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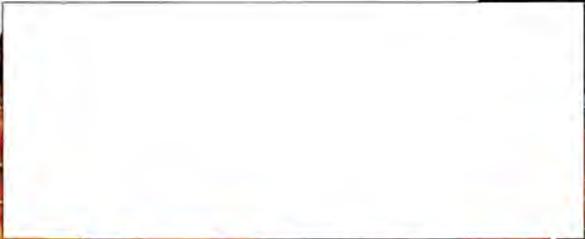


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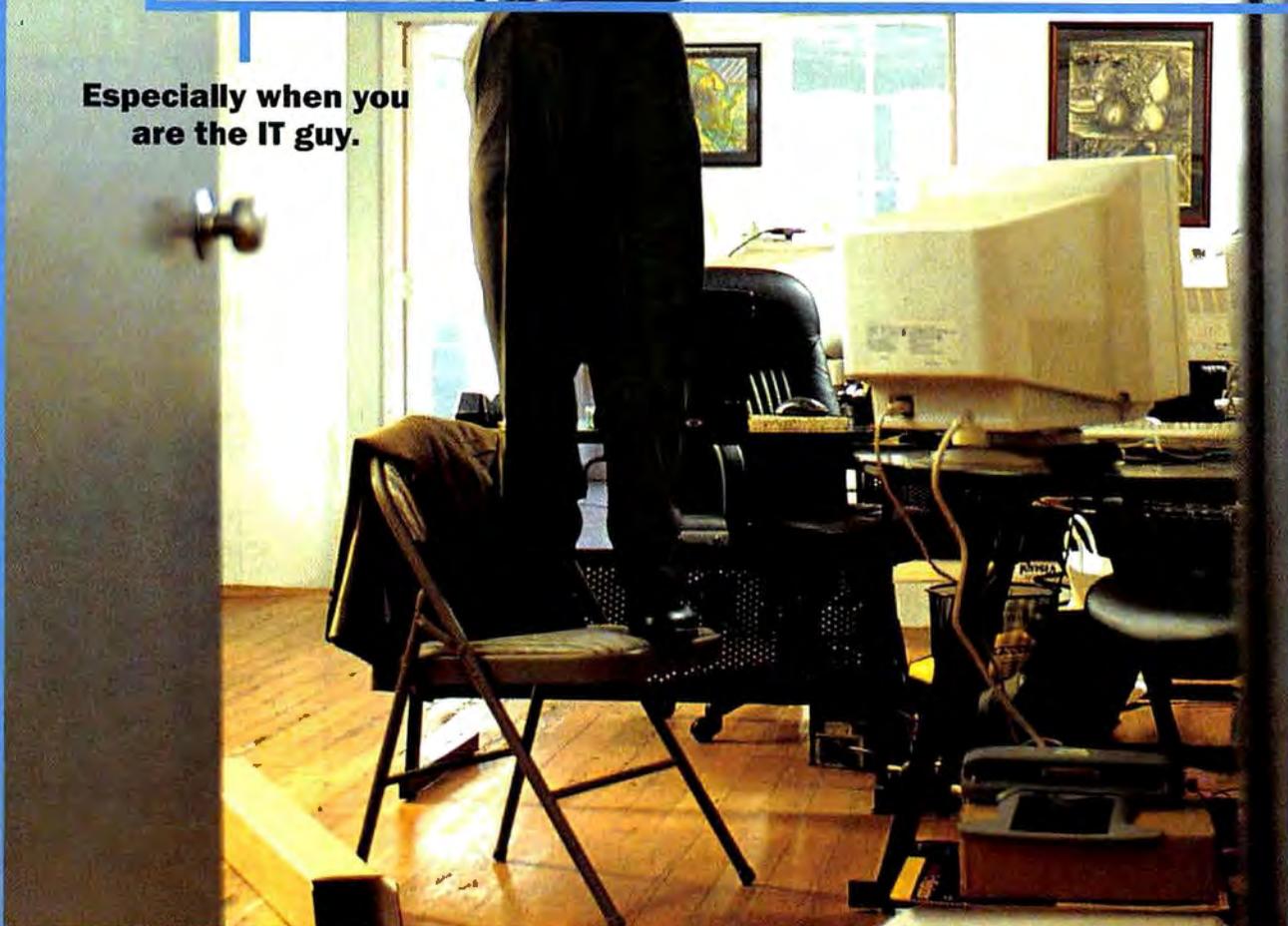
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Computer manufacturers have increased their efficiency and reduced their costs to bring us the cheapest PCs ever. But how reliable are these tempting machines? And do their manufacturers provide adequate technical support? We rate the reliability and service of 11 vendors' desktops and notebooks, based on the survey responses of more than 30,000 *PC World* readers. The results are mixed.

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119 DREAM SCREENS

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Flat-panel LCD monitors aren't just for specialized environments anymore. They save space, lessen eyestrain, and provide maximum cool, with fine image quality and cutting-edge designs. Now many LCD monitors also have more features and lower prices. We check out new 15-inch models—and pick a Best Buy. Remember, with monitors, flatter will get you anywhere.

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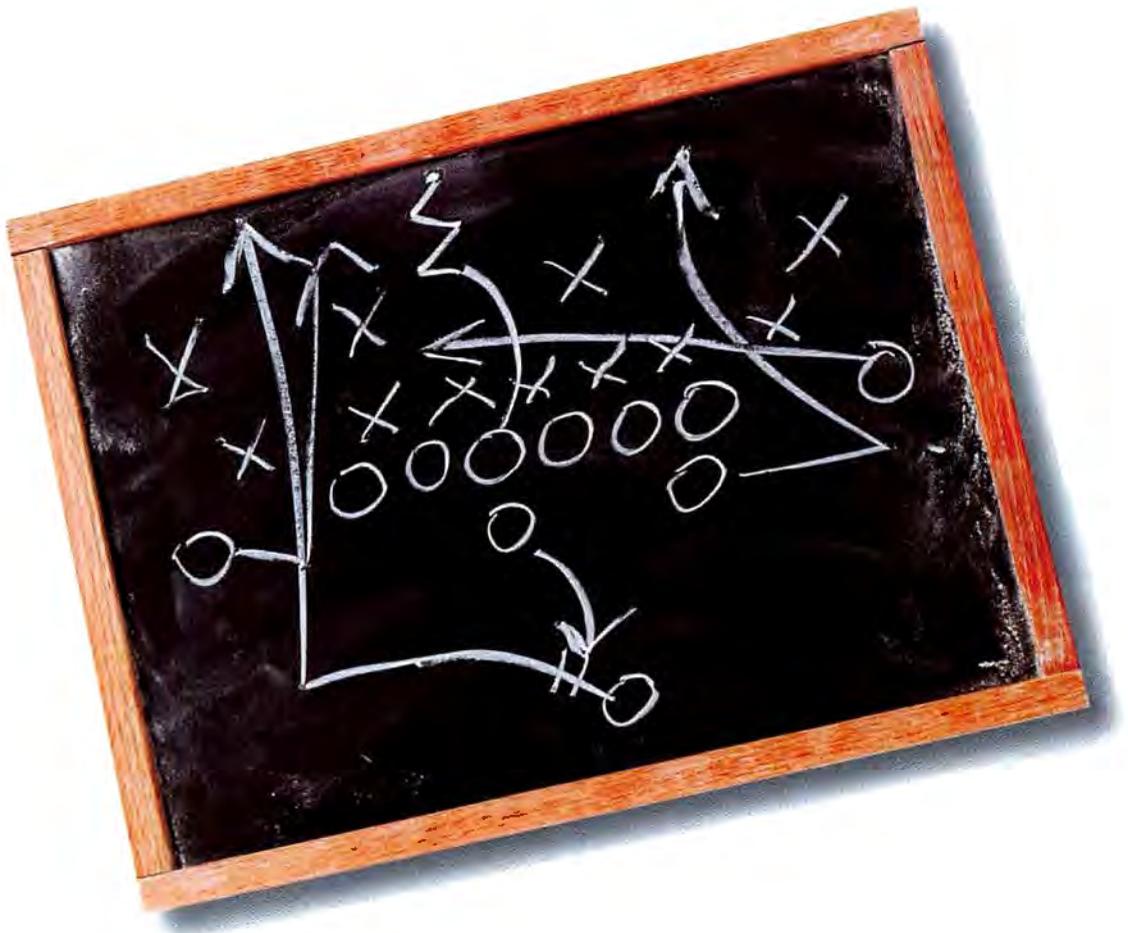
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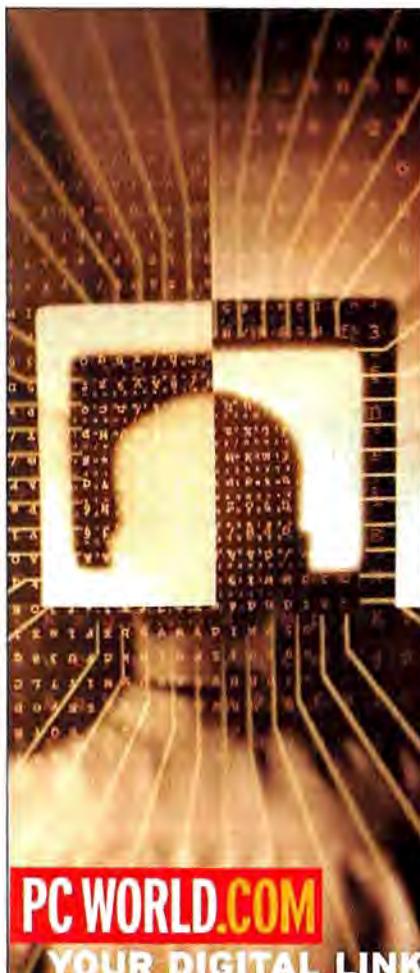
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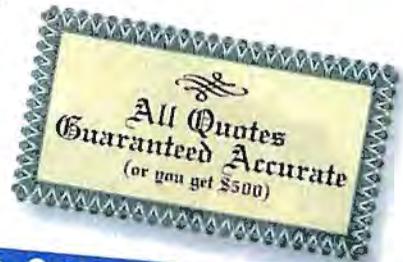
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*Depends on your carrier's service level and coverage area. Connect time charges may apply.

Our Readers Say Broadband or Bust

WHO WOULD HAVE predicted a few years ago that the clunky new Internet would become the fastest-growing medium in history? *PC World* readers, that's who. While the number of U.S. households with Internet connections grew by an astounding 60 percent last year, the percentage of connected *PC World* readers grew hardly at all—because most of them had already been online for years.

Now our readers are leading a new technological charge to high-speed Web access. It's a frontier that not many people have crossed. For most U.S. users, broadband access is available only at work. But for the past couple of years, the readers we surveyed expressed increasing interest in setting up high-speed connections at home or in small offices—usually in order to enjoy Fortune 500-like connectivity. That's why the magazine returns to the subject this month with the three-part cover package "Warp-Speed Web Access," which begins on page 92.

ACQUIRING THE BROADBAND HABIT

WE STARTED by surveying more than 500 readers who had installed their own broadband—in some cases, several times. The results are enlightening. As Scott Spanbauer notes in "Cable vs. DSL vs. Everything Else" (page 94), our readers say that cable-modem connections are much easier to install than phone-based DSL, but that DSL is more reliable. Dennis O'Reilly's "The Best Broadband Sites" (page 97) identifies the top sites to visit with your broadband connection. And in "Sharing the Bandwidth" (page 102), Alan Stafford reviews inexpensive gateways and routers that let multiple PCs share a single high-speed link. But beware: Broadband is addictive. More than half the readers we surveyed said they spend more time on the Web now that they have high-speed connections—and even before that, they averaged 66 hours a month online.

If you're in the market for a computer, "In Search of Trouble-Free PCs" on page 108 is a must-read. *PC World* queried 30,000 readers to find out how the machines they bought have held up. With PC prices falling—35 percent in the past three years—you might expect an erosion in quality. Fortunately, the reliability of business systems and notebooks is up from last year's survey.



Broadband can be addictive: Half our readers spend more time online now that they have high-speed connections.

Only among home PCs did quality decline. Unfortunately, manufacturers seem to be cutting costs in post-sales support—particularly with phone help. Our survey reveals that the quality of service is down across all categories, making our detailed comparison—sembled by Aoife McEvoy, Stephen Swoyer, and the *PC World* survey team—all the more valuable.

To go with that new PC, you might consider one of the sleek new thin-screen monitors described in Leigh Anne Jones's "Dream Screens" (page 119). Only a little over a year ago, the industry finally agreed on a digital standard for driving a display—the Digital Video Interface. The DVI is one reason you'll find a slew of top-performing new LCDs on the market at prices under \$1000. Jones and the *PC World* Test Center report on 10 models that warrant a look.

Gregg Keizer's "Web Shopping" (page 133) offers advice on getting the most out of electronic wallets, shopping bots, and other online buying tools. If you're into pocket-size gadgets, don't miss Denny Arar's review of Kyocera's new Smartphone (page 54). It's not the first PDA-cell phone hybrid. But it's smaller, lighter, and less expensive than earlier versions and promises to simplify the lives of those—like me—who carry a PDA and a phone at all times.

Finally, David Essex reports on our first tests of PCs powered by Intel's Pentium 4. The P4 posts clock speeds of 1.3 GHz today, 3 GHz down the road. But those blazing stats don't yield much advantage in real-world apps. In our tests, the P4 barely beat older 1-GHz PIII PCs on most measures and lagged behind on several (see "Pentium 4: Boon or Bust?" page 48). The P4 is optimized for computationally intensive tasks and surpassed the PIII in the video part of our tests. But if you need more performance from word processing or spreadsheets, the P4 offers little help.

That's all for now. Drop me a line at eddir@pcworld.com.

COMING UP IN FEBRUARY

Essential Windows Tips: What you need to know about upgrading, customizing, and managing files in 9x, 2000/NT, and Me.

Web Apps vs. Shrink-Wrapped: Can a Web-based app replace that pricey program on your PC? We compare the contenders.

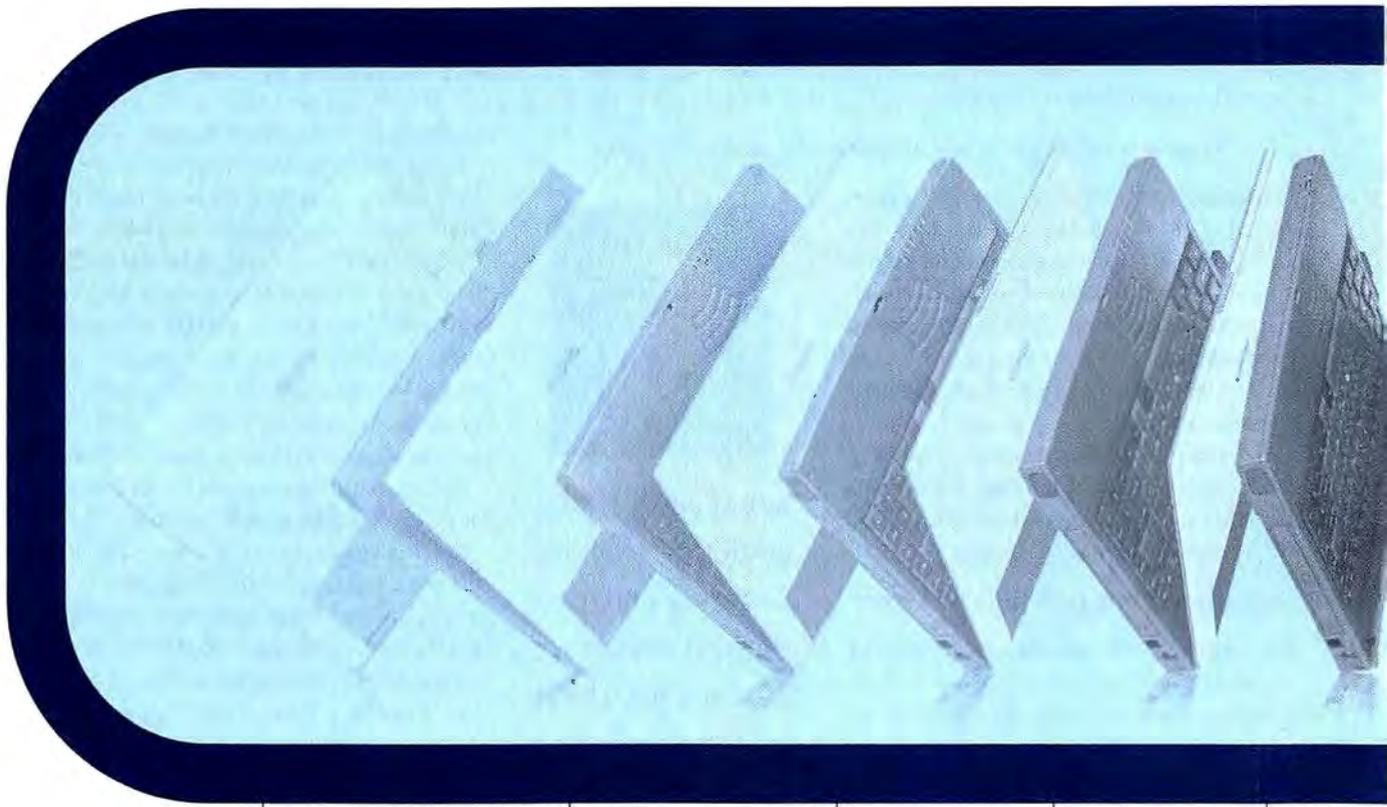
The Better to See You With: *PC World*'s review of today's top graphics boards—the hot technologies, trends, and Best Buys.

Big-Time Hardware for Tight Spaces: The best PCs, flat-panel LCDs, and multifunction devices to build a compact office.

Good Job Hunting Online: Advice for finding productive job leads.

Kevin McKean is editorial director of *PC World*. ■

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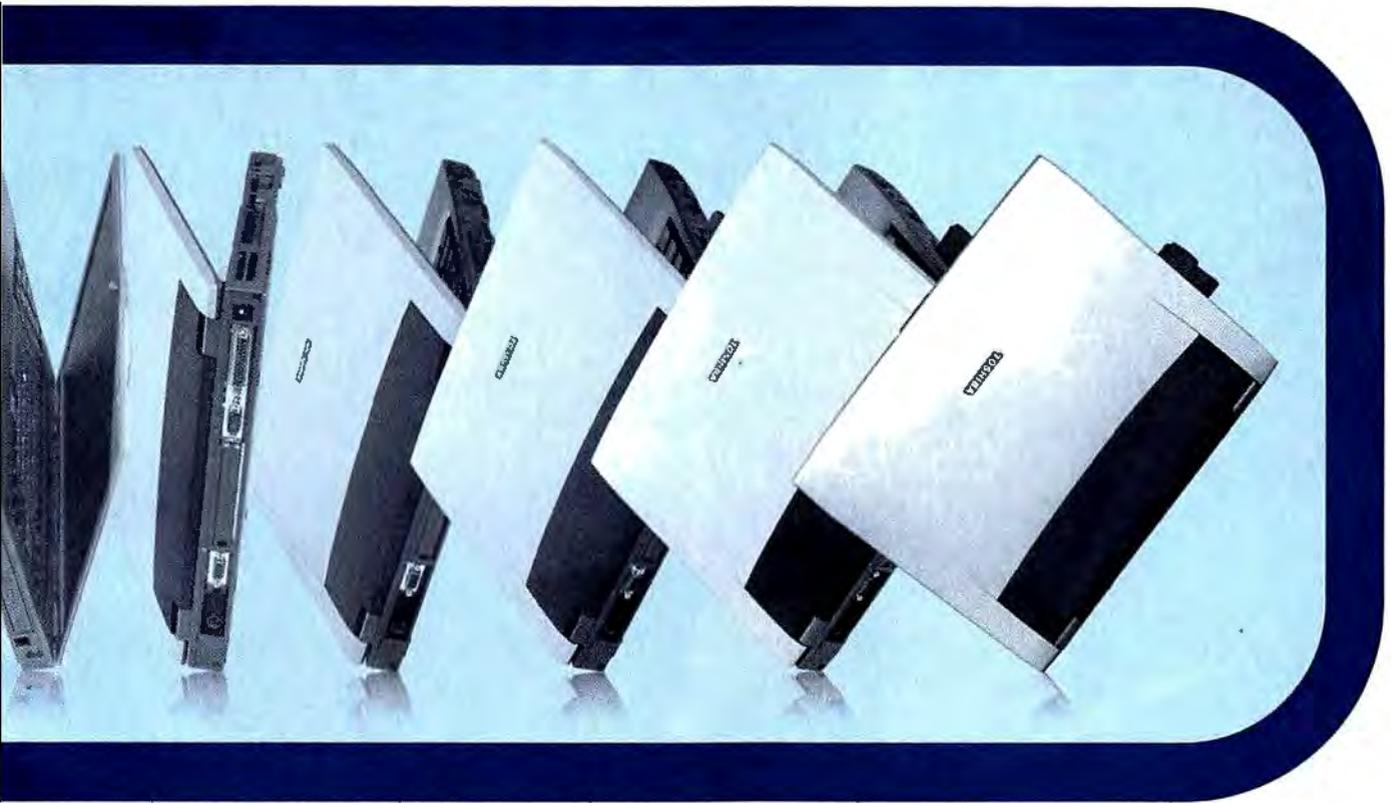
¹The Toshiba Bluetooth PC Card is compatible on Microsoft Windows 98 Second Edition and Microsoft Windows Me. ²When products become available. ³Data transfer rates: 8,112Kbps max. (8X DVD-ROM); 4,104Kbps max. (24X CD-ROM). Bluetooth is a trademark owned by its proprietor and used by Toshiba under license. SPANworks is a registered trademark of SPANworks, Inc. Intel, the Intel Inside logo and Pentium are registered trademarks and Intel SpeedStep

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INK JET PRINTERS

I APPLAUD YOUR new approach of including ink costs for printers ["The Fine Print on Ink Jets," November]. However, I believe you missed a golden opportunity to point out that most printers can be set to produce draft-quality output, which saves a lot of ink.

J. F. Osborne, Cincinnati

I'M CONFUSED by contradictory reviews of the Epson Stylus Color 980 ink jet printer. October's *Top of the News* ["New Ink Jets Offer Big-Ticket Quality at Low Prices"] claimed that this Epson "offers much richer colors, sharper edges, and smoother images" than an older Canon unit. Then in November ["The Fine Print on Ink Jets"], the author says the Epson's color images appear "dotted and foggy, and lacking strong detail"; it also ranked at the bottom of your chart. What happened?

