitive e-mail correspondence with software or a Web-based service.*

PHOTOGRAPH: MIKE CLEMMER

AS WEB DEVELOPER for various businesses, Jeff Burson, of Birmingham, Alabama, felt a need for heightened e-mail security when exchanging professional correspondence with his partner or with clients. "Sometimes we exchange [critical] ideas for a client, and we need to make sure that nothing sensitive gets out," he says.

Many e-mail users have a false sense of security about their correspondence, believing their words are safe from prying eyes until a message reaches its destination. But e-mail resembles a postcard more than a sealed letter. As it passes through one or more servers en route to its destination, it's vulnerable to snooping at every relay point along the way.

One option for shielding your missives is Network Associates' free PGP (an acronym for Pretty Good Privacy), long the de facto standard for person-to-person e-mail encryption. A second possibility is the encryption built into Microsoft's Outlook Express and Netscape Messenger. These solutions make sense for people with critical privacy needs, but mastering them can be a challenge. An easier way to encrypt messages is via free Web-based e-mail services that provide cloaking capabilities to render your mail a meaningless jumble to would-be snoops.

YOU'VE GOT HUSHMAIL

BURSON FOUND HIS solution in HushMail (www.hushmail.com), the most robust of the Web-based encryption systems. HushMail has one drawback: Currently, recipients of encrypted mail must also be HushMail members. But HushMail is free, sign-up is easy, and by the time this column appears, you may be able to exchange encrypted mail with PGP users too.

Once you register with HushMail, you're instructed to move your mouse around an onscreen box for about 15 seconds, prompting the program to create the encryption keys it will use to encode and decode mail. Next, you create a pass phrase. The longer and more cryptic your phrase, the more secure your mail will be.

To write a message, you first log in and click the *Compose* button. Unless you uncheck the 'Send securely' box, the program encrypts any message going to another HushMail member (which it determines by checking the recipient's address). You can read encrypted messages by opening them as you would other mail.

Unlike PGP or Outlook Express, HushMail allows you to encrypt messages from almost any Web-capable PC—even if it's located in an Internet café in Zanzibar. If you sign on at a remote terminal, HushMail downloads a 70KB Java applet to the system to verify your pass phrase and begin its encrypting work, using your unique keys. HushMail can do this because, unlike PGP, it stores all encryption keys on its server. (Users with critical privacy needs, such as businesspeople exchanging sensitive company data, may not want their private keys stored on a centralized server, so HushMail will not be the best option for them.) The HushMail Java applet requires Netscape Communicator or Internet Explorer versions 4.0 or later, or ▶

America Online 5.0, which means that you may run into compatibility problems on systems that use older browsers.

FOR YOUR EYES ONLY

THOUGH HUSHMAIL appeals to users with moderate privacy needs, consider PGP if privacy is crucial to you and your correspondents are willing to invest a few hours in learning how to master this more complex encryption system.

Most noncorporate users will want either PGP Freeware 6.5.2a (which is free) or PGP Personal Privacy 6.5.2a ($19). Both versions integrate seamlessly with popular e-mail packages like Qualcomm's Eudora and Outlook Express 4.0 and later (though not with Netscape Messenger). But the Freeware version of PGP is licensed only for noncommercial use and omits some ancillary features of the retail version, such as the ability to encrypt disk files. This version also comes without Network Associates' technical support.

One new PGP feature allows you to send encrypted documents to people who aren't set up for encryption: To read a file, recipients simply double-click it and enter the password you provide them.

If you use Outlook Express 4.0 (or later) or the version of Messenger included in Netscape Communicator 4.0 for e-mail, you already have encryption tools at hand. Both programs support the Secure Multipurpose Mail Extension standard for encrypting mail. As with PGP, though, learning S/MIME requires study and a digital certificate (a software packet that verifies your identity), which you can obtain from VeriSign for $15 a year. Once you're set up, you can exchange secure e-mail only with others who use S/MIME-compatible software and have a certificate.

PRETTY GOOD ALTERNATIVE

FOR BURSON, HushMail's encryption was the best solution. It provided a way for him to exchange sensitive data with clients, without requiring him or the recipients of his messages to master a complex system. Burson even urges friends to join HushMail. "I'm not worried so much about security [with] friends," he said, "but it is neat to know that no one's going to pick up our messages along the way."

Mitt Jones is a contributing editor for PC World. ■

HushMail
Free; Hush Communications; 512/472-4630
www.hushmail.com

PGP Freeware 6.5.2a
Free (noncommercial use only); MIT Distribution Center for PGP; web.mit.edu/network/pgp.html

PGP Personal Privacy 6.5.2a
$19 street; Network Associates; 800/338-8754; www.mcafee.com

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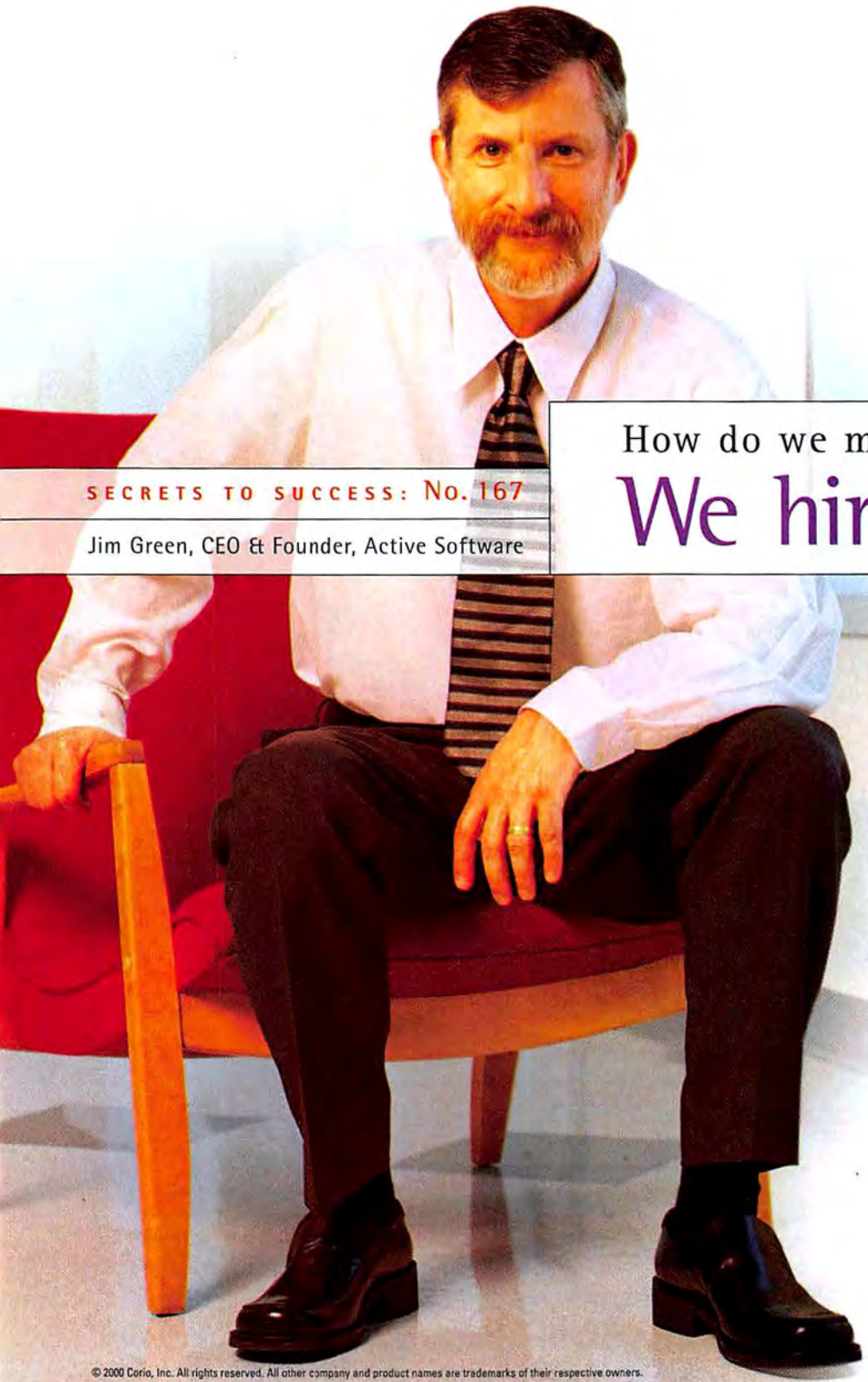

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Mailing Lists for the Masses

IT'S NO SECRET—I suffer from a new psychological disorder called *E-mail addictitus*. Here's the first symptom: You check your in-box for mail and discover you have *no new messages*. You check again, just to be certain, and then you e-mail yourself to make sure that the mail program's working.

But the angst of sending e-mail, especially the same message to many recipients, can be as debilitating as the craving to receive it.

Fortunately, I've discovered Onelist, a free Web-based service to help me stay in touch with anywhere from a dozen to a thousand people at a time. Even better, I can share files with everyone. And, except for one catch, the service is absolutely free.

ILLUSTRATION: MARC ROSENTHAL

LUMBERING LISTS

I PRACTICALLY *live* in Eudora Pro, my e-mail program. For posting individual e-mails—and even sending bad jokes to a dozen people at a time—it's terrific. But sending the same e-mail to, say, 25 or 50 people with Eudora is cumbersome. Adding and removing names from the recipient list is a royal pain. And dealing with address changes is enough to make me stop sending jokes altogether (which some people would probably appreciate).

Help arrived with Onelist (www.onelist.com), a service that keeps an address file for anyone you wish to connect with. The concept is simple: First, I create a private mailing group on Onelist. Then I send a message to the address assigned to that group, and the mail is automatically distributed to everyone on the list (including myself, so I can see that the message gets delivered). But there's more.

I use Onelist to send e-missives—agendas, news, and yes, even jokes—to members of the Pasadena IBM Users Group I lead. I also created a list for a dozen relatives, which took me all of 5 minutes, to allow us to trade gossip and share pictures. If you have a small business, Onelist can help you communicate with customers. In fact, my customers—*Home Office* readers—have their own list. To get on the list, send a blank e-mail to stevebass-subscribe@Onelist.com

I also created a list for a dozen relatives, which took me all of 5 minutes.

SHARING INFO WITH EASE

THE BEAUTY OF Onelist is that it's easy to use—both for the moderator and for subscribers. For example, lists can be interactive, allowing any member to correspond with all other members, or they can be used for announcement postings from the moderator only. Membership can be open or restricted. For instance, anyone can join my user-group list, but membership in the *Home Office* list is contingent on approval from the moderator: me.

If I want to send a file to list members, instead of attaching it to my mail, I simply upload it to a directory at the Onelist Web site. Any member of the list can download files, but I can restrict uploading privileges to specific users. Subscribers also can opt to receive daily e-mails or a once-a-week digest of messages collected in a single e-mail. Or they can opt for no e-mail and just visit the Web site for weekly digests.

I've always been leery of subscribing to lists because unsubscribing can be so difficult. (I'm *still* on a list for DOS 1.1 and haven't a clue how to extricate myself.) Not a problem with Onelist: Just go to the site to see a roster of the lists you're on, and click to be removed. You don't risk getting spammed, either. That's because no one knows about my restricted lists except the people I invite to join them.

SO, WHAT'S THE CATCH?

THE COST FOR THIS great service? An innocuous ad (such as ones for online help or a job service) at the bottom of each message. It can be removed if the moderator pays a $5 per month fee.

One quibble: While Onelist usually takes only seconds to deliver mail, every so often it takes an hour or so. But the service has so much going for it, I'll put up with occasional sluggishness. Hey, it's free, easy to use, and lets me reach the masses with ease—that's all I need.

At press time, Onelist was planning to merge with EGroups (www.egroups.com) in May. You'll still be able to register with Onelist and get the features mentioned here; but you'll also be able to take advantage of EGroups' features, such as chat capabilities and a larger shared files area.

PC World *Contributing Editor Steve Bass is president of the Pasadena IBM Users Group. You can send him mail at steve_bass@pcworld.com.* ■

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Web Privacy: How the Cookie Crumbles

OUR INCREASING dependence on the Internet decreases our chances of maintaining privacy. But with a little care, you can still use the Web without revealing your e-mail address or personal identity—right? Alas, the most recent discovery by independent security analyst Richard M. Smith, challenges that assumption.

Today, many Web sites place cookies on your hard disk to profile your interests and deliver customized information. In theory, cookies identify only the PC, not the person using it.

However, as Smith discovered, a loophole in both Internet Explorer and Netscape Navigator makes it surprisingly easy to match e-mail addresses and cookies, thereby linking a unique identifier to a nameless profile. When you view an e-mail message sent in HTML format, your e-mail software uses a browser to display it. Any graphic in the HTML message must be loaded from the originating server, and any cookie previously deposited by that server will be transmitted back to the site when the graphic is fetched. That fetch request can also transmit your e-mail address. By sending out junk e-mail with graphics, advertisers can match e-mail addresses with previously issued cookies.

So far, no one appears to have tried this trick. And if privacy advocates have their way, no one will: Smith has joined with eight privacy and consumer groups in asking the Federal Trade Commission to require that software makers close the loophole.

Microsoft and Netscape told us they were investigating the issue, but neither had announced a patch. In an e-mail to *PC World*, a Microsoft spokesperson said the company had confirmed Smith's theory, but "it does not appear this is a problem that technology alone can solve. The solution may lie in appropriate regulation [of Web companies]."

For the time being, the surest way to protect your anonymity is to instruct your browser not to accept cookies and delete existing cookies from your hard drive. But if you reject cookies, you may not be able to access your favorite Web sites. For more on tossing your cookies, see www.pcworld.com/jul99/web_privacy.

ICON: JEFFREY PELO

IE Growing Pains

INTERNET EXPLORER 5.01 resolves scores of IE 5 stability and security problems, including memory leaks and numerous security holes covered in previous *Bugs and Fixes* columns (for a complete description of what 5.01 fixes, see the Microsoft Knowledge Base article at support.microsoft.com/support/kb/articles/Q244/6/55.asp). But version 5.01 has a few glitches of its own. Some upgraders have been unable to start Outlook Express or have had problems opening the Outlook Express address book. A Microsoft article at support.microsoft.com/support/kb/articles/q247/7/06.asp attributes the problems to a damaged or corrupted WAB32.DLL file and describes a fix. A second problem will foil attempts to update to 128-bit security after installing IE 5.01. The solution? Upgrade to 128-bit security before installing IE 5.01. For details, go to Microsoft's support site at support.microsoft.com.

MICROSOFT PASSWORD PROTECTION

IF YOU USE Windows 95 or 98 to access an NT network, a snoop with physical access to your PC can snag your password. The old Windows for Workgroups stored users' network passwords in system memory after each log-in. Part of this habit was carried over to Windows 95 and 98 (but not Win 98 Second Edition). By issuing certain commands, an intruder can learn your password. A 148KB patch for Windows 95 is at download.microsoft.com/download/win95/update/168115/w95/en-us/168115us5.exe. For Windows 98, the 161KB patch is at download.microsoft.com/download/win98/update/168115/w98/en-us/168115us8.exe.

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You can find files mentioned in this article at www.fileworld.com/magazine. Mitt Jones is a contributing editor for PC World. ■

IN BRIEF

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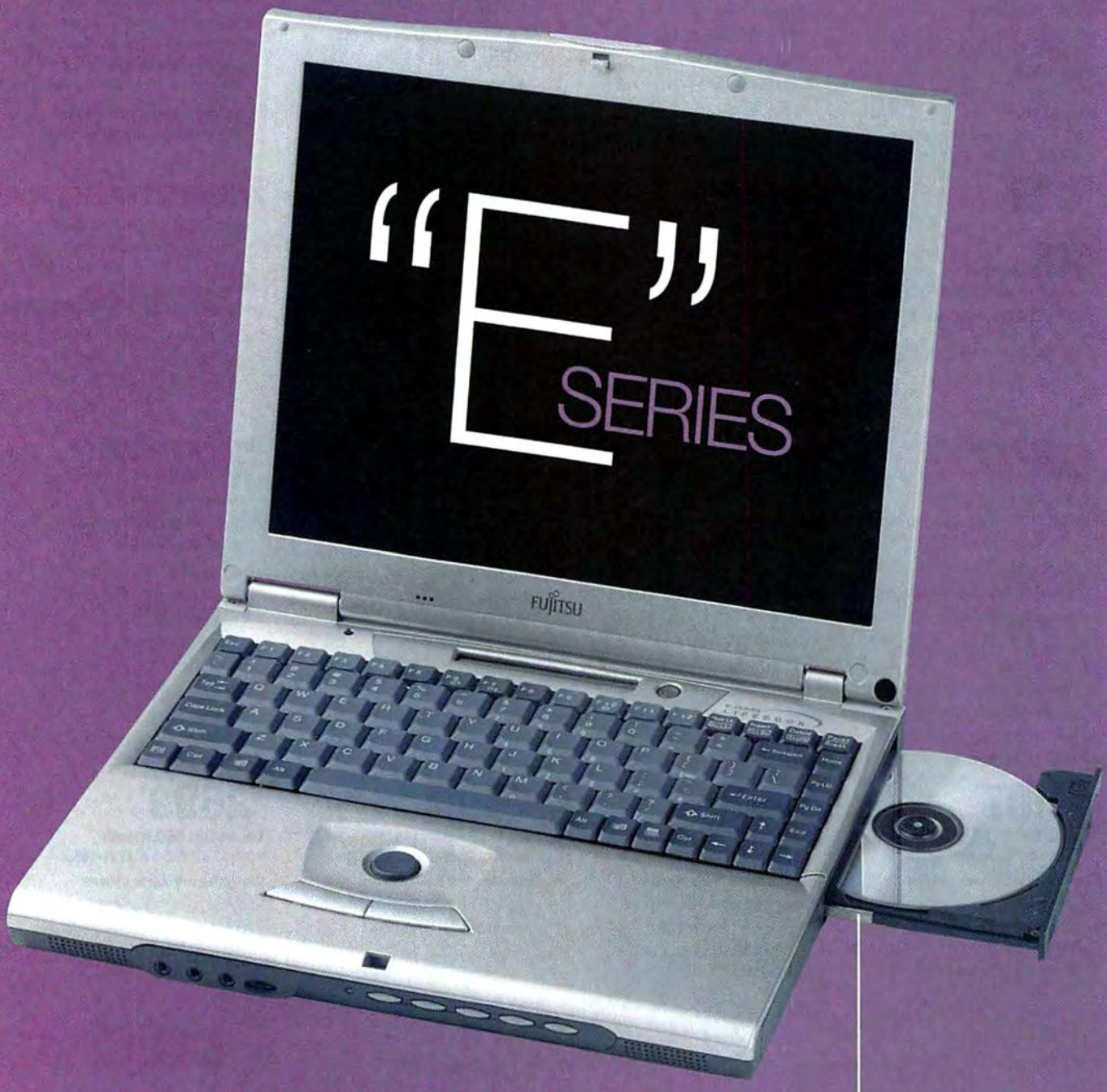

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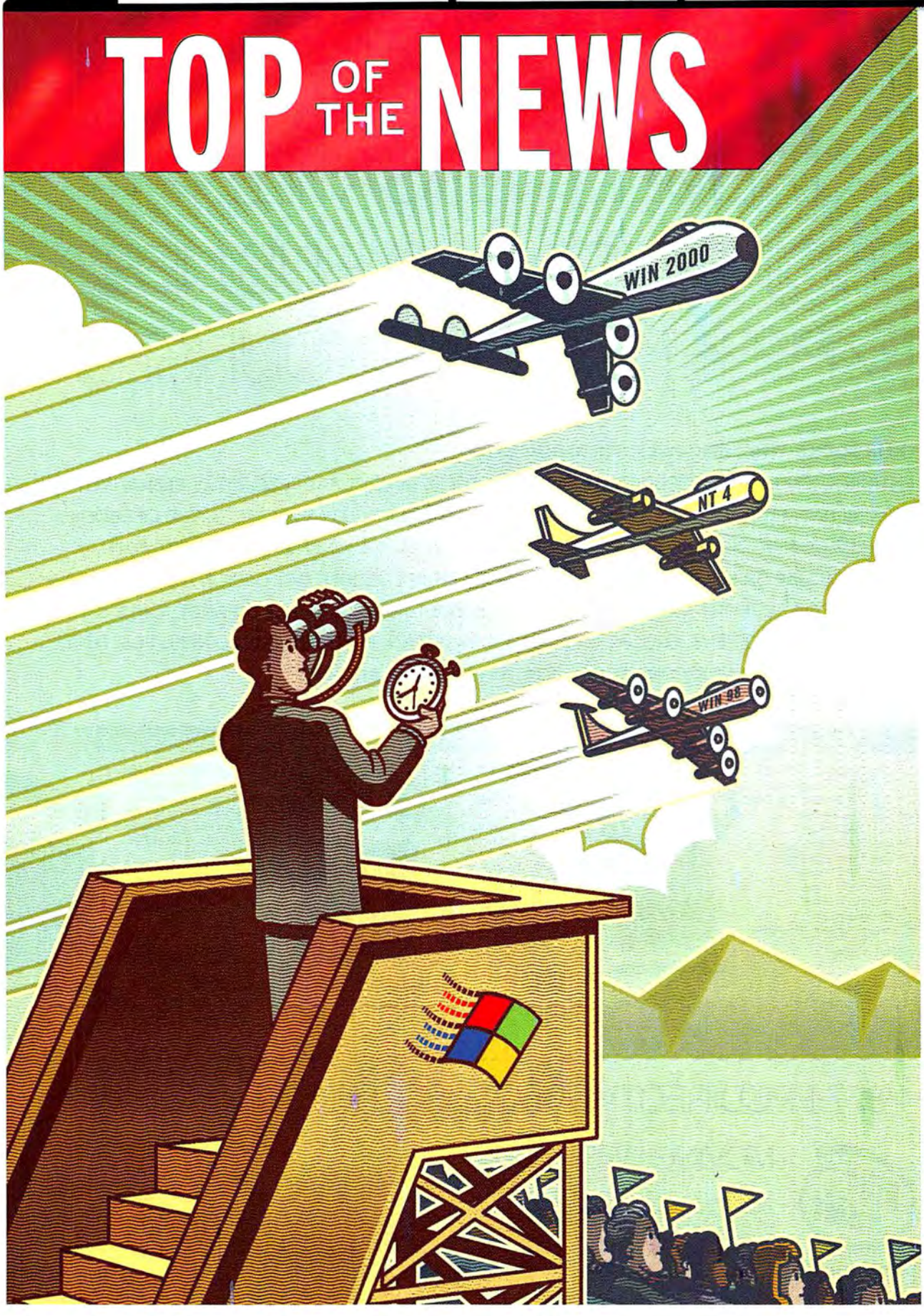
TOP OF THE NEWS



It's big, it's brawny, and it's surprisingly swift. Better yet, you'll need just 64MB of memory to lift Microsoft's new OS off the ground.

Windows 2000

MICROSOFT released its first betas of Windows 2000 Professional back in 1997, so we've had plenty of time to admire its stability, security, and slick interface. But we were concerned that Windows 2000 Pro's 29 million lines of code and 500MB hard-disk footprint might make the OS dog-slow compared to current versions of Windows. We also worried that a system might need a bare minimum of 128MB of RAM to run the new OS efficiently.

Our fears were groundless on both counts. In fact, Windows 2000 is slightly faster than both Windows 98 SE and Windows NT 4.0 Workstation on many common business tasks, and it's only a shade slower on others. And running the new OS on a PC with "just" 64MB of RAM is certainly practical: In many cases, we saw very little performance gain when running the same tests on PCs with 128MB.

Upgrader's Guide to Windows 2000

HOW CAN YOU ensure a trouble-free upgrade to Windows 2000? What do you need to know once you get there? "Destination Windows 2000," our complete guide to the new operating system, has all the answers you're looking for. Turn to page 99.

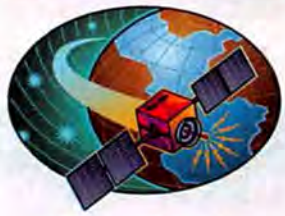
Moreover, *PC World* tests of start-up and shutdown times demonstrate that Windows 2000—despite taking every bit as long as lead-footed Windows NT to boot up—has inherited Windows 98's relatively fleet shutdown speed.

The tests that we ran were designed to gauge the new OS's efficiency in a typical business setting. We timed a range of common Word, Access, and Photoshop tasks under Windows 98 SE, Windows NT 4.0 Workstation, and Windows 2000 Professional on several identically configured Pentium III-600–based computers loaded with 64MB and 128MB of memory.

If you want the best features from previous Windows offerings without those products' major shortcomings, you should upgrade to this OS. But if you want better performance, invest those dollars in a faster processor or a memory upgrade. ▶

◆ **By Scott Spanbauer**

ILLUSTRATION, LEFT: PETER HOEY; ICONS: JEFFREY PELO



Product Pipeline

➤ **IBM Multi-Port USB Hub:** By the time you read this, IBM should be shipping a $149 hub that packs five USB connections—plus serial, parallel, keyboard, and mouse ports—into a device a little larger than a common stapler.

➤ **A Better Home LAN:** Proxim plans to ship the first 10-mbps HomeRF wireless LAN products in the second half of 2000. The technology is cheaper and more reliable than current 802.11b products, Proxim says.

➤ **ELSA Modems:** In March, ELSA will ship a new line of 56-kbps modems including internal ($59), external ($69), and USB ($99) models. Accept free Juno Net access for three months for a $30 rebate on $59 and $69 modems.

Tidbytes

64MB on a Postage Stamp: Secure Digital memory card, a technology well-suited for MP3 players, is gaining steam thanks to backing from Matsushita, Sandisk, and Toshiba. The card, about the size of a stamp, holds 32MB or 64MB of data. Look for products as soon as April.

Who Wants to Be an iMac? HP's newest Pavilion home PCs come in such rare colors as "cobalt blue," "krypton green," and "xenon purple." Will purple PCs look as washed up as Ricky Martin in a few months? Your teen will no doubt have final say. ▶

GET UP-TO-THE-MINUTE NEWS about company products and Internet happenings from PC World Online's News area. Just point your browser to www.pcworld.com/pcwtoday.

LAUNCH TIME TEST REPORT

Win 2000 Starts Slow, Stops Fast

OPERATING SYSTEM	Boot-up (seconds)	Shutdown (seconds)
Windows 98 SE	47.76	7.24
Windows NT 4.0	68.72	20.82
Windows 2000	67.65	6.66

TEST PC WORLD CENTER **HOW WE TEST** All tests were performed on Windows 98 SE, Windows NT 4.0 Workstation, and Windows 2000 Professional (gold) on Pentium III-600-based PCs with Matrox G400 graphics boards and 64MB of RAM. We hand-timed boot-up from the time the On button was pressed until the desktop displayed. Shutdown was timed from when we selected Shut Down until the 'It is now safe to turn off your computer' message appeared or the PC powered itself off. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

We didn't test two other versions of Windows 2000 that are due to ship February 17. Windows 2000 Server is for departmental mail and file servers; Advanced Server is intended for use as a Web server. Microsoft expects Datacenter—a third yet-to-ship server version—to supplant mainframe database servers.

FAST TIMES, MOSTLY

WHERE DID Windows 2000 outpace Windows NT 4.0 and Windows 98 SE, and where did it lag behind? In our first series of tests, we simulated real-world use on a standard midsize tower system equipped with 64MB of memory. In the test, we ran Netscape Navigator and had RealJukebox play a CD in the background; concurrently, we timed six different application tasks.

We also timed the same tasks without running applications in the background. But the results tended to be only marginally better than in the multitasking situation. So we decided to discuss only the multitasking test results here, both to simplify the analysis and to reflect more accurately how most people use their systems.

SPLIT DECISION

IN FOUR of the six tests—Word Mail Merge, Access Import and Run Report, and Photoshop Filter—Windows 2000 performed on par with or slightly faster than Windows NT 4.0, although the speed difference would be undetectable to most users.

Windows 2000's performance advantage over Windows 98 SE was more pronounced—about 15 percent across our six tests. Absent any hardware compatibility issues that might trigger per-

Win 2000 Too Much? Wait for the Millennium

DOES WINDOWS 2000 Professional give you more OS than you need? Then consider waiting for the successor to Windows 98, code-named Millennium. Due out later this year, Millennium will add scores of new features and enhancements to the classic Windows 95/98 operating system base. Though it will lack Windows 2000's stability and security, Millennium may be a better choice for novices, casual users, and game-crazed folk.

NO MORE MS-DOS MODE

JUDGING FROM the second preproduction version released late last year, Millennium is more of a renovation than an innovation—but it's a makeover with much to recommend it. Like Windows 95 OSR2, Windows 98, and Windows 98 SE, Millennium sprinkles lots of little conveniences around the familiar Windows interface. And like previous Windows upgrades, Millennium continues the gradual movement of Windows away from its MS-DOS roots. Though you can still boot to DOS with a start-up floppy and open a command prompt window, MS-DOS mode is gone. This could mean fewer support calls to Microsoft begging it to straighten out the sometimes complicated feature, but it also means you might not be able to run a few older DOS apps and not-so-old games that require the feature.

COURTESY OF WIN 2000

MILLENNIUM incorporates several concepts introduced in Windows 2000, including hibernation—the ability to use a standby (powered-off) mode to save to disk the current state of Windows and the apps you're running. A system file-protection feature prevents applications from replacing Windows system files with their own versions. Like Windows 98 SE, Millennium lets all of the computers on a small home or office network share Internet access on one line, and it adds a new Home Networking Wizard to assist with setup.

Brand-new features include a new Picture Acquisition Wizard that makes grabbing a scan from a digital camera or scanner nearly automatic; the ability to decode .zip archive files within Explorer; and new games.

But the most useful addition may be the System Restore utility, which allows you to roll back your Windows configuration to a previous state. If you have ever installed a buggy program or driver that defies all attempts at removal, you know why this feature alone could make Millennium a must-have.

AS YOU WERE: Millennium's new System Restore utility will let you return to the Windows configuration of a previous date and time.

formance slowdowns, upgrading from Windows 98 to Windows 2000 should yield noticeably better performance in some types of tasks.

But Windows 2000 doesn't always outrun Windows 98. Sometimes the OSs' differing file systems affect the results. We tested each operating system using its default native file system—FAT32 for Windows 98, and NTFS for Windows 2000. Previous *PC World* tests have indicated that NTFS is far slower than FAT32, due to additional file security and logging overhead. The Search and Replace test in Word corroborated this result: Both Windows 2000 and NT 4.0 (which by default also uses NTFS) took a dramatically longer time than Windows 98 SE to complete the task.

NTFS VS. FAT32

MICROSOFT SAYS this delay happened because Word's search-and-replace feature generates numerous file-open and -close operations. NTFS dutifully logs these actions in case something goes wrong; FAT32 doesn't. But NTFS's added security takes time. A Microsoft engineer told us the company would try to modify future versions of Word to minimize the slowdown.

Windows 2000 **doesn't always outrun** Windows 98. Sometimes **differing file systems** affect the results.

Other applications may encounter similar slowdowns during disk-intensive tasks, but some may not. In the Photoshop Save for Web test—in which the computer converts an existing file to prepare it for publication on the Web—Windows 2000 blew away both Windows 98 and NT 4.0, completing the job in roughly half the time. Microsoft's explanation: Windows 2000 is better than its predecessors at supplying big chunks of memory quickly to applications such as Photoshop.

MEMORY NO OBJECT

ALTHOUGH Windows 2000 is capable of running on systems equipped with a scant 32MB of memory, Microsoft recommends that your system have 64MB, and the company predicts that you'll get even better performance if you add more memory. But since few of the business systems that we see these days come with less than 64MB of RAM, we didn't bother to test performance formally with 32MB. Nonetheless, we did notice significant slowdowns on Windows 98 systems that had 32MB of RAM when we upgraded them previously with beta versions of Windows 2000.

Site to See: Office Update

HAD YOUR FILL of 45-minute journeys to nowhere on Microsoft's site? If you use Office, start at the Office Update Page (http://officeupdate.microsoft.com). It's a one-stop shop for program patches, tips, and links to services such as e-stamps. If you're upgrading soon, check out the Office 2000 section for help with mysterious install greetings such as 'Internal Error 2343'. Small-business owners will find useful goodies, including a direct-mail tutorial.

–Laurianne McLaughlin

SAVE ON RAM

BUT OUR comparisons of 64MB and 128MB configurations indicate that bolstering the RAM speeds Windows ▶

OPERATING SYSTEMS TEST REPORT

Windows 2000 Professional Wins Some, Loses Some

In most common tasks, Windows 2000 Professional is at least as fast as Windows NT 4.0, and both are a bit faster than Windows 98 SE. In tasks where Windows NT 4.0 is slightly slower than Windows 98 SE, Windows 2000 Pro improves performance. But in tasks where Windows NT 4.0 is already much slower than Windows 98 SE, Windows 2000 Pro makes little difference.

SYSTEM	Word Mail Merge	Word Search and Replace	Access Import	Access Run Report	Photoshop Filter	Photoshop Save for Web
Windows 98 SE	35	29	46	28	29	41
Windows NT 4.0	30	49	42	22	20	43
Windows 2000 Pro	30	42	39	20	20	24
	Faster		Times in seconds			

TEST PC WORLD CENTER **HOW WE TEST** We performed hand-timed tests in three applications: Microsoft Word 2000, Microsoft Access 2000, and Adobe Photoshop 5.5. All tests were performed on Windows 98 SE, Windows NT 4.0 Workstation, and Windows 2000 Pro (gold) on Pentium III-600-based PCs using Matrox G400 dual-head video boards, in both 64MB- and 128MB-RAM configurations. We performed a set of common tasks, starting the timer at the beginning of the operation and stopping the timer when the hourglass disappeared. All tests were repeated in a multitasking environment with Netscape Navigator 4.7 running in the background and RealNetworks RealJukebox playing a CD. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

2000 negligibly on most tasks. The added RAM most benefited the memory- and disk-intensive Photoshop and Word tests. Our conclusion: Microsoft evidently worked hard to make Windows 2000 more efficient at managing memory than Windows NT 4.0, which manages to match Windows 2000's scores for PCs equipped with 64MB only when the systems are given another 64MB infusion. Like Windows 2000, Windows 98 SE seems to have little use for additional blocks of RAM beyond 64MB, to judge from most of our test results.

Holding your breath for the day when Windows will start up and shut down in a flash? Don't exhale yet. Cold-booting a Windows 2000 machine takes even longer than firing up with Windows 98 SE, and roughly the same amount of time as launching with NT 4.0. Of course, you may not care whether your system takes 45 seconds or 70 to boot, since you probably wandered off to the water cooler after the first 20 seconds anyway.

FAST GETAWAYS

ON THE OTHER hand, Windows 2000 shuts down very quickly—a fraction of a second faster than the already speedy Windows 98 SE—so you won't have to plan ahead before making your getaway from the office. Also, Windows 2000's improved stability frees you from having to administer the sort of daily reboot therapy that Windows 95 and 98 require on some systems. And in our tests, Win 2000's power management capabilities helped it snap out of standby or hibernation mode in a few seconds.

If you currently use Windows and your hardware is fairly up-to-date, Windows 2000's amalgam of 98's and NT 4.0's best features makes it a winning proposition, especially since the sibling OSs completed the performance derby in almost a dead heat. At the very least, Windows 2000 won't slow you down.

Windows 2000: Top Reasons to Switch

IF PERFORMANCE doesn't offer a compelling reason to switch to Windows 2000, what does? Although not an essential upgrade, Windows 2000 collects features geared toward both Windows 98 and NT users. Unlike Windows 95 and 98, Windows 2000 requires you to log on using a name and password, and it uses that log-on authentication to control file access. (If security isn't a big concern, however, you can set Windows 2000 to log you on automatically.) Because it strictly regulates how applications and device drivers behave and interact, Windows 2000 also banishes many of the crashes and unexplained freezes that plague Windows 95 and 98.

PLUG AND PLAY FOR THE NT CROWD

WINDOWS NT users making the move to Windows 2000 will see a different but even more impressive set of improvements. Windows 2000 offers all of NT's features—after all, it was originally called Windows NT 5.0—but inherits such long-overdue Windows 95 and 98 features as Plug and Play hardware detection, support for the FAT32 file system, and power management. A new version of the NT file system builds in encryption. (For more on how to use Windows 2000 features, see "Tips for New Arrivals," page 122.)

Windows 2000 isn't for everyone, however. The $219 upgrade price from Windows 95 or 98 will give some prospective users pause (the upgrade from Windows NT 4.0 is a more reasonable $149). More important, hardware compatibility and system requirements make Windows 2000 an iffy choice for antiquated hardware and for newer PCs that lack a compatible BIOS (see "Your Ticket to a Hassle-Free Upgrade," page 100).

MILLENNIUM ON TAP

IF WINDOWS 2000 is beyond your resources, Microsoft will try to satisfy your upgrade urge later this year with the successor to Win 98, code-named Millennium. With an expected street price of about $90, Millennium is the way to go for most home and casual users (see "Win 2000 Too Much?" page 56).

WINDOWS 2000 looks familiar but adds features business users will appreciate, such as the ability to encrypt files in Windows Explorer.

Top PC World Downloads

1 Norton 2000 BIOS Test and Fix

1.28MB, 35,045 downloads. Compare your computer against a database of known Year 2000 problems.

2 Internet Explorer 5.01 and 5.5 Beta

586KB, 20,106 downloads. New version includes expanded support for Dynamic HTML, Java, and the Channel Definition Format.

3 PrcView

68KB, 13,168 downloads. Find detailed information about applications running in Windows.

4 Cacheman

68KB, 12,264 downloads. Enhance your system performance by adjusting your disk cache.

5 TClockEx

379KB, 11,589 downloads. Change the look of your Windows taskbar clock, or display CPU use and memory load.

Download files can be found on www.pcworld.com/fileworld/top5.

Windows 2000 Professional

$319 list; upgrade from Windows 95, 98, or 98 Second Edition $219 list; upgrade from Windows NT 4.0 $149 list; **Microsoft;** www.microsoft.com

PRODUCT INFO NO. 687

Double Time: New PIII Notebooks Run at 650 or 500 MHz

THE DELL Inspiron 7500 lasts for 5 hours at either speed.

FOR MONTHS we've been hearing about a technology from Intel called SpeedStep: It's a novel way to conserve notebook processor power. When your notebook is plugged in, the processor runs at its top speed, but when it's running on battery power, it "steps down" to a lower speed. The good news: After some delays, the technology has arrived—and it works. The three Pentium III notebooks we tested ran plenty fast, and battery life on two of the units was outstanding. The surprising news: The notebooks managed almost identical battery life running at *either* speed, so we see little reason to run them at the slower speed.

Our $4238 Dell Inspiron 7500, $4199 Hewlett-Packard OmniBook 4150, and $4408 IBM ThinkPad 600X test models all came with Windows 98 and 128MB of RAM. (Dell and HP sent shipping units; the IBM unit was a preproduction machine.) If you are in the market for a high-powered bargain, check out sibling 600/500-MHz systems: You won't take much of a performance hit at the lower speeds, and you should save at least $200.

HOW IT WORKS

INTEL'S SPEEDSTEP technology, also known by its code name Geyserville, involves three components: the processor, a compliant BIOS that recognizes use of battery or AC power, and a motherboard chip that regulates voltage and speed. By focusing not only on the processor speed but also on the voltage, Intel says, it has reduced power consumption a great deal. And that's true: The new CPUs running at their top speed of 650 MHz consume 14.4 watts of power at 1.6 volts, numbers that plummet to 7.9 watts and 1.35 volts at 500 MHz.

BATTERY SURPRISE

BUT A PROCESSOR is just one component in a notebook. The screen, for example, gobbles up about 18 percent of the battery power most of the time, Intel estimates. When working at full capacity, the CPU puts a significant drain on the battery, but usually the CPU doesn't work that hard. When you're performing office tasks like word processing or e-mail, notebook power management kicks in, and the CPU runs at only a quarter to a third of its full power, Intel estimates. Under these conditions, even a 40 percent drop in CPU power consumption makes little difference to overall notebook battery life. And that's exactly what our tests show.

The Dell Inspiron 7500, carrying a 12-cell lithium ion battery, won bragging rights as the endurance champ: It lasted a whopping 5 hours, 6 minutes at 500 MHz. When we stepped the Dell up to 650 MHz, battery life still held out for an even 5 hours. HP's OmniBook 4150, with a 9-cell lithium ion battery, lasted 3 hours, 51 minutes at 650 MHz and 3 hours, 48 minutes at 500. The IBM ThinkPad 600X, with a 6-cell lithium ion battery, lasted a less-laudable 2 minutes, 40 seconds at 650 MHz and 2 minutes, 26 seconds at 500.

Of course, some tasks do push your notebook's CPU harder. If your work in- ▶

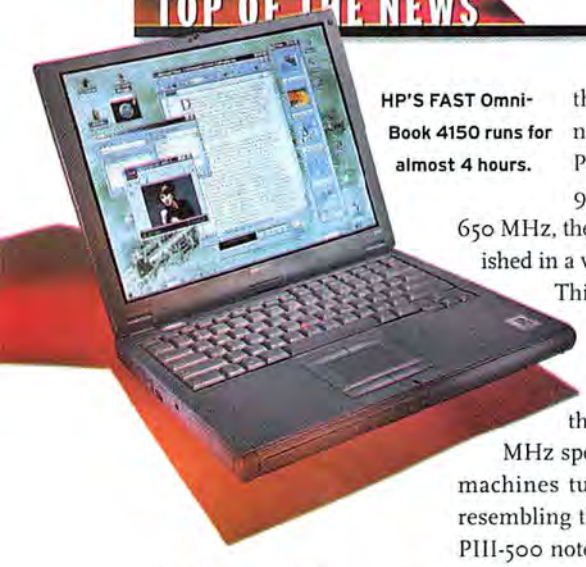
SPEEDSTEP NOTEBOOKS TEST REPORT

Fast and Faster: New PIIIs Run at Record Pace

SYSTEM	CPU	RAM (MB)	MHz	PC WorldBench 98 score (Faster)
IBM ThinkPad 600X	Pentium III-650/500	128	650	269
			500	237
HP OmniBook 4150	Pentium III-650/500	128	650	266
			500	235
Dell Inspiron 7500	Pentium III-650/500	128	650	264
			500	233
Average of 7 notebook systems	Pentium III-500	128	500	230
Average of 2 notebook systems	Pentium III-400	128	400	200

TEST PC WORLD CENTER **HOW WE TEST** All systems are tested with PC WorldBench 98, *PC World's* application-based benchmark. A higher PC WorldBench 98 score is better. For more details on our benchmark and how we run it, see PC World Online (www.pcworld.com/testing). All notebooks have 256KB of L2 cache. Data based on testing designed and conducted by the PC World Test Center. All rights reserved.

PHOTOGRAPH: ARNOLD TIOSEJO



HP'S FAST OmniBook 4150 runs for almost 4 hours.

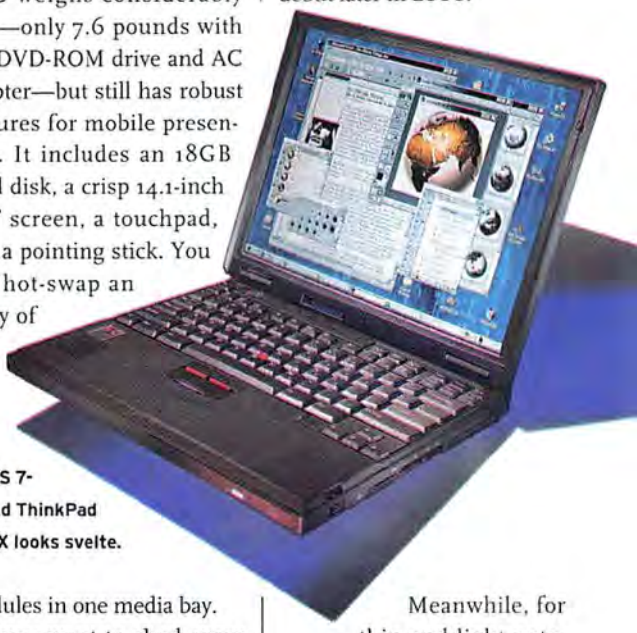
volves heavy number crunching or multimedia creation, or if you want to be able to watch DVD movies when you go on cross-country flights, take note. In our informal testing of how well the notebooks ran a DVD movie, we found improved battery life of up to 14 percent when the processor stepped down to 500 MHz. That percentage translates into 21 more minutes of battery life for the Dell unit, for example.

On the speed front, our PIII-650s trounced the previous mobile champs, running approximately 16 percent faster than a PIII-500 notebook on the PC WorldBench 98 test suite. At 650 MHz, the three units finished in a virtual tie: IBM's ThinkPad scored a 269, the HP a 266, and the Dell a 264. At their slower 500-MHz speed settings, the machines turned in scores resembling those of existing PIII-500 notebooks, across a range from 237 for the IBM to 233 for the Dell.

GUTS AND BOLTS

SO WHICH of these three notebooks is right for you? A true desktop replacement, the $4238 Dell Inspiron boasts a brilliant 15-inch TFT screen with 1400 by 1050 resolution and a roomy 25GB hard drive. Two media bays accommodate various modules including a combo DVD-ROM/LS-120 disk drive. These modules are not hot-swappable. Unfortunately, this unit weighs 10.5 pounds with the DVD-ROM/floppy disk combo drive and AC adapter. And it's more than 2 inches thick. You'll need a big briefcase when you leave your desk.

The $4199 HP OmniBook 4150 weighs considerably less—only 7.6 pounds with the DVD-ROM drive and AC adapter—but still has robust features for mobile presenters. It includes an 18GB hard disk, a crisp 14.1-inch TFT screen, a touchpad, and a pointing stick. You can hot-swap an array of modules in one media bay.



IBM'S 7-pound ThinkPad 600X looks svelte.

If you want to shed every quarter-ounce possible and can live with shorter battery life, consider the $4408 IBM ThinkPad 600X, which tips the scales at 7 pounds with its DVD-ROM drive, external floppy drive, and AC adapter. (If you travel without those two drives, you'll save about 1 pound.) Its screen is smaller than the others (13.3 inches), however, and it has a 12GB hard disk. The ThinkPad has one media bay for various modules, but without hot-swap capability.

DO I HEAR 750?

LOOKING AHEAD, we expect PIII SpeedStep chips to exceed 750 MHz by year's end. Mobile Celeron processors will also get faster, reaching 600 MHz or more—but they won't be getting the SpeedStep technology, according to Intel. AMD plans to release its answer to SpeedStep, code-named Gemini, at midyear in mobile K6-2+ chips starting at about 500 MHz. AMD will also use Gemini technology in mobile Athlon chips, slated to debut later in 2000.

Meanwhile, for thin-and-light notebooks that can't handle the heat requirements of SpeedStep's higher frequency, Intel has recently launched new low-voltage parts—PIII-500 chips running at 1.35 volts, which is the voltage of existing PIII-400 mobile CPUs. And 1.1-volt PIIIs for thin-and-light models will arrive later in the year. Mainstream notebook users, however, can step up to 650 MHz now and enjoy the performance gain.

—*Anush Yegyazarian*

BATTERY LIFE TEST REPORT

Great Staying Power at Either Speed

NOTEBOOK	MHz	Battery life test times (hr:min) — Better
Dell Inspiron 7500	650	5:00
	500	5:06
HP OmniBook 4150	650	3:51
	500	3:48
IBM ThinkPad 600X	650	2:40
	500	2:26

PC WORLD TEST CENTER **HOW WE TEST** We drain and fully recharge the battery twice and set power-saving options to match a consistent profile where possible. For our standard test, Microsoft Office workers use Windows 9*x* applications, periodically saving and allowing regular idle time. Notebooks are rotated among workers. We report the time elapsed when the notebook shuts itself off. All systems have 256KB of L2 cache. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

Dell Inspiron 7500
Street price: $4238; Dell Computer; 800/388-8542; www.dell.com

HP OmniBook 4150
Street price: $4199; Hewlett-Packard; 800/752-0900; www.hp.com/omnibook
PRODUCT INFO NO. 686

IBM ThinkPad 600X
Street price: $4408; IBM; 877/426-4727; www.pc.ibm.com

PHOTOGRAPHS: ARNOLD TIOSEJO

SPEEDS UP YOUR ASSAULT.
SPEEDS UP YOUR ANNIHILATION.

AND IF YOU SUCK, IT ALSO SPEEDS UP YOUR RETREAT.

Add maximum realism to your gaming experience with S3's Diamond Viper II. Tear through high-intensity games and demanding Windows® applications with unrivaled graphics and unprecedented DVD performance. Based on the powerful Savage2000™ processor, Viper II beats the competition with higher frame rates and cutting-edge 3D features including the industry's first QuadTexture™ engine, hardware integrated S3TC™ Texture Compression and acceleration for the newest, coolest software with complete support for OpenGL® and Direct3D®. With 32MB of high-speed memory, TV-out and AGP 4X support, Viper II is a full shot of adrenaline for your interactive gaming. Viper II. Who said anything about playing fair?

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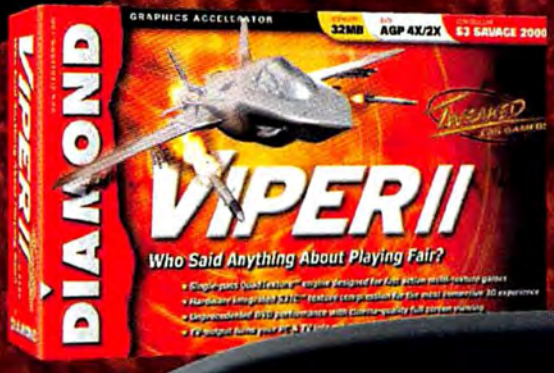

AUDIO | GRAPHICS | COMMUNICATION | HOME NETWORKING

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Circle 37 on card or go to www.pcworld.com/productinfo

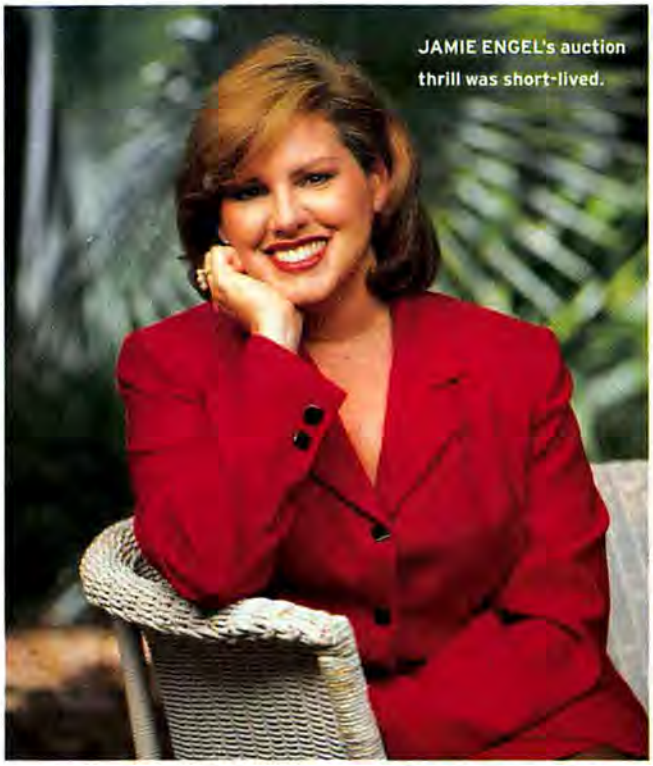
Merchant Auction Sites: Bidder Beware of the Fine Print

CONSUMER ALERT

SHORTLY AFTER Jamie Engel bid on a Sony VAIO notebook at Onsale.com, she received an e-mail saying she'd won. She was thrilled. Onsale.com is a merchant auction site—a site that acquires unsold merchandise (everything from computers to cruises) from outside vendors and auctions it to the public. Unlike EBay and Amazon, merchant auction sites don't auction items from individuals. "It was my first experience bidding in an online auction," Engel says, "and when I won the bid, I thought I'd struck gold."

What she got was more like a lump of coal. The computer didn't show up on time, and a week later she received an e-mail stating that Onsale couldn't fulfill her order since the unit was lost in transit from Sony to Onsale's warehouse. The company, recently merged with Egghead and now known as Egghead.com, canceled her order and refunded her credit card. A customer service rep offered to notify her if the unit appeared, but it never did. Onsale.com wouldn't even give her a tracking number, says Engel, a small-business owner in Miami.

Engel's experience with merchant auctions isn't unique. *PC World* has received complaints from about 30 consumers who feel they've been burned by Egghead/Onsale.com or UBid.com, two of the largest merchant auction sites. Sources of complaints include products that never arrived, incomplete or incorrect shipments, inaccurate product descriptions, and erroneous notification of having won bids. If you plan to shop at these sites, you'd better read the fine print first. The sites don't guarantee that the products you bid on are in stock. And if problems arise, you'll likely have to deal primarily with the merchandise vendor, not the auction site.



JAMIE ENGEL's auction thrill was short-lived.

"When I won the bid, I thought I'd struck gold." But her new PC never arrived.

WHO YOU GONNA CALL?

THE PROBLEM IS, many consumers we heard from didn't consider the fine print before bidding. Take David Brownell, a photographer in Andover, New Hampshire. He got lost in a game of vendor tag after his bid on a refurbished Compaq PC won at UBid.com. The unit was advertised as including Windows 98, but it arrived without an installation disk. A shipping error? No, says UBid.com. The bidding information didn't specify an installation disk. Brownell says he paid for the right to use the software, and he believes that includes the right to reinstall it if necessary.

"After talking with four or five people at Compaq, I got someone to send me a 'restore' disk," Brownell reports. But he says he doesn't dare test the disk because it will only restore the PC to its original configuration—and since the PC is refurbished, he fears that he may run into trouble. "I feel I've been misled by UBid," Brownell says.

In fact, both UBid.com and Egghead.com post disclaimers on their sites that limit their liability when problems or disputes occur, though most of the consumers we spoke to didn't read all this information before bidding. At UBid.com, for example, the House Rules section covers everything from product quality to returns—but it's located three clicks down from the home page.

Here, UBid.com spells out its policy that products purchased on the site are generally considered nonreturnable, unless they are defective. You have one week to return defective products, and if they're found upon return not to be defective, you're subject to a 15 percent restocking fee. Read the Products subsection under House Rules, and you'll learn that refurbished equipment may not come with recovery disks—something Brownell wishes he'd seen. And under the last House Rules heading, Legal Stuff, you'll learn that the selling merchants, not UBid.com, are responsible for providing merchandise and processing orders. UBid itself makes very few guarantees.

Egghead.com, which posts its policies under a Help section on the site's home page, states that merchants provide all product descriptions, and that Egghead.com is not accountable for typos, or for erroneous product descriptions, pricing, or shipping information published on-site.

What about the question ▶

PHOTOGRAPH: DAVID VANCE

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Circle 164 on card or go to www.pcworld.com/productinfo

of what "in stock" means? Although the auctions advertise a certain number of products up for bidding, the sites don't guarantee that an item will be available after your bid wins it.

NO RAIN CHECKS

EGGHEAD.COM'S Terms and Conditions section says the company may "cancel a bid" for merchandise that is "advertised in error" or "is unexpectedly out of stock." And the Legal Stuff section at UBid.com notes that the company "will not be responsible should an item be unexpectedly out of stock."

Charles Gallea of Commack, New York, a customer engineer for a printing company, got confirmation that he had won a bid for two UPS/surge protector products at UBid.com, for a great price of $7 each. But later on he received e-mails from UBid.com support saying the auction had been put up by mistake, the items were not in stock, and the vendor selling the products had gone out of business. Gallea persistently sent e-mails to the product vendor, to UBid.com, and even to AOL's shopping help staff. But he didn't get anything for his effort. His final e-mail from UBid.com says: "Your complaint is with the vendor not UBid. We are now closing our file on this case."

Facilities engineer John Collins of Webster, New Hampshire, made a winning bid on a Mustek scanner at UBid last August 23. On September 9, he learned via UPS online tracking that the scanner had shipped on August 24, gotten to within a state away, and then returned to UBid on September 1. He called customer support. A rep said the scanner was returned to the warehouse but that UBid had others in stock and would reship. "On September 13 I called to make sure it shipped...only to find out that they'd canceled the order and credited my account," Collins says. "I couldn't believe it. They said I'd have to rebid to get the scanner." Collins says he never received a clear explanation.

UBID.COM TOUTS AUCTIONS on goods from PCs to jewelry. Be sure to drill down and read the House Rules...

...including the Legal Stuff section: Selling merchants are responsible for products and order fulfillment.

THE RISK FACTOR

DISAPPOINTING experiences aside, there are bargains to be had on these sites. And the risk of having a problem is statistically low, the companies say. Jeff Sheahan, president and COO of Egghead.com, says that 10,000 to 12,000 transactions take place on Egghead/Onsale.com every day, with a product return rate of less than 3 percent. "The challenge of the merchant auction business is to stand behind all of your products—and that includes even those that are remanufactured or refurbished. We constantly monitor our vendors on sales and customer service requests, and we issue a monthly report card to help us evaluate which ones we'll continue to do business with."

In a similar vein, UBid.com says that it screens vendors on such criteria as their shipping times, their level of cooperation, and their accessibility before it agrees to partner with them. Jason MacLean, the vice president of customer care at UBid.com, says, "Once a merchant is in place, we keep communications tight and don't leave customers without an avenue for assistance." Nevertheless, according to the dissatisfied consumers we heard from, the customer is often told to deal with the product vendor directly.

Troy Folger, a software developer in Austin, Texas, won a bid at Onsale.com last summer for a new telescope. But when it arrived, he could see that it was obviously a used model. Thus began a nightmarish product return odyssey. Folger was told to return the telescope to its vendor for credit. When the vendor failed on three occasions to pick up the telescope as arranged, Egghead.com offered to pay the shipping costs. Six months and countless phone calls and e-mails later, Folger got his shipping costs reimbursed.

Certainly, you can get a good deal at merchant auction sites. But are they worth your time and money? Remember: The sites make no promises about what's in stock, so if you need a product at once, you're wise to look elsewhere. And read all the fine print before you bid.

—Anne Kandra ▶

Be Wise About Bidding

- Read all the terms and conditions you can find on the site *before* you spend time shopping.
- Remember that if anything goes wrong, the merchant—not the auction site—is usually accountable.
- If you've never heard of the product merchant, research it.
- Check all product details, including upgradability, warranties, and the specific items (equipment, software, and manuals) that are included.
- Learn about return policies: Are you subject to restocking fees? Who pays for shipping? What's the time limit?

ILLUSTRATION: JOHN LELAND

"I wanted the best protection available and APC delivered."

– **Fred Lugano**, weatherization.com, Vermont

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Personal computer users across the country recognize APC as a leader in power protection. Now, home users are finding multiple uses for APC products. Some use their APC to run a television or small refrigerator during a disaster. Others will use their APC Uninterruptible Power Supply (UPS) as a "power bridge" to give them enough time to get their power generators started. Still others will use APC to protect sophisticated audio and visual equipment from damaging electrical surges.

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Hide Your E-Mail Tracks With New Privacy Tool

PRIVACY

DESPITE PRO-PRIVACY posturing by vendors and government officials, you have good reason to fear for your anonymity on the Internet. Hackers can easily read e-mail messages, and the servers that push the Internet's bits and bytes log everything—including which Web pages you view. But a new $50 product called Freedom aims to change this, letting you wander the Web anonymously and send e-mail using hard-to-trace pseudonyms. The software's design even prevents its creators at Montreal-based Zero-Knowledge Systems from identifying Freedom users, the vendor claims. In our informal tests, Freedom delivered on many of its promises.

THE COST OF FREEDOM

GETTING STARTED is simple: Visit the Freedom Web site at www.freedom.net and download the software. A straightforward registration process gets you set up with one or more electronic pseudonyms, dubbed "nyms." You receive your first three nyms free, and they last for one month. To renew them, however, you have to purchase a $50 Freedom serial number. You can redeem that number for five untraceable electronic tokens, each of which funds a nym for one year. The process is structured so that if you pay online, your credit card number can't be connected to your nyms.

Once you have Freedom configured, simply launch the program when you go online. At that point, Freedom operates transparently. Here's how the product handles e-mail: It captures messages you send and replaces the return address with your nym's return address. The message is then encrypted and submitted for delivery via the Freedom Network, a chain of servers (some controlled by Zero-Knowledge, some by third parties) that span the globe and hide the message's point of origin. If the recipient responds, the Freedom Network grabs the mail, encrypts it, and routes it back to your true e-mail address, again covering its tracks along the way. According to Zero-Knowledge, the multiple encryption layers—which peel away like layers of an onion as messages traverse the Freedom Network—ensure that no single server ever possesses enough information to correlate a nym with a true identity. I loaded Freedom and sent a simple "guess who this is" note to a friend using Netscape Messenger. The message he received came from a freedom.net address he could not identify as mine. When he replied, the note appeared in my Messenger in-box.

FREEDOM LETS you create five pseudonyms (which it terms nyms), so you can send e-mail and surf the Web anonymously.

FOR ADDITIONAL security, you can easily switch nyms from the program's main screen.

Zero-Knowledge designed Freedom to cover your tracks as you surf the Web, too, routing traffic through the Freedom Network so that Web sites see requests from Freedom machines, not your own. Site cookies—bits of information that Web sites place on your PC—are funneled into Freedom's "Cookie Jars." I perused cookie-happy sites that previously knew who I was, and they no longer did. You can also post to Usenet with your Freedom nym and route Telnet, Secure Shell, and IRC connections through the Freedom Network, though I didn't test this capability.

The program does have several shortcomings. First, Web browsing seemed slightly, though noticeably, slower. Also, it doesn't work over an AOL connection or on machines not running Windows 9*x*. And the program won't work behind some firewalls, so you can't use it from the office to sass your boss. Finally, don't go threatening the President, figuring you're untraceable: Zero-Knowledge admits that—at least theoretically—your nym and your true identity are reconcilable.

Should you demand Freedom? If you're bothered by the eternal vigilance of online entities tracking your comings and goings, $50 is a low price to pay. Freedom is one of the few comprehensive tools for protecting your online identity, according to Abner Germanow, an Internet security analyst at International Data Corporation. The bottom line: It's nice to know you can have Freedom if you want it.

—Matthew Newton

Freedom
List price: $50; Zero-Knowledge Systems; 877/691-3733
www.freedom.net
PRODUCT INFO NO. 685

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LCD 3 PANEL

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[1] Microsoft Windows 2000® Professional available February 17, 2000

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Passwords—Who Needs 'Em? Digital Wallets Help Shoppers

ARE YOU shopping online more but enjoying it less? Tired of typing in billing, shipping, and credit card information on lengthy forms? Can't remember the log-in names and passwords for your 20 favorite Web sites? Help is at hand. Free Web services and utilities—from Microsoft, Novell, big banks, and a raft of Internet start-ups—want to do the job for you. And for the most part, they do it fairly well.

These so-called digital wallets and digital ID tools fill out Web forms for you. Some are applications you must download and install to use with your browser; others are Web-based. Some store all your user IDs and passwords, so you need only log on to the service to access any site you're registered with; others manage your personal information, enabling you to breeze through the frequently tedious process of registering for Web sites. Digital wallets simplify online shopping by adding billing, shipping, and credit card information.

But in our tests, not all services worked perfectly, and the software behind them can make Windows slower and less stable. Privacy is an even bigger concern: A company that has your personal information and sees all the forms you fill out could sell a very accurate consumer profile of you to marketers. Virtually all these services promise not to disclose such information, but privacy policies can change. For this reason, services that don't have direct access to your personal information (usually because it's stored on your own hard drive) are safer than ones that do.

PASSPORT TO WHERE?

THE BIG NAMES in the digital ID game don't necessarily offer the best services. Microsoft's Passport, which started out as a site log-on tool, now has a wallet feature that is easy to use. But it only works at Microsoft's online partners, which at this writing number just 31 (including Barnes & Noble and buy.com), with 80 more signed up. And Microsoft stores your data on its servers. The good news: IDC analyst Malcolm Maclachlan says that because of the public outcry that would inevitably result, Microsoft is unlikely to change its policy and give out your personal information.

Passport is the only tool that works exclusively with partner sites. With support from credit card giants Visa and MasterCard, several banks have also issued digital wallets. And though their design may be optimized for certain sites, these services try (with varying degrees of success) to fill out all online retailers' forms.

A NOVELL APPROACH

NOVELL'S Digitalme uses the business card metaphor to let you reveal varying amounts of information to different people. A work card might ▶

ILLUSTRATION: JOHN UELAND; PHOTOGRAPH: ARNOLD TIOSEJO

Smart Credit Cards Make Shopping Safer

ELECTRONIC WALLETS and digital IDs facilitate browsing and buying on the Internet, but they aren't the last word in security. Already big in Europe and Japan, smart cards—led by the American Express Blue and Visa's Visa Cash—are finally reaching U.S. consumers. Chips inside these cards don't just store your information: They also log you on to a computer or Web site, complete online purchases, conduct online banking transactions, and more. You must insert the card into a reader (like the one shown here to the left of the ActivCard smart card) and then enter a PIN number to run any of its applications. This arrangement is more secure than relying on a unique number or password that hackers might crack.

BLUE NOTES

BLUE COMBINES a conventional credit card with an embedded chip. Cardholders can sign up for the Blue digital wallet, which currently is accepted at about 100 shopping sites. To charge a purchase at one of these sites, you insert the card into a card reader and type in your PIN number.

Visa Cash, which lets you make payments with virtual cash stored on its chip, is used in the Atlanta area and is in trials elsewhere. Major financial institutions such as Citibank are expected to roll out smart cards by the end of the year. These cards may soon be standard plastic among home users—and eventually could become a must-have for online shopping and surfing.

—Yardena Arar

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omit the home phone number you include in a home card, for example. As you change information, the data on cards you've already given out is updated automatically. The software can also fill out forms using data on the Digitalme card you choose.

Like Passport, Digitalme stores your private data on its servers. But Novell insists that encryption renders the data inaccessible to its employees.

Other sites that keep your data on their servers include Zkey.com's Zcentral (www.zcentral.com), Ezlogin.com, Lucent's ProxyMate (www.proxymate.com), and eCode.com. You'll want to consider how much you trust these companies before signing up.

LITTLE-KNOWN HEROES

THE THREE FINEST form-fillers—jotter.com, gator.com, and the Enonymous Advisor (www.enonymous.com)—all store your data in encrypted form on your own PC, so they couldn't sell your information even if they wanted to.

Jotter, which offers a range of personal services, is the best of the three. The program lets you use different log-in identities with separate names, addresses, and so on. Best of all, one Jotter button provides explanations and ratings of most major commerce sites' privacy policies. The descriptions are not detailed, but they suffice to alert you to what you may be getting into.

Digitalme
www.digitalme.com
Enonymous Advisor
www.enonymous.com
Gator
www.gator.com

Jotter's privacy ratings come from enonymous.com, which also offers them with its own Enonymous Advisor software. Smaller than Jotter, Enonymous Advisor has one unique and useful feature: It lets you fill in a form with false data—handy at sites that require personal information before letting you download a file. But Enonymous Advisor will not memorize your log-in names and passwords. For its part, Gator doesn't offer privacy ratings, but it delivers the basics.

Jotter
www.jotter.com
MasterCard
www.mastercard.com/shoponline/wallet
Passport
www.passport.com
Visa
www.visa.com/pd/ewallet

Surfing the Web is a balancing act between convenience and privacy. If you opt for a form-filling service, choose one that stores your information on your own hard drive. And even then, think before you divulge personal data.

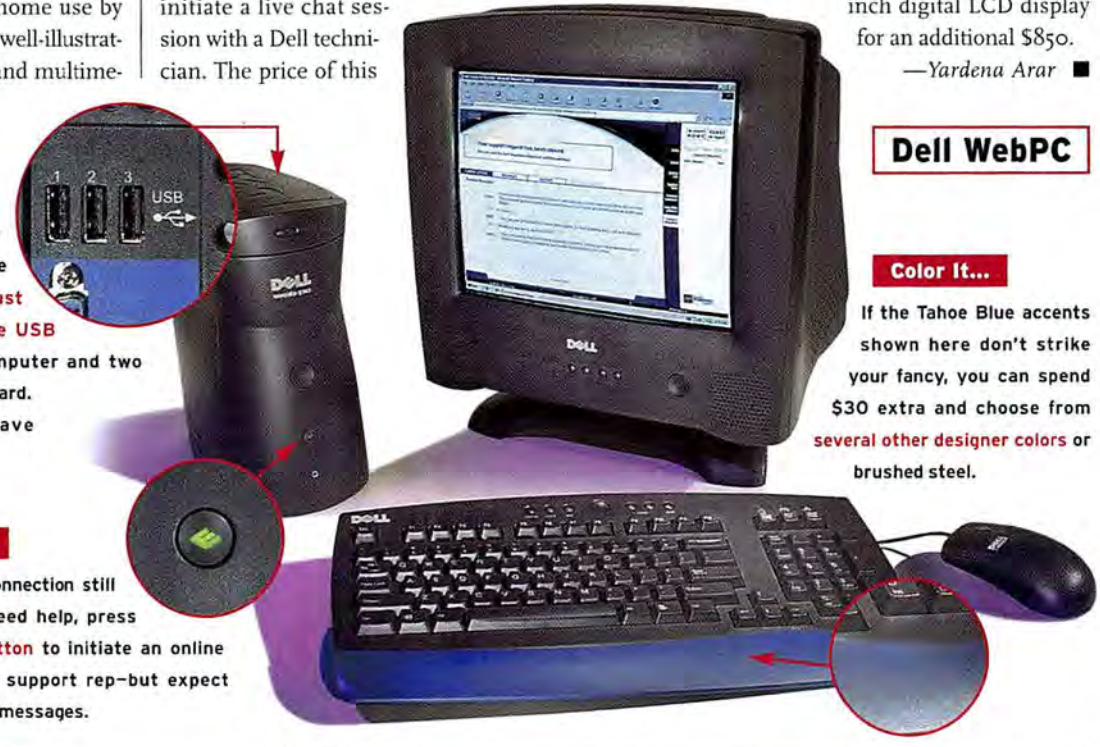
—Lincoln Spector

Dell's Petite WebPC Delivers the Basics With Style

FIRST LOOK

NOT MUCH BIGGER than a breadbox—and far nicer looking on a desk—Dell's WebPC is designed for home use by beginners. If the well-illustrated setup poster and multimedia tutorials can't help you (and your Internet access is working), hit the E-support button on the desktop unit to initiate a live chat session with a Dell technician. The price of this basic Windows 98 SE computer ranges from $999 to $1499 (for the top-of-the-line PIII-500 model); all versions come with an HP color ink-jet printer and a year's free Internet access. If you buy the high-end system, you can get a 14.1-inch digital LCD display for an additional $850.

—Yardena Arar ■



Dell WebPC

USB Blitz

Most peripherals—including mouse and keyboard—must connect via three USB ports on the computer and two more in the keyboard. Some models have ethernet, as well.

Color It...

If the Tahoe Blue accents shown here don't strike your fancy, you can spend $30 extra and choose from several other designer colors or brushed steel.

Panic Button

If your Internet connection still works and you need help, press the E-support button to initiate an online chat with a tech support rep—but expect long lags between messages.

PHOTOGRAPHS: ARNOLD TIOSEJO

Gateway™ Portable PCs:

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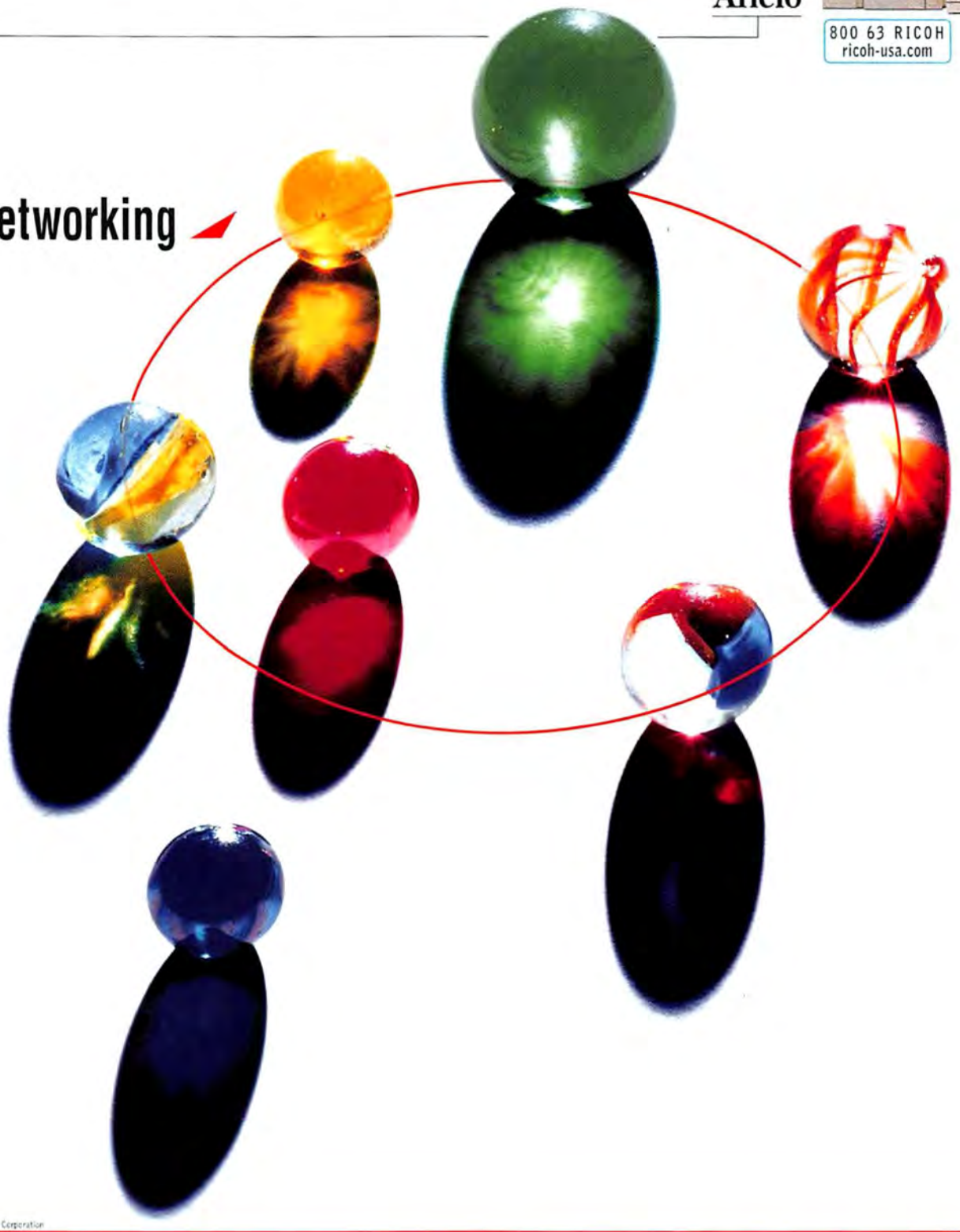

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MULTI-FUNCTION MACHINES ARE BREATHING NEW LIFE INTO INTELLIGENT DOCUMENT MANAGEMENT.

Multifunction devices (MFDs) can be a small business person's best friend. They're the handy-dandy boxes that let you print, fax, scan and copy – all in one place. The higher-end models also let you attach your camcorder and do PC-based faxing, among other jobs.

Not only have prices for MFDs come down significantly in the past few years, but the MFD can also hold its own on the quality front against the competing standalone printers, fax machines and other individual devices. The old saw of "jack of all trades, master of none" no longer applies, observers say.

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The Document Management Series: Part 1

Toshiba's super-fast, high-resolution FC22 copier/printer/scanner

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To be sure, if you need to scan or fax thousands of documents each day, or if you need really specialized copier functions such as the ability to enlarge documents by 1,000 percent, you will probably need a standalone high-end machine that does just the function you need. In that case, you might choose an MFD as a backup machine.

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But for most general small-business users, the MFD will work just fine. "Prices have come down by 75 percent in the past 18 months," says Gary Peterson, a senior analyst at the market research firm ARS Inc. in La Jolla, Calif. "Now they're priced below what it would cost to purchase all the individual products separately. People are getting a great value."

For all these reasons, the MFD market is exploding. Sales are growing by 30 percent each year, Peterson says; approximately 1.8 million MFDs were sold in 1999, compared with under a million in 1997.

One enthusiastic customer is David Hanania, president of the Home-Based Institute in White Plains, N.Y. Not only does he use an MFD for his organization's business needs, but many of his 70,000 home-based business members rely on the devices as well to run their small businesses efficiently. "Our customers are using it for the same reasons we are," Hanania says. "It saves space and money; this is a good example of a technology that makes it efficient for the small-business owner."

More In the Box

There are two basic types of MFDs – those that are copier-based, and those that are fax-based. Depending on the volume of the printer or the fax machine, prices range from around $299 to around $700 for a quality unit geared to a small business of 10 people or fewer. Some of the real industrial-strength models, for an enterprise of 100 employees or more, can reach $60,000.

Typical of today's MFD is Xerox Corp.'s WorkCentre XK35c – with a color inkjet printer and a flatbed copier/scanner. The flatbed copier/scanner comes in handy if you do a lot of work with materials, such as books or brochures, that can't easily be put into the traditional sheet-fed models. The device prints six pages per minute in black-and-white and three pages per minute in color, with resolutions up to 1200 x 1200 dots per inch.

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The Road Ahead

What's ahead for MFDs, most industry watchers agree, is increased integration between the MFD and the PC. Vendors on both sides are working together to make it even easier to set up the MFD from your PC, or to get MFD-related error messages (if the fax is out of paper, or the printer is jammed) on your PC screen. Manufacturers are also working to install sophisticated workflow packages that will let you scan a document in via your MFD, then have the PC's search engine retrieve the document and integrate it with graphics from another PC package.

New Tools

As a result of its recent stake in QMS, Inc., Minolta Corporation has begun marketing cutting-edge laser printer technology under the brand name of

CONTINUED ON PAGE 303

MORE POWER TO THE PEOPLE

Toshiba's Electronic Imaging Division has debuted its full-color, digital copier/printer/scanner. The FC22 is geared toward corporations that need a high-quality, network-ready device for graphics professionals and desktop publishers, among others.

The unit copies at 22 pages per minute and prints at 25 pages per minute in full-color networked mode. The FC22 also features one of the highest print resolutions around – 9600 x 600 dots per inch. Zoom range goes from 25 percent to 400 percent.

Toshiba's four-drum tandem design allows for speedy color copying and printing. A color original can be scanned in a single pass to create all four color separations – cyan, magenta, yellow and black – instead of the four individual scans required by some other units.

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Photograph taken with an Olympus C-2500L digital camera on Lexar Media USB enabled 8x digital film

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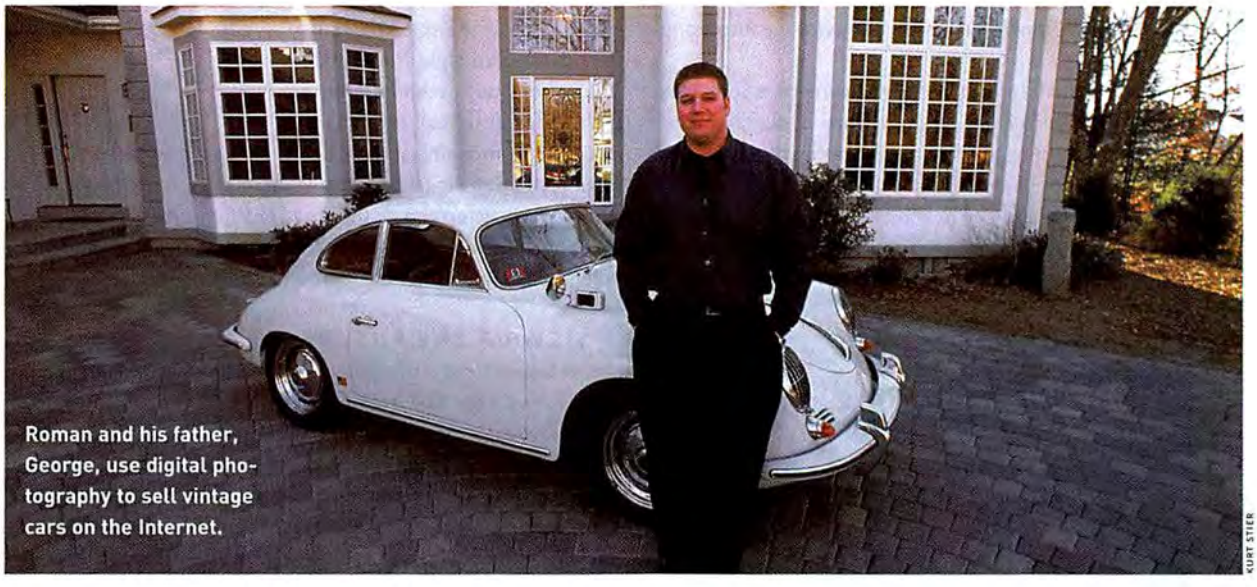

Roman and his father, George, use digital photography to sell vintage cars on the Internet.