Don Holden, via the Internet

Editor's response: We tested for different capabilities in the two articles. Unfortunately, we didn't explain that the October piece tested for photo-quality prints using the best paper and settings, while the November article tested the printers' output using plain paper and normal settings. Epson printers tend to produce significantly better pictures when you use glossy photo paper and the appropriate photo settings. —Lisa Cekan

NET PHONE FOLLIES

THE ARTICLE "Net Phones: Dialing Without Dollars" [November] inspired some thoughts: Imagine a device that lets you drive your car on railroad tracks. It's not convenient; you frequently derail; you can't go everywhere you want; the ride is noisy, rough, and slow; and you often must wait to

get on—all to avoid a relatively modest highway toll. And if everyone drove on the tracks, the auto traffic would quickly interfere with the tracks' original purpose—to carry trains.

To avoid paying a relatively modest toll on regular phone lines, some people apparently will tolerate poor sound reception, frequent interruptions, busy signals, limited calling locations, and being tied to a cord and a computer, while just a few feet away sits a cordless phone that provides perfect connections every time!

*Kurt Neuswanger
Grand Junction, Colorado*

LONG-LIVED COOKIES

AN OCTOBER *Bugs and Fixes* item describes a patch that asks for permission to place third-party cookies on your PC.

The Cookie Pal 1.5e utility I use is an excellent cookie detector. It's also made me aware of another trait of cookies. Some, it seems, specify an expiration date 30 years in the future. One from DoubleClick, for example, will endure until 11/09/2030. And—topping them all—Lycos has given me a cookie good till 11/08/16214.

Wilbur Bosse, via the Internet

NEARLY ULTIMATE WIRELESS GUIDE

THE "WIRELESS WOES" section of "The Ultimate Wireless Buyers Guide" [October] describes a frustrated reader who could not upgrade his older phone because of a two-year commitment. I have sold wireless products for seven years, and only a few companies lack an equipment upgrade option. A two-year contract is not something I would recommend, and it highlights another problem in our industry: overzealous sales reps with little technical knowledge who push services that their customers don't need.

*Karl Ness, Service Technician,
Verizon Wireless ▶*

HOT BUTTON

'Best and Worst ISPs': Readers Speak Up

WHEN I WORKED in Washington, D.C., earlier this year [2000], I signed up with Bell Atlantic (now part of Verizon) for DSL service ["Best and Worst ISPs," November]. But the company's failure to install on the promised date, its long hold times for support, and other service runarounds led me to cancel, and I went with a local ISP that hooked me up quickly. It uses the services of Covad, a DSL service provider that should be coming to my area soon. I'm holding my breath.

Doug Bishop, Raytown, Missouri

A WORD ON the Canadian experience with ISPs: Canada is one of the most wired countries in the world. For better performance, my ISP (Shaw@home) limits the number of clients per node. My download speed is typically 150 kbps. Shaw provides the network card and cable modem for free. It also wired my home, installed the required software, and configured my machine (on a Saturday, no less) for free. My monthly cost, including

SMB of personal Web space and four e-mail addresses, is \$39.95 Canadian (\$26.50 U.S.) for around-the-clock use.

Paul Elmgreen, via the Internet

YOUR SIDEBAR "Free Me From ISP Fees" has errors about free ISPs. It states, "Registering with a free service usually means handing over copious quantities of private information." True, many ask "lifestyle" questions during registration. But these can often be bypassed, or answered with "other." Most simply ask for your name, your address, and the answer to a "clue" question (such as your pet's name) in case you forget your log-in and password.

Pay-for-service ISPs are required for activities like online gaming and Web hosting. But for the average Internet user who browses EBay, buys airline tickets, checks the weather, and writes a few e-mails, the free ISPs can't be beat.

Jeff Nine, via the Internet



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**E-CONTENT VERSUS E-BOOKS**

"PULP FRICTION: E-Books Take On Paper" [*Top of the News*, November] focused on the pros and cons of e-books as part of the information delivery revolution. I doubt that I would soon want to read a long e-book using any of the reader devices the article described. I do, however, use my Pocket PC (a Compaq IPaq 3650) and the AvantGo browser to download daily content from newspapers and online magazines.

I now read this "e-content" on the train while commuting to and from my Chicago office. The Pocket PC has changed my reading habits. I feel it has made me better informed on a wider variety of subjects, and I read content that I would skip if I saw it in print media.

Paul M. Lurie, Evanston, Illinois

A GAP IN E-LEARNING

I WAS EXCITED to see "Get Smart: The Pluses and Minuses of E-Learning" [*New Products*, November], hoping finally to read a review of the different online learning programs. Imagine my disappointment when accredited, degreed online programs weren't even mentioned.

I understand you listed only e-learning Web sites that mainly offer individual classes, but I think accredited programs could at least have been mentioned, especially when institutions like Capella University offer bachelor's degrees with courses in e-business, Web development, and project management.

Theresa London, St. Joseph, Missouri
Editors' response: Many colleges and universities use e-learning as part of their teaching methodology, but we did not include detailed information on their programs because we plan to cover that aspect of e-learning separately. —Linda Grubbs and Mick Lockey

PC World welcomes letters to the editor. We reserve the right to edit letters for space. Send e-mail to letters@pcworld.com. ■

CORRECTIONS AND CLARIFICATIONS

IN SEPTEMBER'S *New Products*, Plextor's contact number should have been listed as 800/886-3935.

PC World regrets the error.

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Resolutions for Smart Buyers

12 tips for avoiding rip-offs, scams, and other shopping hazards in 2001.



I'VE GIVEN UP making New Year's resolutions. It's not that I'm not interested in self-improvement—I could use a gym membership as much as anyone, and I really am planning to start piano lessons again. But I've learned that documenting my unachieved goals in a to-do list accomplishes only two things: It reduces their chances of ever getting done, and it increases my anxiety level.

But one resolution does make sense: vowing to be a savvy consumer. After reading hundreds of letters from unhappy customers looking for help from *PC World*, I'm confident that by avoiding a few common pitfalls, we can all save ourselves a few bucks and a lot

of headaches. So maybe I won't be playing Liszt concertos by next summer, and earning my black belt in karate is more likely to coincide with my son's high school graduation than his upcoming seventh birthday. But by following these rules you and I can be smarter—and safer—consumers whenever we pull out our wallets in 2001.

1. Know your vendor. Before buying anything, research thoroughly the company you're considering dealing with, especially if you've never heard of it before. Look for feedback from other customers at online discussion forums or at sites like consumerreview.com and get a free company report from the Better Business Bureau (www.bbb.org). If you're buying a PC, check *PC World's* ratings of companies' reliability and service (see "In Search of Trouble-Free PCs" in this issue). If you're buying online, make sure the company's Web site lists a physical street address and full contact information, including a toll-free phone number and e-mail links to customer service and tech support.

2. Review the warranty. Be sure you fully understand the warranty details before you purchase. All retailers—traditional and online—must provide written warranties for all products they sell, but these are sometimes hard to find or out of date. Ask for the complete and most current version—and read the fine print. Common gotchas include companies' replacing faulty components with refurbished—instead of new—parts and forcing you to pay to ship back a malfunctioning machine.

3. Get the scoop on shipping and handling. When you're buying, make sure you get a total charge amount—including shipping costs—before you authorize payment. Also, a vendor should never charge your credit card until it has actually shipped the purchased item, so nail down a ship date when you place an order, and check your account status regularly.

4. Learn the return and refund policy. What if you get the goods and they're not so good after all? Before you buy, know your options if you decide to return your purchase for replacement or a refund. Ideally, look for a 30-day, no-questions-asked replacement or refund policy. Ask when the clock starts ticking—that 30-day window sometimes opens when your order leaves the vendor's warehouse, not when you get it. Also, find out whether it stops ticking when you request to return the item or when it arrives back at the vendor—a requirement that can ►

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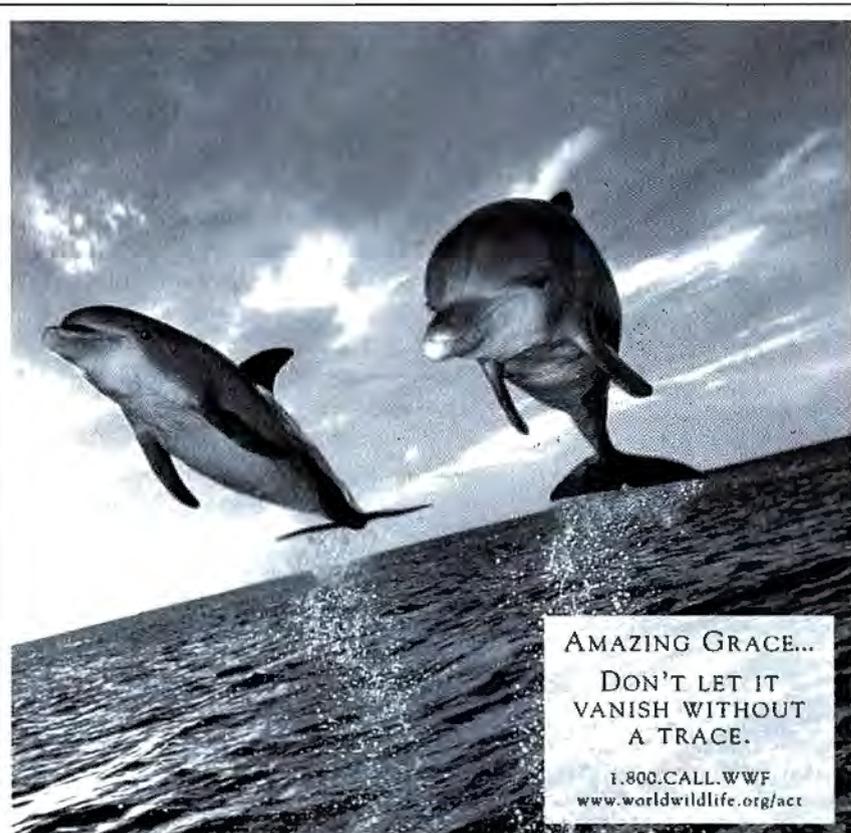
make returns significantly more difficult. Finally, try to steer clear of restocking fees—some sellers charge as much as 20 percent of your purchase price to accept an item you return for any reason.

5. Always use plastic. Credit cards offer the best protection against purchase problems ranging from shipping errors to faulty products to vendor fraud. Just remember that most credit card companies impose a 60-day limit on claims against a vendor, so don't delay if you have a problem. Many premium credit cards, such as American Express Optima and Visa Gold or Platinum cards, provide additional, free warranty coverage for purchases made with those cards.

6. Protect your plastic. Consider using an online payment protection plan such as Private Payments, offered by American Express. Private Payments assigns an individual transaction number to each online purchase and limits the vendor's access to your permanent account number. Many banks and credit companies offer similar online protection services. Again, check on your options.

7. Write a letter. If you get a raw deal, let the culprits know—in writing. If calling doesn't help resolve a dispute with a vendor, sit down and calmly write a letter describing the problem and suggesting a reasonable solution. Carefully document and refer to any previous communications, using names and dates, and send it, certified, to the president of the offending organization. (Okay, it probably won't actually get to the head honcho, but it's more likely to reach someone who will help.) For extra clout, send copies to the BBB and the attorney general's office in the company's state. Conversely, don't forget to stroke the good guys: If you're treated particularly well, let the company know you appreciate its exemplary service.

8. Spread the word. Report your experiences—bad and good—to online discussion groups and consumer forums such as consumeraffairs.com, planetfeedback.com, and deja.com, and to *PC World's On Your Side* column (onyourside@pcworld.com). Some resources also have consumer advocates who can assist in resolving problems with vendors. ▶



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Astra 6400



Astra 6450



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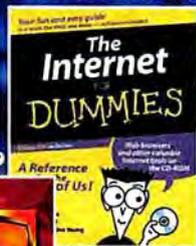
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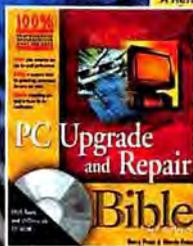
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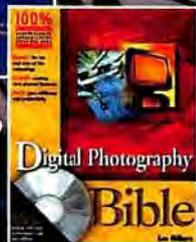


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9. Know the risks of online auctions. The deals can be tempting, but both the FBI and the Federal Trade Commission report a steady increase in Internet auction fraud since 1998. While some sites offer insurance and other limited protections, most claim to be only a meeting place for buyers and sellers and accept no liability if a deal goes sour. For more information on many potential traps, see last October's article on online auction scams, "Going... Going... Gotcha!" at www.pcworld.com/oct2000/auctions.

10. Use an escrow service. If you decide to make a big purchase from an auction site, consider using an escrow service. These services, which typically charge as much as 5 percent of the total purchase price, hold your payment and forward it to the seller only after you've received and approved the purchased goods.

11. Read sites' privacy policies. Until laws are enacted to defend our privacy online, companies' privacy statements are all we have. Make sure the site you're considering doing business with posts its privacy policy prominently—and read it carefully. Sites that share your information with others should notify you that they're doing so and let you opt out. If you can't find a site's privacy policy or aren't comfortable with it, take your business elsewhere—and let the site know why you did.

12. Don't tell all. Obviously, online retailers need some information to send you a product. But before you fill in every field on any Web site's form, ask yourself whether the information is essential for the transaction. For example, unless you're requesting a credit report, there's no reason to divulge your Social Security number. Also treat with discretion such information as your mother's maiden name (often used to verify ID) and your driver's license number.

I can't promise that if you stick to these resolutions you'll look better in a swimsuit, be better read, or have more success at work. But at least you will be less likely to get ripped off. And that counts for something, right?

Anne Kandra is a contributing editor for PC World. ■

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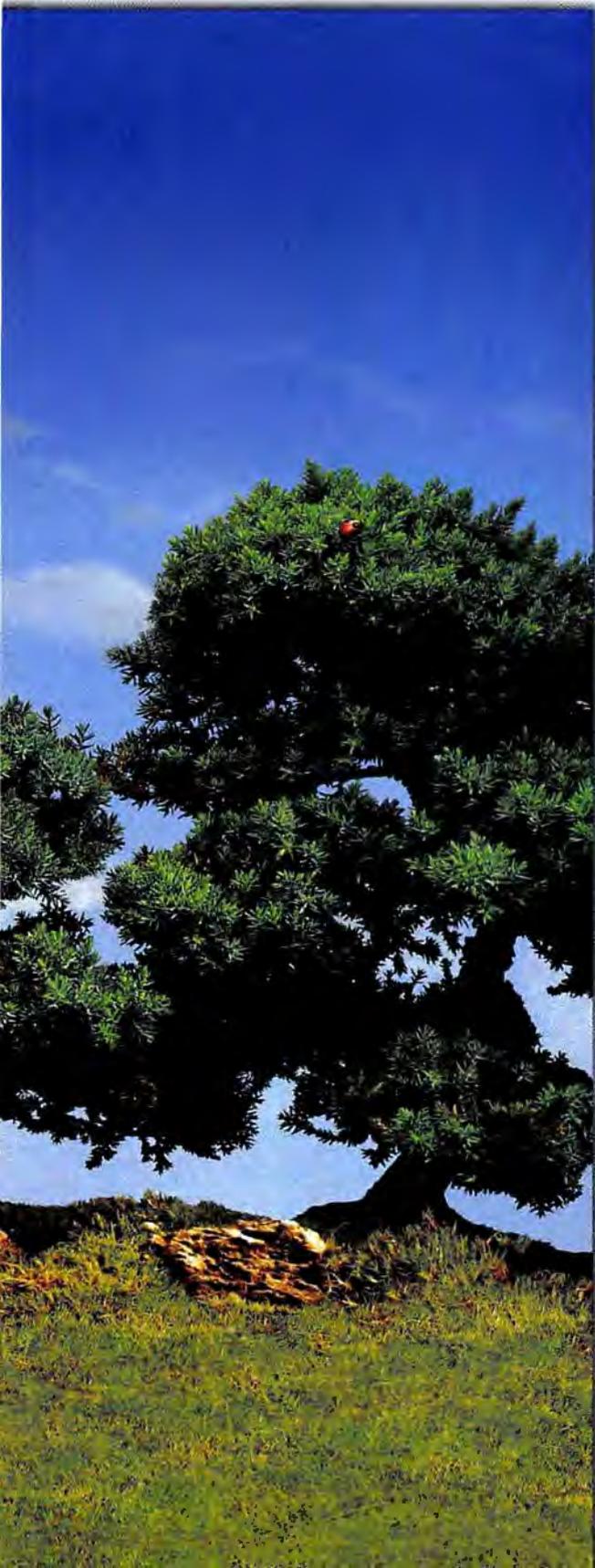


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Refurbished PCs: What's the Deal?

WHEN IT WAS TIME to upgrade his five-year-old Pentium-75 Gateway computer, Scott Noren of Columbus, Georgia, considered buying a refurbished PC. Refurbished or remanufactured PCs are usually unwanted units returned to the manufacturer, which are then tested, polished

up, and resold at discount prices. Noren thought it was a good idea—until he picked up the phone. "Gateway said it wanted \$899 for a refurb, and it offered only a one-year warranty," he recalls. "I'd have to pay an extra \$199 to get [my preferred] three-year warranty."

By buying a refurbished computer, you can save 5 to 15 percent (and sometimes more, if you buy an older system) off the price of a new PC. For example, as we went to press, a brand-new Pentium III-733-based Dell Dimension with 64MB of RAM (without monitor) cost \$928. A similarly configured refurbished Dell PC cost \$719—that's \$209 less.

Still, the drawbacks could outweigh the savings. Beware of shorter warranties, the details of which vary from brand to brand.



Dell and Micron, for example, offer the same warranty on refurbished PCs as on new systems. Gateway reduces its warranty from three years to one; and Compaq, HP, and IBM offer just 90 days of hardware coverage. The vendors' money-back guarantees are skimpy too: Dell offers 14 days, Gateway 5, and Micron 0.

You can't custom-configure or get the latest technology with a refurbished unit either. At press time, the most up-to-date refurb from Gateway sports a 500-MHz Celeron CPU, whereas the corresponding new model has a 667-MHz Celeron.

So before you buy, balance the potential savings against the likely limitations of refurbs—skimpy warranties, limited product choice, and aging technology. For his part, Scott Noren abandoned the idea of buying a refurb in favor of a new PC.

Heads Up...



Bad Batteries in Dell Laptops: The company is recalling defective batteries that shipped with certain models of its Latitude and Inspiron notebooks. These batteries can short-circuit, even when they're not in use, creating a fire hazard. For a list of the notebook models and batteries affected by this problem and to exchange a recalled battery for two replacement ones, call 877/741-6420 or go to support.dell.com/battery... **Dell Delays:** Despite Dell's top ratings in *PC World's* PC Reliability and Service survey (see page 108), I've received complaints about shipping delays. David Garvett was shocked to find out that his new Dell wouldn't arrive for seven weeks. (Delivery usually takes a week.) Geoffrey Sanders, Dell's manager for executive support, explained that certain components—namely, hard drives and controller cards—were unavailable. "We've replaced those components, so customers can expect delivery within three to five days, which are estimated, not guaranteed," says Sanders... **MSN Mayhem:** Customers of Microsoft's MSN ISP service have reported some billing errors. MSN was testing a new billing system, which assessed some improper charges. Affected users can get a refund and a month of free Internet access. Call 800/386-5550 for information.

LETTER OF THE MONTH



I BOUGHT Sony's Clie organizer directly from the company's Web site (www.sonystyle.com) for \$450, plus an extra \$18 for next-day delivery. Two weeks passed and I didn't get my handheld. I wanted a refund, but Sony told me it could only refund the shipping charge; it couldn't cancel the order because the Clie was still in stock. According to the company, in order to get a full refund, I'd have to wait until I received the package and then refuse delivery. Can you help?

Michael Yucha
Milpitas, California

On Your Side responds: We contacted Sony on Yucha's behalf and the company responded by issuing him a full refund immediately. "Last July, we introduced a beta version of sonystyle.com," says Sony spokesperson Grace-Anne Arnold. "During the transition over subsequent months, we had a glitch in the flow of orders on our Web site.

Unfortunately, Mr. Yucha's purchase got caught in the process." Arnold also informed us that Sony expects to have an improved refund-procedure area on the company's site by the time you read this article. ■

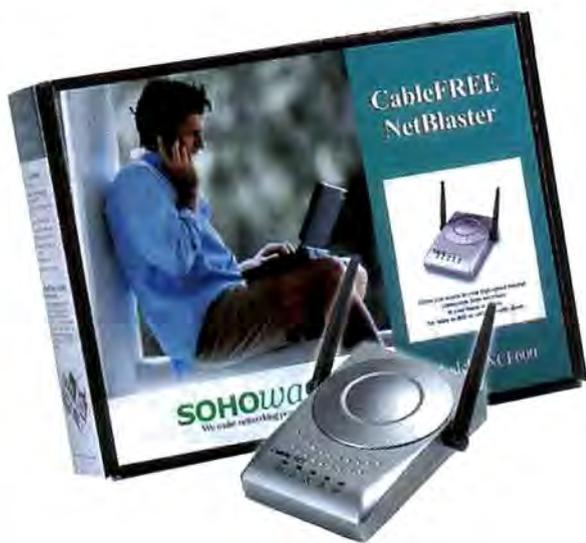
GOTTEN A RAW DEAL?

Or a great one? E-mail the details to onyourside@pcworld.com. We'll follow up on complaints and publish items of the broadest interest. Aoife McEvoy is a senior associate editor for *PC World*.

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If you're looking to network your home or office, and share high-speed DSL/cable modem access without wires, our CableFREE wireless networking solution is the perfect way to go. Here's what *PC Magazine* (11/7/2000) had to say about it:

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The Web? On a Phone? Good Luck!

I GOT A package in the mail from Amazon.com today. Ordinarily, this would not bear mentioning—geez, it's not even my first Amazon delivery of the week. But this order (six timeless episodes of *The Avengers* on videotape) was a first: I placed it a few days ago using my Web-enabled

cell phone while lounging beneath a potted tree at my local mall.

Okay, I was shopping this way...well, primarily because I could. But I was also knee-deep in real-world research for this column. As you may know, service plans from such national wireless providers as AT&T, Sprint, and Verizon include Internet access. And Amazon, Excite, Lycos, MapQuest, MSN, and Yahoo (among other big names on the Web) have developed phone-enabled versions of their sites.

So is the Web-by-phone revolution upon us? Not really, judging from my first few weeks with a Net-capable Motorola Star-



Tac phone and Verizon's Internet service. True, the concept is full of potential. But just about everything related to the Internet needs rethinking before Web phones will be truly useful. There's still a great deal of work to do.

No Web site is truly accessible by phone unless its proprietor has designed a special phone-ready version. And downsizing a modern site for use on a pocketable device with a monochrome screen and no keyboard or mouse is a colossal challenge. Color and splashy graphics are out of the question; even text must be boiled down to its bare essence. You might as well try to rewrite *Alice in Wonderland* in haiku.

New on the Net...



Whither WebHouse? In the November Web Savvy (www.pcworld.com/nov2000/priceline), I reported on my lackluster experiences with Priceline.com's WebHouse Club, a name-your-own-price service for groceries and gas. No sooner did my column appear than WebHouse was shut down. Since then, I've heard from some WebHouse fans who wonder if any similar services exist. Not really, but Carclub.com, a Web-based auto club that offers a 10 percent discount on gas, is angling for former WebHouse customers...

More Free Advice: Web megasite Yahoo now offers Yahoo Experts (experts.yahoo.com), a service that lets you post questions on any topic and get free answers from real people. As with Abuzz (www.abuzz.com) and other rivals, Yahoo's "experts" are self-proclaimed, so the quality of their counsel varies wildly. Part of the fun is perusing all the queries ("How can I tell when a hen is getting old?").

Accessing sites using a Web-enabled phone is no walk in the park, either. My StarTac reveals only three 15-character lines of Web content at a time; just glancing at news headlines requires a ludicrous amount of squinting and scrolling. And typing words via numeric keypad is even worse: Entering my 14-character name takes a finger-numbing 33 keystrokes.

If future phones overcome these hurdles, you still probably won't want the full-blown Net experience in mobile form. Most folks use cell phones when they're on the go and in a rush—dashing through the airport, say, or heading into a meeting. (Or maybe hightailing it down the highway. You know who you are.) That's why the wireless Web works best for quick jolts of time-sensitive information such as stock quotes or driving directions. ▶

GIMME FIVE

E-Books for Everybody



WILL ELECTRONIC books kill off the printed word anytime soon? Probably not. But they're worth checking out at these nifty sites:

1. Project Gutenberg: An indispensable e-library of thousands of public-domain works by everyone from Machiavelli to Edgar Rice Burroughs. www.gutenberg.net

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3. MemoWare: If you have a Palm organizer, get to this site for more than 6000 texts that turn your handheld into an e-book. Nearly all are free. www.memoware.com

4. BiblioBytes: More than 370 free books you can read right in your Web browser—gambling advice, religious theory, and much more. www.bb.com

5. MightyWords: Authors post their work here in Adobe Acrobat format and charge as little or as much as they see fit. This site could offer a preview of the future of publishing. www.mightywords.com

Even these simple applications often left me vexed. MapQuest will give you driving directions, but tapping out street addresses takes an eon. It's enough to make you pull over and plead for navigational help from the nearest stranger. For similar reasons, the e-mail features at wireless portals such as Yahoo Mobile are useful primarily for checking your in-box for urgent messages; composing and sending e-mail is just too unwieldy.

Many sites also suffer from cryptic menus and poor organization. At MSN Mobile, I rummaged through sections called *Find a...*, *Local Info*, and *Entertainment* in hopes of finding movie schedules. Eventually, I figured out that MSN Mobile doesn't do movies yet (it does have details on live theater and museums).

Yahoo Mobile, by contrast, had my movie info neatly filed under *Movies*. It also remembered stuff I'd told Yahoo while on my PC (such as my zip code and news preferences) and tailored its infor-

mation accordingly. In other words, it functioned as a satellite of the full-fledged Yahoo site, not as an island unto itself—and that, I'm convinced, is the smartest strategy for phone-enabled sites to take.

Ordering those *Avengers* videos was surprisingly painless. Amazon already knew my credit card details, address, and shipping preferences, so the tapes were on their way to me after a few clicks. Which leaves only one question: Just how often is anyone going to feel a burning desire to buy a video, book, or CD via cell phone?

THE VOICE CHOICE

ONE THING'S for sure: Web phones won't bring Jetson-style convenience to our lives until their user interfaces evolve from their current Flintstonian state. For now, services like BeVocal (www.bevocal.com) and Tellme (www.tellme.com) provide an intriguing alternative. Using voice recognition and text-to-speech technologies, these services deliver much of the

F Y I

THIS WON'T COME AS MUSIC to the recording industry's ears: A new survey reports that 78 percent of Internet users who download tunes from services such as Napster don't think that it's stealing.

SOURCE: PEW INTERNET PROJECT

same info as phone-enabled Web sites. And they do it from any phone—no typing or reading required. You navigate menus with voice commands, and the services read everything from stock quotes to restaurant reviews to you.

Listening and speaking, after all, make for an uncommonly intuitive user interface. Alexander Graham Bell knew that. And the companies that are racing to bring the Web's riches to cell phone users shouldn't forget it.

Contact PC World executive editor Harry McCracken at websavvy@pcworld.com. ■

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Uninvited Icons Cause More Than Clutter

MY MOTHER CALLED recently, asking me to fix her PC. It seems her monitor was listing to the right, apparently from the weight of the nine icons in her system tray (the area in the taskbar next to the Windows clock). System tray clutter isn't unusual: A poll of the user group I run indicates that most people have five or more items in their tray. If you're like many of the poll respondents, you don't know the function of all the icons you have, you don't want them in the system tray, and you'd like to know how to remove them. Your wish is my command.

The fewer icons you keep in your system tray, the better. Every icon represents a program that may be gobbling system resources, even if it's not doing anything. And the lower your PC's resources, the worse its performance. I keep just three icons in my system tray, all of which I really need: AdSubtract to block cookies and ads, ZoneAlarm for firewall protection, and Second Copy for quick backups.

ICONOCLASM 101

THE SAFEST WAY to remove a program's icon from the system tray is to use the application's own remove-icon option. Sometimes you can find this by right- or left-clicking the icon, but other times you must open the application. Look for 'Options' or 'Preferences', and hope the application offers a choice similar to 'show icon on task bar'. If it does, uncheck or otherwise deselect that option. If it does not, you'll have to take more drastic measures. First, see what programs Windows loads when it starts up. Select *Start+Run*, type *msconfig*, press *<Enter>*, and click the *Startup* tab. Uncheck all the items you recognize and are sure you don't need. In my mom's tray, I discovered icons for a long-



I point a finger (no, not that one) at the many installation routines that arrogantly dump items in the system tray.

abandoned fax program and three other programs she rarely used. When you're done, click *OK* and restart your computer. For more removal details, consult "Let My Resource Go" at www.pcworld.com/hereshow/free_ram.

But how do you block new icons from taking up residence in your system tray? *StartupMonitor* is a neat utility that tells you when a program is about to load an icon into the tray and lets you prevent it from doing so. If you *must* keep many items in your system tray, minimize the clutter by using *TraySaver*, a clever tool that selectively hides icons. Both of these handy programs can be downloaded from PCWorld.com's Downloads.

INSTALL WITH CARE

THERE ARE REASONS why your system tray may be overloaded. First, I point a finger (no, not that one) at the many in-

stallation routines that arrogantly dump items in the tray. For instance, Real Networks' *RealPlayer* adds an icon or two to the tray without permission. And the icon is unnecessary because *RealPlayer* loads automatically when you click on a file associated with it. To get rid of the icon, right-click it, choose *Preferences*, select *Settings* on the General tab, and either deselect *Enable Start Center* or choose to show the icon only when you receive a message. But we users share the blame. Most people (me included) consider installations trivial and rarely pay attention when doing one. Not a good idea. Much of the trouble I have with my PC—from extra icons to a hosed system—occurs immediately after I install something.

You can do several things to steer clear of installation problems. Heed setup programs' warnings to close all other applications. The new program may need access to a file or resource that an open program uses, which could honk up the installation. And leading propellerheads agree—*Installatus Interruptus* is a disorder to avoid. If an installation does go bad, you'll wish you had a way to get yourself back to the status quo ante. *Adaptec's GoBack* restores hard drives to their state a few days, hours, or minutes earlier. Try it at PCWorld.com's Downloads.

Many new programs let you customize their installs by asking many questions and giving you lots of choices. Besides avoiding system tray litter, you can stop programs from adding icons to the Start menu and desktop. So resist the urge to click the *Next* button before you read any other word in the installation window. Amazingly, some of the information on those screens is actually useful.

Uh-oh, Mom's on the line again. Seems her microwave oven picks up the Disney Channel whenever she defrosts a chicken. Anybody got Michael Eisner's number?



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More Microsoft holes ♦ Outlook crashes ♦ HP Pavilion CPU confusion

Prevent One-Click Hack Attacks

IF YOUR NAME is Microsoft, you may be an 800-pound gorilla, but you can never sleep. You're the target of every bug hunter and hacker out there. So it's no surprise that sleuths have exposed a new swarm of bugs in Microsoft's products. The most serious problems this month affect Internet Explorer and some versions of Windows. With these flaws, one fatal click by you could allow PC pirates into your machine.

BUG The first hole could allow a hacker to take over your computer and even reformat your hard drive. Here's how it might happen: A malicious Web site operator tricks you into clicking a specially crafted link at a Web site or in an e-mail message formatted in HTML. If you fall for the trickery and your system runs any version of IE (including the latest version, 5.5), you're vulnerable. The flaw lies in the Java Virtual Machine (or VM) that works with IE. The purpose of the VM is to run Java applets securely. Java applets perform a range of tricks to enliven drab Web pages—from popping up new windows to playing a song. The weakness would let a malicious hacker bypass the VM's security and wreak havoc on your PC.

FIX Microsoft is shipping updated versions of the VM to prevent hackers from sidestepping its built-in security. You first need to figure out which of the several versions of the VM your PC has; then you pick the appropriate patch. To determine which version you have, visit microsoft.com/technet/security/bulletin/fq00-075.asp. To get the patch you need, go to microsoft.com/technet/security/bulletin/ms00-075.asp. Alternatively, you can



Media Player Brings Outlook to Its Knees

MICROSOFT DISCOVERED a problem with one of the controls supporting its Media Player 7 that could enable an attacker to crash Outlook or Outlook Express. The problem lies in a piece of code called an OCX Control that's associated with the Media Player—though it's not part of the Player proper. The OCX Control provides support functions to the player. The hacker could send you a copy of the control embedded in a Rich Text Format (RTF) e-mail message. (Ordinarily, the control would not be embedded in a message, so its inclusion can't be accidental.) When you open the infected message, it will crash your e-mail. Get the patch at microsoft.com/DownloadsRelease.asp?ReleaseID=24421. For more details, visit microsoft.com/technet/security/bulletin/fq00-068.asp.

I N B R I E F

Windows Me Video Drivers Lag Behind

USERS REPORTED that some video drivers shipping with Windows Me are out-of-date. If you installed Me and are having trouble with the video card, check the maker's site for updates. Microsoft says that it also updates drivers as they become available, at windowsupdate.microsoft.com.

HP Pavilion Identity Crisis

A SMALL NUMBER of owners of HP's Pavilion 8755C PC (equipped with a Pentium III-800 processor) got a nasty surprise when they checked the PC's configuration. Windows incorrectly told them that the 8755C has a Celeron CPU instead. HP plans to have a BIOS fix by the time you read this. For more details, go to www.hp.com, select *Support*, click the link for *Home PCs*, and type 8755C.

get a version of the VM that fixes both this problem and another, less-significant bug in the VM; get this double-barreled fix at microsoft.com/technet/security/bulletin/fq00-081.asp.

BUG South American firm Underground Security Systems Research discovered a particularly nasty bug that could allow hackers to easily snare Windows users—as with the first bug, all it takes is one click. Imagine you're surfing the Web and you click an innocuous-looking hyperlink or a link in an e-mail message. This link, however, secretly starts up a Windows utility called HyperTerminal and uses it to take over your machine. Even if your PC doesn't have HyperTerminal running (or if you've never used it), the link automatically starts the program, deliberately crashes it, and allows a cunning hacker to run arbitrary code on your system. HyperTerminal is an old program that lets you connect to a remote PC over the Internet using DOS-like commands. Rarely used, it still ships with current versions of Windows. If you run Windows 95, 98, or Me, your machine could be at risk.

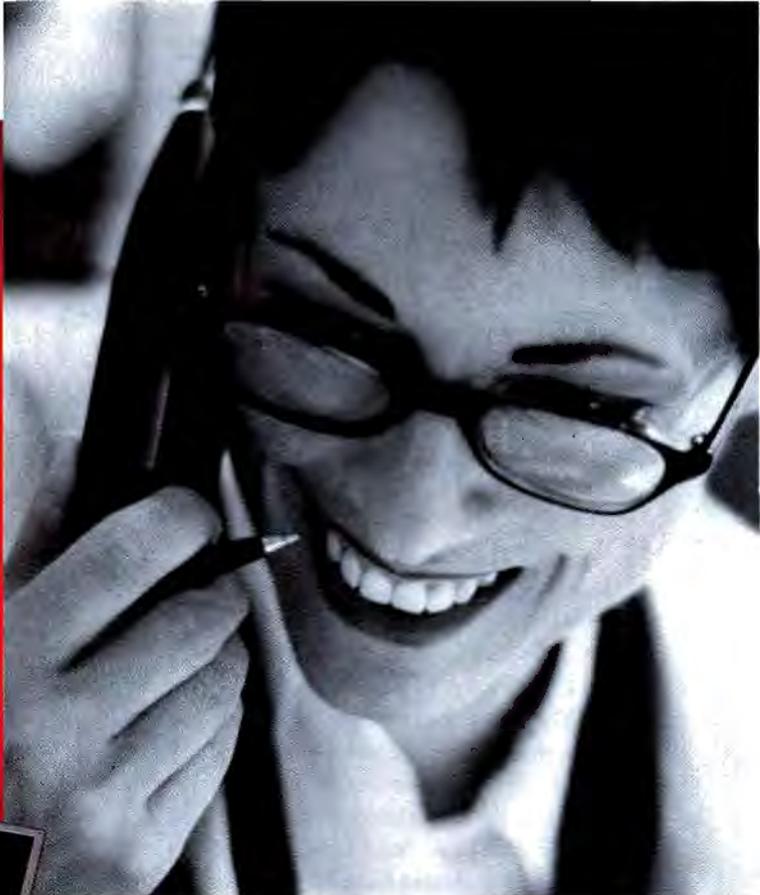
FIX Microsoft provides several different patches that prevent hackers from taking advantage of HyperTerminal. Check out the security bulletin to figure out which one you need. The bulletin is posted at microsoft.com/technet/security/bulletin/ms00-079.asp. For additional details, check out the slew of FAQs at microsoft.com/technet/security/bulletin/fq00-079.asp.



You'll find files from this article at www.pcworld.com/downloads. Stuart J. Johnston is a contributing editor for PC World. He is based in Bellevue, Washington. ■

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TOP OF THE NEWS

Pentium 4 Boon or Bust?



INTEL'S long-awaited Pentium 4 is big, powerful, and ready for new worlds, but where will it take today's PC users?

Formerly known by the code name Willamette, the P4 has been Intel's Next Big Thing for years. When rival AMD leapfrogged Intel with its 1-GHz Athlon chip, some experts sniffed that Willamette would eclipse it. Intel itself released a 1-GHz PIII—impressive, reviewers said, but wait till you see Willamette.

PC World has tested the P4 and looked into its design, and it's clear that the CPU was made to fit Intel's vision of a computing future heavy with 3D graphics as well as audio

and video streaming—a "Visual Internet," to use Intel's term. Unfortunately, for most of us that future seems quite distant and chimerical.

As our tests show, right now most users will be served every bit as well—if not better—by older PIII and Athlon PCs.

WHAT'S THE SCORE?

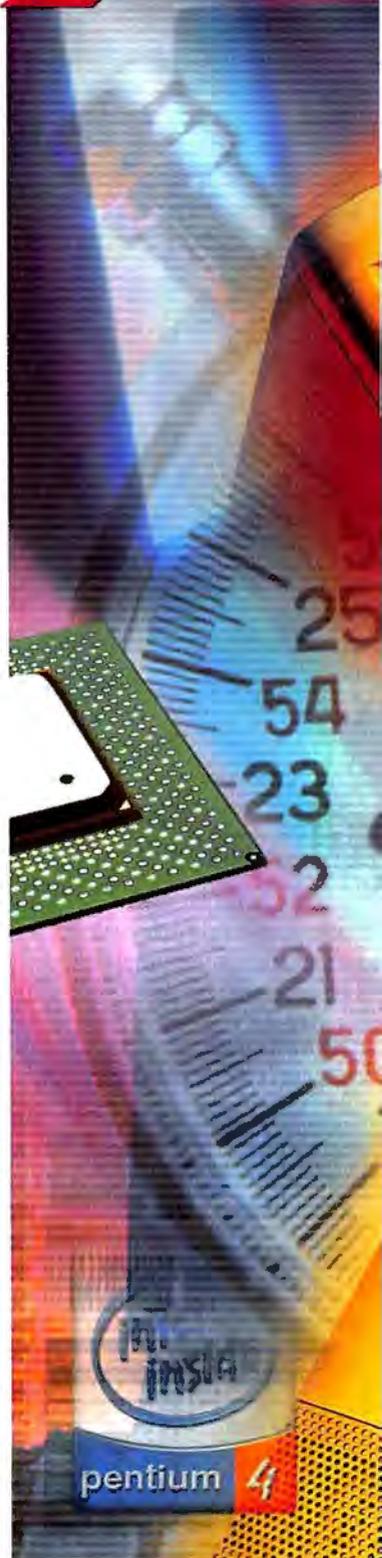
IN OUR TESTS, PCs with the new processor barely kept pace with the 1-GHz PIII units we used for comparison and even fell behind these older

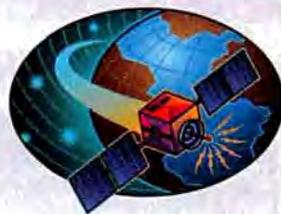
systems on some measures (see the test reports on page 50). Against a 1.2-GHz Athlon PC with DDR (for details, see December's *Top of the News*, www.pcworld.com/dec2000/athlon), the P4 fared worse.

All tested PCs had 256MB of RAM and ran Windows Me. All P4 and Athlon systems also had hard disks of 31GB or more and NVIDIA GeForce2-based graphics cards.

The 1.2-GHz Athlon system we tested, Micron's Millennia Max XP, scored 180 on our ▶

Intel's long-anticipated Pentium 4 boasts a new design and 1.5-GHz speed. What does that mean for your work? PC World tests the new chip to separate hype from reality. ♦ **By David Essex**





Product Pipeline

► **Yahoo Does Pagers:** Yahoo has lent its name and content, such as Yahoo Mail and instant messaging, to a wireless service known as ELink Fortified With Yahoo. For access, you'll need a \$335 RIM Wireless Handheld device as well as service (\$15 to \$35 per month) from Yahoo's partner Motient. Check www.elinkhere.com and shopping.yahoo.com to purchase.

► **Casio Opts for Transmeta:** Casio has announced a new Cassiopeia FIVA model that uses Transmeta's Crusoe chip. Expected to launch in the first half of 2001, the 2.1-pound subnotebook will have an 8.4-inch active-matrix LCD and use Windows Me. Its projected battery life is between 5 and 10 hours. The new system should sell for less than \$2000.

Tidbytes

► **Virgin Drops Webplayer:** Virgin has discontinued its free Webplayer program, which provided Net appliances in exchange for data on users' surfing habits and on-line purchases. About 10,000 players are being recalled; users will be notified by mail. Virgin's partner, Internet Appliance Network, promises to delete all collected data except user names and contact information. For details, see www.virginconnect.com/help/faq_ian.html. ►



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P4 Not So Great for Traditional Business Apps...

MODEL	CPU	RAM (MB)	Level 2 cache (KB)	Graphics chip set	Graphics memory	PC WorldBench 2000 score	Faster
Dell Dimension 8100	Pentium 4-1500	256 RDRAM	256	NVidia GeForce2 GTS	64MB DDR SDRAM	162	
Gateway Performance 1500	Pentium 4-1500	256 RDRAM	256	NVidia GeForce2 Ultra	64MB DDR SDRAM	164	
IBM NetVista P4	Pentium 4-1500	256 RDRAM	256	NVidia GeForce 2 GTS	64MB DDR SDRAM	163	
Micron Millennia Max	Athlon-1200	256 DDR SDRAM	256	NVidia GeForce 2 GTS	64MB DDR SDRAM	180	
Gateway Performance 1000	Pentium III-1000	256 PC133 SDRAM	256	NVidia GeForce 2 GTS	64MB DDR SDRAM	167	
HP Pavilion	Pentium III-1000	256 PC133 SDRAM	256	NVidia GeForce 2 GTS	32MB DDR SGRAM	158	
One system	Athlon-1100	256 PC133 SDRAM	256	NVidia GeForce 2 GTS	64MB DDR SDRAM	180	
One system	Athlon-800	256 PC133 SDRAM	256	NVidia GeForce 2 GTS	64MB DDR SDRAM	153	

HOW WE TEST All systems are tested with PC WorldBench 2000, PC World's application-based benchmark. A higher score on PC WorldBench 2000 is better. All rights reserved. Number highlighted in red represents best score.

PC WorldBench 2000 suite of office-application tests and surpassed the top-performing P4. Gateway's Performance 1500, by about 10 percent. One of our 1-GHz PIII units, the Gateway Performance 1000, also beat all three P4 machines, though just by a nose. We doubled RAM to 256MB on an older 800-MHz

PIII system we had previously tested and again obtained nearly the same results. Intel has stated that the P4 was not designed to speed up standard office applications, but we had expected to see some improvement in performance.

The P4 PCs began to pull even with Pentium III systems when performing media

encoding, one touted strength of the new chip. But even on our tests with MusicMatch Jukebox and Windows Media Encoder (the software behind the Windows Media Player), which involve timing the conversion of audio files from one format to another, the 1.2-GHz Athlon bested the P4. The same pattern was evident

on both the Adobe Photoshop test and the floating-point-intensive AutoCAD and Unreal Tournament tests.