KURT STIER

COMBINED WITH THE INTERNET, DIGITAL CAMERAS BECOME A STAUNCH ALLY TO SMALL BUSINESSES

FOR THOUSANDS OF YEARS, vendors physically displayed the horse collars, swords and amulets they offered for sale in bazaars. Those medieval trading centers, vestiges of an age where vendors had no choice but to physically exhibit their wares, are slipping into oblivion, replaced by photographs in catalogs and on Web sites.

Then as now, a basic rule of successful sales is to show, not tell. And what better way to affordably, conveniently and successfully show a product than with digital imaging?

"The greatest advantage that digital images and cameras have over conventional cameras in any business situation is immediacy," says Alexis Gerad, president of Future Image, an advisory service based in San Mateo, Calif.

Gerad, an advocate of digital imaging long before it became a common phrase, equates increased convenience with increased commerce.

"With digital imaging, you can see right away if you got the picture that you wanted. Secondly, time is money in business. You save both because the picture is immediately ready to be integrated into a brochure, placed onto a Web page, or e-

mailed to a customer. These days, whatever you do with an image in business, it has to be in digital form."

CRUISING ON THE WEB

George and Roman Medynski typify the new breed of businesses that leverages digital cameras to increase their revenue. The father and son sales team operates M&G Vintage Auto, based in Tuxedo Park, N.Y. The company specializes in selling vintage and classic sports cars to customers nationwide. And some of the deals they close result from photographs of the cars customers see in the classified sections of popular search engines on the Internet.

"We wanted to get pictures of our cars onto the classified search engines," says Roman. "Describing classic cars with words wouldn't work as well. We need pictures because pictures sell." Roman says they currently list their cars on sites that do not charge for posting the listing, such as Excite and occasionally Yahoo. They also post the photos on their own Web site, www.vintageautogroup.com.

Other than the cost of the digital camera, a Sony Mavica, the sales-increasing strategy of using digital images cost next to nothing to implement. Roman purchased the Mavica because of its ease of use. That purchase had particular importance when he moved to Boston, Mass., last May and started relying on his "digitally challenged father" to take photos of the cars in the Tuxedo Park, N.Y., showroom.

Roman creates digital images for the Internet showroom.

KURT STIER

They began their use of digital images with another brand of digital camera. "It took good pictures but it was a hassle for my father. He has very little technical experience. He doesn't even use a computer. He would take the pictures and mail me the entire camera. I'd download the pictures, edit and crop them with Adobe Photoshop, and upload them to the classified sites. Afterwards, I'd mail the camera back to him. When we bought the Mavica, it made life much easier. It records up to 20 high-quality images on one floppy. Now, he just mails the floppy to me." George typically takes four photographs of each car: two exterior and one each of the interior and of the engine.

Photographers who need more storage capacity than the Sony's 1.44 MB floppy disk can hold can chose from a number of third-party storage formats. For example, Fremont, Calif.-based Lexar Media offers high-speed "digital film" in capacities up to 160 MB. This same technology, USB-enabled CompactFlash cards, transfers data up to eight times faster than previous methods. The resulting faster refresh time makes the USB CompactFlash cards ideal for use with today's high-resolution digital cameras. Lexar recently announced that it will develop and distribute a Lexar-branded version of Sony's Memory Sticks, another form of removable image storage, for use in cameras and audio devices.

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A VIEW OF THE FUTURE

As testament to the rising importance of digital imaging in business, even Bill Gates, Microsoft's former chairman, is an advocate. He sees a time where digital images will be transmitted by high-bandwidth technologies such as cable modem and DSL to every office and home.

Speaking in Las Vegas at ImageScape '99, Gates predicted, "I think we'll see explosive growth. Probably the neatest thing is the empowerment it will provide. I'm very excited to be involved in this market and see great opportunities for everyone."

"WE NEED PICTURES BECAUSE PICTURES SELL."
—ROMAN MEDYNSKI

While few people would argue with Gate's vision of the future, admittedly the best is yet to come. According to Boston-based InfoTrends, only about four percent of U.S. households currently own or have access to a digital camera. For example, in 1999, purchasers bought 1.8 million digital cameras at a cost of $1.1 billion. InfoTrends' analyst Michelle Lampmann, however, predicts the mar-

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WORKING CAMERAS

lexarmedia

Lexar Media's USB-enabled CompactFlash cards offer storage capacities up to 160 MB and transfer speeds up to eight times faster than previous methods.

ket will explode over the next four years at a compounded annual growth rate of 38 percent. By 2003, she foresees seven million units sold annually at a cost of $2.6 billion.

By 2003, InfoTrends predicts that 50 percent of all U.S. "instant" photo-processing centers will offer digital processing, partially as a result of the Internet's pervasive reach. "As a result of an increase in sharing images over the Internet, an important segment of this market, more minilabs will go digital," says Lampmann. "It streamlines their processing operations and also reduces their need for objectionable chemicals."

One of the products responsible for the rapid rise in Internet-based Web image sharing is Creative Labs Inc.'s Video Blaster WebCam 3. This versatile PC camera quickly captures, creates, and communicates full-color snapshots or full-motion video directly from a desktop PC. Together with Microsoft's NetMeeting software and a Universal Serial Bus or serial port connection, you can hold business meetings with distant colleagues.

HIGH-FLYING IMAGES FOR U2

When it comes to ideas for using digital imaging to enhance your business, you might want to let your imagination, and your camera, soar.

Michael Shellim, of London, England, combined a love of radio-controlled model planes with digital cameras and some philanthropy.

Although Shellim's primary interest is fun, he devotes some of his time to taking aerial photographs for England's guardians of public lands, the National Trust. In return for the Trust's permission to fly his radio-controlled gliders at Ivinghoe Beacon, a park 35 miles north of London, Shellim provides them with pictures that they can use to check on the condition of the trees and undergrowth. Shellim uses an Olympus C400L and takes about 38 high-quality snapshots per flight at heights ranging from treetop to 500 feet. "The great thing about having a camera with a TFT display on the back is how it enables me to immediately review the pictures I've taken. I delete the ones I don't want to make room for new ones on the next flight."

Since Shellim flys gliders, he has no problem with vibration. "My main problem is reducing motion blur," he says. He designed a solid-state interface to trigger the camera. He has posted details of the trigger on his Web site, www.rc-soar.com. Mid-air collisions are another of Shellim's concerns. "I have to watch for planes as I align my glider for the shot. Problems aside, I still tell everyone

"WHATEVER YOU DO WITH AN IMAGE IN BUSINESS, IT HAS TO BE IN DIGITAL FORM." –ALEXIS GERAD

to give it a go," he says. "This is very satisfying. Digital photography makes it a lot more fun because you get your results immediately and that makes it very attractive. And if the pictures are not perfect you can retouch them." He uses PaintShop Pro for image editing.

His next project is transmitting video in real time from the model plane using a Sony miniature video camera.

Another high-flyer, Cedric Could, of Slidell, La., uses a Kodak DC20 to take aerial photographs. Right now he says he does it because "I have a blast with this stuff. It's an exhilarating feeling to look down on the world without being in a full-size aircraft."

Gould, no stranger to digital technology, (he's designing a Web page for a local hobby shop in his hometown of Slidell), hopes to transform a slip stream into a revenue stream.

"I've checked into the business opportunities of selling aerial photos of houses, properties and construction sites," he says. Summarizing the opportunities open for all digital-camera-equipped entrepreneurs, he says "There's some real possibilities out there."

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Driving the market: Creative Labs Inc.'s Video Blaster WebCam 3 captures, creates, and communicates full-color snapshots or full-motion video directly from a desktop PC.

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AGENDA

9–12:20 MORNING SESSION

- **Introduction and Welcome** *Vicki J. Brown — Senior Vice President, Worldwide Operations and Marketing*
- **eBusiness 2.0: Defining the New Online Enterprise** *Frank Gens — Senior Vice President, Internet Research*
- **ASPs: Doing Business on the Brink of IT Industry Disruption** *Clare Gillan — Group Vice President, Applications and Information Access Research*
- **Hardware Evolution: Mapping the New Order** *Crawford Del Prete — Group Vice President, Computers, Components and Peripherals*
- **Defining the New Online Economy** *John Gantz — Senior Vice President and Chief Research Officer*

Session A 1:45 - 2:25	Session B 2:35 - 3:15	Session C 3:25 - 4:05
TRACK 1: Internet		
eCommerce 2.0: New Buyers, New Brands, New Rules Barry Parr	**eCommerce 2000: The New Requirements for Survival** Sean Kaldor	**B-to-B eCommerce 2.0: What's Going On at the Heart of the Revolution?** TBA
TRACK 2: Devices		
The Revolution in PC Business Models Roger Kay	**The Next Wave in Consumer Devices and Peripherals** Bruce Stephen	**Critical Technologies Shaping the Future of Personal Systems** Randy Giusto and Mario Morales
TRACK 3: Enterprise Management		
Linux Servers and Appliance Servers: Can Toasters and Penguins Run a Network? Michelle Bailey	**Servers for the New Business Models: The Engines of ASPs, ISPs and Hosted Services** Martin Hingley	**The Server Business 2.0: Transformation of the Basics** Debra Goldfarb
TRACK 4: Software		
Microsoft Versus the Open Source Community: A Battle of Titans Dan Kusnetzky	**Knowledge Management and Enterprise Portals: Contradictory or Complementary?** Henry Morris	**Winners and Losers in the Stampede to Application Integration** Steve Hendrick
TRACK 5: Delivering Solutions		
eSupply-Chain Services: Linking Technology Innovation to Competitive Advantage Christopher Hoffman	**Taking Customer Relationship Management to the Next Level** Katrina A. Menzigian	**The ASP as a Service Company: What Does It Take to Build a Successful ASP Business?** Meredith Whalen
TRACK 6: Communications		
Interprise Networking: The Convergence of the Internet and the Enterprise Mark Leary	**Web Talk 2000: Opportunities for IT Vendors, Threats to Telephone Companies** Mark Winther	**Wireless and Mobile Meet IP and Internet** Iain Gillott

4:15–5:00 CLOSING SESSION

- **Innovation in an Age of Creative Destruction** *Paul Saffo — Director and Roy Amara Fellow, Institute For The Future*

NEW PRODUCTS

Polywell Serves Up an 800-MHz Business Workhorse

DESKTOP

THE VERY FIRST 800-MHz system we've tested, Polywell's **Poly 800K7-800**, comes with a top-of-the-line 800-MHz AMD Athlon processor that, for the most part, lives up to its speed potential.

Though it's not the fastest PC we've tested, the Poly's not lacking in performance. The Windows 98 SE–based system, with 128MB of RAM, flexes plenty of muscle, scoring 309 in our PC WorldBench 98 tests. That's just 2 percent behind the current Windows 98 speed champ—an Intel PIII-750 reference system we reviewed in February's *Top of the News*. Because PC WorldBench 98 tests the whole system, not just the CPU, the score difference is likely due to variations in subsystem components such as memory and hard disks. Regardless, in real-world business applications such as Word or Excel, you won't see the performance difference.

The $2800 price may seem steep in these days of ultracheap PCs, but consider what you get: Our test system was stocked with high-performance goodies, including a 27.3GB hard drive, a robust 4X AGP graphics card with 32MB of video memory, and a sharp 19-inch monitor. Polywell also throws in a V.90 modem and Lotus SmartSuite Millennium.

The monitor supports a maximum resolution of 1600 by 1200. Text looks precise at nearly all resolutions, becoming just the slightest bit fuzzy at 1600 by 1200. Images looked great all around. DVD playback, via Intervideo's WinDVD program, was clear and crisp, if a bit dark. The included Cambridge SoundWorks speakers and subwoofer deliver confident, albeit slightly boomy, sound.

A step away from the traditional beige box, Polywell's metallic gray case will catch your eye. But on closer inspection, the two-tone case looks a bit tacky, as if it was painted silver, and even the Zip and DVD-ROM drive bays are silver. Still, the chassis slides off in one piece—with little effort and no tools required. The immaculate interior has all wires tucked tidily in place.

Small business users who focus on multimedia presentations or graphics apps or require advanced processing power will appreciate many of the Poly's features as well as its gift of speed. And at $2800, the Poly 800K7-800 costs about the same as a comparably configured Pentium III-750–based system from Gateway.

Both the 750-MHz Gateway and the Poly seem better values than PIII-800 systems. Not only do PIII-800s cost hundreds more than the Poly and PIII-750s, they're harder to find. At press time, Dell, Gateway, and Hewlett-Packard were among the few vendors offering Intel PIII-800 PCs (Intel released the 800-MHz chip to select suppliers initially). If you need 800 MHz now, the Poly's a good choice.

—Michelle Campanale-Surkan

Poly 800K7-800

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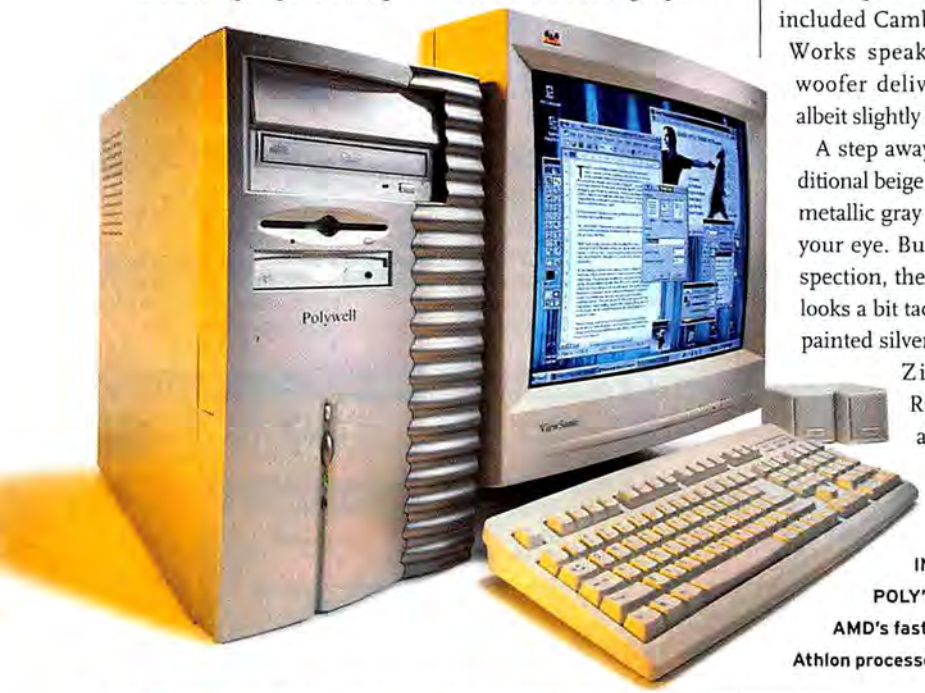

HIDDEN INSIDE THE POLY'S silver case is AMD's fast new 800-MHz Athlon processor.

PHOTOGRAPH: MARC SIMON

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86 Stowaway Portable Keyboard; Kodak QuickPrints, Ofoto, Shutterfly online photo printers
88 Antec Attaché, NEC PetiScan scanners; Logitech mouse
90 Eudora Email 4.3; Maximizer Enterprise 2000
95 Spotlight on online bill-paying services

Light and Thin Notebooks That Act Big

NOTEBOOKS

SHARP'S 4.7-pound **Actius PC-A800** and Panasonic's 4.4-pound **Toughbook 37** offer Solomon-like compromises, combining the convenience of 1-inch-thick subnotebooks with the integrated functionality of larger, heavier notebooks. By adding about 1.5 pounds to the weight of a typical subnote, both vendors were able to pack in 64MB of RAM, swappable drive bays, ports for printers and monitors, full-size keyboards, and larger screens. Both models also have certain limitations that you should consider before purchasing one, however.

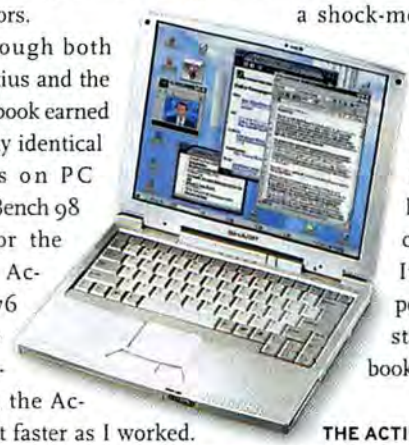
THE 4.4-POUND TOUGHBOOK is both thin and rugged.

Sharp's 13.3-inch TFT display on the Actius is one of the brightest and crispest screens on the market and has 1024 by 768 resolution. Along with the 8.1GB hard drive, the Actius is armed with a CD-ROM drive in a swappable bay; a floppy disk drive; and parallel, monitor, and USB ports. It lacks both serial and PS/2 ports on board. The GlidePad mouse was particularly sensitive to the touch, but some poorly placed keys made the keyboard a little irksome. The <Fn> key was situated where I expected to find the <Ctrl> key, and the <Delete> key was placed above <Backspace>, both causing numerous typing errors.

Although both the Actius and the Toughbook earned virtually identical scores on PC WorldBench 98 (174 for the Sharp Actius, 176 for the Panasonic), the Actius felt faster as I worked. Both are within the average range of their CPU classes. The Panasonic uses a Celeron-366; the Sharp, a PII-366. Panasonic handily beat Sharp on battery life, however, lasting 3 hours, 13 minutes—the Actius held up for just over 2 hours.

The Toughbook 37 sports a 12.1-inch TFT display, but because it's a touch screen with 800 by 600 resolution, it was not as sharp as the Actius, particularly when running on battery power. But it, too, was readable in bright light. The screen opens a full 180 degrees, and with the flip of a switch, the screen image flips 180 degrees for presentations. The Sharp comes with Windows 98 installed. Panasonic, geared mainly toward corporate clients, preloads the older Windows 95 on the Toughbook; other Windows flavors are no-cost options.

While a one-inch-thick chassis demands thinner parts, Panasonic has engineered the Toughbook with—as its name implies—some features for ruggedness: a full magnesium case and internal frame, more durable LCD hinges, and a shock-mounted hard drive to give the machine more shock resistance than you'd have with the competition. It has all the ports found on standard notebooks as well as a modem. Its keyboard handles touch-typing with aplomb, and its touchpad is sensitive. The easy-to-use, swappable drive bay accepts an additional battery, a CD-ROM drive, a DVD-ROM drive, or an LS-120 drive. However, Panasonic made a serious design error: The sliding power switch on the outside of the unit has no lock or cover and is next to the PC Card release lever—making it easy for me to accidentally and unknowingly power the system up or down.



THE ACTIUS packs power in a lightweight bundle.

While the screen on the Panasonic is not the brightest, it is still not hard to view, and it can flip the image for presentations. That, together with more onboard ports, lower price, and ruggedized case, makes it a better choice. Just watch that power switch.

—Michael S. Lasky ▶

Actius PC-A800

PRO: Bright, crisp screen; thin and light but has the features of a full-size notebook.

CON: Poor placement of some keys causes input errors, lacks serial and PS/2 ports.

VALUE: A good system, but comparable units cost less.

List price: $2999

Sharp Electronics

800/237-4277

www.sharp-usa.com

PRODUCT INFO. NO. 679

Toughbook 37

PRO: Versatile ultrathin notebook packs power and some ruggedness without the weight.

CON: Poorly placed power switch can cause accidental drain; touch screen cuts display brightness.

VALUE: Full, integrated set of hardware in a light, ruggedized case.

List price: $2699

Panasonic Personal Computer

800/662-3537

www.panasonic.com/toughbook

PRODUCT INFO. NO. 680

online

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

Next Generation of Portable Music Players

MP3 PLAYERS

GOOD NEWS: There are more ways than ever to take Internet audio with you, and more are coming. I tested three of the newest sound machines: RCA's $200 **Lyra**, Sharp's $250 **MD-MT15 Internet Bundle**, and Sony's $299 **VAIO Music Clip**.

MUSIC WITH A POP

THE RCA LYRA boasts great sound, the lowest price, and the best tone-control features of this bunch. Besides presets for various music styles (which all three provide), an equalizer mode lets you tweak bass and treble. Its LCD, unlike most others', can display up to six songs. But the larger screen pushes the 3.3-ounce Lyra into the portly camp, at least for MP3 players.

Also, loading music onto the product is a bit of a pain. Your tunes live on a removable 32MB flash memory card (a 64MB Lyra is $250). To transfer songs, use the bundled RealNetworks RealJukebox software. But first, you must remove the card and plug it into the included CompactFlash Reader/Writer, which attaches to your PC's parallel *and* keyboard ports. RCA plans to ship a $129 USB adapter by the time you read this—it's long overdue.

The Lyra's support for the MP3, RealSystem G2 and Windows Media audio formats is a mixed blessing. When it switches between formats, the Lyra produces a loud pop that can be painful if you're wearing headphones. RCA says it will fix this flaw in future Lyra models.

RCA'S LYRA features a good-size LCD, but you have to haul a bigger package.

SHARP, KIND OF

SHARP'S MD-MT15 Internet Bundle offers greater flexibility than the others here and is ultimately easier on the pocketbook. It uses MiniDiscs, which hold 74 minutes of audio and cost just a few dollars—a far cry from the $90-plus cost of 32MB flash memory cards. The 6.4-ounce unit is bigger than any MP3 player but small enough to carry.

Voquette's bundled NetLink hardware (www.voquette.com) connects the Sharp to your PC's speaker jack (there's a second jack for your speakers). This lets the Sharp record any PC audio—from MP3s to "you've got mail" notices.

However, to record MP3 files, you must play them in real time—you can't just download them. And because audio comes from the computer's speaker jack, it undergoes further processing that lowers quality.

Another bundled utility, also from Voquette, lets you schedule recording sessions as you would with a VCR. It's a bit rough, but works. The utility also has text-to-speech features so you can record e-mail or Word documents, for example.

SONY'S HIP CLIP

ABOUT THE SIZE of a pen-light, Sony's VAIO Music Clip weighs just 1.6 ounces. But in there it packs 64MB of flash memory that can hold MP3 and WAV, as well as ATRAC3 audio, a Sony-developed compression scheme. The memory isn't removable, limiting your on-the-go music choices, but what's there sounds good.

The Music Clip's downside is its OpenMG Jukebox software, whose copy-protection schemes are only slightly less inconvenient than a surveillance bracelet. For example, you can't use MP3 files without first converting them into Sony's protected format, which took about 2 minutes per song on my Pentium II-400. And transfers to the player are slowed because the software encrypts each song for your specific player first. A 7MB file transfer took 32 seconds—just as long as with RCA's Lyra, despite the Sony's fast USB connection.

PICK YOUR PLAYER

THE RCA LYRA is relatively inexpensive, but its current memory writer complicates tune transfers. Players from Rio and Creative Labs offer comparable features and USB for just $50 more.

If you want to record any noise your PC can make, check Sharp's player. As for Sony's Music Clip—the onerous conversion process will keep most MP3 users away. But its hardware design is terrific; consider it if you're willing to work mostly with ATRAC3 files.

—Jim Heid ▶

THE MUSIC CLIP is hip, but its copy-protection scheme isn't.

RCA Lyra Personal Digital Player
PRO: Large LCD; good tone controls
CON: Needs external writer; pops when switching audio formats.
VALUE: Inexpensive but flawed—wait for the USB version.
List price: $200
RCA
800/336-1900
www.lyrazone.com
PRODUCT INFO NO. 699

Sharp MD-MT15 Internet Bundle
PRO: Records any PC audio; economical media.
CON: Must play MP3s to record.
VALUE: A jack-of-all-trades but a bulky, second-best MP3 player.
List price: $250
Sharp
800/237-4277
www.sharp-usa.com
PRODUCT INFO NO. 700

Sony VAIO Music Clip
PRO: Groundbreaking design; small and light; fast USB transfers.
CON: Can't expand memory; tiny LCD; many copy-protection hassles.
VALUE: Pricey, but the player to buy when portability is paramount.
Street price: $299
Sony
888/315-7669
www.sony.com/vaiodirect
PRODUCT INFO NO. 701

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High-End Video Features at Modest Cost

LCD MONITOR

SAMSUNG BILLS its 15-inch **SyncMaster 570p Plus TFT** analog LCD monitor as a multimedia powerhouse. That may overstate the case, but the 570p Plus is easy to use and includes features—such as advanced image adjustment controls and video input ports—that used to be the province of higher-priced LCDs. At $1254, it's still far from cheap, but it costs $200 to $400 less than comparable 15-inch products and should please image and video editors with flexible budgets, or home users with money to burn.

SyncMaster 570p Plus TFT

PRO: Advanced features and controls for video editing; crisp text.

CON: A tad expensive; colors in graphics somewhat washed out.

VALUE: Good for space-conscious users who want advanced graphics and video capabilities.

Street price: $1254

Samsung Electronics America

800/726-7864

www.samsungmonitor.com

PRODUCT INFO NO. 627

The shipping unit's LCD monitor has NTSC composite/S-Video input and a picture-in-picture feature that lets you hook up your DVD, VCR, or camcorder and set your favorite movie to run alongside your work application—or edit the stream coming in. It also provides advanced features such as detailed image and video adjustments, wide-angle views, and up to 64X zooming capability (helpful for precise photo-editing work). Also handy is the automatic adjustment feature, which optimizes the display settings to your PC. The unit's base pivots for landscape or portrait view, but the screen tends to catch on the adapter cord (so pull the screen forward before pivoting).

PACKING NUMEROUS VIDEO input options in its slim case, the 570p Plus delivers sharp text.

When put to the visual test, the 570p Plus did not disappoint. You get 160-degree horizontal and vertical viewing angles, and text at the optimal 1024 by 768 resolution was crisp and clear (the maximum resolution is 1280 by 1024). When I viewed graphics such as Web pages and images, though, colors looked washed out and less detailed than on high-end CRTs and comparable LCDs. On the plus side, even after leaving the display on all day, I saw no screen jitter or ghosting.

You can add USB to the unit through an optional $35 USB hub with one upstream and four downstream ports. The display also comes with software for making precise color adjustments to the screen.

The SyncMaster 570p Plus's wealth of features and controls makes it worthwhile for high-end graphics users who want advanced graphic controls or for those seeking a thin LCD that delivers crisp text.

—Katharine Dvorak

Epson's Large-Format Ink Jet Scores Big

PRINTER

EITHER YOU LIKE your electronics small—as with PDAs and all-in-one PCs—or you prefer broader vistas, like 21-inch displays and wide-format printers. With its new **Stylus Color 1160**, Epson stands firmly in the plus-size printer camp: This color ink jet handles standard-size pages up to 13 by 19 inches and rolled banner paper up to 44 inches long. At $449, the Stylus Color 1160 is destined for offices that need to print large pages with high output quality but don't want to shell out big-ticket prices for a wide-format color laser. I tested a shipping unit.

As with most Epsons, the 1160 can produce gorgeous photographs, though you'll need to use more costly ink jet paper or glossy photo stock to get the best quality. The printer is quiet and petite for a wide-format model: Folded up, it's 2 feet wide by 1 foot deep by 6 inches high; with the paper trays extended, it gains a foot in depth and height.

The 1160 has reasonable speed for an ink jet. Both letter-size text pages and an 11-by-17-inch chart took 30 seconds per page to print (it takes a few seconds longer in "quality" mode). More complicated pages with graphics printed in about a minute, while a glossy full-page photo ran close to 5 minutes but looked luscious.

Competition for the 1160 abounds. Epson itself makes another wide-format printer, the Stylus Color 1520. You can find the 1520 for about $100 less than the 1160, but you're wiser to choose the 1160. Although it costs more, it contains newer technology and delivers better output quality. Also, Hewlett-Packard has just come out with the DeskJet 1220C, which we couldn't get in time to test. Typical for HP, it's pricey—$499—but the output I saw in previews was beautiful. Even so, the Epson 1160's quality is high and at these prices, every $50 counts.

—Karen Silver ▶

Epson Stylus Color 1160

PRO: Lush photo quality, handy wide-format printing, quiet.

CON: Requires costlier paper to get best graphics quality.

VALUE: Most cost-effective choice around for printing outsize pages.

Street price: $449

Epson America

www.epson.com

800/463-7766

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Slight of Hand: Folding Keyboard for Palms

PALM ACCESSORY

PALM DEVICES are popular because they're easy to use and they fit in a shirt or jacket pocket. Not coincidentally, they also lack a keyboard. So it's surprising that one of the most useful products for Palms I've tried *is* a keyboard.

The $100 **Stowaway Portable Keyboard** from ThinkOutside is a full-size, touch-typable keyboard that folds up into a case about the size of a Palm III. For use, the Stowaway needs to be laid flat so the key panels can snap together. Then you install your Palm on a hideaway easel attached to the keyboard.

THE STOWAWAY PORTABLE Keyboard conveniently folds down to pocket size for travel.

Previously, Palm's only keyboard option was LandWare's $80 GoType, a clamshell-shaped device with distinctly smaller keys. Unlike the GoType, the new Stowaway also comes with dedicated keys to replace some Palm stylus functions such as "Delete" and "Done."

I tested a preproduction unit, but I can safely say I am going to stow away one of these in its final form.

—Michael S. Lasky

Stowaway Portable Keyboard

PRO: Folds to pocket size, full-size keyboard good for touch-typing.

CON: Must be used on a flat surface for full operability.

VALUE: Convenience, functionality, and design transcend high price.

List price: $100

ThinkOutside

www.thinkoutside.com

PRODUCT INFO. NO. 628

A Better Way to Develop Digital Photos

ONLINE PHOTO PRINTING

NEW ONLINE labs **Ofoto** and **Shutterfly,** along with Kodak's older **QuickPrints** site, offer a convenient and inexpensive alternative to processing your digital prints at the local drugstore or buying a personal photo printer. Download images from your camera to a PC, and upload them to one of these online labs. Then sit back and wait for your prints to be delivered. Though quality still suffers in comparison to print film, we found these services worthwhile.

Federal Express delivered my prints from Ofoto and Shutterfly within 36 hours. They weren't too expensive, either: Three sets (in 4-by-6, 5-by-7, and 8-by-10 sizes) of four images cost $18 from Ofoto and $30 from Shutterfly (plus tax and shipping). Sans taxes, equivalent reprints at a nearby drugstore cost $21 for generic or $27 for Kodak prints. Kodak's QuickPrints, however, was a whopping $53 and didn't show for nine business days (no FedEx option).

In color fidelity, prints from Ofoto and Shutterfly hold their own against two snapshot dye-sublimation printers I've used. Ofoto colors appear a bit more lifelike, but on blowups Shutterfly has less pixelation. Kodak's colors are the best here—a bit dark but with little evidence of JPEG's typical color loss. Extreme contrast appears in spots, though.

Online photo labs have other limitations. A high-resolution 6MB JPEG file I sent choked both Ofoto and Shutterfly (Ofoto is releasing an updated client to improve uploads). Kodak was the only one to warn me not to send anything bigger than 3MB. Kodak processes JPEG, BMP, TIFF, and other formats; Ofoto deals with JPEG only while Shutterfly handles JPEG and TIFF.

Then again, there are online-only benefits. All three labs can notify your friends to check out a new photo album stored on the companies' sites. Ofoto and Shutterfly let you store up to 50MB of files on their sites indefinitely for free, but Kodak charges for storage (or deletes your images) after 30 days. Ofoto posts reviews of digital cameras. And Kodak's PhotoNet offers a free feast of photo tutorials and tips, online photo-editing software, and templates for electronic postcards. Kodak can also print your photos on sweatshirts, coffee mugs, and much more.

Ofoto is inexpensive and Kodak offers lots of options for digital shutterbugs. But if you plan to print digital photos fairly often, a photo printer may be a better investment.

—Dan Littman ▶

Kodak QuickPrints

PRO: Wide product range, great tutorials, supports many formats.

CON: Expensive, getting prints takes a long time.

VALUE: Too expensive unless you need prints on specific media.

Pricing: Varies

Eastman Kodak

800/235-5632

www.kodak.com/go/quickprints

PRODUCT INFO NO. 629

Ofoto

PRO: Fast, convenient, good color, inexpensive.

CON: Limited print choices, JPEG files only.

VALUE: Inexpensive way to print your digital photos.

Pricing: Varies

Ofoto

510/647-0514

www.ofoto.com

PRODUCT INFO NO. 630

Shutterfly

PRO: Fast, convenient, reasonably low pixelation on enlarged photos.

CON: Limited print choices, quality could be better.

VALUE: A reasonable option if you need large prints.

Pricing: Varies

Shutterfly

650/610-5200

www.shutterfly.com

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Scan Anywhere With New Ultraportables

PORTABLE SCANNERS

IF YOU'VE EVER wanted to digitize photos, business cards, or documents while on the road, you're a good candidate for a portable scanner. Until now, portable scanners have been so hefty that you had to think twice about taking them along. But two new shipping products—Antec's $149 **Attaché Personal Imaging Device** and NEC Technologies' $149 **PetiScan**—simplify the decision making. Truly designed for travel, these units are the smallest, lightest color scanners we've seen, though they excel at different tasks.

The sleek Attaché, which resembles a three-hole paper punch, weighs only 12 ounces and fits easily into a briefcase. The PetiScan weighs more (21 ounces) and is about the size of a small cigar box. Each is easy to set up, but the Attaché draws power from its Type II PC Card interface, while the PetiScan's power comes from its USB interface. (If you plan to use an external USB hub, it must have an A/C power plug to provide enough juice for the PetiScan.) Both units have an optical resolution of 300 by 600 dpi and can scan various reflective materials.

Both models also come with Presto PageManager, a basic document management app. For more advanced image editing, such as applying special effects to photos, the Attaché offers Presto ImageFolio, while the PetiScan supplies the equally competent and easier-to-use Adobe PhotoDeluxe Home Edition 3.0. Only the Attaché comes with an OCR application, which seamlessly converts text and tabular data into an editable file. Each scanner provides its own TWAIN driver.

But here's where the similarities end. The Attaché is a sheetfed scanner, so you can't scan anything thicker than a single sheet of standard or glossy photo paper. Also, if you don't put the sheet in perfectly straight, the image will be skewed and the sheet may become mangled. With practice, however, your feeding skill will improve.

COMPACT AND LIGHTWEIGHT, the $149 Antec Attaché is a sheetfed portable scanner that provides fast, good-quality scans.

In contrast, the PetiScan operates like a miniature flatbed scanner; simply remove the cover if you want to scan very thick material. Unlike the Attaché, the PetiScan has a handy scan button to jump-start the scanning process. The PetiScan does have one critical limitation: Its maximum scanning area is just 4 by 6 inches per scan. You must scan larger images in pieces and then use PhotoDeluxe's image stitching feature to reassemble the picture digitally (a separate app is bundled for use with Macs).

Overall, the Attaché was the better performer. We scanned a number of photos and text documents with each and found the Attaché generally faster than the PetiScan—twice as fast in some cases. At default settings, the Attaché also typically produced sharper images with greater detail (in shadow areas, for instance) and more accurate color than the PetiScan did. By using the PetiScan's broad selection of advanced image controls—for adjusting hue, saturation, and the like—we produced scans that were closer in quality to the Attaché's scans.

If you do a lot of OCR work in the field and every ounce counts, the Attaché is clearly the scanner for you. But if photos and other images are your top priority—to e-mail or post on the Web, for example—the PetiScan's design and robust editing software make it a better bet.

—Richard Jantz

Attaché Personal Imaging Device

PRO: Light; high-quality scans; handles 8 by 11 documents in one pass.

CON: Needs PC with PC Card slot, can't scan books or magazines.

VALUE: Versatile and portable for those who want to scan on the road.

Street price: $149

Antec

888/542-6832

www.antec-inc.com

PRODUCT INFO NO. 632

PetiScan

PRO: Easy to use, good scanning and editing software, USB device works with Macs and PCs.

CON: Limited to 4-by-6-inch scanning per pass.

VALUE: Good for travelers who need to scan with various systems.

Street price: $149

NEC Technologies

800/632-4636

www.nectech.com/petiscan

PRODUCT INFO NO. 633

QUICK TAKES

Get in Touch With Your Mouse

YOU'LL GET PLENTY of touchy-feely with Logitech's new $99 **WingMan Force Feedback Mouse.** Using Immersion's funky Feelit technology, this rodent gives you added sensation as you scroll around. When your cursor moves over folders or hyperlinks, for example, you feel virtual "bumps"—a strange type of magnetic pull. The effects are meant to enliven games: When we tested a shipping unit, the mouse-whoa-gyrated almost uncontrollably in an explosion scene (we kid you not!). Three games are bundled, including Railroad Tycoon II Gold and Heavy Gear II. However, the mouse requires a bundled pad that limits range of motion, and our PC World Test Center experts say it's hard to stay ahead in a game with such frenetic mouse action. WingMan's main appeal is novelty. Logitech; 800/231-7717; www.logitech.com.

PRODUCT INFO NO. 636

—Aoife McEvoy

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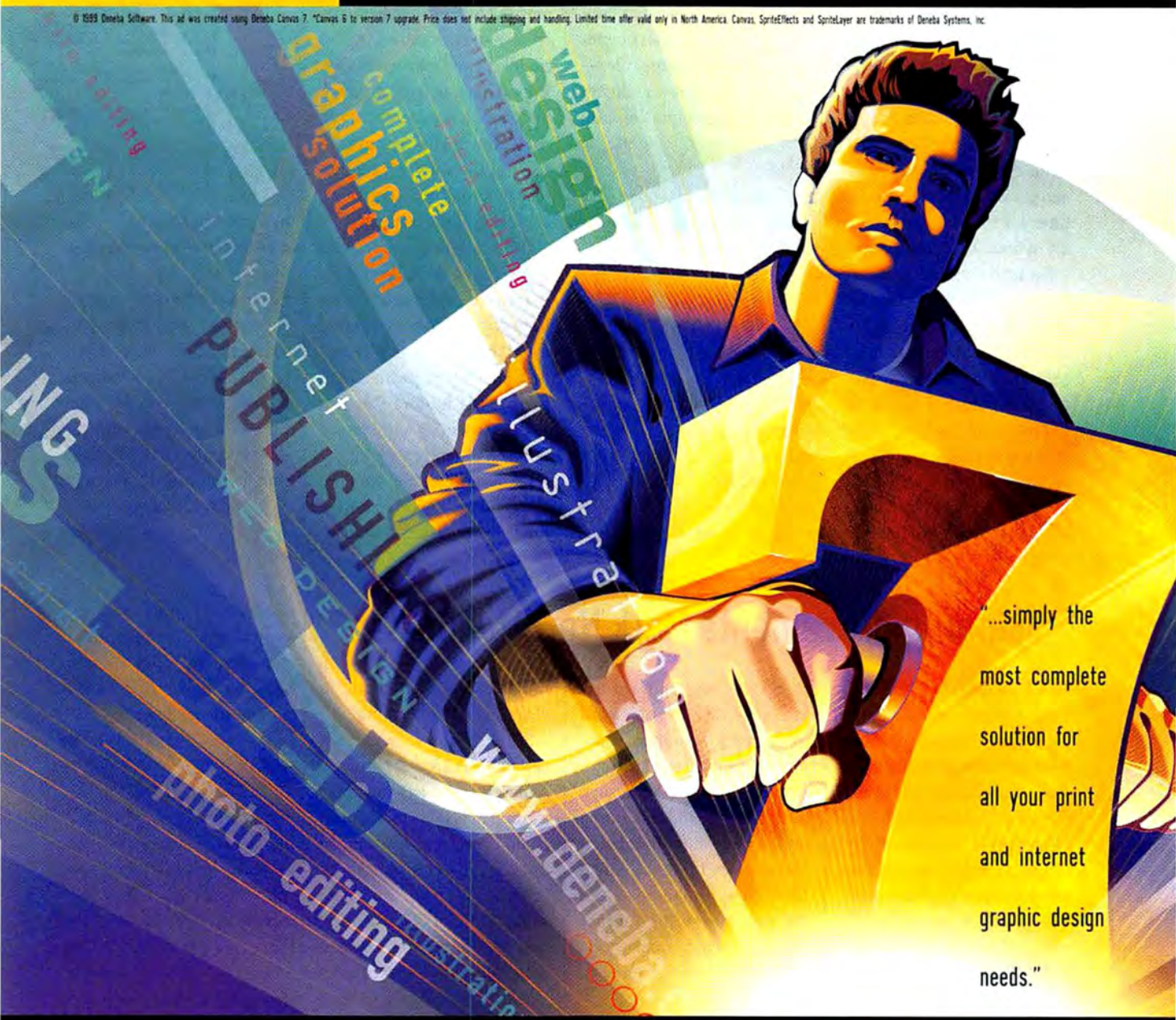

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Because I wasn't connected to the Net when I first started using the program, there was no ad data to download; the software mistakenly concluded I was covering up the ad. Every 60 seconds it would urge me to uncover this Madison Avenue treasure. But simply restarting the interface allowed it to suck the ad data off the Web and position it properly. Be warned that you'll run into this behavior if you try to hide the ad in any way.

There's more to the new release than the pricing bundles. Eudora 4.3 offers better filtering and message rules—for example, a new ability to print upon receipt. You also get an improved importing utility that, in just three clicks, grabs mail, account settings, and address books from Netscape Communicator and Microsoft Outlook. Unfortunately, my beta crashed in the middle of an Outlook mailbox import, though it did preserve all the data transferred up to that point. This should be fixed in the shipping version (out at the end of first quarter), according to the company.

Other new features include color-coded message labels that can be automatically attached, and automatic support for UUencoding and decoding. That's along with all the features of Eudora Pro 4.2, such as its ability to multitask between different accounts.

Frankly, I'd rather drop the cash and pick up the ad-free, full-feature version of Eudora. For those who don't want to pay the $50, Eudora's "sponsored mode" (with ad), might be worthwhile. And it should be very attractive to the many Eudora Lite users who can now upgrade to the full version in exchange for just a bit of screen real estate.

—Oliver Rist

Eudora Email 4.3

PRO: One of the most mature and stable e-mail platforms available; fast; full-featured.

CON: Beta crashed during import from Outlook.

VALUE: Excellent at its $50 list price and outstanding as a freebie if you don't mind the advertising.

List price: $50 for paid mode; free for sponsored mode

Qualcomm

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PRODUCT INFO NO. 634

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Minor Improvements Mark New Maximizer

CONTACT MANAGER

THE LATEST upgrade to the Maximizer contact manager, **Maximizer Enterprise 2000,** provides some cosmetic improvements but doesn't earn its "Enterprise" moniker. The shipping multiuser version lets you share files and calendar info fairly easily (no network administrator needed), but that's the extent of its enterprise features. However, if your sales and marketing workgroup lacks a contact manager, or if you're a novice, ME2000 should be satisfactory.

You'll find a few new features, such as the Suspended status in the Opportunity Manager. ME2000's word processor now supports automatic signatures, and can merge user information such as name and address into a mail-merge document you create to send faxes or e-mail to contacts, for example. And the new Marketing Library serves as a central storage location for common documents, such as parts lists.

Otherwise, ME2000 retains many features from previous versions. The History tab shows who changed what and the original and new values, creating a true audit trail. And it's easy to sort data and to chart just about anything.

Still, the app suffers from several weak spots. ME2000's Action Planner lets you apply a group of actions to a contact (send brochure today and so on), but it's confusing and cries out for a wizard. Also, some of ME2000's customization options are too sophisticated: One new wizard uses Visual Basic source code—decidedly not an end-user tool.

If you have heavy-duty contact management needs for sales and marketing, go with a product like Goldmine. Users in small workgroups will appreciate ME2000's range of customizable features. But if you have an older version, save your money and wait for a more robust upgrade.

—Joel T. Patz ▶

Maximizer Enterprise 2000

PRO: Easy to learn and to create charts, unlimited user-defined fields.

CON: Extensive customization requires a programmer, lack of wizards makes some functions difficult.

VALUE: Will best benefit small sales and marketing workgroups.

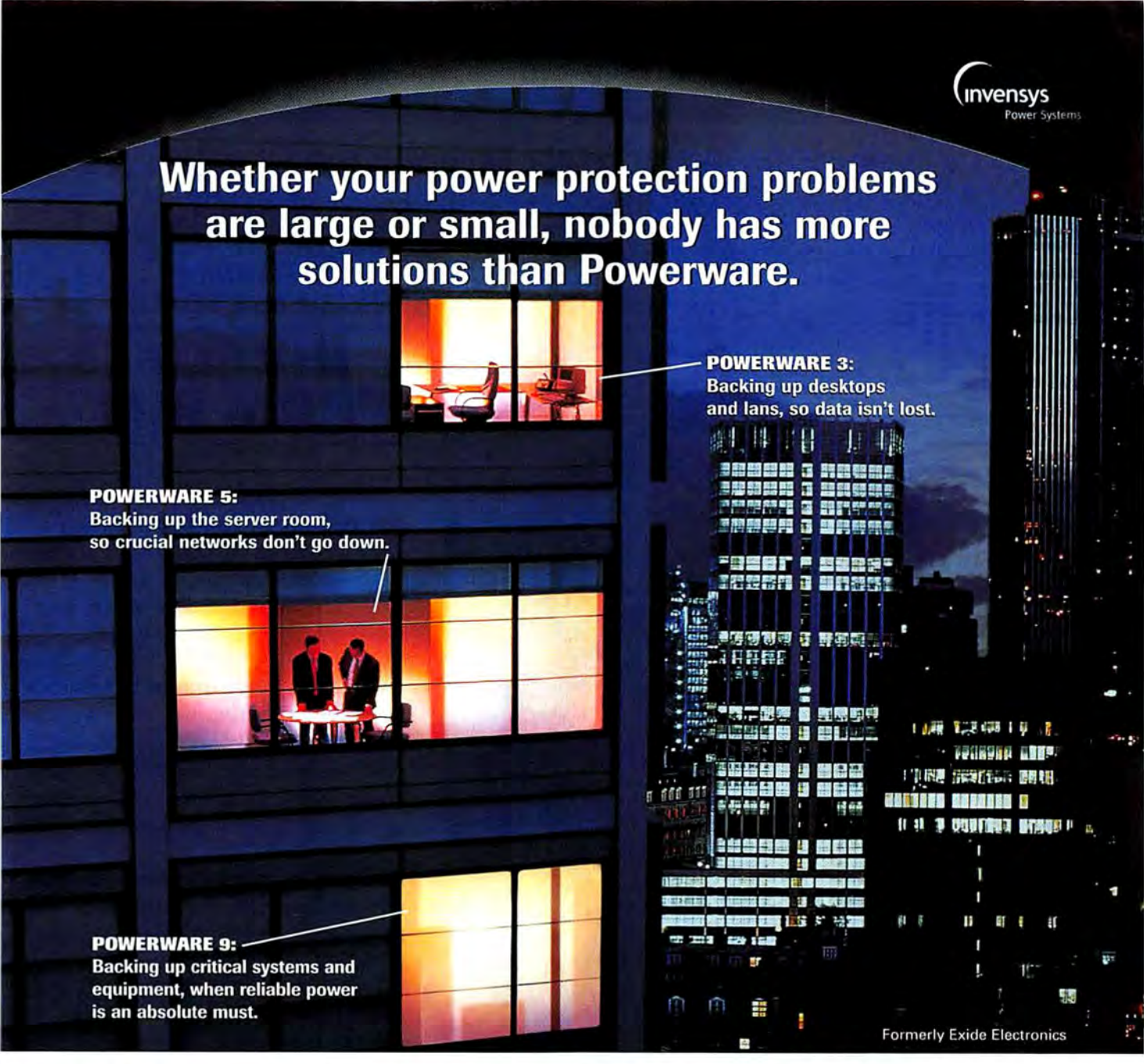
List price: $369 per user (upgrade, $199 per user)

Multiactive Software

800/804-6299

www.maximizerenterprise.com

PRODUCT INFO NO. 635



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Pay Bills Online: Pricey but Convenient

BILL PAYMENT

PAYING BILLS ranks right up there with checking the oil and taking out the garbage as one of life's more tedious chores. Several new Web-based services promise to make the job more savory by allowing you to pay all your bills online with the click of a button. For this review, three *PC World* editors signed up (one each) for three high-profile services—**PayMyBills.com, Paytrust.com,** and **StatusFactory.com**—to see whether they work, how they work, and (at a cost of over $100 a year) whether they're worth the money.

Here's the process: You sign up for the service over the Net. Next, by fax or snail mail, you submit a voided check to arrange electronic payment with your bank (the process is called direct debit). Then you give the service's address to your billers, who redirect their invoices—paper or electronic—to a processing center. (PayTrust can contact your billers for you if you prefer.) The processing center scans the paper bills (which most still are) and converts them into electronic documents that you can view through your browser. Next, the service notifies you by e-mail that you've got a bill; you log on to see it (typically in .pdf format) and set up payment. (PayTrust's bills always appear in Web-based .gif format, which makes them quicker to load and easier to navigate.) If your biller does not accept direct debit, all the services will cut and mail a laser-printed check.

The benefits of online bill-paying are many. It's quicker than the traditional open-the-envelope-and-lick-the-stamp method, and it stems the annoying and ecologically incorrect monthly flood of bills. It's secure: Your billing information is password-protected, all transactions are encoded, and your data is stored on a secure server. It's also appealing to have all your bills in one place. Finally, for those who travel a lot, it's handy to receive and pay bills on the road from any Web-connected PC, rather than returning home to find overdue notices.

For the most part, we found the sites easy to set up, simple to use, and fairly flexible. All of them let you pay a bill automatically for the full amount (or for an amount that you specify) or manually on any date you choose. All three can make regular payments to creditors (such as mortgage lenders) from whom you don't receive a monthly bill. Finally, you can export your transaction history into personal finance software by using the Quicken .qif or standard .csv file formats, or to Excel.

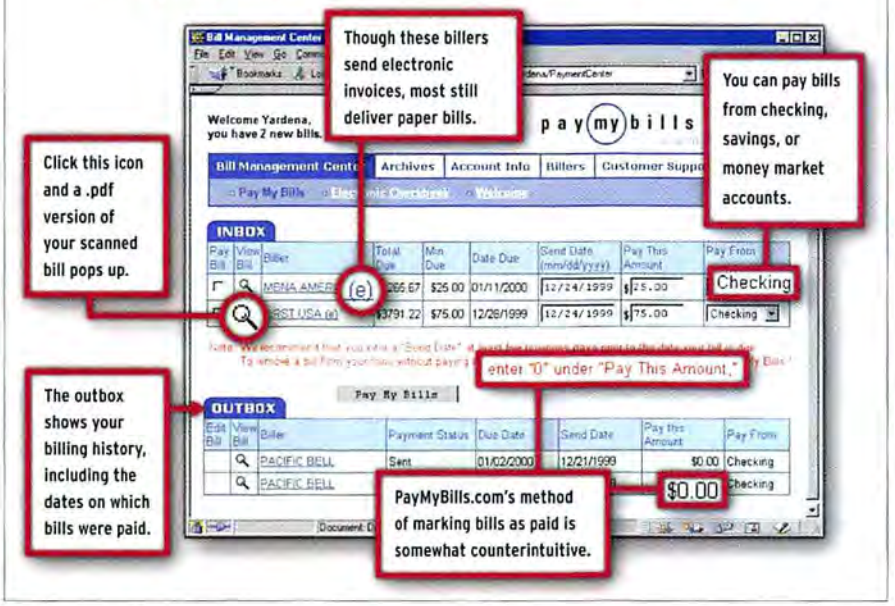
All three services include handy safeguards, too. If you don't have enough cash in your account to cover a bill, both PayMyBills.com and StatusFactory.com notify you and ask for a deposit. (PayTrust lets you set up any future payment—including one that could overdraw your account and bounce a check.) If they lose a bill or are late, all three services pay late fees and contact creditors. (In fact, StatusFactory guarantees to pay you $1000 if it makes a mistake.) ▶

SPOTLIGHT

ONLINE BILL PAYMENT provides relief from the tedium of opening envelopes. The services allow you to:

- Pay bills from any Web-connected PC.
- View all bills on one page.
- Schedule automatic payments, including unbilled ones.
- Download to financial planning software or Excel.

Paying Bills With One Click: How It Works



PAYMYBILLS.COM'S handsome site presents new bills in its easy-to-understand interface. The only catch: Other sites let you use one simple button to mark a bill as paid, but PayMyBills.com doesn't.

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Even though these sites are uncomplicated, some hassles developed. Two of us had trouble with a few bills on our services, though responsive customer service reps resolved the problems efficiently. We also found it hard to remember each service's billing address and zip code (which *must* be used) when shopping online or by phone. PayMyBills.com helps by sending a wallet-size card; still, the discrepancy between home and billing addresses caused one credit-card company to reject payments. Finally, the new billing address includes an account number, which some e-commerce sites can't accommodate in their address fields.

A CLOSE RACE

OVERALL, we found PayMyBills.com the best, by a hair. Its site is appealingly simple and its setup the easiest of the three; even so, the company is experiencing growing pains, as evidenced by the problems we encountered with a few bills. Regardless of the service you choose, online bill-paying isn't for everyone. If you're truly inundated with invoices and you often travel, it makes sense. But if you receive only a handful of monthly bills—or if you've already automated bill payment via personal finance software and direct debit—the cost is too high.

There are alternatives to these three sites. The biggest name is Checkfree, more of a liaison between your billers and your bank than a personal bill-paying service (for example, it doesn't scan paper bills). Yahoo's service is based on Checkfree, while AOL's relies on Quicken. The banks have formed a consortium called Spectrum to smooth the routing of bills between banks and customers. (For more information about online banking, see "Put Your Money Where Your Mouse Is" on page 191.)

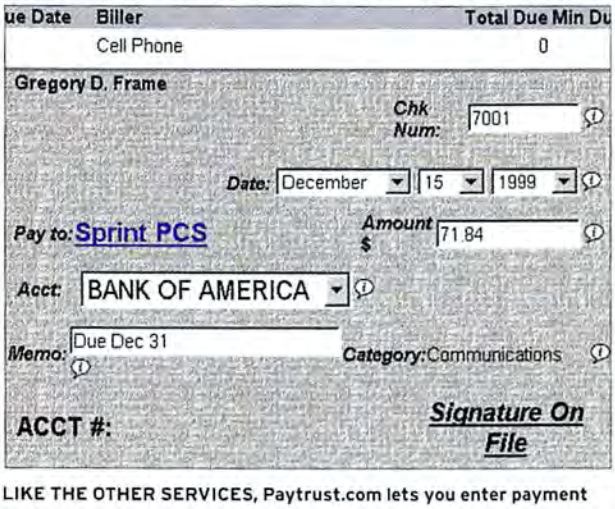
SETUP STAR

PAYMYBILLS.COM has much to recommend it: a slick and handsome site, ultra-easy setup, great customer service, and good—if not perfect—execution. It costs $9 a month for up to 25 bills (and 50 cents per bill thereafter).

The setup is especially helpful. You can start using the service right away by giving billers your new address over the phone and sending a voided check to the service, or you can wait a few days for a startup kit to arrive in the mail. The kit's most helpful items include a sheet of labels with your name, your PayMyBills.com account number, and your billing address to stick onto stubs of current bills as you pay them. (Some billers ignore the stickers, however.) A second bonus: PayMyBills.com has a huge database of billers' addresses, so instead of doing the paperwork for each one, you can simply search on the name (say, AT&T) at the site, choose the address that matches your bill, and enter your account number.

In addition to receiving automatic e-mail notification when new bills are received, you can set up a reminder to jog your memory at a desired number of days before the bill's due date. You can view your bills for a year, as with the other services, and the company shreds your paper bills within 6 months. PayMyBills.com archives its .pdf files for seven years. The company hasn't yet put a limit on how long the bills stay online before the company archives them in a database; but after that time, you'll be able to retrieve individual bills for about $4. The site also allows you to create charts and graphs that highlight your spending patterns—a unique feature.

STATUSFACTORY.COM shows you at a glance whether your bills are paid or unpaid, and lets you mark bills as paid with one click.



LIKE THE OTHER SERVICES, Paytrust.com lets you enter payment amounts and dates manually, though you may risk bouncing checks.

LOOKS AND CATCHES

WE LIKED PayMyBills.com's design best. It's not overly fussy, so it downloads quickly and is easy to navigate. The in-box (bills awaiting instruction) and out-box (scheduled payments) are easy to use.

The site does have couple of irritants. To manually mark a bill as paid, you must first type in "$0.00" as the payment amount—not exactly intuitive. In addition, one bill apparently sat around for several days after PayMyBills.com received it, and showed up only a week before it was due. But other bills arrived in a more timely manner, and a complaint to tech support prompted a profuse apology and an offer of six months of free service.

CHECK THIS OUT

PAYTRUST.COM COSTS the same as PayMyBills.com, for the same number of bills. (A Small Business Edition costs $20 per month, plus 75 cents per transaction, and includes a dedicated account manager.) The service lets you access bills (in Web-native .gif format) online for one year. It holds your paper bills for three months before shredding them, and it will archive them offline forever. To access offline bills, you can pay $4 per paper copy or order a yearly CD-ROM for $10.

Paytrust's interface is not fancy; but when it comes to tracking bills, its simplicity is welcome. You can choose text-only mode if you're on a slower dial-up connection, but even the Rich Graphics mode shouldn't slow you down.

Getting started is fairly easy. First, you mail or fax a canceled check to Paytrust. If you use the fax option, you'll be ready to go in 24 hours or less. Next, you must log in to the site and enter your billers' information, a process that can be a little clunky. (The other services enter the info for you when the bills arrive.) Like PayMyBills.com, Paytrust offers default addresses for some large billers, but its suggested addresses didn't always match the bills we saw.

Much like PayMyBills.com, the service displays your bills logically with an in-box/out-box setup. The reports mode provides access to all your billing information—including the dates and times when any actions (such as sent payments) were taken. And it provides more detail than the other services.

Unlike the other services, Paytrust also lets you directly access the online banking programs of its ten supported banks, which include the biggest institutions. (PayMyBills.com expects to add this feature in 2000.) Another unique feature, Paytrust's SmartBalance, will automatically combine bill payment information with your bank balance data, allowing you to check your account balance on an ongoing basis. If you can't use this feature, you'll have to be extra diligent about entering Paytrust payments in your regular checkbook, or risk major imbalances. (It would also be helpful if SmartBalance could alert you when your account balance is insufficient to cover a scheduled or received bill. Instead, the company lets you schedule any payment, even if it might overdraw your account.)

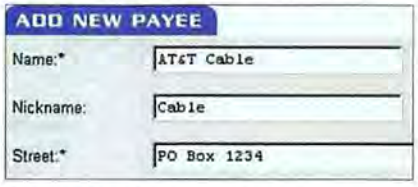
If you travel a lot or are inundated with invoices, online bill-paying services could be the answer to your problems.

PERKY PAYMENTS

STATUSFACTORY.COM—run by CyberBills—offers a typical set of services on a bright, perky site. To its credit, the service also comes in a Lite version of five bills for $4 per month; other versions are Standard ($9 a month for 30 bills), Premier ($30 a month and unlimited bills), and Business ($15 a month for 20 bills, plus a two-year archive). But it's not as easy to set up or use as the other sites.

StatusFactory.com sent no kit when we signed up. You must remember to fax a voided check and write down your new billing address. In our case, the site accidentally set up two dummy checking accounts, which resulted in two late bills. (Again, customer service responded quickly.) Unless you give StatusFactory.com permission, you must call and change your billing addresses yourself. And the company's archiving is pricey: It shreds your paper bills at once and archives the .pdf version for up to two years; after that, you must pay $50 for each year's CD-ROM.

In addition, the StatusFactory.com site is somewhat confusing. For example, it includes a Quick Summary page where you can view, schedule, edit, or cancel payments. But it also has a Scheduled Payments page where you can—well—view and edit all your existing scheduled payments. The pages look different, but the functions could be combined. Also, the site offers no help files or instructions—you must contact customer service for every question (the FAQs are useless). Finally, it's hard to navigate.



EACH SERVICE, including PayMyBills.com (above), lets you set up payees without bills.

We appreciated StatusFactory.com's alerting us to a late invoice (calculating from the date of the previous month's bill). It also offers ten guarantees. Our favorite one: "Your name and/or personal information will never be sold... or you will receive $5,000 and...[an] anonymous donation to the consumer advocacy group of your choice!"

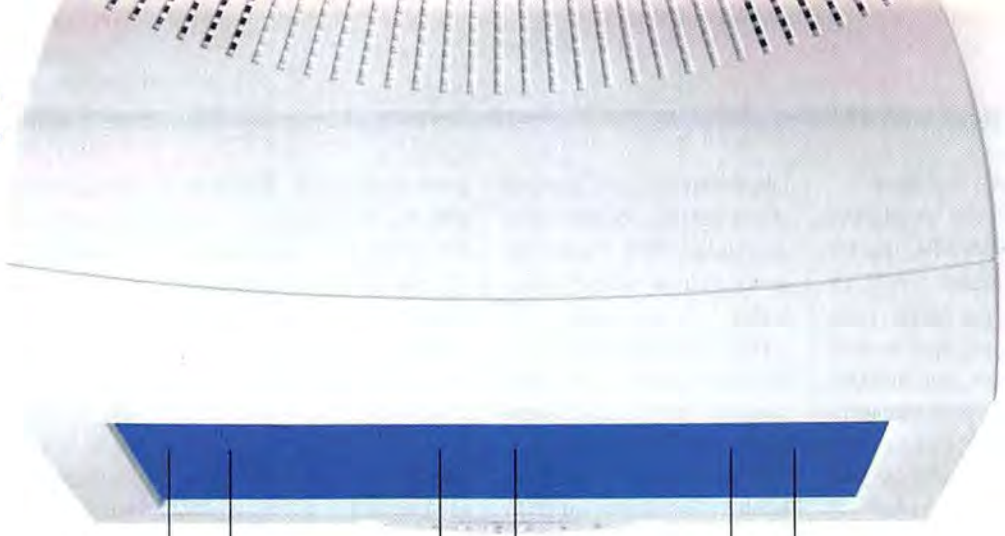
—Yardena Arar, Gregory Frame, and Karen Silver ■

PayMyBills.com and Paytrust.com Vie for Best Bill-Payment Service

SERVICE	Cost per month/ number of bills	Setup	Interface	Comments	Product info number
PayMyBills.com 626/229-3100 www.paymybills.com	$9/25	Very simple, includes a handy kit	Slick and handsome	The easiest of the bunch to set up, this good-looking site made paying bills simple.	682
Paytrust.com 877/729-8787 www.paytrust.com	$9/25	Mostly easy, with some clunky parts	Clean and quick-loading	A close second, this well-designed site isn't as simple to set up, and it has some awkward features.	683
StatusFactory.com 408/844-0340 www.statusfactory.com	$9/30[1]	More confusing than others	Perky but somewhat unintuitive	The Lite version is great, but setting up the service could be easier. And we found the design a little confusing.	684

[1] A Lite version is available at a cost of $4 per month for five bills.

NEC



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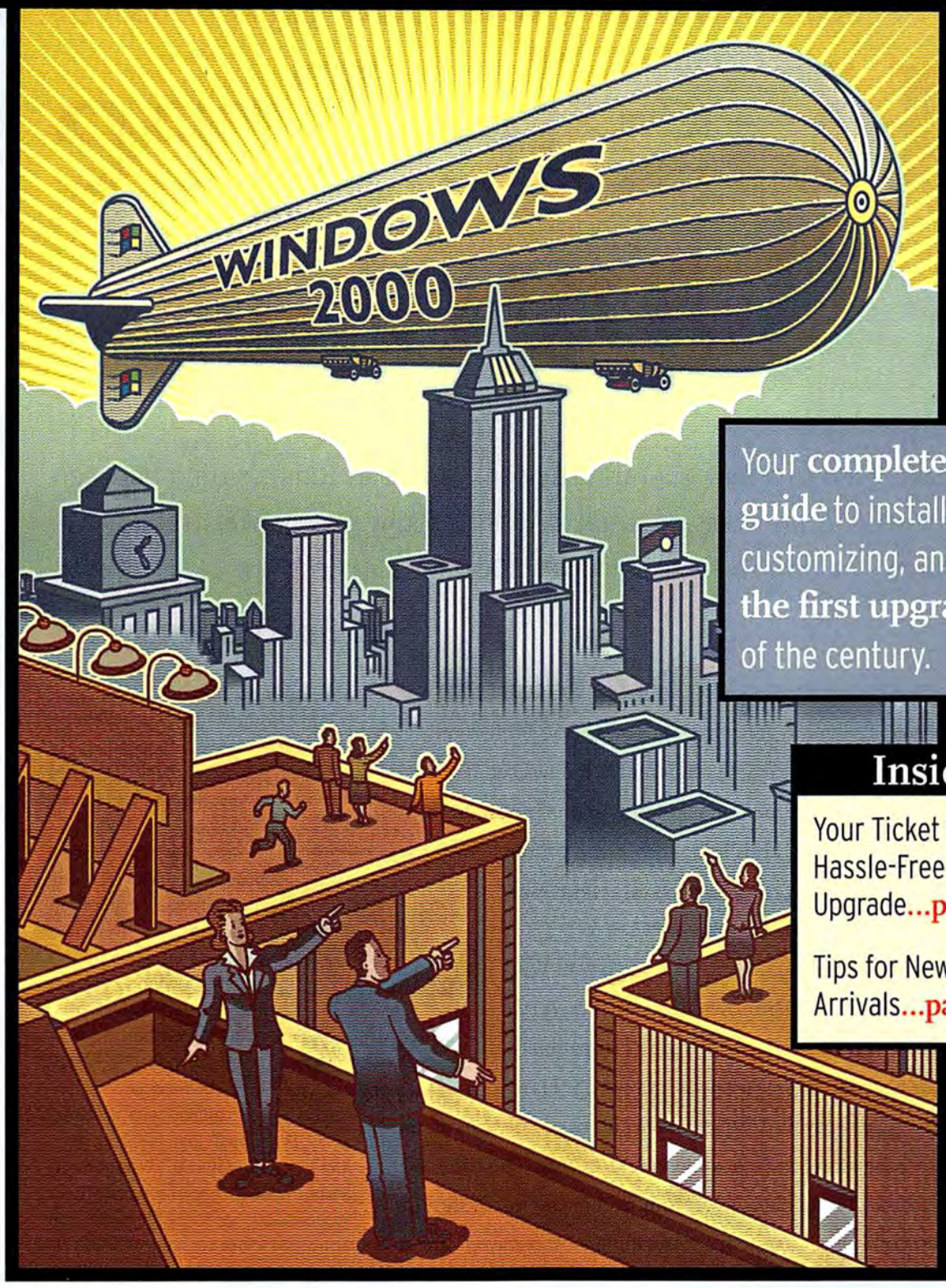
DESTINATION WINDOWS 2000



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Tips for New Arrivals...page 122

ILLUSTRATIONS BY PETER HOEY

WINDOWS 2000

Your Ticket to a Hassle-Free Upgrade

Switching to a new operating system can be as fun as sitting between two sumo wrestlers on a trans-Atlantic flight. But our test results will show you how to install Windows 2000 for a smooth and pleasant ride.

By Scott Spanbauer

WHETHER YOU CONSIDER MICROSOFT FRIEND or foe, it's hard to deny that Windows 2000 Professional is the most stable, capable version of Windows yet. If you've come up against the flaws and limitations in Windows 95 or 98—and you aren't about to jump on the Linux bandwagon—you probably want Windows 2000 on your business PC.

But wait a minute. Sure, compared with Windows NT 4.0, Windows 2000 offers vastly improved hardware and software compatibility, but it's still not as easy as Windows 98. Hasty upgraders may find themselves muttering expletives when key programs, devices, and data go AWOL. The trick to a successful upgrade is to do your homework in advance by researching your system's compatibility. And leave yourself an escape route back to Windows 9*x* or NT, in case the Windows 2000 honeymoon turns prematurely sour.

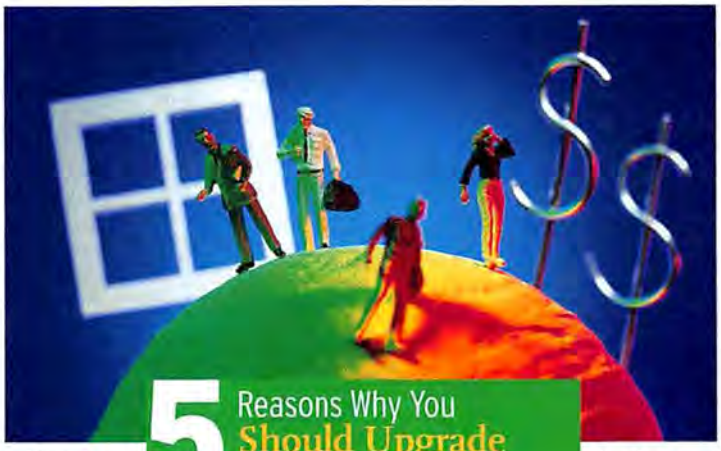
To help you avoid trouble, we tested late beta versions (Release Candidates 2 and 3) of Windows 2000 Professional—and late in our testing process we received the final software version from Microsoft. We attempted upgrades on 24 computer systems (ranging from a Pentium-133–based machine to Pentium III-550–based units), and we tested 29 peripherals and 16 applications for compatibility with Windows 2000. We started upgrades from Windows 95, Windows 98, Windows 98 Second Edition, and Windows NT. In some cases, we installed Windows 2000 over older versions of Win- ▶

ILLUSTRATIONS BY PETER HOEY

UPGRADE
TICKETS
WINDOWS
2000

dows, and in other cases, alongside them.

The results revealed a brutal truth: Depending on your hardware and applications, a Windows 2000 upgrade can be either a breeze or a nightmare. For the smoothest upgrade possible, read our suggestions below before you even buy the software.



5 Reasons Why You Should Upgrade to Windows 2000

- You're suffering too many crashes, seize-ups, and unexplained conflicts under the Windows 9x OSs.
- You want better log-in and file-access security than Windows 9x offers.
- nYou're a long-suffering user of Windows NT 4.0 on a laptop.
- You use NT 4.0 or Windows 95 on a desktop computer with DVD, USB, or other devices that those operating systems support poorly or not at all.
- You have a business machine running the earliest version of Windows 95 (without USB support or FAT32). You're thinking about upgrading to Windows 98, but you want more features.

5 Reasons Why You Shouldn't Upgrade to Windows 2000

- $219 is more than you want to pay for incremental improvements over Windows 95 or 98. (NT 4.0 users get more bang for their $149 upgrade.)
- Your PC doesn't have at least 64MB of RAM and a fast Pentium processor.
- Key applications or hardware devices on your current system aren't supported under Windows 2000.
- You're satisfied with the Windows 9x stability and security, and you use your PC primarily for games and other home-oriented activities. In this case, you're probably better off waiting for the Millennium version.
- Your PC manufacturer does not provide Windows 2000 BIOS upgrades.

2K OR NOT 2K?

A FURTHER WORD of caution: If you have a fairly stable, usable Windows 9*x* system, consider sticking with it. Not only will you save the upgrade cost, you'll be assured of maximum compatibility with the latest—and the most ancient—hardware and software. In any case, Microsoft says that Windows 2000 is best suited for business users, not home users. The company plans to offer home users a Windows 98 upgrade—currently code-named Millennium—later this year (see *Top of the News*, page 56). Millennium promises Windows 98's near-universal hardware and software compatibility, easy upgrades from current Windows versions, and better support for digital media gizmos.

Nevertheless, some Windows 2000 business users may want to take the industrial-strength OS home with them. And why not? Many Windows 2000 features—like iron-clad multiuser log-on security and rock-solid stability—are perfect for home offices, and they may not be part of Millennium.

If you currently use Windows NT 4.0, the upgrade is pretty much a no-brainer. As its direct descendant, Windows 2000 offers all of NT's benefits while removing many of its most glaring limitations. Win 2000 adds support for Universal Serial Bus, PC Cards, the Accelerated Graphics Port bus, and DVD devices. And it grafts the Windows 98 Plug-and-Play prowess onto the NT operating system, automatically detecting and installing devices.

Overall, Windows 2000 was also slightly faster than Windows 98 and NT 4.0 on both our 64MB and 128MB test systems (see *Top of the News*). And laptop users should be wowed by Windows 2000's power management support for Advanced Configuration and Power Interface, or ACPI. (See "Laptop Alert: Is Windows 2000 the Ultimate Road Show?" on page 112.)

Unlike compatible-to-a-fault Windows 98, though, Windows 2000 doesn't bend the rules or look the other way for misbehaving applications or devices (such as applications that access the hardware directly). There is some good news: The result is a more stable operating system. But unfortunately, many applications that somehow muddled through in the less restrictive Windows 98 will fail in Windows 2000.

GET YOUR PC READY

IF YOU DECIDE TO UPGRADE, first make sure your PC meets the basic requirements of Windows 2000 Professional. Like Windows 9*x* and NT 4.0, Windows 2000 craves RAM. But the new OS is somewhat hungrier than its forebears—32MB is the bare minimum, but Microsoft recommends 64MB. And indeed, we found that 64MB of RAM is enough for most daily computing tasks (128MB provides only a slight boost).

Processor requirements are less stringent—Microsoft's recommended minimum CPU is a Pentium-133. We upgraded a Pentium-133 PC with 32MB of RAM from Windows 95 to Windows 2000. The new OS installed without problems, but its speed was just adequate. We were happier with a Pentium-166 machine that had 64MB of RAM, and happier still with machines built around quicker CPUs (no surprise there).

You need a minimum 650MB of free disk space to install Windows 2000 Professional, though some systems may require as much as 1GB for the installation process. Windows 2000's final footprint on your hard disk is around 500MB—about twice that of Windows 98—so consider a drive upgrade if disk space is already tight.

PHOTOGRAPH: ROB CARDIN

CHECK THE COMPATIBILITY LIST

NEXT, PAY A VISIT TO Microsoft's Windows 2000 Product Compatibility Web site (www.microsoft.com/windows/professional/deploy/compatible/default.asp). In addition to hardware and software compatibility information, the site offers a list of specific PC models known to work with Windows 2000—now 276 pages of them. If your system's there, you're less likely to run into problems. If it's not, don't fret just yet—Windows 2000 may still upgrade without a hitch.

You may have a system that Microsoft deems Windows 2000-compatible, but what about the peripherals you've tacked onto it? Take an inventory of your PC's add-ins (CD-R/RW drives, removable-media drives, modems, sound cards, and so on). And check the external peripherals you have attached (printers, scanners, external drives, and such). Though Windows 2000 supports many more devices than NT 4.0, it still lags behind Windows 9x. Of all the devices we tested, we had particular problems with scanners and certain USB digital cameras (see "The Upgrade Aftermath," page 112).

To avoid a nasty post-install surprise, look for your hardware devices on Microsoft's Hardware Compatibility List at www.microsoft.com/hcl/default.asp. You can also search for hardware issues at the Windows 2000 Product Compatibility site above. An older version of the list is on the Windows 2000 installation CD-ROM in \support\hcl.txt.

If your device isn't on the list, either it has been tested and doesn't work, or it hasn't been tested. For the final word, check with the product's manufacturer. At press time, many vendors were still struggling to complete Windows 2000 drivers in time for the operating system's launch.

Generally, if there is an NT 4.0 driver available for the device, you will be able to install it under Windows 2000. (However, you may get a warning that the driver isn't certified for use with Windows 2000.) Proceed carefully—if a driver does not work, you may need to start Windows 2000 in safe mode (by pressing F5 during the boot-up process) in order to remove the offending driver.

UPDATE YOUR BIOS

YOU ALSO NEED to determine whether your computer's BIOS provides sufficiently compatible ACPI support for Windows 2000. (BIOS is the low-level program that controls how the system's processor, memory, and other basic components communicate with each other and with the operating system.

When you install Windows 2000, the setup program checks to see whether your BIOS is on the "good" list for ACPI compliance or, instead, on the list of known noncompliant BIOSs. Depending on ▶

Tales From the Upgrade Road

Beta Tester: David Berry, Planning specialist, State of Connecticut Office of Planning and Management, Hartford, Connecticut
System Profile: Pentium II-400 processor with 128MB of RAM, two 10GB hard drives
Type of Upgrade: Dual-boot installation with Windows 98

I installed Windows 2000 for a number of reasons: To see what was new, to find out how compatible it was with my PC and software, and to evaluate whether the upgrade was worthwhile. Was it? I'm still deciding.

I encountered no problems during several test installations. Afterward, however, I discovered that my system's U.S. Robotics Winmodem would not work—it was not on Microsoft's hardware compatibility list. Windows 2000 (Release Candidate 2) had installed a generic driver that didn't work, but I was able to track down a different generic driver that did.

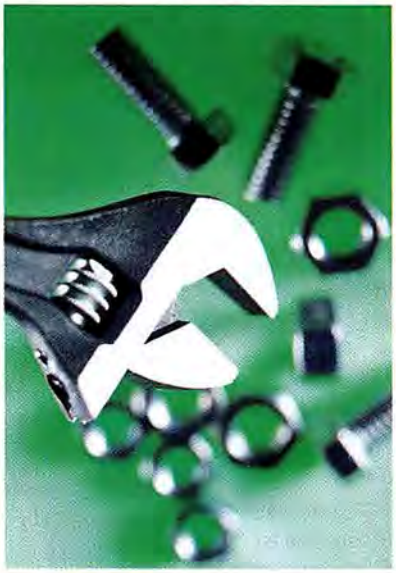
I find Windows 2000 to be more stable than Windows 98 and NT. I like the fact that it requires fewer reboots than Windows 98 or NT did when adding software and making hardware changes. Another plus is that Microsoft consolidated administrative and maintenance functions in the Control Panel for easier access.

Even though Windows 2000 looks a lot like Windows 98, it's geared toward business applications—and it's not cheap. So I wouldn't recommend it to home users. And if your PC is running fine, I wouldn't get Windows 2000 right away. Let hardware and software manufacturers catch up first. They need to find out what problems and successes people are having.

PHOTOGRAPH: AMY ETRA

the results, Windows 2000's setup program either installs an ACPI-enabled version of Windows 2000 or a version of the OS that supports the older APM (Advanced Power Management) specification. ACPI goes beyond APM, providing better power management, more versatile and reliable suspend features, and other benefits for notebook users. (See the sidebar, "Laptop Alert: Is Windows 2000 the Ultimate Road Show?" page 112.)

In some cases, having an ACPI-compliant BIOS may be the only way to get Windows 2000 installed on a given computer. If your BIOS appears on neither the good nor the bad lists furnished by Microsoft, Windows 2000 will make an educated guess about compatibility based on the date of the BIOS. If it is not fully ACPI-compliant, you may never make it through installation. That was the case with a Compaq Presario 5700 we tested—it crashed repeatedly when we tried to install Windows 2000.



The Nuts and Bolts of Switching to Windows 2000

By Stan Miastkowski

The Top Down

Cost

Upgrade from Windows 95/98: $219

Upgrade from Windows NT: $149

Time Required

60–90 minutes

Minimum Requirements

Pentium-133 or above running Windows 95, 98, or NT; 32MB of RAM (64MB recommended); 2GB hard drive (with at least 650MB free space); CD-ROM drive

Expertise level

Beginner-intermediate

Microsoft Web page

www.microsoft.com/windows/professional

Despite the complexity of Windows 2000 Professional, the upgrade process is surprisingly easy and largely automatic. A full upgrade, in which Windows 2000 overwrites your old operating system, is easiest—though a clean install of the OS alongside Windows 95, Windows 98, or Windows NT is only slightly more complex.

Simplicity aside, you'll still need to do some homework before popping the Windows 2000 CD-ROM into your PC. (See our tips beginning on page 102 for details on hardware and software compatibility issues, as well as other preparatory steps.)

1 Do a Complete System Backup. You are about to make *major* changes on your PC. So be sure that you have a means of going back if things go wrong during the installation (such as a power failure) or after Windows 2000 is installed (such as serious compatibility problems). In addition, you may lose all the files in your Recycle Bin, so be sure there's nothing in it that you really want. We used PowerQuest's Drive Image utility to back up and restore existing Windows 98 and Windows NT 4.0 installations. It's a good idea to also have a recent Windows Startup floppy that includes a CD-ROM driver.

Note: Restoring an old operating system is even easier if you segregate your personal documents (word processing files, spreadsheets, and the like) on a separate hard drive partition. That way, you can delete, reformat, and restore other partitions without affecting your personal files. You may also want to install applications to a separate partition.

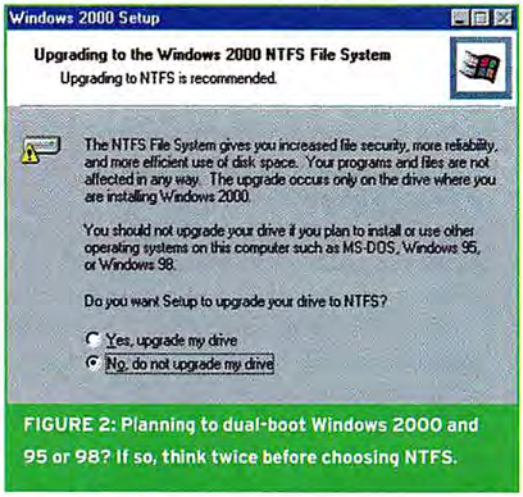


FIGURE 2: Planning to dual-boot Windows 2000 and 95 or 98? If so, think twice before choosing NTFS.

FIGURE 1: You can install Windows 2000 either over your current version of Windows or alongside it.

2 Choose Upgrade or Clean Install. With your current version of Windows up and running on your computer, insert the Windows 2000 upgrade CD into your CD-ROM drive; the Windows 2000 Setup Wizard should start automatically. Once the install begins, the crucial first step is to specify whether you want to upgrade your existing version of Windows or do a

PHOTOGRAPH: ROB CARDIN

One way to avoid problems and ensure that Windows 2000 uses ACPI is to download and install the latest BIOS update from the manufacturer's Web site before upgrading Windows. Microsoft's Windows 2000 BIOS update site, at www.hardwareupdate.com, helps you search for the appropriate update.

INSPECT YOUR SOFTWARE

YOU ALSO NEED to check on the readiness of your software applications. (Here's a quick hint: If you have applications that you no longer use, uninstall them. That will simplify the upgrade process.) The Windows 2000 software compatibility list contains thousands of entries, but will your vital applications be on it? Go to the Windows 2000 Product Compatibility site at www.microsoft.com/windows/professional/deploy/compatible/default.asp and click on the Software link. You can then search for an application by name, manufacturer, or type. We had pretty good luck with software—most ▶

"clean" install **(see FIGURE 1).** See page 106 for help on determining which upgrade route makes the most sense for you.

3 Install Upgrade Packs (if Any). If you are currently running NT 4.0, make sure you get Service Pack 4 or later (and back up) before you install Windows 2000. Whatever type of installation you're performing, Windows 2000 scans all of your local hard disks for NT File System partitions and upgrades them to NTFS5.

That Service Pack is essential if you want to dual-boot between NT and Windows 2000 because the original versions of Windows NT 4.0 can't read NTFS5 partitions, meaning your existing NT installation could be trashed. (Microsoft says that Windows 2000 will warn you before the conversion, but I received no such warning during multiple upgrades using the Windows 2000 Release Candidate 3.) Windows NT 4.0 Service Pack 4 and later (SP6 is the newest) let NT 4.0 read NTFS5 partitions, allowing you to dual-boot between both OSs. Just be sure to install the service pack *before* you install Windows 2000 if you ever want to boot that NT 4.0 partition again.

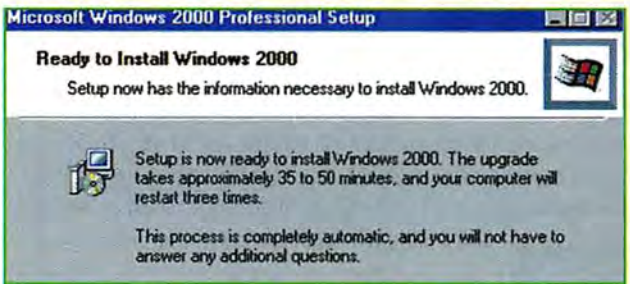


FIGURE 3: Once you reach this point, the rest of the installation process is automatic. Not a bad time for a coffee break.

4 Decide On NTFS. The NT File System in Windows 2000 Professional has a number of advantages over the old File Allocation Table (FAT) system used by Windows 9*x*. NTFS offers much more efficient use of disk space than FAT, and better security. If you're upgrading over your old OS or doing a clean install next to NT, NTFS is a wise choice. But if you're doing a clean install and plan to dual-boot between Windows 2000 and Windows 9*x*, you can only use NTFS on a separate drive partition, which Windows 9*x* won't recognize **(see FIGURE 2).**

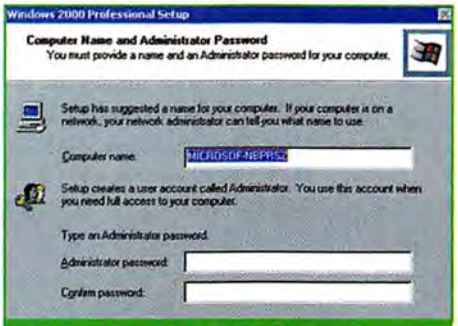


FIGURE 4: A clean install involves a bit more work than upgrading an old version of Windows.

5 Check on the Upgrade Report. Next, Windows 2000 Professional will run an analysis of the PC's configuration and prepare a report that you can save or print. If you followed our first steps, you shouldn't see many surprises at this stage. Note that if you're upgrading from Windows 95 or 98 (instead of doing a clean install alongside another OS), the report is likely to indicate that some entries in your autoexec.bat and config.sys files aren't compatible with Windows 2000. This usually isn't a cause for concern.

6 Sit Back. This one is easy. If you are performing an upgrade, the process becomes virtually automatic at this point, although it can last an hour or more. Windows 2000 Professional will restart your PC several times, copy all the files it needs, and migrate the settings and applications from your prior version of Windows. There will be long periods of time (5–10 minutes) when nothing appears to be happening, including no hard disk activity. Don't panic. The installation is proceeding **(see FIGURE 3).**

7 Select Clean Install Options. With a clean install, you must provide information such as user name, password, date, and time **(see FIGURE 4).** If your PC is connected to a network, a wizard will lead you through the network setup process.

8 Almost There: Final Steps. When you start up Windows 2000 for the first time, you'll be asked to create a log-on password before you can begin using the new OS (see **FIGURE 5**). After logging on, take the introductory tour and make sure everything's working correctly. If you have problems, check the support area of the Microsoft Windows 2000 Web page at www.microsoft.com/windows2000/professional.

FIGURE 5: This dialog is your cue that setup is complete and you're ready to log on to your new OS.

major applications ran without a hitch. But software that is closely linked to hardware—such as games and CD-authoring tools—wasn't always compatible with Windows 2000.

If your application appears on the software compatibility list, it will be categorized as either certified, ready, or planned. "Certified" applications are lab-tested for compliance by an independent organization—you can be (reasonably) certain they'll work. "Ready" means the program's developer has done the compatibility testing and is willing to provide technical support to customers who are using the product with Windows 2000. "Planned" means you shouldn't hold your breath for a version that will run under Windows 2000.

However, just because an application doesn't appear on the list does not mean it won't run like a charm. In fact, most software (and hardware) made in the last two to three years will work just fine. But it's still good to be cautious, especially with software that's critical for your work. Ask the program's developer about Windows 2000 compatibility, and check its Web site for free update downloads.

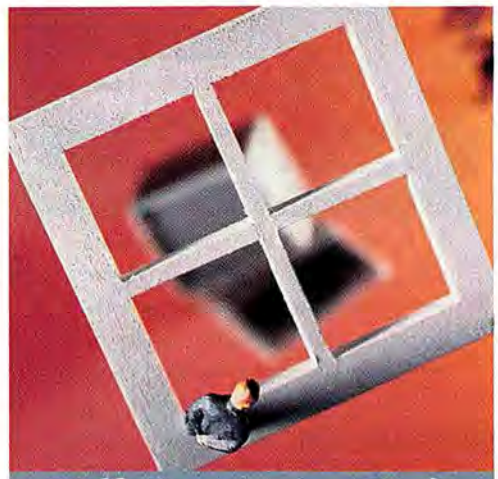
USE THE READINESS ANALYZER

WHEN YOU INSTALL Windows 2000, the setup program analyzes your hardware and software for compatibility, displays an upgrade report that you can print or save to disk, and lets you cancel installation if the compatibility news is just too grim.

But wouldn't it be nice to get any bad news about compatibility before you pay for the upgrade? You can: Microsoft offers a free Windows 2000 Readiness Analyzer at www.microsoft.com/windows2000/upgrade/compat/. The checker is the final test to run before plunking down your upgrade dollars. If you're still willing to take the plunge, update or uninstall incompatible applications. For incompatible hardware, either uninstall or consult the manufacturer for driver updates.

WHICH WAY TO GO?

ASSUMING YOU DECIDE to proceed with the upgrade, you then need to determine whether to do an upgrade or a clean install. Upgrading means you install Windows 2000 over your existing Windows operating system; a clean install leaves your current operating system(s) intact and installs Windows 2000 in a separate directory on your hard drive. If you want to keep your new OS separate, you ▶



All Systems Go?

D-DAY FOR WINDOWS 2000 is February 17—the day that Microsoft officially launches the new operating system. And all the top-tier PC companies we talked to—such as Compaq, Dell, Gateway, and IBM—plan to begin shipping systems with the new OS on or before the launch date. Windows 2000 will be available on both desktop and mobile product lines targeting business users (rather than home users). However, some vendors, including Gateway, will also install Windows 2000 on certain home PCs if customers request it.

But what if you've recently bought a PC, and you now want Windows 2000? If your new PC runs Windows 98, you'll have to shell out for the Windows 2000 upgrade ($219 list). If your almost-new system runs Windows NT 4.0, however, you may qualify for a free upgrade.

PC Vendors' Plans for Windows 2000

WHO QUALIFIES?

THE FINE PRINT on these free upgrade offers for Windows 2000 varies from company to company. For instance, customers who bought Gateway business systems (such as a GP desktop, E-Series desktop or workstation, or a Profile or Solo notebook) with Windows NT 4.0 between September 1, 1999, and February 16, 2000, are entitled to a coupon for a free upgrade to Windows 2000. Dell's offer has similar dates, and if you qualify, either company will ship you the Windows 2000 CD-ROM for free.

Compaq widens the net—from June 15, 1999, until March 31, 2000—and offers free Windows 2000 upgrade kits on its NT 4.0 systems (although it will charge for shipping and handling). IBM's eligibility dates fall between September 1, 1999, and March 31, 2000, and it also charges a shipping fee. In addition, Big Blue will provide upgraders with 30 days of free installation support. The Quantex upgrade period opened September 1, 1999, and ends April 30, 2000. Quantex will also charge you shipping and handling costs.

IN CASE OF EMERGENCY

A WORD OF CAUTION: If you buy Windows 2000 at your local retail store and anything goes wrong after the upgrade, you may be kissing some aspects of the PC's support warranty goodbye. For example, if you run into conflicts with a Dell system after you install a retail version of the new OS, Dell will only troubleshoot the hardware; you have to contact Microsoft for software questions. (However, Dell reports that all its customers can access updated drivers and BIOS information from www.dell.com, no matter where they purchased the Windows 2000 upgrade.)

All things considered, it behooves you to do the upgrade through your PC maker. That way, you can rely on the company for both hardware and software support during the PC's warranty period.

—Aoife McEvoy

PHOTOGRAPH: ROB CARDIN

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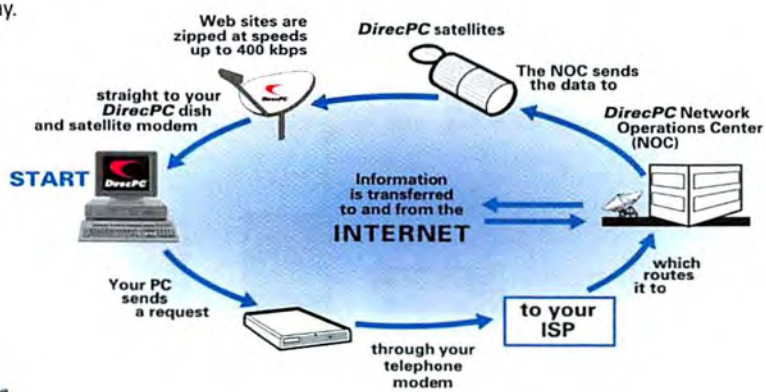

a little Wait?"

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Price of Service Plan (Without ISP)	$19.99/Month	$34.99/Month	$109.99/Month
Hours of Service (Availability)	24 Hours a Day	24 Hours a Day	24 Hours a Day
On-Line Time (Hours of usage for Turbo Internet)	25 Hours /Month	100 Hours/Month	200 Hours/Month
Additional Hourly Rate (Including ISP) Additional Hourly Rate (Without ISP)	$1.99/Hour $.99/Hour	$1.99/Hour $.99/Hour	$1.99/Hour $.99/Hour
DirecPC Services			
Turbo Webcast: Broadcast delivery of popular Websites to your PC's hard drive	Included	Included	Included
Turbo Newscast: Broadcast delivery of up to 30,000 Usenet Newsgroups to your PC's hard drive	Included	Included	Included
Turbo Internet: Fully interactive access to the Internet at speeds up to 400Kbps	Included in Online Time	Included in Online Time	Included in Online Time
Free E-mail Accounts	1	1	4
Networking (Number of Seats)	N/A	N/A	4

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can also install Windows 2000 to an empty hard drive partition.

Let's consider the pros and cons of your various options:

Install Windows 2000 Over Windows 9*x*. Windows 2000 may gripe about your incompatible hardware and software if you install it over Windows 9*x*, but this method is still the easiest and fastest way to migrate your 9*x* settings, applications, and devices to Windows 2000. Just remember that this approach will not allow you to run your old operating system alongside Windows 2000. And if you encounter nasty surprises, you'll find that trying to revert to the older version of Windows will be a chore.

Install Windows 2000 Over Windows NT 4.0. Your experience upgrading from Windows NT 4.0 to Windows 2000 will be similar to the Windows 9*x* upgrade described above—mostly hands-off. Plus, the applications and devices that worked with NT should also work with Windows 2000, so you'll have fewer compatibility problems and thus a slightly swifter installation. If your current system dual-boots with Windows NT 4.0 and 9*x*, after the upgrade you'll end up with a Windows 2000/9*x* dual-boot scenario.

Install Windows 2000 Alongside the Old OS. The clean install option lets you choose between Windows 2000 and your previous operating system (or systems) each time you start your computer. Although a clean install will set up the hardware for Windows 2000, it will not migrate existing applications or settings from your current version of Windows. You will need to install additional copies of programs and re-create your settings within Windows 2000.

This scenario gives you additional control over certain installation options, including one that copies all installation files to the hard disk (making reinstalls much faster). But it's less automatic than installing over your old OS. You'll need to sit in front of the PC to fill in your user name, password, workgroup/domain name, and so on.

If you decide to make Windows 2000 the sole ghost in your machine, the setup utility will ask if you would like to convert any boot partitions that use the Windows 9*x* FAT16 and FAT32 file systems to NT File System 5. NTFS5 is Windows 2000's improved version of the NT file system—it adds encryption and other new features. If you choose to go the NTFS5 route, remember that it will be difficult to install other operating systems (such as earlier versions of Windows) later on.

Tales From the Upgrade Road

Beta Tester: David Pipe, Systems Programmer, Grand Junction, Colorado
System Profile: AMD K6-350 processor with 128 MB of RAM, 8.4GB hard drive
Type of Upgrade: Windows 2000 installed by itself on a newly formatted hard drive

My company is evaluating Windows 2000, and we are testing our software products on it. The verdict? Overall, Windows 2000 does a much better job of detecting hardware than Windows NT—it looks a lot more like Windows 95/98 in that respect.

My computer is not a speed demon, but the install was smooth as silk. Everything installed correctly, including the network, video, and sound cards. I don't find Windows 2000 to be a memory or a CPU hog—even running multiple applications doesn't appear to use more memory. The new OS seems as fast as NT—and it's very stable. However, while Microsoft Office 97 works just fine, Symantec's PC Anywhere 8 won't even install. Before you upgrade, make sure the manufacturers of your essential applications have guaranteed that they will work, or you'll end up shooting yourself in the foot.

One gripe: Many of the functions I used a lot in Windows NT are now buried, hidden, or gone. In NT, if you want to see or modify a computer's name or IP address, for instance, you just right-click on *Network Neighborhood*, choose *Properties*, and you're there. In Windows 2000, you must right-click on *My Network Places*, then right-click on *Local Area Connection*, and then choose *Properties*. On top of that, it takes five steps to see your network instead of one. Sure, you can create a shortcut on your desktop, but *p-u-l-l-e-a-se*.

LEAVE THE BACK DOOR OPEN

MOST VERSIONS of Windows save key files from previous installations—so you can always uninstall the upgrade and ▶

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Female Premiums

Age	10 YEAR	15 YEAR	20 YEAR	25 YEAR	30 YEAR
35	$ 103	$ 125	$ 145	$ 183	$ 205
40	$ 123	$ 158	$ 185	$ 238	$ 260
45	$ 190	$ 215	$ 253	$ 330	$ 368
50	$ 253	$ 290	$ 363	$ 490	$ 495
55	$ 360	$ 413	$ 550	$ 835	$ 940
60	$ 503	$ 608	$ 845	$ 2,135	$ 2,400
65	$ 775	$ 975	$1,320	$ 3,900	$ 3,900
70	$1,338	$ 1,600	$2,970	$ 5,970	$ 5,970
75	$2,275	$ 4,870	$5,820	$ 8,430	$12,420

Male Premiums

Age	10 YEAR	15 YEAR	20 YEAR	25 YEAR	30 YEAR
35	$ 123	$ 138	$ 165	$ 223	$ 253
40	$ 148	$ 183	$ 225	$ 288	$ 335
45	$ 225	$ 300	$ 360	$ 450	$ 513
50	$ 338	$ 455	$ 525	$ 730	$ 793
55	$ 500	$ 670	$ 768	$ 1,560	$ 2,330
60	$ 783	$ 990	$1,265	$ 3,630	$ 3,630
65	$1,330	$ 1,650	$2,295	$ 5,250	$ 5,250
70	$2,448	$ 3,175	$4,860	$ 8,310	$ 8,310
75	$4,400	$ 7,443	$9,600	$11,250	$15,030

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return to the old OS. Windows 2000 offers no such safety net. Once you install it over a prior version, there's no easy way back. Even if you install Windows 2000 to another location—a "clean install"—there's still no uninstall feature. But you can remove the OS manually (see www.budja.com/w2k/uninstall_w2k.html for help).

The easiest way to reverse the upgrade is to back up your partitions—all of them—before you upgrade in the first place, and make sure you have a way of restoring them later if you decide that Windows 2000 isn't for you. When you've done this successfully, you're ready to perform the upgrade. (See page 104 for more information on backing up and for our step-by-step guide on using the Windows 2000 setup program.)

THE UPGRADE AFTERMATH

EVEN IF YOU take all of these precautions and follow our advice, there's no guarantee that you'll sail smoothly into Windows 2000. For a reality check, we tested scores of products with the new operating system. Though ▶

Laptop Alert

GOOD NEWS, notebook users: You no longer have to choose between the convenience of Windows 98 and the power of NT. Windows 2000 merges the best of both into a laptop-friendly operating system that's also stable and secure. Like Windows 98, it supports just about every technology a laptop user might need, including power management, Plug-and-Play installation of PC Cards and USB devices, and DVD-ROM. And like NT 4.0, it runs reliably and boasts a full array of security options.

POWER MOVES

THE NEW OS EVEN tosses in a few new extras for notebook users. While the Windows 98 power management can conserve battery life by automatically putting your system into low-power standby mode, Windows 2000 also offers a hibernation mode that writes the contents of memory to disk, then shuts the system down completely. It also improves upon NT's security options by letting you encrypt files.

It's not all sunshine and roses, though. The Windows 2000 support for Advanced Configuration and Power Interface is great, but your notebook's BIOS must support the ACPI spec nearly perfectly and be on Microsoft's accepted BIOS list. If not, Windows 2000 uses APM mode instead, which may not let you control all of your PC's power management features. And Win 98 utilities that directly access your laptop's hardware won't run under Windows 2000.

To avoid upgrade problems, first check your laptop maker's Web site for Windows 2000 support in the form of an updated ACPI BIOS and Windows 2000 versions of any add-on utilities. Compaq, Dell, IBM, Toshiba, and other portable computer makers already offer Windows 2000 upgrade advice and downloads on their Web sites. After installing the BIOS upgrade, back up your system; then you can perform the OS upgrade.

The best scenario for a dual-boot situation would be to have both operating systems using the same power management scheme. If you run Windows 2000 in ACPI mode and Windows 98 in APM mode, for instance, you may have to change BIOS settings on each reboot. (Windows 95 doesn't support ACPI.) Unfortunately, there's no simple way to force Windows to use a specific power management technology.

Is Windows 2000 the Ultimate Road Show?

COMPATIBILITY GAMBLE

EVEN IF YOUR notebook's manufacturer doesn't officially offer Windows 2000 upgrade support, you *might* still be able to upgrade. As we went to press, Sony's Web site didn't say a word about Windows 2000. But after installing the latest BIOS version, I was able to upgrade Sony's VAIO Z505S super-thin notebook with no trouble. Though the power management feature in Windows 2000 Release Candidate 3 still didn't support standby mode when closing the system's lid, just about everything else worked like a charm.

One other quibble: The Windows 98 utilities that Sony bundled with the system for controlling the touchpad, screen brightness, and battery didn't work under Windows 2000. Though Windows 2000's native tools cover some of these functions, I'll have to live without a few frills until Sony releases compatible versions of its utilities.

–Scott Spanbauer

Portable Support Sites

Compaq
www.compaq.com/partners/Microsoft/Windows2000 /support/portables.html
Dell
support.dell.com/us/en/advisor/index.asp
IBM
www.pc.ibm.com/us/thinkpad/thinkpadnt.html
Toshiba
www.toshibapc.com/win2000

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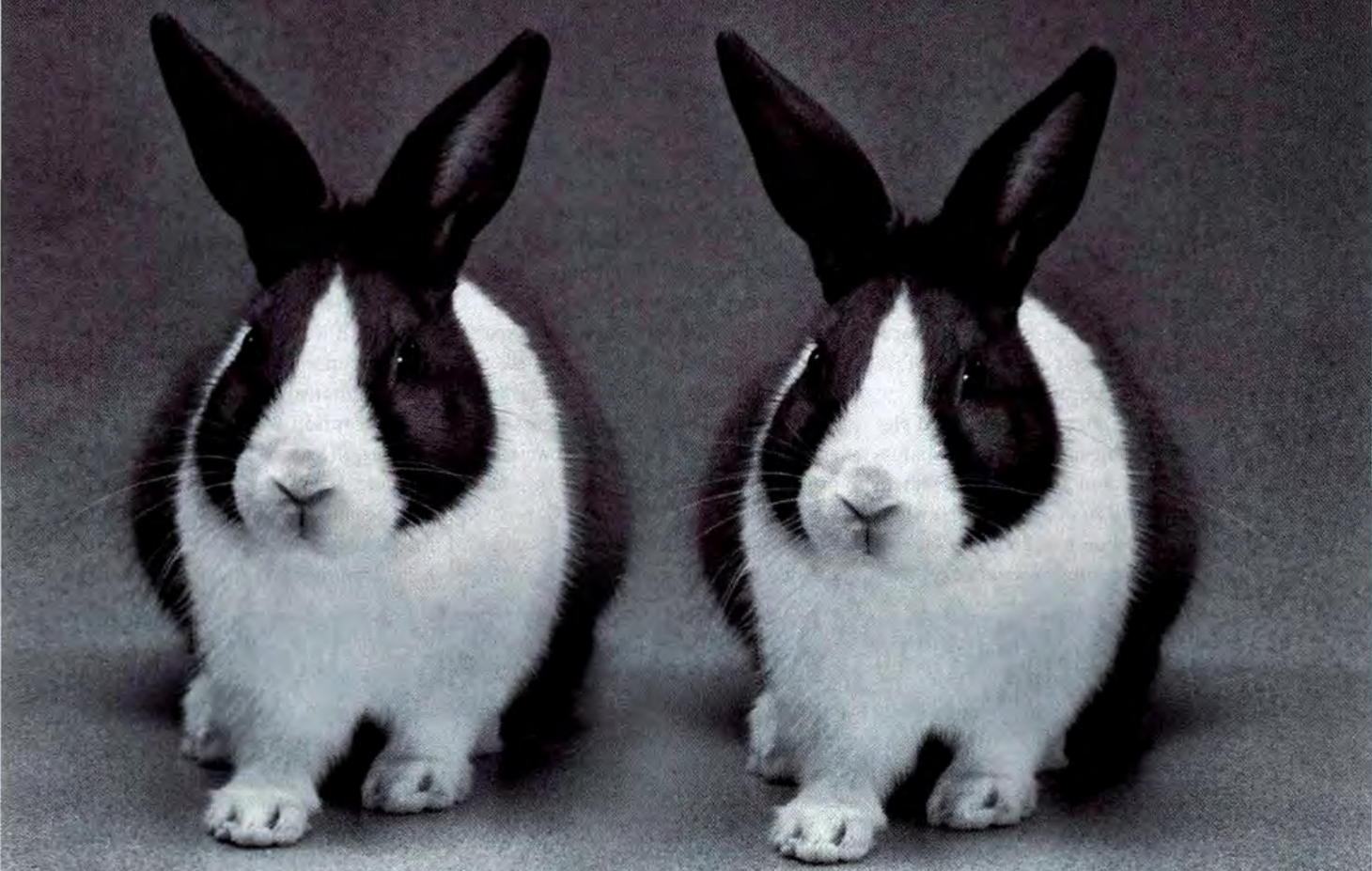

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we were generally impressed with the stability and newfound hardware savvy of Windows 2000, we did experience a few show-stopping incompatibilities. Here are the highlights—and lowlights. (By the time you read this, some drivers that were not included in the release candidate versions, or even in the final shipping product, may be available through the Microsoft Windows Update site at www.windowsupdate.com.)

PC Systems. It's a crap shoot. A surprising number of the 24 systems we upgraded suffered from compatibility glitches. Though some problems could be due to the prerelease status of Windows 2000 candidates we tested, many are likely to occur with the final shipping version.

Newer systems seemed to have the most problems, presumably because they contain cutting-edge devices and hardware utilities. Here's a laundry list of the headaches we encountered:

We couldn't coax DVD movies to play on a new Athlon-500 based Compaq Presario; the modem and audio subsystem were missing in action on a Hewlett-Packard Pavilion notebook (a Celeron-433–based system); we couldn't get back to the factory-installed OS (Windows 98 SE) or apps on a Dell Dimension XPS T600 (with a Pentium III-600 processor) using Dell's CD; Compaq's Presario 5700 vexed us (as well as Compaq and Microsoft) with a mysterious bug that froze the system immediately after completing installation. And finally, although Windows 2000 worked almost perfectly on a Sony Z505S notebook (after a BIOS upgrade), bundled utilities that enabled several features—such as touchpad scrolling and screen dimming—refused to run under Windows 2000.

BLACK BOX DATA: The online version of this story includes an "Upgrade Accident Report" for all the hardware and software we tested. Get it at www.pcworld.com/mar00/win_upgrade.

Graphics Adapters and Sound Cards. Apart from the brand-new boards we tested, we had no problems. Matrox's G200s graphics card worked like a charm, for instance, even in dual-display mode. (However, at press time, Matrox was finalizing new Windows 2000 drivers for the G200s, as well as its new Millennium G400 card.)

Aside from the problem with the HP Pavilion noted above, the audio situation was similar: older sound cards usually worked fine, but newer ones may remain mute until manufacturers post Windows 2000 drivers. We had the most trouble with Creative Labs' Sound Blaster Live and X-Gamer cards. As we went to press, Creative was still working on Windows 2000 drivers for both; a company rep said a driver for Sound Blaster should be available for download from Creative's Web site by mid-February.

Mice and Keyboards. We had to use generic drivers for most of the input devices we tested, as specific Windows 2000 drivers were not available in most cases. As a result, Windows 2000 enables basic pointing and typing, but special features like mouse wheels and multimedia keys may not work. Such functions didn't work with Kensington's USB MouseWorks mouse and Belkin's USB MediaBoard multimedia keyboard, for example. One exception was Logitech's Wheel Mouse—all its functions worked after the upgrade. If you rely on an input device with advanced features, check with the manufacturer for Windows 2000 drivers before committing to the upgrade. ▶

Should You Upgrade to Windows 2000?

Windows 2000 is a costly upgrade that isn't for everyone. All the scenarios below assume that your system has the minimum necessary RAM (64MB), processor speed (Pentium-133), and free disk space (650MB) for the new OS.

If you use...	for...	then...
Windows NT 4.0 on a work desktop system	Business applications	Consider upgrading to Windows 2000; you'll get a better user interface, and (depending on your tasks) you'll see slightly better performance.
Windows 9*x* on a work desktop system	Business and/or recreation	Check for PC and application compatibility, then consider your priorities. Balance stability and security gains against compatibility losses.
Windows 9*x* on a home desktop system	Web surfing, digital photography, making CDs, gaming	Stick with Windows 98 and wait for the Millennium upgrade, expected to arrive later this year.
Windows NT 4.0 on a laptop system	Just about anything	Run, don't walk, to a Windows 2000 upgrade. Check for BIOS, hardware, and software compatibility updates first, of course.
Windows 98 on a laptop system	Business applications	Do your compatibility homework, then consider upgrading to Windows 2000, especially if Win 9*x* isn't stable enough.

Sound goods.

If you're searching for the best possible 3D audio experience, you can spend a lot of time listening to the claims of imitators. Or you can get the ultimate experience with A3D on a Vortex card from Aureal, the folks who invented 3D audio for the PC.

The Vortex SQ1500 delivers award-winning A3D on two or four speaker systems, or on headphones, and is the ideal choice for gamers on a budget.

The Vortex SQ2500 provides A3D 2.0 positional audio with geometry-based Aureal Wavetracing, also on two our four speaker systems, and is the ultimate PC audio experience.

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Modems and Network Cards. We had little trouble with modems or network adapters after upgrading to Windows 2000. The only glitch we encountered was with a Zoom 56-kbps modem that initially failed to operate after the upgrade from Windows 98. The modem worked fine when we reinstalled its driver under Windows 2000, however.

Printers. Like modems and network cards, printers eventually worked after upgrading to Windows 2000. That does not mean the upgrade experience was completely smooth, though. Windows 2000's upgrade checker warned us that two printers—HP's Deskjet 882C and Lexmark's Optra M410n—were incompatible. But when we booted Windows 2000, the printers worked just fine.

Scanners. Compared with our printer experience, we had more hitches in scanner support. Epson's Perfection 1200U wasn't supported at all, though the manufacturer promised that a driver would be available by the time Windows 2000 hits store shelves. And preeminent scanner maker Hewlett-Packard has no plans to support the USB interface on many of its current scanners, including the USB-only ScanJet 3300Cse and the SCSI/USB ScanJet 6350C models we tested. NT doesn't support USB, so NT 4.0 drivers, which will usually work under Windows 2000, don't help for USB peripherals.

Manufacturers like HP have chosen to put development resources where the revenue is—in new products—rather than develop new drivers for the company's older devices. If you want to use your HP scanner under Windows 2000, check with HP first to see if it will work. With some scanners, you'll just have to hope for driver and software updates, use the scanner's SCSI or parallel interface (if it has one), or dual-boot with Windows 9*x* to use a USB-only scanner. Similar workarounds apply to digital cameras, as well.

Digital Cameras. We tested Canon's PowerShot A50, which connects to the PC with a serial cable, but the device would not work after the upgrade. Even though the camera's PC software opened and recognized the camera, we could not access images. As with USB scanners, manufacturers of USB digital cameras must provide new drivers before their products will work in Windows 2000. For instance, we couldn't get Kodak's DC265 digital camera to function with the new operating system because the USB driver it comes with is designed to work with Windows 9*x*. Kodak reports that it's readying a Windows 2000 driver that should be available around the time Windows 2000 ships.

8 Web Sites With the Straight Scoop on Windows 2000

BEFORE (AND AFTER) you upgrade, visit these third-party Windows 2000 sites for news, FAQs, user reviews, message forums, and more. (And check out Microsoft's official site at www.microsoft.com/windows2000.)

About.com's Win 2000 Page
windowsnt.about.com/compute/windowsnt/msub06.htm
ActiveWindows
www.activewin.com
BetaOS
www.betaos.com
BHS.Com Windows NT/2000 Resource Center
www.bhs.com
LabMice
www.labmice.net
Paul Thurrott's SuperSite
www.wugnet.com/wininfo/win2000
Win2KWorld
www.win2kworld.com
WinPortal.com
www.winportal.com

Software. We had far fewer problems with applications than with hardware. Most mainstream applications, including all three leading office suites, emerged from the upgrade with flying colors. (The first time you launch Outlook 2000 after upgrading, it automatically prompts you to drag out the Office install disc and reinstall a handful of .dll files, but that's only a minor nuisance.)

A few CD-related programs may have trouble. Changes in one shared Windows .dll file made it impossible to run CD-burner programs that rely on the file, such as NTI's CD-Maker Pro. Developers promise to have Windows 2000–compatible versions for their CD burners soon.

We encountered a couple other glitches. After the upgrade to Windows 2000, the freeware version of Network Associates' Pretty Good Privacy 6.5.1 will give you an error message—warning that your passphrase may be written to the pagefile (Windows swap file) where someone could conceivably read it. An updated version 6.5.2 that works with Windows 2000 is available at web.mit.edu/network/pgp.html. We also found that Norton SystemWorks 2000 doesn't install under Windows 2000—like many utilities, it can only run under Windows 9*x*. (Symantec says a Windows 2000 version of SystemWorks is under development.)

HELLO, WINDOWS 2000

STILL WILLING TO upgrade? If you follow our suggestions for preparing your system, you can reduce incompatibilities and other problems to a minimum. However, if Windows 2000 doesn't yet support a device or application you rely on, it may be best to stick with your current OS for another season or two.

For most of us, Windows 2000 will be an improvement over the Windows version we currently cope with. Nevertheless, if a digital camera, a scanner, or another peripheral that's vital to your work isn't Windows 2000-compatible, you might not want to take the plunge just yet. Or you might consider a dual-boot system so that you can switch back to your old OS for access to those peripherals. If you're not willing to dual-boot, then you'll have to either live without the devices or live without Windows 2000 for at least a while. (Six months from now, most software and hardware manufacturers planning to make their products Windows 2000–compatible will have done so.)

Consider your options carefully, and may the best Windows win.

Scott Spanbauer and Stan Miastkowski are both PC World *contributing editors. Aoife McEvoy is a senior associate editor for* PC World. *Eric Dahl, a staff editor, also contributed to this article.* ■

BIG THINKING FOR A SMALL OFFICE

Versatile software and powerful hardware spell success

Everyone seems to be calling Lowry Snow for help these days. So far, the Salt Lake City, Utah-based Web site developer has been tapped by clients from local photographers and design studios to Sky West Airlines, Inc., based in nearby St. George. Snow has also written programs for a leading telephony product company, where he contributed to one of his most rewarding projects yet—a voice-activated pizza delivery system.

Snow admits that it is getting harder to find the time he would like to spend with his family. The Web site he created to report on Snow family proms, picnics, and vacations has had to take a back seat to his growing Web development business. "Eventually I will have to focus," he says. "But right now my business is growing exponentially, and in every direction."

ART VALERO

One of the tools Snow will use to keep his business up and running is Microsoft Windows 2000 Professional. Snow, who beta tested the operating system at the telephony company where he worked, says that Windows 2000 Professional combines the best of Windows 98 and NT, and adds much-needed Web capabilities and support for mobile users.

"Anyone who likes the stability of Windows NT and the features of Windows 98 will want to check out Windows 2000 Professional," Snow says. "The system is very, very stable and fast, and provides DirectX support [essential for multimedia gaming software]. Like NT, it is a true 32-bit operating system. I am definitely planning to upgrade as soon as possible."

Snow says Windows 2000 Professional also does a better job of protecting his files when application and system errors occur. "Windows 2000 is more graceful [than Windows 98] when you lock up," he says. "You're more likely to be able to close your apps, save, and

CyberMax Fuels Motor Sports Web Site

While many of us have to get out and push just to keep our businesses moving forward, John Jordan can't seem to find the brakes. Jordan, a Longmont, Colo.-based Web developer, builds sites for Go-Go Racing, LLC, an organization that finds sponsors for motor sports drivers and their teams. Visitors to Jordan's most popular site, gogo-racing.com, can view more than 700 racing images, schedules, and bios of their favorite Ferrari drivers, including Sandy Reddin, Jay Cochran, and Ike Neilson. Since Jordan launched gogoracing.com last April, the site has averaged as many as 130 user sessions per day.

"If my computer goes down, I'm in trouble," he says. "It's the heart of my business." So when Jordan was in the market for a new computer system last spring, he sought the punch of high-speed processing and maximum RAM, in a stable and affordable package.

Jordan's Internet browsing brought him to CyberMax, where he customized his own AMD-based system from a selection in the company's much-heralded Entrepreneur series. Jordan compared CyberMax's prices with those of the Internet's best-known computer makers, right down to the component level. "Buck for buck, item for item, CyberMax had the best prices around," he says. Jordan also bought his 19-inch monitor, DVD player, recordable CD-ROM drive, and scanners from CyberMax.

Jordan's next step is to purchase an upgrade to Microsoft Windows 2000 Professional, which he says will save him time previously lost to system crashes. CyberMax is among the first online vendors to ship Windows 2000 Professional standard with its business computers. "I have gone from Windows 3.1 to 95, and from 98 to NT," Jordan says. "You bet I'm ready for Windows 2000. It takes on the best features of all of them."

Jordan uses his CyberMax PC for scanning, Web page design, image editing, and video production for the Ferrari Racing sites and for his brother's company, Longmont-based Novazen, Inc., an electronic bill-paying company. The PC has handled everything he has thrown at it with gusto, he says.

"I can produce great streaming video with this system," Jordan says. "During editing, when I'm burning down to an MPEG, I see no difference in the playback from my VCR. The quality is unbelievable."

Jordan says the reliability and increased productivity he will get from his CyberMax PC's and Windows 2000 Professional will also help him to see more of his family. "It's been a struggle to balance work time and family," he says. "If I have to, I will hire a consultant to keep up. But I really think CyberMax helps me to strike that balance, by keeping me up and running."

ERIC LARS BAKKE/MURCURY PICTURES

John Jordan, Web developer based in Longmont, Colo.

restart without losing all of your work."

Snow currently runs Windows 98 on a computer he bought from Allentown, Pa.-based CyberMax Computer Inc., which sells PC's, software, and peripherals to small and midsize businesses. The company was one of the first computer makers to combine AMD (Advanced Micro Devices, Inc.) processors with high-end components from leading manufacturers. (Today, CyberMax's PC's sport the latest processors from both AMD and Intel.)

Snow uses his CyberMax system primarily to program the Web's bells and whistles in languages like Visual Basic, Perl, and Java. His clients and friends often ask him to recommend computer systems that will help make their businesses run more smoothly, too. "I have a lot of experience buying PC's from small, local companies, as well as big online sellers," he says. "But I always encourage my clients to shop with CyberMax, because they use AMD processors and support them with the very best components."

SUPPLEMENT SPONSOR:
CyberMax Computer, Inc.
www.cybermaxpc.com

AVOID THE BARGAIN BASEMENT

Experts say that businesses must resist the temptation to buy bargain-basement PC's with cheap components. "You should never invest in technologies the major vendors don't support; otherwise you're likely to place a bet that won't pay off," says Mie-Yun Lee, editorial director at BuyerZone.com, an Internet purchasing hub for small and midsize businesses. "There's a reason why those prices are too good to be true."

For Snow—the consummate

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- K7 MBD featuring AMD-750 Chipset & 200MHz Front Side Bus
- 64MB SDRAM
- 10GB Ultra ATA-66 Hard Drive
- nVIDIA™ TNT VANTA 16MB AGP VGA
- CyberMax 17"(.28dp-15.7"VA) Monitor
- 8x Max Variable Speed DVD-ROM (32x Max Variable Speed CD-ROM)
- Aureal Advantage 3D Sound Card
- V.90 Standard 56K Fax/Modem
- 10/100 PCI Ethernet Adapter
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programmer and gamer—performance is an obsession. This past year, he learned that the AMD Athlon processor was faster than the Intel Pentium III, and that CyberMax charges less for the same processors and components used by its competitors. "Although you might not recognize the name as quickly," Snow says, "CyberMax's rates are better than other online sellers."

"CyberMax may not be a household name, but then again, neither is AMD," says a PC Computing magazine review from August 1999. "Put these two together, though, and you've got a top-of-the-line system that holds its own against Pentium III's."

PC Magazine recently reported that the Athlon 600-MHz processor outperformed the Pentium III 600-MHz processor by 27 percent in the magazine's benchmark tests. In the review, PC Magazine executive editor Carol Venezia says, "The Athlon has microarchitectural advantages over the Pentium III that translate into higher performance on both integer and floating-point code."

Windows 2000 Professional is also scoring high marks in independent testing. "The Windows 2000 Professional operating system performs significantly better [and faster] than Windows 95 and Windows 98, and [is] comparable to Windows NT 4.0," according to ZD Labs, which tested the operating system with popular business applications.

GET HELP FROM AN ENTREPRENEUR

CyberMax's Entrepreneur series of desktop computers harnesses Windows 2000 Professional's optimized code, AMD's Pentium-beating microarchitecture, its

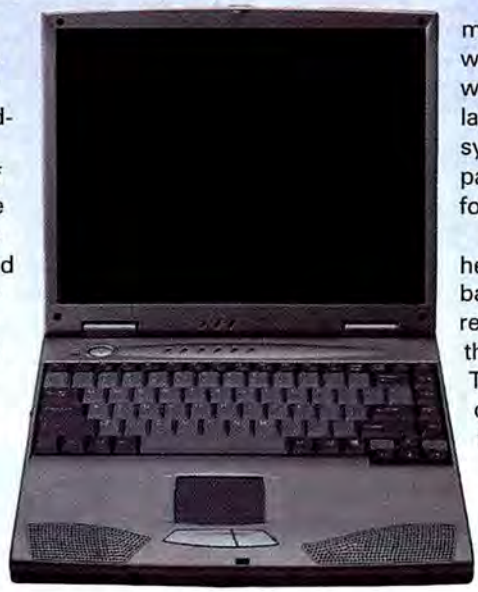
Get More out of Your Notebook with Windows 2000

The jury is in: Microsoft Windows 2000 Professional is a must-have for notebook users. Not only does it offer the most reliable Windows operating system ever, but it also overcomes the shortcomings of previous versions. "Windows 2000—with its enhanced support for advanced power management, docking stations, and other laptop features—is an ideal OS for the latest portable hardware," according to a December 1999 CNET.com report. "For any size of business, Windows 2000 has the right stuff."

That's the *latest* portable hardware. You need cutting-edge hardware to get the most out of Windows 2000 Professional; the new operating system supports over 2,000 high-tech devices and fully integrates Internet connectivity. "The best Win2000 notebook PC experience will be had by those who purchase a new portable PC with Win2000 preinstalled," says a recent Winmag.com review.

CyberMax ships Windows 2000 Professional with all of its TravelMax notebook PC's. The notebooks include features like Intel Celeron processors with speeds up to 433 MHz, as much as 128 MB SDRAM, smart lithium ion batteries, 6.4 GB hard drives, DVD-ROM drives, and V.90 standard 56K internal fax/modems. Each TravelMax notebook also comes with integrated dual stereo speakers, one USB port, and a carrying case.

With your TravelMax notebook, you can take advantage of Windows 2000 Professional's Offline Files feature—which automatically synchronizes your files with your company's network when you reconnect—and boost laptop security with the operating system's Encrypt option, which password-protects your files and folders.



TravelMax Notebook from CyberMax

Windows 2000 Professional also helps to extend your notebook's battery life, and makes adding and removing peripheral devices easier than ever. Plus—and only with TravelMax's three-spindle design—you can run an integrated floppy, a V.90 Data/Fax/Voice Modem, and a 24x CD-ROM or 2x DVD-ROM drive without swapping devices. For Windows 2000 Professional users, TravelMax PC's are the notebooks of choice.

200-MHz system bus, and its 3DNow! technology to give you unsurpassed speed and performance at prices starting around $1,000.

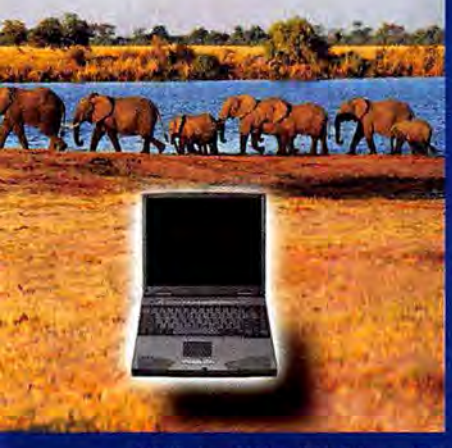
Industry analysts say that Windows 2000 Professional is essential for your business's office network and online computing. "Any SOHO [small office, home office] user that has a peer-to-peer network or that is starting to use the Internet more in everyday business processes should use the latest version on MS Windows," according to Kneko Burney, director of markets and opportunities research at Cahners In-Stat Group. "Microsoft is working hard to make Windows optimized for the Internet, so any user that draws or places content on the Web should consider the upgrade."

"I have one or two clients that I work with online, and I expect that number to grow," says Jerry Miller, who investigates property deals for lawyers in Huntingdon, Pa. Miller has two CyberMax PC's linked in a peer-to-peer network at his home office, and clients throughout Pennsylvania. He plans to purchase a Windows 2000 upgrade from CyberMax this year.

CyberMax has earned its reputation as the go-to resource for small-business computing by embracing new technologies quickly, while keeping the cost to the consumer as low as possible. That's why PC World magazine included CyberMax's Entrepreneur series in its list of top budget PC's last fall, and PC Computing recently added another CyberMax system to its "High Performance Desktop A-List." With the Microsoft Windows 2000 Professional operating system, AMD Athlon processors—and components from industry-leading manufacturers like Intel, Seagate, and 3Com—CyberMax will move your business forward at home and online. ■

Cybermax's Entrepreneur Desktop PC is pre-loaded with Windows® 2000 Professional

Travel light.



*MS Windows 2000 available February 17th

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Even if your work doesn't take you to the Serengeti Plains, our TravelMax Series provides all the power of a desktop, anywhere. These affordable portables offer unparalleled VGA performance with 1024X768 resolution supporting 16M colors, for astonishing visual quality on a roomy 14.1" XGA TFT LCD screen. With speeds of up to 433MHz and 3 spindle design, a TravelMax will let you run an integrated floppy, a V.90 Data/Fax/Voice Modem and a 24x CD-ROM or 2x DVD-ROM drive, without swapping. Any of these desktop replacements are marvelous travelling companions that are ready for anywhere you go.

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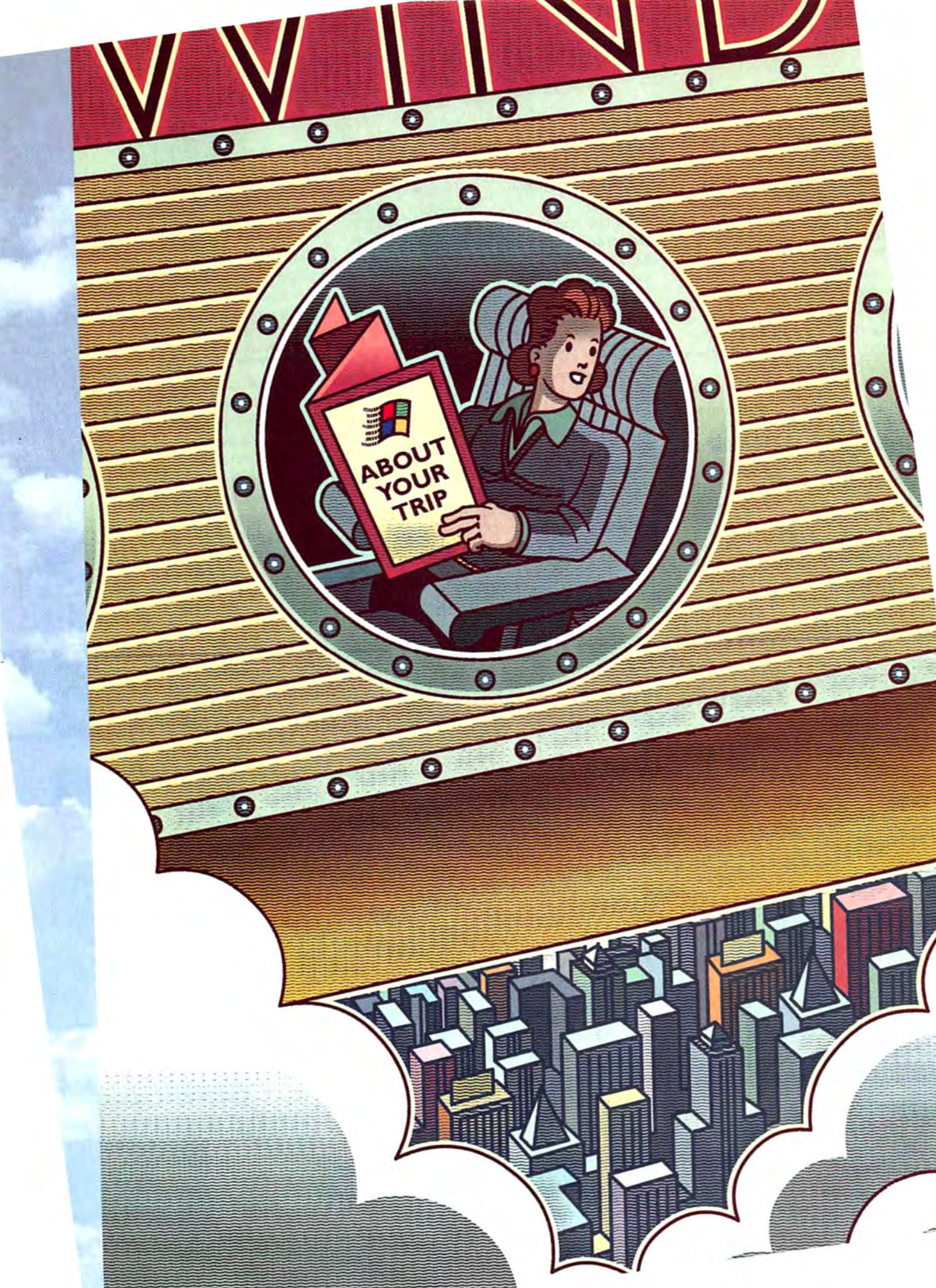

WIND
ABOUT
YOUR
TRIP

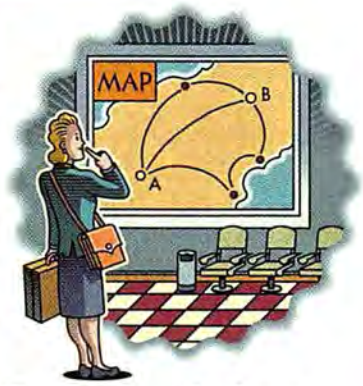
Tips for New Arrivals

Once you've upgraded, you'll find that Windows 2000 is a land of opportunity. Here's how to customize your desktop, manage files, maintain security, access the Internet—and more.

By Matt Lake

WHAT IS IT WITH WINDOWS 2000? At first glance, it looks like Windows 98 or 95—same old Start menu, Recycle Bin, and Task bar. But as you spend more time with it, little differences in looks and functions crop up. It's hardly surprising that Windows 2000 differs from 98 and 95—after all, it is a direct descendent of Windows NT. But, then again, it doesn't look or work exactly like NT either. So no matter which operating system you're upgrading from, you'll find a wealth of niggling little differences. Well, don't wave goodbye to your productivity yet. Even though there's plenty of overlap between this century's Windows and the last few versions from the 1990s, there are some stumbling blocks. The following suggestions will help keep you on track. ▶

ILLUSTRATIONS BY PETER HOEY



Customizing the Desktop

IF THE DESKTOP looks like Windows 9*x* then it must act like Windows 9*x*, right? Not necessarily. Some parts act the same, some don't. Forewarned is forearmed.

PERSONALIZE THE START MENU

THE START MENU in Windows 9*x* has a nasty way of growing out of proportion, creating unwieldy cascading menus. In Win 2000, the Personalized Menu feature collapses the cascading menus under the Start button to show *only* the items you're likely to need. Windows does this by tracking the applications you've recently used or installed, and showing just them—the others drop off the visible menu.

To access the entire contents of a menu, click the *down-chevron* symbol at the bottom of the list. The whole menu defaults to an alphabetical listing, with the top-level items standing proudly on buttons.

If you don't know where an item is hiding, you may want to turn off Personalized Menus and display the whole Start menu. Select *Start•Settings•Taskbar & Start Menu*, and under the *General* tab, deselect *Use Personalized Menus*.

This icon is your clue that this 2000 function works much as in Win 98.

CREATE THE RIGHT TOOLBAR

THE QUICK Launch toolbar (on the taskbar between the Start button and the running-program buttons) provides convenient one-click launching for a few select items—but these aren't your only choices. To add a program, document, or folder icon to the toolbar, simply drag it from an Explorer window to the place you want it on your toolbar. To remove an item from a toolbar, right-click it and select *Delete*. To replace the toolbar with another preconfigured one, right-click a blank space on the taskbar, select *Toolbars*, and then choose one of the alternative toolbar options.

TURN ON THE ACTIVE DESKTOP

WITH ACTIVE Desktop enabled, you can make the Windows desktop look and act more like the Web—right down to making single-click launch icons. More important, you can also introduce Web content from AltaVista search forms to Javascript news tickers right on the desktop, and have that content update itself on a regular basis. Although Active Desktop has been around since Win 95, changing its settings is much easier with Windows 2000.

To turn on Active Desktop the Windows 2000 way, select *Control Panel•Folder Options* (also to be found under the Tools menu of any Explorer window). In the Active Desktop area, select the *General* tab, then click the *Enable Web content on my desktop* radio button. Two other ways to turn on Active Desktop are holdovers from Windows 98. You can right-click a blank area of the desktop and select *Active Desktop•Show Web Content*. You can also right-click a blank space on the desktop, select *Properties*, and under the *Web* tab, select *Show Web content on my Active Desktop*.

PERSONALIZED MENUS help reduce clutter, but to see unabridged menus, you need only click on a down chevron (circled above).

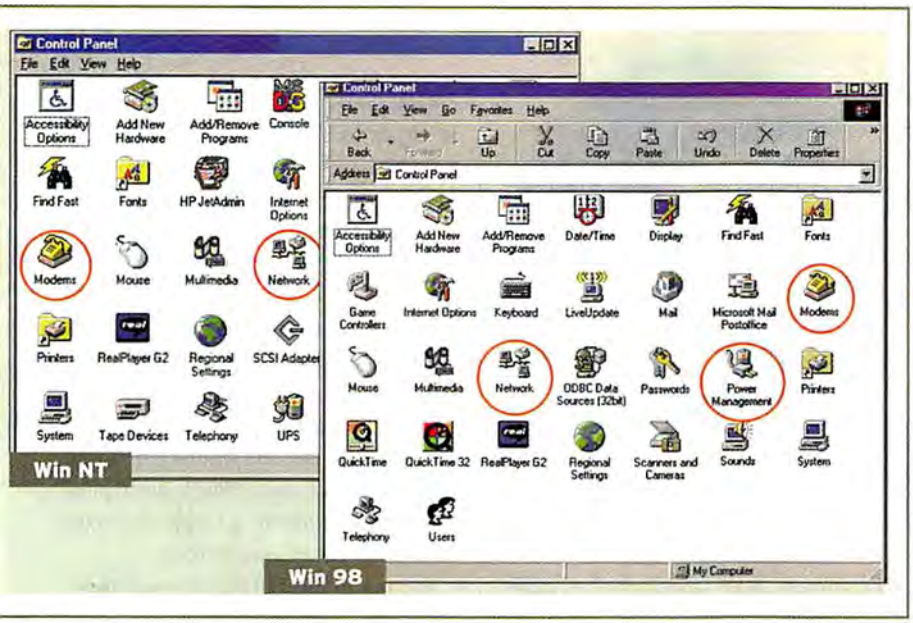
DON'T LET FAMILIARITY FOOL YOU. As you can see by the circled items in the 2000 control panel on the left, a number of name changes (orange) and new icons (blue) differ significantly from those in the familiar Windows NT and Windows 98 control panels pictured at right.

ADD ACTIVE ITEMS

THE FIRST TIME you turn on the Active Desktop feature, only one item of Web content is displayed—the Internet Explorer Channel Bar. To add new items, right-click a blank part of the Desktop, and select *Active Desktop•New Desktop Item*. In a single dialog box, you are given the choice to browse Microsoft's collection of Active Desktop items online (View Gallery), or enter the Web address or location on your hard drive or network of a Web element you'd like to add. Microsoft's Desktop Gallery is worth a look—especially if you're in the market for a stock ticker, weather map, or AudioNet jukebox on your desktop.

CUSTOMIZE ACTIVE DESKTOP

TO TINKER WITH the contents and layout of the desktop, right-click a blank space on the desktop and select *Active Desktop•Customize My Desktop*. This shows the Display Properties Web tab,



with a list of current Active Desktop items that you can enable by clicking the item's check box. You can also add new active items by clicking the *New* button (see "Add Active Items" on the previous page).

KEEP ACTIVE DESKTOP ITEMS IN THEIR PLACE

WHEN YOU HAVE set Active Desktop to suit your preferences, you can prevent the accidental resizing or moving of items by locking them in place. Right-click a blank space on the Desktop and select *Active Desktop*. If the Lock Desktop Items listing has a check mark next to it, your desktop can't be edited. But what if you want to edit it later? Right-click a blank space on the Desktop, select *Active Desktop*, and click *Lock Desktop Items* to access and remove its check mark.

VIEW MORE FILES IN THE EXPLORER WINDOW

THE BROAD PANE down the left side of Explorer windows is handy for previewing and retrieving information—but it also takes up a lot of space. If you prefer to see more files, change Explorer's Web-view settings: Select *Tools•Folder Options*, and in the Web View section, select *Use Windows classic folders* and click *OK*.

TRULY USEFUL FOLDER DESCRIPTIONS

EVEN WITH long folder names at your disposal, there's just not enough room to really describe what's in a folder, who put it there, and what it's there for. But in 2000, you have a way to annotate information to a folder—using plain text or HTML. Open the folder you want to annotate, and right-click in a blank area in it. Select *Customize This Folder*, click *Next*, and check only *Add Folder Comment*, ▶

2000 ON THE GO
Mobile Tips

THE TROUBLE WITH having an Internet-ready mobile system on your desk is that it's not always on your desk. And when you take a notebook away from the network, docking station, and power cable, its configuration and power needs change. Here are a few Windows 2000 tricks that help you get the most out of your notebook.

POWER PLAY

WHEN YOU REMOVE a laptop from its docking station, you should change the power scheme to insure optimal performance. In Control Panel, select *Power Options*. In the default Power Schemes tab, select *Portable/Laptop* from the drop-down list box—or *Max Battery* if you're keen on preserving power. When back at your desk, select the *Home/Office Desk* scheme.

KEEP IN SYNC

FILES ON A NETWORK OR storage device hooked up to a docking station won't be available when you undock. To make sure they're accessible, mark them as Available Offline and ensure they will be synced up (see "Synchronize Offline" on page 140). Then, most important, select *Start•Log Off* before removing your system from the docking station.

PACK YOUR BRIEFCASE

IF YOU TRANSFER information using Zip disks or the like, use My Briefcase to maintain version control of the files. As in Windows 9*x*, this function is still tricky to master, but it works fine: First, insert a removable "shuttle" disk into your main computer. Open *My Briefcase* and drag the files you want to transfer into it. Then drag the Briefcase folder into the shuttle disk. When it's fully copied, remove the disk, and insert it into your portable or home office system. Open the *Briefcase* folder from the shuttle disk and work on the files.

When you are ready to synchronize the files to your main desktop system, remove the shuttle disk from your portable computer and reinsert it into a disk drive on your main computer. Now, here's where you've got to watch it: Open *Briefcase* on the removable disk, and then either select the Briefcase menu's *Update All* (which updates all of the files), or if you want to update only one or two of the files, click to select them, and then go to the Briefcase menu's *Update Selection*.

PHOTOGRAPH: ROB CARDIN

then click *Next*. In the Folder comment area, enter text or a block of HTML. Click the *Next* button, and then *Finish*. Results will appear in the left pane of the commented folder and its parent folder when the commented folder is selected (if your Explorer folders are set with Web view).

A FOLDER WITH A VIEW

WANT TO VIEW all the file extensions of all your files? Doesn't it make sense to display compressed files and folders in different colors? Windows 2000 can do all these things—but only if you tell it to. Open *Folder Options* either from Control Panel or the Tools menu of any Explorer window. Click the *View* tab, and scroll down the list, clicking to add or remove item check marks where necessary. Click *OK* to make the changes to the current folder, or click the *Like Current Folder* button to apply your settings to all of your folders. (This option is grayed out if you open Folder Options from Control Panel—by default, changes made there affect all folders.) To revert to the default view settings later, reopen *Folder Options* and click the *Restore Defaults* button.

THE SHORTER ROUTE TO SHORTCUTS

CREATING A SHORTCUT on the Desktop (or in any folder, for that matter) has always been fairly simple: Right-click a blank space, select *New•Shortcut*, and then enter the shortcut. In the past, this last step usually meant clicking the Browse button and then browsing through folders till you found the item. But Windows 2000 autocompletes paths: Type in **C:** and you'll get a list of everything in the root directory of C:, including all the first-level folders. Type **C:\m** and you'll get any file in the root directory starting with *M*, and all such folders (for example: My Documents and My Photos). The more you type, the narrower the list becomes. This autocomplete feature also works under Start•Run but lists only executable programs and folders.

Working With Files

WINDOWS 2000 HANDLES files differently than Windows 95 and 98 do. It's designed to store files in a different way, using NTFS—the NT File System. But NTFS isn't required—Windows 2000 can also handle the DOS/Windows throwback file allocation table and 98's improved FAT32 (32-bit file allocation table). But here's where the differences begin...

SEARCH AND YE SHALL FIND

WINDOWS 2000 replaces the simple Find Files or Folders with a more Web-like Explorer window called Search. It's got more useful features than Find—but to using it well requires a little finesse. On the *Start* menu, select *Search•For Files or Folders*, and a two-paned window pops up with a search form in the left pane. The first three boxes in the form neatly combine the three most common search criteria—file or folder name, text within files, and the folder or disk to search. By default, Search roots through subfolders in any folder or disk that you select.

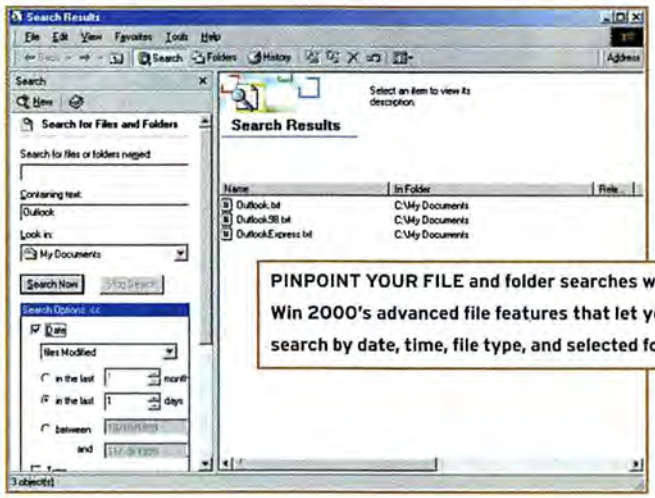
Search uses fairly basic criteria—just keyword or phrase, without more-sophisticated Boolean logic. But you can use the asterisk (*) and question mark (?) as wildcard characters in the file or folder name and text fields. You can use the asterisk as a prefix (*.doc), suffix (boo* could return *boogie*, *boolean*, or *bootstrap*), in the middle of a string of characters (*tr*ble* could fetch *trainable*, *tribble*, and *trouble*), or some combination of uses (*My*). Each question mark stands for a single character (*boo?* could return *book* or *boot*).

For more-sophisticated searches—based on file date, file type, or size—click the *Search Options* heading, and click a check mark next to the relevant search criterion. Click *Date*, for example, and you're presented with a list box that enables you to narrow your search to files created, modified, or last accessed within a timeframe of days or months, or in a date range. The Type and Size criteria enable you to narrow a search to any registered file type of a given size. In addition, the Advanced Options include the capabilities to switch off subfolder searching, enable case sensitivity, and search so-called slow files—that is, files that reside on removable storage media.

SAVE AND REUSE YOUR SEARCHES

DO YOU SEARCH for the same type of file or a specific directory on your hard drive frequently? Don't squander your efforts—save whatever set of criteria you use in Search and reuse it. After you finish constructing your search query and conducting the search, right-click in the search results pane (or select the *File* menu) and select *Save Search*. You will be prompted for a file name and location, and Search will save the results as a file with the extension .fnd.

To conduct the search again, use Explorer to track down the .fnd file and double-click it. This launches the Search with ▶



PINPOINT YOUR FILE and folder searches with Win 2000's advanced file features that let you search by date, time, file type, and selected folders.

Extend

"Its DualHead Display is the most powerful dual-monitor implementation we've seen."
- PC Magazine (November 1999)

Play

"Players of all skill levels will enjoy the excitement, intensity and strategic advantage gained from multi-display game play."
- Microsoft on Baseball 2000

Zoom

"Matrox has demonstrated valuable insight into the needs of the professional graphics market through the development of their DualHead Display."
- Adobe Systems Incorporated

Share

"The quality of the bundled DVD player is amazing, by far the best software DVD decoder that I've seen to date."
- Extreme Hardware (August 1999)

Matrox **DualHead** Ready

Double your desktop

And reach new levels of business productivity and home entertainment

The underlying principle behind a graphics card is to process and speed up 2D and 3D graphical functions. The award-winning Millennium G400 has taken speed and unprecedented image quality a step further, by adding practicality and flexibility into the mix. Its innovative DualHead Display feature, for example, is essentially a free built-in upgrade that has revolutionized mainstream computing by giving you the ability to not only see more, but do more with your computer. Whether you're thinking of buying a new monitor or have an old one lying around, the beauty of DualHead is that it's ready when you are. You can hook up a TV and output a presentation, or set up a second monitor for more desktop space. And should you ever want to upgrade to a digital flat panel, the Millennium G400 is right there with you.

"DualHead brings new application possibilities to the PC"
-Hewlett Packard

One chip: 8 display options

Unique to Matrox, the revolutionary DualHead Display technology allows a single graphics chip to support two separate displays, making it the most cost-effective multi-display solution available. With up to eight different configuration options to choose from, you have the flexibility to customize your desktop to your exact needs.

DualHead Multi-Display

This feature allows you to double your Windows® desktop for a larger viewing area and a less crowded desktop. You can now extend or move one application window across two monitors or open multiple applications at once for a truly efficient display setup. Imagine being able to refer to research material from the web on one monitor while writing a Word® document on the second; all without having to toggle back and forth between windows.

DualHead DVDMax

With the highly versatile DualHead DVDMax mode you can share your computer with multiple users for a truly flexible single PC solution. You can watch DVD content on your TV, while someone else accesses e-mail or a web browser on the main monitor. Without DVDMax, you would lose the use of your desktop when running a DVD video because the DVD window would be forced to cover the screen.

DualHead Zoom

With the easy-to-use DualHead Zoom mode, you can now instantly zoom any region of your desktop to the second monitor without losing sight of the original desktop on the main monitor. This is ideal for remarkably precise photo retouching, or for enlarging detailed areas of a document, drawing or presentation.

DualHead TV output

DualHead TV output mode, meanwhile, lets you output corporate presentations or 3D games onto a big screen TV. But unlike other TV output solutions, the Millennium G400 doesn't lock the refresh rate of the primary monitor to that of the TV, thereby preserving the flicker-free displays that Matrox is famous for.

High performance 2D/3D & DVD

The Millennium G400 gives you innovative display features as well as the high performance graphics features you've come to expect from Matrox, including blistering 2D, 3D and DVD video acceleration with 16 or 32 MB of memory and compatibility with AGP 2X/4X systems. With an UltraSharp RAMDAC of up to 360 MHz and unique support for 3D Environment-Mapped Bump Mapping, the Millennium G400 remains the undisputed leader in graphics technology.

Upgrade or integrate

To upgrade your current AGP system you can buy a Millennium G400 graphics card direct from the **Shop@Matrox Online Store**. Or you can choose to purchase the Millennium G400 as an integrated or pre-installed component in a new PC from Compaq, Dell, Fujitsu/Siemens, Hewlett Packard, IBM, or your local system integrator.

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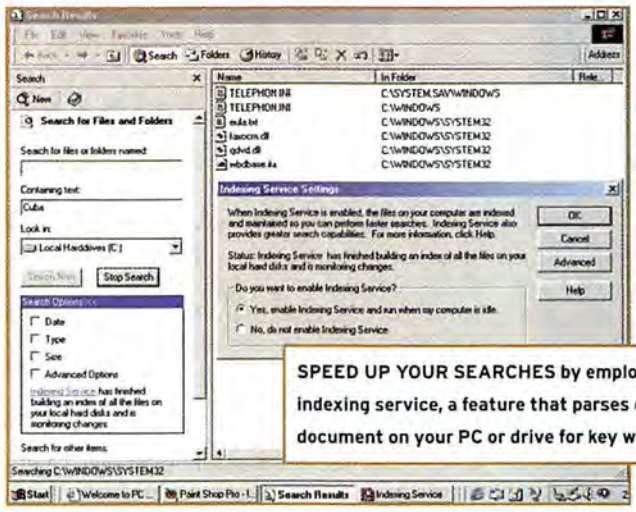
the save criteria already conveniently inserted into the appropriate fields.

INDEXING FOR SWIFTER SEARCHES

TO SPEED up the Search function and increase its capabilities (such as searching for the author of a Microsoft Office document), use the Indexing Service. Click the *Indexing Service* link in the Search dialog box and follow the screen prompts. This begins a process that parses every document on your computer or specified hard drive partition, lifting properties such as author information from Office documents, e-mail and newsgroup messages, and HTML documents. It interprets a document's language and extracts key words. These details are indexed in a compressed file that Search can root through quickly.



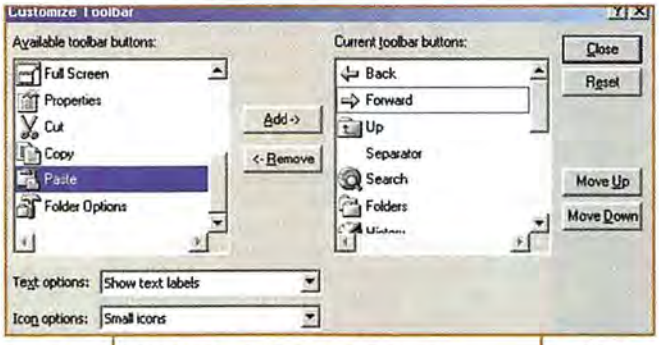
SPEED UP YOUR SEARCHES by employing indexing service, a feature that parses every document on your PC or drive for key words.

Indexing a whole hard disk takes time and system resources—you will want to compile your first index overnight while you're away from your computer. But subsequent indexing sessions don't take much out of your system, and they are performed automatically. Indexes don't take up too much disk space either—our index of almost 1700 documents takes up about 1 MB.

If you notice your system performance suddenly begin to drag, disable indexing for a while. Select *Start•Search•For Files and Folders*, click the *Indexing Service* link, and click *No, do not enable Indexing Service.*

CUSTOMIZE EXPLORER TOOLBARS

EXPLORER'S Toolbars aren't set in stone. To add or remove buttons, go to *View•Toolbars•Customize.* The customize dialog box contains two lists of buttons—Available toolbar buttons, and Current toolbar buttons. To remove a button, click its name in the Current toolbar buttons and click *Remove.* To add one, click the place you'd like it to fit in the Current toolbar buttons—the new button will go above the selected one—select the button you would like to add, and click *Add.* To change the position of a button, select it and click *Move Up* or *Move Down.* In addition, you can use your mouse to drag and drop list items to add, remove, or move. If you veer too far from a usable toolbar, you can revert to a default setting simply by clicking the *Reset* button in the Customize Toolbar dialog box.



MAKE YOUR OWN TOOLBAR: Windows 2000's customizing tool lets you add, delete, and move icons where you want them.

SAVE TOOLBAR TERRITORY

TIRED OF CLICKING the chevrons to see Explorer toolbar icons at the far right of your toolbar collection? Just lose the text labels to reclaim horizontal real estate.

Don't worry—if you forget what a button does, simply hold the mouse pointer over it, and a description will soon pop up. Select *View•Toolbars•Customize.* In the Text Options drop-down list box, select *No text labels.* This setting is immune to the Customize Toolbar Reset button.

QUICK COMPRESSION

TO SAVE DISK space, why not compress a file or folder you don't use often? This could be a program you use infrequently, old data you aren't ready to archive completely—anything that you can afford to load up a little slower than usual (yes, that's the trade-off with file compression).

In Explorer, right-click the file or folder, and select *Properties.* On the *General* tab, click the *Advanced* button, and click a check mark in the box labeled *Compress contents to save disk space.*

PREVIEW MULTIMEDIA FILES

IN ANY EXPLORER that uses the Web view—including those in the Search Results window—you can play a sound or video file without running a separate program. To play back .avi, .mpg, or .wav files, make sure that *Enable Web content in folders* is checked in *Tools•Folder Options•General,* and make certain that Windows Media Player or RealPlayer is installed.

PLAY BACK MULTIMEDIA previews in Windows Explorer by setting it to Web view.

Then select the ▶

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multimedia file. In the Web view's file information pane, a preview window will appear with the first frame of a video file, and a slider bar with player controls will appear for sound files. To listen, click the *Play* button. To check out frames of a video file, slide the bar beneath the preview.

TRIM THE FAT

IF YOU chose FAT or FAT32 for your file management system when you installed Windows 2000 but still want to take advantage of Windows' better, higher-security file management based on Windows NT File System, there is a solution.

You can convert the disk or partition—but it's time consuming. First, you must boot from a different disk or partition which is easiest to do using a system boot disk. (See "Create a Boot Disk" in "System Maintenance," page 136.)

Start the system in command line mode—it's an option that shows up during Windows 2000's boot-up. Its syntax is: **convert** [*drive:*] **/fs:ntfs [/v]**.

To convert your C: drive to NTFS you would enter **convert c: /fs:ntfs** with an optional **/v** at the end to specify verbose mode, that is, to display all messages as the drive is being converted.

But be aware that once NTFS is set up, the system will not longer be able to boot MS-DOS or Windows 9*x*.

CHANGE THE 'SEND TO' MENU

IF YOU send items to a particular destination—say, your floppy drive or a particular folder—one of the quickest ways to do it is to right-click the selected files in Explorer and select the *Send To* option.

By default, this menu includes common destinations such as My Briefcase. But it's easy to add to this menu, or remove items. In Explorer, double-click the drive where Windows 2000 is installed and open the *Documents and Settings* folder. Double-click your folder. Double-click the *Send To* folder, and add or delete new shortcuts as appropriate (select *File•New•Shortcut*, and locate the item you want to include as a new shortcut).

(Note: Unlike in Windows 95 and Windows 98, the Send To folder in Windows 2000 carries the Hidden attribute: If you can't see it, select *Tools•Folder Options* in any Explorer window, and click the *View* tab. As long as you make sure that *Show hidden files and folders* is selected, all files should remain visible.)

Controlling Security

WINDOWS 2000 KNOWS who you are. Before starting a session, you must have a user account with its own password. Even Default Users can use a password of no characters, but it *must* exist before you can get on. But this tactic can keep your desktop settings and document history away from prying eyes—since each user's settings are stored in a unique folder under the Documents and Settings on the hard disk that contains Windows 2000.

KEEP YOUR SECRETS

THERE ARE TWO quick ways to keep people away from your desktop when you ▶

Accessibility Tools

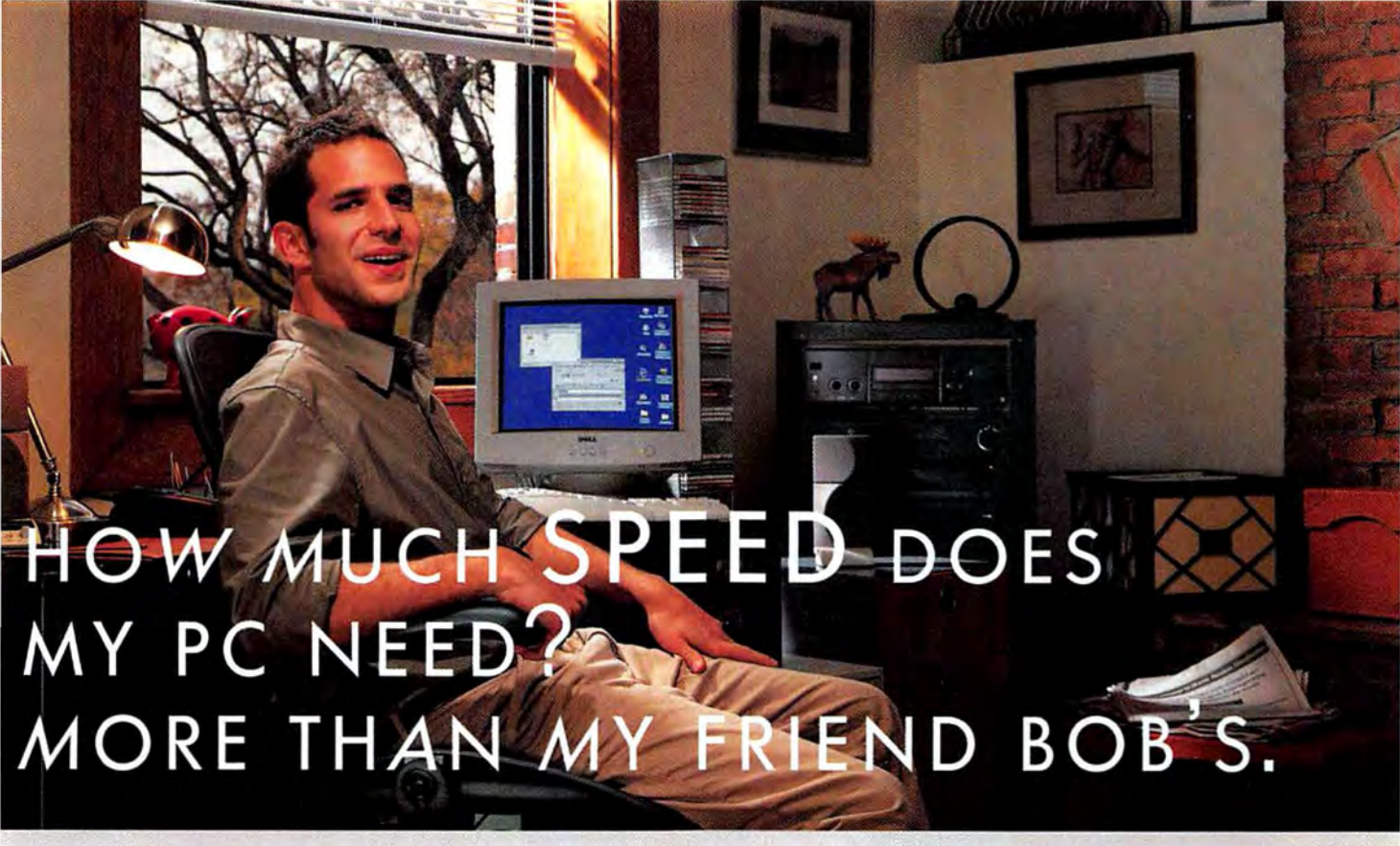
TO THOSE WITH IMPAIRED vision, hearing, or mobility, a multimedia graphical operating environment isn't necessarily a godsend. That's why Microsoft includes accessibility tools (Select *Start•Programs•Accessories•Accessibility*). Even if you have no impairment, you might find some of these applets useful. Here are the highlights, but be sure to check even more downloadable, robust tools at www.microsoft.com/enable.