In fact, the P4s excelled on only one test. When we used Windows Media Encoder to convert an .avi file to .wmv format, the P4s performed the task in 52 to 54 seconds—at least 14 seconds faster than

SUPPLEMENTAL PERFORMANCE TESTS

TEST REPORT

...but New Chip Shines on Video Conversion

MODEL	CPU	L2 cache (KB)	Windows Media Encoder audio file (seconds)	Windows Media Encoder video file (seconds)	MusicMatch (seconds)	Multitasking background task (seconds)	Multitasking foreground task (seconds)	AutoCAD (seconds)	Unreal Tournament (frames per second)	Photoshop 5.5 (seconds)
Dell Dimension 8100	Pentium 4-1500	256	88	53	75	323	59	583	67	144
Gateway Performance 1500	Pentium 4-1500	256	86	52	74	324	57	575	75	141
IBM NetVista P4	Pentium 4-1500	256	86	54	74	326	57	605	60	142
Micron Millennia Max	Athlon-1200	256	71	68	66	317	43	448	83	115
Gateway Performance 1000	Pentium III-1000	256	88	71	105	326	55	594	70	141
HP Pavilion	Pentium III-1000	256	90	76	105	324	59	619	66	144
One system	Athlon-1100	256	80	78	72	319	43	491	68	126
One system	Athlon-800	256	107	104	98	326	58	665	56	168

TEST **HOW WE TEST** In the AutoCAD 2000 test, we time the Autodesk Group International's AUGI Gauge benchmark, which runs computer-aided drafting tasks. In the Unreal Tournament test, we run the included demo and report its results. In the Photoshop 5.5 test, we time the running of a macro that applies a series of filters to a 1.6MB image file. In the MusicMatch encoding test, we time the conversion of a raw 14.3MB .wav file into an .mp3 file using MusicMatch Jukebox. Using Windows Media Encoder, we time the conversion of an 8.9MB .mp3 audio file to .wma format; in a separate test, we time the conversion of an 11.2MB .avi video file to .wmv format. To test multitasking performance, we timed three operations in Microsoft Access 2000 in the foreground while downloading a file from a Web server in the background. A higher score on Unreal Tournament is better; in all other cases, lower is better. Number highlighted in red represents best score.

the 1.2-GHz Athlon system, and 17 seconds faster than the fastest 1-GHz PIII PC.

A multitasking test timing a typical Internet scenario—downloading a file in the background while performing Microsoft Access tasks in the foreground—ran no faster on our P4s, despite Intel's indications that such a task should.

The P4 may actually be slower at processing certain apps that haven't been rewritten for it. But its disappointing performance may be temporary. If Intel convinces developers to optimize applications for the P4, you can expect performance to improve. On the oth-

spread design innovations (see "Under the Hood: An Inside Tour of the P4," page 52) are directed primarily at cranking up clock speed—to 1.4 and 1.5 GHz initially, with sufficient headroom to double that to 3 GHz in coming years.

And the P4 and its 850 chip set bring design enhancements to widen some of the data bottlenecks that currently limit performance potential, such as the relatively slow 100- and 133-MHz PIII system buses (the P4's bus is 400 MHz) that constrain high-speed CPUs.

Paul Otellini, executive vice president and general manager of Intel's architecture

ory option for the P4. You can expect P4s using double data rate (DDR) SDRAM and the slower SDRAM to appear by the second half of 2001. Via Technologies and Intel will both produce chip sets, which should lower P4 system prices significantly, according to PC vendors and analysts.

THE SYSTEMS

OUR REVIEW SYSTEMS ARE expensive performance PCs aimed at serious gamers and at users who want to play streaming Web and locally stored audio and video files on the best-looking, loudest systems possible. Web-content and multimedia developers, workstation users, and other graphics professionals may want these loaded computers as well.

The Pentium 4 and Athlon systems pack speedy graphics boards based on the latest NVidia chip, the GeForce2 Ultra, or on the slightly older GeForce2 GTS. All have 19-inch screens, fast DVD-ROM drives, CD-RW drives, 56-kbps modems, ethernet ports, and powerful speakers. To save yourself \$200 to \$300, specify 128MB of RAM instead of the 256MB we used in testing.

If you need a P4 unit, the \$2999 IBM NetVista A601 offers the best value among the three systems we tested; however, its 8X DVD-ROM drive was the slowest here. Gateway's Performance 1500 has the most feature-rich configuration—and a \$3999 ▶

group, says the chip's new design is meant to improve performance "where users will appreciate it most"—in areas like 3D gaming, digital video creation, MP3 encoding, and streaming video.

Intel took a significant step to enhance the P4 platform's appeal in July, when the company announced that it would offer support for the P4 with additional types of high-speed memory besides pricey Rambus DRAM (RDRAM), which was previously the only mem-

THE P4s: IBM's NetVista A601, Gateway's Performance 1500, and Dell's Dimension 8100.

er hand, the processor seems unlikely to deliver much improvement to the office apps most people use heavily.

IN CHIP

DESPITE current performance disappointments, the P4 is a milestone in the history of the microprocessor. With 42 million transistors (nearly 50 percent more than the PIII possesses), the P4 represents a major CPU advance. Its wide-



Site to See: TechTracker.com

MORE NEW software seems to surface every day. TechTracker.com promises to keep you in the know about new releases by providing daily updates at its site or via newsletter. Much of the software is also available for download. The site originally focused on Mac software, but it recently added Windows and Palm coverage. Its Palm offerings look good, and we like the applications' organization by categories such as Finance and Games; however, the Windows offerings could use beefing up. With luck, the list will improve as the site matures.

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 - 3 TClockEx**
467KB
Tailor your Windows taskbar.
 - 4 TweakUI**
113KB
Adjust your Windows user interface with this free update.
 - 5 Microsoft Money 2001 Deluxe**
21.16MB
Trial version of the personal finance program.
- Find files on www.pcworld.com/downloads/top5/jan2001.

tag to match. At \$3559, Dell's Dimension 8100 is slightly cheaper, perhaps due to its smaller hard drive (40GB versus the Gateway's 60GB) and slower DVD-ROM drive (12X versus 16X for the Gateway).

The clear price/performance victor among the machines we tested is the \$2699 Micron Millennium Max XP, the 1.2-GHz Athlon system. It won nearly every benchmark test and features a combination 12X DVD-ROM and 12X/10X/32X CD-RW drive from Ricoh. Micron says the Ricoh drive's JustLink technology minimizes the data gaps that often make recorded CDs unusable.

The unit's 31GB hard drive is the smallest here, however.

If buying an Intel-based PC is important to you, our surprising test results should point you toward a 1-GHz PIII like our Gateway and Hewlett-Packard comparison units. PIII systems generally cost \$500 to \$700 less than P4s. The PIII chip is cheaper, and you can save even more if you buy a PIII with SDRAM instead of the pricier RDRAM.

IN THE ETHER

WITHIN THE next year, the P4's value may improve dramatically. By mid-2001, P4 systems equipped with DDR

Dell Dimension 8100

\$3559; 800/388-8542;

www.dell.com

Gateway Performance 1500

\$3999; 800/846-4208;

www.gateway.com

IBM NetVista A601

\$2999; 888/746-7426;

www.ibm.com

Micron Millennium Max XP

\$2699; 888/224-4247;

www.micronpc.com

and SDRAM should arrive, shaving \$200 or more off system costs. And by the third quarter, industry observers expect P4 speeds to reach 2 GHz. Combine that gain with richer streaming media content and greater access to the broadband needed to deliver it, and the P4's appeal may grow.

AMD will not be standing still. In the first half of 2001,

the company plans to release a faster, more powerful Athlon, code-named Palomino, which will target the mobile, desktop, and workstation markets.

Today, the price/performance sweet spot hovers at the highest peaks of Pentium III and Athlon chips. Where does that leave the P4? Just beyond the reach of most users, at least for now. ▶

Under the Hood: An Inside Tour of the P4

THE PENTIUM 4, Intel's first new micro-architecture since 1995, when the current x86 architecture debuted in the Pentium Pro, is designed to provide blazing speed—especially in handling multimedia content. Collectively dubbed Intel NetBurst Micro-architecture, the new elements are meant to push more low-level programming instructions through the chip's electronic pipelines, avoiding the bottlenecks and other restraints that will likely cap the clock speeds achievable with the PIII's older design at around 1.3 GHz.

Kevin Krewell, senior analyst at MicroDesign Resources, says NetBurst's design is meant to speed up apps that send data in bursts, such as streaming media, MP3 playback, and video compression. "The design is a change in emphasis from typical integer performance [as in standard business apps] to media performance," he says.

In the Pipeline

THE P4'S NEW Hyper Pipelined technology doubles the depth of transistors that process the electronic on/off bits making up the CPU's program instructions, so more instructions can be worked on at a time. Another feature,

Advanced Dynamic Execution, keeps up to three times more instructions in the pipeline than the PIII can and makes educated guesses about which instruction branch to process. ADE acts like a chef's helper who doesn't know the exact recipe but tries to assist by fetching anticipated items. But speculative execution can hinder the chip if the

system guesses wrong, says

Nathan Brookwood, principal analyst at Insight 64.

Such branch mispredictions are more common with office apps, he says.

Intel increased the speed of the system bus to 400 MHz, compared to

133 MHz in the fastest PIIIs. To

ensure that instructions don't back up while traveling from memory to CPU, the new Execution Trace Cache holds already-decoded instructions while others finish. A so-called double-pumped arithmetic logic unit (ALU) runs twice as fast as the rest of the CPU, quickly calculating integer (whole-number) math. It, along with the higher clock speed, ought to speed up all applications, including word processors and spreadsheets. We're not sure why our application tests showed so little improvement, but we think branch misprediction may be one culprit.

Finally, the P4 introduces Streaming SIMD Extensions 2 (SSE2)—144 new multimedia and graphics instructions designed to speed up various applications. For example, some SSE2 instructions improve processing of speech, video, image editing, and encryption—the rich Web content that Intel says the P4 was born to run. Until programmers write software to take advantage of these instructions, you won't see performance improvements, however. Intel touts a short but impressive list of upcoming SSE2 programs, including Shiny Entertainment's Sacrifice game, Dragon Systems' Dragon NaturallySpeaking, and Macromedia's Dreamweaver. More important, Intel says Microsoft will add SSE2 support to its DirectX 8 driver, the lingua franca of Windows graphics.

Wait and See

ANALYSTS ARE reserving judgment on P4's performance vis-à-vis its current rival, AMD's 1.2-GHz Athlon paired with DDR SDRAM.

"They've come up with an architecture that clearly allows them to scale the clock rate," says Brookwood. "The challenge for Intel is to demonstrate that the clock-rate superiority translates into performance superiority."

That's a challenge Intel has apparently not met on most measures—at least not with the first handful of P4 systems.



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PDA-Based Cell Phones Deliver All-in-One Convenience



MY FRIEND Jacob hasn't bought a cell phone or a handheld device, for one good reason: "I'm waiting until I can get both in one," he says.

Jacob's wait may be over.

Kyocera's new Smartphone cleverly combines both devices into a unit that we can wholeheartedly recommend. Qualcomm's (now Kyocera's) PdQ Smartphone was the first cell phone/PDA combo out of the gate, but it was too bulky and expensive. The Smartphone looks like a husky flip-open cell phone—until you open it. Then the monochrome screen fills with the Palm OS's familiar-looking rows of icons. This phone is a full-fledged Palm—complete with stylus and Hot-Sync recharging cradle.

It's also noticeably smaller, lighter (7.3 ounces), and (with a street price of about \$500) less expensive than the 9.8-ounce, \$700 to \$800 PdQ.

The Smartphone heralds a clutch of products designed to free mobile users from the need to carry both a cell phone and a PDA. Some will be all-in-ones like the Smartphone; others will be add-ons that turn a handheld into a cell phone. IDC analyst Kevin Burden says that even smaller hybrids will appear in the next year or two.

GET SMART

IN MY TESTS of a preproduction unit, I found Kyocera's Smartphone to be intelligent in several ways. For starters,

you can tap an entry in your contact list, and the phone will dial it. In addition, you can use the Smartphone as a speakerphone. A built-in speech recognition capability enables you to assemble a voice-dial phone book so that you can "call mom" simply by speaking those words into the handset. Very cool.

If your service plan permits, you can access the Web via an HTML or Wireless Application Protocol browser, or you can run wireless Palm applications. The Smartphone also functions as a wireless fax modem. It supports CDMA PCS (1900 MHz), CDMA Cellular (800 MHz), and analog wireless protocols, which are used on such phone networks as Sprint and Verizon.

The downside? The screen is smaller than a regular Palm display. I found the stock type

The Smartphone heralds a clutch of products designed to free mobile users from the need to carry both a cell phone and a PDA.

readable, but I missed the conventional Palm's larger font. Still, by cell phone standards the 5.6-by-2.6-by-0.9-inch Smartphone is huge; the size may put off cell phone users who aren't used to carrying a PDA. Kyocera rates the battery life at a so-so 4.5 hours of talk time or 110 hours of standby.

Kyocera says major CDMA carriers will sell the phone within the next few months.

People who already own a Palm or Handspring Visor of recent vintage may find the coming crop of phone add-ons more attractive. A

PALM IN PHONE'S clothing: Kyocera's Smartphone runs Palm apps.



representative example, Handspring's \$300 VisorPhone is expected to ship by the time you read this. It consists of a Springboard module that turns

a Visor into a GSM phone with text messaging capabilities. The add-on will most interest the European market, where GSM is the sole digital cellular standard, but some U.S. carriers (Pacific Bell, for example) use a GSM network. Support for other popular North American digital cellular networks is in the works: AirPrime, for instance, is preparing a Springboard module for CDMA networks.

These PDA add-ons don't support roaming, though, and they're expensive, since the

PDA itself costs \$180 or more.

If you don't insist on having the Palm OS in your PDA-phone, stay tuned. Microsoft has been showing a prototype of a device based on a variant of Windows CE (code-named Stinger) that's optimized for mobile telephones.

STINGER RINGER

STINGER PHONES won't be as powerful as Pocket PCs, which have fast CPUs that

drain batteries quickly by cell phone standards.

But they will have moderately large

screens and a bountiful array of Pocket PC and

Web-enabled cell phone features. The first of

these phones—for CDMA and GSM networks—are in

the works from Samsung; they are scheduled to ship by mid-2001.

Other handset vendors are developing

phones that will include PDA features, if not a major name-brand PDA OS. NeoPoint, for

example, is poised to bring two new CDMA phones to market: the NeoPoint 2000 and the NeoPoint 2600. Both

have the same roomy 11-line screen as current models but are smaller and have beefed-up PDA and e-mail features.

Meanwhile, competition is heating up. Motorola has announced plans for (but not details of) a Palm-phone hybrid that should give Kyocera a run for its money.

For now, though, the Smartphone might be just the thing if you want to turn two indispensable devices into one.

—Yardena Arar ▶



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TV as You Like It: New Tricks for the Old Box

BETA

INTERACTIVE TV. Enhanced TV. ITV. Whatever you call it, it's the couch potato's dream: a boob tube that allows you to e-mail mom, order pizza, and watch any episode of the *Beverly Hillbillies* whenever you want.

Finally, after years of hype and promises, this show is hitting prime time. From big-leaguers Microsoft and America Online to your local pay television provider and upstarts TiVo and Replay, a range of companies are scrambling to compete for the right to let you save a season's worth of *The West Wing* while e-mailing your pals about an EBay auction.

Details and emphasis vary by service: AOLTV, for example, throws in its famed instant messaging and other features of its online service. TiVo and Replay will leverage their

existing digital video recorder (DVR) services to enable you to watch what you want and whenever you want. In some areas you'll have unprecedented video-on-demand service.



Whatever their focus, these services won't be cheap: Most require you to pay \$300 or more for a set-top box, plus monthly service fees on top of your current pay TV costs.

Your choices will depend

mostly on the type of pay TV service you have or can get: Microsoft's UltimateTV, for example, will work with digital services—and at launch this holiday season, it will be avail-

able only with DirecTV satellite service. Many other services limit you to Internet access via an old-fashioned 56-kbps modem and phone line, which might be a problem in some living rooms. You also need a fairly large TV screen to handle the picture-in-picture displays of features such as content-related Web sites and pop-up menus.

Still, serious channel surfers who would like to harness the power of digital technology to render their hours of self-imposed sofa sitting more fun and informative will love interactive TV.

Among the various interactive TV initiatives, perhaps the

most ambitious is Microsoft's UltimateTV, which marries a full-featured DVR to WebTV-like Internet capabilities.

THE MICROSOFT SHOW

EXPECTED TO launch by the time you read this, UltimateTV requires a \$399 set-top box that you'll buy retail; Thomson/RCA and Sony are the initial vendors; Sony's box comes with a keyboard (you'll have to buy the dish separately), and a DirecTV dish accompanies RCA's (keyboard sold separately). You'll also have to pay a monthly service fee of \$10 or \$15 on top of a DirecTV programming package (which start at about \$30 a month).

In the demonstration we saw, the digital video recorder features looked particularly impressive: You can record up to 35 hours of programming, which you ferret out either by browsing or by searching the electronic program guide. When you are ready to ►

Going Interactive: Services, Hardware Choices Abound

INTERACTIVE SERVICE	Set-top box (vendor/cost)	Pay TV service	Has digital video recorder (DVR)	Internet access	Monthly service charge (exclusive of cable/satellite package)
AOLTV	Philips/\$250	Any broadcast or cable service	○	●	AOL members \$15, nonmembers \$25
	TiVo/not applicable ¹	Any cable service	●	●	Not applicable ¹
	Hughes/not applicable ²	DiracTV	○	●	AOL members \$15, nonmembers \$25
ReplayTV	Panasonic, Replay/\$400 to \$700 (DVR only, price depends on hard drive size)	Any cable service	●	○	Free
	Motorola (includes cable box)/depends on cable provider	Charter Communications, Comcast, Time Warner ³	●	○	Not applicable
TiVo	Philips, Sony/\$250 to \$400 (DVR only)	Any cable service	●	○	\$10
	Philips/\$400	DiracTV	●	○	\$10
UltimateTV	RCA, Sony/\$399	DiracTV	●	●	\$10 ⁴
WebTV	Philips, Sony, RCA/\$100 or \$200 ⁵	Any cable service	○	●	\$25 or \$30 ⁶
	EchoStar/\$400	EchoStar	●	●	\$25 or \$30 ⁶
Wink	Various/varies	Various cable and satellite companies	○	○ ⁷	Varies

● Yes ○ No

¹ Due mid-2001. ² Due first quarter 2001. ³ All in test phase. ⁴ Includes 3 hours of Net access; \$5 surcharge for unlimited use of existing ISP. ⁵ Higher charge is for picture-in-picture feature. ⁶ Higher charge is for DVR feature. ⁷ Proprietary online service.

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watch a recorded show, simply click the *My Shows* option in a menu that appears when you turn your set on. UltimateTV works only with digital services (AT&T is committed to supplying 7.5 million UltimateTV licenses to digital cable subscribers starting this year); as a result, Microsoft says, recordings are superior in quality to those made from analog TV services. You can also record one show while watching another—something not all DVRs permit you to do.

The \$10-a-month UltimateTV service includes 3 hours of WebTV-style Internet access via a built-in 56-kbps modem. That's enough to let you dash off an occasional e-mail or surf to a program-related Web site during commercial breaks. If you already have an ISP, you can pay Microsoft an addition-



CHAT 'N SURF: AOLTV lets you log on while watching shows on TV.

al \$5 per month in exchange for unlimited use of the account with UltimateTV (Microsoft says it imposes the charge because you will be accessing its servers for some content).

AOL: AS SEEN ON TV

INTERNET colossus AOL entered the fray last fall in several cities with AOLTV, which lets AOL users chat, send instant messages, and look at e-mail while watching television. AOLTV eventually plans

to introduce TV-themed Web content and chat rooms (see "Beyond Channel Surfing"), plus a program guide that groups TV channels under headings such as Movies, News, and Sports.

To use AOLTV, consumers must purchase a \$250 box and pay a monthly service fee (\$15 for AOL members, \$25 for nonmembers). One of AOLTV's most powerful selling points is that it works with any cable service. At launch, how-

ever, AOLTV's box has no digital video recorder, so the video looks more like a WebTV re-run. AOLTV intends to offer a box that includes TiVo digital recording capability early this year, and it's working on a DirecTV box. A merged AOL and Time Warner would gradually upgrade Time Warner Cable set-top boxes with a version of AOLTV, thereby eliminating the need to obtain a special AOLTV box.

HARD DRIVE TO THE TV TOP

STARTING THIS January, DirecTV competitor EchoStar will introduce an UltimateTV competitor—a new line of digital video recorders based on the OpenTV operating system. EchoStar's new box will not offer e-mail or Web browsing. Instead, it will rely on a proprietary interactive service called Wink, which requires a modem hookup. ▶

Beyond Channel Surfing: Point, Click, Shop, Chat

THERE'S MORE TO interactive TV than digital video recorders, e-mail, and plain-vanilla Web browsing. Increasingly, you'll be able to access program-related content, hang out in chat rooms, look up facts and figures, and play games. But content will vary depending on the interactive service you get.

NBC, for example, has teamed with Microsoft's WebTV Networks to add interactive stock tickers and hyperlinks to shows on its CNBC and MSNBC cable channels. WebTV (and soon, UltimateTV) customers who watch NBC's *Friday Night*, a rock video show, can vote for their favorite videos, link to artist biographies, and join t-clubs (t stands for *television*) that hold live chats during the program. Not to be left behind, CBS plans to add 500 hours of inter-

active content to its network this winter.

Cable channels such as the Game Show Network let viewers become contestants during shows like *The Price Is Right*, *Family Feud*, and *Wheel of Fortune*. From your living room,

You may not win a Jet Ski, but you can take quiet pride in beating other online players to the draw.

for example, you can guess the phrase on *Wheel of Fortune* before Vanna flips the letters. You may not win a Jet Ski, but you can take quiet pride in beating other online players to the draw.

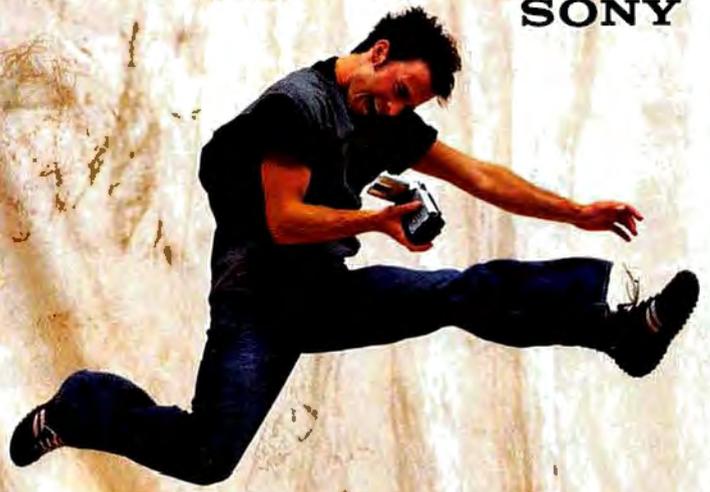
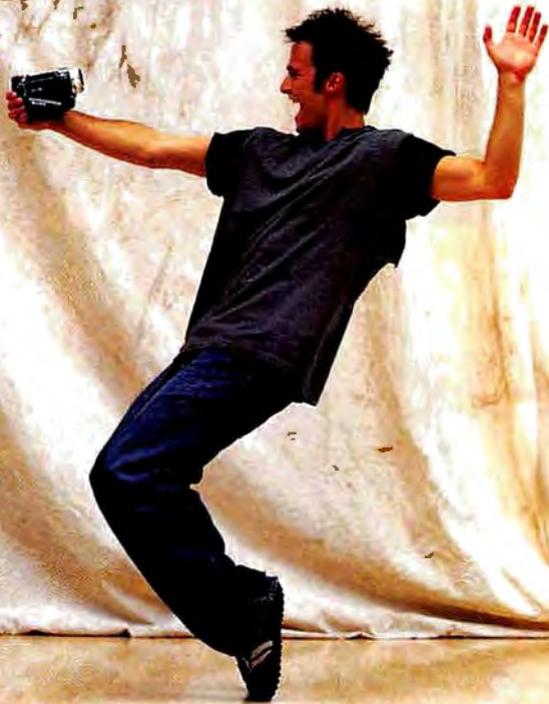
AOLT V reduces the TV picture to roughly one-fifth its original size, puts it in the upper-right-hand corner of the TV screen, and surrounds the picture with chat rooms and TV-themed Web content. AOL is already working with merger partner Time Warner to embed video triggers that invite you to take a trivia quiz, participate in a live poll, or buy the

dress Jennifer Aniston is wearing on *Friends*.

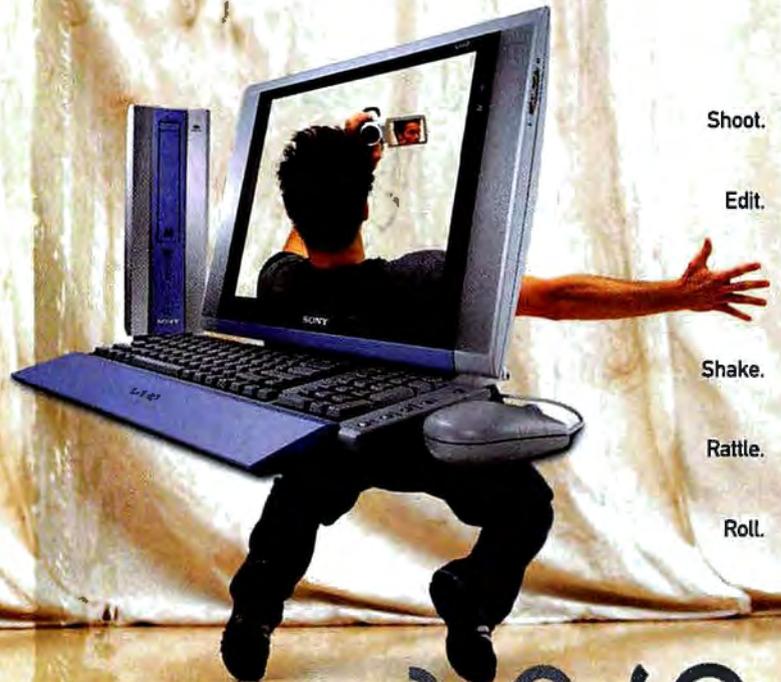
Unfortunately, WebTV and UltimateTV subscribers won't be able to access AOL's content, or vice versa. That's because the content formats differ—a situation that shows no sign of changing despite calls for an open standard. But AOL and WebTV aren't the only content games in town. Wink, a service that several cable systems offer, superimposes a stylized letter *i* on your TV screen to identify programs with related content. Push a corresponding button on your remote, and you'll see overlays of text and graphics you can click on to request information or order merchandise. For example, if you heard a band you liked on *The Tonight Show*, you could click on the remote to send a purchase order for the group's CD over a modem hookup.

Interactive content isn't yet king. But within the next few years, it promises to make TV more entertaining and educational—in short, less of an idiot box.

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DVR pioneer TiVo has partnered with DirecTV to build a box that records as many as 35 hours of satellite programming. A new Wish List option allows you to search through two weeks of upcoming television show listings by program genre, by actor, or by director.

Meanwhile TiVo arch-rival ReplayTV is adding a My ReplayTV feature that will let customers program their DVR via any Web-enabled device. Users will enter their requests on a MyReplayTV.com Web page, and their modem-equipped ReplayTV box will retrieve the desired shows by dialing up the Net several times a day.

ReplayTV has a deal with Charter Communications to roll out set-top boxes with ReplayTV DVR features later this year. Replay's free basic service, however, recently started serving up banner ads.

Although digital television (which promises broadcast

quality superior to that of old-fashioned analog cable) is most widely available by satellite, the tiny percentage of U.S. households that can obtain interactive digital cable services will enjoy the greatest convenience. Not only does digital cable dispense with the



YOU DECIDE: UltimateTV's opening menu lets you watch live TV or shows that you recorded.

messy business of installing a satellite dish and cables—a process that's particularly unwieldy for apartment dwellers—it also permits such features as video on demand, e-mail, and Web browsing, without the added hassle of a phone-line hookup.

Insight Communications' customers can already spend \$7 more a month for access to 400 video-on-demand movies, 40 digital music channels, an interactive program guide, and interactive community information and entertainment guides. The \$7 doesn't yield free movies: You have to pay an additional \$4 for a recent title, \$1 for an older film. The films are streamed from Insight's servers, but viewers can stop, start, pause, and rewind them just as if they resided on a local drive. Charter Communications, meanwhile, is one of several cable companies that offer limited interactivity (but not Internet access) via the Wink service.

BIG PICTURE FOR THE SMALL SCREEN

INTERACTIVE TV differs from earlier concepts that envisioned merging personal computers and televisions, as well

as from more-recent Internet appliances designed to compete for space on your kitchen counter or night table. Interactive TV services are unequivocally TV-centric; they use Internet and digital technology only to enhance the entertainment that you expect to see when you plop yourself down in front of the tube.

Which of these choices is for you? If you're interested only in searching for programs and recording them for later viewing, consider buying a Replay or TiVo box and signing up for the company's basic services. If you're also interested in adding Internet services and you can get DirecTV, you'll want to investigate UltimateTV. AOL addicts might find AOLTV appealing. Even if you don't seek out these services, you can count on hearing from your existing cable or satellite service about its interactive offerings soon. Passive TV is going the way of rabbit ears.

—Tom Spring

Bluetooth Brings Cable-Free Networking to Small Devices



IMAGINE transferring a list of contacts from your mobile telephone to your desktop—without cables. Or accessing a corporate network without an ethernet card; or using your mobile phone to buy food from a vending machine or a store. That is the promise of Bluetooth.

BLUETOOTH BENEFITS

THIS SHORT-RANGE wireless technology uses a low-power radio frequency to connect a range of devices for file sharing and ad-hoc networking

across distances up to 33 feet (300 feet with an amplifier).

An open standard backed by a consortium whose 2000 members include Ericsson, IBM, Intel, Motorola, and Nokia, Bluetooth has for several years been the most loudly trumpeted imminent arrival in instant wireless networking. But apart from a couple of notebooks with Bluetooth ports, products have been slow to appear. We tested two of the first non-notebooks to use Bluetooth: an Ericsson cellular telephone with a Bluetooth wireless headset, and a pair of

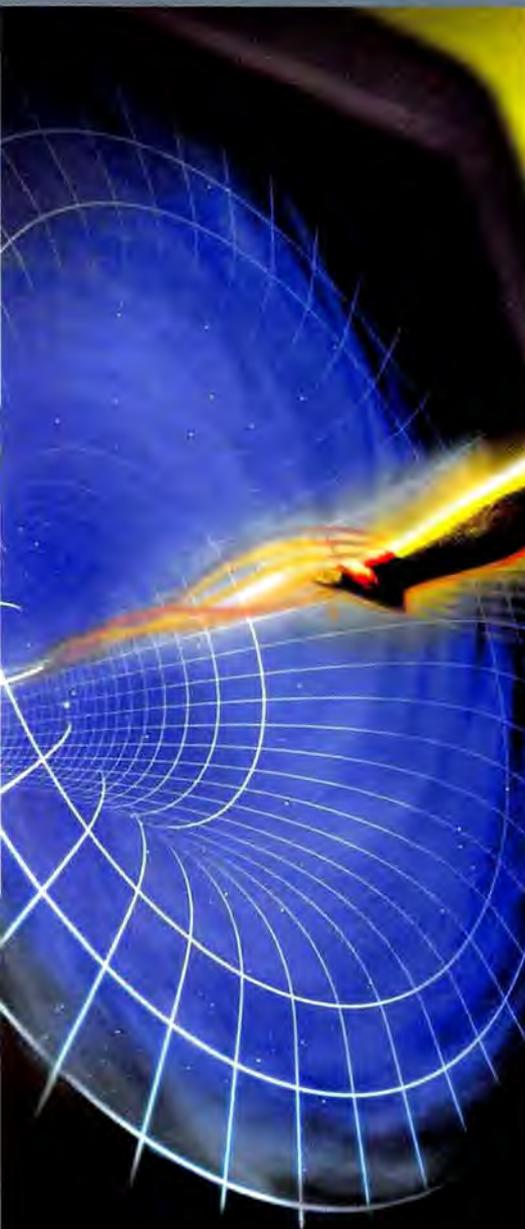
Toshiba Bluetooth PC networking cards. Our conclusion: Bluetooth works, but it is not without some flaws.

Wireless networking protocols such as HomeRF and 802.11B are widely used for connecting notebooks and desktops, but Bluetooth offers some additional benefits. Because its battery power consumption is minimal, it can work on small devices. It can, for example, hook a

mobile phone to a PDA or a laptop so the phone will act as a wireless modem. A Bluetooth headset permits hands-free calling without the constraints of a wired earpiece. On a laptop, Bluetooth allows wireless file ex- ▶



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change and network access.

Bluetooth pays a performance price for its power conservation. With an underlying speed of only 1 mbps, Bluetooth's real-world throughput is about 725 kbps. That's fast enough for voice and audio data but not for full-motion video, which the next revision of 802.11 will support. Version 802.11A has a speed of 54 mbps but won't be available before mid-2001. HomeRF, which currently tops out at 2 mbps, is expected to attain 10 mbps at about the same time.

Bluetooth is unlikely to supplant 802.11B, but it should render infrared obsolete, since it eliminates that technology's line-of-sight requirement. It operates in the same 2.4-GHz frequency range as 802.11B, HomeRF, and some microwaves, so it may encounter interference in locations where other wireless technologies are in use.

BLUETOOTH IN ACTION

BLUETOOTH DEVICES are supposed to be interoperable, but in our tests, not every connection was compatible.

Setting up the Bluetooth wireless headset to work with the Ericsson phone required some effort. After we plugged the DBA-10 Bluetooth adapter

into the T28 World phone, we had to browse menus on the phone's display to find out how to connect Ericsson's HBH-10 wireless headset.

The headset transmits and receives audio through the



NO STRINGS ATTACHED: Bluetooth headset needs no wires.

phone fairly well and, though a bit bulky, is comfortable for walking. In a building with poor phone reception, you can leave the phone in the best reception area available and roam from there. In our tests, the headset delivered clear sound over Bluetooth's 30-foot range. Its signal traveled adequately through one wall.

The second product we examined, Toshiba's PA3053U PC Card, is a PC Card with a flat antenna and a status light.

The card comes with driver software, a "Bluetooth neighborhood" browser for handling interdevice communications, and a collaboration tool called SPANworks 2000.

We installed a card on each

of a pair of IBM ThinkPad notebooks running Windows 98 and used the Discovery command on the Bluetooth browser to get them to recognize each other. After establishing this local network, we shared printers and moved files between the laptops at about 270 kbps. At that rate, transferring a 10MB file would take about 5 minutes. The Bluetooth browser can also set up connections for sharing electronic business cards or accessing a remote dial-up connection. Our efforts to transfer files using OBEX (an object transfer protocol for

Bluetooth) were unsuccessful.

The SPANworks 2000 application, a tool for impromptu meetings, worked as advertised. We found it easy to share files, chat, and view a common PowerPoint presentation.

Getting Bluetooth to work across device platforms was not easy. We did "discover" the Ericsson phone, but we couldn't connect it to the laptop. The headset went unrecognized altogether. It may be some time before different vendors' products really work seamlessly together and share a common look and feel.

STILL ON THE WAY

BY MIDYEAR Bluetooth will start appearing in phones, pagers, Palms, Pocket PCs, desktops, notebooks, network adapter cards, and more PC Cards. Microsoft will build Bluetooth support into the successor to Windows Millennium and 2000, code-named Whistler. Cahners In-Stat Group predicts that more than a billion Bluetooth products will ship by 2005.

But early adopters will pay a premium. Toshiba's PC Cards cost \$199 each—more than many HomeRF and 802.11B cards—and the T28 phone runs \$299 without the headset and adapter, for which pricing has not been set. A similar headset from GN Netcom is expected to cost \$499 when it ships next year.

Nevertheless, prices should eventually come down. And once the interference and the other incompatibilities are resolved, Bluetooth should eliminate a fairly large share of the cable clutter in our lives. That will be progress that you won't have to trip over.

—Jamie Fenton ■

Networking Standards Go Head-to-Head

WIRELESS PROTOCOL	Speed ¹ (approximate)	Range ² (approximate)	Use	Cost per adapter (approximate)
Bluetooth	1 mbps	33 feet	Device networking	\$50 to \$200
802.11B	11 mbps ²	300 feet	Business/home LAN	\$180
HomeRF	1.6 mbps ³	150 feet	Home LAN	\$125
Infrared	Up to 4 mbps	3.3 feet	Line-of-sight device networking	Usually built in
COMMON WIRED PROTOCOL				
Universal Serial Bus	12 mbps ⁴	Not applicable	Device networking	Usually built in
Ethernet	10 or 100 mbps ⁵	Not applicable	Business/home LAN	\$130

¹ Actual speed and range depend on obstructions and other variables. ² 54 mbps with next version. ³ 10 mbps with next version. ⁴ 480 mbps with next version. ⁵ Depending on version.



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Moving at Internet Speed

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Outfitting the road warrior

To fight the good fight in the information war, today's mobile warriors know that their single most important weapon is their notebook computer, which represents their lifeline to the organization from wherever they may be working. But with such an enormous selection of notebook brands and models, what's the right one?

For the Michigan House of Representatives, the choice was an easy one: WinBook. Today each of the 110 House members has not one but a pair of WinBooks: one for each member's desk, and another to take back to the district. The purchase of the WinBooks, from WinBook Corp., Hilliard, Ohio, is part of an overall technology drive mandated by House Speaker Charles Perricone, who "is pushing to have legislators get all the benefit they can from IT," according to Rick Wright, director of IS for the House.

Wright says the House members regularly use their WinBooks to access the Blue Book, which is a database listing all current and pending bills and amendments, as well as historical information related to these items. House members also access House calendars, e-mail and other mission-critical applications designed to improve their efficiency and effectiveness.

Why WinBooks?

"They work very well and very reliably," notes Wright. "We deal directly



The WinBook Si features a 14.1-inch active matrix XGA and weighs in at 7.1 lbs.

with them on support, which has also been just excellent."

"SPEC FOR SPEC" THE BEST PRICE AROUND

The House's enthusiasm for WinBooks is shared by the American Cancer Society in Birmingham, Ala., which is the proud and satisfied owner of some 190 WinBooks purchased over the past several years.

The Society has deployed the notebooks to its field workers in a six-state region.

"It's their lifeline to the central office, to various databases and to each other as well," says Lisbeth Smith, information technology project manager at the Society. The most common applications for the Society's remote workers include extensive collaborative work using Lotus

Notes and various Microsoft Office applications, including multimedia and other display functions.

"We needed our machines to be highly reliable and to have exceptional video output as well as great screen quality for small group presentations," Smith says. "In addition, we wanted the notebooks to be lightweight but also suitable to replace desktop machines. We get all that and more with the WinBooks."

In addition, Smith says emphatically, "spec for spec, WinBook has the best price in the market."

For these and for scores of other businesses as well as consumers, WinBook represents an undeniable advantage in overall notebook value, combining the very latest technology at highly competitive prices. The notebooks are intelligently crafted as well, featuring such items as e-mail and Internet browser keys on the WinBook keyboards. WinBook Si² models have both a pointing stick and touch pad, a feature pioneered by WinBook seven years ago.

In addition, WinBooks come in a wide variety of configurations to fit the specific needs of just about any mobile professional. These range from the sub-\$1,000 Si with a powerful 566 MHz processor and 32 MB of RAM, to the feature-rich Si², complete with 14.1-inch XGA active matrix screen, 128 MB of SDRAM and a 20 GB hard drive.

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 PC Magazine -
 October 3, 2000.

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The Big Screen

THERE'S A LOT MORE GOING ON BEHIND YOUR DISPLAY THAN MEETS THE EYE

THE Personal Connection

Of all the great applications that have come across your computer display over the years, perhaps nothing holds more potential to change the way people work and interact with one another than video conferencing.

The reason is simple. Video conferencing is the logical third step in a process of getting people to communicate electronically that began 100 years ago with the telephone. This process took a great leap forward in the 1990s with PCs and e-mail. And now this process is set to vault ahead with full-motion video delivered to any screen on any device, large or small. This says nothing of the benefits of interactive video sessions.

No matter what size or style your business might be, video conferencing can become a suitable replacement for scores of business trips where face-to-face contact is important. More importantly, interactive video conferencing will enable additional meetings to take place that, for logistical reasons, would never have in the first place. The plain and simple fact is that people love to see one another's faces and expressions during a conversation. That's why businesspeople will book a cross-country flight for nothing more than a breakfast meeting, rather than doing the meeting over the phone.

Research from International Data Corp., Framingham, Mass., projects that video conferencing shipments will climb steadily from 500,000 "end points" or viewing points in 2000 to more than two million in 2003. Driving this rapid growth is the evolution of video conferencing from the six-figure, room-sized video conferencing dinosaurs of yesterday, to

age the power of the Internet and Web. Denver-based MSHOW.com (www.mshow.com) is delivering just such a solution in addition to a range of interactive broadcasting services. MSHOW combines the power of the Internet with interactive broadcasting technologies to deliver high-impact presentations to individuals and businesses any-

time, anywhere around the world. All that is needed is an Internet connection to participate in an MSHOW.

The range of MSHOW services includes preshow content development, conference leader training and support, live operator help desk, post-conference reporting, and content archiving for on-demand presentation playback.

No matter what the interactive broadcast you want to produce, MSHOW



the sleek, PC-based offerings and PC video conferencing services available today. In fact, IDC predicts that the average sales price for commercial desktop video conferencing will plummet to \$850 within three years. The price for consumer video conferencing solutions will drop in that time frame to \$150, IDC says.

MSHOW LEVERAGES THE INTERNET

Some of the most innovative and practical video conferencing solutions are those built from the ground-up to lever-

age the power of the Internet and Web. Denver-based MSHOW.com (www.mshow.com) is delivering just such a solution in addition to a range of interactive broadcasting services. MSHOW combines the power of the Internet with interactive broadcasting technologies to deliver high-impact presentations to individuals and businesses any-

time, anywhere around the world. All that is needed is an Internet connection to participate in an MSHOW. The range of MSHOW services includes preshow content development, conference leader training and support, live operator help desk, post-conference reporting, and content archiving for on-demand presentation playback. No matter what the interactive broadcast you want to produce, MSHOW does not require you or any other conference participant to buy any special hardware or software. The MSHOW service provides an end-to-end solution that includes all hardware and software, Internet connectivity, monitoring and management services, reservation and invitation management, help desk support and content support.

The bottom line is that MSHOW allows you to focus on your business and your presentation, not on all the technology behind it.



Presentation Tools of the Past

1980—2000 A.D.

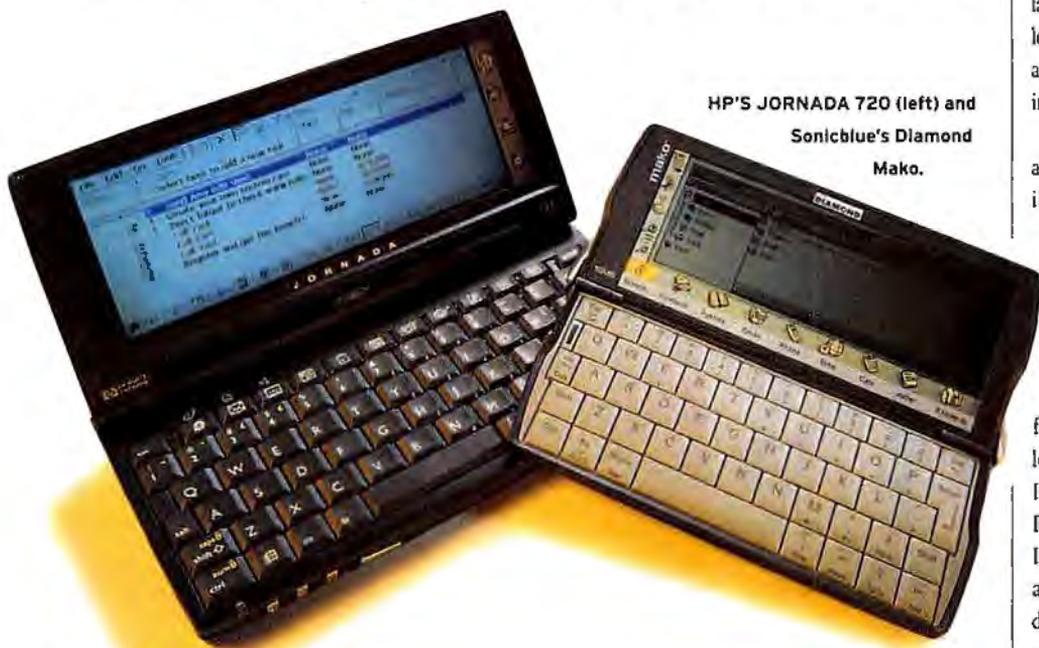
Once upon a time, people were quite fond of these devices and used them for meetings, conferences and presentations. Imagine that?

Has your competition already evolved their communication methods? Because today, there's an innovative way to present ideas to large dispersed audiences. MSHOW – an interactive, rich multi-media, Web-based presentation tool. It will turn your conferences, meetings and seminars into real-time events in which hundreds, even thousands, can participate. Invest 20 minutes and experience a free, live, interactive MSHOW. Register at www.MSHOW.com or call 1-888-99MSHOW.

NEW PRODUCTS

A PDA for Every Pocket: Color Brightens New Choices

HP'S JORNADA 720 (left) and
Sonicblue's Diamond
Mako.



HANDHELD S

IF YOU'RE FINALLY ready to entrust your appointments, date book, memo pad, and other essentials to a personal digital assistant (or if your old one is on its last legs), here's some good news: A flurry of new arrivals give you more choices than ever—especially if you have a yen for speed and features such as color display or the ability to run word processors or spreadsheets.

But keep this in mind: The four shipping units I checked out—Handspring's **Visor Platinum** and **Visor Prism**, Hewlett-Packard's **Jornada 720 Handheld**

PC, and Sonicblue's **Diamond Mako**—cost between \$299 and \$999, so shop carefully.