Magnifier: This tool, which was initially introduced in Windows 98, repurposes the top sixth of the Windows screen so that it displays the area around the mouse cursor, magnifying it anywhere from two to nine times its standard size.

Windows Narrator: This text-to-speech engine explains where you are—whether the focus is on the desktop, in a dialog box, or in an application. A computer-generated voice reads out the text on buttons and menus, explains what check boxes are checked, and provides the keyboard actions necessary to close dialog boxes. To adjust the pitch and speed of the voice, just click the *Voice* button.

On-Screen Keyboard: For those who are unable to handle keyboards, Windows 2000 includes a customizable on-screen keyboard that you can type on using either a mouse, a trackball, or a joystick. While operating it, you can enter text in any running Windows application either by clicking letters, or for those who experience difficulty clicking, by hovering over a letter for a specified length of time (which is easy to configure in the dialog box under *Settings•Typing Mode*).

Utility Manager: To launch any of the three previously mentioned applications, use the Utility Manager (select *Start•Programs•Accessories•Accessibility*). As soon as the program launches, so does Narrator. But you can configure any of the three tools to launch when either Windows or Utility Manager starts.



Congratulations. You just left Bob and his computer back there about a half a mile, standing in a cloud of your dust. Meanwhile you're cruising at Mach II thanks to the new motherboard. Combined with RDRAM, it offers up to a 116% increased memory performance gain over earlier systems.[47] The result — *WHOA!* Start it up and you'll find that everything is faster, smoother, more realistic and more intense. Technology at warp speed. It's one more benefit of the Dell4me℠ total ownership experience. A complete resource for products and services that make it easy for you to get the most out of technology.

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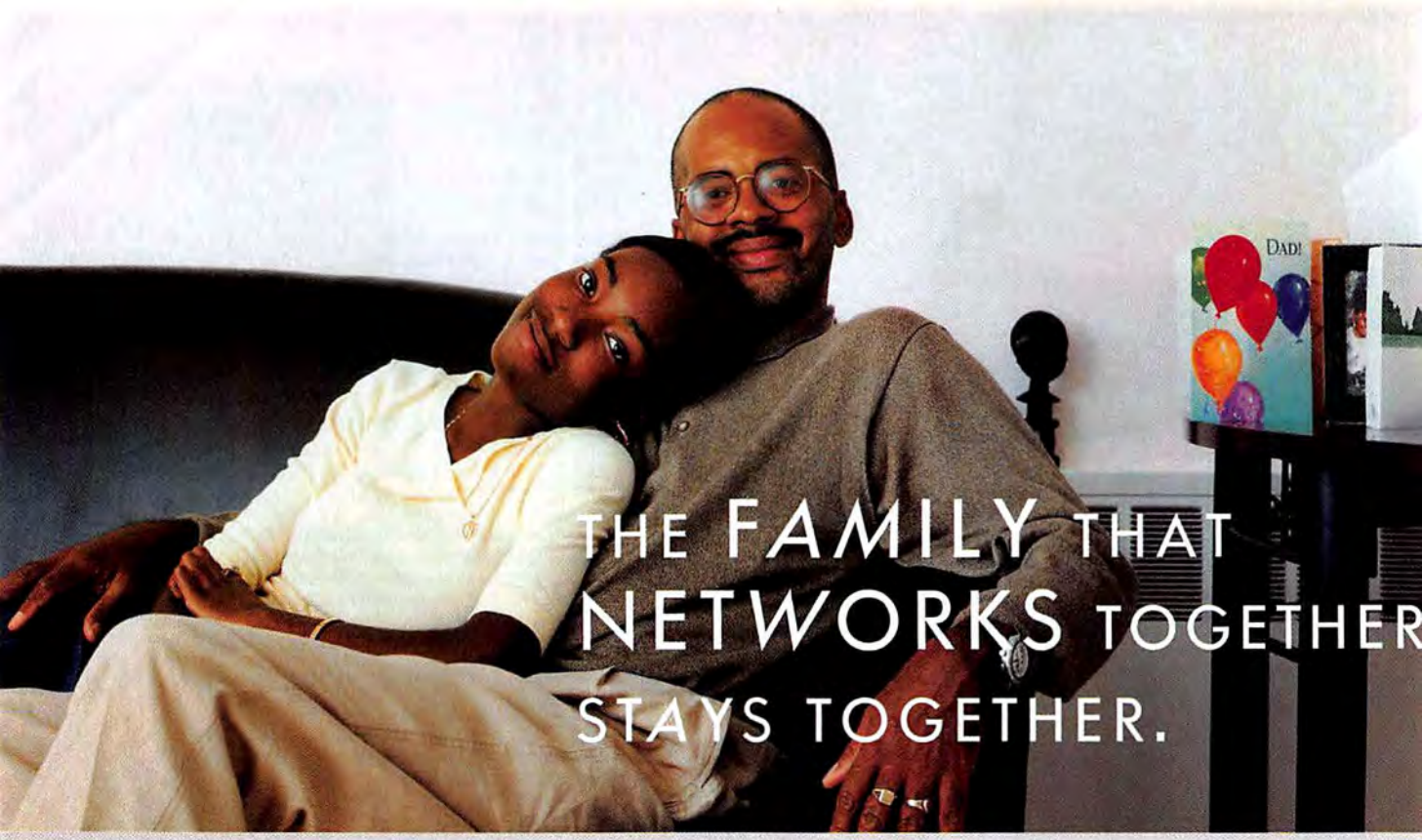

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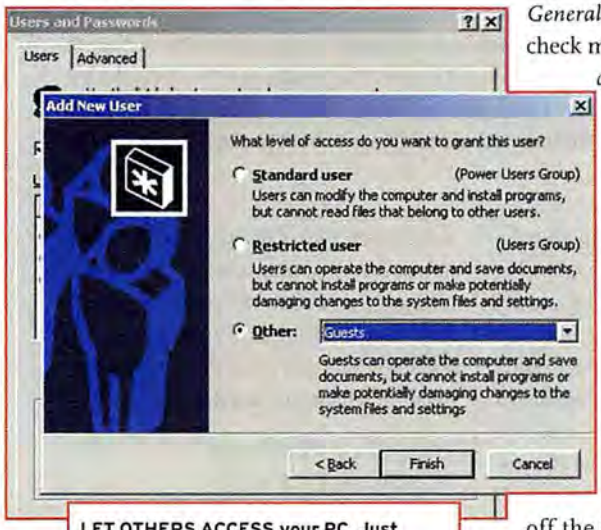
leave your machine for a while. Both involve pressing **<Ctrl>-<Alt>-<Delete>**. In Win 9*x*, the Task Manager box pops up with a three-finger salute. In Windows 2000, this key combo kicks up a six-button multiple-choice dialog box. Click *Lock Computer*, and your session is blanked out until you reenter your user name and password. When you're done with your session, click the *Log Off* button.

CREATE A NEW USER

IF YOU WANT TO allow access to your computer, but not to your desktop, documents, and so on, create a new user account. User accounts can be restricted at many levels, and can be set up in the Control Panel's *Users and Passwords* applet. Press its *Add* button, assign a user name and optionally, a full name, and description of the user. Click *Next*, and enter a password for the new user.



LET OTHERS ACCESS your PC. Just create a new user account and define each user's limits and level of network access.

On the next screen, you're faced with three choices of security level: Standard user, Restricted user, and Other. Standard and Restricted users can access programs and save documents, though neither can access other people's files without permission. Restricted users can't install software. The Other option allows a wider set of permissions, from omnipotent Administrators to Backup Operators, who can only run backup software. Pick the new user's restriction, click *Finish*, then *OK*.

RESTRICT USER PRIVILEGES

WHETHER YOU work in an office setting or at home, there are always some files and settings you want to protect from prying eyes or clumsy tinkering. Windows 2000 can help by enabling you to specify each user's access privileges.

Log on to Windows 2000 with an administrator-level account and select *Start•Settings•Control Panel•Users and Passwords*. Select the user name, and click the *Properties* button. Click the *Group Membership* tab, and select an appropriate level, such as *Restricted users*, or in the Other drop-down list, *Guests*.

ENCRYPT FILES OR FOLDERS

WINDOWS 2000's file storage system NTFS enables you to encrypt files and folders on your hard disk. To do this, right-click a file or folder you want to encrypt and select *Properties*. Under the *General* tab, select *Advanced*. Click a check mark in the box labeled *Encrypt contents to secure data*. When you encrypt a folder, you'll be asked whether you want to encrypt all the files and subfolders in it. No matter what you choose, all files and subfolders *subsequently* added to the folder will be encrypted as they are added.

This technique has some restrictions. You can't encrypt folders containing system files or compressed files and folders. If you have checked off the Compress option, you must uncheck it before you can encrypt.

LOCK YOUR DOORS

UNDER NT 4.0 and now under Windows 2000, all new users logging on must press **<Ctrl>-<Alt>-<Delete>** to perform a secure boot. But this process, anomalous for Win 9*x* veterans, adds a degree of security against casual snoops, and it's a Microsoft-recommended option in Win 2000. To turn it on, select *Start•Settings•Control Panel•Users and Passwords*. Click the *Advanced* tab, and place a check mark in the box labeled *Require users to press <Ctrl>-<Alt>-<Delete> before logging on*.

Working With Hardware and Software

THE MUCH-VAUNTED Plug and Play that almost worked under Windows 95 and 98 is still *almost* working under Windows 2000—but it's not automatic or error-proof. Windows 2000 has its idiosyncratic way of handling your troubleshooting issues. Likewise, installing and maintaining software in Windows 2000 is just different enough from the Windows 9*x* way that you'll have a new learning curve.

PLUG AND PLAY, NOT PRAY

SO-CALLED Plug and Play hardware hasn't always been quite as simple as advertised. Often when you first plug in a USB device under Windows 98, you have to check the folders in the installation CD-ROM until you find the right driver. Windows 2000 is smarter about finding drivers: It'll sweep through all the folders in any drive you point it to during an installation. In the Found New Hardware Wizard, select the source for drivers (say, your A: floppy drive or CD-ROM drive), and wait for Windows 2000 to find the right driver. If you don't have an installation disk, you still may not be out of luck. Windows 2000 has built-in drivers for a slew of hardware that Windows 98 did not—such as Imation SuperDisk drives. If Windows 2000 doesn't include the driver that you need, and the manufacturer does not provide it, you may still be able to substitute a downloaded Windows 98 driver for some devices. ▶

System Maintenance

NO MATTER HOW advanced your operating system is, it will not prevent your system from crashing. Sure, system crashes are less common with Windows 2000, but they still occur, and you need to be prepared for such calamities. Windows 2000 offers solutions unlike previous versions of Windows did to help you get back up and running. Here's how to get going with a couple of them.

CREATE A BOOT DISK

HERE'S A SIGN OF HOW times have changed: Instead of creating a boot disk as every PC operating system back to DOS 1.0 did, Windows 2000 uses *four* 1.44MB diskettes to hold all the boot data it needs. Of course, Windows 2000 can boot up from its CD-ROM to repair a corrupted Windows installation. But to create boot disks for notebooks or other PCs without permanent CD-ROMs, you need the floppies. First, hook up a CD-ROM drive with the Windows 2000 Pro CD-ROM in it and insert one of four formatted floppy disks into your system. Then select *Start•Run* (or press the **<Windows>** key and **R** simultaneously on a "Windows" keyboard). In the Run dialog box, click the *Browse* button, and select the CD-ROM drive that contains your Windows 2000 setup disk. Now go to the *BOOTDISK* folder and double-click *makeboot.exe*. Click *OK* to launch the command line program. Answer the prompt for your floppy drive's letter. Windows 2000 starts to copy boot files to the drive, prompting you to enter new disks as each one fills up.

BACK UP YOUR SYSTEM CONFIGURATION

DO YOU LIVE IN FEAR of serious corruption of your system configuration? Use a new option in Windows 2000's Backup program to back up the System State data. This compact backup set provides just enough information to restore settings—including the Registry, the system boot files, and the personalized configuration information—without requiring you to restore massive gigabytes of data files. It's an excellent precaution for Registry tinkerers with more enthusiasm than technical know-how.

To back up data, select *Start•Programs•Accessories•System•Tools•Backup*. In the dialog box, click *Backup Wizard* and *Next*, and in the radio buttons listed, select *Only backup the System State data* and complete the wizard and the backup. To restore System State data, insert the backup set that contains the information into the appropriate drive, run the *Restore Wizard* from Backup's Welcome tab, and select the correct backup set from the list.

PRINTER CONFIGURATION

IN PREVIOUS Windows versions, the Printers folder was in two places—under Start menu's Settings, and in My Computer. It's still under *Start•Settings* in Windows 2000, but not directly under My Computer. Instead, it's tucked away with all the other configuration tools in Control Panel. As with previous versions, to add a printer, double-click the *Add Printer* icon and follow the prompts. To choose a different default printer, right-click it and select *Set as Default Printer*. A check mark will appear on top of the new default printer's icon.

INSTALLING NON-PLUG-AND-PLAY DEVICES

THE CONTROL PANEL'S Add/Remove Hardware applet works differently and better under Windows 2000 than it did in previous versions of Windows. Launch it, and you get two options—to add or troubleshoot a device, and to remove or unplug one. Select *Add/Troubleshoot a Device*, and the wizard scans for new Plug and Play hardware. If it finds none, it will present a list of installed devices (in case you want to troubleshoot). Select *Add a New Device*, and click *Next*. The wizard will try to find new hardware, and if it fails, it will furnish you with a list of hardware categories from which to choose. If you don't find your hardware in the lists that the wizard provides, select *Other devices*, then *Next*. Click the *Have Disk* button, and use the manufacturer's drivers.

If you don't have the manufacturer's disk, download the drivers from the vendor's Web site and point the wizard to the folder in which you saved them.

WIN 2000's WIZARD for adding new hardware will search through all your directories to find the right driver, not leaving it for you to find the right locator.

PROPERLY REMOVING REMOVABLE DEVICES

WITH THE proliferation of USB devices, it's easier to remove hardware than ever before—but unlike Windows 98, Windows 2000 sometimes resists separation. Removing storage devices, modems, or network interface cards can cause problems for Windows applications that expect to access them—so Windows 2000 provides a safety warning when you try. Unplug a Zip or SuperDisk drive, for example, and a dialog box will warn you of the dangers.

Fortunately, however, Windows 2000 provides an Unplug or ▶

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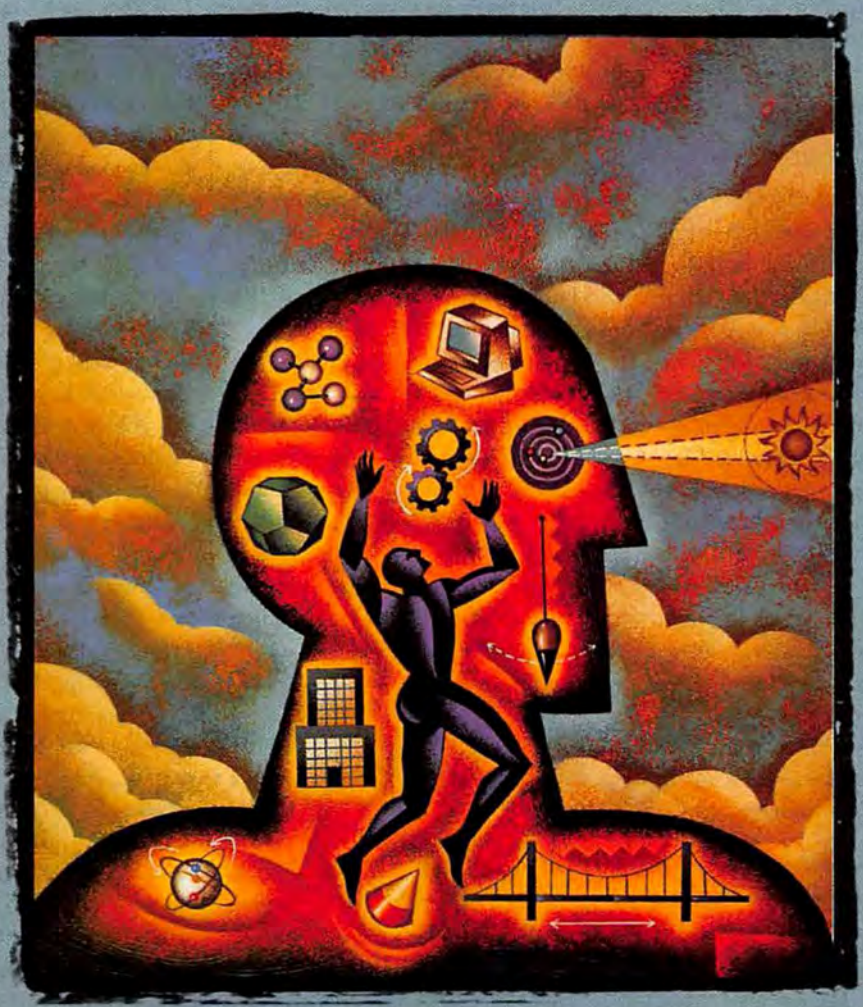

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Eject Hardware program, with an icon loaded in the system tray It lists any critical hardware you attempt to remove. Before removing the hardware, run the Unplug or Eject Hardware applet and disable the item.

TROUBLESHOOT HARDWARE

UNDER WINDOWS 2000, the Control Panel's Add/Remove Hardware applet streamlines the process of troubleshooting hardware. Launch it and select *Add/Troubleshoot a Device*. Any devices Windows 2000 recognizes as problematic appear at the top of the list, with yellow or red markings on them indicating the severity of the problem. Click an item to select any problem hardware, then click *Next*. You'll get an analysis of the problem; click *Finish* to launch the troubleshooting wizard.

FIND THE SYSTEM HOG

YOU'RE RUNNING only a few applications, but your PC's performance is lagging. Windows 2000 offers an easy way to find the culprit. Press **<Ctrl>-<Alt>-<Delete>**, and click the *Task Manager* button. You'll see a list of running programs under the Applications tab—but you'll find out more about your system resources by clicking the *Processes* tab. This lists all the system processes and applications, along with the memory and CPU usage for each. If you find one application hogging memory or CPU time, close it to free up others. But don't rush into this one-click decision: You could crash or lose unsaved data. Instead, press **<Alt>-<Tab>** to switch to it, then save data and exit the program in the normal way. Some programs may be minimized as icons in the system tray.

REMOVE THAT PESKY SELDOM-USED SOFTWARE

RUNNING SHORT of valuable disk space? Windows 2000 gives you more assistance than previous Windows versions did in deciding what programs to remove. Where Windows 95 and 98 provided a straight, no-frills list of program names in Control Panel's Add/Remove Programs, Windows 2000 supplies a highly detailed list.

Click the name of a program to select it, and the listing expands to show details such as the exact time the program was last used; a summary of whether the program is used often, frequently, or rarely; and in most cases, the amount of disk space the program takes up.

Also in the summary are Change and Remove buttons, which you can click to determine the future status of the program. But be forewarned that in some cases doing so will automatically remove the program—*often without any further warning*. Many office suites, however, provide you with the opportunity to customize a program's configuration by adding or removing components.

REMOVING A DEVICE under Win 2000 can cause problems later, so expect to get a warning screen alerting you to the proper way to remove hardware.

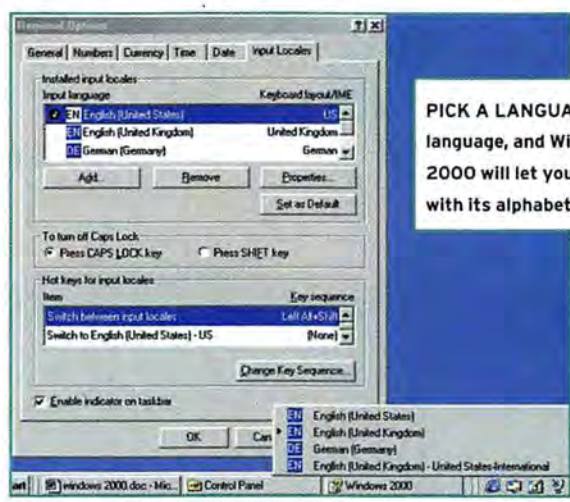
MULTILINGUAL SUPPORT

SPRECHEN SIE DEUTSCHE? *¿Se habla español*? Want to write letters in those languages—or read a document written in yet a different language? Windows 2000 lets you localize the layout of the keyboard and other system settings to include languages with alphabets as diverse as Cyrillic, Hebrew, and Thai. These settings also include alternate formats for rendering dates (which in the United Kingdom, for example, run dd/mm/yy), currency, and numbers. Best of all, you can install support for multiple languages and swap them in when you need them.

To set up a new language for your system, log on as Administrator, then open Control Panel's *Regional Options*. Click the *Input Locales* tab. Click the *Add* button, and select a new language from the Input Locale drop-down list box and the appropriate keyboard layout from the other drop-down list box. In the Installed Input Locales list, a check mark appears next to the default Input language.

Once you've installed all the language settings you intend to use, make sure there's a check mark in the box *Enable indicator on taskbar*. Then click *Apply* or *OK*. A blue *Regional Settings* square with two letters in it will appear in the taskbar's system tray, next to the clock.

When you are ready to handle a foreign-language document, click the blue *Regional Settings* icon. From the pop-up small list, pick the appropriate language. Menus, toolbars, and dialog boxes will all remain in their original settings, but in most applications, you will be able to read and write documents in different languages and alphabets, using regional keyboard layouts.



PICK A LANGUAGE, any language, and Windows 2000 will let you work with its alphabet.

Attention! ¡*Cuidado*! *Vorsicht*! If the letters in the Regional Setting square next to the system clock are *EN*, the language is set for English—but it could be U.K. or U.S. English. Depending on your preference, click the *Regional Settings* square to expand the label or change the language. ▶

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Dealing With Networks and the Internet

IN WINDOWS 2000, you set up connections to local area networks and the biggest network of them all—the Internet—using the same setting in the Control Panel. Network and Dial-up Connections steps you through the basics—but once you're connected, the fun really begins...

SHARE INTERNET CONNECTIONS

AS IN WINDOWS 98 SE, Windows 2000 can connect all the computers on a home or small-office network to the Internet using a single network connection. To arrange this cooperation, you have to set up a shared connection—and the procedure is pretty straightforward. On the computer that connects to the Internet, select *Start•Settings•Network•Dial-up Connections*. Right-click the listed connection that you want to share, and click *Properties*. Select the *Sharing* tab, and then click a check mark into the *Enable Internet connection sharing for this connection* box. Want another computer to dial up if the connection's not active? Just click a check mark into the *Enable on-demand dialing check box*.

To use the shared connection, rerun the Internet Connection Wizard on the networked computers and choose *Connect through LAN*.

Caveat: In setting up shared network access, Windows 2000 assigns IP addresses to the computer with the Internet connection—so it's not recommended if the computers on your network have a static IP address assigned by an ISP (something cable providers typically do, for example). Also, don't try this if your network uses Windows 2000 Server or Windows NT domain controllers, DNS servers, gateways, or DHCP servers.

ASSIGN A DRIVE LETTER TO A SHARED FOLDER

IF YOU OFTEN use a shared folder on someone else's computer, why take the time to drill down through My Network Places to locate the computer and the folder on it. It's much more convenient to map the folder to a drive letter—where it's easy to locate files using File Open dialog boxes or switch to the drive in Explorer. To map a shared resource to a drive letter, open Windows Explorer and select *Tools•Map Network Drive*. Select an open drive letter in the Drive area; click the *Browse* button next to the Folder field to find the shared folder. Then click *OK* and *Finish*.

THE QUICKEST ROUTE to any shared folder is via a single assigned drive letter.

SYNCHRONIZE OFFLINE

NETWORK drives are great places to store your data files—your administrator handles backup, and you can get to them from someone else's PC if yours goes under. But what if the network goes down or you disconnect your laptop from it? Windows 2000 has a great fix: It can flag folders or files as Available Offline. Under My Computer or My Network Places, find the shared network file or folder that you want uninterrupted access to. Select *File•Make Available Offline*. If you don't see this option, set your PC to use offline files. In My Computer, select *Tools•Folder Options*. Click the *Offline Files* tab, and check *Enable Offline Files*.

FLAG THE FOLDERS or files you want to use when you are not on the network by using the Make Available Offline tool.

The first time you try to make an item available offline, the Offline Files Wizard steps you through the process and syncs up the files on your hard drive and the network. When your network connection drops, the Offline Files icon appears in the status area (formerly known as the system tray, where the clock appears on your taskbar) with a balloon explaining you are offline. But you can continue to work with your files. When you reconnect, Windows 2000 updates the files you've worked on with those on the network.

Synchronizing offline files and folders is foolproof. If someone else has edited a network file you've made available offline, you'll be given three options: Keep the one on the network, keep the one on your hard drive, or keep both. If you delete an offline file, but someone else edits its network counterpart, it'll remain on the network after synchronization. Files put in the network folder are added to your offline files when the computers sync up.

online *You can find additional tips about Windows 2000 at PC World Online at www.pcworld.com/maroo/win_tips. Matt Lake is a freelance technical writer based in Ridley Park, Pennsylvania.* ■

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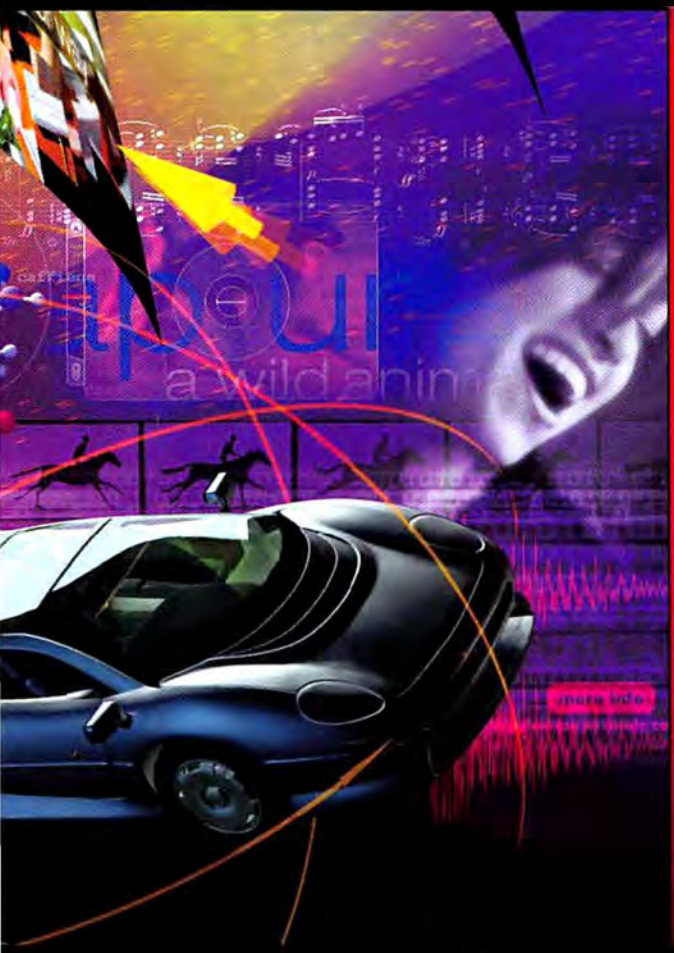

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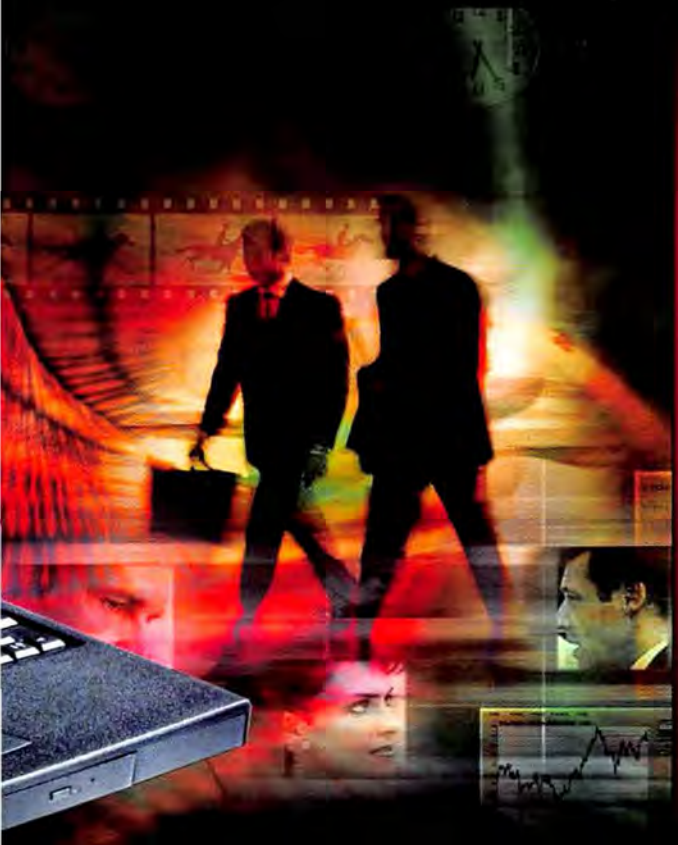

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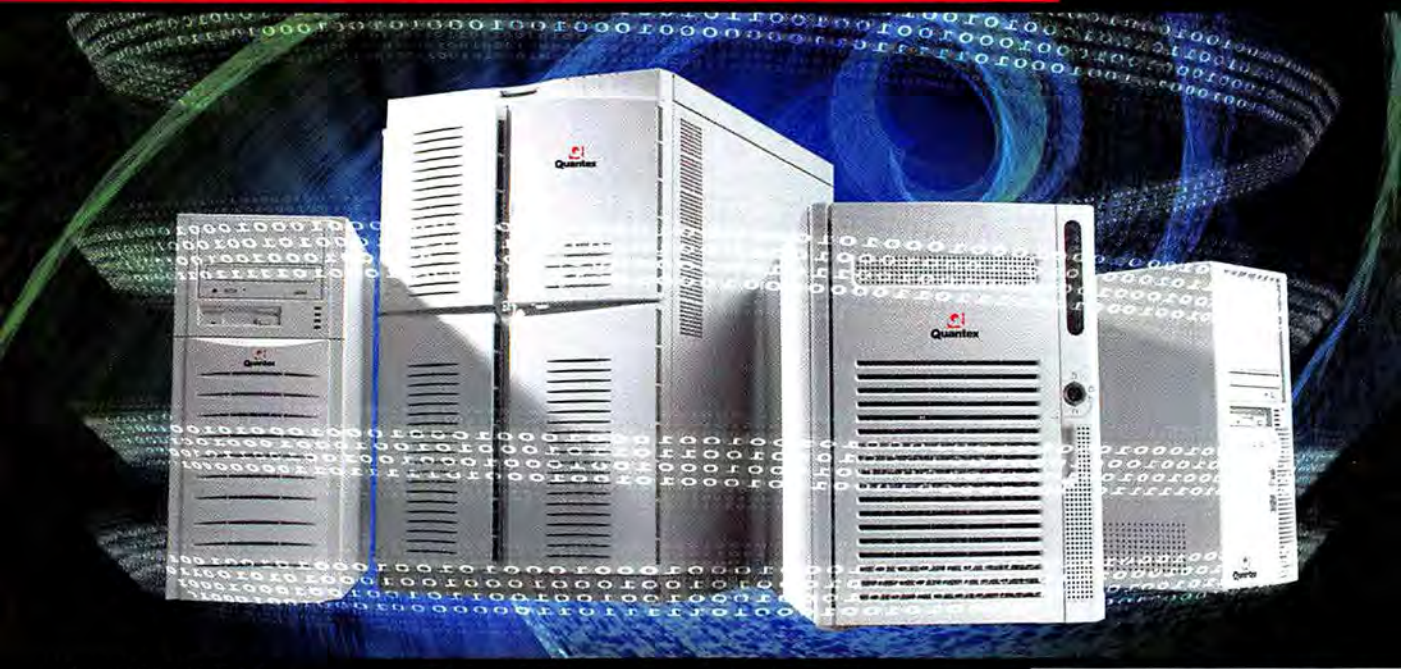

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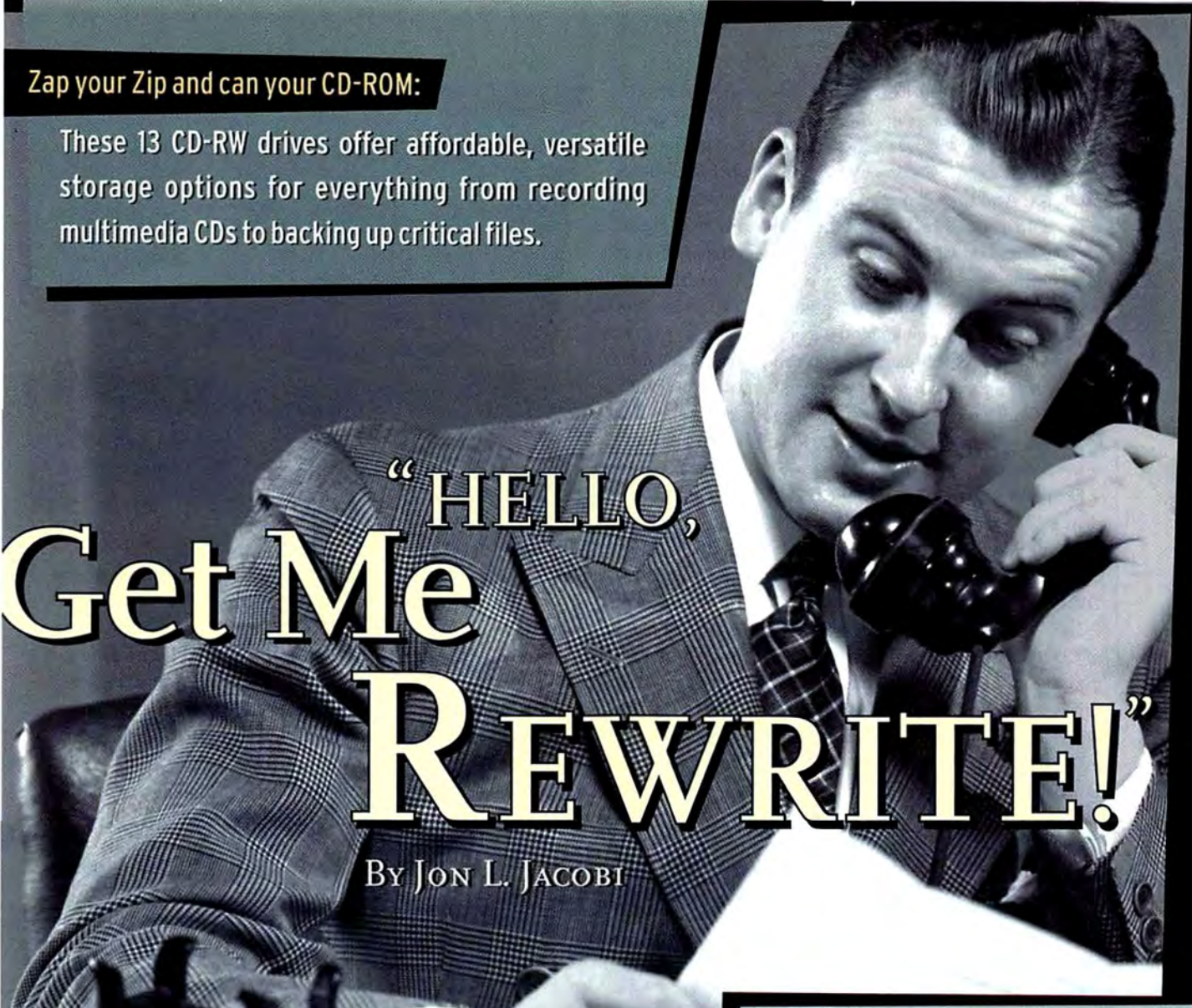
Zap your Zip and can your CD-ROM:

These 13 CD-RW drives offer affordable, versatile storage options for everything from recording multimedia CDs to backing up critical files.

"Hello, Get Me Rewrite!"

By Jon L. Jacobi



DOUBLE SPRESSA TO GO: Sony's Spressa Professional writes fastest in this group.

YOU PUT all-weather tires on your car. You use all-temperature laundry soap. Why can't you find all-purpose storage for your PC? Floppy drives are painfully small and snail slow. Zip drives are faster but far from universal, and the media isn't cheap. Optical drives are even more rare and expensive. But now, new CD-Rewritable drives combine affordability with enough speed and flexibility to qualify as a first-rate storage option. ▶

DIGITAL PHOTOGRAPHY: KEN SMITH; STOCK IMAGES: PHOTODISC; PHOTO COLLAGES: SANDRA KELCH

The big news: Speed. This crop of CD-RW drives makes last year's models look like slackers. These drives write CD-RW media at 4X and CD-Recordable media at up to 8X. And they can read CD-ROM disks at up to 32X, which means they can replace standard CD-ROM drives. (For information on speed ratings, see "X-ceedingly Complex X-ratings X-plained," page 160.) Here's a telling point: According to Iomega's specifications, you can *write* data to its Zip drive about 50 percent faster than to a CD-RW, but Iomega's own CD-RW drive can *read* data four times more quickly than its Zip drive.

Flexibility is another charm of CD-RW drives: They can all read CD-ROM discs and write to both CD-R and CD-RW media (and a new type of CD-RW drive can read DVD-ROMs as well). Because nearly every PC sold in the last decade sports some sort of CD-ROM drive, the format is almost as ubiquitous as the floppy drive. CD-RW drives aren't nearly as common, but they are becoming more popular: Sony's newest desktop PCs carry both CD-RW and DVD-ROM drives in place of CD-ROMs.

Other removable storage solutions also have their advantages, but each of them imposes unique limitations. For instance, Iomega's Zip drive works well if you want reasonably fast data transfers and media that'll fit in a shirt pocket. But its discs cost up to six times as much as CD-RW media, and they work only in other Zip drives. (Plus Iomega now makes 250MB discs that won't work in the older, more common, 100MB drives.) And though many PCs feature Zip drives, CD-ROMs are still more prevalent. Castlewood's Orb drive and Iomega's Jaz drive both offer the hard drive–style speed and capacity needed for audio and video applications, but they aren't common either. And their cartridges cost even more—$40 for the Orb and $125 for the Jaz. Tape drives remain the only option for backing up today's gigantic hard drives on a single discrete unit of media. But finding and retrieving files on them can be slow. And while tape may be the only storage media that competes with the cost per megabyte of CD-

THE REWRITE STUFF — FEATURES COMPARISON

	CD-RW DRIVE [1]	Street price (12/01/99)	CD-R speed	CD-RW speed	CD-ROM speed	Drive type	Price	Performance	Features	Documentation
1	Hewlett-Packard CD-Writer Plus 9110i 800/826-4111 www.hpcdwriter.com	$269	8X	4X	32X	EIDE	Average	Very good	Very good	Very good
2	LG Electronics CED-8042B 800/243-0000 www.lgeus.com	$160	4X	4X	24X	EIDE	Very inexpensive	Good	Good	Good
3	Ricoh MP 7060A 877/742-6479 www.ricohdms.com	$249	6X	4X	24X	EIDE	Average	Very good	Good	Good
4	Sony Spressa Professional CRX140S/C 800/352-7669 www.sony.com	$399	8X	4X	32X	SCSI	Very expensive	Very good	Good	Good
5	Acer CRW 4432A 800/379-2237 www.acerperipherals.com	$199	4X	4X	32X	EIDE	Inexpensive	Very good	Satisfactory	Good
6	TEAC 4x4x32 CD-RW 323/726-0303 www.teac.com	$199	4X	4X	32X	EIDE	Inexpensive	Very good	Good	Good
7	Ricoh MP 7060S 877/742-6479 www.ricohdms.com	$299	6X	4X	24X	SCSI	Average	Very good	Good	Good
8	Iomega ZipCD 650 800/697-8833 www.iomega.com	$210	4X	4X	24X	EIDE	Inexpensive	Good	Good	Very good
9	Plextor PlexWriter 800/886-3935 www.plextor.com	$279	8X	4X	32X	EIDE	Average	Good	Very good	Good
10	Yamaha CRW8424SZ 714/522-9011 www.yamaha.com	$350	8X	4X	24X	SCSI	Expensive	Very good	Good	Good
11	Pacific Digital CR-4804TE 888/333-6732 www.1pdc.com	$179	4X	4X	24X	EIDE	Inexpensive	Good	Satisfactory	Good
12	TDK VeloCD Re-Writer 8x/4x/32x 800/835-8273 www.tdk.com	$300	8X	4X	32X	EIDE	Average	Very good	Good	Good
13	Philips PCRW404K 888/239-6948 www.pcstuff.philips.com	$249	4X	4X	32X	EIDE	Average	Satisfactory	Satisfactory	Good

Best Buy

[1] Listed in order of overall value.

R and CD-RW, it's basically a one-trick format, performing backups.

The consumer CD-R–only drive is doomed, though CD-R maintains a niche in high-end uses such as audio recording. CD-RWs can do all that CD-Rs do, and much more, usually for only a few extra bucks. DVD-RAM is still pricey, and it can't write to other optical media (see "DVD-RAM: Waiting in the Wings," page 151).

Any of the CD-RW drives reviewed here can perform all the functions of other storage devices to at least some degree, and they may save you money. CD-RWs are fast enough for making daily backups, archiving images and databases, or whipping out quick copies of files for clients. And you needn't worry about the cost: The average price of a CD-RW disc now hovers around $3, and CD-R discs (that you can write to once) cost as little as $1.

BURNING NEEDS

THE POPULARITY of CD-RW drives is also due in part to the many ways in which you can connect them. Besides EIDE and SCSI drives, vendors now offer CD-RWs that connect to parallel, USB, or IEEE 1394 ports. We picked internal EIDE drives for this review because they're the most popular and least expensive, plus three SCSI drives to test their ostensible performance advantage over EIDE drives. USB and parallel port drives sacrifice speed for ease of use, and no vendor could supply us with an IEEE 1394 drive, so we didn't test either type. However, we also test CD-RW drives monthly on PC World Online; you can check there to read reviews of all CD-RW types.

Only the last generations of CD-ROM drives can read rewritable discs.

CD-R and CD-RW discs offer equal capacities and durability. They both hold up to 650MB (or 700MB on discs that cost about 50 percent more). Manufacturers estimate that both recorded media last as long as 70 to 200 years, making them great for archives (except that the discs don't come encased in a protective shell, and scratches can ruin them). Your choice of media depends on the application. CD-Rewritables make the more practical and economical choice: You can overwrite a CD-RW disc up to 1000 times, but you can write a CD-R disc only once. When the information on your CD-R becomes obsolete, there's nothing to do but toss the disc or add it to your coaster collection.

CD-Recordable does offer some advantages over CD-RW, and compatibility leads the list. Only the last couple of generations of CD-ROM drives are able to read rewritable discs, while practically all drives can read CD-Rs. Furthermore, conventional audio CD players will read ▶

Installation	Support	Comments	CD-R software included	Bundled packet-writing software	Other bundled software	Product info number [2]
Very good	Satisfactory	Top-notch speed and easy installation, but stingy support.	Adaptec Easy CD Creator 3.0	Adaptec DirectCD 3	Brøderbund Print Shop, Filing Central, HP Disaster Recovery, Multimedia Organizer Professional, Neato CD Labeler, Sonic Foundry Acid	638
Good	Good	Price leader offers around-the-clock support.	Adaptec Easy CD Creator 3.5	Adaptec DirectCD 2.5	None	639
Good	Good	Above-average speed, but a bit noisy.	CeQuadrat's WinOnCD 3.6	CeQuadrat PacketCD	Justaudio, Seagate Backup Exec	640
Good	Excellent	Stellar speed; bundled software can write to two drives at once.	Sony CD Extreme	Prassi abCD	CD Stomper Pro, Mixman Studio Pro Music Creation, Spressa Back-Up with disaster recovery, Spressa Play & Record MP3 player with CD recording	641
Good	Excellent	Low price and around-the-clock support, but small buffer.	Adaptec Easy CD Creator 3.5	Adaptec DirectCD 2.5	None	642
Good	Poor	Best performer when reading CD-R discs.	Adaptec Easy CD Creator 4	Adaptec DirectCD 3	Adaptec Jewel Case Creator, AudioMatic, Liquid Audio	643
Good	Good	Includes SCSI adapter.	CeQuadrat's WinOnCD 3.6	CeQuadrat PacketCD	Justaudio, Seagate Backup Exec	644
Very good	Good	Reasonable price and easy installation.	Adaptec Easy CD Creator 3.5	Adaptec DirectCD 2.5	1-Step Backup, Photoshop LE, Quick Sync	645
Good	Satisfactory	Uneven performance, but excellent audio features.	Adaptec Easy CD Creator 3.5	Adaptec DirectCD 2.5	AudioFS, PlextorManager 2000	646
Good	Excellent	Pricey, middle-of-the road performer has round-the-clock support.	Adaptec Easy CD Creator 3.5	Adaptec DirectCD, Adaptec Toast	Adaptec CD Copier Deluxe, Adobe PageMill, Adobe PhotoDeluxe Business Edition, CD labeling software and application tool	647
Good	Very good	Its price is attractive, but other drives outrun it.	Adaptec Easy CD Creator 3.5	Adaptec DirectCD 3	MP3 player, Sonic Foundry Acid, Sound Forge XP demo	648
Good	Good	Midrange performer is on the expensive side.	Adaptec Easy CD Creator 3.5	Adaptec DirectCD 2.5	Adobe ActiveShare, MusicMatch Jukebox, TDK CD Blender	649
Good	Very good	Average price offset by flagging speed.	Philips Write2CD by CeQuadrat	CeQuadrat Packet Writer	Backup compression system, CD-label maker, audio sampling	650

[2] For more information about all the products listed in this table, select number 904 on the product information card, or visit www.pcworld.com/productinfo.

DIGITAL PHOTOGRAPHY: KEN SMITH; PHOTO COLLAGES: SANDRA KELCH; STOCK IMAGES: CORBIS (LEFT), PHOTODISC (RIGHT)

CD-R discs, but only the very newest players will read CD-RWs. Then there's the time factor—many CD-RW drives write CD-R discs faster than they do CD-RW discs, and most drives read CD-R discs faster.

Performance depends not only on your choice of media but also on how you use a CD-RW drive. With *session writing*, you select a group of files from within a session writing application and write it all to the CD in one fell swoop.

Packet writing, on the other hand, lets you use CD-RW discs as you would any other removable media, dragging and dropping in Windows Explorer to write or delete files at will. But this flexibility exacts a price: Packet writing ropes off about 150MB, almost 25 percent of the disc's capacity, for file system data—the directory information for the rest of the files on the disc. In contrast, writing sessions lets you use nearly all of a CD's capacity, and that method is also typically a bit faster than packet writing.

DISC INFERNO: LG Electronics' 4X drive is the least expensive CD-RW drive we tested.

To some extent, the writing method depends on your choice of CD-R or CD-RW. Ninety-nine percent of the time, you'll write CD-R in sessions—the write-once nature of CD-R media lends itself to archiving large batches of files. But packet writing makes more sense for CD-RW: You can treat the discs like any other form of mass storage, such as a hard drive, a floppy drive, or a Zip drive.

When should you choose writing from an image (precreating a single file that holds all the individual files to be written), and when should you go with on-the-fly writing? If your system won't support burning on the fly (as is sometimes the case with older, slower computers), or if you want to burn multiple copies, creating an image first is your best bet. Writing copies from an image takes less time during the burn, but it takes time to set up. If you're only copying once, it's more time-efficient to burn on the fly.

TEST REPORT

CD-RW Drives Store More, Spin Faster

Sony wins the speed trials, but Hewlett-Packard also performs well.

	CD-RW DRIVE[1]	Controller type	Manufacturer's preferred DMA setting	Test times for recording to and copying from CD-R discs (minutes:seconds)			Test times for recording to and copying from CD-RW discs (minutes:seconds)		
				Write 430MB to CD-R from master image	Write 430MB to CD-R on the fly	Copy 430MB from CD-R	Write 100MB to CD-RW using packet writing	Rewrite 100MB to CD-RW using packet writing	Copy 100MB from CD-RW
1	Hewlett-Packard CD-Writer Plus*	EIDE	On	7:10	7:37	3:50	3:25	4:14	1:16
2	LG Electronics CED-8042B	EIDE	Off	13:51	14:24	5:09	3:38	5:49	2:19
3	Ricoh MP 7060A	EIDE	Off	9:12	9:26	5:25	3:30	4:28	1:14
4	Sony Spressa Professional	SCSI	n/a[2]	7:05	7:17	4:12	3:24	3:25	1:25
5	Acer CRW 4432A	EIDE	On	13:51	14:20	4:35	3:36	5:22	1:03
6	TEAC 4x4x32 CD-RW	EIDE	On	13:41	14:47	3:30	3:39	4:31	2:10
7	Ricoh MP 7060S	SCSI	n/a[2]	9:15	9:21	4:41	3:31	4:22	1:05
8	Iomega ZipCD 650	EIDE	On	13:50	14:24	4:30	3:43	7:52	1:00
9	Plextor PlexWriter	EIDE	On	7:11	7:47	4:11	3:48	8:08	2:18
10	Yamaha CRW8424SZ	SCSI	n/a[2]	7:12	7:46	4:39	3:48	6:38	3:31
11	Pacific Digital CR-4804TE	EIDE	Off	13:51	14:19	5:24	3:40	7:22	1:48
12	TDK VeloCD Re-Writer 8x/4x/32x	EIDE	On	7:11	7:40	4:14	3:47	7:48	2:17
13	Philips PCRW404K	EIDE	Off	14:28	14:49	9:22	3:56	6:60	:59
				Faster			Faster		

*Best Buy n/a = not applicable

TEST PC WORLD CENTER **HOW WE TEST** We used a Micron Celeron-400 system with 64MB of SDRAM and a 13GB hard drive. The CD-RW drives were tested with the vendors' recommended DMA setting (on or off) as the master on the secondary IDE channel. To gauge CD-RW performance, we formatted a CD-RW disc, wrote 100MB to it, overwrote the same 100MB without deleting the data first, then copied the 100MB back to the hard drive. We judged CD-R write performance by how quickly each drive wrote a disc using a precreated 430MB image, and then wrote 430MB of files on the fly (without creating an image beforehand). We also tested the drives' capability to copy CD-R media by copying back the same 430MB of data. To judge CD-ROM read performance, we used

AS OUR TESTS REVEAL, you should not buy a CD-RW drive based solely on its X-ratings. Two drives with the same CD-RW X-rating may perform dramatically differently. Software plays a big part in performance; many of the drives we tested use the same software for the basic functions, but some drives also throw in some of their own applications. None of the drives here require special effort to set up, but a couple deserve notice for making setup especially easy. The drives also vary in price, ranging from $160 to $399.

Our Best Buy, Hewlett-Packard's CD-Writer Plus 9110i, outperformed all but one drive and did it with a midrange price. And you don't have to work hard to get great performance—HP's installation was easier than that of all the other drives.

Sony's Spressa Professional SCSI drive squeaks by the HP on performance and offers better support policies, but it costs $130 more. Among the 4X drives, LG Electronics' $160 CED-8042B is a standout. ▶

Test times for reading from CD-ROM discs (minutes:seconds)

Microsoft Office 2000 install	Digital extraction from audio CD	Overall drive rating (speed)
5:26	3:09	21.0X
5:46	3:09	12.6X
5:56	3:23	15.1X
5:17	3:45	20.4X
5:27	4:16	18.9X
5:00	4:23	21.0X
5:41	2:42	15.9X
6:18	4:20	16.0X
6:49	2:13	21.4X
5:42	2:05	15.8X
6:10	3:10	14.9X
6:12	2:34	21.4X
6:45	4:24	15.9X
Faster		Higher = better

Testa Labs' CD Tach 98 version 2.0, which provides an overall X-rating and measures CPU usage. We tested digital audio extraction capabilities by extracting a single 250MB audio file. [1]Listed in order of overall value. [2]SCSI drives do not use DMA.

DVD-RAM: Waiting in the Wings

LOOK HONEY, I BURNED YOU A DVD: A DVD-RAM drive holds gigabytes, but it can't hold a candle to the flexibility of CD-RW.

IF YOU'RE LOOKING for more capacity than CD-RW can provide, DVD-RAM may be your answer—as long as you can live with some significant limitations.

Creative Labs recently dropped the price on its 2X DVD-RAM drive to $299—about the price of an 8X CD-RW drive. These drives read and write cartridges containing 2.6GB of single-sided or 5.2GB of double-sided media—about nine times the capacity of a packet-written CD-RW. DVD-RAM media costs about $15 to $20 per side, about the same price per megabyte as CD-RW discs. Single-sided media can be popped out of its protective cartridge and read in some (but not all) of the newest DVD-ROM drives. Better yet, DVD-RAM drives can read (but not write) CD-ROM, CD-R, CD-RW, and DVD-ROM media. Unfortunately, far fewer people own DVD-ROM drives than own CD-ROM drives, so it's harder to share data.

DVD-RAM media costs about $15 to $20 per side, about the same price per megabyte as CD-RW discs.

We took three drives from the current crop for informal test spins: the Panasonic LF-D103, Hi-Val's SDW1101 kit (which includes a Sigma Designs MPEG decoder card), and Creative Labs' PC-DVD RAM. Some vendors include decoder cards or sell them separately—they improve MPEG playback but have no effect on writing performance.

Unlike with CD-R and CD-RW, you can't write DVD-RAM discs in sessions—you must use packet writing. As with CD-R and CD-RW, packet writing gobbles up some disc space for file-system duties. But at only 300MB per 2.6GB side, that's a much lower percentage of the disc's total capacity.

The drives in our tests read DVD-RAM media at slightly better than 8X, comparing favorably to the roughly 7X the CD-RW drives managed with their own media. However, the 2X DVD-RAM drives wrote at roughly half the speed of 4X CD-RW drives.

The Creative Labs PC-DVD RAM's performance and price make it our pick among the three. But stay tuned—new 4X/4.7GB-per-side drives will soon appear. The high-capacity drives, with room to fit an entire movie per side, will cost a hefty $700 or more.

DIGITAL PHOTOGRAPHY: KEN SMITH; PHOTO COLLAGES: SANDRA KELCH; STOCK IMAGES: VINTAGE SUPERSTOCK (LEFT), PHOTODISC (RIGHT)

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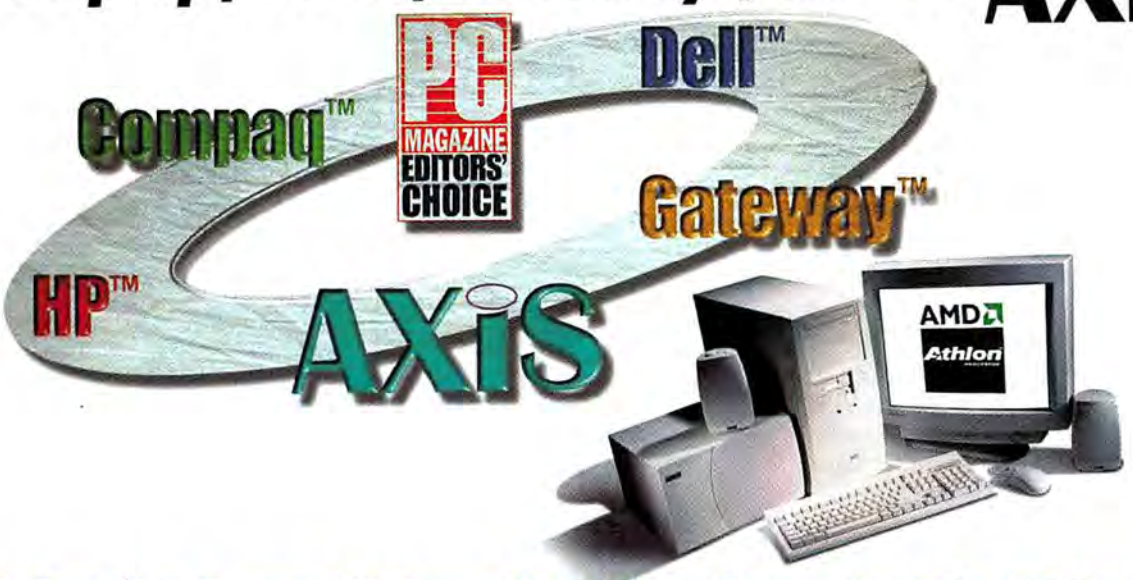

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Rating the Writers

OUR PERFORMANCE tests yielded some clear winners and a couple of surprising losers. We suggest you buy a drive based on how it performs the tasks you'll likely throw at it, so we tested each drive in a number of specific jobs.

One important note: Most CD-RW vendors recommend you use at least a Pentium-133 machine with 16MB of RAM, but you'll need even more speed and RAM to write reliably at the fastest speeds. For example, LG Electronics specifies a Pentium-166 and 32MB of RAM for 4X writing. If you own an older system, you can probably save money by sticking with a 4X drive, rather than buying an 8X drive that your system can support only at 4X.

CRACKING THE CASE

BEFORE YOU start spinning the platters, you must install the drive. All the drives came as internal units with installation kits, so we rated the ease of installing them. None put up any roadblocks.

Of the 13, the HP CD-Writer Plus 9110i and the Iomega ZipCD 650 make installation as painless as possible. Friendly is Iomega's middle name—its all-in-one software installation and excellent documentation make setting up the drive a breeze. But the HP goes a step further with an installation disc that features an AVI video covering the physical installation of your drive (although you can't watch it while you work, unless you own another PC). HP's documentation may not be as pretty as Iomega's, but it's equally informative.

HP and TEAC don't offer toll-free telephone support, though both offer extensive Web support. All the other vendors offer toll-free support; and three companies—Acer, Sony, and Yamaha—provide it around the clock. All the drives in our review carry a one-year warranty.

CD-R PERFORMANCE: BURN IT

THE SONY SPRESSA Professional earned top marks in our tests, but our Best Buy, the HP CD-Writer Plus 9110i, ran a very close second.

In our session-based CD-R write tests, all the drives—both EIDE and SCSI—came close to their advertised X speed ratings. On average, the 4X drives burned a 430MB image file in a little less than 14 minutes, and the 8X drives burned the image file in just over 7 minutes. Speeds varied less than 2 percent, except for Philips' PCRW404K, which lagged more than half a minute behind the next slowest drive.

Performance wasn't quite as close among the drives when writing 430MB of files to CD-R media on the fly. We saw a 3 percent difference between the fastest and slowest 4X (CD-R rating) drives and 6 percent between the fastest and slowest 8X models. Software accounts for some of the greater performance differences—it must gather and cache copies of the files before burning the CD-R disc.

The 8X Sony Spressa Professional performed best in this test, with the HP 9110i trailing closely. Among the 4X drives, the Pacific Digital eked out a narrow victory.

Although the speed differences between drives with the same X-rating may not be significant, the disparity between 4X and 8X drives is. Of course, you'll pay $120 more on average for an 8X drive. ▶

KIT AND CABOODLE: Ricoh's MP 7060S SCSI drive comes with everything you need, including a SCSI card.

Pros & Cons CD-RW Versus Other Storage Devices

DRIVE TYPE	Drive price	Capacity	Media cost (per unit)	Cost per MB (approx.)	Strengths	Drawbacks	Best use
CD-RW	$160-$400	650MB	$3	0.5 cents	Inexpensive media, low cost per megabyte, rewritability, long media life.	Relatively slow writing to CD-RW.	Data backups, copying music CDs, archiving, distributing data.
Castlewood Orb	$200	2.2GB	$40	1.8 cents	As fast as many hard drives, high capacity.	Expensive media can't be read in other devices, sharing data is difficult.	Frequent backups of large files.
CD-R	$120-$250	650MB	$1	0.2 cents	Inexpensive media, low cost per megabyte, secure data capability, long media life.	Can't rewrite media.	Distributing secure data, copying music CDs, archiving.
DVD-RAM	$300-$600	2.6GB/5.2GB	$15/$30	0.6 cents	High capacity, reasonably fast, low cost per megabyte.	Media can't be read in other devices; 2X drives are slow.	Data backups, archiving.
Iomega Jaz	$300	2GB	$125	6.3 cents	As fast as many hard drives, high capacity.	Very expensive media can't be read in other devices, sharing data is difficult.	Frequent backups of large files.
Iomega Zip 250 drive	$170	250MB	$18	7.2 cents	As easy to use as a floppy; older Zip 100 discs are ubiquitous.	Relatively slow, expensive media can't be read in other devices.	Distributing unsecure data, small backups.
Magneto-optical	$260-$1700	128MB-5.2GB	$5-$70	1.3-3.9 cents	High data integrity, rewritability, high capacity.	Media can't be read in other devices, sharing data is difficult, expensive high-capacity drives.	Secure backups.
Tape	$249+	10GB	$25	0.3 cents	Low cost per megabyte, high capacity.	Slow to locate and restore files.	Full-system backups.

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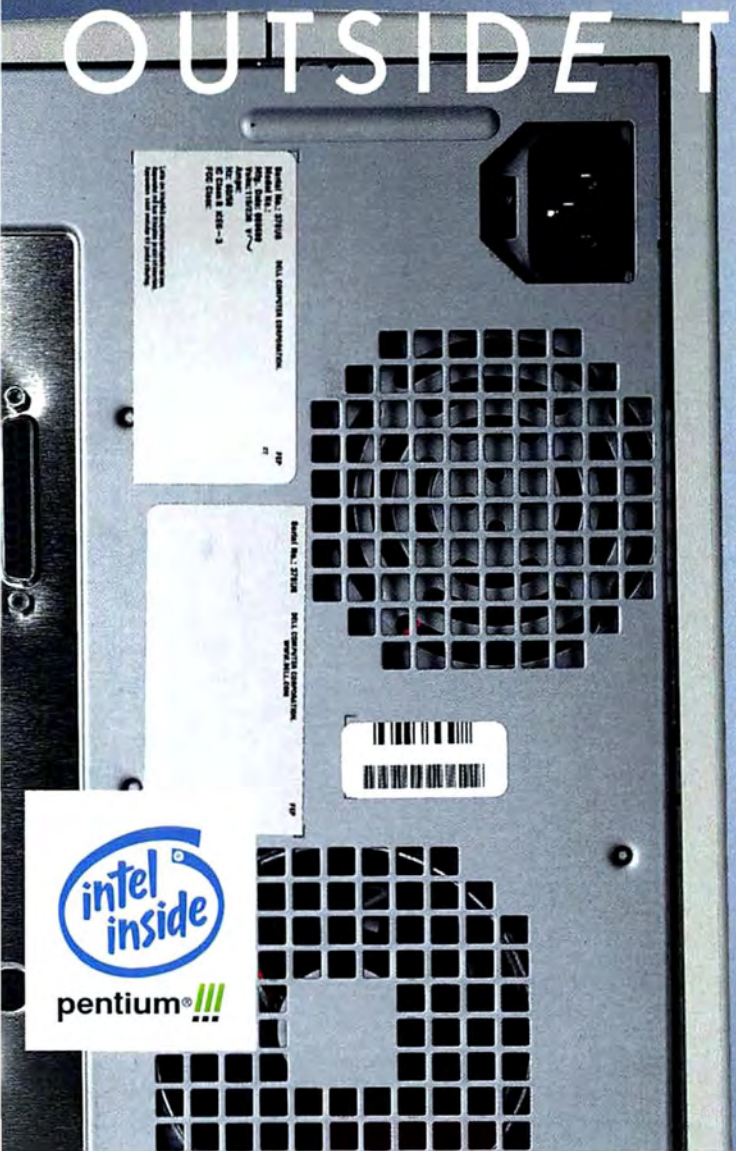

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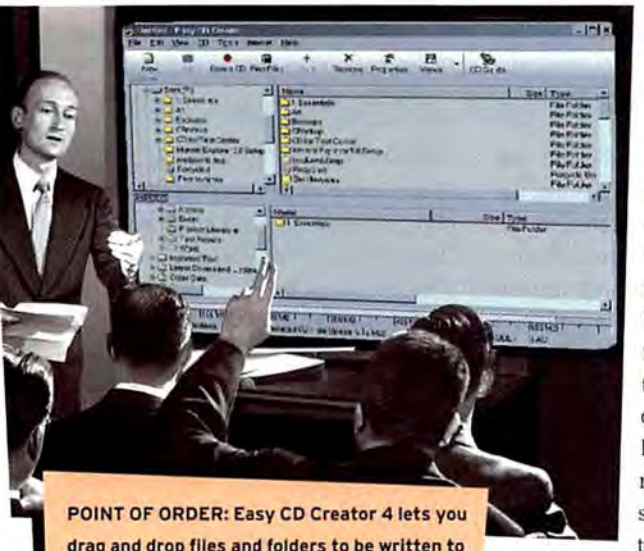
FOR OUR packet-writing test, we dragged and dropped 100MB of files via Windows Explorer to a CD-RW disc. Again the Sony wrote fastest, copying the data in 3 minutes, 24 seconds. Again the HP was hot on its heels—a mere second behind. No other drive lagged much more than 10 percent off the pace, except the last-place Philips, which took half a minute extra.

Rewriting the same 100MB of data to the same CD-RW disc turned up far greater performance differences. Only the Sony managed to rewrite as quickly as it wrote the original data; and four of the drives—the Iomega, the Plextor, the Pacific Digital, and the TDK—took more than twice as long to rewrite data.



POINT OF ORDER: Easy CD Creator 4 lets you drag and drop files and folders to be written to CD-RW or CD-R media in a "session."

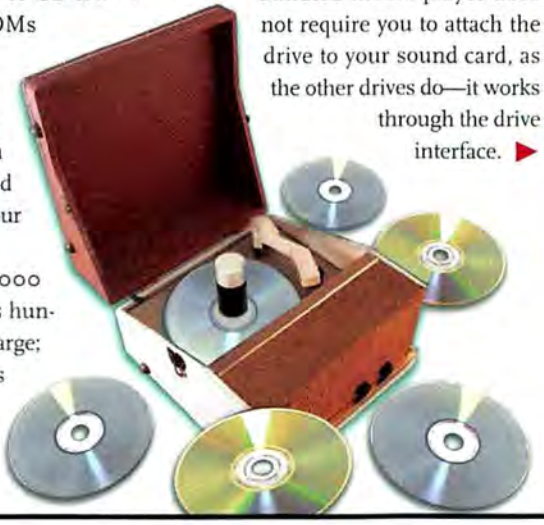
SPEED READER

PREVIOUS GENERATIONS of CD-RW drives couldn't read CD-ROMs very quickly, so they worked best as supplements to CD-ROM drives. The new 32X drives, however, read data faster than the drives bundled with a few of the systems in our Top 10 desktop PCs sections.

Our Microsoft Office 2000 install test locates and copies hundreds of files, both small and large; it's a thorough test of a drive's overall CD-ROM read performance. The TEAC captured first place at 5 minutes even, but the Sony finished just 17 seconds behind. Surprisingly, the Plextor, despite its 32X rating, placed dead last at nearly 7 minutes—4 seconds slower than the 32X Philips. The two fastest 24X drives—the Ricoh MP 7060s and the Yamaha—both SCSI models—came in with times of 5 minutes, 41 seconds and 5 minutes, 42 seconds, respectively. Both of these drives very likely benefited from SCSI's capability to perform multiple operations without bogging down the CPU.

Audiophiles probably use another criterion to judge CD drives: digital audio extraction performance, or how long it takes to copy a .wav file from an audio CD onto a hard drive. (Copying a .wav file, as opposed to an MP3 file, taxes the drive itself, but not the CPU.) The Yamaha CRW8424SZ led the field with a pacesetting time of 2 minutes, 5 seconds, while Plextor's EIDE PlexWriter was the runner-up, a scant 8 seconds slower. This was the only test in which the Sony fell well behind the pack, extracting the file in a leisurely 3 minutes, 45 seconds, the slowest of the 8X drives for DAE.

For audio, Plextor's AudioFS drivers let you drag and drop files from an audio CD to perform on-the-fly extraction from within Windows Explorer. And Plextor's bundled media player does not require you to attach the drive to your sound card, as the other drives do—it works through the drive interface. ▶



LAB NOTES

Drive DMA, Disk DOA?

WHEN WE TEST computer products, we follow manufacturers' installation instructions to the letter, because we assume they know how to make their products perform best. However, in our tests of CD-RW drives, we found that some manufacturers aren't telling you about an important setting—direct memory access, or DMA.

If you check the Properties settings for EIDE hard drives and CD-ROM/CD-RW drives in Device Manager, you'll find a check box labeled DMA. Direct memory access relieves the CPU of the chore of transferring data between a device such as a CD-ROM drive and your computer's memory.

But more important, the drives perform better with DMA. According to our tests with CD Tach, a drive performance benchmark, EIDE drives without DMA averaged about 54 percent CPU usage during 12X memory transfers; with DMA enabled, the same drives averaged a minuscule, 4 percent CPU usage. CD-RW packet read and write times also dropped by about 5 percent. CD-R write times didn't change much, because session writing is naturally less dependent on the CPU than packet writing is.

According to some vendors, enabling DMA can result in ruined CD-R discs, inaccurate data transfers, and even system crashes. However, we've yet to see such erratic behavior in our tests. If you bought your system within the last couple of years, the odds are your drive will work with DMA enabled.

Mike Mihalik, vice president of engineering at LaCie, a CD-RW vendor, says, "Our drives can handle DMA; we just can't anticipate the quality of the hundreds of different motherboard [types] out there." Vadim Brenner, engineering division manager at Plextor, says his company optimizes its drives for DMA, and he claims that writing at 8X with any EIDE drive is problematic *without* DMA enabled.

The DMA setting should be specified in the product manual, but most of the drives' manuals make no mention of it. For our tests, we used the manuals' specifications, or we called the companies to get the setting. We recommend you do the same.

DIGITAL PHOTOGRAPHY: KEN SMITH, PHOTO COLLAGES: SANDRA KELCH. STOCK IMAGES: CLOCKWISE FROM TOP LEFT, VINTAGE SUPERSTOCK, VINTAGE SUPERSTOCK, CORBIS

The Best Connections

THE INTERFACE YOU USE to connect a CD-RW drive to your PC helps determine how fast it can read and write discs. Mathematically, with each X equal to 150 KBps, a 32X CD-ROM reader requires 4.8 MBps of sustainable throughput. Of the five interface types CD-RW drives offer, only EIDE, SCSI, and IEEE 1394 meet this need. Easily connectable, hot-swappable USB and parallel port drives are limited by their interfaces to 4X CD-R or CD-RW writing and 8X reading.

SCSI drives still cost more than EIDE drives, and they require a SCSI controller. Of the three SCSI drives we tested, only the Ricoh MP 7060S provided its own controller; the Yamaha CRW8424SZ and the Sony Spressa Professional CRX140S/C came to the dance alone. SCSI drives put less of a burden on your CPU, and they write more reliably on older, slower systems. However, if you purchased your system within the last year or two, you should get topflight performance from an EIDE drive.

Sony already offers IEEE 1394 CD-RW drives (but couldn't provide one for this review). TDK and Plextor are also investigating the interface. Currently, Sony's drives use an EIDE drive and a converter to add the 1394 interface, but the company will soon offer native 1394 drives.

A SHOW OF HANDS: CD-RW drives come in a variety of interfaces, including parallel port, USB, EIDE, SCSI, and IEEE 1394. Of those five types, only the last three provide enough throughput to use CD-RW to its full potential.

THE WRITE SOFTWARE

BY ITSELF, WINDOWS doesn't support CD-R or CD-RW recording; though once you install some underlying software, you can use Windows Explorer to copy files. All the CD-RW kits we tested include the software needed to write data with your drive. HP and Sony provided the best bundles overall. Most drives bundle Adaptec's Easy CD Creator software for audio and data CD creation and DirectCD for packet writing. TEAC upped the ante by offering the newer Easy CD Creator 4, which offers some embellishments but doesn't boost performance. The Ricoh drives, on the other hand, opted for CeQuadrat's WinOnCD 3.6 and PacketCD. The Philips drive used older CeQuadrat products—Write2CD for audio and data and Packet Writer for packet writing; the software probably contributed to the drive's abysmal performance. Sony's Spressa Professional came with its own CD Extreme mastering software (Sony's answer to Easy CD Creator) and Prassi's abCD packet-writing software.

For the drives that bundle it, Easy CD Creator 3.5 earns them some bonus points with its stability and straightforward approach. But CeQuadrat's WinOnCD and Write2CD garner style points for their colorful interfaces. For packet writing, PacketCD offers an advantage over DirectCD 2.5 and abCD: transparent, on-the-fly data compression when writing to CD-RW. It also installs a driver on the CD-RW that you're burning, which allows other systems to read the compressed data. The recently released DirectCD 3 also includes data compression, but at the time we conducted our tests, only the Hewlett-Packard CD-Writer Plus 9110i and TEAC 4x4x32 CD-RW shipped with it.

Ricoh bundles the highly capable Seagate Backup Exec with its drives; Iomega provides a simple backup program called 1-Step Backup; and HP, Sony, and Philips provide disaster recovery software that you can program to back up critical system files automatically. Sony bundles a very attractive media player with DAE and audio-CD writing capabilities—plus Mixman Studio Pro, a program that lets you create your own music. Pacific Digital and HP include Sonic Foundry's Acid (which performs many of the same duties as Mixman). Pacific throws in an MP3 player.

Sony provides possibly the handiest feature among all the drives in the review: Its software allows it to link to another CD-RW drive (not necessarily another Sony) and write two discs simultaneously. If you write lots of CD-R discs, cutting your burn time in half should be a very attractive proposition.

San Francisco–based freelance writer Jon L. Jacobi contributes regularly to PC World. *Robert James and John Tjon, PC World Test Center performance analysts, conducted all performance tests.* ■

X-ceedingly Complex X-ratings X-plained

WHICH 'X' IS WHICH? Most vendors show X-ratings in the order of CD-R, CD-RW, and then CD-ROM speeds. For example, an 8X/4X/32X drive can write a CD-R at 8X, write a CD-RW at 4X, and read a CD-ROM at up to 32X. But because not all vendors follow this order, remember two simple rules:

1. The largest of the three numbers is always the maximum CD-ROM read rating—even if it's shown first.

2. Of the two X-ratings that may remain, the larger is always the CD-R write speed.

So what is an X-rating anyway? The *X* equals roughly 150 kilobytes per second. Thus 2X means 300 KBps, 24X means 3600 KBps (3.6 MBps), and so on. But when describing CD-ROM read speed, vendors often indicate only a maximum rating. CD-ROM drives rated 8X and faster spin discs at a constant rate. But the tracks farther from the center of a disc pack more data per revolution; so drives read the outside tracks faster than they do the inside tracks.

X-ratings reflect how long it takes to write a full 650MB disc in one session: 2X takes 36 minutes, 4X takes 18 minutes, and so on (though speeds will vary based on your particular system). However, packet writing, because of file-system overhead and the continual on-and-off activity of the laser, generally falls about 5 percent short of its actual X-rating.

DIGITAL PHOTOGRAPHY: KEN SMITH; PHOTO COLLAGES: SANDRA KELCH; STOCK IMAGES: VINTAGE SUPERSTOCK

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- 30-page automatic document feeder
- Advanced HP CopySmart II

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- Fax - 14.4 Kbps modem; 8MB memory (600 pages)
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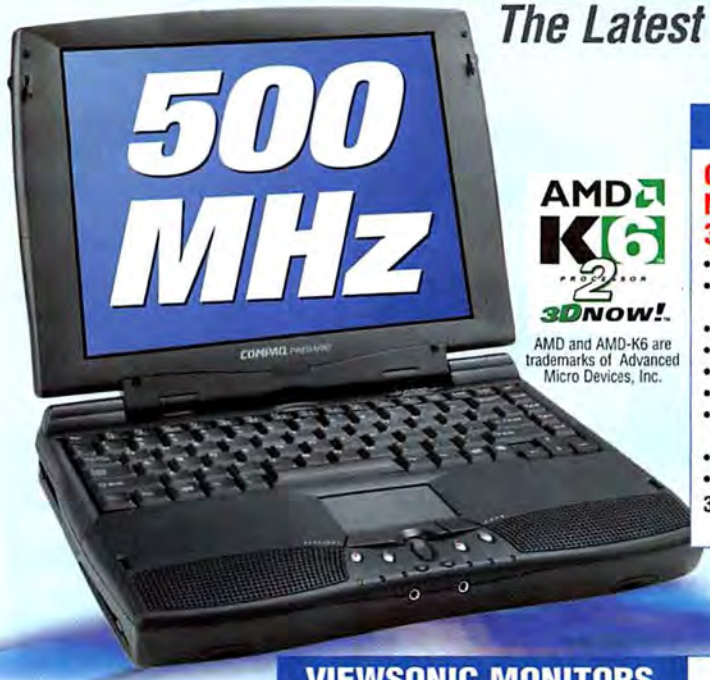

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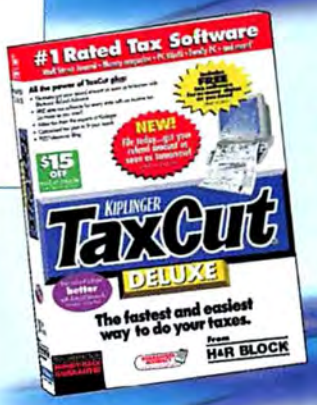

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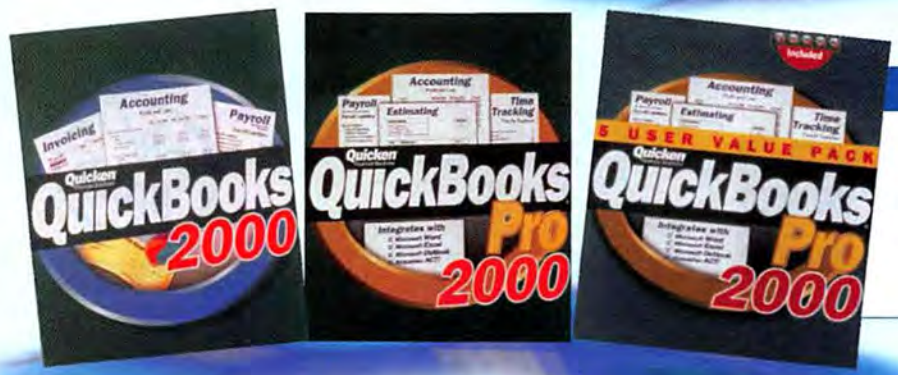

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Panasonic

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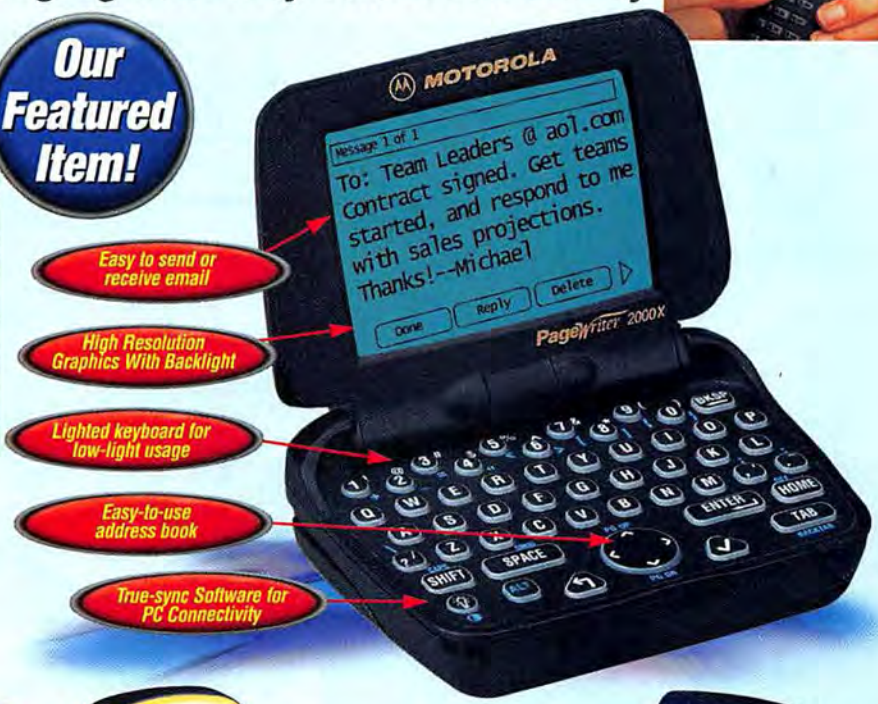

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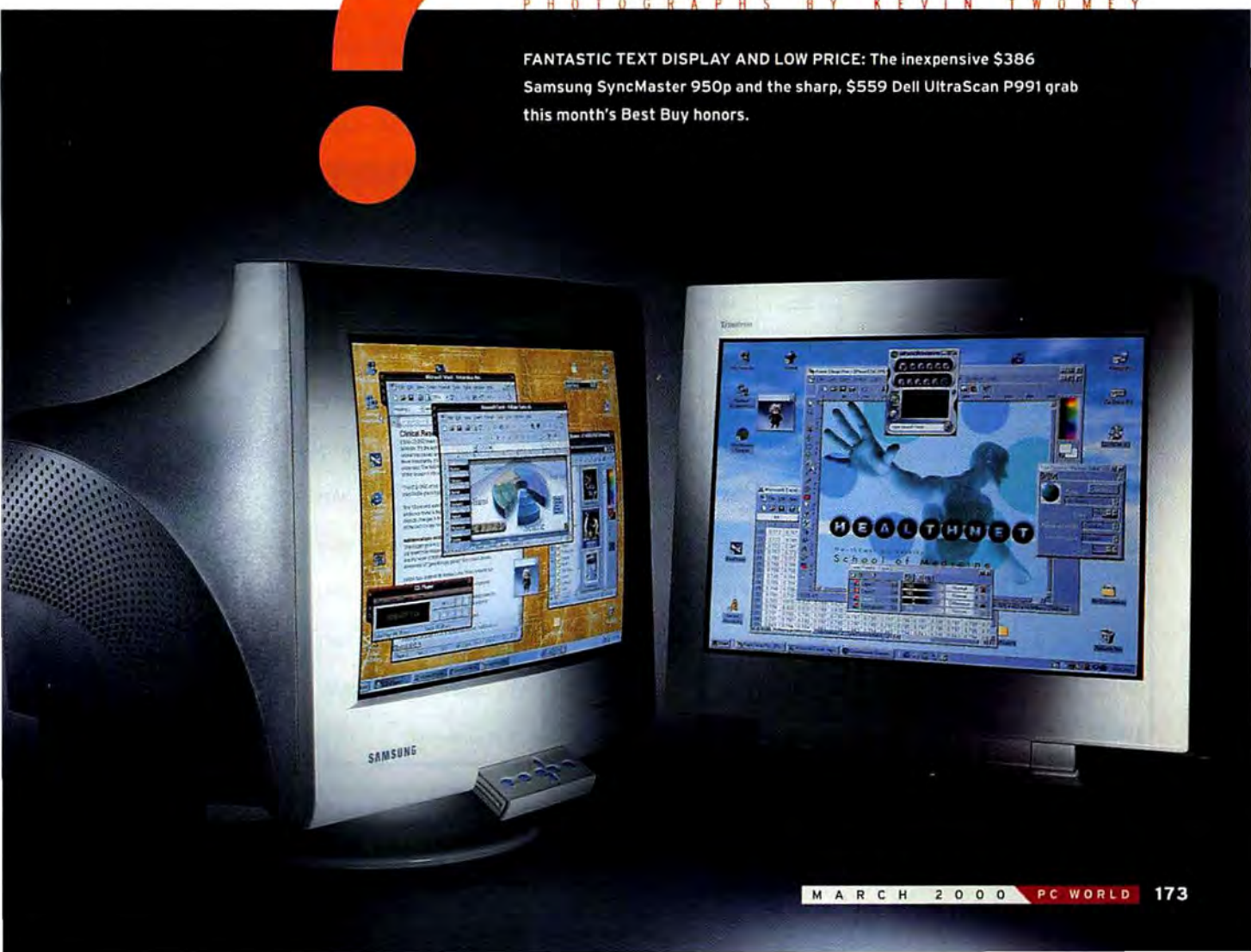
is flat where it's at?