VISORS LOOK SHARP

THE NEW Handsprings are upgrades to the popular Visor line of devices that all use the same operating system as their hugely successful Palm competitors—meaning they can run all that great Palm software. The more impressive arrival here is the **Visor Prism**. Its attractive 65,000-color display makes it great for viewing photos or videos, compared to the 256 colors you get from Palm's compet-

ing IIIc. When I compared them side-by-side, however, the screen on the Palm IIIc was discernibly brighter.

The Prism also holds firm on the standard Visor footprint, though it is a tad thicker and heavier than monochrome Visors. (In contrast, the Palm IIIc is slightly taller than other Palms.) The Prism is a negligible 0.1 ounce heavier than the IIIc.

The navy-blue, 8MB Prism has the usual Visor extras—a date book with more views than Palm's, a nicer calculator, the Springboard slot for easily adding expansion modules,

and a USB cradle that syncs up about four times faster than the Palm's serial hookup. The cradle also recharges the Prism's internal batteries, which in my informal tests lasted approximately the same length of time between charges as the IIIc's—a week or so of intermittent normal use.

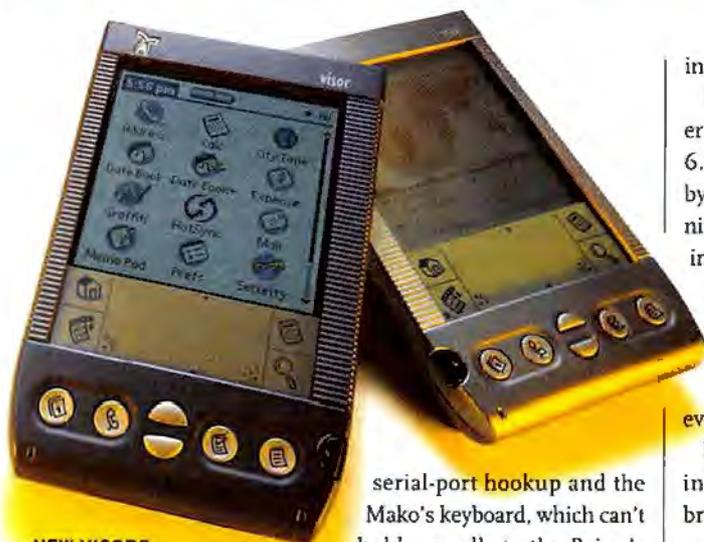
The Prism doesn't win on all counts, however. At \$449, it costs \$120 more than the newly reduced IIIc—and that's too high a premium unless you plan to use the device to view photos.

The Visor Platinum is basically a Visor Deluxe with a faster processor and a sharp-looking pewter-colored case. It's billed as the speediest Palm OS unit available—but I've never heard complaints about slow Palms, so this doesn't seem a great selling point. The \$299 Visor Platinum costs \$50 more than its somewhat less fancy sibling.

HANDHELD WITH KEYBOARDS

IF YOU WOULD rather type—even on a decidedly small keyboard—than deal with Graffiti (the Palm OS's handwriting system for text entry), you have a couple of new options to consider as well.

The \$399 Diamond Mako from Sonicblue (formerly S3) is an exceptionally lightweight clamshell device with 16MB of memory; it runs on EPOC 32, the operating system used to run Psion devices. In fact, the



NEW VISORS:
Prism (left) and Platinum.

Mako is the same as Psion's entry-level Revo Plus, available only online for the same \$399 as the more widely distributed Mako. In addition to the usual items (address book, date book, memo pad, to-do list, and calculator), you get Opera's capable EPOC 3.2 browser plus Microsoft- and Lotus-compatible spreadsheet and word processing applications.

The Mako's monochrome screen is quite legible, and its 7-ounce weight and 6.2-by-3.1-by-0.7-inch dimensions make it almost as portable as a palm-top. The price is another plus, especially compared to the \$900 cost of the high-end Psion Series 7. On the other hand, you have to live with a

serial-port hookup and the Mako's keyboard, which can't hold a candle to the Psion's when it comes to easy touch-typing. The stylus also looks a bit fragile, and to go online you'll need either an optional \$129 battery-powered 56K travel modem or an infrared-equipped GSM cell phone. Connect either of them via the device's infrared port.

AN OUT-OF-POCKET EXPERIENCE

HP'S JORNADA 720, one of the few remaining Windows CE devices on the market that isn't a Pocket PC, has a slightly larger keyboard and a much sturdier stylus than the Mako. It should: At 1.1 pounds and 7.4 by 3.7 by 1.3 inches, the Jornada 720 isn't trying to fit into a shirt pocket or even a small purse. Even so, its larger keyboard falls a bit short of offer-

ing users touch-typing quality.

For Web browsing, however, the Jornada 720's gorgeous 6.5-inch, 65,000-color, 640-by-240-pixel screen is a definite asset—and so are its built-in 56-kbps V.90 modem and its powerful 206-MHz processor. Overall, the Jornada 720 delivered the best browsing experience I've ever had with a handheld.

In addition, the unit has an infrared port and accepts a broad range of media: CompactFlash cards, Smart Cards, and Type II PC Cards.

A serial syncing cable is included, but the Jornada also comes with a syncing cradle. If you plan to use the latter, buy a standard USB cable for it; the unit will sync two to four times faster this way.

Beyond the standard pocket Office apps (Outlook, Word, Excel, PowerPoint, Access), you get a useful OmniSolve calculator utility. The extras don't come cheap. The Jornada 720's \$999 cost screams "Power users only."

TRY BEFORE YOU BUY

THE VISOR PRISM might be worth investigating if you're willing to pay extra for the best display available on a Palm OS unit. The Visor Platinum may suit people who want to use

- 72** Handspring Visor, HP Jornada, and Sonicblue Diamond Mako handheld devices
- 74** LapLink.com PCsync software; Ricoh CD-RW/DVD-ROM drive
- 76** Acer Veriton FP2 and HP E-pc business desktops; Executive Software Diskeeper 6 utility
- 78** Boston Acoustics and Creative Labs multichannel speakers; Creative Labs and Phillips sound cards
- 80** Intuit QuickBooks 2001 and QuickBooks for the Web
- 82** Logitech iFeel and Microsoft Trackball pointing devices
- 84** Yahoo by Phone voice portal; Adobe GoLive 5 Web software
- 86** Vox2 Vox.Link cell phone base station/recharger; Iomega FotoShow Digital Image Center



FOR MORE PRODUCT news and the latest announcements, check the offerings of the PC World Daily News Service at www.pcworld.com/news. To try out some of the software mentioned here, go online to www.pcworld.com/downloads.

power-hungry Springboard add-ons, and the Mako delivers Psion-like capabilities at a more affordable price. Finally, if you yearn for great color display and Office apps, the Jornada 720 might be for you. But remember to check out the competition before you buy.

—Yardena Arar ▶

Diamond Mako

PRO: Psion-like productivity at a bargain price; lightweight.

CON: Very small keyboard tough to type on; modem costs extra; sluggish serial port syncing.

VALUE: Versatile productivity tool for slim wallets.

Street price: \$399

Sonicblue

800/468-5846

www.diamondmako.com

Jornada 720 Handheld PC

PRO: Fast; great screen; PC Card and CompactFlash slots.

CON: Pricey; heavy for a PDA; keyboard on the small side.

VALUE: Versatile, powerful, and Internet-friendly tool if weight isn't a problem.

Street price: \$999

Hewlett-Packard

888/999-4747

www.hp.com/jornada

Visor Platinum

PRO: Fastest Palm-based PDA; handsome case; fast USB syncing.

CON: For most Palm apps, speed is not an issue.

VALUE: Good for users of power-hungry add-ons, but most people should stick with \$249 Visor Deluxe.

Street price: \$299

Handspring

888/565-9393

www.handspring.com

Visor Prism

PRO: 65,000-color display, fast USB syncing.

CON: Pricey; not quite as bright a screen as the Palm IIIc's.

VALUE: This one's worth the premium only if you plan to use it to handle photos and video or games.

Street price: \$449

Handspring

888/565-9393

www.handspring.com

Thanks for Sharing: LapLink's PCsync

FILE MANAGEMENT

GETTING IN SYNC is a common problem: You buy a new machine and need to copy all files from your old PC. Or a business trip forces you to copy multiple files from your desktop to a laptop. That's where PCsync comes in. This software transfers files from

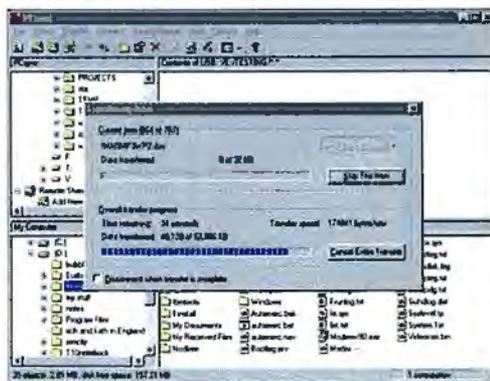
PCsync

PRO: Copies files fast; easy to use.
CON: Probably unnecessary if you have access to a network.
VALUE: Enables people without networks to transfer files to a new PC or synchronize data on a laptop. Street price: \$55 with cables; \$50 download from LapLink.com
LapLink.com
 800/343-8080
 www.laplink.com

one machine to another via cables or over the Internet.

The \$55 package from LapLink.com—which also makes LapLink, the popular high-end remote-control and file-transfer program—includes two cables for connecting one notebook's USB or serial port to another's (the software costs \$50 if you download it from LapLink, but cables are not included). LapLink says PCsync can achieve speeds of 5 mbps for USB and 500 kbps for serial. In my tests of shipping software, the USB connection took about 5 minutes to transfer a 90MB directory between

two laptop machines. That translates to about 18MB per minute (approximately 45 times faster than an infrared



LAPLINK.COM'S PCsync software allows users who lack network connections to get speedy file transfers.

connection's transfer speed). PCsync can also selectively copy files that have changed since the last transfer, thanks

to its SmartXchange feature. And a single mouse click lets you transfer all the files from one PC to another.

The system allows you to share files over the Internet with anybody who has a copy of PCsync (and the right password).

It's relatively easy to transfer files between a pair of networked PCs using software built into Windows, so if you just want to do that, this product isn't for you. But if one of the machines isn't networked (or if you want to synchronize files over the Internet), PCsync provides a good, fast way to copy files—with some useful extra features.

—Richard Baguley

Ricoh Delivers Two Fast Drives in One

REWRITABLES

RICOH'S second-generation combination CD-RW/DVD-ROM drive, the new MediaMaster MP9120A, doubles or triples the write performance of first-generation units. Increased performance means better value: At \$349, this drive has a hefty price, but that's no more than you'd pay separate-

ly for a 12X/10X/32X CD-RW and an 8X DVD-ROM drive.

Earlier combo drives were space-efficient and convenient but relatively slow (6X or 4X CD-R, 4X CD-RW, 24X CD-ROM, and 4X DVD-ROM).

The MP9120A 12X/10X/32X/8X is Ricoh's first CD-RW drive to offer the company's JustLink buffer-underrun

protection—no more flawed discs due to momentary system glitches. Like Sanyo's Burn-Proof, this function enables the program to shut off, realign, and relight the drive's write laser if the drive's buffer runs out of data to write.

Ricoh recently dropped the Easy CD Creator/DirectCD software from Adaptec (now Roxio) in favor of Prassi's PrimoCD CD mastering and AbCD packet-writing packages.

With Prassi's programs at the helm, the shipping unit I tested burned my 430MB test folder to CD-R in a speedy 4 minutes, 58 seconds, and it burned my 100MB test folder to CD-RW in a record-tying 1 minute, 27 seconds. Testa

Labs' DVD Tach gauge rated the MP9120A's DVD-ROM reading at 5.2X. The average dedicated DVD-ROM drive scored 8X in PC World's July 2000 roundup. DVD movie playback—using the bundled WinDVD 2000 software player on my Celeron-400 test PC—was smooth as butter.

—Jon L. Jacobi ▶

Ricoh MediaMaster MP9120A

PRO: Stellar CD-RW, CD-R, and DVD-ROM performance in a single drive. This drive has one-tray, all-media convenience.

CON: Not for shoestring budgets.

VALUE: Great drive for the power user, and a space saver to boot.

Street price: \$349

Ricoh

877/742-6479

www.ricohdms.com



THE MEDIAMASTER MP9120A combination CD-RW/DVD-ROM drive from Ricoh burned a test folder to CD-RW in record-tying time.



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Business Desktops That Don't Crowd the Desk

BUSINESS PCs

WITH THEIR latest corporate systems, Acer and Hewlett-Packard prove that buying a little style doesn't have to send your accounting department into a tizzy. Both companies have produced stylish, modular desktops that sweeten the pot

Functionally, the two systems I tested are not exciting. Each packs a Pentium III-800 processor. The \$2099 Acer uses a 133-MHz front-side bus to connect between the CPU and main memory; for its part, the \$2298 HP uses a slower, 100-MHz front-side bus. Both systems are configured with a 20GB hard drive and 128MB of SDRAM. Running Win-

MONITOR MOVEMENT

ACER'S STYLISH monitor is removable and can sit in a \$99 optional stand, or you can replace it with a larger panel. HP's equally fancy display can pivot from landscape to portrait format. Both systems include a number of features that business users will appreciate, such as management software, security locks, and integrated network chips. You also get extras such as keyboard buttons (for fast Internet access), CD-ROM/DVD-ROM control functions, and well-labeled ports. The FP2 comes with four USB ports, and the E-pc has two, but neither offers open PCI slots.

Important structural differences do exist, however. The Veriton FP2's case is difficult to open, but it is slightly more expandable than the E-pc's. Acer's design incorporates an AGP slot in addition to its integrated graphics (permitting a graphics upgrade) and provides two externally accessible bays to accommodate other devices of your choice. You can hot-swap out the included floppy and CD-ROM drives in favor of an optional CD-RW, DVD-ROM, or second hard drive

while the PC is on. The FP2's built-in speakers sound tinny and distant. The HP E-pc's simpler design offers a single slimline CD-ROM drive and no available slots, floppy drive, or speakers (they are available for purchase as accessories).

Overall, the Acer's greater

Network Defragger Updated

NETWORK MANAGERS know that optimized hard disks dramatically improve performance and speed network response. Now out: Executive Software's **Diskeeper 6**, a new version of its popular defragger. Its Workstation and Server editions come in versions for Windows 95, 98, Me, NT, and 2000. The Server edition also enables an administrator to deploy and control Diskeeper programs in the network from a console. At \$49 per user, \$29 to upgrade, Diskeeper isn't a cheap upgrade from Windows' Disk Defragmenter. Its strong management features do make it a nice addition for Windows users on a network. Executive Software, 800/829-6468, www.execsoft.com

—Karl Koessel



A TRIM DESIGN for HP's E-pc business system.

with included 15-inch LCD monitors—for under \$2300.

The Acer Veriton FP2 and the HP E-pc are small-footprint contenders for users who want to protect precious desk real estate. The Acer measures 15 by 17.5 by 9.2 inches; the HP, 9.5 by 10.7 by 3.5 inches.

Acer Veriton FP2

PRO: Various optional drives may be swapped out when the PC is on; detachable monitor.

CON: Poor speakers; case is somewhat difficult to open.

VALUE: Slim profile and more options for a cost-conscious buyer.

List price: \$2099

Acer America

800/733-2237

www.acer.com/tp2

dows 2000, both performed comparably in our PC WorldBench 2000 tests: The E-pc's 167 score put it in a virtual tie with the FP2's 165.

Given its faster front-side bus speed, I expected slightly higher numbers from the Acer, but both figures are well in line with scores of similarly configured PCs we've tested. PC WorldBench 2000 scores for such systems average 175.

HP E-pc

PRO: LCD monitor can pivot to landscape or portrait format.

CON: Lacks a floppy drive.

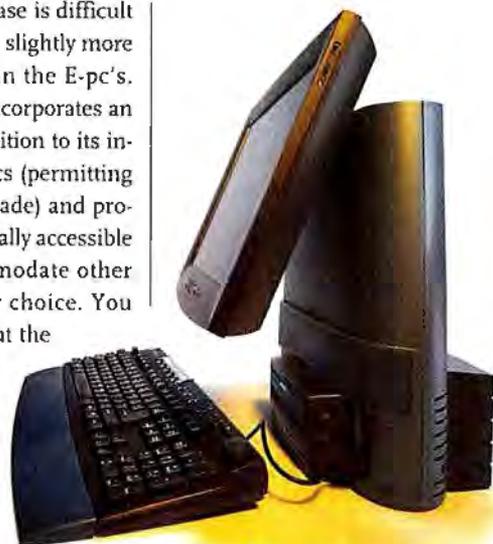
VALUE: Has all the musts without the fuss for a highly managed PC environment.

List price: \$2298

Hewlett-Packard

800/752-0900

www.hp.com/desktops/epc



ACER'S VERITON FP2 system has a detachable LCD monitor.

number of options make it the more flexible choice. Where simplicity holds the key to office harmony, however, the slightly pricier HP is more likely to meet expectations.

—Kalai Murugesan ▶

TEST
PC WORLD
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IBM recommends Microsoft Windows
2000 Professional for business.

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Theater-Quality Sound Comes to the PC

SPEAKERS

HOME THEATER-quality audio is coming to a PC near you—if your wallet's agreeable. Dolby Digital 5.1, now available for desktop PCs, distributes six channels of sound

Boston Acoustics Digital BA7500

PRO: Big, booming bass.

CON: Not a true 5.1-channel setup.

VALUE: Good all-around speakers.

List price: \$300

Boston Acoustics

978/538-5000

www.bostonacoustics.com

Cambridge SoundWorks DeskTop Theater 5.1 DTT3500 Digital

PRO: Crisp sound at any volume.

CON: Bass is less powerful than on the Boston Acoustics set.

VALUE: Great all-purpose system.

List price: \$299

Creative Labs

800/998-5227

www.creative.com

through a central speaker, four satellites, and a subwoofer. I looked at shipping units of two-speaker sets—one with true six-channel sound and one with a virtualized sixth channel—that pour out auditory ambrosia.

The \$300 **Digital BA7500** set from Boston Acoustics looks like a standard four-channel array of speakers plus a subwoofer; the Boston set, however, uses digital coaxial input (a primary connection type for digital components) to create a virtual central channel of sound from the front pair of speakers. In contrast, the Creative Labs **Cambridge SoundWorks DeskTop Theater 5.1 DTT3500 Digital** set has six speakers plus a mini-remote; a decoder amplifier lets you connect to other

sound sources, such as set-top DVD players or the PlayStation2 gaming console.

I played various Dolby Digital 5.1 clips in digital mode. The Boston speaker set nearly equaled the sound produced by the six-channel, \$299 Creative Labs set. Both delivered movie theater-quality sound when paired with my Creative



THE BOSTON ACOUSTICS Digital BA7500 speaker set offers impressive virtual Dolby 5.1 sound.

Labs Sound Blaster Live Platinum 5.1 sound card, but the Digital BA7500 set's virtual channel couldn't quite match a real central speaker.

In informal four-channel and Surround Sound tests of music files, ambient-sound games, and other audio, the Creative Labs set sounded slightly better. Both sets produced precise 3D audio with games—footsteps echoed on cobblestones; I heard enemies

above and below. The DTT3500s did deliver crisper sound, especially at high volume. The Boston set distorted the clips slightly, but its subwoofer pumped out low frequencies with more power.

Ultimately, I think both products make... well, very sound options. Note: Before purchasing any speakers, make sure your sound card is compatible.

—Joel Strauch

Crank It Up With Dolby Digital Sound Cards

SOUND CARDS

BEFORE YOUR new digital PC speakers can perform at their best, you need to give them appropriate sound-card support. I tried out two options for the Dolby Digital 5.1 format: the **Sound Blaster Live Platinum 5.1** card from Creative Labs and the **Acoustic Edge**, the top card in Philips's new line.

An EMU10K1 audio processor—standard in all Sound Blaster Live cards—powers the \$199 Platinum package. It includes a Live Drive, which occupies a drive bay in your

PC and lets you connect various analog and digital audio sources to the front of the system instead of to the rear. The Platinum also has a great software bundle and an infrared sensor for the wireless remote control—nice for DVD movie playback via PC.

Philips's \$99 **Acoustic Edge**, with its ThunderBird Avenger sound chip, offers fewer connection options than the Platinum. It ships with standard media applications for MP3 ripping and audio and video playback.

MP3 files and CD music sounded clear with the shipping versions of both cards, as did Dolby Digital 5.1 files. Both are well equipped to handle Dolby 5.1's six-channel playback or 3D audio. While each

claims to deliver Surround Sound from stereo and monaural media files, the Philips did so more competently.

If you need a card with an array of audio inputs, grab the Platinum. If you're looking for an affordable 5.1-channel option, try the Acoustic Edge.

—Joel Strauch ▶

Acoustic Edge

PRO: Great 5.1-channel emulation.

CON: Fewer connections than the Sound Blaster offers.

VALUE: Excellent Dolby 5.1 sound.

List price: \$99

Phillips Consumer Electronics

800/326-6586

www.pcstuff.philips.com

Sound Blaster Live Platinum 5.1

PRO: Extensive connectivity options.

CON: Pricey, fewer analog channels.

VALUE: Fine 5.1-channel sound.

List price: \$199

Creative Labs

800/998-5227

www.creative.com

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QuickBooks 2001—Bill 'Em at Internet Speed

ACCOUNTING SOFTWARE

INTUIT'S LATEST VERSION of its small-business accounting program, **QuickBooks 2001**, is the most innovative in years, allowing users to communicate electronically with customers from within the program. Intuit also has a new Web-based product, **QuickBooks for the Web**, designed for entrepreneurs on the go.

The beta version of QuickBooks 2001 that I reviewed is chock-full of useful enhancements, from electronic billing to more-flexible pricing formats. You can e-mail or e-fax invoices and estimates over the Internet. (There is a nominal charge for e-fax service.)

E-mailed invoices let your customers take advantage of the nifty new online invoice-payment option. By clicking on a link embedded in the in-

QuickBooks 2001

PRO: Handy electronic invoicing and payment options.

CON: Regular and Pro versions both cost \$30 more than last year.

VALUE: Excellent bookkeeping choice for small businesses. List price: QuickBooks 2001 \$150, upgrade \$90; QuickBooks Pro 2001 \$250, upgrade \$170.

QuickBooks for the Web

PRO: Access your books from any Internet connection.

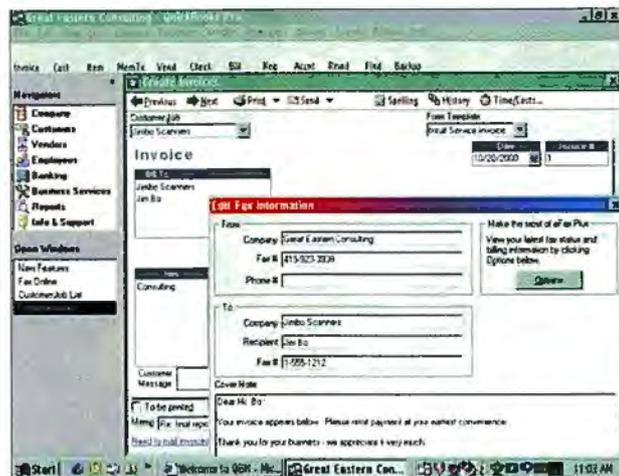
CON: No invoices; lack of inventory tracking makes this most suitable for service businesses.

VALUE: Interesting option for service professionals on the move. Street price: \$15 per month (includes up to 50 faxes).

Intuit

800/446-8848

www.quickbooks.com



THE ABILITY TO E-FAX INVOICES to customers over the Internet (for a nominal fee) is a great new feature of QuickBooks 2001.

voice, customers can pay you electronically via credit card or direct transfer from a bank account. This option could get payments to you more quickly, though you pay a small charge for the service.

Other additions include batch printing of frequently used reports and improved payroll setup, with 60 days of free online tax-table updates.

The \$250 multiuser QuickBooks Pro 2001 includes capabilities—for time and billing and for job costing—that the \$150 single-user version lacks. Pro also delivers more pricing options: You can use up to 20 different price levels as a percentage of an item's standard selling price—a feature that allows greater selling flexibility. Electronic billing options in both versions of QuickBooks 2001 make them well worth the upgrade for current users.

INTERNET QUICKBOOKS

QUICKBOOKS FOR THE Web is not a clone of the packaged desktop program—it's been

redesigned from the ground up for faster page loading. Yet even with a broadband Internet connection, using QuickBooks for the Web takes longer than running a program on your local PC. Fur-



QUICKBOOKS FOR THE WEB enables you to enter customer charges online by using your computer system's Internet Explorer browser.

thermore, the beta version I reviewed can't do everything the desktop QuickBooks can. For example, it doesn't track product inventory, and it offers far fewer reports (30 compared to more than 100).

The Web version's biggest limitation: It doesn't let you send an invoice to a customer. Any charges are included in a statement that you can print out or e-mail or e-fax over the Internet. This causes problems for customers who pay by invoice rather than by statement. Also, Intuit's Web product is pricier than the competing NetLedger, which also offers such optional features as payroll capabilities and online ordering for customers.

On the other hand, for its \$15 monthly fee, QuickBooks for the Web supports multiple users, whereas NetLedger charges \$5 per month per user.

QuickBooks for the Web is Intuit's decent, albeit unimpressive, first crack at a Web-based bookkeeping product. It may prove useful for professionals who frequently find themselves out of the office and for on-the-go owners of

small service businesses.

Other businesses will find the product's limitations dissuasive and will want to wait for the next version or just stick with desktop products.

—Richard Morochove ▶



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On Point: New Mouse Technologies

POINTING DEVICES

TODAY'S ADVANCED alternatives to the traditional mouse provide plenty of ways to make pointing simpler, more precise, and more comfortable. I looked at shipping versions of new products from Logitech and Microsoft that play off the designs of conventional pointing devices but optimize them with the latest in optical and tactile technologies.

Logitech's \$40 **IFeel Mouse** and \$60 **IFeel MouseMan** add responsive vibration to give

devices, are the first mainstream mice to incorporate a revolutionary new technology from Immersion called TouchSense that gives tactile feedback to users.

The **IFeel Mouse** is a traditional wheel mouse designed for left- or right-handed users; the wheeled **IFeel MouseMan**, which is sculpted to fit the hand's contours, is for righties only.

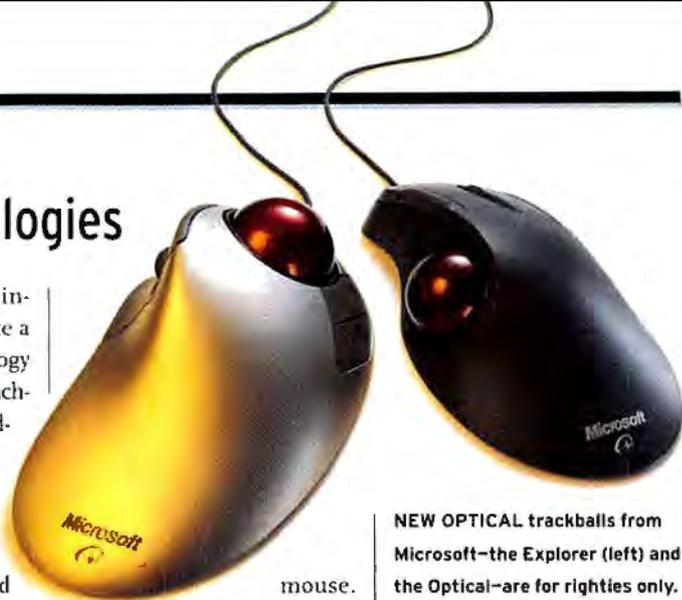
So why make a mouse that vibrates on cue? Ostensibly, as Web pages and Windows screens grow more cluttered, zeroing in on the exact place to click becomes more difficult. I tested the **IFeel** mice on a variety of Web sites as well as on my busy Windows 98 desktop, and they did help me target where I wanted to click.

Though the **IFeel** software works in Internet Explorer 5 and in Netscape 4.5 or later, it requires you to install IE 5 before it will load the necessary drivers. It may conflict with touch-pad devices on some notebooks, too.

These minor complaints aside, at only \$10 more than their unfeeling counterparts, either Logitech device would make a handsome investment, especially as more software is written to exploit the TouchSense technology.

TRACKBALL AND CHAIN

TRACKBALLS ARE the pointing device of choice for many people whose hands cramp when they use a conventional



NEW OPTICAL trackballs from Microsoft—the Explorer (left) and the Optical—are for righties only.

mouse.

Microsoft's two new right-hand trackballs rely on optical tracking technology that replaces internal moving parts with an optical sensor that takes "snapshots" of the trackball at 2000 images per second, providing the user with precise pointer movement from a device that stays stationary on your desk.

The difference between the **Trackball Explorer** and the **Trackball Optical**, other than price, lies in how the trackball itself and the customizable buttons are positioned.

The Explorer's large red ball sits atop the contoured, bulbous, silver and slate device, with the wheel and the left and right buttons situated where your thumb naturally rests. Two customizable buttons to

the right of the trackball rely on your pinkie and ring fingers for operation and are more difficult to manipulate for any length of time.

The **Trackball Optical** puts the ball on the left side for the thumb to navigate, leaving the scroll wheel and left and right buttons in a more conventional location on top for easier clicking. Two customizable subordinate buttons are also on top, but once again one of them requires you to use your pinkie, which I found to be a very inefficient arrangement in the long run. I liked both trackballs, though only you can judge which is right for you. I definitely recommend that you try before you buy.

—Michael S. Lasky ▶

SENSORY MICE from Logitech have "feelings."

you palpable feedback when the cursor moves over icons, menus, hyperlinks, and bookmarks. Meanwhile, Microsoft's \$45 **Trackball Optical** and \$75 **Trackball Explorer** combine an improved version of the vendor's IntelliEye optical technology with dynamically different trackball positioning.

Logitech's two **IFeel** mice, ensconced in the same housing as previous Logitech

IFeel Mouse, IFeel MouseMan

PRO: Tactile feedback feature enhances already superb optical mice, making them the best yet.

CON: Requires installing Internet Explorer 5 even if you use Netscape.

VALUE: At only \$10 more than their nontactile cohorts, these mice are a good investment.

List price: **IFeel Mouse** \$40, **IFeel MouseMan** \$60

Logitech

800/231-7717

www.logitech.com

Microsoft Trackball Optical, Microsoft Trackball Explorer

PRO: Two choices with optical technology; differing comfort options.

CON: Some buttons require inefficient pinkie manipulation; Explorer is overpriced.

VALUE: The Optical is the better value, providing similar features for a lower price.

List price: **Optical** \$45, **Explorer** \$75

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Vox Unpopuli: Yahoo by Phone

PORTAL TRENDS

FROM ONLINE auctions to online bill paying, Yahoo tries to be all things to all people. Now, the megasite wades into voice-portal waters with **Yahoo by Phone**—and emerges a bit bedraggled. The service provides bits of news, sports, weather, and stock information, as well as voice-enabled e-mail. But it has fewer features than voice portals such as Tellme and BeVocal.

Set-up is easy, though it involves many numbers. First, you call the service's toll-free number and specify a 10-digit mailbox number. Hint: Use a sequence that's easy to remember—such as your own phone number. Next, you select a four-digit password. To leave messages, your friends and associates must know both the toll-free number and your account number. You use these two numbers, plus the password, to retrieve your voice-mail messages or news and weather information. I found the automated voice reading the e-mail difficult to understand at times, especially at the start of a message.

Yahoo by Phone's news and stock information is standard

Yahoo by Phone

PRO: Easy setup, no cost to user.
CON: Not as full-featured as the competition.

VALUE: Suitable for people with Yahoo e-mail accounts; others should try voice portals that offer more services.

Free

Yahoo by Phone
800/699-2466
phone.yahoo.com

fare, but its technology update section sounded more like product announcements than news. You may access weather information by keying in a zip code—more reliable than speaking a city's name, but unhelpful if you don't know

the zip code. As with other voice portals, you must listen to short ads in return for obtaining retrieved information; but the others typically offer more services, such as airline flight info, driving directions, or restaurant guides.

I'd recommend the service if your primary e-mail account is with Yahoo. Otherwise, establishing another set of contact numbers for others to reach you with might not be worth the extra effort. Try to sign up with a portal that pays you back in information for putting up with ads.

—Mick Lockey

GoLive 5: Shrewder Web Management

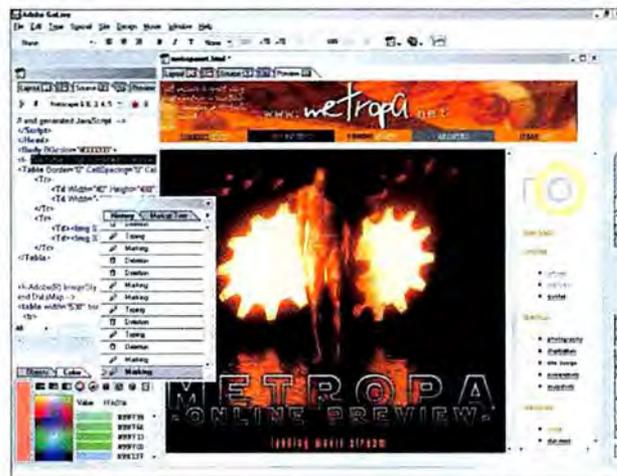
WEB SOFTWARE

POSTING AN ERROR on your business Web site is something like waltzing around all day with your fly open. If you manage employees who produce Web pages, equipping them with a capable program like **Adobe GoLive 5** can help minimize snafus and keep online credibility intact.

The \$299 shipping version I installed boasts more than 100 new features to help you visualize, design, and analyze Web sites. This 60MB program may not nab all of the bloopers at your online outpost, but GoLive's improved site-analysis tools can spot download delays, errant links, and elusive coding glitches.

The enhanced file-sharing capability should prevent designers from mixing up versions or overwriting work. For e-commerce and dynamic Web publishing, GoLive easily links objects on Web pages to databases, such as Access, without requiring the user to peck in code. Meanwhile, Webmasters can make sweeping changes (or create new sites) just by rearranging icons on a Site Design diagram.

Since GoLive adopts much



EXTENSIVE SITE ANALYSIS, broad media support, and clever file sharing make GoLive 5 a good choice for high-visibility Web projects.

of Adobe's trademark interface, it should feel familiar to newcomers who use other Adobe products. For instance, the handy new History palette can restore a session that lies several edits in the past. The only catch: The History's list of edits clears whenever you jump between any of GoLive's five modes—Layout, Source, Frame, Outline, and Preview. Adobe-centric users should enjoy GoLive's Smart Objects, which link Photoshop, Illustrator, or LiveMotion source files to Web page copies. Editing the original automatically updates the Web copy. Also

new: RealMedia and Scalable Vector Graphics (SVG) support, plus an updated QuickTime 4.0 editor that can add interactive Flash (SWF) elements to movies.

—John Goddard ▶

Adobe GoLive 5

PRO: Detailed site analysis; protects custom code; improves file sharing; optimizes Web graphics.

CON: No file preview inside folders.
VALUE: Excellent for developing professional Web sites.

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also gain the ability to use your cell phone from any extension.

In an informal test, I set up the preproduction device in less than a minute, running the supplied phone cable between the cradle and a standard phone and plugging it in. I was then ready to place and

receive cell-phone calls using the wired-phone extension.

Would you find **Vox.Link** worthwhile? Well, if you want to replace your local phone service provider with a cell-phone account that you can use with your existing phone system; or if you want to com-

bine your regular landline service with your cell-phone service (and you're already wired and equipped for two lines); or if you only have one landline available but don't mind making wired and wireless services an either/or proposition, then **Vox.Link** could be a valuable telecom investment. Just watch out for those *ifs*.

—Dennis O'Reilly

View Digital Pictures Easily on Your TV

PHOTO PRESENTATION

WITH IOMEGA'S **FotoShow Digital Image Center**, viewing digital photos for fun or business is as easy as watching television. The \$299 system unites a standard-size 250MB Zip drive with SmartMedia and CompactFlash slots, and it easily hooks up directly to a TV.

Even if you can't program a VCR, you'll be able to connect and use **FotoShow**, thanks to a step-by-step getting started sheet and helpful manual. I attached a shipping unit to my 27-inch Sony television via the included audio and video RCA cables, turned on **FotoShow** and the TV, and changed the video input settings with the TV's remote control until the **FotoShow** intro screen came up. **FotoShow** has its own remote control, and an included USB port lets you connect the drive to a PC; it may also be used as an external storage drive.

Before I could view any images, I had to transfer them from a CompactFlash card to an Iomega Zip disk by push-

ing the copy button; easy, but slow. You can copy all or only selected images, without connecting to a PC. Once I completed this step, I could view the images at full-screen size or as a slide show; organize

Image quality was surprisingly good. I transferred images from both 2.1- and 3.3-megapixel cameras; and though I saw some slight flicker and image pixelation at close range, these problems were virtually un-

detectable at a more typical viewing distance of 8 feet. I managed to obtain better picture

quality and a reduction in flicker by using an optional S-Video-out cable.

Despite being a bit pricey, **FotoShow** has the flexibility and mobility to enhance business presentations or make an appealing addition to a digital-photography enthusiast's gear.

—Melissa J. Perenson ■



IOMEGA'S

FotoShow Digital Image Center.

them; add captions; and perform basic image-editing tasks like removing red-eye, cropping, rotating, and automatically enhancing images.

FotoShow also enables business users to display their Microsoft PowerPoint presentations to a wider audience by using a TV screen instead of a laptop display. Truly mobile professionals—or users who simply must view their Grand Canyon pix immediately—can spend \$15 extra to get **FotoShow's** optional car adapter.

FotoShow Digital Image Center

PRO: Easy to set up; convenient way to view digital photos on any TV.

CON: Performance sluggish while converting images for TV.

VALUE: Potential for family fun and business use where cost is no bar.

Street price: \$299

Iomega

www.iomega.com

800/697-8833

Vox.Link

PRO: Easy, versatile way to combine cell phone with standard home or small-office telephone system.

CON: Relatively high price; works only with specific Ericsson and Nokia models; high potential to run into wiring problems.

VALUE: For small businesses and homes with the right equipment, wiring, and telecom-service needs, it's a bargain. Impractical for most.

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- Upgrade to CompleteCare™ Service™ from 3-Yr NBD On-site Service³, add \$169

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NEW—Small Business Value Solution

- Intel® Pentium® III Processor at 800MHz (up to 1GHz)
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- 9GB¹ (7200 RPM) Ultra3 (Ultra 160) SCSI HD (up to 36GB¹ 10K RPM)
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- 48X Max IDE CD-ROM
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BUSINESS LEASE: \$43/MO., 48 MOS.¹¹

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- 40X Max SCSI CD-ROM
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BUSINESS LEASE: \$53/MO., 48 MOS.¹¹

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WIRELESS SPEED WEB ACCESS

The latest in fast Net for 2001:

We compare the providers, identify the best broadband sites, and rate the new home gateways.

FAST-ACCESS FACE-OFF ▶ Page 94

Cable, DSL, ISDN, satellite, and wireless face off in our guide to choosing the right broadband connection to meet your needs.

BY SCOTT SPANBAUER

BROADBAND SITES ▶ Page 97

Want to put your powerful new high-speed connection through its paces? Check out these intriguing broadband-enabled sites.

BY DENNIS O'REILLY

GATEWAY OPTIONS ▶ Page 102

We test five inexpensive gateway routers that let you share a broadband connection.

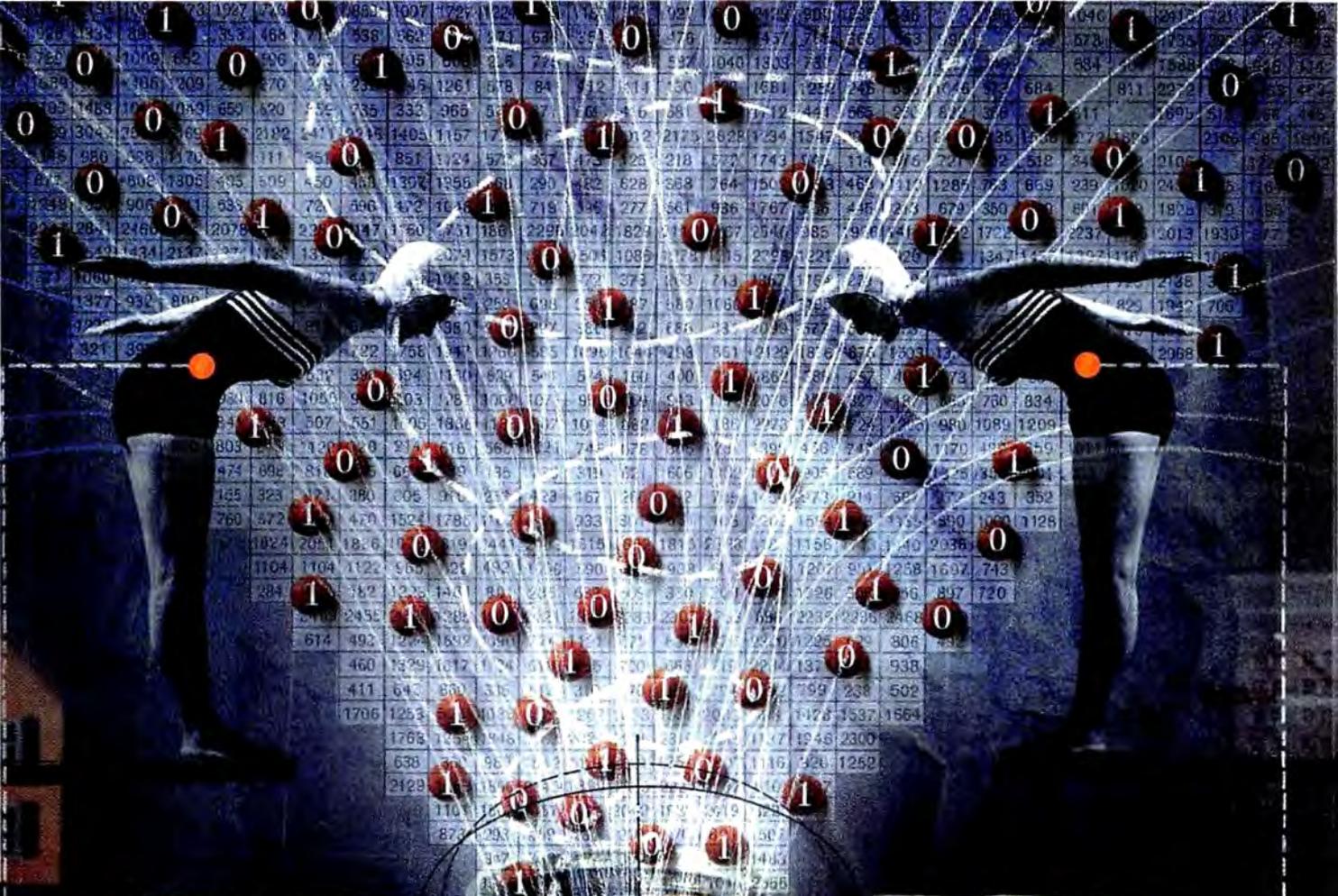
BY ALAN STAFFORD

Here at *PC World*, we've long predicted the arrival of widespread high-speed Internet access. Now, finally, we can say it: After years of fumbling and false starts, broadband is here.

Thanks to better technology, experienced service providers, and steady customer demand, 2001 promises to be the first year that you can get fast Net access almost anywhere in the United States.