Our review of the latest 19-inch monitors shows that flat screens don't necessarily give you better image quality. But lower prices and smaller cases make them tempting options. **By Rick Overton**

PHOTOGRAPHS BY KEVIN TWOMEY



FANTASTIC TEXT DISPLAY AND LOW PRICE: The inexpensive $386 Samsung SyncMaster 950p and the sharp, $559 Dell UltraScan P991 grab this month's Best Buy honors.

WHILE almost every computerized gizmo from cell phones to personal digital assistants gets smaller and smaller, a monitor screen is the one piece of hardware that we always wish was bigger. If you churn out complex word processing documents, manipulate long and involved spreadsheets, or prepare images for publication, you already know that the bigger the display, the more expansive the view. Good news: Today's 19-inch monitors can provide that grand vista—and their prices are becoming more affordable by the minute.

Best Buy

KUDOS ALL AROUND: With good text and graphics, loads of features (including BNC ports), and a low price, the **Samsung SyncMaster 950p** ($386) is a top-notch monitor at a top-notch value. **Dell's UltraScan P991** ($559) delivers superior text and sports a spiffy flat FD Trinitron tube at a reasonable price.

The greatest advantage to a 19-inch monitor is, obviously, that it gives you more screen area to work with. For example, compared with 17-inch monitors, a 19-incher can give you about 27 to 30 percent more viewable real estate. Having a larger screen area means you can crank up the resolution from the 1024 by 768 commonly used on 17-inch monitors to 1280 by 1024, with little change in the number of pixels per inch. Your menus, toolbars, and icons stay about the same size, but more program and document buttons fit on the longer Windows taskbar, more columns fit on a spreadsheet, and more lines of text are viewable upon the screen.

Keep in mind that not all graphics cards can generate 1280 by 1024 resolutions, and that image quality and the number of colors displayed also depend on your graphics card. So before you run out and buy a 19-inch monitor, expecting to get a cutting-edge view, make sure your graphics card is up to the job. Older cards, if they can do higher resolutions at all, may slow the screen refresh rate to eye-straining speeds and may not have the memory to support millions of colors.

We looked at 23 of today's 19-inch displays: 13 new models and 10 from our December Top 10 that we retested for this review. We extensively evaluated each for the quality of its text and graphics. We also rated features, price, service policies, and usability, as well as compliance with tough emissions standards.

When the dust settled, two monitors grabbed Best Buy honors. Samsung's SyncMaster 950p took first place thanks to its low price and comprehensive feature set, including BNC connectors for high-end graphics adapters. Dell's UltraScan P991 snapped up the number two spot on the strength of its text scores—it's the only monitor to have earned a rating of excellent—and its relatively low price.

THE INCREDIBLE SHRINKING CASE

EVEN THOUGH screens are getting bigger, they don't have to take up more room on your desktop: "Short-neck" or "reduced depth" monitors save space because their cases are less deep. Monitor manufacturers have learned how to further bend the electron beam (which travels from the back of the cathode ray tube to the screen glass to form the image). This increased "deflection angle" means the electron gun can be closer to the screen. Early versions of short-neck monitors suffered from

TOP 10 MONITORS

FEATURES COMPARISON

	19-INCH MONITOR	Street price (12/15/99)	Overall rating [1]	Features: Tube manufacturer	Pitch type (mm)	Rated/tested viewable area (inches)	Max. refresh rate at 1024 by 768/ 1280 by 1024 (Hz)	Depth (inches)	BNC ports [2]
1	**Samsung SyncMaster 950p** 800/726-7864 www.samsungmonitor.com	$386	86	Samsung	.26 dot	18/17.9	119/89	18.6	●
2	**Dell UltraScan P991** 800/388-8542 www.dell.com	$559	83	Sony FD Trinitron	.24-.25 variable stripe [4]	18/17.8	134/95	18.2	○
3	**LG Studioworks 995E** 800/243-0000 www.lgeus.com	$440	82	Hitachi	.26 dot	18/18	120/90	18.7	○
4	**Philips 109B** 877/835-1838 www.philips.com	$479	81	Philips	.26 dot	18/17.9	120/90	15.6	○
5	**Sampo AlphaScan 812SR** 770/449-6220 www.sampotech.com	$399	80	Panasonic SL	.25 dot	18/17.5	130/100	16.6	○
6	**Sony CPD-G400** 800/352-7669 www.sony.com/displays	$700	77	Sony FD Trinitron	.24-.25 variable stripe [4]	18/17.9	85/85	18.2	○
7	**Cornerstone Technology p1401** 800/562-2552 www.bigmonitors.com	$645	76	Hitachi	.26 dot	18/18.1	134/102	17.5	○
8	**ViewSonic PF790** 800/888-8583 www.viewsonic.com	$499	76	Mitsubishi SonicTron	.25-.27 variable stripe [4]	18/17.7	118/90	18.8	○
9	**AcerView 99sl** 800/379-2237 www.acer.com	$399	76	Philips	.26 dot	18/17.7	121/91	16.7	○
10	**Compaq P900** 800/345-1518 www.compaq.com	$649	74	Sony FD Trinitron	.24-.25 variable stripe [4]	17.9/17.7	120/100	17.7	○

Best Buy ● Yes ○ No

[1] 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 (25 percent each), price (25 percent), features and ease of use (20 percent), and service and support (5 percent). The best possible overall rating is 100. Data based on tests designed and conducted by PC World Test Center. All rights reserved.

fuzzy text and uneven focus, but newer models often correct this distortion.

Five of the 19-inch monitors in this review qualify as short-neck monitors. Of those that grabbed places on the chart, the Philips 109B is the shallowest at 15.6 inches, with the Sampo AlphaScan 812SR and the AcerView 99sl following close behind at 16.6 and 16.7 inches, respectively. In contrast, the MGIC Technologies MGC 9107, which missed the Top 10 due to its subpar image quality, measures a full 19.1 inches deep—a once-typical size that today seems needlessly bulky.

IT'S A FLAT, FLAT WORLD

WIDER, SHALLOWER—what's next? Screen fronts are getting flatter, too. During the past year we've seen a steady influx of flat CRTs, and for this review, we tested eight of them. Conventionally curved, "flat square" CRTs—the kind you're most likely to have inside your desktop monitor—still thrive, but variations on the flat CRT concept are becoming nearly as commonplace as a winter cold. Whether they're called "natural flat," "pure flat," or "flat display," these new CRTs offer sharper focus, brighter pictures, and more accurately rendered ▶

SLIM IS IN: The AcerView 99sl (16.7 inches) and the Philips 109B (15.6 inches) take up less space on your desktop than the typical CRT. The 109B delivered better graphics quality.

USB connectors installed/ optional	On-screen controls: Screen position/ size	On-screen controls: Pincushion/ barrel	On-screen controls: Trapezoid/ keystone	On-screen controls: Focus/ convergence	On-screen controls: Image tilt/manual degauss	On-screen controls: Color temperature/ RGB control	Compliance: MPR-II low emission	Compliance: TCO shielding ('95/'99)	Support: Warranty (years)	Support: Toll-free support hours	Support: Weekend support	Product info number [3]
○/●	●/●	●/●	●/●	●/○	●/●	●/●	●	99	3	24	●	610
○/○	●/●	●/●	●/●	○/●	●/●	●/●	●	99	3	24	●	–
○/○	●/●	●/●	●/○	○/●	●/●	●/○	●	99	3	24	●	611
●/●	●/●	●/●	●/●	●/●	●/●	●/●	●	99	3	16	●	612
○/●	●/●	●/●	●/●	●/●	●/●	●/●	●	95	3	0	○	613
○/●	●/●	●/●	●/●	●/●	●/●	●/●	●	99	1	24	●	614
○/●	●/●	●/●	●/●	○/●	●/●	●/●	●	99	5	24	○	615
○/○	●/●	●/●	●/●	●/●	●/●	●/●	●	99	3	24	●	616
○/●	●/●	●/●	●/●	●/●	●/●	●/●	●	○	3	24	●	617
○/●	●/●	●/○	●/●	○/●	●/●	●/●	●	99	3	24	●	618

[2] Specialized connector used with some high-end graphics cards for complex graphic design and publishing.

[3] For more information about all products in this table, select product information number 901.

[4] Uses an aperture grille tube with a variable stripe pitch that is smaller at the center than around the perimeter.

images than their convex, flat-square predecessors. Despite these benefits, flat CRTs don't necessarily deliver better image quality, as our tests bear out.

Of the new flat CRTs we tested this month, the pricey Sony CPD-G400 had the best graphics quality, while the more affordable and handsomely styled Dell UltraScan P991 grabbed a Best Buy. The ViewSonic PF790 landed at number seven while the Compaq P900 squeaked in at tenth place. For reviews of other flat CRTs that didn't make the cut, visit www.pcworld.com/maroo/monitors.

The steady influx of flat CRTs doesn't mean that the traditional flat-square CRT is on its way out: It can still hold its own in our image-quality tests. Five of the displays on this month's chart feature old-school, flat-square CRTs, including the Samsung SyncMaster 950p, a Best Buy.

Still, these new flat CRTs benefit primarily those who do extensive, professional-level graphics, such as image editing or prepress work. With traditional flat-square monitors, you'll see the picture bending slightly with the curvature of the glass, and for work such as highly detailed, complex graphics, that distortion becomes a problem. If you're a graphics professional, a flat CRT is the way to go.

PRICES ARE FLATTENING OUT, TOO

IN PRICE and footprint, 19-inch monitors are beginning to look remarkably like 17-inch units did six months ago. In our last roundup ("19-inch Monitors: Flat-out Fabulous," May 1999), a high-quality 19-inch display could cost as much as $1000. Now, 19-inch CRTs run from a high of $700 (Sony's CPD-G400) to as little as $386 (Samsung's SyncMaster 950p).

With such a wide price spread (the least expensive monitor is less than half the price of the most expensive), we wondered: What does an extra $300 buy? The differences in performance are not striking. Top-shelf displays from Cornerstone and Sony posted top-three numbers for graphics, but bargain-basement screens from Sampo and Samsung were in the top five. The differences in monitors' service and support are getting narrower, too.

What it boils down to is that your $300 premium buys additional features. For example, the three monitors we tested that did not meet stringent TCO environmental requirements were all priced under $400. (TCO compliance ensures a monitor meets tough standards for radiation emissions and that the monitor can be recycled safely.) None of the bargain monitors comes bundled with image-adjustment software, either, but three of the higher-priced displays do. Finally, you're likely to see a few more advanced controls in the on-screen menu of a higher-priced display, such as those on the Compaq P900, Cornerstone p1401, and Sony CPD-G400 that help you adjust resolution and troubleshoot typical problems like screen flicker. Some advanced controls correct moiré (swirling pattern) on different parts of the screen, and horizontal and vertical convergence controls adjust pixel alignment, helping, over time, to keep images in focus.

The good news is that pricing and technology trends have continued to work in consumers' favor. Monitors are bigger of face and smaller of foot—as well as lighter of wallet—than ever before. And with affordable prices for the latest tube technologies, now could be a good time to take that 19-inch monitor off your wish list and place it squarely on your desktop.

EASIER ON THE WALLET: 19-inch CRTs are becoming more affordable. Sampo's $399 AlphaScan 812SR and LG Studioworks' $440 995E are among the lowest-cost units on the chart.

1 SAMSUNG SYNCMASTER 950P

WHAT'S HOT The 950p is the best dot-pitch monitor (as opposed to stripe pitch) we reviewed. Judges gave above-average marks for its sharp text in spreadsheets and word processing documents, and its graphics quality in test photos also looked good (though a few ▶

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other monitors sported brighter colors). At $386, the 950p ranks as the least expensive unit on the chart, and the only one equipped with BNC ports for high-end graphics. Excellent documentation and software for color adjustment round out the offerings.

WHAT'S NOT The 950p isn't the best bet for people with shallow workstations. At 18.6 inches, the SyncMaster 950p is among the deepest monitors we tested.

WHAT ELSE On-screen controls were a breeze to master. Sensitive dials under the front bezel let you adjust contrast and brightness without having to go to the on-screen menu. The 950p's case has a blue-and-gray inlaid design—a nice change from boring putty-colored cases.

BEST USE The affordable SyncMaster 950p excels in every category we tested and would make a top-notch general-use monitor, regardless of application. Its BNC-5 ports provide additional graphic throughputs for imaging professionals.

2 DELL ULTRASCAN P991

WHAT'S HOT The UltraScan P991 is long on virtues, garnering the only rating of excellent for text, with crisp icons and letters in word processing documents and spreadsheets. It also handles graphics well, with colors nearly as deep and saturated as those on Sony's CPD-G400 and Cornerstone's p1401. Its $559 price is the least expensive among those on the chart that use Sony's flat FD Trinitron tube, a feature you usually pay a premium for.

WHAT'S NOT At $559, this display's cost is in the middle of the pack. You could easily pay $200 more for an inferior display—but you could also pay almost $200 less for a model like the Best Buy SyncMaster that's equal if not better.

WHAT ELSE Despite its bulk (it weighs in at 56.9 pounds), the P991 tilts and swivels with little effort. Dell also provides an industry-standard three-year warranty and 24-hour toll-free support.

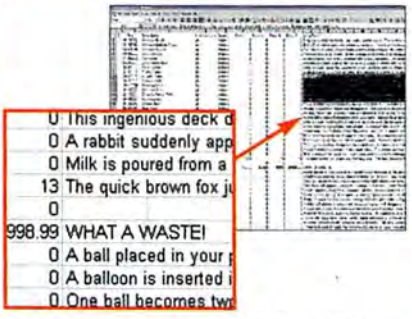
BEST USE The P991 is a terrific choice for businesses and home offices that churn out text documents and work with general business graphics such as those for marketing materials and brochures.

3 LG STUDIOWORKS 995E

WHAT'S HOT The Studioworks 995E earned ratings of very good for both text and graphics display, the latter ranking second highest among all the units. ▶

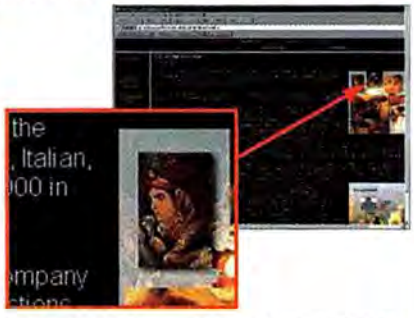
The Right Monitor for the Right Job

IN IMAGE QUALITY, our Top 10 list didn't reveal striking differences—good big screens abound. Most of the monitors here can handle everyday business applications quite well. But if you typically work with one application, consider a monitor best suited to what you do. If you churn out lots of text documents, avoid an expensive display aimed at graphics pros. The bottom line? Don't buy more monitor than you need. (Note: Test images are examples not meant to show actual screen quality. We rank displays by score, and names in color are Best Buys.)



TEXT Dell's UltraScan P991 delivered top scores for crisp text on spreadsheets and word processing documents. If you work with text, this moderately priced display is for you.

GRAPHICS Sony's CPD-G400 displayed the colors of this fruit tart photo with gusto. Strawberries looked luscious. Though pricey, it's a great choice for graphics enthusiasts.



WEB PAGE Samung's SyncMaster 950p is our top pick for viewing Web pages. If you spend a lot of time cruising the Net, this low-cost model offers solid colors and legible text.

TEXT	
Monitor	Text quality
Dell UltraScan P991	Excellent
Samsung SyncMaster 950p	Very good
LG Studioworks 995E	Very good
Sampo AlphaScan 812SR	Very good
Sony CPD-G400	Very good
Cornerstone Technology p1401	Very good
Compaq P900	Very good
Philips 109B	Good
ViewSonic PF790	Good
AcerView 99sl	Good

GRAPHICS	
Monitor	Graphics quality
Sony CPD-G400	Very good
LG Studioworks 995E	Very good
Samsung SyncMaster 950p	Very good
Dell UltraScan P991	Very good
Sampo AlphaScan 812SR	Very good
Cornerstone Technology p1401	Very good
Philips 109B	Very good
ViewSonic PF790	Good
AcerView 99sl	Good
Compaq P900	Good

WEB PAGE	
Monitor	Text/graphics quality
Samsung SyncMaster 950p	Very good
Dell UltraScan P991	Very good
LG Studioworks 995E	Very good
Sampo AlphaScan 812SR	Very good
Sony CPD-G400	Very good
Cornerstone Technology p1401	Very good
Compaq P900	Very good
Philips 109B	Good
ViewSonic PF790	Good
AcerView 99sl	Good

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Colors in graphics were rich, yet not overly dark, and a sample Web page stood out with crisp whites, legible text, and briskly rendered images. On-screen controls, while not advanced, are simple to use, intuitive, and well organized.

WHAT'S NOT At 18.7 inches, the 995E is the second-deepest monitor in the Top 10. This model also lacks controls for adjusting focus and convergence (how closely red, green, and blue pixels align).

WHAT ELSE You have to use the 995E's on-screen menu to adjust contrast and brightness, the most commonly used controls. Separate adjustments on the monitor's bezel would be easier.

BEST USE Top-notch image quality and a fair $440 price make the Studioworks 995E a good pick for nondemanding business and home-office tasks. The lack of advanced controls rules it out for professional graphics use.

4 PHILIPS 109B

WHAT'S HOT The 109B rendered graphics deftly on test photos and Web pages, displaying deep, rich colors with subtle shading. Like the SyncMaster 950p, the Philips unit ships with a software bundle for enhancing and managing colors. With a depth of 15.6 inches, the 109B is the shallowest monitor we tested, and at 44 pounds, it's also the lightest. Finally, the 109B is the only model on the chart that comes standard with a USB port.

WHAT'S NOT The 109B stumbled on both text documents and spreadsheets. Our judges doled out low marks for blurry-looking text and icons that weren't as crisp as text and icons displayed by other chart-makers. Its 16 hours of daily toll-free tech support is probably adequate for the majority of users, but most vendors offer round-the-clock help.

WHAT ELSE A short-neck picture tube decreases the case's depth, which allows the monitor to fit into tight corners better than most boxy units. It's also easy to navigate the on-screen menu using the set of four buttons that are located on the monitor's front bezel.

BEST USE Its very good graphics score, short case design, USB port, and optional USB hub make the 109B a good bet for offices tight on desktop space and those with undemanding business graphics needs. But the lack of BNC connectors prevents it from being considered for professional-level design work. ▶

Power Tipping

IF YOU'RE READY to step up to the 19-inch plate, here are some buying tips that can help you avoid costly mistakes.

graphics Remember that your monitor is only part of the graphics picture. The images that sparkle on your screen are driven by your graphics card, and an inadequate card can bring down a top-shelf monitor. If the monitor you buy is included as part of a PC bundle, the graphics card that comes with it is probably fine for most uses. If you're buying a monitor and graphics card separately, make sure you get a card that can handle resolutions higher than 1024 by 768—nearly all 19-inch monitors offer 1280 by 1024 resolutions. We tested the monitors in this review with the top-rated Matrox Millennium G400 AGP graphics adapter ($199). For the PCI bus, we recommend the $150 16MB 3dfx Voodoo3 3000.

connections Don't assume a new monitor has USB connections. All of the displays we tested have traditional serial cable connectors, and a few sport BNC ports for high-end color management, but standard USB ports are surprisingly rare. Only the Philips 109B includes a USB port with the option to add more. Most of the others on the chart at least offer USB as an option, but three (the Dell UltraScan P991, LG Studioworks 995E, and ViewSonic PF790) lack standard ports and the option to add them. Adding a USB hub to your monitor will cost $60 to $100, depending on how many ports the hub has.

refresh The Compaq P900 claims to support an eye-popping 1920 by 1440 pixels. That's great, but the monitor can refresh that many pixels only at a rate of 60 Hz. When refresh rates fall below 75 Hz, the eye starts to detect flicker, which can lead to eyestrain and headaches. Generally speaking, the higher the resolution the lower the refresh rate needed to display the image. Our advice? Keep an eye on those refresh rates.

memory The number of colors you can see at a given resolution depends on how much memory your video card has. If you want to run true 32-bit color, or 16.7 million colors, you'll need at least 16MB of memory.

footprint Just because monitor makers are building shorter electron guns—and thus shorter monitor necks—it doesn't mean you don't need to think about how much space you have on your desktop. For one thing, many monitors have cords sticking straight out the back that effectively add another inch or two to your footprint. Before buying, measure how much desktop space you have to work with.

costs It's always a pleasure to see a low price, but sometimes it's a distraction from additional costs; conversely, a high price tag should bring additional valuable features or services. The Cornerstone p1401, for example, is priced at a high $645, but the company offers a rare five-year warranty, which would cost extra from other manufacturers or, frequently, is not available at all. And the Compaq P900, also fairly high-priced at $649, includes three years of on-site service, which typically runs an additional $100 or so. Before you commit, do your research on the Web to find the best deals. Sites such as www.pricewatch.com can help you find prices cheaper than those on manufacturers' sites.

speakers Are built-in speakers a good thing? Probably not. None of the 23 monitors we tested this month has them. In fact, speakers on the side of CRTs aren't the clever design boon we thought they were a few years ago. When a speaker is embedded in the bezel, you can't move it to improve sound coverage, and audio from a built-in speaker is typically tinny because the speaker is so small. In addition, monitors with embedded speakers tend to be heavy, because the picture tube has to be shielded from the speakers' magnets by a layer of metal. Separate speakers are cheap. Buy some.

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Before we start, a word or two of silence for the vanquished. *(So sorry Dell... so sorry Compaq.)*

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Intel Pentium III processor 533MHz	Intel Pentium III processor 733MHz	Intel Pentium III processor 800MHz
128MB 133MHz SDRAM	128MB 133MHz SDRAM	256MB 133MHz SDRAM
3.6GB[◊] ATA-66 (7200 rpm) hard drive	27GB[◊] ATA-66 (7200 rpm) hard drive	34GB[◊] ATA-66 (7200 rpm) hard drive
17" Micron 700Cx (15.9" display) monitor	19" Micron 900Lx (17.9" display) monitor	21" Micron 721v (19.5" display) monitor
8X/40X DVD-ROM drive	8X/40X DVD-ROM drive	8X/40X DVD-ROM drive w/hardware decoder
32MB nVidia TnT2 Pro AGP card	32MB nVidia GeForce 256 AGP graphics	32MB NVidia GeForce 256 AGP graphics
128-voice Wavetable sound	Aureal Vortex2 SQ2500 audio	Aureal Vortex2 SQ2500 audio
Advent 009 speakers	Monsoon MC200 3-piece stereo system	3Com USRobotics V.90 PCI modem
3Com USRobotics V.90 WinModem	3Com USRobotics V.90 WinModem	3Com 10/100 NIC
5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty
Microsoft Windows 98 Microsoft Office 2000 Small Business Norton AntiVirus	Microsoft Windows 98 Microsoft Office 2000 Small Business Norton AntiVirus Sony 24X var.° speed CDRW	3-year next-business-day on-site warranty Microsoft Windows 98 Microsoft Office 2000 Small Business Norton AntiVirus Sony 24X var.° speed CDRW Hauppauge TV/FM tuner card Cambridge Soundworks Desktop Theater 5.1 Iomega 250MB ZIP with 1 disk

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5 SAMPO ALPHASCAN 812SR

WHAT'S HOT What really sets the AlphaScan 812SR apart is its $399 price tag, making it one of the least expensive monitors in this review. Similar to Philips' 109B, the AlphaScan also features a shortened case, measuring 16.6. inches. It posted impressive scores for text and graphics, with above-average marks for overall legibility of multisized fonts—good if you do your fair share of word processing. Colors in graphics looked bright and rich, and were not overly saturated.

WHAT'S NOT The 812SR was cruising toward a higher ranking until we subtracted points for meager service and support offerings. Although Sampo includes a three-year warranty, tech support personnel are available for just 10 hours a day on weekdays (compared with 24 hours for most others), and not at all on weekends. In addition, Sampo doesn't provide a toll-free phone number for support.

WHAT ELSE Crudely designed icons mar the 812SR's on-screen control menu. Adjusting the picture isn't much easier than with more run-of-the-mill button controls. In addition, you cannot increase the 8-second on-screen menu time-out, which might not be long enough to let you make your adjustment.

BEST USE The 812SR handles general text and graphics well, and its price makes it a winner for the budget minded. But subpar support offerings mean that the 812SR is best suited to offices with a knowledgeable support staff.

THE FLAT PACK: Both ViewSonic PF790 and Compaq P900 use different variations of the flat CRT. Both deliver sharp text but fall a tad short on brightness and graphics quality.

6 SONY CPD-G400

WHAT'S HOT The CPD-G400 posted a best-of-breed score for graphics, earning high marks for rich and vivid colors, thanks in part to its flat CRT. On a photo of Olympic runners, for instance, flesh tones looked warm and lifelike, and fine details stood out. The primary adjustment tool for on-screen controls—an easy-to-use finger-size joystick—is a welcome relief from the control buttons that we usually see on the bezel.

WHAT'S NOT Priced at $700, the CPD-G400 is more than twice as expensive as the cheapest of the 23 monitors we looked at and the costliest on the chart.

WHAT ELSE The on-screen controls include a built-in troubleshooting menu, which provides solutions to common image problems such as screen flicker.

BEST USE It's not the best overall value here, but its luscious screen colors and easy-to-use joystick control make the CPD-G400 an excellent choice for heavy graphics work—whether you're sprucing up a sales brochure or playing games.

7 CORNERSTONE PERIPHERALS TECHNOLOGY P1401

WHAT'S HOT With an outstanding five-year warranty, Cornerstone offers two more years of coverage than most of its competitors. The p1401 was a high finisher for both text and graphics quality, displaying crisp letters and icons in word processing documents and spreadsheets, and vivid colors on images. A test photo of marathoners showed vibrant colors.

WHAT'S NOT At $645, the p1401 is the third most expensive monitor on the chart, after the Sony CPD-G400 and the Compaq P900. Like Sampo, Cornerstone doesn't provide weekend tech support.

WHAT ELSE Cornerstone puts the p1401 on a good base that you can tilt and swivel easily using just one hand. You also get a helpful, diagram-intensive manual.

BEST USE Despite its relatively high price, the p1401 has great image quality, good color-temperature controls, and a generous warranty, making it a fine choice for businesses that work with robust graphics and computer-aided design.

8 VIEWSONIC PF790

WHAT'S HOT In all categories, the ViewSonic PF790—using a "perfect flat" SonicTron picture tube—landed in ▶

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the middle of the pack, receiving mid-range marks for sharp word processing documents and spreadsheets and for overall graphics quality. This middle-of-the-road workhorse, however, distinguishes itself with a reasonable $499 price and strong service and support ratings.

WHAT'S NOT Among the PF790's less-than-stellar scores were those for image quality of text and graphics, meaning that it isn't the best choice for high-end graphics or word processing. At 18.8 inches, the PF790 is also the deepest display on the chart. And with no brightness and contrast controls on the face and a dauntingly jargon-laced on-screen menu, adjusting the monitor can be tricky.

WHAT ELSE Last September, ViewSonic's more fully featured version of this monitor, the PT795, landed a Best Buy spot, while this version achieves only seventh place. Did ViewSonic get worse, or did everyone else in the pack get better? In any case, the PF790's reasonable price could help raise it back into the top five in months to come.

BEST USE Industry-standard warranty and support combined with a reasonable $499 price make the PF790 a fine pick for general home use, including light small- or home-office tasks. Graphics professionals are advised to look elsewhere, however.

9 ACERVIEW 99SL

WHAT'S HOT At $399, the 99sl is priced as low as Sampo's AlphaScan 812SR. It garnered good scores for sharp icons and crisp text in spreadsheets. Graphics fared slightly better, with rich colors on test photos. The 99sl also has one of the shallowest cases we saw—16.7 inches.

WHAT'S NOT You won't find many fancy features on the 99sl. It's equipped with all the basic controls you'll need for color management and image-quality adjustment, but it lacks helpful power and emissions controls; for example, it lacks the capability of changing power-down times. It also fails to comply with strict, environment-friendly TCO standards, unlike every other monitor on the chart.

WHAT ELSE Despite its moniker, Acer's blue-toned iKey, on the monitor's front bezel, has nothing to do with the Internet. Instead, the misleadingly named iKey reverts the monitor back to its default image settings. The 99sl also lacks an auto-degauss command.

BEST USE A low price, industry-standard warranty and support, and acceptable image quality indicate the 99sl would suit small businesses and home users, provided that graphics tasks aren't any more demanding than the occasional scanned photograph or marketing proposal.

CRISP DISPLAYS, HIGH PRICE: Posting very good scores for graphics display, the $645 Cornerstone p1401 and the $700 Sony CPD-G400 are two of the priciest monitors on the chart.

10 COMPAQ P900

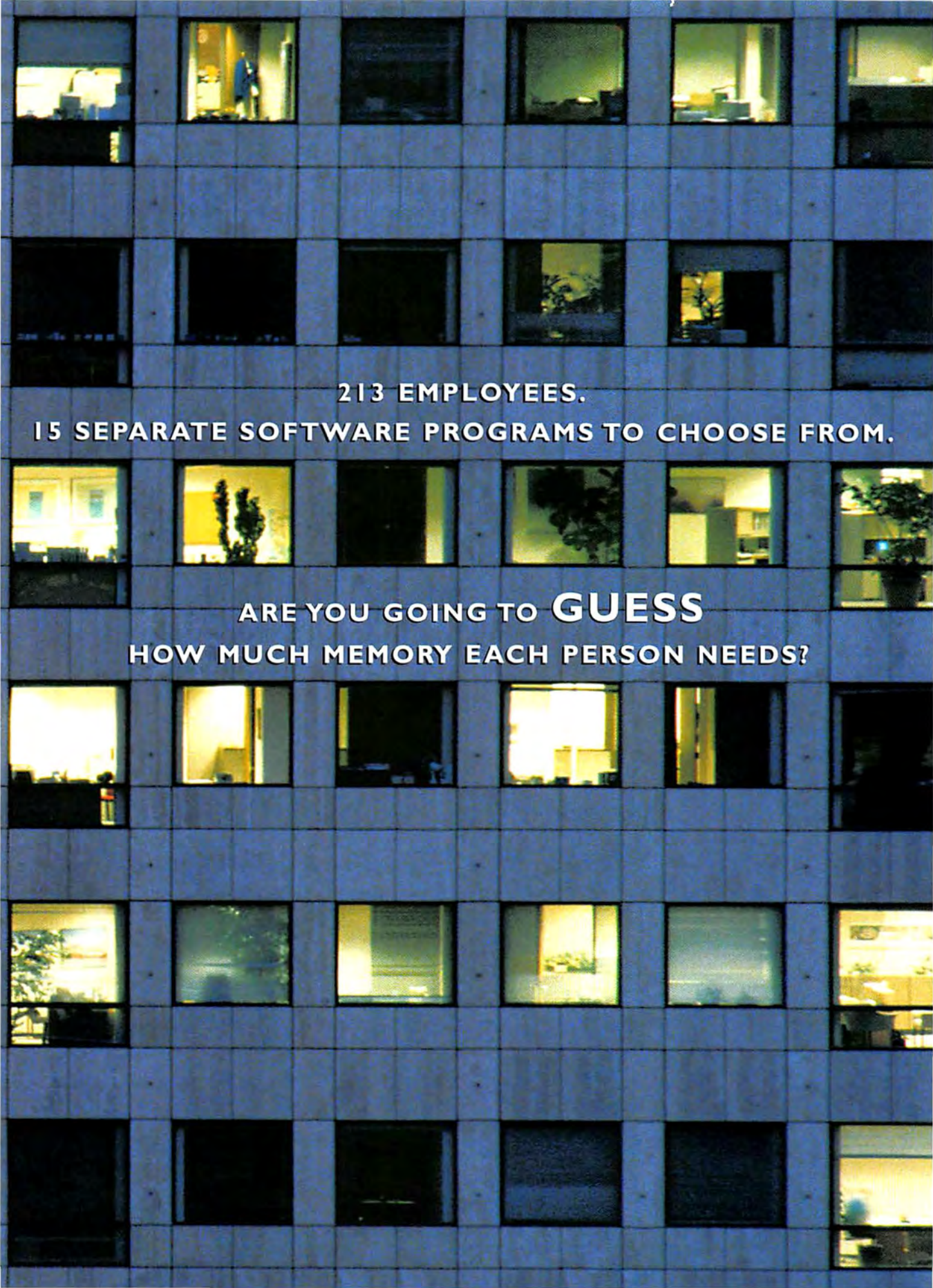
WHAT'S HOT The P900 earned a score of very good for text, with crisp letters and icons in word processing documents and spreadsheets. Color saturation in photos was rich but a bit dark. Besides a three-year warranty, Compaq provides three years of free on-site service, the most generous support policy offered here.

WHAT'S NOT The $649 price is the P900's biggest drag, holding company with high-priced models from Sony and Cornerstone. Despite its flat FD Trinitron tube, the P900's graphics, though acceptable, didn't look as bright as those on competing brands with the same tube.

WHAT ELSE Like Sony's CPD-G400, the P900 features a simple help menu in its on-screen controls, providing quick answers to questions such as how to fix simple screen flicker.

BEST USE With strong text quality and decent-looking colors, the P900 is a safe bet for corporate users seeking the added security of an extensive warranty.

online *For reviews of monitors that did not make the chart, visit www.pcworld.com/maroo/monitors. Rick Overton is a freelance writer based in Boise, Idaho.* PC World *Associate Editors Katharine Dvorak and Mick Lockey contributed to this review.* ■


213 EMPLOYEES.
15 SEPARATE SOFTWARE PROGRAMS TO CHOOSE FROM.
ARE YOU GOING TO GUESS
HOW MUCH MEMORY EACH PERSON NEEDS?

THE KINGSTON/WINDOWS 2000 UPGRADE GUIDE

MEMORY IS ONE OF THE MOST IMPORTANT COMPONENTS IN YOUR SYSTEM, along with your CPU and storage configuration. Understanding how much memory to install in a system can ultimately affect employee productivity and performance. Kingston® and Microsoft® understand that it is not the individual needs of each application, but the combination of the OS and software applications required for different tasks that make determining memory so challenging. This guide has been designed to help IT managers, like yourself, determine optimal requirements for the Windows® 2000 family of products.

WINDOWS 2000 PROFESSIONAL

Windows 2000 Professional runs software applications faster. Notebook-ready and designed with the future in mind, Windows 2000 Professional allows users to take advantage of a full-range of features today. Windows 2000 Professional is future-ready and promises to run today's and tomorrow's applications better.

Baseline: 64MB – 128MB
Optimal: 128MB – 512MB

- Administrative & Service
- Executives & Analysts
- Engineers & Designers

WINDOWS 2000 SERVER

Designed to help businesses of all sizes run better, Windows 2000 Server offers a manageable, reliable and internet-ready solution for today's growing enterprises. For optimal performance, consider adding more memory to take advantage of Windows 2000 Server's robust feature set. Windows 2000 Server is internet-ready and promises to run today's and tomorrow's applications better.

Baseline: 64MB – 128MB
Optimal: 256MB – 1GB

- Application Server
- Directory Server
- Print Server
- Communication Server
- Web Server

WINDOWS 2000 ADVANCED SERVER

Windows 2000 Advanced Server is designed especially for running line-of-business and e-Commerce applications. Windows 2000 Advanced Server delivers on the promise of a powerful and robust operating system. Supporting up to 8GB of memory, 8 processors and its embedded clustering technologies, Windows 2000 Advanced Server is the right choice for companies who rely on technology to do business.

Baseline: 128MB
Optimal: 4GB – 8GB

- Web Server
- Application Server
- Database Server

WINDOWS NT® WORKSTATION

Recent tests show Windows NT Workstation performs 30% faster than Windows 98 with 64MB.

Baseline: 64MB – 128MB
Optimal: 128MB – 512MB

- Administrative & Service
- Executives & Analysts
- Engineers & Designers

WINDOWS® 98

Windows 98 requires 16 – 32MB to run basic applications. Tests show 45 – 65% performance improvements at 64MB and beyond.

Baseline: 32MB – 64MB
Optimal: 128MB – 256MB

- Students
- Home Users

* Please Note: These figures reflect work done in a typical PC environment. Higher-end workstation tasks may require up to 4GB. Naturally, a chart such as this evolves as memory needs and trends change. Over time, developers of software and operating systems will continue to add features and functionality to their products. This will continue to drive the demand for more memory. More complex character sets, like Kanji, may require more memory than the standard Roman based (English) character sets.

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Microsoft Windows 2000

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Light-	Word processing, e-mail, data-entry	64MB – 96MB
Medium-	Fax /communications, database administration, spreadsheets; >2 applications open at a time	64MB – 128MB
Heavy-	Complex documents, accounting, business graphics, presentation software, network connectivity	96MB – 256MB
Light-	Proposals, reports, spreadsheets, business graphics, databases, scheduling, presentations	64MB – 96MB
Medium-	Complex presentations, sales/market analysis, project management, Internet access	96MB – 128MB
Heavy-	Statistical applications, large databases, research/technical analysis, complex presentations, video conferencing	128MB – 512MB
Light-	Page layout, 2 – 4 color line drawings, simple image manipulation, simple graphics	96MB – 128MB
Medium-	2D CAD, rendering, multimedia presentations, simple photo-editing, web development	128MB – 512MB
Heavy-	Animation, complex photo-editing, real-time video, 3D CAD, solid modeling, finite element analysis	256MB – 1GB

Houses one or more applications to be accessed over a wide user base	256MB – 4GB
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Distributes print jobs to appropriate printers	128MB – 512MB
Manages a variety of communications such as PBX, Voicemail, E-mail and VPN	512MB – 2GB
Internet and intranet solutions	512MB – 2GB

Web server supporting an organization's web site and/or online commerce. In most cases, supported by Database server for data warehousing.	1GB – 4GB
Runs enterprise applications like SAP®, PeopleSoft® or Siebel® software supporting a wide user base of 100 or more.	2GB – 8GB
Runs high-end database applications like Oracle®, Sybase® or SQL® Server. Houses and manages an organization's central database to handle file systems for large scale applications.	4GB – 8GB

Light-	Word processing, e-mail, data-entry	64MB – 96MB
Medium-	Fax /communications, database administration, spreadsheets; >2 applications open at a time	64MB – 128MB
Heavy-	Complex documents, accounting, business graphics, presentation software, network connectivity	96MB – 256MB
Light-	Proposals, reports, spreadsheets, business graphics, databases, scheduling, presentations	64MB – 96MB
Medium-	Complex presentations, sales/market analysis, project management, Internet access	96MB – 128MB
Heavy-	Statistical applications, large databases, research/technical analysis, complex presentations, video conferencing	128MB – 512MB
Light-	Page layout, 2 – 4 color line drawings, simple image manipulation, simple graphics	96MB – 128MB
Medium-	2D CAD, rendering, multimedia presentations, simple photo-editing, web development	128MB – 512MB
Heavy*-	Animation, complex photo-editing, real-time video, 3D CAD, solid modeling, finite element analysis	256MB – 1GB

Light-	Word processing, basic financial management, e-mail and other light Internet use	32MB – 64MB
Medium-	Home office applications, games, Internet surfing, downloading images, spreadsheets, presentations	64MB – 128MB
Heavy-	Multimedia use such as video, graphics, music, voice recognition, design, complex images	128MB – 384MB
Light-	Word processing, basic financial management, e-mail and other light Internet use	32MB – 48MB
Medium-	Home office applications, games, Internet surfing, downloading images, spreadsheets, presentations	48MB – 64MB
Heavy-	Multimedia use such as video, graphics, music, voice recognition, design, complex images	64MB – 128MB

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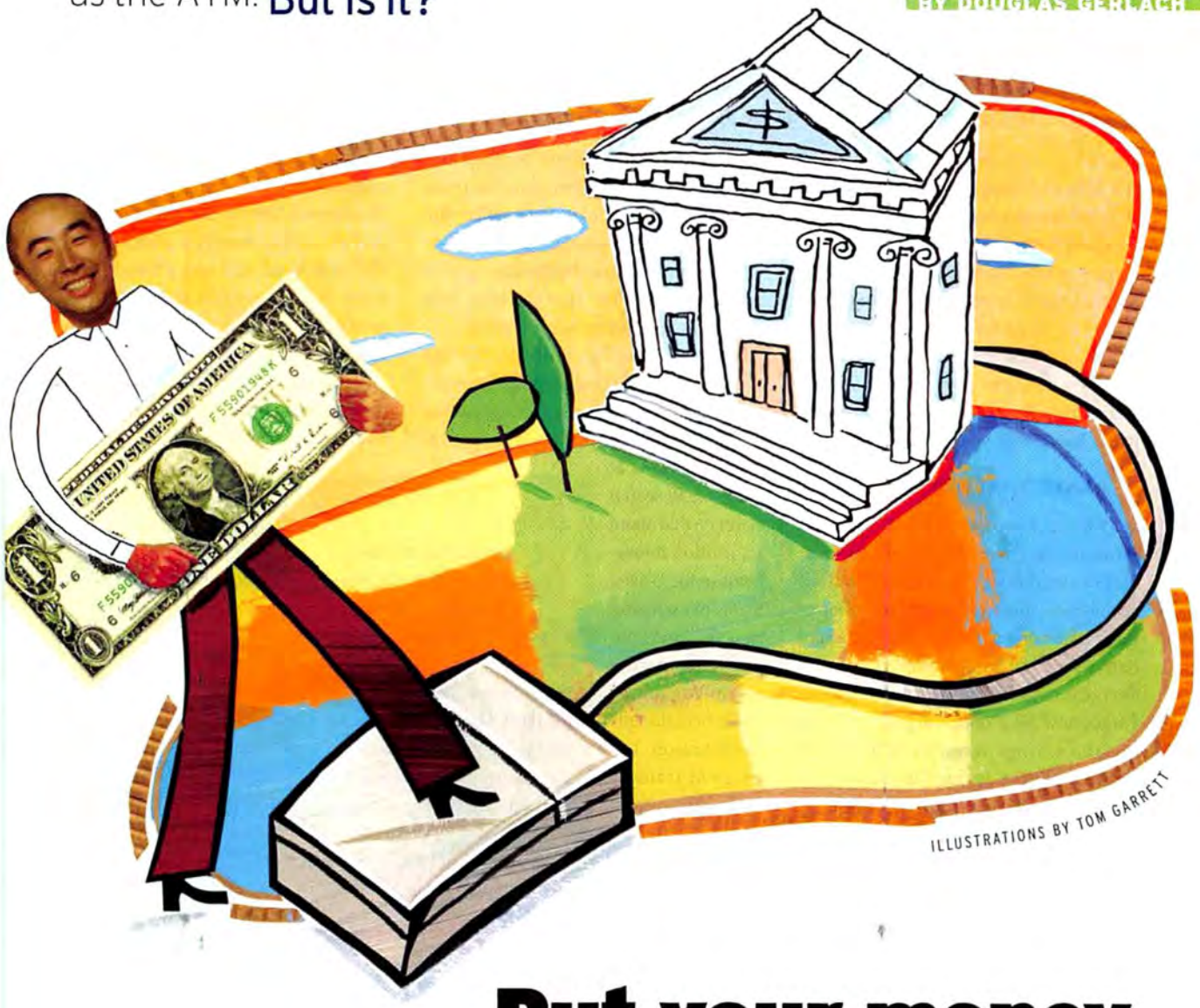
BY DOUGLAS GERLACH



ILLUSTRATIONS BY TOM GARRETT

Put your money where your mouse is

Consider the toaster.

In the 1950s and 1960s, this lowly kitchen appliance was elevated to iconic status as a come-on for banks. In those days, you picked the bank closest to your home or workplace—or the one that gave you the shiniest new toaster.

The toaster incentives are long gone: These days, convenience is the major draw. Drive-up windows, ATMs, and banking by touch-tone telephone led the way, but new technologies could make these time-savers inconsequential. Welcome to the age of online banking.

Today, you can do nearly all your banking without setting foot inside a lobby or even talking to a human—just point and click, any time of day or night. The convenience can be impressive, but there are hazards, too. Interest rates and fees aren't always as competitive as they seem. And as with all things computerized, you run the risk—no matter how small—of falling victim to glitches and bugs that could wreak havoc with your financial life.

BANKS THAT NEVER CLOSE

MORE THAN 500 conventional banks (plus another 300 or so credit unions) offer customers online access to their accounts—three times the number of institutions that did just a year ago. Major banks such as Bank of America, Bank One, Citibank, Huntington, and Wells Fargo, now offer online access to checking and savings accounts, CDs, credit cards, and even loans. Customers can handle most of their routine transactions through the Internet or via a direct-dial connection to their banks, at any time of day.

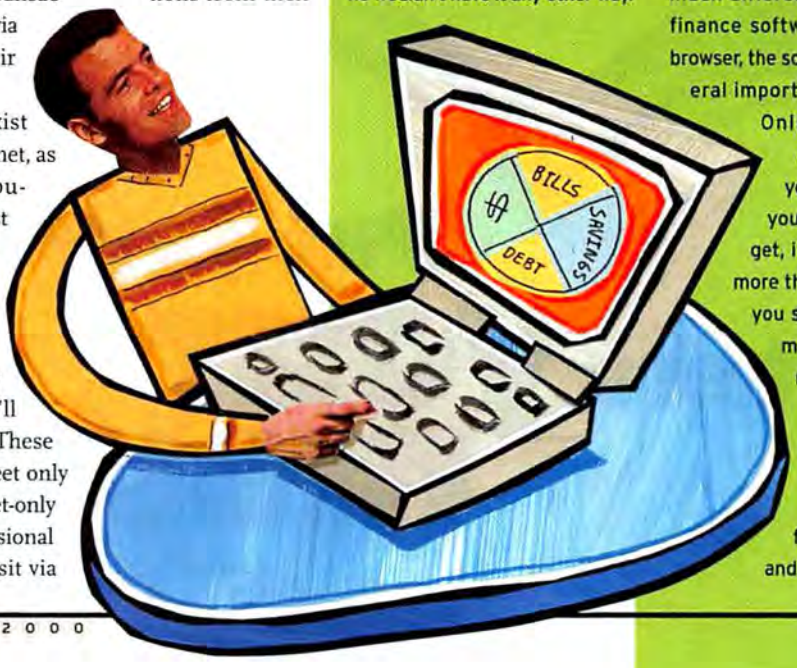
A handful of banks even exist solely or primarily on the Internet, as their names suggest: CompuBank, Net.B@nk, Security First Network Bank, and WingspanBank.com, to name but a few. They have no branches or only a small number of them. Their offices might be halfway across the continent, but you'll never have to set foot inside: These banks and their customers meet only in cyberspace. With an Internet-only bank, you might make an occasional telephone call or send a deposit via snail mail instead of simply popping in at the local branch, a convenience that many customers may be loath to sacrifice. But you also might be able to save a bundle: Because Internet-only banks don't pay for branches and tellers, they can offer both lower fees and higher interest rates.

Internet banking services are the cybersiblings of the dozens of Internet brokerage firms that are currently patronized by some 6.8 million U.S. households. Analysts at Forrester Research estimate that about 3.3 million households in the United States pay bills and transfer funds online, and another 4.5 million households occasionally check account balances or transactions from their computers. Goldman, Sachs analysts predict that the number of online banking customers will *quintuple* by the year 2002.

What's so great about online banking? Just about everything, says Lowell Herr, a retired physics instructor from Portland, Oregon. "I will never go back to writing checks by hand," says Herr, who graduated from touch-tone banking to CheckFree's online bill-paying to Web banking. Herr recently signed up for online banking with the Portland Teachers Credit Union and appreciates the convenience, excellent record-keeping, and efficiency. "It saves me lots of time," he explains. "I just go on the Internet, connect to the PTCU Web site, and with a few clicks and dollar entries, my bills are paid. I never need to write checks. And I have an excellent record of bills that I've paid."

Forget about churning out dozens of checks by hand each month—or running out of checks. When you bank online,

Banking by browser is fine, but Ron Mayhew prefers a different approach. "Quicken is my bank," says the North Carolina sculptor. Intuit's popular personal finance software serves as Mayhew's bank teller, record keeper, and check writer in one package, and he wouldn't have it any other way.



Intuit's Quicken and its arch-rival Microsoft Money do more than help you create a household budget or balance a checkbook. Both programs now hook up with more than 750 banks to allow you to download account transactions directly into your software, or even pay your bills online. While reviewing statements and paying bills aren't much different with personal finance software than with a browser, the software offers several important advantages. Online bank statements won't tell you if you're within your household budget, if you're spending more than you earn, or if you should contribute more to your retirement plan. Deluxe versions of Money and Quicken both feature extensive suites of financial-planning and investment tools

your bank will either arrange electronic payments with regular payees—utilities, credit cards, and so on—or send computer-generated paper checks on your behalf.

And you can still dash off a handwritten check to merchants that don't accept payments by mail, much less electronically—the dry cleaner or corner grocer, for instance. Just remember to update your online register when you get home so you'll be able to recognize the payee of the check when it clears. You can usually tell electronic transactions by their identifying numbers (five or six digits), which are longer than those of your paper checks.

SAVE A FEW TREES

WITH ONLINE BANKING, you can forget about saving boxes of paper. All your transaction records will be stored online, and you'll have instant access to details of deposits, checks, transfers, and balances, as well as to an account history going back several months up to several years. Many banks enable you to download transaction records directly into a personal finance program such as Quicken or Microsoft Money (see "Beyond Browsers," below).

You will not receive any cancelled checks with your monthly bank statement; many banks no longer send them anyway. Should you need copies of your checks—to get a loan, for example—online banks such as CompuBank, NBank, and Security First Network let you view and print the scanned images.

"Every time I download transactions to Quicken from my bank, I see all of the charges and credits to all of my accounts since the last download," explains Ron Mayhew, a sculptor who lives in the Blue Ridge Mountains of North Carolina. Mayhew, who has been banking online with Centura Bank for two years, says that this feature alerts him to unexpected charges days or weeks before his monthly paper statement arrives. And when tax time rolls around, Mayhew appreciates the efficiency of being able to prepare an annual report of his income and expenses in just minutes.

Since you don't have to mail payments, your savings on postage and supplies might offset any bill-payment fees. ▶

Security First Network Bank touts a 6 percent interest checking rate that won't last forever.

beyond browsers: online banking with quicken and money

to help you meet your long-term financial goals. In addition, both programs allow you to download information from a number of online brokerages.

TAX TIME-SAVERS

PERSONAL FINANCE software also shines at tax time, when it can create reports or data files to import into popular tax software such as TurboTax and TaxCut. "At the end of the year, it takes only a matter of minutes to have a profit-and-loss statement for my business ready to go the CPA," Mayhew says.

Many new computers ship with basic versions of Quicken or Money, but you will need to upgrade to a deluxe edition to take advantage of all the bells and whistles, including most of the planning and investment features. But before you go out and spend $40 or more for an upgrade, you might want to check with your bank—some will give you the software.

If your bank supports Quicken or Money, you'll need to do some setup work to get going. This generally involves letting the bank know which package you're using—perhaps on its Web site, or by phone—and then waiting for a personal identification number that you'll have to use with the software (the PIN usually comes by snail mail, for security reasons). Both of these finance programs walk you through the setup process in a very short time.

Even if your bank doesn't let you do all your banking through Quicken or Money directly, it may enable you to download transaction histories and account statements from its Web site for import into the software.

And if your bank is not online at all, Quicken and Money still allow you to enjoy some online banking services. Both of these programs offer links to CheckFree's electronic billing and payment service, which you can use no matter what bank you patronize. CheckFree charges $13 per month for up to 35 payments, plus $3 for each additional 10 payments.

THE BILL, PLEASE

WHILE THE MAJORITY of brick-and-mortar banks offer basic online access at no cost, most of them charge a fee of $5 or $6 per month for online bill paying. You may be able to sidestep this fee altogether (as Mayhew did) either by maintaining a minimum account balance or by signing up for direct deposit of your paycheck.

Quicken also offers a free online billing and payment service for a few utility and credit-card companies. If one of your regular billers participates, this lets you receive bills via e-mail and view them in Quicken before making an electronic payment.

Both Money and Quicken are excellent and easy to use; Quicken Deluxe 2000 has slightly better features for serious investors, while Money Deluxe 2000 may be a tad more accessible for novices. But if you can point and click, you can use either of these powerful packages to dial up your bank, bring order to your bank accounts, and keep tabs on your personal finances.

10 questions to ask before signing up

If you'd like to start banking online, and you're not happy with the services that your current bank offers, the first place to shop is Gomez.com's Internet Banker Scorecard at www.gomez.com (see chart). The Online Banking Report (www.onlinebankingreport.com) is another resource.

Once you find a few candidates, here are the questions that you'll want to answer:

1. What's the initial amount you'll need to open an account?
2. What are the checking-account fees? Is a minimum balance required to qualify for free basic checking or free interest-bearing checking? If your paycheck is deposited directly, will monthly fees be waived?
3. What are checking and savings interest rates? Are the rates promotional? When do they end?
4. Can you download transaction records directly to Quicken or Money? Do you need one of the packages to use banking services, or will a browser suffice?
5. Is online access available by direct dial-up, Internet, or both? A dial-up connection lets you bank online even if your ISP goes down or the Net is congested.
6. Can you check balances and/or pay bills by telephone? Is the call toll-free?
7. What level of encryption is required to access the bank's site? Make sure your browser supports the encryption level your bank's site uses.
8. Does the bank offer online bill payment? What does it cost? Can you avoid a fee by maintaining a certain minimum balance?
9. Does the bank offer free ATM access? If not, does it offer rebates on ATM fees?
10. Does the bank offer credit cards linked to your accounts? Does it offer money-market accounts, lines of credit, certificates of deposit, or mortgages?

Make sure any bank you're considering has a federal or state charter and is insured through the Federal Deposit Insurance Corporation. If you find the bank in the FDIC database (www.fdic.gov), it's legit.

And if you don't come out ahead, the convenience will almost surely be worth the small difference. Mayhew maintains a minimum balance in his account that qualifies him for free, unlimited bill payments (which otherwise would cost $6 a month). Most online-only banks don't even require minimum balances for this service.

Electronic payments typically arrive promptly, which could work either for you or against you. On the one hand, you can always prove you paid your mortgage on time. On the other, you don't have much credibility when you try to blame late payments on the post office.

Not only can you schedule specific payments to be made at a future date, you can also arrange for regular fixed bills—rent, utilities, cable, and so on—to be paid on a specific date each month. You could be on vacation or away on business, and your bills would still be paid on time. ▶

a few good online banks

Gomez Advisors evaluates online services of 80 banks based on 100 criteria in five categories. Here are the Gomez Scorecard's top five banks as of press time.[1]

	BANK	Overall score	Gomez Advisors categories[2]: Ease of use	Customer confidence	On-site resources	Relationship services	Overall cost	Other key features: Interest checking rates and fees	ATMs	Cancelled checks	Customer service
1	**Security First Network Bank** www.sfnb.com	7.16	7.54	8.17	6.52	5.75	9.76	6 percent promotional interest rate until April 15; no fees, $100 minimum balance.	Must use third-party ATMs; no rebate on ATM fees.	Viewable online for 90 days; thereafter, copies available for $3 each.	24/7 phone support
2	**Wells Fargo** www.wellsfargo.com	6.61	8.93	7.17	5.78	6.12	5.2	Interest rates vary by state from 0.4 to 1.36 percent; $0 to $14 monthly fees.	Free at 6100 Wells Fargo and Norwest ATMs in 21 states; no rebate on third-party ATMs.	Three free copies per month; $5 for up to four additional copies; $2 thereafter.	24/7 phone support
3	**Net.B@nk** www.netbank.com	6.41	7.61	4.36	6.24	6.01	9.6	3.05 percent interest rate on no-fee accounts; 3.93 percent on accounts with $4.50 monthly fee.	Must use third-party ATMs; no rebates on ATM fees.	Copies of cancelled checks available for $5 each.	M-F 6 a.m.-midnight, Sun. 1-10 p.m. phone support
4	**First Internet Bank of Indiana** www.firstib.com	6.34	6.75	6.62	6.57	4.23	8.29	3.05 percent interest rate; $3.50 monthly fee unless average daily balance is $2500 or customer direct-deposits $1000 per month.	Must use third-party ATMs; $6 monthly rebate on ATM charges.	View cancelled checks online; no time limit.	M-F 8 a.m.-8 p.m. phone and live chat support
5	**WingspanBank.com** www.wingspanbank.com	6.17	6.19	5.93	6.29	4.37	9.74	Interest rates up to 4.59 percent; no fees.	Free use of 4000 Bank One and First Chicago ATMs; $5 monthly rebate for other ATM fees.	Free copies of three checks per month; $2 per additional check.	24/7 phone support

[1] Updated scores are available at www.gomez.com.

[2] Gomez Advisors ratings (on a scale of 0 to 10, 10 being best).

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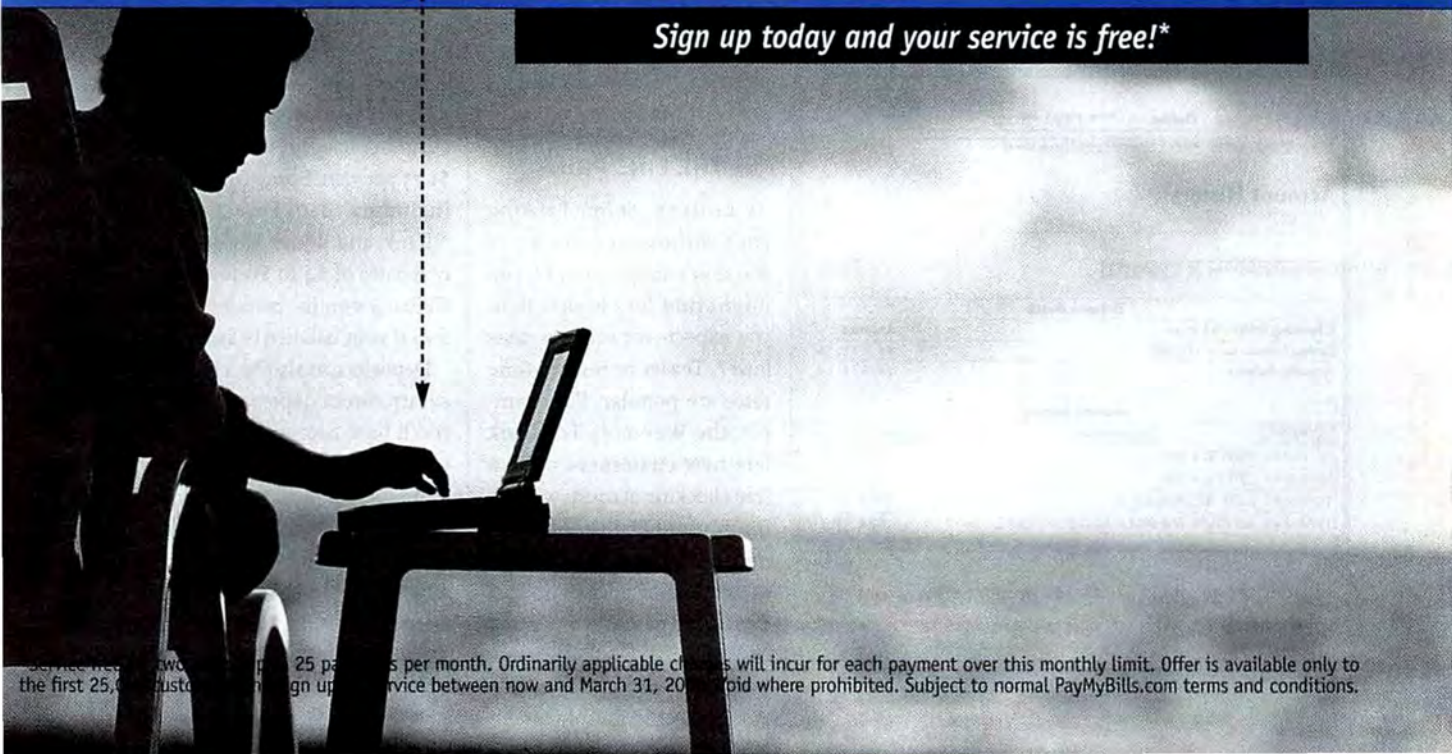
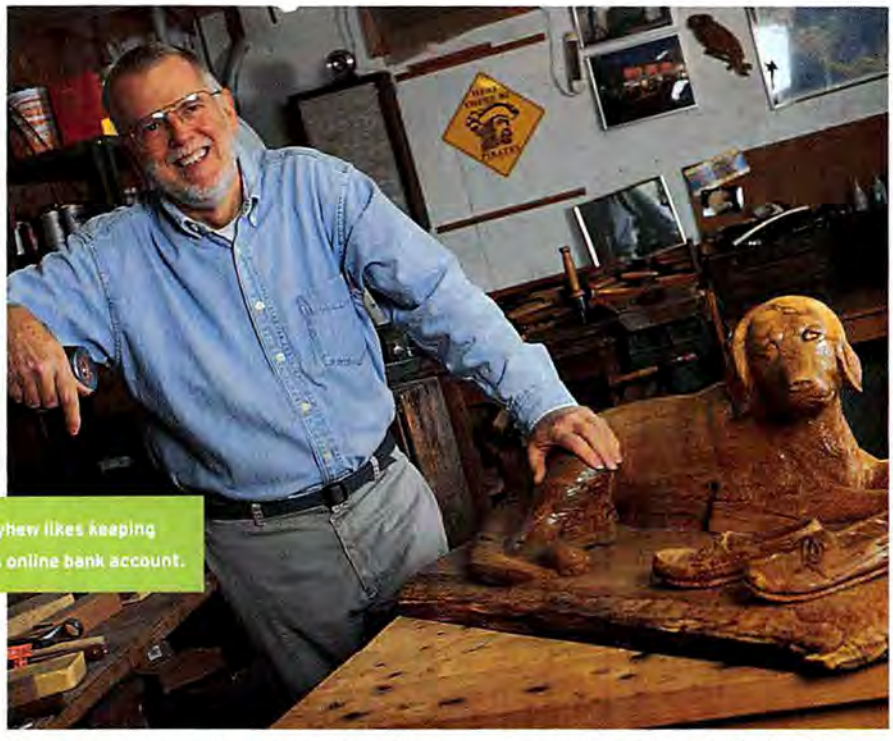


*two … 25 pa… per month. Ordinarily applicable ch… will incur for each payment over this monthly limit. Offer is available only to the first 25,… custo… sign up… rvice between now and March 31, 20… oid where prohibited. Subject to normal PayMyBills.com terms and conditions.

With online banking, your checkbook will always be perfectly balanced. You can take your online bank with you, should you relocate. But the biggest draw for online-only banks may be the reduced or eliminated fees and higher interest rates. CompuBank, First Internet Bank of Indiana, NBank, Net.B@nk, and Wingspan Bank all offer no-fee, no-minimum basic checking accounts, with an initial deposit of just $50 or $100. Net.B@nk and WingSpan even pay interest on the balance.

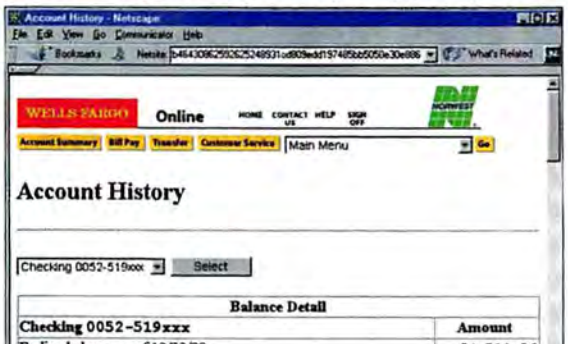
And typical Internet bank interest rates are two to five times the national average, even without the high promotional rates that some of them offer. According to Bankrate.com, a Web site that tracks interest rates on banks and credit cards, the average checking account in the United States in November 1999 paid an interest rate of 0.84 percent. In contrast, no-fee checking accounts at Internet-only banks were paying 2.50 to 4.64 percent.



HIGH ON ONLINE BANKING: Sculptor Ron Mayhew likes keeping close tabs on his money using Quicken with his online bank account.

Setting up an account at an online bank is fairly painless. In many cases, you can do it online, using an existing account with a brick-and-mortar bank, or starting one with a Web-based bank. Typically, you fill out the forms most banks require, and the bank approves or declines your application, sometimes in moments. Security First Network Bank, for instance, will pull a credit report and get back to you within a minute. Even so, you may have to wait a couple of weeks before you can use all the features of your new account (such as online deposit or bill payment).

Most banks snail-mail each new account holder a welcome kit containing an account number, access instructions, deposit slips, and a signature card, which you return with your initial deposit (some things still can't be done electronically). ATM cards and paper checks take an additional week or two to arrive.



Virtual ledger: Wells Fargo's account history page identifies handwritten checks by number as they clear.

THE FINE PRINT

OF COURSE, online banking isn't without drawbacks. If you don't shop carefully, you might find fees higher than you expect—or interest rates lower. Teaser or limited-time rates are popular. For example, the Web-only Telebank lets new customers open a free checking account with no minimum balance. After six months, however, you must maintain a balance of at least $1000 or pay a $5 monthly fee. Security First Network Bank pays a whopping 5.83 percent interest rate on checking accounts—but only through April 2000 *and* only on balances up to $10,000. For amounts above $10,000, the rate falls below 2.50 percent.

Some of the other big drawbacks come when you open an account with an Internet bank that doesn't have branch offices near you. How do you get money into your account and out of it?

To withdraw cash, you can use your ATM card almost anywhere. But since most Internet-only banks don't have ATMs of their own, you'll probably have to use those of other banks—and pay non-customer usage fees that range from $1 to $1.75 per visit. Some Internet-only banks, including BankDirect, CompuBank, NBank, and Wingspan Bank, pay monthly rebates of $4 to $6 to cover these fees; Citibank's online banking waives all ATM fees if your balance is $10,000 or above.

Deposits can also be a hassle. If you can set up direct deposit of your paycheck, you'll have near-immediate access to the cash—no waiting for the check to clear. Some banks, such as First Internet Bank of Indiana, will waive the monthly fee for interest checking if you arrange a direct deposit of at least $1000 each month.

But you'll have to mail all paper ▶

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checks to the bank. Most online banks provide preaddressed, and sometimes even postage-paid, envelopes. But in addition to the time it takes your check to clear, you'll have to consider the time the postal service takes to deliver it to your bank—or the expense of paying UPS or FedEx to speed up delivery. And you can't mail cash, so you'll just have to spend that $500 Grandma gave you for your birthday.

While you can't tell creditors that the dog ate your bills, you might experience a high-tech variation: the computer glitch. Ron Mayhew ran into problems with the new version of Quicken that his bank sent him as part of its Y2K-compliance effort. "Between Windows, Quicken, and my ISP, I had trouble downloading my transactions, and no one could solve the problem," he complains. Eventually, his ISP upgraded some equipment, he purchased a new computer with an updated version of Windows, and the trouble disappeared.

Paul Thomasson, supervisor at a Sioux Falls, South Dakota, social services agency, got a call from his mortgage company a few weeks after he set up his online account at Wells Fargo and made the first round of payments. "They wanted to know why they hadn't been paid," he says. "I was sure I had made the payment through the online bill-paying system, but when I checked, I saw that I indeed had not. I don't pay house and vehicle payments through bill-pay anymore." In addition, Thomasson got hit with a late fee because he misjudged the amount of time that it took to have bills paid electronically.

While you can't **tell creditors that the dog** ate your bills, you might experience a **high-tech variation:** the computer **glitch.**

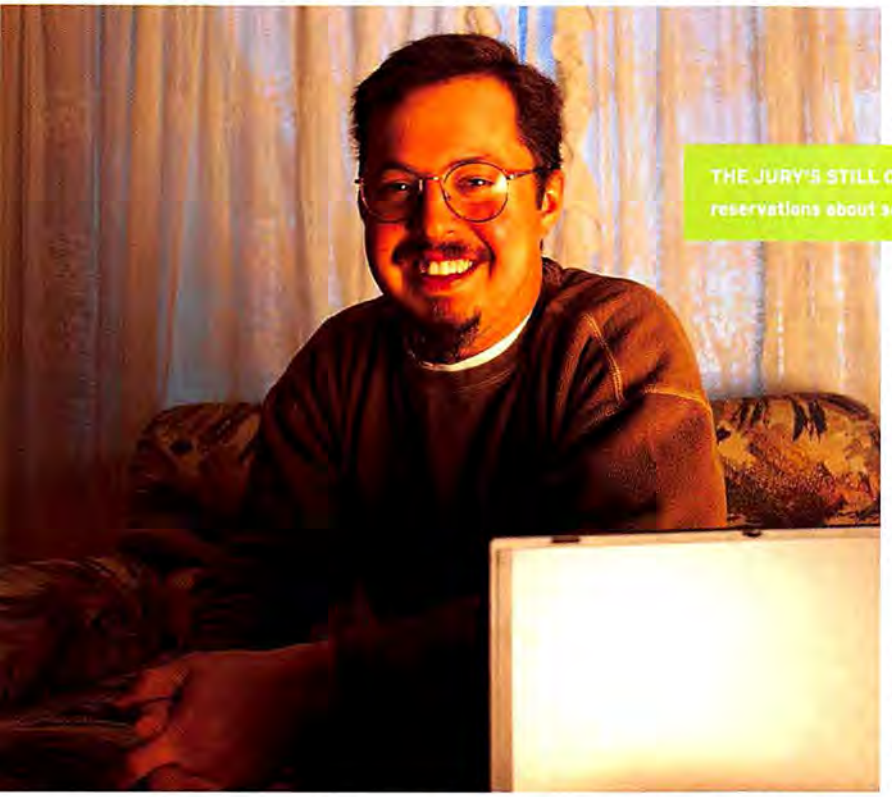
What happens if your online bank's Web site goes down or if the Net is completely congested? You could be locked out of your bank account for hours—or longer. Last September, Bank of America's online banking site effectively shut users out for the better part of a day as a result of unforeseen maintenance and a new requirement that customers fill out a profile on their site. The company said "fewer than 5000" customers were affected, but that's small consolation if you were one of them. Users were still able to do some banking by phone or direct dial-up connection. Many online banks, such as Net.B@nk, Security First Network Bank, and Telebank, offer toll-free telephone banking (though they may not offer services like bill-paying on the telephone).

Online security is, of course, a major consideration. Many online banks skirt Internet security concerns by offering direct dial-up access to their network. If you do access your account over the In-

top tips for online banking

To get the most from online banking, you may need to change your personal finance habits. Here are several worthwhile strategies:

- **Minimize ATM visits.** Even if your bank offers rebates for ATM charges, it might cover only a few visits. So make larger cash withdrawals less frequently. Or request $50 cash back when you buy groceries with your ATM card. Try to use fee-free ATMs, listed on many bank Web sites.
- **Protect your PIN.** It's never a good idea to write down a personal identification number or password. And if you bank online from work (or from any other public location), log out completely and close your browser when you're finished. If you don't, a friendly coworker could see your account balances or make a transaction, inadvertently or otherwise. Change your PIN or password occasionally.
- **Use prepaid postage.** Ask whether the bank supplies preaddressed envelopes with prepaid postage so you can mail deposits on its dime, not yours. Sign up for direct deposit of checks.
- **Pay bills early.** When scheduling online bill payments, allow time for your bank to process those transactions. If you don't, you risk incurring late fees.
- **Get overdraft protection.** Or link a savings or money-market account to your checking. You'll be glad you did when your automatic mortgage payment clears even though you did not have enough money in checking. You may pay an overdraft fee, but it will probably be cheaper than the penalty for the cyberequivalent of a bounced check.
- **Automate when possible.** If you transfer money regularly from one bank to another, see if your bank will let you set up a recurring Automated Clearing House transaction. Banks use the ACH to move a client's funds from one institution to another (such as when you transfer an account). Some banks, like Security First Network Bank, will set up a monthly deposit at no charge.



THE JURY'S STILL OUT: Paul Thomasson banks online but still has reservations about security and uses snail mail for important bills.

ternet, your bank will require that you use a secure Web browser that encrypts the information while it's in transit.

HOW SECURE IS THAT SERVER?

ENCRYPTION STRENGTH is measured by the number of bits in the encryption algorithm (the more bits, the stronger the encryption). Most Web browsers use 56-bit (standard) or 40-bit (low) encryption. Some banks may require a browser with 128-bit (high) encryption. This restriction could present a problem if you live outside the United States or Canada, which both bar distribution of 128-bit encryption abroad. Typically, you'll need at least Microsoft Internet Explorer 3.02 or Netscape Navigator 3.0. You may be able to upgrade your browser's security with a patch.

Even with encryption, some users aren't ready to trust their finances completely to the Web—a concern that may be well-founded. A July 1999 study by the General Accounting Office, the investigative arm of the U.S. Congress, found that 44 percent of banks hadn't done all that they should have to make online banking safe for customers. Some banks had not devised policies and procedures to address security concerns; others did not audit online activities sufficiently or didn't have proper agreements with the third-party firms that built their Web sites. While none of the banks surveyed had lost money or experienced security breaches, the GAO concluded that Internet banking is by nature riskier than conventional banking.

Lending credence to the GAO report was an incident last November in which a Net.B@nk customer gained online access to another customer's account. While Net.B@nk publicly attributed the snafu to human error (committed by a bank employee), the matter does raise some questions about the safety of online banking in general.

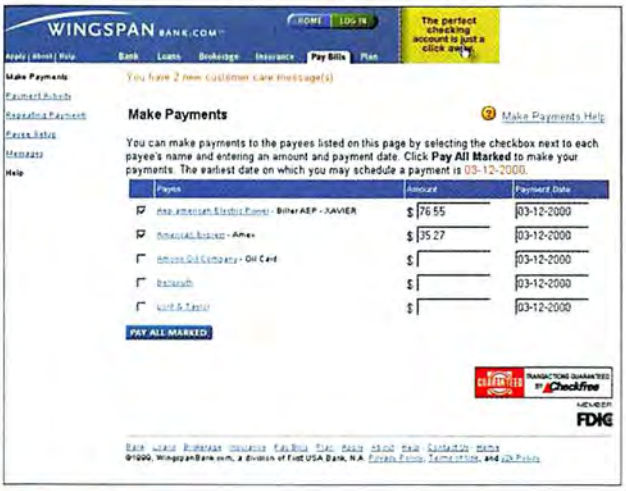
Another consideration: While you may be able to bank around the clock, a bank's customer service department may keep more conventional hours. Though toll-free phone numbers are common, the bank may urge you to submit complaints by e-mail before calling. The ability to walk into a branch office and complain to a live human is one advantage a local bank may have over Web-only institutions.

Nonetheless, more and more people are putting their finances online. And greater innovations are in store. Many banks are now beginning to let you receive and manage recurring bills online (a service that's already offered by facilities like Yahoo's Bill Pay, which is essentially the CheckFree electronic billing service offered under Yahoo's auspices).

BANK ON PROGRESS

SOON YOU'LL be able to bank online with wireless handhelds such as smart phones and personal digital assistants. The Bank of America already offers wireless access to its California customers who use 3Com's Palm VII.

No wonder toasters have vanished as a force in the world of banking incentives. The real prize is what you get with online banking: lower fees, higher rates, and complete control over when, where, and how you manage your money.



WingspanBank.com now offers electronic bill payment services to utilities and major merchants.

Douglas Gerlach, founder of Investorama.com, wrote The Complete Idiot's Guide to Online Investing *(MacMillan, 1999).* ■

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Crucial Technology: Meeting the RAM Needs of Netizens

www.crucial.com

Desktop technology never stands still. Neither do the needs and desires of the 'Net-connected users. That's why PC upgrades—especially additional RAM—have become an essential aspect of Netizenship.

So where can you go on the Web to find the best deals on quality RAM?

Micron Technology division Crucial Technology, Meridian, Idaho, believes it has the answer. The company's Web site, http://www.crucial.com, is the only place on the Web where consumers can buy DRAM upgrades for their PCs directly from the manufacturer. In fact, Micron is the largest DRAM manufacturer in the country and one of the top three in the world. In addition to providing memory modules for their own highly respected brand, Micron Technology is also a top supplier for other industry leaders, including Compaq, Dell, Gateway, HP, and IBM.

That makes Crucial a very different source from the typical reseller operation, which either slaps someone else's chip on a board, or simply re-labels pre-assembled modules with their own logo.

"With our approach, the customer is assured of getting the same quality as the PC manufacturers themselves demand," states Rafe VanDenBerg, Crucial marketing director. "That's something you can't find anywhere else on the Web."

VanDenBerg points out that such quality has become increasingly critical as processor speeds increase, since manufacturing tolerances have become proportionally tighter. "The new chipsets and processors have critical timing and circuit requirements that mandate precision manufacturing and design," he observes. "Since Micron works directly with the top PC manufacturers, we can assure our customers that our upgrades match the exacting specifications they need to boost their system performance."

"With our approach, the customer is assured of getting the same quality as the PC manufacturers themselves demand."
Rafe VanDenBerg, marketing director, Crucial Technology

A Guide to Memory

To further ensure that customers get the right memory upgrade for their needs, Crucial's site provides even the novice users all the information they need to know about memory and upgrading their systems. The site is most notable for its unique Memory Selector, which guides customers through a simple step-by-step interface to find the exact memory they need for nearly 8,000 different desktops, notebooks, servers, printers, and routers. The site also provides a complete reference library on memory technology, manufacturing processes, and upgrade considerations. "We've really created one of the most informative and comprehensive sites on the Web related to memory," declares VanDenBerg. "Even if you're not buying from us, it's a very educational place to browse."

In addition to maintaining its full-function Web site, Crucial—which has been selling online since 1996—offers toll-free phone, fax, and e-mail ordering. Same-day shipping and overnight delivery are also available. Consumers get free technical support and a limited lifetime warranty on all products, as well as a full 30-day money back guarantee.

Just as important as the quality and service Crucial offers are its discounts for ordering online. Consumers can now save an additional 10% by ordering through Crucial.com. Crucial also provides additional value to its enterprise customers through its online purchase programs.

"With memory pricing increasing, our online discounts provide an even greater savings opportunity for our customers," says VanDenBerg. "And the more business we conduct online, the more savings we'll be able to pass on to our customers."

IBM, Gateway, HP, and Apple buy our memory direct.

They don't take risks. Neither should you.

Buy your memory direct from one of the largest memory manufacturers in the world. Performance, reliability, selection *and* factory direct savings — Crucial Technology, a division of Micron.

"Thanks for the quick service and for having the best prices. Also, your web page really makes it easy to find the correct memory for your machine. Other sites I went to weren't nearly as efficient. Great Job!"

David Smith, Crucial Customer

Compare the Savings . . .

64MB Upgrades

Compaq	Kingston	**Crucial**
Presario 5304	$186.00	$94.49
Presario 5070	$186.00	$94.49
Presario 5360	$186.00	$94.49
Micron Electronics	Kingston	**Crucial**
Millennia 400	$154.00	$94.49
Millennia 450	$154.00	$94.49
Millennia MAX 450	$154.00	$94.49
Gateway	Kingston	**Crucial**
G6-450	$154.00	$94.49
G6-400	$154.00	$94.49
Performance 450	$154.00	$94.49
IBM	Kingston	**Crucial**
Aptiva (2153) Model E2U	$154.00	$94.49
Aptiva (2139) Model E5D	$154.00	$94.49
HP	Kingston	**Crucial**
Pavilion 4530	$186.00	$94.49
Pavilion 4535	$186.00	$94.49
Kayak XU PC Workstation 440BX Chipset	$207.00	$106.19
Vectra VL Series 8	$154.00	$94.49
Apple	Kingston	**Crucial**
Power Mac G3 PC100	$154.00	$94.49
Power Mac G4	$168.00	$94.49

Crucial prices reflect an automatic 10% discount for ordering online. Prices were taken from Crucial and Kingston Web sites on 1/4/00, however, they can (and do) change daily. Prices may vary according to specific system requirement.

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CDW.com: Attention Shoppers!

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CDW.com's My Favorites option lets the shopper create one-click comparison charts for computer products.

What causes your e-commerce headaches? The sudden price changes? The late deliveries? The unanswered e-mails and phone calls? For fast relief, check out CDW.com, the Web site *PC Week* (May 24, 1999) called the number-one e-commerce site for IT buyers.

"CDW is doing the e-commerce thing right," says Bill DiCocco, systems infrastructure manager for S. Abraham and Sons, Inc., a convenience-store distributor based in Grand Rapids, Mich. The moment you become an online customer, CDW.com connects you with a personal account manager and support team to answer your questions and ensure quality customer service.

"We are a penny-profit business," DiCocco says, "and we watch our expenses carefully. My CDW account manager helps me to make sure I get the best price on just about anything."

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DiCocco also saves time and money on his purchases with CDW@work, CDW's customizable extranet service. "I have made purchases [through CDW@work] at 4:30 p.m. on a Thursday and had the order delivered Friday morning, before 10 a.m.," DiCocco says. "That's very hard to find in an e-commerce Web site."

DiCocco uses his CDW.com Buyers' Alert list to notify him when products reach the price targets he designates, or when out-of-stock items become available. "But I have to say," DiCocco adds, "it's hard to remember the last time that something I wanted from CDW was out of stock."

Your CDW.com account manager can give you the extra level of service you need to locate hard-to-find products. "If there's something I can't find online, my CDW account manager can always get it for me," says Rick Maegaard, technical specialist for NCH Nuworld Marketing, Ltd., a coupon clearing house based in Lincolnshire, Ill. "She seems to have connections with everybody and his brother."

On the Web, Maegaard uses CDW.com's My Favorites option to create one-click comparison charts for servers, routers, and software. "My Favorites instantly lays out all of the pricing and specs for the categories I shop in most often," he says. "It does all of the work for me."

You can use the CDW Compare tool to gauge the prices and specifications of items in any category. You can then buy any item in the comparison or add it to your My Favorites list for future reference. In My Favorites, you can review product names and numbers, brief descriptions, and prices, and add items to your shopping cart with the Buy Now option.

My Favorites automatically updates the prices in your comparison charts and individual products list, so your information is always kept current. And for easy housekeeping, the Edit Favorites area lets you quickly rename and delete charts and remove items from the products list.

Maegaard says CDW.com earns his loyalty every day with a caring account manager and a Web site he can tailor to his business's needs. "I get calls all the time from other suppliers, but leaving CDW hasn't even crossed my mind," he says. "I know that I'm getting the best prices I can. There's just no reason to go elsewhere."

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I've found the solution at CDW.com.

I need to identify the products that are right for my applications.

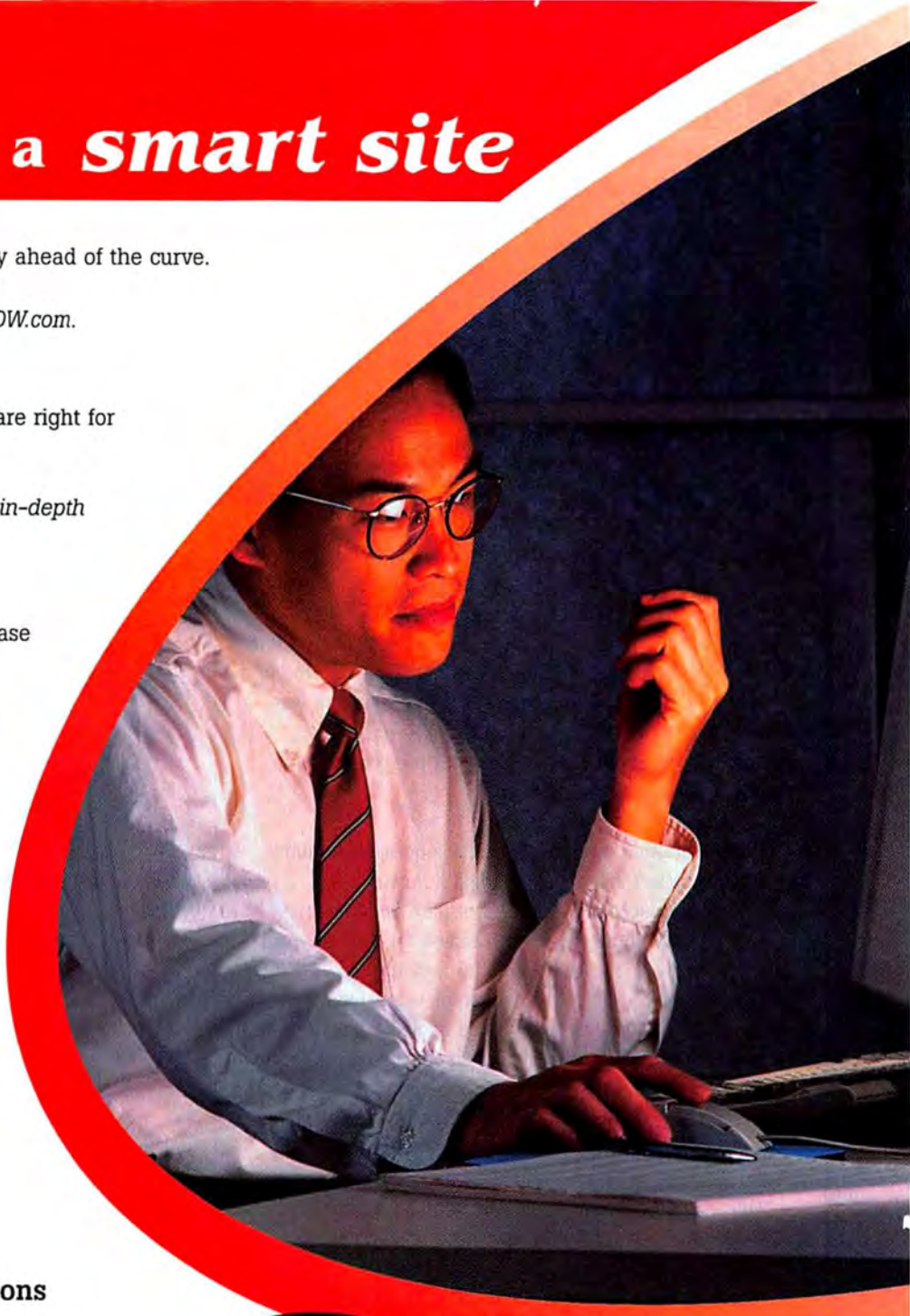
I rely on CDW Compare for in-depth cross-brand research.

I like to stay on top of special purchase offers on the latest technology.

I subscribe to CDW Buyers' Edge e-mail newsletter.

I've got to know when the items I need are in stock, especially the hard-to-find ones.

I use CDW Buyers' Alert to keep in touch with product availability, even price moves.



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Once, while standing in the middle of a furniture showroom, Paul Smith, chief of staff at the State University of New York at Brockport, thought, "This stuff looks great, but I wonder if we can get it cheaper somewhere else." Smith surfed the Internet for savings, and found them at OfficeFurniture.com. "OfficeFurniture.com was the site that had the prices and convenience I was looking for," Smith says. "Even with the cost of shipping, their prices were better."

OfficeFurniture.com is the Internet's largest online furniture resource. The company behind it, Advanced Furnishing Concepts, LLC, based in Danville, Calif., has been in the furniture business for over 15 years. You can search for furniture in OfficeFurniture.com's extensive online catalogue by brand name or product category. OfficeFurniture.com also offers its customers secure online payment, and welcomes phone and fax orders. The company's customer service representatives are available 9 a.m. to 6 p.m. PST, Monday through Saturday.

officefurniture.com

"OfficeFurniture.com's telephone support is really good—they always follow up with me," says Muna Issa, treasurer for Kingston, Jamaica-based SuperClubs Resorts International Ltd. When the company was moving some of its people to a new 2,500 square foot office space in nearby Ocho Rios, Issa sent OfficeFurniture.com a copy of the floor plan. "They called us right back, and told us exactly what we needed," Issa says.

"OfficeFurniture.com offered me discounts on large orders where the office superstores could not," Issa adds. "They were able to send me what I needed, when I needed it, and at a lower price."

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When Computer Problems Strike... You Need An Incredible Safety Net.

GoBack™

HAS A SYSTEM CRASH OR VIRUS EVER SENT YOUR HEART RACING?

Or a simple mistake caused your blood to boil – and your data to disappear? Chances are your last backup wasn't enough to rescue you.

When computer problems happen – and it's just a matter of time before they do – you need an incredible safety net. One that allows you to:

- Recover from a major system crash in minutes, without ever having to know what caused the problem.
- Retrieve all the data wiped out by a devastating virus that slipped past your anti-virus program, without calling upon outside support or accessing your most recent backup.
- Remove all traces of a failed software installation, without going through a tedious, and often unsuccessful, uninstall process.
- Instantly recover a critical file you accidentally deleted or overwrote.

With Wild File's award-winning GoBack software you can do this, and more!

How? GoBack provides immediate recovery from system crashes, virus attacks, failed software installations, even user error, by taking the computer back to a time when everything was okay. And because GoBack runs underneath the operating system, you can use it to restore a PC to working order even if Windows won't boot! (No special disks required.)

GoBack lets you return a computer to virtually any moment in the recent past – five minutes, five hours, even five days ago – making it the only product that offers continuous data protection. Also, immediate retrieval of "lost" files is a mere mouse click away. A PC protected by GoBack is virtually indestructible. You can download and install software, exchange e-mail and delete files without the fear of complications bringing your work to a sudden halt.

With GoBack's exceptional protection, worry-free computing has arrived!

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PC WORLD

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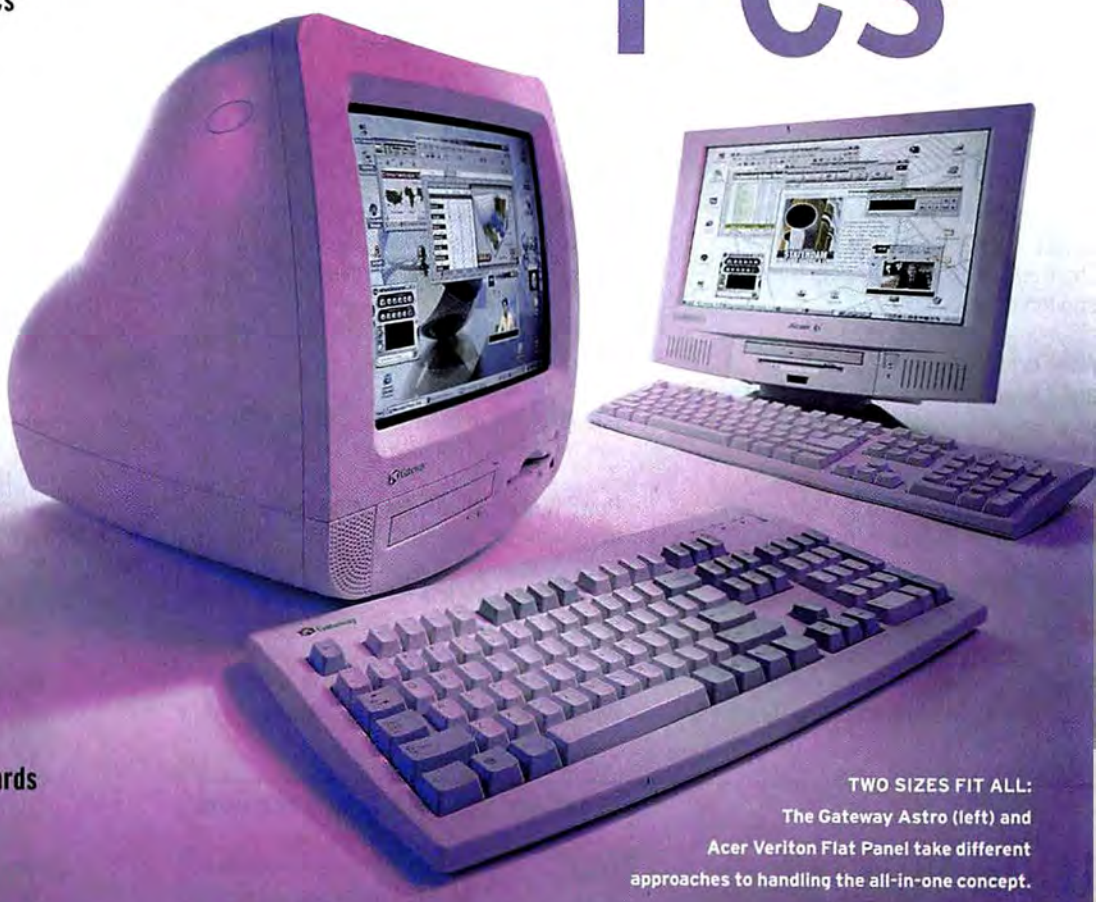
Old Concept, New Look:

All-in-One PCs

Edited by Cameron Heffernan



TWO SIZES FIT ALL: The Gateway Astro (left) and Acer Veriton Flat Panel take different approaches to handling the all-in-one concept.

THESE DAYS, every manufacturer worth its silicon is releasing an all-in-one machine that squeezes an entire system, including the monitor, into one box. Models like the Gateway Astro on our Home PCs chart and the Acer Veriton (which failed to make our Power chart) take up much less space and are more portable than desktop or tower models. They're also significantly cheaper than standard piece-by-piece systems in many instances, and they look pretty darn cool. But not everyone should jump aboard the iMac bandwagon. Most low-budget all-in-one systems turn in lackluster performance and provide pathetically scant upgrade options. To upgrade any of the Gateway Astro's components, for example, you must take the unit in to a dealer or return it to Gateway; you can't open the case yourself. Meanwhile, the few high-end all-in-one models on the market cost a small fortune. And there's also the issue of appeal: How important is it to you to own a cute PC? Until now, all-in-ones have primarily attracted consumers who desperately need to save space, money, or both. Will the next generation of one-piece suits fit the rest of us?

IMAC ATTACK

PC MAKERS ARE getting behind the all-in-one craze. The form factor has been around for years, but not until Apple's iMac came along in 1998 did it take off. Now, you can't walk into a computer store without seeing a dozen variations on the colorful, low-fi baubles. But unlike in the early days, little vendors are no longer the only ones making these systems. For evidence, consider the Gateway and Acer models we tested this month.

Also, thanks to a massive marketing push, Dell's $999 WebPC (see *Top of the News*) will most likely become a household name. At the same time, high-end integrated systems are now being packaged with flat-panel monitors—an encouraging sign. Even better, vendors are starting to ship the latest processors with their all-in-one units. As hard drives and CD-ROM drives become both smaller and faster, you can expect to see all-in-one systems inch closer to their full-size cousins in power and performance.

PHOTOGRAPHS: MARC SIMON

ON OTHER FRONTS...

PRINTERS GET COLORFUL this month with the debut of our first-ever Top 10 Color Laser chart. We've grown used to seeing color in newspapers, on computer screens, and in homemade photo prints.

LEGAL EASE: The Microtek ScanMaker V6UPL scans legal-size documents.

But until recently, the workplace has been a black-and-white holdout. Now, as the prices of color lasers continue to drop, we're seeing a sudden influx of more affordable models into the workplace. The competition is fierce: Nine companies vied for spots on our chart this month. Which ones made the grade? See page 238 for the results.

If you're concerned about the big picture, you'll want to peruse our in-depth 19-inch monitor roundup, "Is Flat Where It's At?" on page 173, which preempts our *Top 10 Monitors* section this month. We reviewed 23 units and ranked the top ten.

The new ScanMaker V6UPL from Microtek joins our *Top 10 Scanners* chart this month in the SOHO category. This $149 model allows you to scan legal-size documents, a first on our SOHO chart. The large bed also permits batch scanning, so you can scan multiple photos at the same time.

Grace Aquino, Michelle Campanale-Surkan, Katharine Dvorak, Cameron Heffernan, Mick Lockey, Kalai Murugesan, Karen Silver, and Alan Stafford contributed to the Top 100 *this month. Testing was performed by Ulrike Diehlmann, Robert James, Elliott Kirschling, Jeff Kuta, and Sean Tieu of the PC World Test Center. See page 14 for contact information.* ▶

online

POINT YOUR browser to www.pcworld.com/top400 for late-breaking reviews of desktop computers. In PC World Online's Top 400 section, you'll find comprehensive reviews and ratings for products in 16 categories. You'll also find reviews that are not available in print.

YOUR GUIDE TO THE TOP 100

QUESTIONS ABOUT OUR CHARTS? The following information should answer most of them.

How do the charts work? Each month we test a large number of PCs, printers, scanners, monitors, graphics boards, and modems, and compare them with previously reviewed products. Only the best products land on the charts, which are refreshed monthly. System configurations are shown as tested. Vendors may have since changed components.

What does the overall rating mean? This 100-point scale reflects results from our hands-on evaluations and performance tests. A score in the 90s is exceptional, while one in the 70s is above average.

What does the PC WorldBench 98 score mean? It's a measure of how fast a PC can run a mix of common business applications as compared to our baseline machine, a Gateway PMMX-200 configured with 32MB of RAM, a 2GB hard drive, and 512KB of secondary cache. A PC that scores 200, for instance, is twice as fast as the baseline system.

Where do the scores for reliability, support quality, and support policies come from? Reliability and support quality scores are based on surveys of *PC World* readers and anonymous support calls made by *PC World* staff. The policies score is based on vendor support policies.

TOP 10 POWER PCs

PC WORLD

	SYSTEM: $2000 AND OVER	Month tested	★ Overall rating	Street price (12/17/99)	PC WorldBench 98 performance score [1] Faster	Base configuration
1	Gateway GP7-700 800/315-2536 www.gateway.com	NEW	90	Inexpensive: $2198	Outstanding 295	**Satisfactory:** Pentium III-700, 128MB of RAM, 256KB L2 cache, 10GB hard drive, 17-inch monitor, Windows 98 SE
2	Dell Dimension XPS T700r 800/388-8542 www.dell.com	Feb 00	85	Expensive: $2759	Outstanding 373	**Good:** Pentium III-700, 128MB of RAM, 512KB L2 cache, 20.4GB hard drive, 17-inch monitor, Windows NT 4.0
3	Micron Millennia Max 667 800/642-7667 www.micronpc.com	NEW	84	Average: $2424	Very good 293	**Very good:** Pentium III-667, 128MB of RAM, 256KB L2 cache, 20GB hard drive, 19-inch monitor, Windows 98 SE
4	CyberMax Enthusiast A700W 800/437-4596 www.cybermaxpc.com	Feb 00	81	Inexpensive: $2199	Very good 288	**Outstanding:** AMD Athlon-700, 128MB of RAM, 512KB L2 cache, 27.3GB hard drive, 19-inch monitor, Windows 98 SE
5	Compaq Prosignia Desktop 330 PIII-700 800/345-1518 www.compaq.com	NEW	80	Expensive: $2736	Very good 289	**Outstanding:** Pentium III-700, 128MB of RAM, 512KB L2 cache, 34GB hard drive, 19-inch monitor, Windows 98 SE
6	Axis Systems Orion CXV PIII-600EB 800/378-9014 www.axissys.com	NEW	78	Very inexpensive: $2107	Good 270	**Very good:** Pentium III-600, 128MB of RAM, 256KB L2 cache, 20GB hard drive, 19-inch monitor, Windows 98 SE
7	IBM PC 300PL 800/587-2883 www.ibm.com/pc	Aug 99	75	Very inexpensive: $2081	Satisfactory 232	**Good:** Pentium III-500, 128MB of RAM, 512KB L2 cache, 13GB hard drive, 19-inch monitor, Windows 98
8	Polywell Poly 800K7-650 800/999-1278 www.polywell.com	Dec 99	75	Inexpensive: $2250	Very good 277	**Outstanding:** AMD Athlon-650, 128MB of RAM, 512KB L2 cache, 27GB hard drive, 19-inch monitor, Windows 98 SE
9	Systemax Venture PV0-700A 800/830-3121 www.systemaxpc.com	NEW	73	Average: $2499	Very good 283	**Good:** AMD Athlon-700, 128MB of RAM, 512KB L2 cache, 26GB hard drive, 17-inch monitor, Windows 98 SE
10	Sys Performance 600A 800/613-9963 www.sys.com	Nov 99	72	Average: $2299	Very good 345	**Good:** AMD Athlon-600, 128MB of RAM, 512KB L2 cache, two 9.1GB hard drives, 17-inch monitor, Windows NT 4.0
	Best Buy	Percent of overall rating ▶		Price: 15 percent	Performance: 20 percent	Base configuration: 10 percent

[1] A system's performance word score is relative to the scores earned by other PCs running the same operating system. For more details, see "Your Guide to the Top 100" on page 211.

[2] We define vertical cases as towers (taller than 20 inches), midsize towers (15.5 to 20 inches), or minitowers (shorter than 15.5 inches); and horizontal cases as desktops (5 inches or taller) or compacts (shorter than 5 inches).

[3] For more information about all of the products listed in this table, select number 901 on the product information card or visit www.pcworld.com/productinfo.

LOTS OF NEW TALENT joins the power chart this month—half the players are rookies. Coppermine-based systems lead the way, with Gateway's GP7-700 taking the top spot and Micron's Millennia Max 667 slipping in at a respectable third, just behind last month's first-place Dell Dimension XPS T700r.

1 GATEWAY GP7-700

WHAT'S HOT: With a PIII-700 processor and Windows 98 SE, the GP7-700 earned a searing 295 NEW on our PC WorldBench 98 tests. The 17-inch EV700 monitor produced sharp text and deep, rich colors in our test images. The $2198 price covers an Iomega Zip 100 drive and an APC surge suppressor that protects eight outlets and two phone lines. Getting inside the system is simple, thanks to a side panel that slides off smoothly after you twist a couple of thumbscrews. And the GP7-700 includes both a modem and network card.

WHAT'S NOT: You get just two open expansion slots to go with five open drive bays, and interior cabling obstructs access to memory upgrade slots. The 10GB hard drive is puny by power-chart standards.

WHAT ELSE: Documentation includes a detailed setup guide and a system manual with many color illustrations. The two-speaker Cambridge SoundWorks SBS52 system sets up easily and pumps out rich midrange sound. The solid keyboard allows smooth and fairly quiet typing.

BEST USE: For small to midsize businesses, the GP7-700 nicely combines the right office-ready features and raw power.

2 DELL DIMENSION XPS T700R

WHAT'S HOT: What happens when you cross Intel's new enhanced 700-MHz Pentium III processor with Windows NT? You get the fastest system we've ever seen, with a PC WorldBench 98 score of 373. The 17-inch, Trinitron-based Dell UltraScan P780 monitor adds beautiful display quality to the mix. Our test images had rich, vibrant colors, and text was sharp up to the maximum resolution of 1600 by 1200. A network card, a 4X CD-RW drive, and an Iomega Zip 100 drive round out the package.

WHAT'S NOT: Performance doesn't come cheap. This $2759 PC remains the most expensive system on the power chart. The side of the tower pops off easily, but getting it back in place requires finesse.

WHAT ELSE: The Dimension XPS T700r contains a detailed system manual with extensive troubleshooting information plus a quick-setup guide. The Altec Lans-

Extra features	Design and expandability [2]	Vendor's system reliability	Tech support quality/ policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)	Product info number [3]
Outstanding: 3dfx Voodoo3 3000 graphics board with 16MB of RAM, 17X-40X CD-ROM drive, V.90 modem, network card, Iomega Zip 100 drive, Microsoft IntelliMouse	**Good:** midsize tower case, 5 open drive bays, 2 open slots	Good	Fair/ Outstanding	24/7, toll-free	3/1	602
Very good: STB NVidia TNT2 graphics board with 32MB of RAM, 4X CD-RW drive, V.90 modem, network card, Iomega Zip 100 drive	**Good:** midsize tower case, 3 open drive bays, 3 open slots	Outstanding	Good/ Good	24/7, toll-free	3/1	–
Good: Creative Labs CT6960 graphics board with 32MB of RAM, 8X DVD-ROM drive, V.90 modem	**Good:** midsize tower case, 4 open drive bays, 4 open slots	Good	Good/ Outstanding	24/7, toll-free	Varies [4]/3	603
Good: 3dfx Voodoo3 3500 TV graphics board with 16MB of RAM, 8X DVD-ROM drive, V.90 modem, Iomega Zip 100 drive	**Good:** midsize tower case, 5 open drive bays, 4 open slots	Fair [5]	Good [6]/ Good	24/7, toll-free	3/1	604
Outstanding: Diamond Viper V770 graphics board with 16MB of RAM, 2X CD-RW drive, 10X DVD-ROM drive, network card, Microsoft IntelliMouse	**Satisfactory:** midsize tower case, 1 open drive bay, 3 open slots	Good	Fair/ Good	24/7, toll-free	3/1	605
Good: Diamond Viper V770 Ultra graphics board with 32MB of RAM, 4X CD-RW drive, 10X DVD-ROM drive, V.90 modem	**Very good:** midsize tower case, 2 open drive bays, 4 open slots	[5]	Good [6]/ Outstanding	24/7, toll-free	3/3	606
Good: S3 Trio Voodoo3 2000 Interactive graphics board with 16MB of RAM, 17X-40X CD-ROM drive, network card, Iomega Zip 100 drive, Microsoft IntelliMouse	**Good:** midsize tower case, 2 open drive bays, 5 open slots	Good	Good/ Good	24/7, toll-free	3/3	–
Good: Diamond Viper V770 graphics board with 16MB of RAM, 6X DVD-ROM drive, V.90 modem, Iomega Zip 100 drive, Logitech three-button mouse	**Good:** midsize tower case, 3 open drive bays, 4 open slots	[5]	Fair [7]/ Fair	24/7,[8] toll-free	3/3	607
Outstanding: Creative Labs 3D Blaster RIVA TNT2 graphics board with 32MB of RAM, 4X CD-RW drive, 10X DVD-ROM drive, V.90 modem, network card	**Good:** midsize tower case, 2 open drive bays, 3 open slots	[5]	[7]/ Good	24/7, toll-free	Varies [4]/3	608
Good: Matrox Millennium G400 DH graphics board with 32MB of RAM, 17X-40X CD-ROM drive, network card, scroll mouse, RAID, and two hard drives	**Good:** midsize tower case, 4 open drive bays, 3 open slots	[5]	Good [6]/ Good	24/7,[8] toll-free	Varies [7]/5	609
Extra features: 10 percent	Design and expandability: 15 percent	Reliability: 15 percent	Support and warranty: 15 percent			

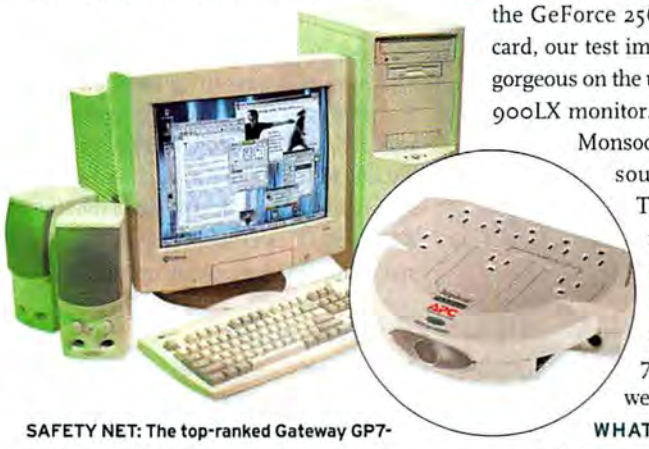
[4] Five years on CPU and main RAM, three years on other parts.

[5] Insufficient data to give a rating, or the rating is derived from the vendor's Reliability and Service survey scores for its home PCs. For tech-support quality, this rating may also depend on our anonymous support-quality calls.

[6] Tech support ceases to be 24/7 after the first year.

[7] Six years on CPU and main RAM, three years on other parts.

ing ACS340 speaker set provides crisp sound with powerful bass. You get adequate expansion room, with three open PCI slots and three open drive bays, but an internal crossbar and poorly organized cabling impede your access to them.



PHOTOGRAPH: KEN SMITH

SAFETY NET: The top-ranked Gateway GP7-700 comes with a surge suppressor from APC that protects eight outlets and two phone lines from blackouts, brownouts, and power surges.

BEST USE: Corporate users will appreciate this swift, reliable unit's many backup options and its high-capacity hard drive.

3 MICRON MILLENNIA MAX 667

NEW **WHAT'S HOT:** Thanks in part to the GeForce 256-powered graphics card, our test images and text looked gorgeous on the unit's 19-inch Micron 900LX monitor. The flat, metal-clad Monsoon MM-700 speakers sound and look great. This PIII-667 Micron romped to a 293 on our PC WorldBench 98 tests, faster than all but one Athlon-700–based system we've tested.

WHAT'S NOT: Though it qualifies as average for a power system, the Millennia Max 667's $2424 sticker price may deter some people. The side of the midsize tower case pops off easily, via a handle in back, but we had to do some careful maneuvering to replace it. The interior is a tad cluttered.

WHAT ELSE: The large interior offers four open PCI slots and four open drive bays. The 8X DVD-ROM drive produces excellent images on the large monitor. The system manual offers useful troubleshooting and system-care information, and you also get a handy quick-setup guide.

BEST USE: With its excellent multimedia features and modem (instead of a network card), the Millennia Max 667 would make a great all-around performer for a small, graphics-oriented office.

4 CYBERMAX ENTHUSIAST A700W

WHAT'S HOT: Following a $100 price cut, the $2199 Enthusiast A700W—is a great deal. The system's CyberMax CX-900N 19-inch monitor displayed vibrant ▶

colors in our test images. The 3dfx Voodoo3 3500 TV graphics board delivers crisp images and includes a TV tuner, a digital VCR, and an FM tuner. The Aureal Vortex2 sound card and Altec Lansing ACS33 speakers generate clear sound with solid bass. For storage, you get a 27.3GB hard drive and an Iomega Zip 100 drive.

WHAT'S NOT: It's not much of a knock, but this Athlon-700–based machine's PC WorldBench 98 score of 288 is only a few points above the average score for all Athlon-650 systems we tested.

WHAT ELSE: The 8X DVD-ROM drive, complete with software MPEG-2 decoder, automatically played our test movie smoothly. With four available slots (three PCI and one ISA) and five open drive bays, the interior offers generous expansion room. Unfortunately, the bundled cabling obstructs access to the RAM slots.

BEST USE: The modem-equipped Enthusiast A700W will win strong support from small-office users.

5 COMPAQ PROSIGNIA DESKTOP 330 PIII-700

NEW **WHAT'S HOT:** This unit's 19-inch Compaq S900 monitor delivered deep, rich colors in our test images and sharp text up to the maximum resolution of 1600 by 1200 (though the screen image wavered a bit at this resolution). Running on a PIII-700 CPU, the unit earned a 289 on PC WorldBench 98—fine for its class. The system's 34GB hard drive is the largest ever on a power PC chart maker.

WHAT'S NOT: At $2736, this is the second-costliest machine on the chart. The floppy eject button on our test system wiggled like a loose tooth. With three open slots and one open drive bay, the PC has limited expansion room. And two thick audio cables extend across the interior, partly blocking access to expansion slots.

WHAT ELSE: The Desktop 330 includes a 10X DVD-ROM drive and a 4X/2X/24X CD-RW drive—a combination far more useful to a business than a DVD-ROM drive alone. After loosening two large thumbscrews, we pulled off the side of the case with little effort, but the panel is trickier to replace. The Altec Lansing ACS233 three-speaker set produces crisp sound and booming bass response.

BEST USE: Its network card and bundled Microsoft Office 2000 suit the Prosignia for small to midsize businesses.

QUICK PERFORMER: The Dell Dimension XPS T700R is the fastest system we've reviewed to date.

6 AXIS SYSTEMS ORION CXV PIII-600EB

NEW **WHAT'S HOT:** Speed sells, and the Axis Orion CXV PIII-600EB is a racer. Its score of 270 on PC WorldBench 98 exceeds that of any other Pentium III-600 system we've tested under Windows 98. This Orion's 10X DVD-ROM drive and 4X/2X/24X CD-RW drive make it a power PC bargain at $2107 price.

WHAT'S NOT: You have to remove four screws and take off the entire case to get inside; once you're there, cables and wires hinder access to its four open slots and two open drive bays. Hardware components are amply documented, but there's no printed manual for the system (an electronic manual is loaded on the machine).

WHAT ELSE: The Adobe Acrobat PDF manual packs lots of useful information on troubleshooting and setup, and myriad illustrations. The three-speaker Altec Lansing ACS33 set delivers crisp sound and powerful bass in concert with the SoundBlaster Live card. The unit ships with a ViewSonic E790 19-inch monitor, but due to scheduling constraints our test system used a now-discontinued monitor.

BEST USE: This Orion will work best as a standalone PC for making presentations.

7 IBM PC 300PL

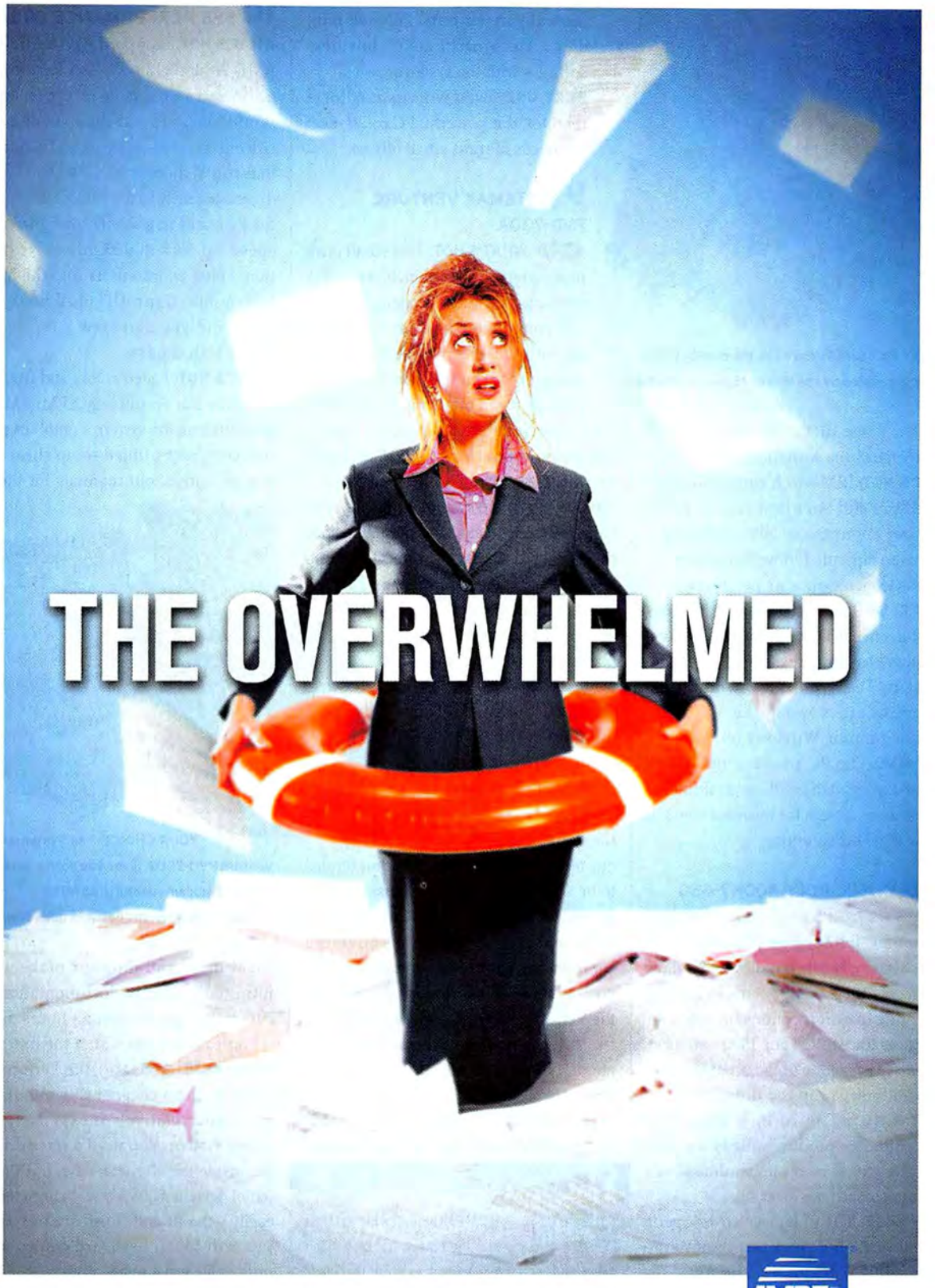
WHAT'S HOT: At $2081, the IBM PC 300PL is the least-expensive system on the power chart. Its 13GB hard drive and Iomega Zip 100 drive provide plenty of storage space, though less than some competitors offer. IBM bundles its ▶

A Modem and a Network Card: Do You Need Both?

TECH TREND MOST CORPORATE PCs come with a network interface card for office network hookup, while home-office systems usually ship with a 56-kbps modem for dial-up connectivity. But some machines (like this month's Best Buys from Gateway and Dell) have both a modem and a network interface card to handle any type of connection.

Do you need both? Probably not. If you use your corporate network for Internet and intranet access, modems just cost money and take up expansion slots. Conversely, if your home office has a single PC, you don't need a network interface card because, well, you don't have a network. The strongest argument for buying a unit with both a modem and a network card is that you can connect to the Internet even if your network goes down. Also, some users like to separate their Internet access from the office network (for personal e-mail, bulletin board access, or direct access to a non-networked PC, for example). If you add PCs to your home office, you may want network cards to connect those machines.

Find out which networking tools are installed in the PC you're buying. Rejecting an unwanted modem can save you $20 to $50, while forgoing a network card can shave $70 or more off the system's price.



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PRETTY PICTURES: You'll like the quality of the images generated by the Micron Millennia Max 667.

own ViaVoice dictation software and Lotus SmartSuite with the system.

WHAT'S NOT: IBM's tech support has improved but still isn't first rate, to judge from our anonymous calls. Reaching a rep can be difficult, but we found them to be knowledgable once we got through.

WHAT ELSE: This midsize tower includes a built-in ethernet connection and has two open drive bays and five open PCI expansion slots. The system's PC WorldBench 98 score of 232 is average for a PIII-500 machine running Windows 98.

BEST USE: The PC 300PL should work well as a presentation PC or multimedia development system for business users in a networked office setting.

8 POLYWELL POLY 800K7-650

WHAT'S HOT: At $2250—$45 less than last month—the 800K7-650 is cheap for a power system. Neatly bundled wires allow easy access to all components inside the case. The expansion options include four open slots (three PCI, one ISA) and three open drive bays (one of the occupied bays holds an Iomega Zip 100 drive).

WHAT'S NOT: The 19-inch DecaView G400 monitor produces fuzzy text and dull colors at all resolutions, though it's fine for standard business use.

WHAT ELSE: The one-piece cover opens without tools, but you must remove the whole thing to get inside. The Aiwa TS-CD40 speakers deliver adequate sound. Video playback on the 6X DVD-ROM drive is smooth, even with other applications open, but movies didn't start automatically in our tests. Polywell bundles Lotus SmartSuite 97 business software with the system.

BEST USE: Even with its mediocre monitor, this powerful PC could meet the needs of most small offices.

9 SYSTEMAX VENTURE PVO-700A

NEW **WHAT'S HOT:** This small business–oriented system includes both a network card and a modem. The solidly constructed keyboard supports smooth, quiet typing and includes many programmable buttons. This midsize tower offers nearly effortless access to the interior through a sliding side panel. You get a 4X CD-RW drive and a 10X DVD-ROM drive.

WHAT'S NOT: The system's interior is so cluttered that you can't see the RAM slots, though you'll find ample room to expand once you wade in. No DVD software player was installed with the DVD-ROM drive on our test system, though playback looked smooth after we installed a player.

WHAT ELSE: Text looks crisp on the AOC Spectrum 7Glr monitor at the maximum resolution of 1600 by 1200, but you probably won't want to crank the 17-incher up that high. Colors on our test images appeared rich but tended to be a bit dark. The Altec Lansing ADA-305 three-speaker set delivers excellent treble and bass, and it permits on-screen control when connected through the USB port. A 283 PC WorldBench 98 score puts the Venture PVO-700A slightly below par for Athlon-700 machines, but quick enough for most office tasks.

BEST USE: With its CD-RW drive, modem, and network card, this PC is ready for any office that can pay the $2499 price.

10 SYS PERFORMANCE 600A

WHAT'S HOT: Equipped with a 600-MHz AMD Athlon chip, the Sys Performance 600A racks up a score of 345 on our PC WorldBench 98 test suite, easily outdistancing comparable Pentium III-600 PCs that run Windows NT. Two 9.1GB hard drives connect to a Promise UltraDMA 66 PCI card in a RAID configuration to speed up certain disk-intensive operations. Plug twomonitors into the Matrox Millennium G400 DH (dual head) video card, and you can view your desktop across both displays.

WHAT'S NOT: Faded colors and fuzzy text from the Sys Technology SPM17 MS display sandbag the system's graphics potential. One laser-printed setup sheet and a pair of component manuals for the CD-ROM drive and monitor make up the minimal hardware documentation. Sys cuts tech support from 24 hours daily to 9 hours on weekdays after the first year.

WHAT ELSE: At $2299, the Performance 600A is $100 cheaper this month than last—and relatively inexpensive for a power system. You need a screwdriver to get inside the all-metal case, but the side panel detaches quickly and slides back on easily—the fit and finish are impressive. The soft-touch keyboard comes with a removable wrist rest.

BEST USE: With a better monitor (or two), the Sys would make a killer 2D graphics workstation: You could keep work files on one monitor and tools on the other.

YOUR CHOICE: The Systemax Venture PVO-700A gives you both a network card and modem—useful in an office environment when the network goes down.

ALSO NEW THIS MONTH

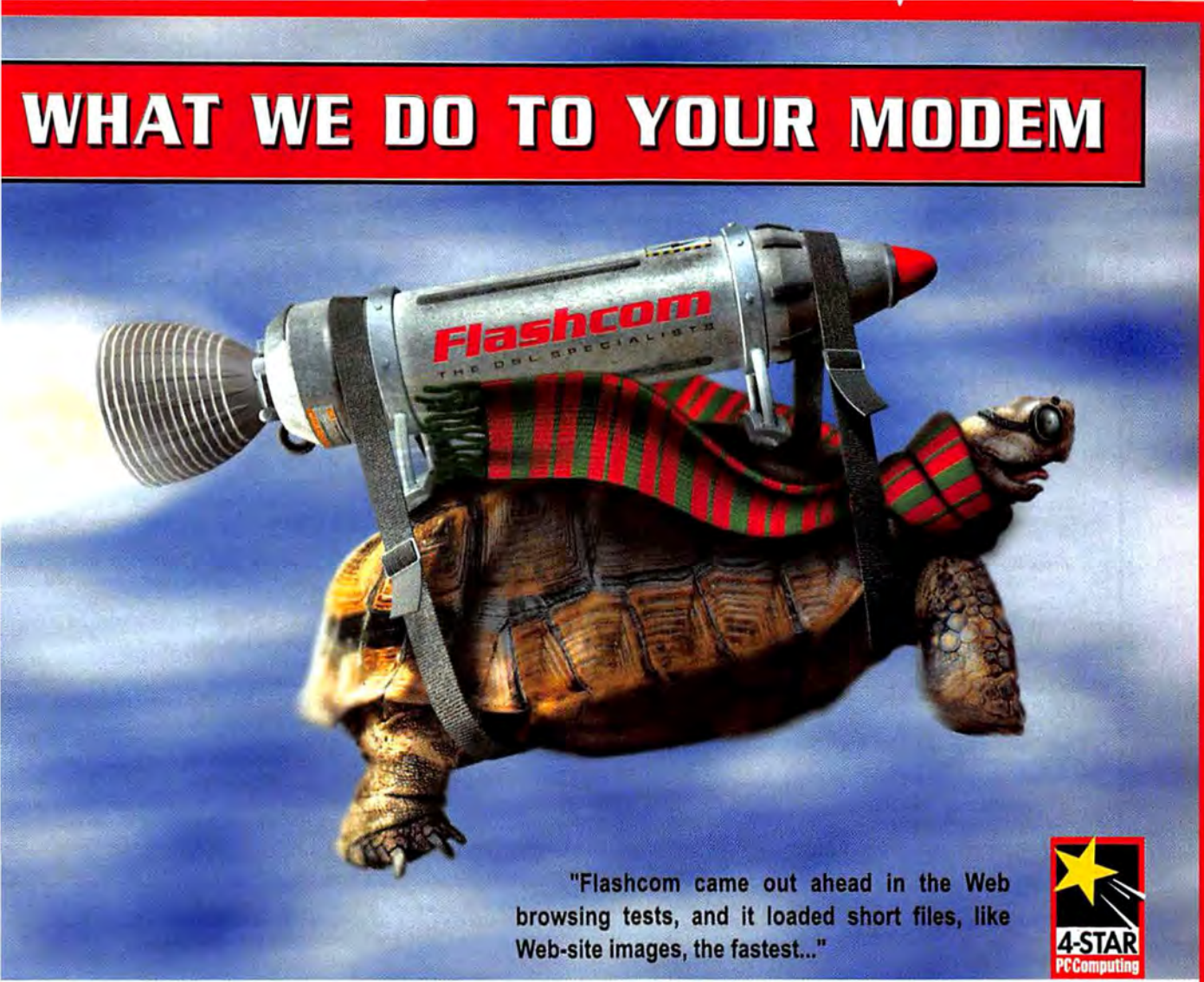
online

WE EVALUATED the following systems along with the others, but they didn't score high enough to reach the *Top 10 Power PCs* chart. For write-ups, visit PC World Online (www.pcworld.com/t10pcs).

- Acer Veriton Flat Panel
- Micron Millennia Max 533

PHOTOGRAPHS: KEN SMITH

WHAT WE DO TO YOUR MODEM



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PC WORLD TOP 10 MIDRANGE PCs

	SYSTEM: $1200 TO $1999	Month tested	★ Overall rating	Street price (12/17/99)	PC WorldBench 98 performance score [1] Faster	Base configuration
1	Micro Express MicroFlex-550B 800/989-9900 www.microexpress.net	Jan 00	88	Inexpensive: $1299	Very good 256	**Good:** AMD Athlon-550, 128MB of RAM, 512KB L2 cache, 18GB hard drive, 17-inch monitor, Windows 98 SE
2	Systemax Venture PVO-600A 800/830-3121 www.systemaxpc.com	NEW	86	Average: $1749	Outstanding 273	**Very good:** AMD Athlon-600, 128MB of RAM, 512KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
3	Dell Dimension XPS T500 800/388-8542 www.dell.com	Dec 99	83	Average: $1619	Good 229	**Good:** Pentium III-500, 128MB of RAM, 512KB L2 cache, 13.6GB hard drive, 17-inch monitor, Windows 98 SE
4	Xi Computer 700K MTower 800/432-0486 www.xicomputer.com	NEW	80	Expensive: $1949	Outstanding 295	**Very good:** AMD Athlon-700, 128MB of RAM, 512KB L2 cache, 22GB hard drive, 17-inch monitor, Windows 98 SE
5	Quantex SM600 SE 800/896-4898 www.quantex.com	Nov 99	78	Expensive: $1949	Outstanding 260	**Very good:** Pentium III-600, 128MB of RAM, 512KB L2 cac 18GB hard drive, 19-inch monitor, Windows 98
6	Micron Millennia Max 600 800/642-7667 www.micronpc.com	Dec 99	78	Average: $1797	Very good 250	**Good:** Pentium III-600, 128MB of RAM, 512KB L2 cache, 13.6GB hard drive, 17-inch monitor, Windows 98 SE
7	Cumetrix A-760e 877/787-3332 www.cumetrix.com	Jan 00	76	Average: $1699	Outstanding 279	**Good:** AMD Athlon-650, 128MB of RAM, 512KB L2 cache, 17GB hard drive, 17-inch monitor, Windows 98 SE
8	Dell Dimension L500c 800/388-8542 www.dell.com	Nov 99	75	Inexpensive: $1429	Satisfactory 214	**Satisfactory:** Celeron-500, 64MB of RAM, 128KB L2 cach 13GB hard drive, 17-inch monitor, Windows 98 SE
9	Axis Systems Orion 100H DVD 500 800/378-9014 www.axissys.com	Nov 99	75	Average: $1593	Good 237	**Good:** Pentium III-500, 128MB of RAM, 512KB L2 cache, 13GB hard drive, 19-inch monitor, Windows 98
10	NEC PowerMate ES 5250-500k 888/632-8701 www.nec-computers.com	Jan 00	73	Average: $1758	Good 228	**Good:** Pentium III-500, 128MB of RAM, 512KB L2 cache, 13GB hard drive, 17-inch monitor, Windows 98 SE
	Best Buy	Percent of overall rating ▶		Price: 17 percent	Performance: 18 percent	Base configuration: 10 percent

[1] A system's performance word score is relative to the scores earned by other PCs running the same operating system. For more details, see "Your Guide to the Top 100" on page 211.

[2] We define vertical cases as towers (taller than 20 inches), midsize towers (15.5 to 20 inches), or minitowers (shorter than 15.5 inches); and horizontal cases as desktops (5 inches or taller) or compacts (shorter than 5 inches).

[3] For more information about all the products listed this table, select number 902 on the product infor tion card or visit www.pcworld.com/productinfo.

TWO NEW SYSTEMS scrambled aboard our midrange chart this month. The Athlon-600–powered Systemax Venture PVO-600A captured a Best Buy but couldn't quite unseat the Micro Express MicroFlex-550B, which retained its number one ranking for the third consecutive month. Meanwhile, the Xi Computer 700K MTower elbowed its way past half a dozen older systems to grab fourth place, as its Athlon-700 processor offset a high sticker price.

1 MICRO EXPRESS MICROFLEX-550B

WHAT'S HOT: Powered by an AMD Athlon-550 CPU, the MicroFlex-550B zipped to a PC WorldBench 98 score of 256, much higher than that of any Pentium III-550 PC we've tested, and slightly higher than the average PIII-600 system's score. Best of all, the system will set you back only $1299. Documentation includes a quick-setup guide and a thorough manual. The tidy, well-designed interior has four open slots (three PCI and one ISA) and four free drive bays to handle upgrades. The 6X DVD-ROM drive (with a software MPEG video decoder) played our DVD test movie smoothly, even with other applications running.

WHAT'S NOT: To get inside the box, you must loosen a screw, remove the top, and slide off the side panel. Of course, putting the case back together requires just as many steps. The keys on the big, solid keyboard make for rather noisy typing, and they're almost too large for comfort.

WHAT ELSE: The 17-inch Impression 7VX monitor's color quality is subpar, but the screen displays readably crisp, clear text at most resolutions. The Altec Lansing ACS44 speaker set includes powerful satellites and a booming subwoofer.

BEST USE: The well-equipped MicroFlex-550B makes a great all-around workhorse for a budget-conscious office.

2 SYSTEMAX VENTURE PVO-600A

WHAT'S HOT: Solid multimedia hardware surrounds this reasonably priced ($1749) machine. The NEW AOC Spectrum 7Glr 17-inch monitor produces impressively rich colors and crisp text; and the Cambridge SoundWorks SBS52 three-speaker set pumps out powerful bass and treble. The 4X/4X/24X CD-RW drive lets you write and rewrite valuable data to your CD-ROM.

Extra features	Design and expandability [2]	Vendor's system reliability	Tech support quality/ policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)	Product info number [3]
Very good: ATI Rage Magnum graphics board with 32MB of RAM, 6X DVD-ROM drive, V.90 modem, scroll mouse	**Outstanding:** midsize tower case, 4 open drive bays, 4 open slots	[4]	Fair [4]/ Outstanding	24/7, toll-free	4/4	610
Outstanding: NVidia Vanta graphics board with 16MB of RAM, 4X CD-RW drive, V.90 modem	**Very good:** midsize tower case, 4 open drive bays, 4 open slots	[4]	[4]/ Good	24/7, toll-free	Varies [5]/3	611
Good: NVidia TNT2 graphics board with 16MB of RAM, 8X DVD-ROM drive, V.90 modem, Microsoft IntelliMouse	**Very good:** midsize tower case, 4 open drive bays, 4 open slots	Outstanding	Good/ Good	24/7, toll-free	3/1	–
Good: Diamond Viper V770 graphics board with 32MB of RAM, 6X DVD-ROM drive, V.90 modem, Logitech scroll mouse	**Very good:** midsize tower case, 4 open drive bays, 3 open slots	[4]	Fair [4]/ Good	24/7, toll-free	3/3	612
Very good: NVidia RIVA TNT2 Ultra graphics board with 32MB of RAM, 8X DVD-ROM drive, V.90 modem, network card, Microsoft IntelliMouse	**Very good:** midsize tower case, 6 open drive bays, 4 open slots	[4]	Good [4]/ Good	24/7, toll-free	3/1	613
Good: STB NVidia RIVA TNT2 graphics board with 16MB of RAM, 8X DVD-ROM drive, V.90 modem	**Good:** tower case, 5 open drive bays, 4 open slots	Good	Good/ Outstanding	24/7, toll-free	Varies [5]/3	614
Good: Diamond Viper V770 graphics board with 32MB of RAM, 20X-50X CD-ROM drive, V.90 modem, network card, multimedia keyboard	**Good:** midsize tower case, 5 open drive bays, 3 open slots	[4]	[4]/ Poor	8/5, toll-free	1/1	615
Satisfactory: integrated Intel 810 graphics with UMA and 4MB of 3D cache, 17X-48X CD-ROM drive, V.90 modem, network card, Logitech mouse	**Satisfactory:** minitower case, 1 open drive bay, 3 open slots	Outstanding	Good/ Good	24/7, toll-free	3/1	–
Good: ATI Rage Fury graphics board with 32MB of RAM, 6X DVD-ROM drive, 4X CD-RW drive, V.90 modem	**Good:** midsize tower case, 3 open drive bays, 4 open slots	[4]	Good [4]/ Outstanding	24/7, toll-free	3/3	616
Very good: ATI Rage Pro graphics board with 8MB of RAM, 10X DVD-ROM drive, network card, LS-120 drive, Logitech mouse, DMI management	**Good:** midsize tower case, 3 open drive bays, 5 open slots	Good	Poor [4]/ Outstanding	24/7, toll-free	3/3	617
Extra features: 10 percent	Design and expandability: 15 percent	Reliability: 15 percent	Support and warranty: 15 percent			

[4] Insufficient data to give a rating, or the rating is derived from the vendor's Reliability and Service survey scores for its home PCs. For tech support quality, this rating may also depend on our anonymous support-quality calls.

[5] Five years on CPU and main RAM, three years on other parts.

(Note: According to Systemax, the CD-RW drive on this unit will have been upgraded to 8X/4X/32X by February 2000.) Unless you traffic in gargantuan files, the 20GB hard drive will take a long time to fill up. Interior access is outstanding: The midsize tower case pops off when you depress a lever on the side.

WHAT'S NOT: The cheapo keyboard flexes easily, and though typing is quiet, the keys—especially the backspace key—are so small that they invite character misses.

WHAT ELSE: The Venture PVO-600A earned a 273 on our PC WorldBench 98 tests—average for an Athlon-600 system running Windows 98. Though some cables criss-cross the interior, you'll enjoy unimpeded access to the four open slots (three PCI and one ISA) and four open drive bays. Documentation includes a quick-setup guide and a substantive manual with plenty of detailed illustrations.

BEST USE: With its CD-RW drive, high-grade monitor, and top-notch sound system, this would make an excellent multimedia PC for small-office users.

3 DELL DIMENSION XPS T500

WHAT'S HOT: The XPS T500's PC WorldBench 98 score of 229 places it slightly above average for a PIII-500 system running Windows 98. The easy-open case conceals a tidy interior. Dell's work PCs received an Outstanding rating for reliability in our latest reader survey. The 8X DVD-ROM drive has a hardware decoder card and plays movies smoothly.

STORAGE GALORE: The Best Buy Systemax Venture PVO-600A not only includes a large 20GB hard drive, but also a 4X CD-Rewritable drive so you can burn the day away.

WHAT'S NOT: The Dell M780 17-inch monitor maxes out at 1280 by 1024 resolution, with smaller text blurring. Text is sharp and legible at lower resolutions.

WHAT ELSE: Reasonably priced at $1619, the Dimension XPS T500 comes with Microsoft Office 2000 Small Business Edition. Setup is a snap, thanks to color-coded, labeled, and icon-marked ports, plus an assortment of component ▶

PHOTOGRAPHS: KEN SMITH

THE Xi COMPUTER 700K MTower has the top speed on the chart, thanks to an AMD Athlon-700 CPU.

manuals and an illustrated setup guide.
BEST USE: The Dimension XPS T500 is a fine choice for growing businesses that require excellent vendor service.

4 Xi COMPUTER 700K MTOWER

NEW **WHAT'S HOT:** The Xi's easy-open case pops on and off smoothly. And the uncluttered interior features plenty of expansion room, with three open PCI slots and four open drive bays. This $1899 Athlon-700–based PC scored 295 on PC WorldBench 98, higher than most similarly configured systems. The 22GB hard drive is the largest on the midrange chart, and you also get a 6X DVD-ROM drive.
WHAT'S NOT: While the 700K MTower ships with solid documentation for most of its hardware components, it lacks an overall system manual—a shortcoming Xi is currently working on. The funky blue midsize tower gives the system a nice "fortress of solitude" look, but trying to find the awkwardly located power button can seem like a game of Where's Waldo?
WHAT ELSE: The 17-inch OptiQuest Q71 monitor produces bright colors and crisp text at 1024 by 768 resolution, but it blurs at the higher setting of 1280 by 1024. The Koss SW/115 three-speaker set has a svelte design but produces slightly thin sound. The ergonomic keyboard includes a wrist rest and a unique set of mouse keys—to handle mouse cursor functions in case of an input device meltdown.
BEST USE: The 700K MTower delivers the goods small offices need, without creating a credit-card nightmare.

5 QUANTEX SM600 SE

WHAT'S HOT: The SM600 SE is one of the fastest Windows 98–based PIII-600 systems we've seen. For just $1949, you get an 18GB hard disk, an 8X DVD-ROM drive, and an NVidia RIVA TNT2 Ultra graphics card that handles MPEG decoding. Audio sounds great on the Altec Lansing ADA305 satellite-and-subwoofer system, which supports Dolby ProLogic Surround Sound via a USB cable.
WHAT'S NOT: You won't need to use tools to open the case, but three thumbscrews plus an all-metal wrap-around enclosure don't make entry child's play. Rear port labels are inconveniently located on a separate diagram pad.
WHAT ELSE: The clear documentation includes a helpful setup poster but no hard-copy software manuals. Though the 19-inch DiamondTron Natural Flat CRT monitor yielded laser-sharp text in our tests, colors looked slightly faded. The PC has a total of six open drive bays but only one free PCI slot and three open ISA slots. You could, however, free a second PCI slot by removing either the included modem or the included network card.
BEST USE: With copious storage space and connectivity, the SM600 SE should suit just about any office user.

6 MICRON MILLENNIA MAX 600

WHAT'S HOT: The unit's mammoth case opens easily—push down a handle on the back, and the side panel slides off. (To reattach the panel, push the handle again.) We got smooth playback from the 8X DVD-ROM drive. Priced at $1797, the system costs $169 less this month.
WHAT'S NOT: Despite the Millennia Max 600's huge interior, cables impede access to the RAM slots. The 17-inch Micron 700VX monitor produces bright colors but slightly blurry text. (You can upgrade to a sharper Trinitron monitor for an extra $99.) The Advent AV009 three-piece speaker set—especially the satellite speakers—musters disappointingly weak audio.
WHAT ELSE: The Millennia Max 600's PC WorldBench 98 score of 250 is quite fast, though average for a PIII-600. Accessing expansion cards for upgrades is easy: ▶

Data Storage Blues? Rewrite Could Change Your Tune

TECH TREND MANY PCs—including our number two Best Buy, the Systemax Venture PVO-600A—now ship with CD-Rewritable (CD-RW) drives. But what exactly does the "rewrite" mean, and how fast do these drives run? Here's a brief primer. (For a more comprehensive look, see "Hello, Get Me Rewrite," page 147.)

Before the advent of CD-RW, CD-Recordable (CD-R) discs and drives let you record on blank CD-R discs—but only once. After filling the CD-R, you can't reuse it, since you can't write over its content. In contrast, CD-RW drives let you write and rewrite to CD-RW discs multiple times. And CD-RW drives can read any CD, CD-ROM, CD-R, or CD-RW disc.

But there are a few catches. First, only the last couple of generations of CD-ROM drives can read rewritable discs, whereas practically all drives can read CD-R media. You can, of course, use a CD-RW drive to write data to a conventional CD-R disc, but that disc won't be rewritable.

Second, writing to CD-RW media is often slower than recording with a CD-R. CD-RW discs must first be formatted, a process that takes an hour, unless you buy more-expensive preformatted discs. To clarify how long these processes should take, most CD-RW drives list three speeds, such as 6X/4X/24X. The first number indicates how fast the drive writes to a CD-R disc, the second how fast it can rewrite to a CD-RW media, and the third how fast it reads CD-ROMs. The "X" stands for "times 150KB of data per second."

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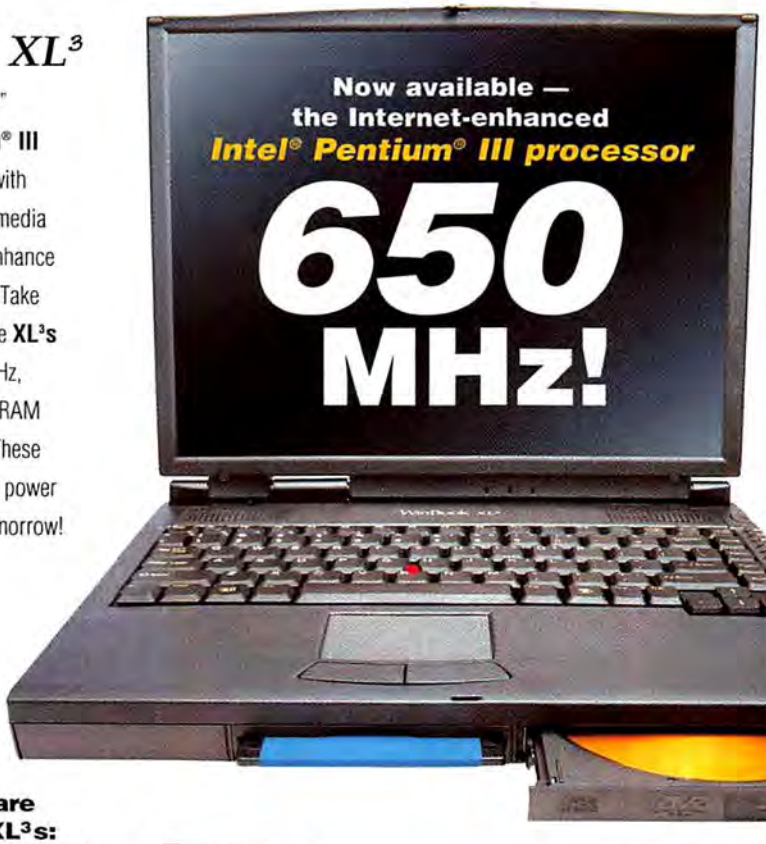

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- Portable Computing, December 1999

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You simply loosen a thumbscrew on the metal rail, and you're in.

BEST USE: The Millennia Max 600 fills the bill as a powerful, upgradable, bare-bones multimedia system.

7 CUMETRIX A-760E

WHAT'S HOT: The Cumetrix A-760e earned a 279 on our PC WorldBench 98 tests—extremely quick considering the model's $1699 price. The 17-inch Sceptre DragonEye D73P monitor produced vibrant colors in our test images and sharp text at 1024 by 768 resolution. With three open slots and five open drive bays, the interior can accommodate plenty of expansion.

WHAT'S NOT: Though the Cumetrix includes documentation for individual hardware components, it lacks an overall system manual. The side of the case slides on and off smoothly—after you remove two screws. Cumetrix offers toll-free support only on weekdays from 8 a.m. to 5 p.m.

WHAT ELSE: The well-organized interior cables are tied off, but they criss-cross the interior and partly block access to the expansion and RAM slots. The powerful Creative Labs SBS 52 speakers set up easily and pump out clear sound through the Creative Labs SoundBlaster Live card.

BEST USE: The A-760e will satisfy business owners seeking a lean, fast machine.

NEC's PowerMate ES 5250 delivers adequate performance and an LS-120 drive for those in a networked environment.

8 DELL DIMENSION L500C

WHAT'S HOT: The affordable $1429 Dell Dimension L500c earned a 214 on PC WorldBench 98—just 4 points shy of the fastest score we've seen for a Celeron machine running Windows 98. We had no trouble getting inside this minitower's stiff, plastic case; and Dell color-codes ports on the rear.

WHAT'S NOT: The L500c's integrated components (such as Intel 810 graphics) limit the performance of the system's otherwise solid peripherals (such as the 17-inch Dell M780 monitor). If you decide later to upgrade the system's graphics, you'll have to choose a PCI video card.

WHAT ELSE: The interior is quite small, but the power supply swings out, enabling you to access the various motherboard components easily. The easy-to-configure Harman/Kardon HK195 speakers faithfully reproduce sound, despite the inherent limitations of integrated audio.

BEST USE: The L500c would make a good, low-cost workstation for a small office on a budget.

ROOM TO SPARE: The well-organized interior of the Quantex SM600 SE affords easy access to the unit's six free drive bays. But you get only one free PCI slot to go with three open ISA slots.

9 AXIS SYSTEMS ORION 100H DVD 500

WHAT'S HOT: The Orion 100H DVD 500 packs both a 6X DVD-ROM drive and a 4X CD-RW drive, making it a fair deal at $1593. The 19-inch monitor displays clear text and graphics even at 1600 by 1200 resolution. The system's Altec Lansing ACS33 speakers and subwoofer, along with a Creative Labs SoundBlaster Live audio card, provide great surround sound.

WHAT'S NOT: To open the case, you must first take off the top and then remove the side panels.

WHAT ELSE: Though the Orion 100H DVD 500's rear ports are labeled, they're not color-coded.

BEST USE: This system would be an excellent choice for a business user who makes presentations, thanks to its powerful multimedia features.

10 NEC POWERMATE ES 5250-500K

WHAT'S HOT: The $1758 PowerMate ES 5250-500k's well-designed case puts various controls at your fingertips. A bar at the top of the tower houses power and sleep buttons, a volume control, and a headphone jack. A front-mounted USB port sits next to the bar. The interior leaves room for substantial expansion, with five open slots (four PCI and one ISA) and three open drive bays. A removable LS-120 drive provides users with even more storage options.

WHAT'S NOT: Expansion cards fit into the case upside down, making installation awkward, and unkempt wiring impedes your access to them.

WHAT ELSE: The NEC S770 17-inch monitor produces less-saturated color and brightness than most. In our tests, text looked sharp at 1024 by 768 resolution. The PowerMate's chassis features color-coded ports and a case lock.

BEST USE: The affordable, network-ready PowerMate ES 5250-500k will make a nice fit in offices that don't have a demand for overwhelming speed. ▶

ALSO NEW THIS MONTH

online

WE EVALUATED the following systems along with the others, but they didn't score high enough to make the *Top 10 Midrange PCs* chart. For write-ups, visit PC World Online (www.pcworld.com/t10pcs).

- Acma C533
- Dell OptiPlex GX110
- IBM PC 300PL
- Idot.com SI 550
- Kingdom Pinnacle 600 DVD
- Toshiba V3100

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PC WORLD

TOP 10 BUDGET PCs

	SYSTEM: UNDER $1200	Month tested	★ Overall rating	Street price (12/17/99)	PC WorldBench 98 performance score [1] Faster	Base configuration
1	Micro Express MicroFlex-55C 800/989-9900 www.microexpress.net	NEW	83	Expensive: $1199	Outstanding 242	**Good:** Pentium III-550, 64MB of RAM, 512KB L2 cache, 18GB hard drive, 17-inch monitor, Windows 98 SE
2	Quantex M466-2c 800/896-4898 www.quantex.com	Sept 99	80	Average: $999	Very good 209	**Good:** Celeron-466, 64MB of RAM, 128KB L2 cache, 13GB hard drive, 17-inch monitor, Windows 98
3	Nutrend Celeron-500 888/482-6678 www.nutrend.com	Feb 00	79	Average: $959	Very good 214	**Good:** Celeron-500, 64MB of RAM, 128KB L2 cache, 13.5GB hard drive, 17-inch monitor, Windows 98 SE
4	Dell OptiPlex GX100 800/388-8542 www.dell.com	Dec 99	78	Expensive: $1180	Very good 260	**Good:** Celeron-500, 64MB of RAM, 128KB L2 cache, 6.4GB hard drive, 17-inch monitor, Windows NT 4.0
5	Axis Systems Orion 100C DVD 800/378-9014 www.axissys.com	Oct 99	75	Expensive: $1168	Very good 210	**Very good:** Pentium III-450, 128MB of RAM, 512KB L2 cache, 10.2GB hard drive, 17-inch monitor, Windows 98
6	Gateway E-1400/Celeron-500 800/315-2536 www.gateway.com	Jan 00	75	Average: $1029	Very good 211	**Satisfactory:** Celeron-500, 64MB of RAM, 128KB L2 cache, 6.8GB hard drive, 15-inch monitor, Windows 98 SE
7	Racer PC500c 800/308-8767 www.racerpc.com	Feb 00	72	Inexpensive: $949	Very good 218	**Good:** Celeron-500, 64MB of RAM, 128KB L2 cache, 6.4GB hard drive, 17-inch monitor, Windows 98 SE
8	Compaq Prosignia Desktop 320 800/345-1518 www.compaq.com	Oct 99	72	Average: $1019	Good 202	**Good:** Celeron-466, 64MB of RAM, 128KB L2 cache, 8.4GB hard drive, 17-inch monitor, Windows 98
9	Quantex SB500c 800/896-4898 www.quantex.com	Jan 00	70	Expensive: $1199	Good 244	**Very good:** Celeron-500, 128MB of RAM, 128KB L2 cache, 13.6GB hard drive, 17-inch monitor, Windows NT 4.0
10	Premio Apollo II CS1 800/677-6477 www.premiopc.com	Dec 99	70	Average: $959	Very good 211	**Good:** Celeron-500, 64MB of RAM, 128KB L2 cache, 13.6GB hard drive, 17-inch monitor, Windows 98 SE
	Best Buy	Percent of overall rating ▶		Price: 22 percent	Performance: 13 percent	Base configuration: 10 percent

[1] A system's performance word score is relative to the scores earned by other PCs running the same operating system. For more details, see "Your Guide to the Top 100" on page 211.

[2] We define vertical cases as towers (taller than 20 inches), midsize towers (15.5 to 20 inches), or minitowers (shorter than 15.5 inches); and horizontal cases as desktops (5 inches or taller) or compacts (shorter than 5 inches).

[3] For more information about all the products in this table, select number 903 on the product information card or visit www.pcworld.com/productinfo.

THE MICRO EXPRESS MICROFLEX-55C, the only newly tested system to make the budget chart for March, claims top honors with a blazing-quick Pentium III-550 inside and an outstanding feature set. The MicroFlex-55C squeaks in just under our $1200 maximum price for a budget PC, but the package it offers makes it a tempting selection. Hot on its heels, the number two Quantex M466-2c offers plenty of expandability and a sub-$1000 price.

1 MICRO EXPRESS MICROFLEX-55C

WHAT'S HOT: With four open slots (three PCI and one ISA) and four open drive bays, the large, well-NEW organized interior provides plenty of expansion room. It's easy to access, too: After loosening one large thumbscrew, you remove the top and pop off the side; and the shell goes back on just as smoothly. Microsoft's Natural keyboard permits comfortable, quiet typing.

WHAT'S NOT: Our test PC lacked any business suite or software designed for the small or home office. At $1199, it hits the budget chart's price ceiling.

WHAT ELSE: Powered by a PIII-550 chip, the MicroFlex-55C earns a slightly above-average 242 score on PC WorldBench 98. The 17-inch Impression 7VX monitor produces deep colors and sharp text at 1024 by 768 resolution. The MidiLand SW190 Super three-speaker set sports a funky rippled-plastic design; it sets up easily and pumps out adequate audio for most office environments. Documentation includes a quick-setup guide, a system manual, and some component manuals.

BEST USE: This feature-rich system should meet the needs of most home offices or small businesses, but you'll have to get productivity software elsewhere.

2 QUANTEX M466-2C

WHAT'S HOT: Inside, you get six open slots, six open drive bays, and a tidily arranged interior—all outstanding for a budget system. Quantex cut the M466-2c's price by $50, to $999. A robust 13GB hard drive can satisfy all but the most demanding users' needs.

WHAT'S NOT: Quantex's 17-inch AT897c monitor looked somewhat fuzzy at what should have been a less-than-exacting screen resolution of 1024 by 768.

WHAT ELSE: This Celeron-466–based system earned a middling score of 209 on

Extra features	Design and expandability [2]	Vendor's system reliability	Tech support quality/ policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)	Product info number [3]
Very good: ATI Rage 128 graphics board with 32MB of RAM, 6X DVD-ROM drive, V.90 modem, Microsoft Natural keyboard	**Very good:** midsize tower case, 4 open drive bays, 4 open slots	[4]	Fair [5]/ Outstanding	24/7, toll-free	4/4	618
Good: 3dfx Voodoo3 2000 graphics board with 16MB of RAM, 6X DVD-ROM drive, V.90 modem	**Outstanding:** midsize tower case, 6 open drive bays, 6 open slots	Good [4]	Good [5]/ Good	24/7, toll-free	3/1	619
Good: ATI Xpert98 graphics board with 8MB of RAM, 22X-48X CD-ROM drive, V.90 modem, multidirectional multimedia microphone	**Very good:** midsize tower case, 4 open drive bays, 4 open slots	[4]	Fair [5]/ Good	24/7, toll-free	3/lifetime	620
Satisfactory: integrated Intel 810 graphics with UMA and 4MB of 3D cache, 10X-24X CD-ROM drive, network interface, Wake-on-LAN, chassis intrusion	**Satisfactory:** desktop case, no open drive bays, 2 open slots	Outstanding	Good/ Outstanding	24/7, toll-free	3/3	–
Good: integrated Intel 740 graphics with 8MB of RAM, 10X DVD-ROM drive, V.90 modem	**Good:** minitower case, 4 open drive bays, 4 open slots	[4]	Good [5]/ Outstanding	24/7, toll-free	3/3	621
Satisfactory: integrated Intel 752 graphics with 4MB of RAM, 12X-24X CD-ROM drive, network card, Microsoft IntelliMouse, Wake-on-LAN, chassis intrusion	**Satisfactory:** desktop case, no open drive bays, 2 open slots	Good	Fair/ Outstanding	24/7, toll-free	3/3	622
Satisfactory: integrated Intel 810 graphics with UMA and 4MB of 3D cache, 4.8X DVD-ROM drive, V.90 modem	**Good:** minitower case, 1 open drive bay, 3 open slots	[4]	Fair [5]/ Good	24/7, toll-free	Varies [5]/3	623
Good: NVidia Vanta graphics board with 16MB of RAM, 16X-32X CD-ROM drive, V.90 modem, Iomega Zip 100 drive, Microsoft IntelliMouse	**Satisfactory:** minitower case, no open drive bays, 2 open slots	Good	Fair/ Outstanding	24/7, toll-free	3/1	624
Satisfactory: integrated Intel 810 graphics with UMA and 4MB of 3D cache, 17X-40X CD-ROM drive, network card, Microsoft Natural keyboard, scroll mouse	**Good:** midsize tower case, 6 open drive bays, 2 open slots	Good [4]	Good [5]/ Good	24/7, toll-free	3/1	625
Satisfactory: integrated Intel 810 graphics with UMA and 4MB of 3D cache, 24X-48X CD-ROM drive, V.90 modem, Microsoft Natural keyboard	**Satisfactory:** midsize tower case, 2 open drive bays, 2 open slots	[4]	Fair [5]/ Fair	10/5, toll-free	3/3	626
Extra features: 10 percent	Design and expandability: 15 percent	Reliability: 15 percent	Support and warranty: 15 percent			

[4] Insufficient data to give a rating, or the rating is derived from the vendor's Reliability and Service survey scores for its home PCs. For tech support quality, this rating may also depend on our anonymous support-quality calls.

[5] Five years on CPU and main RAM, three years on other parts.

LOW-PRICED POWER: The MicroFlex-55C sports the best speed on the budget chart for a Win 98 PC.

our PC WorldBench 98 test suite. The 6X DVD-ROM drive that accompanies the M466-2c sustains smooth, uninterrupted video playback, even with other applications running simultaneously.

BEST USE: For the same money, a small office or home office with severe budget constraints would be hard pressed to obtain better mileage than this fast, multipurpose PC can deliver.

3 NUTREND CELERON-500

WHAT'S HOT: The $959 Nutrend Celeron-500 earns a PC WorldBench 98 score of 214—an exceptionally high rating for a Windows 98 system in its CPU class. The 17-inch OptiQuest V71 monitor produces sharp text and vibrant colors. With four open slots (three PCI and one ISA) and four open drive bays, the Nutrend sets aside a generous amount of room for expansion.

WHAT'S NOT: Accessing the system's interior is no easy task, though once you get there you'll find everything neatly arranged. The flimsy plastic Multimedia EP-280 speakers deliver poor sound that distorts heavily at higher volumes.

WHAT ELSE: The skimpy system manual provides few illustrations, but Nutrend supplies decent documentation for the rest of the hardware. The multimedia keyboard includes various programmable buttons and an attachable wrist rest.

BEST USE: Small offices on a short economic leash will find a lot to like in the Nutrend Celeron-500.

4 DELL OPTIPLEX GX100

WHAT'S HOT: Dell's $1180 OptiPlex GX100, one of the few Celeron-based Win NT systems the PC World Test Center has received, exceeded our expectations in lab tests. Equipped with a Celeron-500 processor, the OptiPlex GX100 turned in a respectable PC WorldBench 98 score of 260, surpassing most PIII-450 systems we've tested running NT. The solidly constructed QuietKey keyboard permits smooth, soft typing. With an integrated network interface, a case lock, and built-in Wake-on-LAN management fea- ▶

WORK OR PLAY: The Quantex M466-2c comes with a 6X DVD-ROM drive if you need a break from the grind.

tures, this machine ships business-ready.

WHAT'S NOT: This system has no unoccupied drive bays, only one open RAM slot, and just two free PCI slots. The accompanying system manual scantily covers Windows NT and includes no information on the OptiPlex's hardware or on any components other than the monitor. (Dell does provide online documentation for all of these parts, however.) You can't upgrade the integrated Intel 810 AGP graphics and 4MB of 3D cache, either. The system employs a rickety, notebook-style CD-ROM drive—a component excusable in a portable environment where weight is of primary concern, but inappropriate for a desktop system.

WHAT ELSE: To access the OptiPlex GX100's interior, you simply press two buttons (one on either side of the rather flimsy plastic case) and lift off the top. Dell's 17-inch M770 monitor displays crisp text and bright colors at the standard 1024 by 768 resolution.

BEST USE: With its compact size, integrated network interface, and management features, the speedy OptiPlex GX100 seems destined to grace many a stall in corporate cubicle farms.

5 AXIS SYSTEMS ORION 100C DVD

WHAT'S HOT: Though the Orion 100C DVD lacks an MPEG decoder card, the 10X DVD-ROM player on our test system worked well—the PC automatically adjusted its screen resolution to 800 by 600 during playback. The 17-inch ADI CM700 monitor displays crisp images. The system's documentation includes detailed diagrams and a thorough troubleshooting section.

WHAT'S NOT: With a score of 210 on PC WorldBench 98, the Orion 100C DVD is slightly slower than the average Pentium III-450 machine running Windows 98. Manipulating the case cover requires considerable dexterity—and removal of four screws.

WHAT ELSE: The unit's $1168 price tag might appeal to budget-conscious buyers searching for an expandable multimedia machine. The unit now ships with suitable Altec Lansing ACS22 speakers.

BEST USE: The Orion 100C DVD would make a solid presentation system.

6 GATEWAY E-1400/ CELERON-500

WHAT'S HOT: This pint-size desktop takes up minimal space. And by standing it on its optional base, you can transform the E-1400 into a minitower. At the press of two buttons, the case slides off easily to display a well-organized interior where almost all add-in devices connect directly to the system board, instead of via cables.

WHAT'S NOT: You may have to struggle with the case to make it fit snugly on its chassis. Despite its neat appearance, the interior offers little expansion room, with just two open PCI slots and no available drive bays. The 6.8GB hard drive is small even for a budget system. The 15-inch Gateway EV500 monitor matches the rest of the system's compactness, but the integrated Intel 752 graphics yield fuzzy text and dull colors at 800 by 600 resolution.

WHAT ELSE: The Cambridge SoundWorks SBS52 two-speaker set produces crisp audio. Gateway supplies adequate documentation, including quick-setup and technical support guides, but it omits manuals for some of the individual hardware components. The system's PC WorldBench 98 score of 211 is typical for a Celeron-500–based PC running Win 98.

BEST USE: The E-1400 is put together for maximum appeal to corporate buyers seeking a compact, inexpensive system with management features.

7 RACER PC500C

WHAT'S HOT: With a 218 PC WorldBench 98 score, this Racer is the fastest chart-making Celeron-500 we've seen running Win 98/98SE. And the $949 PC500C is the lowest-priced budget system on our chart. Its unique minitower design (with side handles for easy portability) simplifies accessing the system's innards.

WHAT'S NOT: Colors appeared washed out on the ADI VD-697 17-inch monitor. The DVD-ROM drive, though a welcome feature at this price, didn't automatically play our test movie, and playback on the substandard monitor looked poor.

WHAT ELSE: The unit comes with documentation for all components, but it lacks an overall system manual, a potentially frustrating omission for first-time PC owners. The Altec Lansing ACS43 two-speaker set provides adequate, if somewhat weak, sound. The system interior comes well organized but offers little expansion room—three open PCI slots and one open drive bay.

BEST USE: This system provides solid power at a sensible price for small-office users who don't demand topflight multimedia performance.

8 COMPAQ PROSIGNIA DESKTOP 320

WHAT'S HOT: This Celeron-466–based Prosignia ships with great extras, including an Iomega Zip 100 drive and an ▶

STRONG MULTIMEDIA: Presentation makers will admire the abilities of Axis Systems' Orion 100C DVD.

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NVidia Vanta graphics board. The 17-inch Compaq S700 monitor impressed us with crisp text and images. The quality of Compaq's tech support has improved. In our recent anonymous calls, reps went the extra mile to thoroughly explain answers to our many questions. The already affordable PC now costs $88 less than last month, at $1019.

WHAT'S NOT: Some of our test system's front bezel pieces—the floppy drive faceplate and eject button, in particular—arrived loosely mounted in their bays. The PC conspicuously lacks labels and color-coding on the rear ports. With only two open PCI slots, the computer leaves little room for expansion. Its PC WorldBench 98 score of 202 is among the lowest we've seen for a Celeron-466 system running Windows 98.

WHAT ELSE: The unit ships with Microsoft Office 2000 Small Business Edition, and the 8.4GB hard drive should suffice for most text-centric business uses. Compaq includes a solidly constructed keyboard with this model.

BEST USE: Compaq's improved support makes the Prosignia 320 a good bet for small businesses and home offices that prefer to buy from a well-known vendor.

9 QUANTEX SB500C

WHAT'S HOT: This $1199 Quantex packs a network interface card and Microsoft Office 2000 Small Business Edition. If you're already accustomed to ergonomic keyboards, you'll find typing on the Microsoft Natural keyboard comfortable. The Altec Lansing ACS90W two-speaker set delivers vibrant sound.

WHAT'S NOT: The Quantex SB500c's PC WorldBench 98 score of 244 falls considerably short of the average number posted by Celeron-500 systems running Windows NT. In our graphics tests, the 17-inch Quantex XP175N monitor produced blurry text at 1024 by 768 resolution and dull colors at all resolutions.

WHAT ELSE: Quantex uses three large thumbscrews to fasten the case in place, which makes the spacious interior fairly easy to access; on the other hand, you must remove the entire case to get inside. Cables clutter the interior, and a small motherboard limits your expansion options to only two open PCI slots, even though the chassis has space for six free slots. The mediocre documentation includes a handy quick-setup guide and paper manuals for all the hardware, but you won't find many illustrations.

BEST USE: Many offices on a budget will welcome the network-ready Quantex SB-500c, which comes bundled with Microsoft Office 2000 Small Business Edition.

PRESTO CHANGE-O: Rotate Gateway's E-1400 on its optional base to make the desktop a minitower.

10 PREMIO APOLLO II CS1

WHAT'S HOT: The $959 Apollo II CS1 has an orderly interior with bundled-out-of-the-way cabling and easy access to components. A case lock helps prevent intrusion into the midsize tower. The Microsoft Natural keyboard permits smooth typing.

WHAT'S NOT: The 17-inch Premio TE770B monitor produces blurry images at all resolutions, but the blurriness progressively worsens at higher settings. You must remove two screws to access the interior of the flimsy plastic case. Once inside, you'll notice that one of the two serial ports is located awkwardly on a bracket near the expansion slots.

WHAT ELSE: The Celeron-500 CPU boosts the Apollo's PC WorldBench 98 score to 211—a respectable showing but average for its processor class. The large Premio 636A speaker combination is easy to set up but rather weak. The motherboard offers only two free PCI slots and two open drive bays for future expansion. Premio bundles Microsoft Office 2000 Small Business Edition with this model.

BEST USE: With decent power and Office 2000 installed, the Apollo II CS1 could make a successful landing in a budget-conscious home office. ▶

Come Together: Integrated Graphics

TECH TREND BUDGET PC MAKERS are equipping more systems—like this month's fourth-ranked Dell OptiPlex GX100—with integrated Intel 810 graphics. With dedicated memory and a graphics processor chip on the motherboard, typical integrated graphics cost less (and run slower) than a graphics card and don't require an AGP slot on the motherboard.

Intel's 810 graphics improve on the traditional integrated approach in several ways. First, instead of operating from a discrete chip, the graphics processor is integrated into a system's chip set, which streamlines performance. In addition, 810 graphics employ Unified Memory Architecture, in which portions of system memory are appropriated for graphics use. This saves costs further by obviating the need for dedicated graphics memory.

To offset the shortcomings of using system memory for graphics, manufacturers can boost 3D performance and use less system RAM by adding 4MB of display cache memory dedicated to 3D graphics structures to the motherboard. The Intel 810 chip set also enables systems to reallocate memory for system use when it is not needed for graphics (for example, when you lower the screen's resolution).

ILLUSTRATION, DOUG ROSS

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The award-winning Diamond Pro 900u (19-inch CRT/18.0-inch DVI) is truly distortion-free with a perfectly flat screen surface.*

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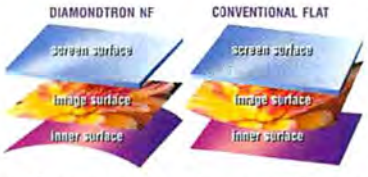

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PC WORLD WORLD CLASS — Diamond Pro 900u July 1999

Macworld Digital Choice — Diamond Pro 2020u June 1999

CADENCE LAB verdict — Diamond Pro 2020u June 1999

PC Magazine Editors' Choice — Diamond Pro 900u Jan. 19, 1999; Best 19" upgrade March 9, 1999

1998 Eddy Winner — Diamond Pro 900u March 1999

Desktop Publishers — Diamond Pro 900u February 1999

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PC WORLD

TOP 15 NOTEBOOK PCs

	POWER NOTEBOOK: $2700 AND OVER	Month tested	★ Overall rating	Street price (12/11/99)	PC WorldBench 98 performance score (Faster ▶)	Base configuration
1	Gateway Solo 9300LS 800/315-2536 www.gateway.com	Feb 00	92	Inexpensive: $2919	Very good 216	**Very good:** Pentium III-450, 15-inch active screen, touchpad, 64MB of RAM, 6GB hard drive
2	Dell Latitude CPx H500GT 800/388-8542 www.dell.com	(NEW)	87	Expensive: $3707	Very good 222	**Very good:** Pentium III-500, 14.1-inch active screen, touchpad, eraserhead, 128MB of RAM, 6.4GB hard drive
3	Dell Inspiron 7500 R500VT 800/388-8542 www.dell.com	Feb 00	85	Very expensive: $4101	Outstanding 236	**Very good:** Pentium III-500, 15-inch active screen, touchpad, 128MB of RAM, 25GB hard drive
4	IBM ThinkPad 600X 5EU 800/426-7255 x4751 www.ibm.com/pc/us/thinkpad	(NEW)	82	Very expensive: $4099	Outstanding 231	**Very good:** Pentium III-500, 13.3-inch active screen, eraserhead, 64MB of RAM, 12GB hard drive
5	WinBook XL3 800/965-9349 www.winbook.com	(NEW)	81	Expensive: $3599	Outstanding 233	**Very good:** Pentium III-500, 14.1-inch active screen, touchpad, eraserhead, 128MB of RAM, 10GB hard drive
	MIDRANGE NOTEBOOK: $2000 TO $2699	**Percent of overall rating ▶**		**Price: 14 percent**	**Performance: 20 percent**	**Base configuration: 5 percent**
1	HP Pavilion N3190 800/322-4772 www.hp.com	(NEW)	85	Average: $2299	Outstanding 200	**Very good:** Celeron-466, 14.1-inch active screen, touchpad, 64MB of RAM, 6.4GB hard drive
2	IBM ThinkPad I Series 1480 800/426-7255 x4751 www.ibm.com/pc/us/thinkpad	Jan 00	85	Average: $2299	Good 183	**Very good:** Celeron-466, 14.1-inch active screen, eraserhead, 64MB of RAM, 6.4GB hard drive
3	Sony VAIO PCG-F340 888/315-7669 www.sony.com/pc	Jan 00	83	Very inexpensive: $1799	Good 187	**Good:** Pentium II-366, 13-inch dual-scan screen, touchpad, 64MB of RAM, 6.4GB hard drive
4	Micro Express NP7400 800/989-9900 www.microexpress.net	Jan 00	83	Inexpensive: $1899	Very good 189	**Very good:** Pentium II-400, 14.1-inch active screen, touchpad, 64MB of RAM, 6GB hard drive
5	Dell Latitude CPT V466GT 800/388-8542 www.dell.com	(NEW)	82	Inexpensive: $1978	Good 188	**Very good:** Celeron-466, 14.1-inch active screen, eraserhead, 64MB of RAM, 6.4GB hard drive
	BUDGET NOTEBOOK: UNDER $1999	**Percent of overall rating ▶**		**Price: 17 percent**	**Performance: 17 percent**	**Base configuration: 5 percent**
1	HP Pavilion Notebook PC 800/322-4772 www.hp.com	Jan 00	92	Average: $1599	Outstanding 185	**Satisfactory:** Celeron-433, 12.1-inch active screen, touchpad, 64MB of RAM, 4.8GB hard drive
2	Compaq Prosignia Notebook 150 800/345-1518 www.compaq.com	Nov 99	88	Average: $1499	Good 153	**Good:** AMD K6-2-380, 12.1-inch active screen, touchpad, 64MB of RAM, 4GB hard drive
3	WinBook XL2-C400 800/965-9349 www.winbook.com	(NEW)	87	Inexpensive: $1299	Outstanding 185	**Satisfactory:** Celeron-400, 12.1-inch dual-scan screen, touchpad, 64MB of RAM, 6.5GB hard drive
4	Acer TravelMate 512T 800/637-7000 www.acer.com	Nov 99	86	Average: $1499	Good 166	**Good:** Celeron-366, 12.1-inch active screen, touchpad, 64MB of RAM, 4.1GB hard drive
5	Enpower ENP-313 Pro 800/997-2258 www.enpower.com	Feb 00	85	Average: $1599	Outstanding 184	**Good:** Celeron-466, 13.3-inch active screen, touchpad, 64MB of RAM, 3.2GB hard drive
	Best Buy	**Percent of overall rating ▶**		**Price: 20 percent**	**Performance: 14 percent**	**Base configuration: 5 percent**

[1] Includes computer; adapter; power cord; and floppy, DVD-ROM, or CD-ROM drive.

[2] For more information about all the products listed in this table, select number 909 on the product information card or visit www.pcworld.com/productinfo.

[3] One year on battery, three years on other parts.

THIS MONTH'S TOP 15 has it all—from the fastest to the cheapest. For the true speed demons, check out our power chart, where Pentium III notebooks from Dell, Gateway, IBM, and WinBook have routed the last Pentium IIs. Two Hewlett-Packard notebooks win kudos in the midrange and budget categories; both sport front-side buttons for playing CDs. Looking for the sweetest deal? Check out WinBook's loaded XL2-C400 for $1299.

POWER NOTEBOOKS

1 GATEWAY SOLO 9300LS

WHAT'S HOT: Despite its featherweight price, this Pentium III-450–equipped Solo 9300LS posted a heavyweight PC WorldBench 98 score of 216, outperforming similarly configured PII-400 notebooks by about 10 percent. The Solo's 15-inch display feels

Extra features	Design and ease of use	Battery life (hours:min)	Travel weight (pounds) [1]	Vendor's system reliability	Tech support quality/ policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)	Product info number [2]
Very good: 10X-24X CD-ROM drive, V.90 modem, ethernet adapter, multipurpose bay takes second lithium ion battery	**Excellent:** smoothly designed presenter's dream	**Outstanding:** 5:13	**Average:** 8.6	Good	Good/ Good	24/7, toll-free	3/3	702
Good: 4X CD-RW, multipurpose bay takes second battery, lithium ion battery	**Excellent:** highly configurable	**Outstanding:** 4:02	**Average:** 8.3	Good	Good/ Best	24/7, toll-free	Varies [3]/3	–
Excellent: 6X DVD-ROM drive, V.90 modem, multipurpose bay takes second battery, lithium ion battery, Zip 100 drive	**Very good:** storage galore and a CD-RW option	**Outstanding:** 4:22	**Very heavy:** 10.4	Good	Good/ Best	24/7, toll-free	3/3	–
Good: 6X DVD-ROM drive, V.90 modem, multipurpose bay takes second battery, lithium ion battery	**Very good:** comfortable keyboard its biggest plus	**Very good:** 3:05	**Average:** 7	Good	Good/ Fair	24/7, toll-free	3/3	–
Good: 4X DVD-ROM, V.90 modem, multipurpose bay, lithium ion battery	**Average:** decked out, but a challenge to upgrade	**Good:** 2:44	**Average:** 8.4	Fair	Fair/ Poor	13/5, [4] toll-free	1/1	703
Extra features: 5 percent	Design and ease of use: 10 percent	Battery life: 8 percent	Weight: 8 percent	Reliability: 20 percent	Support and warranty: 10 percent			
Good: 4X DVD-ROM, V.90 modem, lithium ion battery	**Average:** includes CD player buttons	**Good:** 2:34	**Average:** 6.8	Good	Good [3]/ Poor	24/7, toll call	1/1	704
Good: 4X DVD-ROM drive, V.90 modem, lithium ion battery	**Very good:** innovative Think-Light and covers set it apart	**Outstanding:** 3:44	**Average:** 8.1	Good	Good/ Fair	24/7, toll-free	1/1	–
Very good: 10X-24X CD-ROM drive, V.90 modem, multipurpose bay takes second battery, lithium ion battery	**Very good:** port replicator comes standard	**Satisfactory:** 2:23	**Average:** 8.1	[4]	Fair [3]/ Good	24/7, toll-free	1/1	705
Satisfactory: 2X DVD-ROM drive, V.90 modem, lithium ion battery	**Very good:** multimedia talents, noisy keyboard	**Very good:** 3:09	**Heavy:** 9.2	[4]	Fair [3]/ Fair	24/7, toll-free	4/4	706
Good: 10X-24X CD-ROM drive, multipurpose bay takes second battery, lithium ion battery	**Average:** highly configurable	**Very good:** 3:05	**Average:** 8.3	Good	Good/ Good	24/7, toll-free	1/1	–
Extra features: 5 percent	Design and ease of use: 10 percent	Battery life: 8 percent	Weight: 8 percent	Reliability: 20 percent	Support and warranty: 10 percent			
Satisfactory: 10X-24X CD-ROM drive, V.90 modem, lithium ion battery	**Average:** all-in-one with external CD controls	**Good:** 2:42	**Average:** 6.6	Good	Good [3]/ Poor	24/7, toll call	1/1	707
Satisfactory: 12X-24X CD-ROM drive, V.90 modem, lithium ion battery	**Very good:** superb built-in sound	**Satisfactory:** 2:19	**Average:** 8.1	Fair	Fair/ Good	24/7, toll-free	1/1	708
Good: 8X-20X CD-ROM drive, V.90 modem, multipurpose bay, lithium ion battery	**Average:** includes TV-out and a nice screen	**Good:** 2:32	**Average:** 7.8	Fair	Fair/ Poor	13/5, [4] toll-free	1/1	709
Satisfactory: 10X-24X CD-ROM drive, V.90 modem, touchpad pointing device, lithium ion battery	**Average:** stand-alone CD player, pesky keyboard	**Very good:** 3:02	**Average:** 7.8	Fair	Fair [3]/ Fair	24/7, toll-free	1/1	710
Satisfactory: 12X-24X CD-ROM drive, V.90 PC Card modem, lithium ion battery	**Poor:** basic laptop carries fast chip	**Satisfactory:** 2:10	**Average:** 7.2	[4]	Fair [3]/ Fair	11/6, toll-free	1/1	711
Extra features: 5 percent	Design and ease of use: 10 percent	Battery life: 8 percent	Weight: 8 percent	Reliability: 20 percent	Support and warranty: 10 percent			

[4] Thirteen hours a day M-F, 7 hours on Saturdays. No support on Sundays.

[3] Due to insufficient data from survey, score is based on responses to anonymous calls for tech support.

[4] Insufficient data to give a rating.

sturdy enough to withstand an occasional bump. The unit's 12-cell lithium ion battery far outlasted other laptop power packs in our tests, running for a record-breaking 5.2 hours.

WHAT'S NOT: While competitors like Sony's VAIO provide video-editing software, Gateway doesn't offer a package to complement its high-speed IEEE 1394 port (often used to connect a digital video camera). The speakers are fairly loud, but they lack strong bass response and sound fuzzy when cranked to higher volume.

WHAT ELSE: In addition to the IEEE 1394 port, it has TV-in and -out ports and a Dolby jack for connecting a Surround Sound stereo system. Two modular bays make configuration changes a snap. You can swap the floppy or CD-ROM drive for a second hard drive (up to 10GB for ▶

ENERGIZER: The battery on the Gateway Solo 9300LS lasts 5.2 hours.

PHOTOGRAPHS: KEN SMITH

$499), a SuperDisk drive ($75), or a second battery ($100).

BEST USE: The Solo 9300LS is a beautifully designed, full-featured notebook for presentations and video editing.

MIDRANGE NOTEBOOKS

1 HEWLETT-PACKARD PAVILION N3190

WHAT'S HOT: Buttons on the front of the Pavilion's case let you play music CDs and control the volume without turning on the notebook or even raising its screen. The stereo speakers sound great—almost as good as the ones in the best-sounding Compaq Prosignia notebooks.

WHAT'S NOT: Calls to HP's technical support staff are on your nickel, and HP pulls the plug on free telephone support after three years. Thereafter, support costs $25 per incident. The notebook's otherwise fine design falters in a couple of places.

HEWLETT-PACKARD'S Pavilion Notebook PC comes loaded with Microsoft Works and Money, as well as Quicken Basic 99.

The headphone port sits inconveniently in back, and the translucent-blue CD controls are hard to read and so shallow that they're a little difficult to press.

WHAT ELSE: The 6.8-pound Pavilion weighs relatively little for a notebook with built-in floppy and DVD-ROM drives. The comfortable keyboard is one of the quietest we've ever used, and a software utility that comes with the notebook lets you program the mouse buttons to launch applications. Parts are easy to access (including the hard drive, which is locked in by only a screw). The adequate consumer software bundle includes Microsoft Works, Money 99, and Quicken Basic 99. Hewlett-Packard tries to board the style bandwagon by describing this new line of consumer notebooks as "midnight blue," but the company's business-oriented OmniBook, identical to the Pavilion in all but software, has used the same handsome dark-gray case for months.

BEST USE: The HP Pavilion N3190 would make an excellent machine for a music-loving desk jockey or a good first notebook for the consumer who has a little extra money available to spend on a big screen and a DVD drive.

PROGRAM-A-MOUSE: Think most notebooks make navigating a pain? You can program the keyboard on Hewlett-Packard's Pavilion N3190 Celeron-466 to launch applications from mouse buttons.

BUDGET NOTEBOOKS

1 HEWLETT-PACKARD PAVILION NOTEBOOK PC

WHAT'S HOT: This versatile notebook has front-side buttons that let you play CDs without turning the system on or even raising the screen. The stereo speakers generate good sound.

WHAT'S NOT: The skimpy parts-and-labor warranty on the Pavilion expires after one year. Extending it to three years costs an extra $179. With a PC WorldBench 98 score of 185, the Celeron-433–based Pavilion performs no better than a typical PII-366 notebook. The headphone port is awkwardly located on the back of the notebook; and the shallow, dark-blue CD control buttons are hard to read and press.

WHAT ELSE: The $1599 Pavilion comes loaded with software, including Microsoft Works and Money 99 and Quicken Basic 99. It's also relatively thin and light for a notebook with built-in floppy and CD-ROM drives: just 1.7 inches tall and only 6.6 pounds (not including the AC adapter). The Pavilion is smartly designed with a 12.1-inch screen; a quiet, comfortable keyboard; and a port replicator connection on the bottom. And the Pavilion's interior is easy to access.

BEST USE: Despite HP's stingy support, the Pavilion is still a reasonably priced, well-designed notebook for home or work.

Contributing Editor Carla Thornton regularly covers notebooks for PC World. ■

BEYOND THE TOP 15

WE EVALUATED the following system along with the others, but it didn't score high enough to reach the Top 15 Notebook PCs chart. For a write-up, visit PC World Online (www.pcworld.com/top400).

- **Compaq Armada M300**

The Skinny on Cheap NBs

TECH TREND HALF A DOZEN notebooks premiere on our Top 15 chart this month—more than ever before. The theme: You can never be too cheap or too thin.

WinBook, a leader in good-quality bargain portables, outdoes itself with the WinBook XL2-C400, which ranks third on our budget chart. Though basic in comparison with high-end notebooks, the XL2 has few peers in the sub-$1300 market. For $1299 you get a peppy 400-MHz Celeron processor, a 6.5GB hard drive, a docking connection, a sturdy-feeling keyboard, and one of the best dual-scan screens we've ever seen.

The most exciting trend is toward ultralight notebooks that weigh under 4 pounds (without external CD-ROM and floppy drives). These petite notebooks now challenge standard-size laptops on price, performance, and features. Although the newer models such as Compaq's Armada M300 didn't sail onto our charts, their scores did improve thanks to beefed-up features.

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PC WORLD

TOP 15 HOME PCs

	POWER SYSTEM: $2000 AND OVER	Month tested	★ Overall rating	Street price (12/17/99)	PC WorldBench 98 performance score [1] Faster ▶	Base configuration [2]
1	**Dell Dimension XPS T650r** 800/388-8542 www.dell.com	Feb 00	93	Average: $2489	Outstanding 278	Pentium III-650, 128MB of RAM, 256KB L2 cache, 20.4GB hard drive, midsize tower case, 19-inch monitor, Windows 98
2	Quantex GX700 800/896-4898 www.quantex.com	NEW	90	Average: $2399	Outstanding 293	Pentium III-700, 128MB of RAM, 256KB L2 cache, 28.5GB hard drive, midsize tower case, 19-inch monitor, Windows 98
3	Micron Millennia Max 600 800/642-7667 www.micronpc.com	NEW	89	Inexpensive: $2145	Very good 253	Pentium III-600, 128MB of RAM, 512KB L2 cache, 20GB hard drive, midsize tower case, 17-inch monitor, Windows 98
4	IBM Aptiva E Series 595 800/426-2968 www.ibm.com/pc/us/aptiva	Dec 99	87	Inexpensive: $2228	Outstanding 271	AMD Athlon-600, 128MB of RAM, 512KB L2 cache, 22GB hard drive, minitower case, 17-inch monitor, Windows 98
5	Compaq Presario 5900Z-700 800/345-1518 www.compaq.com	NEW	87	Very expensive: $3229	Outstanding 288	AMD Athlon-700, 128MB of RAM, 512KB L2 cache, 34.2GB hard drive, midsize tower case, 19-inch monitor, Windows 98
	MIDRANGE SYSTEM: $1200 TO $1999	Percent of overall rating ▶		Price: 10 percent	Performance: 20 percent	
1	**Dell Dimension XPS T500** 800/388-8542 www.dell.com	Dec 99	93	Inexpensive: $1549	Good 228	Pentium III-500, 128MB of RAM, 512KB L2 cache, 13.6GB hard drive, midsize tower case, 17-inch monitor, Windows 98
2	Gateway Essential 500 800/315-2536 www.gateway.com	Dec 99	90	Inexpensive: $1449	Very good 230	Pentium III-500, 128MB of RAM, 512KB L2 cache, 13.6GB hard drive, midsize tower case, 17-inch monitor, Windows 98
3	Quantex M500c 800/896-4898 www.quantex.com	Dec 99	89	Very inexpensive: $1299	Good 213	Celeron-500, 128MB of RAM, 128KB L2 cache, 13GB hard drive, midsize tower case, 19-inch monitor, Windows 98
4	Micron Millennia Max 533 800/642-7667 www.micronpc.com	Feb 00	88	Average: $1717	Very good 236	Pentium III-533, 128MB of RAM, 512KB L2 cache, 13.7GB hard drive, tower case, 17-inch monitor, Windows 98
5	Sony VAIO PCV-R536DS 888/315-7669 www.sony.com/pc	Jan 00	84	Inexpensive: $1548	Good 216	Pentium III-450, 128MB of RAM, 512KB L2 cache, 10.2GB hard drive, minitower case, 17-inch monitor, Windows 98
	BUDGET SYSTEM: UNDER $1200	Percent of overall rating ▶		Price: 20 percent	Performance: 15 percent	
1	**Gateway Astro** 800/315-2536 www.gateway.com	NEW	90	Very inexpensive: $799	Good 181	Celeron-400, 64MB of RAM, 128KB L2 cache, 4.3GB hard drive, all-in-one case, 15-inch monitor, Windows 98
2	Micron Millennia C466 800/642-7667 www.micronpc.com	Dec 99	89	Average: $953	Outstanding 203	Celeron-466, 64MB of RAM, 128KB L2 cache, 4.3GB hard drive, minitower case, 15-inch monitor, Windows 98
3	Quantex M466c 800/896-4898 www.quantex.com	Feb 00	86	Average: $999	Outstanding 209	Celeron-466, 64MB of RAM, 128KB L2 cache, 13.6GB hard drive, midsize tower case, 17-inch monitor, Windows 98
4	Dell Dimension L400c 800/388-8542 www.dell.com	Dec 99	85	Inexpensive: $909	Good 185	Celeron-400, 64MB of RAM, 128KB L2 cache, 6.4GB hard drive, minitower case, 15-inch monitor, Windows 98
5	CyberMax Enthusiast 500 CBG 800/437-4596 www.cybermaxpc.com	NEW	83	Expensive: $1149	Outstanding 216	Celeron-500, 128MB of RAM, 128KB L2 cache, 13GB hard drive, midsize tower case, 17-inch monitor, Windows 98
	Best Buy	Percent of overall rating ▶		Price: 25 percent	Performance: 15 percent	

[1] A system's performance word score is relative to the scores earned by other PCs running the same operating system. For more details, see "Your Guide to the Top 100" on page 211.

[2] We define vertical cases as towers (taller than 20 inches), midsize towers (15.5 to 20 inches), or minitowers (shorter than 15.5 inches); and horizontal cases as desktops (5 inches or taller) or compact (shorter than 5 inches).

IF YOU'RE SHORT ON space and money, check out Gateway's Astro. Its all-in-one case combines the CPU, monitor, and speakers in a tidy package. And its $799 price can't be beat: You get a decent-performing system with a 15-inch monitor and a 4.3GB hard drive. But thrift has its limitations. If you want top speed and flashy features, consider one of the systems on our power chart.

POWER HOME PCs

1 DELL DIMENSION XPS T650r

WHAT'S HOT: Dell's Dimension XPS T650r boasts great speed for its price and CPU class, sprinting to a PC WorldBench 98 score of 278. In our multimedia tests, we saw super-fast frame rates on AVI video playback and 3D

Extra features	Setup/ ease of use	Graphics	Reliability/ support	Comments	Product info number [1]
Outstanding: NVidia GeForce 256 graphics board with 32MB of RAM, 8X DVD-ROM drive, V.90 modem, Iomega Zip 100 drive	Outstanding/ Very good	Good	Outstanding/ Outstanding	**PRO:** Sizzling performance, top-notch reliability and support. **CON:** Tinny audio, second most expensive system on the chart.	–
Outstanding: NVidia GeForce 256 graphics board with 32MB of RAM, 8X DVD-ROM drive, V.90 modem, Iomega Zip 100 drive	Good/ Satisfactory	Good	Good/ Good	**PRO:** Fastest home PC we've tested, swift 3D-gaming performance. **CON:** Poorly illustrated setup sheet, inadequately marked connectors.	688
Good: NVidia GeForce 256 graphics board with 32MB of RAM, 8X DVD-ROM drive, V.90 modem	Outstanding/ Good	Good	Good/ Good	**PRO:** Speedy gaming performance, easy-open case. **CON:** Monitor displays fuzzy small text, documentation too basic.	689
Very good: Number Nine SR9 graphics board with 8MB of RAM, 4X DVD-ROM drive, V.90 modem, Sony CRX-100E CD-RW drive	Satisfactory/ Very good	Good	Good/ Fair	**PRO:** Lots of storage, easy-to-use DVD player software. **CON:** A tad sluggish in 3D games, graphics on monitor slightly blurry.	–
Very good: Creative Labs 3D Blaster RIVA TNT2 Ultra graphics board with 32MB of RAM, 10X DVD-ROM drive, V.90 modem, CD-RW drive	Very good/ Good	Very good	Fair/ Fair	**PRO:** Second fastest home PC we've seen, colossal storage. **CON:** Most expensive system here, few illustrations on its setup sheet.	690
Extra features: 15 percent	Setup/ease of use: 5 percent	Graphics: 15 percent	R & S: 35 percent		
Very good: 3dfx Voodoo3 3000 graphics board with 16MB of RAM, 8X DVD-ROM drive, V.90 modem, Iomega Zip 100 drive	Outstanding/ Very good	Good	Outstanding/ Outstanding	**PRO:** Performs well in 3D games, good sound card and speakers make for pleasing audio. **CON:** Skimpy software bundle.	–
Very good: 3dfx Voodoo3 3000 graphics board with 16MB of RAM, 6X DVD-ROM drive, V.90 modem, ink jet printer	Satisfactory/ Very good	Good	Fair/ Good	**PRO:** Terrific speed for the price, speedy in games, built-in ethernet port. **CON:** Low-quality monitor.	691
Very good: integrated Intel 810 graphics with UMA and 4MB of 3D cache, 6X DVD-ROM drive, V.90 modem, Iomega Zip 100 drive	Good/ Very good	Satisfactory	Good/ Good	**PRO:** Bargain price, pleasing graphics quality on monitor. **CON:** Slow 3D-graphics performance, mediocre speakers.	692
Good: Diamond Viper V770 graphics board with 16MB of RAM, 8X DVD-ROM drive, V.90 modem	Outstanding/ Good	Good	Good/ Good	**PRO:** Fastest midrange system here, quick setup. **CON:** Highest-priced midrange PC, small fonts fuzzy at high resolutions.	693
Good: ATI Xpert 99 graphics board with 8MB of RAM, 8X DVD-ROM drive, V.90 modem	Outstanding/ Good	Good	Good/ Fair	**PRO:** Easy setup and use, lots of video-editing tools. **CON:** Sluggish performance, 10.2GB hard disk may seem small to some.	694
Extra features: 10 percent	Setup/ease of use: 10 percent	Graphics: 10 percent	R & S: 35 percent		
Satisfactory: integrated Intel 810 graphics with UMA and 4MB of 3D cache, 17X-40X CD-ROM drive, V.90 modem	Outstanding/ Very good	Good	Fair/ Good	**PRO:** Lowest-priced home PC reviewed, very easy setup. **CON:** A tad slow, poor built-in speakers, not upgradable.	695
Satisfactory: integrated NVidia RIVA 128zx graphics with 8MB of RAM, 17X-40X CD-ROM drive, V.90 modem	Satisfactory/ Good	Satisfactory	Good/ Good	**PRO:** Relatively speedy performer, multimedia keyboard. **CON:** Limited expandability, poor-sounding speakers.	696
Satisfactory: integrated Intel 810 graphics with UMA and 4MB of 3D cache, 6X DVD-ROM drive, V.90 modem, bubble jet printer	Good/ Satisfactory	Satisfactory	Good/ Good	**PRO:** Terrific value, fast, roomy interior with easy access. **CON:** Small fonts blurry, scant software bundle, simplistic manual.	697
Satisfactory: integrated Intel 810 graphics with UMA and 4MB of 3D cache, 17X-40X CD-ROM drive, V.90 modem	Very good/ Very good	Good	Outstanding/ Outstanding	**PRO:** Reasonable price, built-in ethernet port. **CON:** Lackluster performance, limited range of software titles.	–
Good: integrated Intel 810 graphics with UMA and 4MB of 3D cache, 6X DVD-ROM drive, V.90 modem	Good/ Satisfactory	Satisfactory	Fair/ Good	**PRO:** Speedy, twice the memory of other budget PCs here. **CON:** Pricier than other budget systems, slow 3D graphics.	698
Extra features: 5 percent	Setup/ease of use: 10 percent	Graphics: 10 percent	R & S: 35 percent		

[1] For more information about the products listed in this table, select number 908 on the product information card or visit www.pcworld.com/productinfo.

DELL'S DIMENSION XPS T650r is a powerful machine with a high-quality 19-inch monitor.

PHOTOGRAPHS: KEN SMITH

games, thanks in part to its high-end NVidia GeForce 256 AGP graphics board. Dell's 19-inch M990 monitor displayed rich, luscious colors in our graphics tests and generated crisp, readable text, even on small fonts, when we set the display to 1280-by-1024 resolution. Dell's version of Microsoft's Natural Keyboard Pro is equipped with programmable buttons, multimedia controls, and two USB ports. **WHAT'S NOT:** The XPS T650r is the second most expensive home PC here. The swank Harman/Kardon HK595 speakers and subwoofer account for some of its $2489 price. But the hefty subwoofer is paired with speakers that deliver only moderate volume and middling tonal quality. Another quibble: We had to ▶

bump up the monitor's brightness to comfortably view DVD movies, then return to original settings for other tasks.

WHAT ELSE: The XPS T650r offers great expandability, with three open drive bays (two external and one internal) and three open PCI slots. A plastic bar spanning the front of the case blocks access to several of the slots, although it can easily be removed. The T650r also features an Iomega Zip 100 drive. Dell includes a clearly illustrated setup poster and a handy pamphlet. Plus, the well-organized reference and troubleshooting guide tackles key maintenance issues. Dell's software bundle includes Microsoft Works 4.5 and Microsoft Web Publishing.

BEST USE: A great PC for the power user who wants expandability.

MIDRANGE HOME PCs

1 DELL DIMENSION XPS T500

WHAT'S HOT: This model's 3dfx Voodoo3 3000 card delivers strong graphics, and its video-out port lets you view games and other video on a TV screen. A Turtle Beach Montego II sound card and Altec Lansing ACS340 speakers produce crisp sound, and an easy-to-use CD-player interface makes adjusting audio settings a breeze. This system also features a Zip 100 drive.

WHAT'S NOT: The system comes with a minimal software bundle of Microsoft Works Suite 99 and one game—Descent FreeSpace; other systems on the chart provide a wider array of applications.

WHAT ELSE: With a PC WorldBench 98 score of 228, the XPS T500 is plenty fast for most office applications, but it still ranks as average for a P-III-500 system. DVD videos played smoothly.

BEST USE: The Dimension XPS T500 is a good all-around workhorse for office tasks and games, but the thin software bundle may disappoint first-time buyers.

THE DELL DIMENSION XPS T500 offers solid performance at a moderate price of $1549.

BUDGET HOME PCs

1 GATEWAY ASTRO

WHAT'S HOT: The Astro's all-in-one case is easy to set up, thanks to an illustrated setup booklet, a NEW well-written manual, and an online-based "Quick Answers" database that covers maintenance and how-to issues. The entire system is the size of a 15-inch monitor, with a slightly swollen base. Budget shoppers will appreciate the Astro's $799 price.

WHAT'S NOT: While the all-in-one design makes setup easy, it makes upgrades impossible. You can't remove the case to install new components, and you'll have to send the unit to Gateway for any repairs. In terms of performance, the Astro's PC WorldBench 98 score of 181 is somewhat slower than other home systems with a Celeron-400 processor. Its built-in speakers sound terrible.

WHAT ELSE: Text looked crisp on the Astro's 15-inch monitor at 800-by-600 resolution, and colors appeared realistic, though they lacked richness.

BEST USE: The all-in-one design and low price make the user-friendly Astro a terrific candidate for first-time users on a tight budget.

New This Month

WE TESTED seven new systems this month. And five of them broke into our Top 15 Home PCs chart, including our top budget PC from Gateway.

Another newcomer, the Quantex GX700, is a speed demon. It's the first Pentium III-700 home system we've tested, and it soared to a PC WorldBench 98 score of 293—the fastest we've seen from any home PC. The NVidia GeForce 256-based graphics board helped churn out breakneck speed in 3D games.

Micron's 600-MHz Pentium-III Millennia Max offers strong performance. Its two flat-panel Monsoon MM-700 speakers (each about the size of a large billfold) and a subwoofer produce great sound. Access to the interior is a snap—literally. One flick of a latch and the cover pops right off.

At $3229, Compaq's Presario 5900Z-700 is the most expensive home PC here, but you get a lot for the money. It has speed and plenty of extras such as a built-in Ethernet port, a Diamond Rio MP3 player, an LG Electronics CD-RW drive, and a Klipsch Pro Media v2-400 sound system with four satellite speakers and a subwoofer. Its AMD Athlon-700 CPU pushed the system to a blistering WorldBench 98 score of 288—the second fastest home PC we've seen and just a few points behind the Quantex GX700.

COMPAQ'S SOUPED-UP Presario 5900Z-700 comes with many extras, including a powerful Klipsch Pro Media v2-400 sound system with four satellite speakers.

Kirk Steers is a contributing editor for PC World. *Joel Strauch is a freelance writer based in the San Francisco Bay Area.* ■

BEYOND THE TOP 15

WE EVALUATED the following systems along with the others, but they didn't score high enough to reach the Top 15 Home PCs chart. For write-ups, visit PC World Online (www.pcworld.com/top400/newhomepcs).

- HP Pavilion 8565c
- Kaypro 4100

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PC WORLD

TOP 10 PRINTERS

	COLOR LASER PRINTER	Street price[1] (12/22/99)	Overall rating	Speed for plain text/full-page graphics (ppm)	Print quality for text/color graphics	Comments	Product info number
1	QMS Magicolor 2 DeskLaser 800/523-2696 www.qms.com	$1104	85	7.8/1	Very good/ Very good	**FEATURES:** Rated 16 ppm monochrome/4 ppm color. Standard 8MB of RAM, 600-by-600-dpi maximum resolution, 250 sheets input and output. **SUMMARY:** Not only is it the least expensive model on the chart by far, but this well-designed QMS color laser is relatively quick at both text and graphics printing and produces high print quality across the board.	661
2	Lexmark Optra SC 1275 800/539-6275 www.lexmark.com	$1713	85	6.8/1	Good/ Good	**FEATURES:** Rated 12 ppm monochrome/3 ppm color. Standard 16MB of RAM, 600-by-600-dpi maximum resolution, 400 sheets input, 250 output. **SUMMARY:** A great choice for busy offices, Lexmark's Optra SC 1275 impressed us with its speedy printing, extensive paper-handling options, good all-around print quality, and ease of use.	662
3	Xerox DocuPrint NC60 800/832-6979 www.xerox.com	$1995	83	7.8/1	Very good/ Very good	**FEATURES:** Rated 16 ppm monochrome/3 ppm color. Standard 64MB of RAM, 1200-by-600-dpi maximum resolution, 250 sheets input, 150 output. **SUMMARY:** Top-notch print quality on both text and graphics and a 30 percent price cut take the DocuPrint NC60 to the chart for the first time. Xerox's strong service and support sweeten the deal.	663
4	NEC SuperScript 4200N 800/632-4636 www.nectech.com	$2199	81	8.8/1.1	Very good/ Very good	**FEATURES:** Rated 16 ppm monochrome/4 ppm color. Standard 32MB of RAM, 1200-by-1200-dpi maximum resolution, 500 sheets input, 250 output. **SUMMARY:** You'll get solid print quality (including crisp text and detailed graphics), speedy text printing, and a good range of features on the 4200N, NEC's version of a low-end color laser.	664
5	QMS Magicolor 6100N (NEW) 800/523-2696 www.qms.com	$3399	81	8.3/1	Very good/ Very good	**FEATURES:** Rated 24 ppm monochrome/6 ppm color. Standard 64MB of RAM, 1200-by-1200-dpi maximum resolution, 250 sheets input, 500 output. **SUMMARY:** The only new tabloid-size (11-by-17-inch) printer to make the chart this month, the 6100N matches Best Buy QMS in handsome print quality. This full-featured model is also the cheapest tabloid printer here.	665
6	NEC SuperScript 4400N 800/632-4636 www.nectech.com	$2499	79	9.2/1.2	Good/ Very good	**FEATURES:** Rated 16 ppm monochrome/4 ppm color. Standard 96MB of RAM, 1200-by-1200-dpi maximum resolution, 500 sheets input, 250 output. **SUMMARY:** A fuller-featured and speedier version of the number four SuperScript 4200N, this color laser makes it mark by churning out text faster than any other printer on the chart.	666
7	Mita Ci1100 (NEW) 800/222-6482 www.mita.com	$2718	77	7/1.2	Very good/ Good	**FEATURES:** Rated 16 ppm monochrome/4 ppm color. Standard 48MB of RAM, 1200-by-1200-dpi maximum resolution, 350 sheets input, 500 output. **SUMMARY:** Dark, readable text and a good array of features round out this reasonably priced new model. Unfortunately, the Ci1100's weak documentation and confusing control panel can be frustrating.	667
8	Lexmark Optra Color 1200N 800/539-6275 www.lexmark.com	$5999	77	7.8/2.1	Good/ Adequate	**FEATURES:** Rated 12 ppm on both monochrome and color. Standard 32MB of RAM, 1200-by-1200-dpi maximum resolution, 350 sheets input, 250 output. **SUMMARY:** Quicker at printing graphics than any other model here, Lexmark's LED model offers a wealth of features—including the capability to produce tabloid-size pages—for a steep price.	668
9	IBM Infoprint Color 8 (NEW) 800/358-6661 www.ibm.com/printers	$2699	76	4.2/0.9	Very good/ Good	**FEATURES:** Rated 8 ppm on both monochrome and color. Standard 32MB of RAM, 600-by-600-dpi maximum resolution, 500 sheets input, 250 output. **SUMMARY:** Using an array of LEDs instead of a laser, the Infoprint Color 8 produces clean, sharp text and detailed color graphics, though its text-printing speed is the slowest here.	–
10	HP Color LaserJet 4500 DN 800/752-0900 www.hp.com	$3799	74	8.1/1.6	Good/ Very good	**FEATURES:** Rated 16 ppm monochrome/4 ppm color. Standard 64MB of RAM, 2400-by-2400-dpi maximum resolution, 400 sheets input, 250 output. **SUMMARY:** HP's laser zipped out text and graphics and ranks second in color speed. It produces rich color and comes with a built-in duplexer that allows you to print on both sides of the page.	669

Best Buy

All products: 906

TEST PC WORLD CENTER **HOW WE TEST** The overall rating is based on print quality (25 percent), price (25 percent), features (15 percent), speed (10 percent), service and support (10 percent), and ease of use (15 percent). For all ratings, higher is better. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

[1] All street prices include a network card.

LEAPIN' LASERS! When we set out to discover the state of the art in office-ready color printers, we were inundated with new models. This flood of products prompted us to launch our Top 10 color laser chart this month, covering printers from the plain and inexpensive to the sophisticated and costly.

Eight of the 15 printers we tested are new: Five print standard-size color documents, and three are tabloid (11-by-17-inch) mod-

els. Three new models—from IBM, Mita, and QMS—made the chart. We also retested seven printers from previous months on our new ethernet network.

LEADING LASERS

THE CAPABILITIES of standard printers—even those from the same vendor—tend to overlap. QMS Magicolor 2+ CXE, which just missed the chart, prints the same attractive text and detailed, colorful graphics as sibling Best Buy Magicolor 2 DeskLaser. Both operate similarly, but the 2+ CXE offers a bit more speed and memory, plus extras like watermarks and color separations. The 2+ CXE's 8.6-ppm text printing is 10 percent faster, but its $1869 price is a whopping 70 percent higher. The DeskLaser's impressive print quality and performance for a low $1104 price make it our top pick. But if you need extra features, the 2+ CXE is still a good deal.

NEC's new SuperScript 4600N (not on the chart) and the sixth-ranked 4400N are also close relations. Both offer solid quality and similar speeds—1.2 ppm on graphics and about 9 ppm on text—but the 4600N costs $500 more. If you need more features and a faster processor, the 4600N may be worth the higher price.

Another chart newcomer, Mita's seventh-ranked Ci1100, impressed us with its sharp text, broad array of features, and reasonable $2718 price. Text speed, however, lagged at 7 ppm, and the printer's weak documentation and baffling control panel unfortunately may take the fun out of using it.

Oki Data's OkiColor 8n and IBM's Infoprint Color 8—essentially identical printers in different packages—use an array of LEDs instead of the laser found in most color page printers. Oki Data has perfected the technology, and these two models produce admirable text quality and detailed, if average, color on graphics. They're very slow on text, however. With a PostScript driver, the IBM turns out only 4.2 ppm, and the OkiColor with a PCL driver prints at 4.7 ppm. The main difference (beyond a few features) is price: The $2699 IBM lands in ninth place, while the $3795 OkiColor misses the chart altogether. (For more information about these two products, see www.pcworld.com/jan00/np_lasers.)

EXTRA LARGE

THREE OF our new models print tabloid-size pages—great for multiple-page layouts or spreadsheets. QMS's $3399 Magicolor 6100N debuts in fifth place, offering crisp text printing and detailed, if pale, graphics. It's quick too—8.3 ppm on text and 1 ppm on graphics—and it's easy to set up and maintain. QMS throws in an excellent maintenance video to help you.

Other tabloid contenders included the hefty $4995 Tektronix Phaser 780/N, which weighs in at over 150 pounds, and the enormous $6799 Hewlett-Packard Color LaserJet 8500N, which comes with its own wheeled cart. Both models offer a wealth of features, but neither made the chart—the Tek held back by slow text-printing (3.3 ppm), and the HP handicapped by weak print quality and the lack of toll-free support despite its high price.

NEAR-PERFECT BLACK TEXT and tabloid-size printing land the new $3399 QMS Magicolor 6100N in fifth place.

REFRESHER COURSE

AS WE'VE SEEN on black-and-white models, all color lasers that we retested performed slower on text and faster on graphics this time around. Lexmark's Optra Color 1200N, a $5999 tabloid-size printer, whipped out graphics at 2.1 (letter-size) pages per minute in our new tests—almost twice as fast as any other model here. It debuts in eighth place.

Lexmark's $1713Optra SC 1275 also fared well in our retests and earns a Best Buy. This low-cost unit is easy to use, fast, and has extensive features. The Xerox DocuPrint NC60 climbs onto the chart in third place after a $700 price cut to $1995. NEC makes the chart with two older models, the $2100 SuperScript 4200N, at number four, and the sixth-ranked SuperScript 4400N, priced at $2499. HP's $3799 Color LaserJet 4500 DN includes a duplexer for double-sided printing and rounds out the list in tenth place.

For more-detailed information, including estimated operating costs for all the color printers we tested this month, visit www.pcworld.com/mar00/color_lasers.

—Dan Littman ■

PRINT QUALITY SAMPLES

Lexmark, QMS Lead With Smooth Graphics

HP LASERJET 8500N

We expected a lot more from this Hewlett-Packard laser: We saw text drop out at small sizes, monochrome graphics with no grays, and blurry color images.

LEXMARK OPTRA SC 1275

This Lexmark produces readable if somewhat thick text, and grays with smooth transitions and great range. Color graphics could be more subtle but are still pleasing.

QMS MAGICOLOR 2 DESKLASER

This chart-topping QMS prints sharp, even characters in most point sizes. Gray-scale and color graphics appear smooth, rich, and true to life.

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PC WORLD

TOP 10 SCANNERS

	SOHO SCANNER	Street price (12/27/99)	Overall rating	Scan quality	Scan speed—B&W at 300 dpi/color at 600 dpi (seconds per page)	Comments	Product info number
1	Epson Perfection 1200U 800/463-7766 www.epson.com	$249	99	Very good	9/67	**FEATURES:** USB, 1200 by 2400 dpi, 11.3-by-16.8-by-3.5-inch case,[1] 9.9 pounds, 8.5-by-11.7-inch scanning area, optional transparency adapter. **SUMMARY:** Outstanding resolution, fast performance, and superb scans make the Perfection 1200U our top pick. For $50 more, you can buy a slightly faster SCSI version.	–
2	Epson Perfection 636U 800/463-7766 www.epson.com	$199	99	Very good	12/74	**FEATURES:** USB, 600 by 2400 dpi, 11.3-by-16.8-by-3.5-inch case,[1] 9.9 pounds, 8.5-by-11.7-inch scanning area, optional transparency adapter. **SUMMARY:** First-rate features and performance plus easy USB installation and lifetime tech support make this model a close runner-up to its sibling, the Epson Perfection 1200U.	–
3	Microtek ScanMaker V6UPL (NEW) 800/654-4160 www.microtekusa.com	$149	96	Very good	19/80	**FEATURES:** Parallel and USB,[2] 600 by 1200 dpi, 11.8-by-21.5-by-3.2-inch case,[1] 8.8 pounds, 8.5-by-14-inch scanning area, includes 35mm transparency adapter. **SUMMARY:** First legal-size scanner on SOHO chart. Newcomer serves up high-quality scans; transparency adapter handles reflective and 35mm slides.	670
4	Microtek SlimScan C6 800/654-4160 www.microtekusa.com	$90	90	Very good	36/81	**FEATURES:** USB, 600 by 1200 dpi, 10.4-by-16.4-by-1.7-inch case,[1] 7.7 pounds, 8.5-by-11.7-inch scanning area, no transparency adapter available. **SUMMARY:** This low-cost, lightweight unit is the only non-CCD scanner on the chart. Great software and good support hours make it a top choice for home users.	671
5	Umax Astra 2200 800/562-0311 www.umax.com	$199	89	Good	26/99	**FEATURES:** SCSI and USB,[2] 600 by 1200 dpi, 12.2-by-18.4-by-3.9-inch case,[1] 8.5 pounds, 8.5-by-11.7-inch scanning area, includes transparency adapter. **SUMMARY:** This former third-place unit boasts a $50 drop and great software for building Web sites, but a dip in live tech-support hours pulls it down to fifth place.	672
6	HP ScanJet 5200Cse [3] 800/722-6538 www.scanjet.com	$299	87	Very good	24/80	**FEATURES:** Parallel and USB,[2] 600 by 1200 dpi, 12-by-19.1-by-4.9-inch case,[1] 12.5 pounds, 8.5-by-11.7-inch scanning area, optional 35mm slide adapter. **SUMMARY:** This versatile but pricey model features admirable scan quality; it comes bundled with a Caere and Adobe software package and is easy to use.	673
7	AcerScan Prisa 620UT 800/379-2237 www.acerperipherals.com	$149	87	Good	27/112	**FEATURES:** USB, 600 by 1200 dpi, 12-by-18-by-4-inch case,[1] 9.5 pounds. 8.5-by-11.7-inch scanning area, includes transparency adapter. **SUMMARY:** This all-purpose device works particularly well with transparent and reflective materials but runs especially slow when scanning color images.	674
	CORPORATE SCANNER						
1	Umax Astra 2400S 800/562-0311 www.umax.com	$299	96	Good	12/67	**FEATURES:** SCSI, 600 by 2400 dpi, 13.2-by-23.3-by-5.9-inch case,[1] 14.6 pounds, 8.5-by-14-inch scanning area, optional transparency adapter. **SUMMARY:** Fast performance and outstanding support earn this legal-size unit a Best Buy. The Astra 2400's scan quality, software, and price are other strong points.	675
2	Canon CanoScan FB 1200S 800/652-2666 www.ccsi.canon.com	$299	94	Very good	20/74	**FEATURES:** SCSI, 1200 by 1200 dpi, 11.5-by-18.1-by-3.7-inch case,[1] 8.8 pounds, 8.5-by-11.7-inch scanning area, optional transparency adapter and an automatic document feeder. **SUMMARY:** Although this competitively priced corporate model offers high resolution, great color, and good detail, it runs a tad slow.	676
3	HP ScanJet 6350C 800/722-6538 www.scanjet.com	$499	94	Very good	13/76	**FEATURES:** SCSI and USB,[2] 1200 by 2400 dpi, 12.3-by-19.6-by-7.6-inch case,[1] 15.8 pounds, 8.5-by-11.7-inch scanning area, includes transparency adapter and ADF. **SUMMARY:** A great choice for OCR, this speedy unit includes an automatic document feeder, handles 35mm slides, and produces top-quality scans.	677

Best Buy For expanded reviews of this month's scanners, visit www.pcworld.com/mar00/t10scanners. All products: 907

HOW WE TEST All scanners are tested with default settings under Windows 98 on a Dell Dimension V333 (Pentium II-333) PC with 64MB of RAM, using each scanner's bundled software. Overall score is based on scanned image quality (28 percent), scanning speed (25 percent), ease of use (17 percent), features (15 percent), support (10 percent), and price (5 percent). Speed tests are timed from the start of scanning until cursor control is regained. Data based on tests designed and conducted by the PC World Test Center.

[1] Dimensions are listed in the following order: width, depth, and height. [2] Scanner was tested with USB interface. [3] The HP ScanJet 5300c replaced this unit in February 2000.

UNTIL RECENTLY, only our corporate chart featured models with legal-size or high-resolution scanning. This month Microtek introduces the ScanMaker V6UPL, the first legal-size scanner to appear on our SOHO chart that costs far less than its corporate counterpart. Epson's 1200U, which debuted in January as the first 1200 by 2400 scanner on our SOHO Top 10, continues to dominate this category with its high-performance scanning. ■

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TOP 10 GRAPHICS BOARDS

	AGP BOARD	Month tested	Street price (1/5/00)	Overall rating	Mixed-media business rating	3D rating	Features rating	Comments	Product info number
1	Creative Labs 3D Blaster RIVA TNT2 Ultra 800/998-1000 www.creative.com	Feb 00	$179	92	Excellent	Very good	Good	**FEATURES:** 2X AGP, NVidia RIVA TNT2 Ultra chip, 32MB of SDRAM, 300-MHz RAMDAC, video-out, bundled E-Color Colorific and 3Deep color calibration tools. **SUMMARY:** Great speed, impressive image quality make it ideal for games and office apps.	651
2	Guillemot Maxi Gamer Xentor 32 877/484-5536 www.guillemot.com	Feb 00	$200	90	Very good	Excellent	Good	**FEATURES:** 2X AGP, NVidia RIVA TNT2 Ultra chip, 32MB of SDRAM, 300-MHz RAMDAC, video-out, bundled 3D games—Interplay's Kingpin and UbiSoft's Speed Busters. **SUMMARY:** This speedy board's an excellent upgrade option for gaming enthusiasts.	652
3	Diamond Viper II 800/468-5846 www.s3.com	(NEW)	$199	90	Very good	Excellent	Fair	**FEATURES:** 4X AGP, S3 Savage 2000 chip, 32MB of SDRAM, 350-MHz RAMDAC, video-out, bundled 3D game—Acclaim's TrickStyle. **SUMMARY:** Terrific choice for devotees of Quake 3, where it ripped to a blistering 78 frames per second in 32-bit mode.	653
4	ELSA Erazor III Pro 800/272-3572 www.elsa.com	Feb 00	$169	89	Excellent	Good	Fair	**FEATURES:** 4X AGP, NVidia RIVA TNT2 Pro chip, 32MB of SGRAM, 300-MHz RAMDAC, bundled ELSA MainActor video-editing tool. **SUMMARY:** Attractive option for business graphics and gaming thanks to its solid performance, reasonable price.	654
5	Matrox Millennium G400 32MB 800/361-1408 www.matrox.com/mga	Feb 00	$199	89	Excellent	Fair	Very good	**FEATURES:** 4X AGP, Matrox G400 chip, 32MB of SGRAM, 300-MHz RAMDAC, video-out, two VGA ports, bundled Micrografx Picture Publisher and Simply 3D, plus Rage Software's Expendable. **SUMMARY:** A fine pick for dual-monitor support.	655
6	Creative Labs 3D Blaster Annihilator 800/998-1000 www.creative.com	Feb 00	$250	89	Excellent	Excellent	Fair	**FEATURES:** 4X AGP, NVidia GeForce 256 chip, 32MB of SDRAM, 350-MHz RAMDAC, bundled E-Color Colorific and 3Deep color calibration tools. **SUMMARY:** An expensive upgrade (due to latest NVidia processor), but great for hardcore Quake 3 fans.	656
7	Diamond Stealth III S540 Xtreme 800/468-5846 www.s3.com	Feb 00	$129	88	Good	Good	Fair	**FEATURES:** 4X AGP, S3 Savage4 Xtreme chip, 32MB of SDRAM, 300-MHz RAMDAC, bundled PowerPoint plug-in from CrystalGraphics. **SUMMARY:** This board offers a viable solution for any budget-conscious graphics shopper.	657
	PCI BOARD								
1	ATI Xpert 128 905/882-2600 www.ati.com	(NEW)	$99	92	Very good	Good	Excellent	**FEATURES:** ATI Rage 128GL chip, 16MB of SDRAM, 250-MHz RAMDAC, built-in hardware MPEG decoder, bundled PowerPoint plug-in from CrystalGraphics and 3D games. **SUMMARY:** A good buy thanks to solid all-around performance.	658
2	ELSA Erazor II 800/272-3572 www.elsa.com	retested this month	$89	88	Excellent	Very good	Good	**FEATURES:** NVidia RIVA TNT chip, 16MB of SDRAM, 250-MHz RAMDAC, no bundled applications. **SUMMARY:** Lowest-priced board on the chart performs well in day-to-day graphics tasks. Occasional 3D gamers should be satisfied as well.	659
3	3dfx Voodoo3 3000 800/234-4334 www.3dfx.com	(NEW)	$150	87	Excellent	Very good	Fair	**FEATURES:** 3dfx Voodoo3 chip, 16MB of SDRAM, 350-MHz RAMDAC, bundled 3D games—GT Interactive's Need for Speed III and Unreal. **SUMMARY:** Speedy in office applications and 3D games, but pricier than its competition.	660

Best Buy For reviews of other new graphics boards that we tested this month, visit www.pcworld.com/t10graphics. All products: 905

TEST PC WORLD CENTER **HOW WE TEST** We test boards under Windows 98. Business tests include PC WorldBench 98. Our 3D-gaming score is based on four games, each evaluated on frame rate and image quality. We test AGP boards in a Dell Dimension XPS T600 with a PIII-600 and 128MB of RAM. We test PCI boards in a Micron Millennia Mme PC with a Pentium MMX-233 and 32MB of RAM. Overall rating is based on performance (AGP 42.5 percent, PCI 45 percent), features (AGP 27.5 percent, PCI 25 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.

NVIDIA-BASED BOARDS continue to dominate the top of the AGP chart, led by Creative Labs' quick 3D Blaster RIVA TNT2 Ultra. But the new Diamond Viper II, sporting S3's latest Savage 2000 chip set, delivers breakneck speed at a moderate price. On the PCI chart, ATI takes the lead with its inexpensive, high-quality Xpert 128. Though pricey for a PCI board, consider 3dfx's new Voodoo3 3000 for better 3D-gaming performance. ■

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HERE'S HOW

WINDOWS TIPS SCOTT DUNN

Discover Hidden Windows Tools

WHEN YOU LOOK at the sheer number of applications that Windows installs under your Accessories menu and its submenus, you may think you're seeing all the Windows utilities installed on your system. Not so. In addition to the items listed on those menus, more than a dozen other installed applications don't show up on any menu. Some of them are diagnostic tools you may never use, but others are nifty for common tasks such as browsing through files or checking system information. You can launch some of these utilities from within other applications such as Microsoft Office, but why open one app just to launch another? Here's how to make utilities appear on a handy menu, plus a list of useful tools.

Create a menu. First, set up your new menu: Right-click the *Start* button and choose *Open* or *Explore*. To create a Tools menu that's most accessible, right-click an empty area of the Start Menu folder and choose *New•Folder*. Type a name for your menu, such as **Tools**, and press **<Enter>**. If you don't think you'll need the items in this menu very often, create the folder deeper within the Start Menu hierarchy, in the Start Menu\Programs folder, for example. Next, double-click *My Computer*, navigate to the Windows folder (or in some cases the Windows\System folder), and find the .exe file for the application you want to add to your menu (we list a few of these utilities below). Using the right mouse button, drag the .exe files to your new Tools folder and choose *Create Shortcut(s) Here*.

Some useful tools. Microsoft Office 2000 comes with a number of utilities, but only a couple seem worthy enough to have their own menu item. One of them is System Information (C:\Program Files\Common Files\Microsoft Shared\Msinfo\msinfo32.exe). Windows 98 users already have a version of this utility they can launch from the Start menu (see below), but the Office version is great for Windows 95 users. In addition to providing helpful system information, it includes a Tools•Windows menu that lets you launch other utilities, some of which already appear on the Start menu. (To locate the others, follow the instructions below.) Another handy tool is Clip Art Gallery (C:\Program Files\Common Files\MicrosoftShared\Artgalry\cag.exe), which lets you browse multimedia files.

Windows 98 provides the largest collection of hidden tools for your new menu. You can launch most of them by choosing *Start•Programs•Accessories•System Tools•System Information* and then selecting from that program's Tools menu (see **FIGURE 1**). If you're wondering what all these utilities do or you just want convenient access to the help facility for each tool, right-click into an empty area of your new menu folder and choose *New•Shortcut*, type **c:\windows\help\msinfo32.chm** for the command line (your path may differ), and click *Next*. Then type a name for the short-

ILLUSTRATION: HARRY CAMPBELL

HIDDEN UTILITY	.exe file	Windows 98 folder and subfolders	Windows 2000 folder
Automatic Skip Driver Agent	asd	Windows	n/a
DirectX Diagnostic Tool	dxdiag	System	System32
Dr. Watson	drwatson	Windows	System32
Registry Checker	scanregw	Windows	n/a
Signature Verification Tool	sigverif	Windows	System32
System Configuration Utility	msconfig	Windows	n/a
System File Checker	sfc	System	n/a
Update Wizard Uninstall	upwizun	Windows	Winnt
Version Conflict Manager	vcmui	Windows	n/a
Windows Report Tool	winrep	Windows	Winnt

n/a = not applicable

FIGURE 1: HIDDEN UTILITIES LURK on your hard drive, but you can add them to the Start menu for instant launching—here's where to find them.

cut (such as **Tools Help**), and click *Finish*.

The only utility this help file doesn't include is the DirectX Diagnostic Tool. For help here, you can use the same process to make a shortcut to its help file, but use **c:\windows\help\dxdiag.chm** or **c:\windows\help\dxdiag.help** for the command line.

Windows 2000 has fewer hidden nonadministrative tools than Windows 98 (see Figure 1 for a list) and no all-in-one help file. Fortunately, most of the available tools have their own Help buttons or on-screen explanations.

All versions of Windows have a few hidden tools in common: The Registry Editor (regedit.exe in the Windows folder) is a tool for advanced users to modify specific Windows settings. The System Configuration Editor (sysedit.exe in the Windows\System folder) is an editor for modifying config.sys, autoexec.bat, win.ini, system.ini, and other settings files. Task Manager is a floating task-switching utility with several customization options (taskman.exe in the Windows folder, or taskmgr.exe in Windows 2000's Windows\System32 or Windows NT's WINNT\System32 folder).

QUICK FIX FOR BLOATED TOOLBARS

THE TOOLBARS THAT come with Windows Explorer and Internet Explorer 4 or later can be powerful time-savers. But they can also get in your way when you're trying to see the greatest number of files or get the biggest view of a Web page. If you've already customized your system to add and remove the toolbars and buttons you don't need, your only apparent choice is to turn off toolbars one at a time when they're in the way and turn them back on later. What a pain.

But not so fast. If you just want to get toolbars out of the way quickly and restore them later, you do have other options. The first is to press **<F11>** to use Explorer's full-screen mode. This not only gives you the biggest view possible, it also collapses the tools and menu into a single bar. If the menu bar is not present, right-click on the toolbar and select it from the drop-down list. Press **<F11>** again to return to normal view.

Another quick fix for screen real-estate problems is simply to position the pointer on the bottom edge of the bottom toolbar (the boundary between the bar and the file list or Web page) and then drag up or down. Dragging up collapses the bars to the smallest number of items possible, while dragging down restores a more expansive view (see **FIGURE 2**).

This technique won't display any toolbars that are turned off in the View•Toolbars menu; it will only condense or stretch. However, it will turn text labels on and off for the Standard Buttons toolbar. You'll have to drag up to turn the labels off, and drag down to redisplay them.

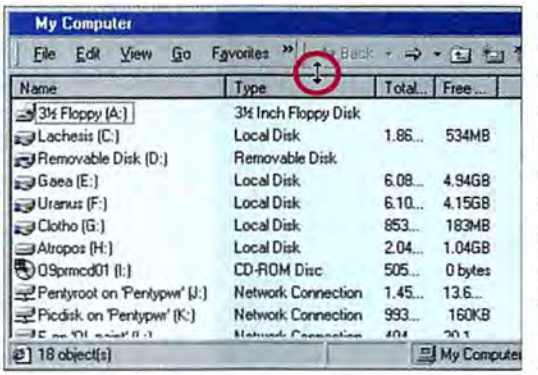

FIGURE 2: GIVE EXPLORER WINDOWS more space—drag the double-arrow cursor to resize the toolbars.

If you have Windows 2000 or a version of Windows with Internet Explorer 5, you can prevent the text labels from being affected: In Windows 2000, just right-click the toolbar and choose *Customize*. From the 'Text options' drop-down list, choose *Selective text on right* and click *Close*. In the future, dragging the toolbar edge won't affect text labels.

Other versions of Windows don't let you customize the Explorer toolbar directly; but you can fix that by making the corresponding adjustment in the Internet Explorer 5 browser. In Windows 9*x*, display a Web page in Explorer—just type a Web address into the Address bar, even if you're using the Windows Explorer file manager. Right-click the *Standard Buttons* toolbar (the one that contains the Forward, Back, Stop, and Refresh buttons) and ▶

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DON'T MISS ADDITIONAL HERE'S HOW information at **www.pcworld.com/heres_how**.

choose *Customize*. From the 'Text options' drop-down list, choose *Selective text on right* and click *Close*. Then you can go back to viewing whatever files or Web page you prefer. The next time you drag the toolbar up or down to resize it, the text labels will remain unaffected.

ALWAYS ON MY FIND

IS THERE A WAY to modify the contents of my Find menu under the Start menu?

Jared Miller, Melbourne, Florida

THE START menu in a standard version of Windows has several submenus—Documents, Settings, and Find—that you can't customize. If you download Microsoft's free Power Toys utility, however, you can get around this limitation.

Add FindX to your bag of tricks. The FindX Power Toy creates a Find folder in your Start Menu folder; almost anything you put inside will appear on your Find menu when you choose *Start•Find*. You can add shortcuts to files, folders, applications, or Web sites. Although Microsoft never supported this utility and has not updated it for Windows 98, I've had no problem using it in any 9*x* version. Unfortunately, it does not work in Windows 2000.

You can download FindX or the entire Power Toys collection from FileWorld or from Microsoft's Web site at www.microsoft.com/Windows95/downloads/contents/WUToys/W95PwrToysSet/Default.asp. After downloading, create an empty directory and move W95powertoy.exe into it. Double-click the directory to decompress the contents.

To install just the FindX utility (and not any of the others), simply right-click *Findx.inf*, choose *Install*, and follow the on-screen prompts. FindX creates a hidden folder named Find within the Windows\Start Menu folder. Any item you add to this new folder will appear on your Find menu. The tips below will work only if you have already loaded FindX.

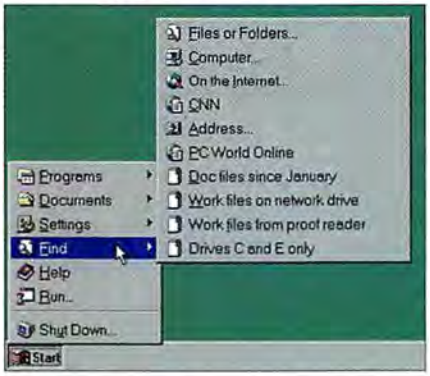

FIGURE 3: CUSTOMIZE your Find menu with FindX, a free Microsoft Power Toys utility.

Save your searches. For tight organization, keep the contents of this menu related to the Find command. For example, you might use this folder as a repository for storing saved searches. This strategy eliminates the trouble of entering some commonly used information, such as filling the 'Look in' box.

To implement this solution, choose *Start•Find•Files or Folders*. Enter the information you'll want to reuse, typing **e:\doc** in the 'Look in' box, for example. Then click *Find Now*. If you want to save the findings along with the other information already entered, choose *Options•Save Results*. Then choose *File•Save Search*. When the saved search icon appears on the desktop, rename it to something useful, such as **Document Searches**, and move it to the Find folder in the Start Menu folder.

Put search links in the Find menu. The Find menu is also a convenient place to store links to your favorite Web search engines. To take advantage of this tip, open the Find folder in the Start Menu folder. Right-click in an empty area, choose *New•Shortcut*, and type the URL of your favorite Web search engine (such as www.yahoo.com or www.infoseek.com).

Create Find menu shortcuts. For expeditious keyboard access to items on your Find menu, add an ampersand (&) to the beginning of the shortcut's name. The letter immediately following the ampersand will appear underlined in the menu, which means that it is available for use as a keyboard shortcut. For example, if you create a Web shortcut and name it **&PC World Online**, it will appear as 'PC World Online' in the menu (see **FIGURE 3**). To access the shortcut, simply press **<Ctrl>-<Esc>**, type **F**, then **P** (the first key combination opens the Start menu, the *F* opens the Find menu, and the *P* starts your shortcut).

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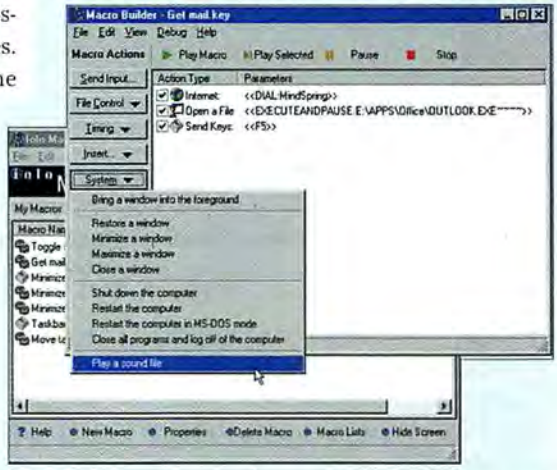
WINDOWS TOOLBOX

Experience the Magic of Macros

EVER SINCE MICROSOFT dumped Windows Recorder from the mix of utilities included with Windows 95 and later, I've been looking for an adequate macro-recorder replacement. The stand-in, Macro Magic from Iolo Technologies, isn't merely adequate—it's fabulous. You can create macros by recording your actions or choosing from an easy-to-use set of building blocks. Then launch the macros via keyboard shortcuts, icons, or certain actions—such as typing a particular word or opening a specified window. And if you're fresh out of ideas about how a macro utility could automate your repetitive tasks, just check out the tutorial on the Iolo Web site. Macro Magic carries a $40 registration fee. Download the utility from FileWorld or from developer Iolo at www.iolo.com.



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As co-founder of the company that originally developed and marketed ACT!, Pat Sullivan created the contact management category. Today he's creating a whole new way of selling as President/CEO of SalesLogix Corp., the world's fastest-growing front office and e-commerce software company – and the new publisher of ACT!

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YOUR QUESTIONS ON: Freeze-free boots • Resetting internal modems

Share Your Computer, but Keep It Private

I SHARE my PC with two people but don't want them to access my programs and files. How can I lock them out of selected parts of my system?

Name withheld at reader's request

BECAUSE WINDOWS 9*x* is almost completely lacking in security features, I recommend that you go the shareware route to keep prying eyes out of your files. (If you use Windows NT 4.0 or Linux, your security has been better thought out, and you won't have to search for the right shareware to find peace of mind.)

If your only concern is keeping others away from your files, try MegaShock Software's Stealth. You can download the demo version from www.fileworld.com or www.megashock.net/stealth/info.htm. (The full working version costs $20.) Stealth creates a virtual drive on your real hard drive that disappears when Stealth isn't running. But launch Stealth and type in your password, and there it is—with all the files you've created on it or moved to it. By the time you read this, a new version may properly encrypt your data.

For a more comprehensive security tool, try SIHS's Safelock. Again there's a free download, from http://sihs.bizland.com or www.fileworld.com. And though this tool's $36 registration takes a bigger bite than Stealth, you get much more. Safelock (see **FIGURE 1**) lets you keep would-be snoops from files, folders, programs, and sensitive Control Panel settings. You can prevent other users from changing the wallpaper, adding to the desktop, or exiting to DOS (although they can always reach DOS by rebooting). As with Stealth, you can access items you've protected only when Safelock is running, and you can't launch Safelock without the password. One drawback remains: Safelock hides your files, but it doesn't encrypt them; determined hackers can still ferret out what they're looking for.

NO MORE FREEZES AT BOOT-UP

WHEN I TURN on my PC, Windows freezes more often than not. I usually have to reboot five or six times before I can get to work. What's going on?

Eric Galley, Ottawa, Ontario

EACH PC has a different configuration, so I can't say for sure. Try these suggestions:

Start by booting Windows in Logged mode. This will let you create a text file of the entire boot process, so you can see where it fails. First, bring up the boot menu. In Windows 95, watch the screen as you start up the computer, and press the **<F8>** key as soon as you see the words 'Starting Windows 95'. In Windows 98, hold down the **<Ctrl>** key from the beginning of the boot process until the menu comes up. At the menu, select the option for Logged (\BOOTLOGTXT), and continue with the boot.

Of course, Windows may boot flawlessly in this instance. Keep at it every time you boot until one of the boots fails. After your system has crashed, reboot again without logging. To read the log, select *Start•Run*, type **c:\bootlog.txt**, and press **<Enter>**. If your system is in such bad shape you can't get into Windows, you can read the log from the DOS prompt by typing **c:\windows\command\edit c:\bootlog.txt** and pressing **<Enter>**.

You'll find a long file, but don't worry. Just go to the end—whatever is causing the problem will be in the last few lines. The line that says 'LoadFail' or 'failure' will tell you what file is the culprit.

If the troublemaker is an irksome DLL, you can try reinstalling Windows or the application that the DLL comes from (you can reinstall these over the current installation without wiping out your configuration). If the problem is a hardware driver, you might try uninstalling and then rein-

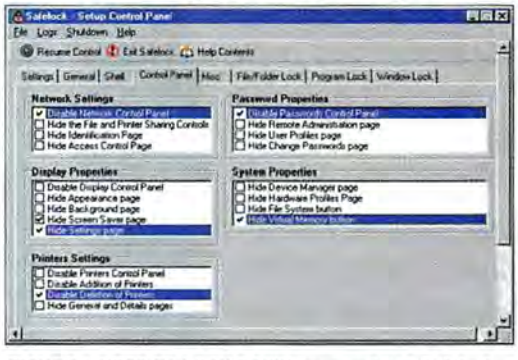

FIGURE 1: NEED TO LOCK DOWN your system? Safelock lets you control what other users can and cannot access.

Restore Outlook Express Choice

WHEN YOU double-click a file attachment in Outlook Express, do you want to be asked if the file should be opened or saved? With some file types, such as Microsoft Word, the file just gets saved. To avoid that default, select *View•Options* (or *View•Folder Options*) in any Windows Explorer folder. Click the *File Types* tab. Select the appropriate file type—Microsoft Word Document, for example. Click *Edit*. In the Edit File Type dialog box, check *Confirm Open After Download*, and then click *OK* twice.

stalling the hardware, or getting an updated driver, or replacing the possibly defective peripheral. In the worst case, you may need to leave the troublesome device or program uninstalled until such time as its maker devises a solution.

RESET AN INTERNAL MODEM

I OFTEN get a 'modem not responding' message when I try to go online. I could turn an external modem off and on, but with an internal one, I have to reboot the computer. Is there a quicker way?

Norman R. Kay, Tucson, Arizona

THERE MIGHT BE. First, try breaking the connection. Reach behind the computer, unplug the modem's phone jack, wait a couple of seconds, and plug it back in. You can also try sending a reset command to your modem. You may be able to do this through the DOS prompt with a command like **echo atz>com1**; you'll almost certainly be able to do it with HyperTerminal, a program that comes with Windows. (HyperTerminal won't work if the problem is a mismatch between the modem's and PC's serial port speeds.) If HyperTerminal is already installed, you'll find it at *Start•Programs•Accessories•HyperTerminal* or *Start•Programs•Accessories•Communications•HyperTerminal*.

If you need to install HyperTerminal, insert the Windows CD-ROM. From *Start•Control Panel*, click *Add/Remove Programs*. Click the *Windows Setup* tab. Double-click *Communications*. Then check *HyperTerminal*, and click *OK* twice.

The next time your modem is unresponsive, open HyperTerminal as noted above, following the sequence for the version of Windows that you're running. In the resulting folder, double-click *Hypertrm*. If you get a Connection Description box, click *Cancel*.

Now try typing some commands. Start with **atz>com*n***, where ***n*** is the number of your modem's serial port address, such as com1 or com2. If that doesn't work, try **at&f1>com*n*** or **at&f>com*n***. After each command, press **<Enter>**, select *Call•Disconnect*, and try using your modem.

If none of these gambits work, grit your teeth, exit Windows, and reboot. Sometimes it's the only way.

FIND THOSE OUTLOOK FILES

I'VE FORMATTED my hard drive twice, and the biggest pain is reentering Outlook data. Where does Outlook keep my contacts, appointments, and other data so I can back it all up?

Bill Roth, Empire, Michigan

MICROSOFT OFFICE introduced both Outlook and the wonderful concept of My Documents, a single location for your data files, making them easier to back up and protect. Then Microsoft messed the whole thing up by not putting your Outlook data in My Documents. Outlook keeps your contacts, appointments, and e-mail in a file that's most likely called outlook.pst. What exactly it's called and where you can find it will depend on what version of Outlook you're using, what versions you've used in the past, whether you've ever used Microsoft Exchange, and whether you share or have shared your computer.

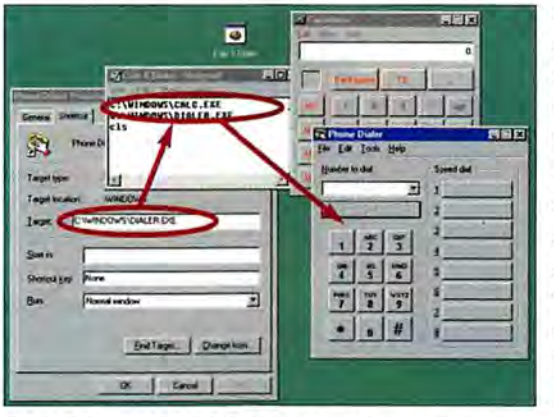

FIGURE 2: A SHORTCUT CAN launch only one program, but a batch file can launch two, as the above example shows.

No matter where the Outlook data is stored, the files you want will have the extension .pst, so you can find them by searching your hard drive. Select *Start•Find•Files or Folders*. For the Named field, enter ***.pst**. For 'Look in', select *Local hard drives*. Click *Find Now*.

Backing up data is no good unless you can restore it, and restoring a .pst file is tricky. After reinstalling Outlook, search for a .pst file as described in the previous paragraph. When you find it, copy the old .pst file from the backup over the new one on your hard drive, changing the name if necessary. Then launch Outlook. If you get a wordy message box starting with 'The location messages are delivered to...', click *Yes*. You'll find your old information ready to be used again.

If you use Outlook 2000, you may also want to save configuration info like mail rules and toolbar settings. For that, back up the files in your C:\Windows\Application Data\Microsoft\Outlook folder.

TWO PROGRAMS, ONE ICON

HOW CAN I double-click one icon and have it open several programs?

Nachie Guterman, Staten Island, New York

THERE ARE TWO WAYS to do this. You can use an old-fashioned DOS batch file instead of a shortcut (see **FIGURE 2**): First, launch Notepad by selecting *Start•Programs•Accessories•Notepad*.

In Notepad, enter the command to launch one program (such as notepad.exe), press **<Enter>**, then enter the command to launch another (say, calc.exe), and so on. If you aren't sure of a command name, right-click a shortcut for the program and select *Properties*. In the Properties dialog box, check the Shortcut tab's *Target* field; it will show the name you want. When you finish, enter **cls** on the very last line in Notepad. Do *not* press <Enter>. Select *File•Save*. In the Save As box, navigate to \Windows\Start Menu, the desktop, or wherever you want the icon. For 'Save as type', select *All Files (*.*)*. Give the file the extension **.bat**.

Or you can download Winx32, a free program by Don Beusee available at www.fileworld.com. Winx32 doesn't make the job any easier than it is with a batch file (you still have to create a script in Notepad), but it doesn't bring up a DOS box and doesn't need a command like cls.

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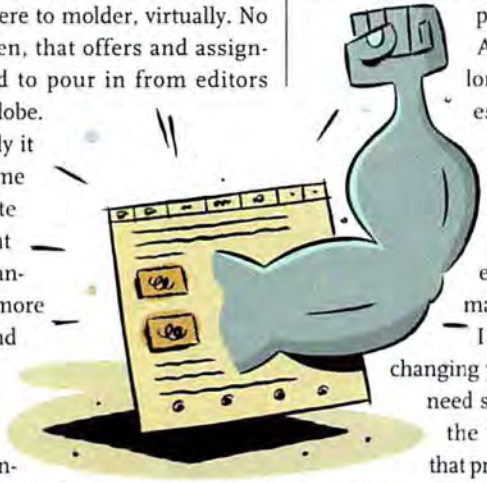
Clean up and redesign online ◆ Weave a winning Web site ◆ **Share your connection**

Whip Your Web Site Into Fine Fettle

THE LIST OF most-neglected species includes middle children, voter guides, and half-empty jars of imported capers. To that group you can now add the personal Web site. When I first created one a few years back, I was so proud of myself. Since I'm devoid of design skills, I just learned a little HTML, threw the thing together in a way that made sense to me, and left it there to molder, virtually. No surprise, then, that offers and assignments failed to pour in from editors around the globe.

But recently it occurred to me that if my site could present the Scott Spanbauer story more effectively and professionally, I might land a prestigious assignment from *Rolling Stone* or the *New Yorker*. I'd also had a couple of years to stare at the same old design—plenty of time to notice its shortcomings (for the pre-redesign site, see **FIGURE 1**). The three-column table of links was too cumbersome a gateway to the hundreds of *PC World* article links my site contains. Adding new links required inserting table rows, moving data between table cells, and doing other bits of HTML housework I dislike. The image map I used as a navigational device was sufficiently hard to update that I simply never did. And my photo was goofy. In short, I needed a redesign. By following some of the tips below, I ended up with a brighter, more professional-looking page (see **FIGURE 2** for the post-makeover me).



TIME FOR A REDESIGN?

PERHAPS YOUR site needs a refresh too. It's not a trivial decision: If your visitors are used to finding information in a certain way or place, reshaping the geography could put them off. And the job might take longer than you expect, especially if your site has grown over the years. On the other hand, if the new design makes the site easier to use, the pain may be worth enduring.

If you can't imagine changing your site's look or you need structural ideas, scout the Web. Look for sites that present information in a way that would make sense for you—and steal the design. If you can't figure out how a particular site works, choose *View•Source* in Internet Explorer, or *View•Page Source* in Navigator to see the HTML code that makes it tick.

The Web is also a great place to learn how *not* to design your site. If you're considering adding Web doodads, take a few minutes to revisit some of the garish, blinking, flashing sites that drive you crazy. More important, observe how frequently designers—both professional and amateur—let their enthusiasm get in the way of easy navigation. For the bottom line on what not to do, see Jakob Nielsen's "Top Ten Mistakes in Web Design" at www.useit.com/alertbox/9605.html.

LESS IS MORE

WEB SITES CAN contain lots of things—animated graphics, image maps, scripting, background images, background music, and color, color, color. But they don't have to. Your site's most important element is text; it should be as concise as possible and sensibly organized via HTML's headings, paragraphs, and lists. Put anything that interferes with your message on the to-be-jettisoned list.

Background colors and bit maps can ▶

FIGURE 1: SPOT THE AMATEUR. A personal Web page laden with gratuitous features is a turn-off.

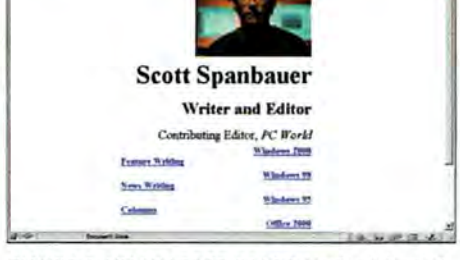


FIGURE 2: MY SHARPER IMAGE. Having trimmed the fat from my page, I appear more professional.

Defeat Dial-Tone Dilemmas

EVER DRAG YOUR laptop into the office, only to find that you can't access the Net? Office phone systems often change the dial tone from a steady drone to a stuttering beep to notify you of waiting messages—and unfortunately Windows' Dial-Up Networking can't handle this tone. Select *Start•Programs•Accessories•Communications•Dial-Up Networking*, right-click the connection icon you want to use, choose *Properties*, and click *Configure* and then the *Connection* tab. Uncheck *Wait for dial tone before dialing.*

ILLUSTRATIONS: HARRY CAMPBELL (LEFT); JEFFREY PELO (RIGHT)

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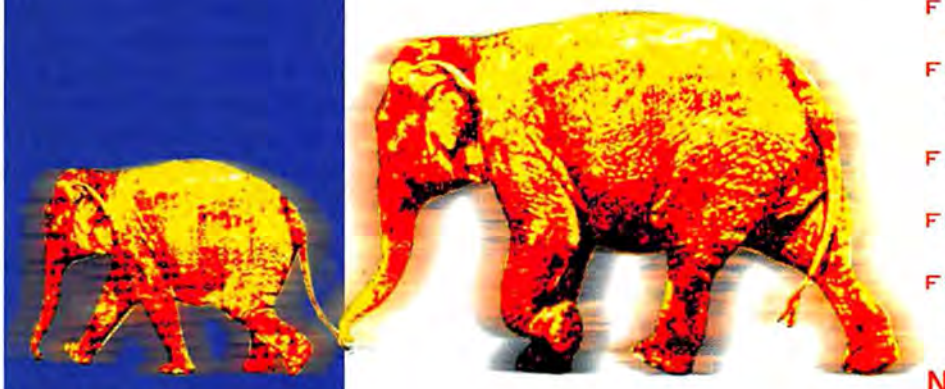

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make your page pretty, and they often improve on the default gray background that browsers display when a page does not specify a background color. White or light-colored text on a black or very dark background can be fairly readable as well, but for a really radical scheme, consider black text on a white background. It works for books, magazines, and newspapers, and it works on the Web too. But don't take my word for it—check out www.salon.com, www.nytimes.com, and www.pcworld.com for proof.

Text is your site's main ingredient, but images are the spice that gives the content flavor—the trick is not to add too much. Even a tiny graphic slows a page's load time, and the longer you make visitors wait, the greater the chance they'll hit the Back button and go elsewhere. As a rule of thumb, keep your pages under 50KB—some top sites, such as Yahoo's, are even smaller. For help slimming your JPEG images, visit the Online JPEG Wizard at www.jpegwizard.com.

WEAVING YOUR FIRST WEB SITE

HAVEN'T JUMPED aboard the runaway Web train yet? Not everyone needs a site, but if you maintain a private Internet account with an ISP such as AOL, MindSpring, or Prodigy, it probably permits you to post a Web site. And advertising your business isn't the only reason to publish a site—the Web is a good way to share photos or information with family and friends, or to share your expertise in a particular area with people around the world.

PUT YOUR WEB SITE'S IMAGES on a strict no-fat diet with the Online JPEG wizard.

Probably the easiest way to start is to launch the Web-authoring tool that comes with your browser. Netscape's Communicator includes Composer; choose *Start•Programs•Netscape Communicator•Netscape Composer* to run it. Starting with version 4.0, Internet Explorer includes Front Page Express. To launch it, choose *Start•Programs•Internet Explorer•Front Page Express* (*Start•Programs•Accessories•Internet Tools•FrontPage Express* with IE 5).

If Front Page Express isn't installed on your PC and you use Internet Explorer 4 as your Web browser, choose *Start•Settings•Control Panel*, double-click *Add/Remove Programs*, pick the *Windows Setup* tab, double-click the *Internet Tools* entry in the Components list, check *Microsoft FrontPage Express* in the resulting Components list, and click *OK* twice to start the installation. If your browser is IE 5, you can download FrontPage Express 2 from Microsoft's Windows Update site (windowsupdate.microsoft.com).

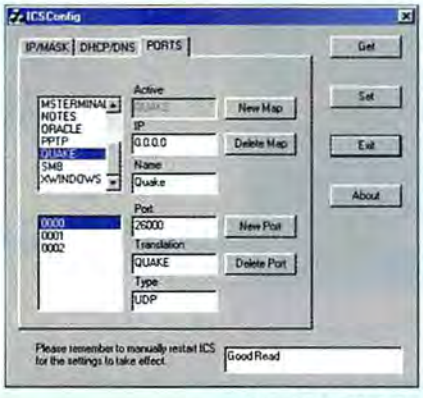
FrontPage Express doesn't come with a tutorial, but you can find a handy primer at the University of Sioux Falls' Web site (www.thecoo.edu/~iverson/fpetutorial/frontpage_express_tutorial.htm). Even though Composer's Help files are reasonably good, Montana State University's Composer tutorial (www.msubillings.edu/tool/tutorial) is better.

You can use these tools to get an uncomplicated site up and running quickly, but it pays to know the basics of HTML (short for Hypertext Markup Language). The authoring tools don't always do a perfect job of generating HTML, and they don't let you create every kind of HTML command, or tag. PageResource.com offers dozens of Web design tutorials, including beginning HTML guides, at www.pageresource.com/html/hclist.htm. Or go straight to the source: HTML 4.0 lead architect Dave Raggett's "Getting Started With HTML" at www.w3.org/MarkUp/Guide. For a more comprehensive reference work printed on paper, get Chuck Musciano's and Bill Kennedy's *HTML: The Definitive Guide, 3rd Edition* ($35, O'Reilly & Associates, 1998) or Ian S. Graham's *HTML 4.0 Sourcebook* ($35, John Wiley & Sons, 1998).

DOWNLOAD OF THE MONTH

ICSConfig v2.01

INTERNET CONNECTION SHARING is one of the few reasons to upgrade from Windows 98 to Windows 98 Second Edition. ICS lets all the PCs on your home or small-office network share one computer's connection to the Internet, saving you the cost and hassle of additional lines and modems or more costly routers. ICS is fairly easy to set up. Unfortunately, Microsoft forgot to endow ICS with any user interface for configuring its more advanced settings. For example, you might want to block Microsoft's file-sharing protocol over the shared connection to keep hackers away from your hard disks. And to discourage your employees, children, and spouse from gobbling up time and bandwidth, you might need to block the standard TCP/IP ports used by the game Quake.



Allan McCombs's free ICSConfig utility lets you do all this and more. You'll find the teeny-tiny 21KB download on McCombs's Web site at lynx.neu.edu/aamccombs or on FileWorld. If you're not a networking guru, though, you may have trouble with some of the settings. An included readme file offers basic instructions. For more help, check McCombs's site, which contains a link to a discussion board where the author and other users can give you a hand.

online

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Learn highlighting basics • Don't save, Save As • How to "load" bullets

Get Their Attention With Voice Attachments

SOMETIMES YOU NEED to say something striking in a document to get the reader's attention. Why not dictate a voice comment directly into what you are writing, so the reader will really prick up their ears? It's easy to do, as long as you have a microphone connected to your PC. Just remember to use voice comments sparingly, because sound objects can be quite large and will significantly increase the file size. For example, a 3.5-second voice comment will add about 75KB.

Word 97 and 2000: Start by positioning the cursor where you want the voice attachment to appear, then select *Insert•Object*. Go to the *Create New* tab in the Object dialog, select *Wave Sound* from the Object Type list (as shown in **FIGURE 1**), and click *OK*. When the Sound Object dialog box appears, click the red *Record* button and speak. When you're finished recording, click the *Stop* button. Then select *File•Exit* and *Return to Document*. At this point, you'll see a speaker icon for the sound attachment in the text at your curser position.

To play the sound, just double-click the speaker icon in the document. If you want to edit the sound or record over it entirely, right-click the speaker icon, select *Wave Sound Object•Edit*, then click the red *Record* button and make your changes.

WordPerfect 8 and 9: While WordPerfect offers an *Insert•Sound* command, there's an easier way to record a new .wav sound: First, position the cursor where you want your comment to appear in the text, then select *Insert•Object*. Next, select *Create New* in the Object dialog box, and select *Wave Sound* from the Object Type list. Then click *OK*. When the Sound Object dialog box appears, simply click the *Record* button and step up to the mike. Click the *Stop* button when you're finished recording. Then select *File•Exit* and *Return to Document*. A speaker icon will appear at the insertion point.

To play the sound, just double-click on the speaker icon, then click the *Play* button in the Sound Object dialog box. Close the dialog box when you're finished. If you want to edit or record over the sound entirely, right-click the speaker icon, then select *Wave Sound Object•Edit*, and repeat the recording process.

Note that in both Word and WordPerfect, the technique described above saves the .wav sound data in the document itself, making it truly portable.

THE LOWDOWN ON HIGHLIGHTING

WHETHER YOU WANT to call attention to a point in your document or tag sections of it for your own access, highlighting is an easy way to make your mark without altering the text. For many people, though, highlighting remains a mystery. Here are some tips to help end the confusion.

Word 95 through 2000:

• To highlight text, click the arrow next to the highlighting icon (the pencil with the color bar underneath it) on the formatting toolbar, and choose a highlighting color (see **FIGURE 2**). When you've chosen a color, your mouse pointer will turn into a felt pen symbol. Click and drag the felt pen over the text you'd like to highlight, then release the mouse button.

• To highlight a specific block of text quickly, use these shortcuts (instead of dragging the mouse pointer over the text): To highlight a word, double-click that word; for a sentence, **<Ctrl>**-click anywhere in the sentence; and for a paragraph, triple-click inside the paragraph.

• When you want to turn off the highlighting mouse pointer, click the highlighting icon once more, or press **<Esc>**.

• To remove highlighting from text, reselect the text using the highlighting mouse pointer. Or use the shortcuts described above to remove it in a single step.

WordPerfect 8 and 9:

• To highlight text, click the arrow next to the highlighting icon on the formatting toolbar and choose a color. Then click ▶

FIGURE 1: ATTENTION PLEASE! Add your voice to a document by inserting a .wav sound object.

Display Full Menus in Word 2000

WORD 2000's NEW personalized menus can be too smart for your own good. It's frustrating to select a main menu then not find the command you want. You can wait a few seconds for the full menu to appear, or click the expansion arrow, but who wants the hassle? An undocumented work-around: Double-click any main or submenu command to display the entire menu. For permanent fix, select *Tools•Customize*, then click the *Options* tab. Clear the *Menus Show recently used commands* checkbox, then click *Close*.

ILLUSTRATIONS: MARY CAMPBELL (TEXT); JEFFREY FELD (INSET)

FIGURE 2: CONTROL HIGHLIGHTING colors in Word (left) or WordPerfect (right) by clicking the arrow next to the highlighting icon, then the desired color.

the icon itself. The mouse pointer will turn into a felt pen symbol; click and drag the felt pen over the text to highlight it.

- To highlight a specific block of text quickly, use these shortcuts instead of dragging: To highlight a word, double-click that word; to highlight a sentence, triple-click inside the sentence; to highlight a paragraph, double-click in the left margin next to the paragraph, or quadruple-click inside the paragraph itself.
- To turn off the highlighting mouse pointer, click the highlighting icon again
- To remove highlighting from text, reselect the text using the highlighting mouse pointer, delete the Highlight codes in the Reveal Codes window, or simply repeat the shortcuts described above.

MAKE 'SAVE AS' THE DEFAULT

SINCE I OFTEN create new documents based on older ones, I sometimes run into a problem with saving. Several times I have accidentally overwritten the old document by selecting Save instead of Save As. Is there some way in Word to make Save As the default?

Julia I. Miller, Long Beach, California

THERE'S NO DIRECT way to do this, but you can eliminate the Save command under the File menu, which would have the same effect. This works in all versions of Word, from 97 through 2000. Select *Tools•Customize*, and a dialog box will open. You don't need to do anything in *this* box, but once it's open, you'll have the power to customize your menus. Now open the File menu, click the *Save* command, drag the command off the menu, and drop it on the document window. This will remove it from the File menu. If you really want to be sure that you won't accidentally save a file, you can also click and drag the Save icon off of the Standard toolbar (while the Tools•Customize dialog box is open). Any time you need to simply save a file, press **<Ctrl>-S**. The File Menu, though, will only offer the Save As command. You can also press **<F12>**, which is Word's default "Save as" key.

If sometime later you want to restore the Save command to the File menu, select *Tools•Customize*, and click the *Commands* tab. Then open the File menu, select *Save* from the list of commands in the dialog box and drag the *Save* command back onto the File menu.

CREATE SIDE-BY-SIDE BULLETED LISTS

I NEED TO CREATE two parallel bulleted lists, side-by-side on the page, but I can't find a way to do this in Word or WordPerfect. I'm sure there must be a way, but I can't find a solution in the programs' Help menus. Can you help?

William Meyer, Lincoln Park, New Jersey

SURE. This common need is easy to fill but takes a little creative thinking about using tables to arrange text on the page (as shown in **FIGURE 3**). Although it's almost impossible to align text reliably in columns, tables are great at creating these kinds of parallel text arrangements. Here are the basic steps required.

Word 95 through 2000: Position the cursor where you'd like the parallel lists to begin. Select *Table•Insert Table*, and in the Insert Table dialog box, set the Number of columns to 2 and the Number of rows to 1. Click *OK*. Next, click inside the left column, and click the *Bulleted List* icon in the main toolbar. Type the left list, or cut and paste an existing list into the cell. Repeat this process to create the right column.

To make the table gridlines invisible when printing, right-click in the table, then select *Borders and Shading* from the context menu. Select *None* in the Borders and Shading dialog box, then click *OK*. Although the borders and gridlines will appear light gray on your screen, the lines will not show up on your printout.

Note that Word allows you to adjust the width and position of the table's columns simply by clicking and dragging them from within the document.

WordPerfect 8 and 9: Start by positioning the cursor where you want the parallel lists to appear, then select *Insert•Table*. Next, in the Create Table dialog box, set the Columns to 2 and the Rows to 1, and click *Create*. Click inside the left column, and then click the *Bulleted List* icon on the main toolbar. Type the left list, or paste in an existing list. Then repeat this process to create the right-hand column.

If you want to make the table borders and gridlines disappear in the printout of your document, right-click in the table, then select *SpeedFormat* from the context menu. In the Table SpeedFormat dialog, select *No Lines No Border* from the Available Styles list, then click *Apply* and *Close*.

FIGURE 3: CREATE SIDE-BY-SIDE bulleted lists using a simple table. Format it to look like normal text in your printed document.

Note that you can adjust the width and position of the table's columns by clicking and dragging them inside the document.

Send word processing questions and tips to george_campbell@pcworld.com. We pay $50 for published items. George Campbell is a PC World *contributing editor. Visit his Web page at www.osomin.com.* ■

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Add Graphics to Your Page Header

EXCEL USERS frequently ask me "How can I insert my company's logo into the page header?" The simple answer: You can't. Despite thousands of user requests, Microsoft hasn't made this feature available. But there are a few ways to fake it.

Perhaps the simplest solution is to print your reports on company letterhead—paper that's preprinted with your logo. Another option is to use a custom font with a character that displays your logo. You can create this custom font using shareware or commercial font creation programs, or hire a professional to do the job. But even professionals will be limited to the use of simple line graphics.

Another way to display a graphic within a page header involves a bit of trickery. Excel lets you specify that one or more rows print at the top of every page (these are known as print titles). You can take advantage of this option and use a print title row to store your logo. **FIGURE 1** shows a graphic that will print at the top of each page. Note that the row height is adjusted to fit the image. Here are the basic steps.

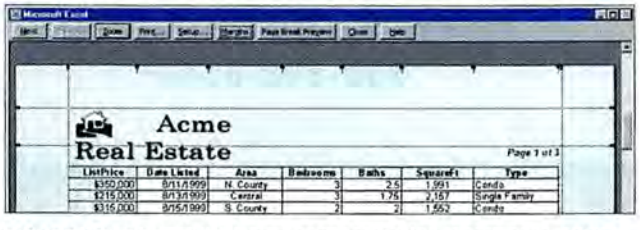

FIGURE 1: THE GRAPHIC in row 1 prints at the top of each page. Adjust the margin handles in the preview window to get a good-looking header.

First, specify the rows for the print titles. Choose *File•Page Setup* and click on the *Sheet* tab in the Page Setup dialog box. Our example uses the first two rows as the print titles, so that both the graphic (row 1) and the column headers (row 2) will appear at the top of every printed sheet.

You can also combine standard header options (found in the Header/Footer tab of the Page Setup dialog) with this title rows trick—but make sure the graphic doesn't obscure the text. For example, if the graphic sits on the left side of the page (as in the example), you'll need to put the page numbers in the right or center sections of the sheet's header.

Now here's where it gets tricky. Click the *Print Preview* button to preview your worksheet. In the preview window, click the *Margins* button to display the margin handles, which let you adjust the margins and column widths. Specifically, you'll need to adjust the top margin and the header margin, represented by horizontal lines in the preview window. Normally, the upper horizontal line represents the header margin, and the second horizontal line the top margin. Drag these lines up or down until the page header looks correct. In Figure 1 the header margin has been moved above the page margin, so the page margin overlaps with the header margin. The result is that the graphic will align vertically with the normal header text (in the example shown, the page number).

If your worksheet happens to be wider than a page, you'll need to copy the graphic and paste it to the cell that occupies the same location on the subsequent pages.

REFERENCING A SHEET INDIRECTLY

MY EXCEL WORKBOOK has a sheet for each month, named January, February, and so on. I also have a summary sheet that displays key calculations for a particular month. For example, one of my formulas is: =SUM(February!F1:F10). Is there any way that I can enter the month name into a cell on my summary sheet, and then have my formulas use the data for the specified sheet?

Roger Blattner
San Clemente, California

YES. EXCEL'S INDIRECT function was designed specifically for this sort of thing. This function accepts a text string as an argument, and then evaluates the text string to arrive at a cell or range reference. In your case, assume that cell B1 on your summary worksheet holds the month name. The following formula utilizes the INDIRECT function to create the range reference used by the SUM function:

=SUM(INDIRECT(B1&"!F1:F10"))

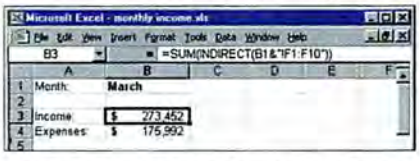

FIGURE 2: THE INDIRECT function tells Excel that it should treat text as part of a formula.

Note that I use the ampersand operator to join the month name with the cell reference (expressed as text). For example, **FIGURE 2** shows if cell B1 contains the text March, the SUM function returns the sum of the range March!F1:F10.

Spreadsheets welcomes questions and tips and pays $50 for published items. Contributing Editor John Walkenbach is the author of Excel 2000 Bible *(IDG Books, 1999) and maintains The Spreadsheet Page (www.j-walk.com).* ■

ILLUSTRATION: JEFFREY PELO

Prevent Row or Column Insertion

ONE WAY TO prevent unauthorized users from inserting a new row or column into a spreadsheet is to protect the worksheet. If you prefer to keep the sheet unprotected, input something into the last cell on the worksheet (cell IV65536). A single space is a good choice, since it's invisible. When the last cell is filled, Excel and 1-2-3 will not allow insertion of a new row or column. Instead, the programs will display a rather cryptic message that the casual user won't understand (but that savvy users will figure out).

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Keep Your PC Clean to Keep It Running

IT DOESN'T NEED gas, oil, or new tires. But your computer *does* need occasional maintenance—it's easy to forget that when you're focusing all your energy on keeping your software and data organized and up-to-date. Without regular maintenance, your PC may flail, sputter, or even grind to a halt, leaving you on the soft shoulder of the information highway.

Dust, grime, and the proverbial waxy yellow buildup aren't just an aesthetic concern; they can lead to serious problems with your PC. The chips and circuits in your system have two mortal enemies: heat and corrosion. Excessive dust and grime can hinder the ventilating airflow through the PC's case and form a layer of insulation on the surface of chips. As a result, chips can overheat and decay prematurely. Likewise, soot and smoke—especially from cigarettes—can, over time, corrode or short out delicate circuits.

The solution is simple: Keep your PC clean. If your system is located in a relatively sterile environment like a hermetically sealed, climate-controlled office, cleaning once a year may suffice. But in dust-prone places (such as rooms with wall-to-wall carpeting or in or near where food is prepared or eaten), performing a basic cleaning every two to three months could add years to the life of your PC.

Any good computer store should carry the following cleaning supplies. (See **FIGURE 1**.) An antistatic brush and lint-free wipes and swabs are a must for wiping surfaces. So is canned compressed air for blowing dust out of hard-to-reach spaces. To prevent system damage caused by harmful static charges that can build up on your skin, you'll also need a grounding strap that fits on your wrist. And if your computer is really dirty, a small, handheld vacuum is also worth buying.

You can find cleaning solutions for every component of your PC, but a small bottle of pure isopropyl alcohol is equal to the task of cleansing your motherboard and other cards. If you frequently remove expansion cards and memory modules for cleaning, get yourself a bottle of lubricating contact cleaner.

WHAT TO CLEAN AND HOW

The PC case. First, wipe out excessive dust or other obstructions from the opening for the power supply fan at the back of the case. Do the same for any ventilation openings. Clean the exterior of the case with a lint-free wipe lightly moistened with a very mild soap or ammonia solution. And remember the cardinal rule of cleaning a PC: Always spray the cleaning liquid *on the rag*, not on the PC.

Motherboard, cards, and memory. Before opening your case, turn off the power. And if your system has any type of active soft-on or sleep mode (check your PC's manual), unplug the system from the electrical outlet. Otherwise, you can leave it plugged in. Put on your grounding strap and clip it to the PC frame if your system can remain plugged into the wall power outlet. If it can't, you'll have to attach it to another suitable ground contact such as a plumbing fixture or other metal object.

Remove excessive dust with a brush and/or canned air. Remember, the object is to *remove* the dust, not just move it. So turn the case on its side first, or better yet, use a small vacuum cleaner to ensure dust doesn't just resettle.

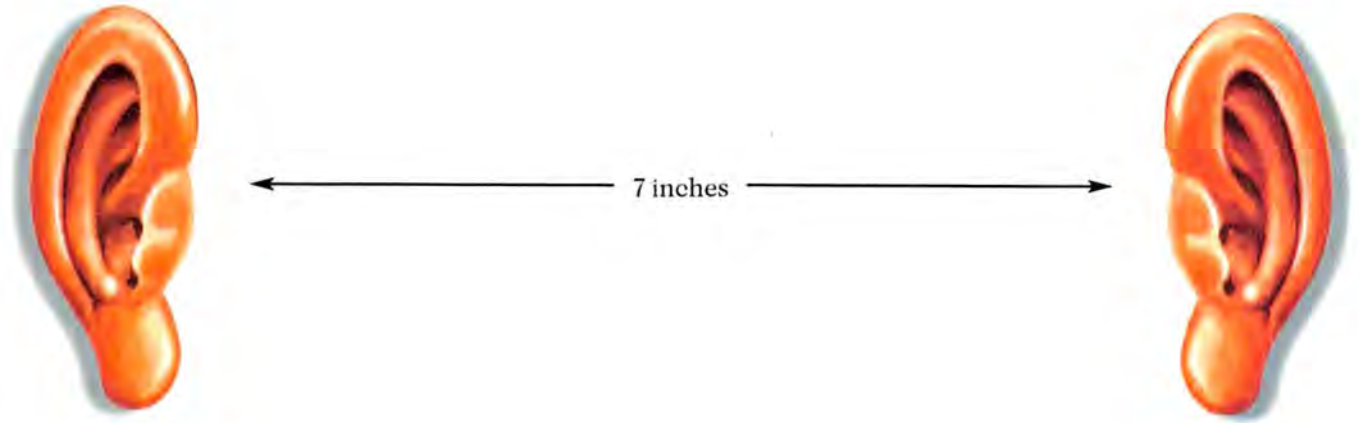
Over time, expansion cards and memory chips can become partially unseated due to movement and even temperature fluctuations. Cleaning offers a good opportunity to reseat them. Use caution during removal and insertion. Wipe the contacts gently with a lint-free swab and, ideally, a lubricating solution. Cautiously do the same to the inside of each slot on the motherboard. And when you reinstall cards, don't overtighten the screw attaching the card to the case; doing this can partially unseat the card.

The keyboard. Turn the keyboard upside down and blow dust and dirt out from between the keys with canned air. Most keys can be gently pried off to expose the contacts below. Computer shops have ▶

FIGURE 1: STOCK UP ON PROPER PC cleaners and housekeeping tools, available at all good computer stores.

Test Your Printer Driver

IF YOUR PRINTER doesn't print, the fault could lie with its software or hardware. A quick way to check your hardware connection is to print from DOS. From *Shutdown* select *Restart in MS DOS mode* to get to the C:> prompt. Then type dir C:\windows>lpt1. If you get a printout, the hardware connection to your printer is fine and the trouble stems from the software. Try reinstalling the printer from the Add Printer icon in Control Panel. Also check the CMOS setup program for the proper EPP or ECP settings.



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special tools for this, but something soft like a pencil with the lead broken off will work nicely. Just be very gentle and apply an even pressure to opposing sides of the key as you lift. Take care not to lose any springs or grommets that may be on the underside of the key. The keys and exterior surfaces—but not the contacts under the keys—can be cleaned with a mild soap or ammonia solution on a lint-free wipe.

The monitor. Thanks to strong electrical fields, monitors are literally dust magnets. Wash your monitor's case with a mild soap solution and a lint-free cloth. Make sure all ventilation openings are dust-free and unobstructed. Monitors produce a lot of heat, so any blockage can cause high-temperature failure. Many monitor screens can be safely cleaned with ammonia-based window cleaners. Check your documentation or ask the manufacturer if your screen has any antiglare or other delicate coatings. If it does, you will have to follow special cleaning instructions.

Configuration 1		Configuration 2		Configuration 3	
Single hard disk	Drive letters	Two hard disks, each with a primary partition	Drive letters	Two hard disks, only one primary partition	Drive letters
Floppy 1	A:	Floppy 1	A:	Floppy 1	A:
Floppy 2	B:	Floppy 2	B:	Floppy 2	B:
Hard drive 1		Hard drive 1		Hard drive 1	
Primary partition	C:	Primary partition	C:	Primary partition	C:
Logical partition	D:	Logical partition	E:	Logical partition	D:
		Hard drive 2		Hard drive 2	
		Primary partition	D:	Logical partition	E:
		Logical partition	F:	Logical partition	F:
CD-ROM drive	E:	CD-ROM drive	G:	CD-ROM drive	G:

FIGURE 2: RETAIN OLD DRIVE LETTER ASSIGNMENTS when you add a new hard disk by creating—as shown in Configuration 3—only logical partitions on the new drive, using a utility like PartitionMagic.

KEEP DRIVE LETTERS IN ORDER

I HAVE A PC with the original release of Windows 95 and a 4GB hard drive split into two partitions, C: and D:. My CD-ROM drive is E:. But when I added my new 6GB hard drive, all the drive letter assignments shifted. Now my D: partition has become E: and my CD-ROM drive is H:. And Windows can't locate software programs and files that it expects to find on the original D: drive or on the CD-ROM. Is there any way to add my new hard drive and preserve the old drive letter assignments?

Rex Fairbairn, Portland, Oregon

YES AND NO. Saving your D: drive designation is no problem thanks to a little DOS trickery. Unfortunately, you won't be able to keep the same CD-ROM drive letter this time, but you can change the current CD-ROM drive letter so it won't change in the future.

Each time you start your PC, Windows assigns a single letter to each of its drives. The letters A: and B: are assigned to floppy drives. (If you have only one floppy drive, B: is not used for other drive types.)

From there, drive assignments become more complicated. A subsequent letter, starting with C:, is assigned to each partition on each drive in your hard drives or Zip or tape drives. Because many hard drives come with just one partition, they have only one letter assignment.

But in your particular case, the original version of Windows 95 recognizes drives only up to 2GB in size, so your 4GB hard disk is divided into two 2GB partitions. Partitions are created when your hard disk is first set up, using the DOS fdisk utility or another utility such as PowerQuest's PartitionMagic. Using fdisk deletes any existing data. PartitionMagic is easier to use and lets you keep your data intact. When you create partitions on your hard disks, you must choose one of two types: primary or extended. Only hard disks with primary partitions are bootable. On your hard disk, C: is a primary partition. There's usually only one primary partition per drive, but extended partitions can be divided up into multiple "logical" (in other words, virtual) drives, each with its own drive letter. Your D: partition is a logical partition.

When Windows launches and assigns drive letters, you might expect it to assign letters to all the partitions on one hard disk and then, in an orderly fashion, move to the next hard disk and do the same. Not so. Instead, Windows gives the first letter (C:) to the first primary partition on the first drive. The next letter (D:) goes to the primary partition on the second hard drive. And so on. **FIGURE 2** shows how drive letters are assigned.

Once the primary partition on each drive has a letter, Windows goes back to the first drive and begins assigning letters to all the logical partitions on the first drive, then to those on the second, and so on. When you added the second drive to your system, Windows assigned the letter D: to the primary partition on your new drive and E: to your old D: partition on your original drive.

Fortunately, the fix is easy. Just use fdisk or a utility such as PartitionMagic to create only an extended partition on your second disk. Since you aren't booting your system from this disk, there's no need for a primary partition.

To avoid future changes in your CD-ROM drive letter, assign this drive a letter in the middle of the alphabet that won't be changed by new drives or partitions. Select the CD-ROM drive in *Device Manager*, open the *Settings* tab, and select a letter in the *Reserved drive letters* box.

Send your questions and tips to kirk_steers@pcworld.com. We pay $50 for published items. Kirk Steers is a contributing editor for PC World. ■

PartitionMagic 5
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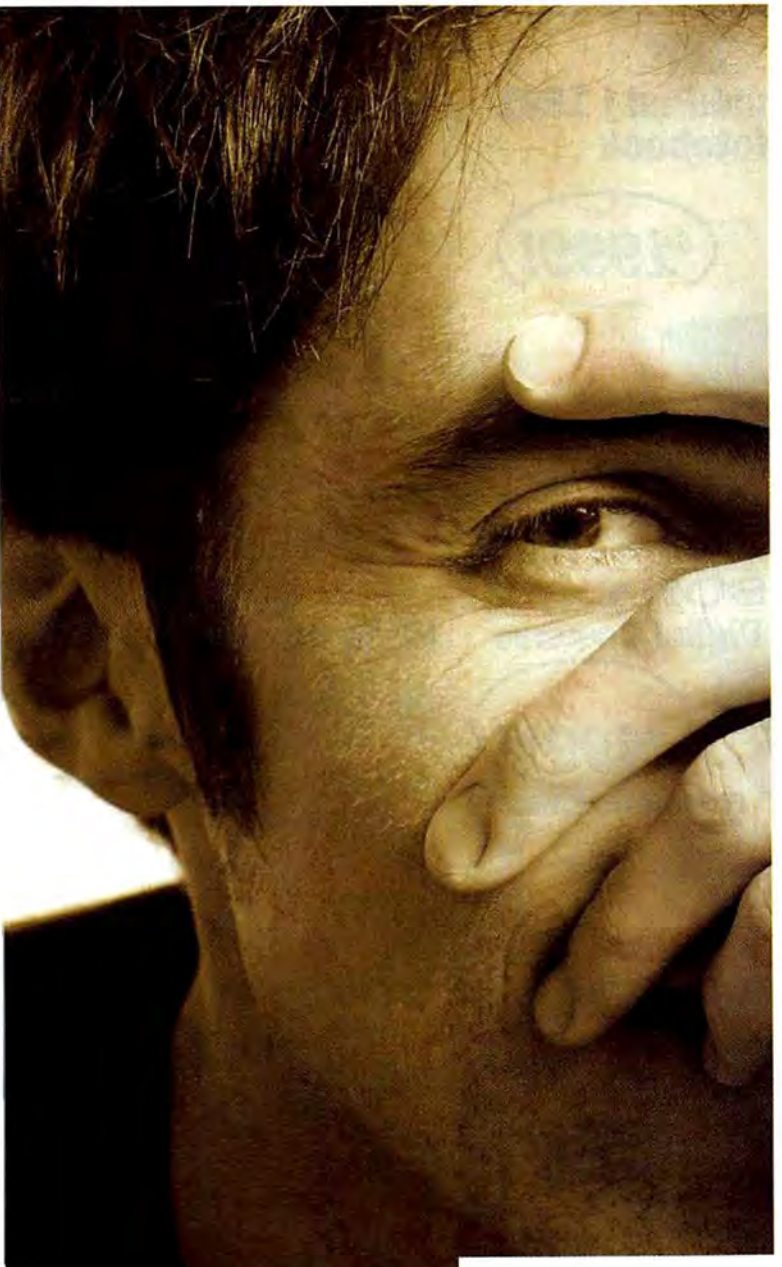

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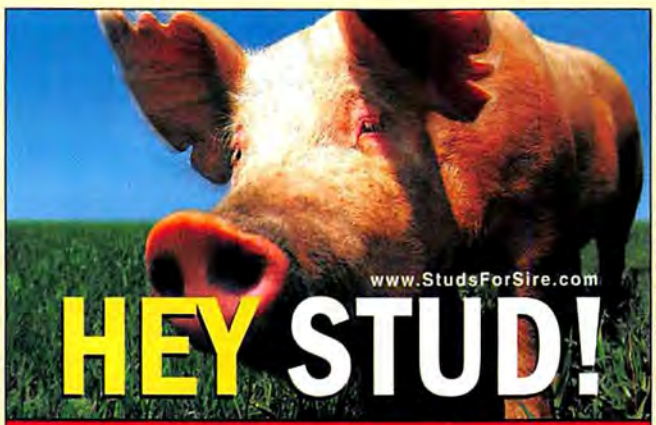

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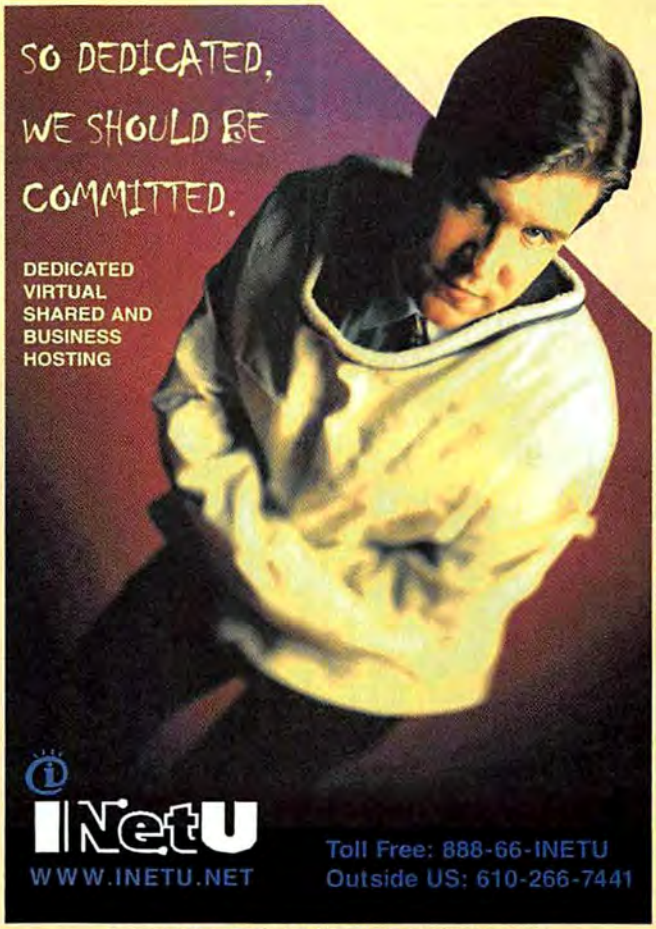

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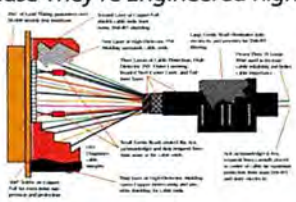

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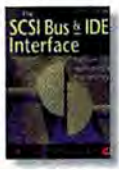

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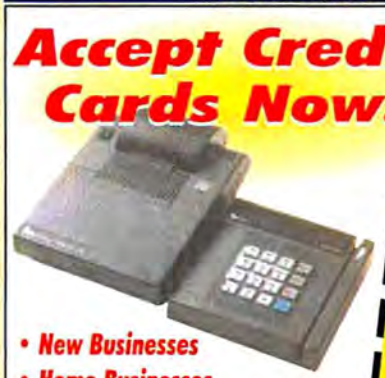

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ONE DEVICE, GLOBAL BENEFITS

Ed Coffin's Dallas-based import/export consulting business relies heavily on an MFD – a Brother 4650, in fact. Coffin, who helps companies large and small deal with foreign governments' sometimes labyrinthine trade regulations, uses his MFD to print and fax documents all over the world.

Worth More than A Thousand Words

The MFD is "the hard-copy core of what I do," Coffin says. He does, of course, e-mail documents whenever possible. But not all of his clients, particularly those overseas, can support the various electronic formats used by American computer manufacturers. So Coffin relies on the fax function of his MFD to keep information flowing both ways.

Also, some countries don't accept e-mail documents as legal and binding, Coffin explains. "In Latin America, you must fax for certification – they require a hard copy on site. Fax is essential for delivery of documents overseas."

The "MFD is reliable, easy to use and easy to set up. It's almost a no-brainer," Coffin says. He adds that he didn't want multiple individual devices hanging off the PC to do tasks such as print or fax because of performance issues.

The more quickly he can respond to customers' needs via his MFD, the better the results. "I've obtained five-figure rebates for customers in places like Italy, which is usually very difficult to get rebates from, because of a fast turn-around," Coffin says. Key to that effort was Coffin's ability to receive documents from his customers, and then fax the necessary proof to the foreign government.

Though not the fault of the MFD, Coffin initially had some problems getting the device to work with his computer, an Alpha-based PC running the Windows NT operating system. However, a conversation with Brother led to the discovery that HP printer drivers would indeed connect the MFD and his PC – but that they wouldn't provide some of the scan-to-text services that the MFD would provide with a more widely used, and better supported, PC.

Coffin acknowledges that his particular PC is an unusual choice for a one-person shop such as his. But he chose it because of its lightening-fast speed – crucial for uploading changes to his Web site, a central part of his business. He updates his site a minimum of three times each month, and the speed of the PC has allowed him to reduce upload time from a half-hour to just a couple of minutes at most. "The critical factor was being able to save three or four hours of my 19-hour workday by using a better workstation," he explains.

web & flow
The Document Management Series: Part 1

In For the Long Haul

What's next for Coffin, on the equipment front, is probably a new PC that supports the Brother MFD more fully. And he's going to a broadband communications line that will free his telephone line so he can leave his MFD's fax machine component on around the clock. Currently, he has to switch between being online (to receive e-mail or check his Web site) and sending/receiving faxes. Using broadband and his MFD will let him print, fax, and be online simultaneously.

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AT-A-GLANCE

PRICES

Item #	CPU	Monitor	RAM	Hard Drive	CD-ROM†	Video	Case	Tiger Credit Card†	Tiger Pri
TM44D	AMD K6-2/300 3DNow!	15"	32MB PC 100	8GB UDMA	44X	AGP/8MB	Compact	$17/Month	$564.99
TM55B	AMD K6-2/400 3DNow!	15"	64MB PC 100	8GB UDMA	44X	AGP/8MB	Compact	$19/Month	$629.99
TM56C	AMD K6-2/475 3DNow!	15"	64MB PC 100	8GB UDMA	44X	AGP/8MB	Compact	$20/Month	$644.99
TM50C	Celeron 400MHz	15"	32MB PC 100	8GB UDMA	44X	AGP/8MB	Mid-Tower	$20/Month	$654.99
TM57B	AMD K6-2/400 3DNow!	15"	128MB PC 100	12GB UDMA	44X	AGP/8MB	Compact	$22/Month	$724.99
TM68A	Pentium II 450MHz	15"	96MB PC 100	8GB UDMA	44X	AGP/8MB	Compact	$22/Month	$729.99
TM51C	Celeron 500MHz	15"	96MB PC 100	12GB UDMA	44X	AGP/8MB	Compact	$24/Month	$779.99
TM43E	Pentium III 500MHz	17"	96MB PC 100	12GB UDMA	44X	AGP 3D 16MB	Mid-Tower	$31/Month	$1014.99
TM45E	Pentium III 550MHz	17"	96MB PC 100	13GB UDMA	44X	AGP 3D 16MB	Mid-Tower	$33/Month	$1089.99
TM46D	Pentium III 600BMHz	17"	96MB PC 100	13GB UDMA	44X	nVidia AGP 3D/16MB	Mid-Tower	$38/Month	$1249.99
TM52D	Pentium III 667BMHz	17"	128MB PC 100	20GB UDMA	44X	nVidia AGP 3D/16MB	Mid-Tower	$43/Month	$1419.99
TM59B	Athlon 700MHz	17"	64MB PC 100	13GB UDMA	44X	Voodoo 3 2000/16MB	Mid-Tower	$45/Month	$1499.99
TM60B	Athlon 750MHz	17"	96MB PC 100	20GB UDMA	44X	Voodoo 3 2000/16MB	Mid-Tower	$53/Month	$1739.99
TM53C	Pentium III 733BMHz	17"	128MB PC 100	27GB 7200 RPM UATA/66	DVD	SoundBlaster/32MB	Mid-Tower	$57/Month	$1879.99

† Monthly payments when purchased using the Tiger Credit card. Ask about special financing programs available. ' CD-ROM speeds are variable, maximum speeds are shown. Sorry, we do not offer price protection in event prices rise or fall. Call for warranty information. All systems include a 1-year upgradable Depot warranty. See www.tigerdirect.com/warranty for entire policy. Copyright, 2000 TigerDirect. All trademarks acknowledged. Monitor viewable areas: 15"—13.9", 17"—15.9". The AMD logo, K6, 3DNow!, and combinations thereof, are registered trademarks of Advanced Micro Devices, Inc.

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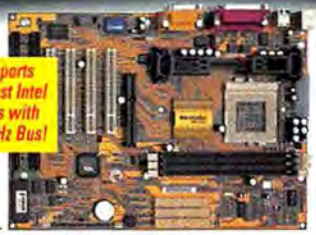
DO IT YOURSELF AND SAVE!

Tiger ATX 7112C Socket 370/ Slot 1 With AGP Port & Sound!

Supports Newest Intel CPUs with 133MHz Bus!



The MS-7112S has all the features your looking for: *133MHz bus support*, AGP video port, 3D wavetable sound, 4 PCI/2 ISA expansion slots and 3 DIMM slots that support up to 768MB of SDRAM. Plus twin slots—Slot 1 & Socket 370.

Motherboard Includes:
Motherboard with cable and manual.

Tiger 7112C Form Factor: **ATX** • CPU: **Socket 370/Slot 1** • Bus Speed: **Up to 133 MHz** • On-board Video: **No** • On-board Audio: **YES** • PCI Slots: **4** • ISA Slots: **2** • Memory: **3 DIMM** • Max Memory: **768 MB**

Tiger 599LMR M-ATX Socket 7 with AGP

599LMR—ATX Socket 7 with 2 PCI/1 ISA, PCI Sound & AGP Video Onboard, 56K Modem & NIC Opt.

Tiger 599LMR Form Factor: **M-ATX** • CPU: **Socket 7** • Bus Speed: **Up to 100MHz** • On-board Video: **AGP 8MB** • On Board Audio: **YES** • PCI Slots: **2** • ISA Slots: **1** • Memory: **3 DIMM** • Max Memory: **768 MB**

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Tiger MATX 741LMRT Socket 370/ Slot 1

M-741LMRT Micro-ATX SOCKET 370/Slot 1 with Video, Sound, Modem & NIC on-board

Tiger 741LMRT Motherboard Features At-A-Glance
Form Factor: **M-ATX** • CPU: **Socket 370/Slot 1** • Bus Speed: **Up to 100MHz** • On-board Video: **AGP 8MB** • On-board Audio: **Yes** • PCI Slots: **1** ISA Slots: **1 (Shared)** • Memory: **3 SIMM** Max Memory: **768 MB**

Tiger 5EMA+ ATX Super Socket 7

Motherboard Includes:
Motherboard with 1MB Cache ; cables, manual

Tiger 5EMA+ Motherboard Features At-A-Glance
Form Factor: **ATX** • CPU: **Socket 7** • Bus Speed: **Up to 100 MHz** • AGP Slots: **1** • PCI Slots: **5** • ISA Slots: **2** • Memory: **3DIMM Sockets** • Max Memory: **768MB**

Tiger 598 AT Super Socket 7 with AGP Video

Motherboards Include:
Motherboard, cables & manual

ATX Super Socket 7 with 3 PCI/2 ISA, PCI Sound & AGP Video onboard. 56K Modem & NIC Opt.

Tiger 598 Motherboard At-A-Glance
Form Factor: **AT** • CPU: **Super Socket 7** • Bus Speed: **Up to 100 MHz** • On-board Video: **8MB AGP** • On-board Audio: **YES** • PCI Slots: **3** • ISA Slots: **2** • Memory: **3 DIMM** • Max Memory: **768 MB**

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Item #	Description	Price
TC1-2001	Scrolling-Wheel Mouse	$4.99*

*Limit 2 at this price

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104 Keys, for Windows/NT

FROM $8.49

Item #	Description	1-2 Units	3-5 Units	6+ Units
TC1-1000	104-Key Keyboard	$9.99	$8.99	$8.49

44X CD-ROM

FROM $35.99

Great Player Great price!

Item #	Description	1-2 Units	3-5 Units	6 units or more
TC1-4020	44X CD-ROM†	$39.99	$37.99	$35.99
TC1-4025	50X CD-ROM†	$44.99	$42.99	$39.99

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56K, v.90 & X2 Fully Compatible PCI Modem With Voice Features!

FROM $19.99

Item #	Description	Price
TC1-5501	56k Faxmodem	$19.99*

*Limit 2 at this price

MOTHERBOARD SPECIFICATIONS

Motherboard Design	Processors Supported
Tiger 598 AT including	**AMD** Up to K6-2/500; K6-III/400
512KB Cache, Wave Table	**Intel** Pentium up to 233 MMX
sound and AGP On-board	**IBM/Cyrix** Up to PR333
Tiger M599LMR M-ATX	**AMD** Up to K6-2/450; K6-III/450
512KB Cache, Wave Table	**Intel** Pentium up to 233 MMX
sound and AGP On-board	**IBM/Cyrix** Up to PR366
Tiger 5EMA+	**AMD** Up to K6-2/500; K6-III-450
Super Socket 7	**Intel** Pentium up to 233 MMX
1MB Cache and AGP Port	**IBM/Cyrix** up to MII 366
Tiger 7112 ATX	**Celeron** up to 500MHz
Slot 1 w/AGP Port	**Intel** Pentium III up to 733MHz
Tiger 741LMRT ATX	**Celeron** up to 500MHz
Slot 1 w/AGP On-board	**Intel** Pentium III up to 600MHz

MOTHERBOARD ONLY

Item No.	1-2 units	3-5 units	6+ units
MB1-E-9B	$86.99	$83.99	$79.99
MB2-modem	$14.99	$13.99	$12.99
MB2-NIC P	$7.99	$6.99	$5.99
MB2-M599LMR	$82.99	$79.99	$75.99
MB2-modem	$14.99	$13.99	$12.99
MB2-NIC	$7.99	$6.99	$5.99
MB1-T-7B	$83.99	$78.99	$74.99
MB2-MS 7112C	$89.99	$84.99	$79.99
MB2-741LMRT	$103.99	$98.99	$93.99

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All cases accept Micro ATX, ATX or AT motherboards. All include large power supplies, Spacious designs.

Compact Mid-Tower Full Tower

Item #	Description	Units 1-2	3-5	6+
CA1-C-3D	Compact Case 6-Bay 230-W P/S	$43.99	$39.99	$37.99
CA1-C-2D	Mid-Tower Case 6-Bay 230-W P/S	$54.99	$49.99	$46.99
CA1-C-4B	ATX Full Tower 9-Bay 300-W P/S	$79.99	$72.99	$64.99

Power Your Motherboard With A Premium Processor!

AMD K6-2 With 3DNow!

AMD K6-2 Processors	1-2 Units	3-5 Units	6 units or more
CP2-K62-300 300 3DNow!	$34.99	$31.99	$28.99†
CP2-K62-333 333 3DNow!	$37.99	$34.99	$31.99†
CP2-K62-350 350 3DNow!	$49.99	$44.99	$41.49†
CP2-K62-400 400 3DNow!	$56.99	$52.99	$49.99†
CP2-K62-450 450 3DNow!	$62.99	$59.99	$56.99†
CP2-K62-475 475 3DNow!	$72.99	$69.99	$64.99†
CP2-K62-500 500 3DNow!	$89.99	$86.99	$84.99†
CP2-K62-533 533 3DNow!	$129.99	$126.99	$124.99†

Pentium & Cyrix MII

Tiger recommends the AT or a Super Socket 7 motherboard with these processors.

From $29.99

Pentium & Cyrix MII		1-2 Units	3-5 Units	6 units or more
#CP2-6X300	MII 300 CPU	$39.99	$34.99	$29.99
#CP2-P233	Pentium 233 CPU	$46.99	$43.99	$39.99

1.44MB 3.5" Drives

FROM $15.99

Item #	Description	1-2	3-5	6+
TC1-6000	Floppy (Beige)	$19.99	$17.99	$15.99

Cooling Fan SALE!

FROM $3.49

Protects your CPU against the damaging effects of heat!

Item #	Description	1-2	3-5	6+
A216-1010	Socket 7 Fan	$4.99	$3.99	$3.49
A216-1002	Slot 1 Fan	$5.99	$5.49	$4.99
CI-PPGA370	Celeron Slot 1 Adapter	$8.99	$7.99	$7.49

Supports Socket 7 AMD, Intel, Cyrix/IBM CPUs.

MEMORY SALE!

FROM $45.99

Item #	Size	1-2	3-5	6+
TC1-MEM-32	32MB PC100 SDRAM	$47.99	$46.99	$45.99
TC1-MEM-64	64MB PC100 SDRAM	$91.99	$89.99	$88.49
TC1-MEM-128	128MB PC100 SDRAM	$181.99	$176.99	$173.99

Note: *In order to bring you these low unheard of prices on premium bulk memory, we have negotiated returns for defective exchange only and a 20% restocking charge on all returns with our memory vendor. We will pass these policies on to all retail sales of bulk memory. Call for PNY Branded Memory prices. Prices are subject to change.*

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Item #	Manufacture	Size	Units 1-2	3-5	6+
THD-102C	Quantum	10GB	$128.99	$126.99	$124.99
THD-13C	Quantum	13GB	$140.99	$138.99	$136.99
THD-19Q	Quantum	19GB	$159.99	$149.99	$139.99

Intel Celeron, Pentium II & III

*** Celeron CPUs are socket 370 format and require a fan and adapter (see far right) to be used in any slot 1 motherboard.

Intel Celeron, Pentium II & III Processors		1-2 Units	3-5 Units	6 or more
#CP1-CI366	Intel Celeron **366** processor (370) w/fan	$54.99	$49.99	$45.99
#CP2-CI400	Intel Celeron **400** processor (370)	$79.99	$74.99	$69.99
#CP2-CI500	Intel Celeron **500** processor (370)	$159.99	$154.99	$149.99
#CP2-P2-450	Intel Pentium II **450** processor†	$124.99	$122.99	$114.99
#CP2-P3-500	Intel Pentium III **500** processor†	$249.99	$244.99	$229.99
#CP2-P3-550	Intel Pentium III **550** processor†	$309.99	$304.99	$284.99
#CP2-P3-600	Intel Pentium III **600** processor†	$389.99	$374.99	$364.99
#CP2-P3-600B	Intel Pentium III **600B** processor†	$389.99	$374.99	$364.99
#CP2-P3-733B	Intel Pentium III **733B** processor†	$729.99	$709.99	$694.99

Sorry, but as prices are always changing on CPUs and memory, we do not offer price protection in the event prices rise or fall. ¹Requires 100MHz bus motherboard and 8ns PC100 SDRAM Memory. ²Requires 95MHz bus motherboard and 8ns PC100 SDRAM. ³Requires 97.3MHz bus motherboard and 8ns PC100 SDRAM. ⁴Requires 133MHz bus motherboard and 8ns PC100 SDRAM Memory. † CD-ROM speeds are variable, maximum speeds are shown. Call us for details and warranty information. No returns accepted on CPUs.

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If You Buy It Online, Will It Come?

"YOU KNOW HOW TO *take* the reservation," Jerry tells the rental-car clerk in a memorable *Seinfeld* episode. "You just don't know how to *hold* the reservation." Sure enough, something similar (although less comical) is happening online. With the explosion of e-commerce, there are plenty of online retailers who know how to *take* your order, just not many who know how to *fill* your order.

Last Christmas season was a festival of e-commerce botches. And I speak from experience: My niece and nephew in New York didn't get the presents my wife had ordered from EToys until after the holiday. What showed up on time were gifts for a November baby shower in North Carolina. My wife did get three e-mails confirming that the order had been shipped, but not mentioning that it was the wrong one.

Come to think of it, the e-commerce companies aren't so hot at taking your order, either. On a busy pre-Christmas evening, several sites managed to garble my shopping carts and spit me back to square one, where I had to reenter all the information I'd just typed in. Nordstrom's site was so confusing that I ended up using the phone—and connecting with a courteous, knowledgeable salesperson who completed the transaction in less than 5 minutes.

E-tailers of all stripes need to follow some basic guidelines if they're going to get my business.

In my lifetime, the retail world has continuously moved toward self-service, which amounts to replacing an employee's labor with your own. I remember local grocery stores that took orders by phone and brought them to your door, sometimes on credit. Supermarkets wiped them out with lower labor costs and economies of scale. With e-tailing, your fingers on the keys do the work of salespeople on the showroom floor, at a cash register, or over a toll-free line.

Fine, when it works. But e-tailers of all stripes need to follow some basic guidelines if they're going to get my business:

Accurate stocking and delivery information: Lines like "usually ships in two to three business days" generally mean "not in stock, but we can probably get it pretty quickly." That's not good enough for us. The retailer's computer should be linked to the wholesaler's or transshipper's, so that you can find out exactly what will happen, and when.

Up-front totals: Every system should tally the total charges, including shipping, as you shop—and before you submit your billing information.

Clear access to customer service: I'm talking about a big button clearly marked "customer service." Click it while placing your order to learn about things like return policies. Click it later and get the status of your order. And when you have problems that a computer can't solve, click it again to get help from a human.

Low-price guarantee: Many retailers with printed catalogs, especially those in the computer business, offer only their *highest* prices online. Often customers can get better prices by picking up the phone and asking a clerk to match the competition. So why not save labor costs and make that best deal available in the first place?

Automatic deals: Don't make me look for some coupon buried on the site. Program your checkout system so that customers automatically get any special offers they are entitled to. The loyalty of delighted consumers will more than compensate for the few dollars lost.

Spam relief: Don't hide the check box for opting out of e-mail solicitations at the bottom of the screen. And don't fill it in by default. Better still, offer some immediate incentive for surrendering our e-mail addresses—like a one-time discount, not the vague promise of future deals.

Follow-through: Do what you promise, no excuses. If a shipment will be late, explain the problem in detail and offer me the opportunity to cancel. If you demand an e-mail address, then use it to inform, not just to sell.

And don't get me started on incomprehensible return policies, poor search engines, inadequate product pictures and descriptions, or fields that let you type in free-form data—only to spit it back at you for not entering it the right way. Other Web options are just a click away, the phone is nearby, and the mall's not far. This country offers plenty of ways to buy stuff. Incompetent e-tailers will learn that in a hurry.

PC World *Contributing Editor Stephen Manes is cohost of* Digital Duo, *a series appearing on Public Television stations nationwide. For program information, see www.digitalduo.com.* ■

PHOTOGRAPH: ERIK BUTLER

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- SB Live! Value Digital with MusicMatch® Jukebox Enhanced[36]
- Harman Kardon HK-595 Surround Sound Speakers with Subwoofer
- V.90 56K Capable[11] PCI Telephony Modem for Windows
- 1-Year Dellnet℠ Internet Access[44] with 20MB of Online Backup[35]

$2799 As low as $76/Mo., for 48 Mos.[33]
E•VALUE CODE: **03721-500227h**

Dell Recommended Upgrades:

- 19" (17.9" vis, .24-.25AG) P991 FD Trinitron® Monitor, add $207
- 8X Max Variable DVD-ROM Drive and Decoder Card with TV Out with *FREE* DVD Movie Offer,[37] add $59

DELL® *DIMENSION*® L433cx Desktop

Affordable Desktop Solution

- Intel® Celeron™ Processor at 433MHz
- 64MB SDRAM at 100MHz ■ 4.3GB[4] Ultra ATA Hard Drive
- *NEW* 15" (13.8" vis) E550 Monitor ■ Intel® 3D AGP Graphics
- 40X Max Variable CD-ROM Drive
- SoundBlaster 64V PCI Sound Card with MusicMatch® Jukebox Standard[36]
- harman/kardon Speakers
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$899 As low as $25/Mo., for 48 Mos.[33]
E•VALUE CODE: **03721-500208**

Dell Recommended Upgrades:

- 10GB[4] Ultra ATA Hard Drive, add $68
- *NEW* 17" (16.0" vis, .28dp) E770 Monitor, add $68

Dimension® Desktop Systems include:

- **Keyboard ■ Mouse ■ 3.5" Floppy Drive**
- **Microsoft® Windows® 98, Second Edition**
- ***NEW* Microsoft® Works Suite 2000 with Money 2000 Basic**
- **Norton AntiVirus™ 2000 (CD)**
- **3-Year Limited Warranty[2] ■ 1-Year At-home Service[3]**

NEW DELL® *INSPIRON*™ 5000 Notebook

Performance and Mobility

- Intel® Pentium® III Processor at 500MHz
- 15" SXGA+ Active Matrix Display
- 64MB 100MHz SDRAM
- 6.0GB[4] Ultra ATA Hard Drive
- Modular 24X Max Variable CD-ROM
- 2X AGP 8MB ATI RAGE Mobility™-P 3D Video
- Internal PCI 56K Capable[11] V.90 Fax Modem

$2799 As low as $76/Mo., for 48 Mos.[33]
E•VALUE CODE: **03721-800227d**

Dell Recommended Upgrades:

- HASBRO® Interactive GamePack[22], add $79
- Intel® PC Camera Pack[22], add $79

DELL® *INSPIRON*™ 7500 Notebook

Mobile Desktop

- *NEW* Intel® Pentium® III Processor at 650MHz with Intel® SpeedStep™ Technology[40]
- 15.4" SXGA TFT Active Matrix Display
- 96MB 100MHz SDRAM
- 6.0GB[4] Ultra ATA Hard Drive (75GB Max[41])
- Removable Combo 32X Max Variable CD-ROM and Floppy Drive
- 2X AGP 8MB ATI RAGE Mobility™-P 3D Video
- Internal PCI 56K Capable[11] V.90 Fax Modem

$3599 As low as $98/Mo., for 48 Mos.[33]
E•VALUE CODE: **03721-800235**

Dell Recommended Upgrades:

- Inspiron™ 7500 Advanced Port Replicator, add $259
- *NEW* Accessories Bundle (harman/kardon Speakers, Intel® PC Camera Pack[22], Headphones, Microphone), add $99

DELL® *INSPIRON*™ 3700 Notebook

Design and Affordability

- Intel® Pentium® III Processor at 450MHz
- 14.1" XGA Active Matrix Display
- 64MB 100MHz SDRAM ■ 6.0GB[4] Ultra ATA Hard Drive
- Removable 6X Max Variable DVD-ROM Drive with *FREE* DVD Movie Offer[37]
- 1-Year Dellnet℠ Internet Access Service[44] with 20MB of Online Backup[35]
- 3Com® 56K Capable[11] V.90 WinModem PC Card with XJACK®

$2599 As low as $71/Mo., for 48 Mos.[33]
E•VALUE CODE: **03721-800225**

Dell Recommended Upgrades:

- Traveler's Bundle (Nylon Carrying Case, Targus Defcon Notebook Alarm, APC Notebook Surge Protector), add $99
- Second 53WHr Lithium Ion Battery, add $99

Inspiron™ Notebooks include:

- **Microsoft® Windows® 98, Second Edition**
- ***NEW* Microsoft® Works Suite 2000 with Money 2000 Standard**
- **Norton AntiVirus™ 2000 (CD)**
- **Lithium Ion Battery**
- ***NEW* i-Learn My Dell® PC ■ 3-Year Limited Warranty[2]**

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[33]Monthly payments based on sales price depicted for 48-mo. term at 13.99% APR. APR FOR QUALIFIED CUSTOMERS VARIES BY CREDITWORTHINESS OF CUSTOMER AS DETERMINED BY DELL FINANCIAL SERVICES L.P. PAYMENTS EXCLUDE TAXES AND SHIPPING CHARGES THAT VARY. Taxes & shipping charges due with 1st payment unless included in the amount financed, in which case your monthly payment will be higher. Purchase Plan offered through Dell Financial Services L.P., 14050 Summit Dr., Austin, TX 78728, to U.S. state residents (including D.C.) with approved credit, excluding AR and MN residents. Availability may be limited or offer may vary in other states.

[36]Includes one (1) upgrade and online support from MusicMatch. [41]To achieve 75GB Max. hard drive capacity on the Inspiron 7500, you must purchase a 25GB internal primary hard drive and the 25GB HDD option for both the 2nd and 3rd hard drive bays. Note that the Inspiron 7500 notebook must be used on AC power when utilizing the 75GB Max. hard drive configuration. [44]Includes 150 hours Internet access per month with a $1.50 per hour charge for each hour (or fraction thereof) over 150 hours. Remote subscribers subject to an additional charge of $4.95 for each hour of Dellnet service. Excludes applicable taxes and local/long distance telephone access fees or charges. Additional $1.00/hr. surcharge for Dellnet service in HI and AK. [40]The processor may be reduced to a lower operating speed when operating on battery power. [35]Online Backup services are provided by a third party, and such services are provided subject to terms and conditions between such a third party and the customer. Limited to 20MB of online storage space; additional storage space available for additional charge. Dell disclaims any responsibility for lost customer data. Intel, the Intel Inside logo, and Pentium are registered trademarks; Celeron, SpeedStep, and Pentium III Xeon are trademarks of Intel Corporation. MS, Microsoft, BackOffice, IntelliMouse, Windows NT and Windows are registered trademarks of Microsoft Corporation. 3Com is a registered trademark and Fast EtherLink is a trademark of 3Com Corporation. HP and DeskJet are registered trademarks and OpenView is a trademark of Hewlett Packard Corporation. Trinitron is a registered trademark of Sony Corporation. ©2000 Dell Computer Corporation. All rights reserved.

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E•VALUE CODE: **03721-290232**

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Entry Level Server

- Intel® Pentium® III Processor at 500MHz (up to 700MHz)
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- 64MB 100MHz ECC SDRAM (up to 1GB)
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- 108GB[4] Internal Storage Capacity
- NIC & Integrated SCSI Controller; 40X Max CD-ROM
- Dell® OpenManage™ Resolution Assistant
- 3-Year NBD On-site[3] Service; 7X24 Phone Tech Support

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E•VALUE CODE: **03721-290216**

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  Bundle Includes: MS® BackOffice Small Business Server 4.5, Modem, Training on CD-ROM & System Support

DELL® *OPTIPLEX*® GX110 Desktop

Performance-Managed PC at a Great Value

- Intel® Pentium® III Processor at 533EB MHz (up to 733MHz)
- 64MB SDRAM at 100MHz (up to 512MB)
- 13.6GB[4] SMART II Ultra ATA Hard Drive (up to 20GB[4])
- 15" (13.8" vis) M570 Monitor (up to Flat Panel)
- Intel® 3D AGP Graphics, 24X Max CD-ROM
- 64V Sound Card and Internal Speaker
- Integrated 3Com® 10/100 NIC
- Microsoft® Windows NT® 4.0
- OptiFrame™ Small Form Factor Tool-less Chassis
- Remote Client Manageability Support via DMI 2.0
- 3-Year Next-Business-Day On-site[3] Service

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E•VALUE CODE: **03721-390214**

DELL® *OPTIPLEX*® GX100 Desktop

Affordable Managed PC

- Intel® Celeron™ Processor at 433MHz (up to 500MHz)
- 64MB SDRAM at 100MHz (up to 512MB)
- 4.3GB[4] SMART II Ultra ATA-66 Hard Drive (up to 15GB[4])
- 15" (13.8" vis) E550 Monitor, Intel® 3D AGP Graphics
- OptiFrame™ Small Form Factor Tool-less Chassis
- Integrated 3Com® 10/100 NIC
- Microsoft® Windows NT® 4.0
- Remote Client Manageability Support via DMI 2.0
- 3-Year Next-Business-Day On-site[3] Service

$899 Business Lease™: $30/Mo., 36 Mos.
E•VALUE CODE: **03721-390208**

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Advanced Performance, Specialized Graphics

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- Dual Processor/RAID Capable
- 128MB ECC SDRAM (up to 1GB)
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- Dual 17" (16.0" vis) M780 Monitors (up to Flat Panel)
- 32MB Matrox G400 Max Graphics Card
- Integrated NIC & Sound; 48X Max Variable CD-ROM
- Microsoft® Windows NT® Workstation 4.0
- 3-Year NBD On-site[3] Service; 7X24 Phone Tech Support

$2969 Business Lease™: $99/Mo., 36 Mos.
E•VALUE CODE: **03721-490229**

- Second Intel® Pentium® III Processor at 550MHz, add $576
- Upgrade to Dual 19" (17.9" vis) P991 Trinitrons, add $510

DELL® *INSPIRON*™ 3700 Notebook

Design and Affordability

- Intel® Celeron™ Processor at 433MHz
- *NEW* 12.1" SVGA Active Matrix Display
- 32MB SDRAM, 4.8GB[4] Ultra ATA Hard Drive
- Modular 24X Max Variable CD-ROM/Floppy Drive
- 2X AGP 8MB ATI RAGE Mobility™-M1 3D Video
- Dual Pointing–Touchpad and Pointing Stick
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- Microsoft® Windows® 98, Second Edition
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E•VALUE CODE: **03721-890216**

NEW DELL® *INSPIRON*™ 5000 Notebook

Performance and Mobility

- Intel® Celeron™ Processor at 466MHz
- 14.1" XGA Active Matrix Display
- 32MB SDRAM, 6.0GB[4] ATA Hard Drive
- Modular 24X Max Variable CD-ROM/Floppy Drive
- 2X AGP 4MB ATI RAGE Mobility™-P 3D Video
- 52WHr Lithium Ion Battery
- *NEW* Microsoft® Works Suite 2000 with Money 2000 Standard
- Microsoft® Windows® 98, Second Edition
- 3-Year Limited Warranty[2]

$1999 Business Lease™: $67/Mo., 36 Mos.
E•VALUE CODE: **03721-890219**

- Upgrade to 15" SXGA+ Active Matrix Display, add $400

DELL® *INSPIRON*™ 7500 Notebook

Mobile Desktop

- Intel® Celeron™ Processor at 433MHz
- 15" XGA Active Matrix Display
- 64MB SDRAM, 6.0GB[4] Ultra ATA Hard Drive
- Removable Combo 24X Max Variable CD-ROM and Floppy Drive
- 2X AGP 8MB ATI RAGE Mobility™-P 3D Video
- 79WHr Lithium Ion Battery
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- Microsoft® Windows® 98, Second Edition
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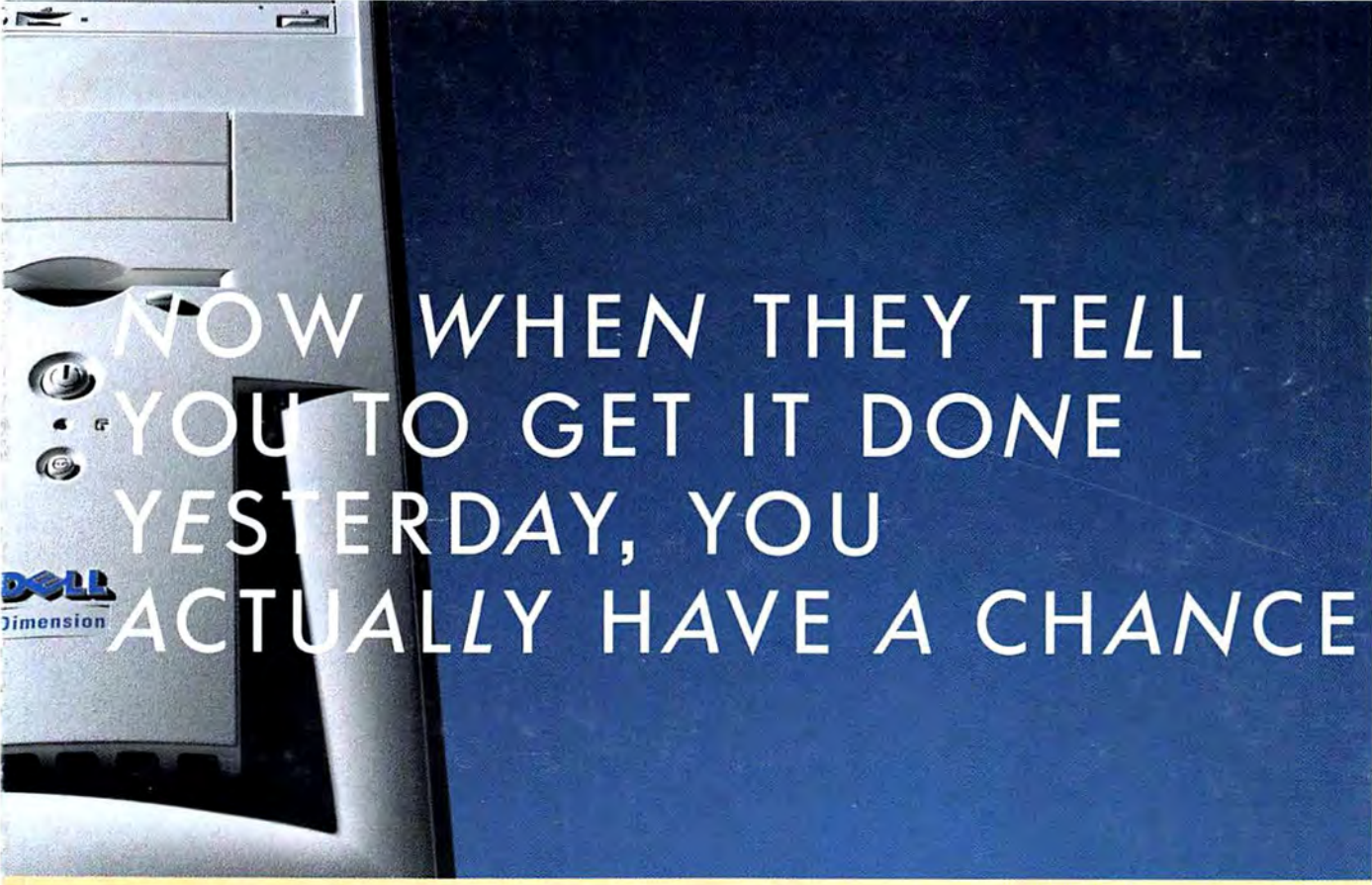

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- 17" (16.0" vis) M780 Monitor (up to Flat Panel)
- 32MB 4X AGP Graphics Card; 48X Max CD-ROM
- Microsoft® Windows® 98 and Office 2000 Small Business
- 3-Year Limited Warranty; 1-Year NBD On-site[1] Service

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- Premium Sound Card and Speakers, add $59

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