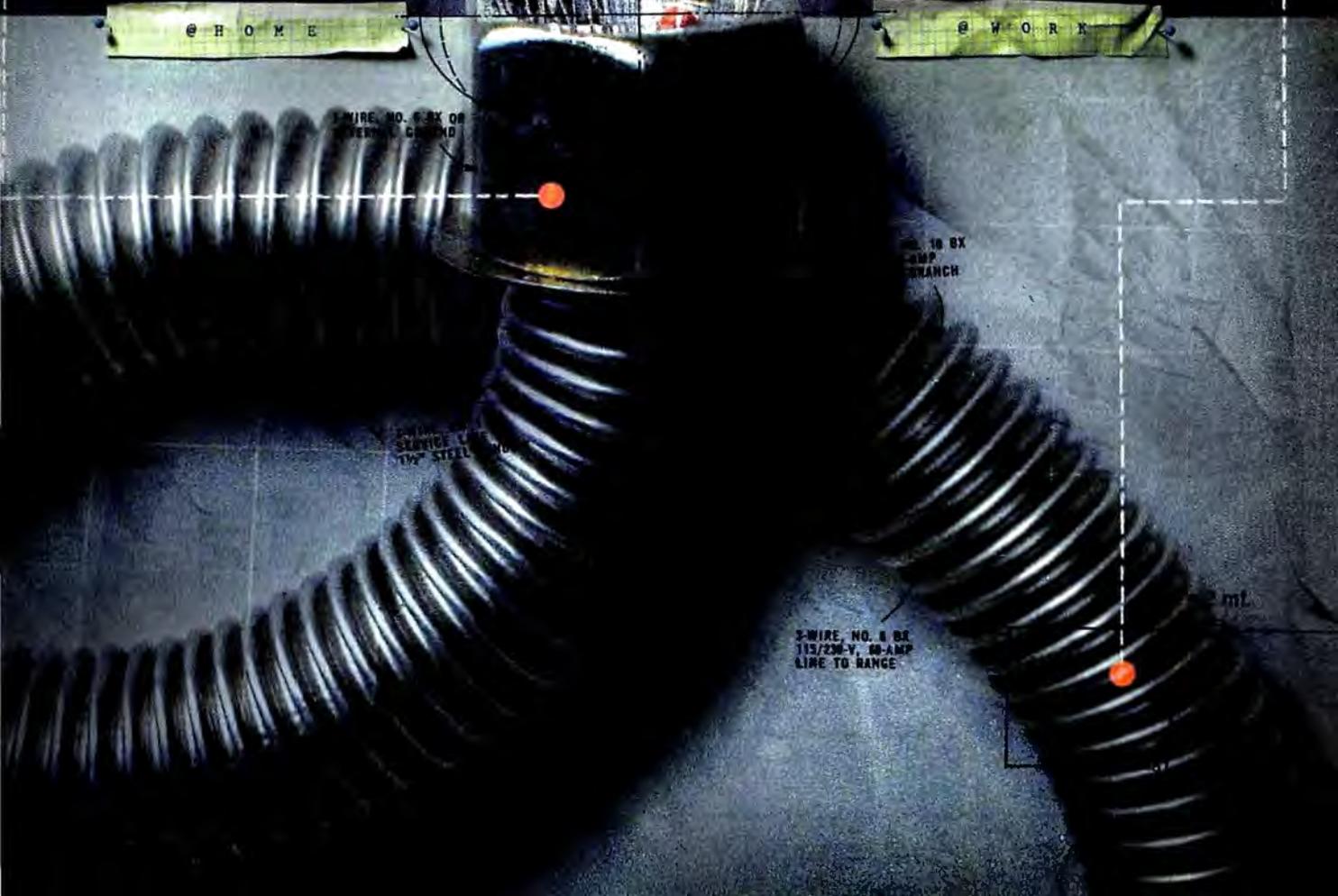
What's more, the Net is finally taking advantage of broadband. New Web sites tailored to high-speed access are pumping everything from financial news broadcasts to short movies. And new low-cost hardware lets multiple PCs in a small or home office share a single high-speed connection securely and efficiently.

Is all the news good? Nope. In our survey of 500 *PC World* subscribers with broadband connections (see "The People's Voice," page 100), many complain of installation and other hitches; even so, almost 90 percent say broadband's benefits justify the hassle. Read on for our complete guide to fast Net access circa 2001. ▶



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@ W O R K



3-WIRE, NO. 6 BX OR
EQUIV. TO CORD

NO. 10 BX
10-AMP
BRANCH

STAINLESS
STEEL

3-WIRE, NO. 8 BX
115/230-V. 30-AMP
LINE TO RANGE

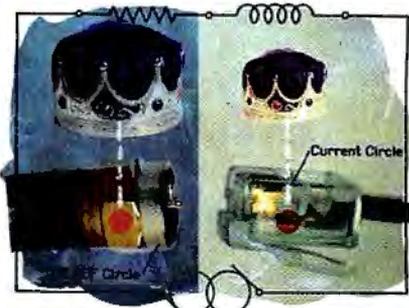
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FAST-ACCESS FACE-OFF

Cable vs. DSL vs. Everything Else

BY SCOTT SPANBAUER

BROADBAND ENCOMPASSES many different technologies—some mainstream, some moribund, others immature. Which one you get depends on what's available in your neighborhood, how much you are willing to pay, and how broad the bandwidth you really need. In theory, cable and DSL connections can reach speeds of 30 mbps and 8 mbps, respectively. In practice, both can easily match the 1.5-mbps speed of a T1 line,



of the cable users—report spending more time online after getting their broadband connections than they did before. After switching to broadband, according to a study conducted by Forrester Research, users go online twice as often and stay on

twice as long as they did before making the switch.

But with broadband's convenience comes risk. A computer that uses the same IP address for weeks and months is a sitting duck for

hackers. PC users who connect to the Internet—and broadband subscribers especially—should protect themselves from attack (see "Safe, Secure Speed," page 98).

CABLE IS KING

ACCORDING TO research firm Jupiter Communications, cable ISPs provide three-quarters of all home broadband connections. The reason? Cable got there first. While the Baby Bells and independent providers were still wrestling with

DSL's complexities, companies like Excite @Home and

TCI (both recently absorbed by AT&T), Road Runner, and Comcast were busily rolling out broadband services on the existing cable infrastructure.

That head start may explain why the cable users who responded to our survey had better luck with installation than the DSL users. More than half the cable users we polled report having service up and running within a week of ordering, compared to only 17 percent of DSL subscribers. Though about 10 percent of cable installations took more than a month, the corresponding figure for DSL is nearly 40 percent. And a hopping-mad 15 percent of DSL users were still waiting for the truck after six weeks. DSL is trickier to install than cable, Forrester analyst Bruce Kasrel says, but the main reason you can get cable quicker is provider experience. "A year and a half ago, cable took months," Kasrel recalls. "They had all kinds of installation problems, and poor coordination with their suppliers."

Cable installation may get even easier as cable services increasingly accommodate off-the-shelf cable modems that support the DOCSIS (data over cable service interface specification) standard, making self-installs a money-saving alternative. If you aren't comfortable about trying to set up your own connection, have your provider do it for you—92 percent of the cable users we surveyed went this route.

If you decide to order cable, look for promotional offers of free installation and a few months of free service. A free cable modem is a plum, since modem rentals

Cable and DSL aren't just faster than dial-up; almost all versions of both provide *always-on* access, so you don't have to wait while establishing a connection. They improve the Internet's accessibility so much, in fact, that you may find yourself spending more time online. Over half of the DSL users we surveyed—and two-thirds

Pick Your Pipeline

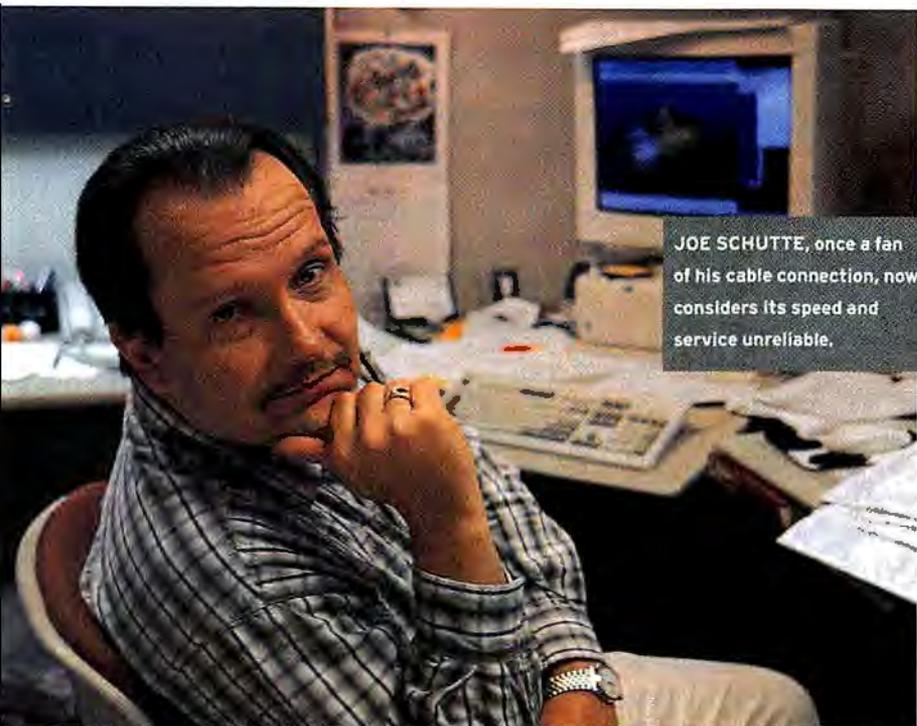
Though cable and DSL are the main contenders, new technologies—and a few older ones like ISDN and satellite—may fit your needs and location better.

TECHNOLOGY	Speed down/up ¹ (approximate)	Time to download 10MB file (minutes) ²	Price (per month) ³	Features		Availability	
				Pro	Con	Urban	Suburban
Cable	200 kbps-30 mbps/ 128 kbps-3 mbps	1.4	\$30-\$50	Blazing downloads; comparatively quick installation.	Limited upload speed; bandwidth sharing can degrade performance.	Good	Good
DSL	144 kbps-8 mbps/ 128 kbps-8 mbps	1.8	\$30-\$500	Variable-bandwidth services can be tailored to your needs and budget.	Higher bandwidth tends to cost more; long waits for installation.	Good	Good
Fixed wireless	500 kbps/ 150 kbps	2.7	\$60	Nice if you can get it.	Not yet widely available.	Poor	Poor
Satellite	400 kbps-500 kbps/ 28.8 kbps-256 kbps	3.4	\$30-\$80	New bidirectional services bring DSL-like speeds to rural users.	Inexpensive one-way service requires dial-up modem for upstream communication.	Good	Good
ISDN	128 kbps/ 128 kbps	10.7	\$70-\$150	Provides two analog lines or a 128-kbps Internet connection.	Not fast enough for the price.	Good	Good
Analog dial-up	56 kbps/ 33.6 kbps	28.4	free-\$20	Cheapest Internet connection.	Provides a fraction of broadband speed.	Excellent	Excellent

¹ According to service provider's claims.

² Based on 1-mbps cable, 768-kbps DSL, and 48-kbps analog speeds.

³ Includes cost of ISP service. Does not include cost of a phone line.



JOE SCHUTTE, once a fan of his cable connection, now considers its speed and service unreliable.

can add \$10 or so a month to your bill, and most cable modems cost about \$250.

Cable is fast, but it isn't trouble-free. Because cable modems use shared connections, they're prone to slowdowns if too many users along a particular stretch of cable are online at one time. "Speed is never guaranteed," says analyst Kasrel. "There's definitely high tide and low tide." Consequently, you'll probably see the fastest cable-modem performance in the wee hours of the morning, after your neighbors have put their mice to bed.

Speedy access isn't guaranteed at any time. MediaOne subscriber Joe Schutte of Westland, Michigan, enjoyed two years of

excellent service only to find one evening that access to West Coast addresses had slowed to sub-dial-up levels, a problem perhaps due to congestion in MediaOne's routing. Schutte has complained repeatedly, but two months later, he says, the provider hasn't delivered the promised fix—though it has refunded a month's fees. "Big freakin' deal," he says. "I'd pay double for a fast, reliable, steady connection, but it seems that the broadband service providers count on people accepting bad service rather than no service."

Prospective subscribers should note that most providers cap upload speeds at significantly lower levels than they do download speed. As a result, cable is generally much faster at retrieving information from the Net (say, displaying a Web page or downloading a browser patch) than at uploading data to the Net (for instance, sending e-mail). That's not a serious problem if you use the connection mostly for Web surfing, but it could be an issue if you plan to shuttle hefty files between office and home PCs.

ENTER DSL

SUPERFICIALLY, DSL is much like cable. It's fast, it uses wires that already run to your house (phone lines, in this case, as opposed to CATV wires), and it usually costs between \$20 and \$60 per month.

But there the similarities end. Though the DSL users we polled found installation a bear, they report fewer service outages and more-consistent speed. Thirty percent of DSL users report unwavering speed in an average month, compared to only 15 percent of cable users. And though 10 percent of DSL users report daily slowdowns, the number among cable users is even higher—18 percent.

Two main challenges face DSL users: deciding what type to order and selecting a service to buy it from. With cable, one provider is likely to be the only game in town. Not so with DSL. Most states require the local phone company that owns the wiring infrastructure (firms like Pacific Bell and Verizon) to make it available to competing companies (like Rhythms and Covad). Probably the best way to find a DSL provider in your area is to consult the excellent DSL Reports Web site (www.dslreports.com), which reviews the zillions of national providers and shows which ones provide what kind of service to your exact address.

Unlike cable, DSL is usually available in multiple flavors at different price points. Your choices include ADSL (the A is for *asymmetric*), in which upload speeds are slower than downloads; SDSL (the S is for *symmetric*), where upstream and downstream speeds are the same; and IDSL (the I stands for *ISDN*), which overlays a DSL connection on ISDN. Despite being limited to 144 kbps, IDSL bypasses the strict distance limitations of the other two choices. In most instances, ADSL and SDSL connections must be located within 18,000 feet of the telephone company's central office. Consequently, they tend to be most widely available in urban and thickly settled suburban areas.

Which type of DSL you get depends on the speed you need in both directions and on your location. ADSL download rates can reach 1500 kbps or higher, but upload rates are capped at a lower number. The faster either rate is, the more you pay. The same is true of SDSL connections, which tend to be more expensive than ADSL but are better suited to businesses that need to transfer lots of files from their own servers or that must access a virtual private network (VPN). IDSL is a last-resort technology for people who can't get ▶

PHOTOGRAPHY: AMEEN HONWRAHI

	Suitability		
	Rural	Home	Office
Poor	Good	Satisfactory	Satisfactory
Poor	Good	Good	Good
Poor	Satisfactory	Good	Good
Good	Satisfactory	Poor	Poor
Satisfactory	Satisfactory	Poor	Satisfactory
Excellent	Satisfactory	Poor	Poor

5 Reasons We (Still) Love Dial-up

IN A WORLD gone batty for broadband, dial-up Net access just isn't sexy. But the humble 56-kbps modem and dial-up ISP account still have their virtues. Consider the following:

CHEAP IS GOOD. Broadband service starts at about \$30 a month, and the necessary modems can cost \$250 or more. But a 56-kbps modem costs as little as \$20 these days, and free nationwide ISPs abound. If you have more time than money and don't need to gather MP3

files, download the latest Linux distribution, or watch the BBC online, dial-up is a good deal.

AN UNWIRED PC IS A SAFE PC. Most broadband connections remain on 24 hours a day, seven days a week; many assign your computer a static IP address. That's like hanging out a flashing neon sign that says, "Yoohoo, hackers—over here!" Dial-up connections use temporary IP addresses, and since your PC spends less time connected to the Net, you're safer.

CABLE AND DSL MODEMS DON'T TRAVEL WELL. In fact they don't travel at all, unless you've got a really long LAN cable. It's a safe bet that laptop users will continue to depend on dial-up modems long after broadband has become standard for desktop PCs.

DIAL-UP IS EVERYWHERE. Broadband is far more pervasive than it was a year ago, but if you live in Simcoe, North Dakota, chances are poor that you'll be able to order a cable modem or

DSL connection any time soon. Even satellite access can be foiled by a leafy tree standing in the wrong location.

SIMPLICITY. I'm no Luddite, but sometimes I yearn for the days when the only things flooding into my computer were e-mail, my own feverish typing, and the occasional soft drink. Now, I'm constantly installing or removing the latest buggy media-player software, herding endless files onto CD-R, and watching movie trailers. Does any of this make me more productive?

—Scott Spanbauer

cable or one of the faster DSLs. Here, too, look for money-saving promotions, especially from the phone company.

Unlike with cable's mostly hands-off installations, you can hook up DSL yourself. Forty percent of the DSL users we surveyed performed the installation com-

pletely on their own. This response highlights another factoid: DSL users tend to be more technically proficient. "DSL is a little more attractive to technical users because of its two-way upstream/downstream potential," Kasrel states.

Of course, DSL presents its own prob-

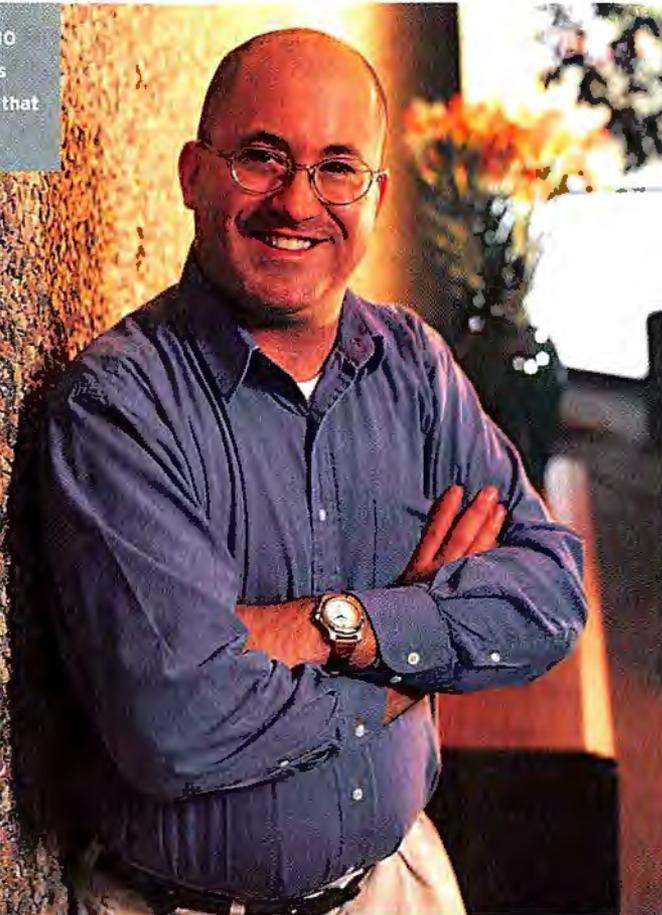
lems, many of them traceable to the interplay between the phone company, the DSL provider, and (often) the ISP used for service. Dave Pasquantonio from Mills, Massachusetts, had so many problems getting Bell Atlantic to install DSL that he went for cable access instead. "It was one of those situations where, every time you speak to someone, you get a different story about what [the problem] was," he says. "The same day my service was being turned off, I got a welcome letter from them and another DSL modem. None of the departments knew what any of the other ones were doing."

THEY ALSO SERVE

IF NEITHER CABLE nor DSL are available in your area, you have other options. If you live more than 3 miles from the phone company's central office, you may still be able to get ISDN, which offers rates of 128 kbps in both directions and includes two analog phone lines. ISDN can be pricey, though, and its brief heyday is over, so you probably won't reap discounts and special offers for signing up.

If you need more than 128 kbps of bandwidth, consider Net access via satellite. Hughes Network Systems' DirecPC, long the only player, usually charges between \$30 and \$80 per month for the service, depending on how much time you spend online (satellite dishes start at just over \$100). Though DirecPC's 400-kbps download speed is nearly on a par

DAVE PASQUANTONIO had so many problems getting DSL installed that he switched to cable.



with real-world cable and DSL rates, the connection is one way only. All upstream traffic runs through a dial-up modem connection, which causes a noticeable delay when you click on icons or otherwise interact with remote servers. Don't try to play Quake on the Internet using a satellite link. Boom, you're dead.

That limitation, however, may vanish when Hughes rolls out a bidirectional version of DirecPC. At press time, the company said the two-way service would be available in late 2000, offering 400-kbps downloads and 128- to 256-kbps uploads. Current DirecPC users would have to purchase new equipment for the service; prices for the new service and equipment upgrades weren't available as we went to press (for details, visit www.direcpc.com).

Meanwhile, an Israeli company may beat Hughes to the two-way satellite marketplace. Partnering with RadioShack and EchoStar, Starband will offer an oblong dish with 500-kbps downloads and 150-kbps uploads to any location in the continental United States for \$60 to \$70 per month. Unfortunately, RadioShack insists that you purchase a Compaq PC with your Starband dish, raising the total hardware price to about \$1200.

Don't feel like buying a brand-new computer system just to obtain a broadband connection? EchoStar's 20,000 U.S. DishNetwork retailers will soon offer a dish and satellite modem for delivering Starband service to any PC. The monthly fee will be similar to RadioShack's, but the initial equipment and installation will cost a more palatable \$300 to \$500. EchoStar hopes many of its 4.3 million DishNetwork customers will jump on the Starband wagon, but to do so they have to purchase a new 3-by-2-foot dish capable of reaching all the satellites.

Wireless is another newcomer to the broadband market. Metricom's 28.8-kbps Ricochet service has been around for years, but now the company is upgrading its system to 128 kbps and expanding service beyond the current 11 metropolitan areas covered. This convenient, always-on service is perfect for mobile users, but it costs a hefty \$70 a month.

In the past, a few companies have offered special-purpose (and high-expense) fixed wireless connections—named for

the receiver antenna aimed at a transmission tower. Now AT&T is offering a general-purpose fixed wireless service in at least one Texas test market. With 512-kbps download and 128-kbps upload bandwidth and an included telephone line for

about \$60 per month, AT&T's service may satisfy broadband demand in areas cable and DSL can't reach.

Scott Spanbauer is a contributing editor for PC World.

STREAM A LITTLE DREAM

The Best Broadband Sites

BY DENNIS O'REILLY

BROADBAND CHANGES everything. Forget text and still images. One glimpse of the fancy sites people are putting on the

Web these days, and the old stuff will seem practically as passé as a poodle skirt. Prepare yourself for sites that move, talk, sing, and caress your psyche like a soft summer breeze.

But not every site tailored for broadband access is a winner. In fact, of the 100 or so sites I visited via my home-office DSL connection, most delivered less-than-compelling content or were so heavily ad-laden that I couldn't wait to leave. Still others, such as the high-profile AtomFilms.com, generated choppy, un-

satisfying video playback in my tests.

Eventually, I found a handful of sites that truly take advantage of broadband to provide content with a serious hook, either informational or entertaining.

Undoubtedly, between the moment I describe them and the time you read this, the sites will metamorphose numerous times. But of course, that variability need not be seen as a problem: Never knowing what you'll find the next time you visit them is simply part of the fun.

NEWS/INFORMATION

NBCi-Broadband (speed.nbc.com) may be the trendsetter in merging television news and entertainment with the ▶



THE AMERICAN CENTURY exhibit on display at ArtMuseum.net presents 100 years of illustrated art history, which visitors access by using this clever scrolling timeline interface.

Safe, Secure Speed

IS IT SAFE online? Well, nobody can reach in through your Internet connection and grab you, but bored, mean-spirited hackers do have a habit of looking for connected PCs that incautiously leave all their doors and windows open. In a worst-case scenario, a nosy Netizen could exploit your always-on connection to examine your files (including whatever sensitive data they contain), delete files, crash your computer, or plant a Trojan horse—a program that conceals nefarious code within what looks like a normal application.

All of these dangers are more real for broadband customers

than for dial-up users (see "Five Reasons Why We (Still) Love Dial-Up," page 96).

ESSENTIAL SECURITY

WHAT CAN YOU do? First, gauge your system's vulnerability. Go to Gibson Research's Shields Up Web site at grc.com (it's free), click the *Shields Up* link, and run the tests for system vulnerabilities. Depending on what these tests turn up, site author Gibson offers plain-English suggestions on how to plug your system's security leaks. Anyone who uses Windows and has a broadband Internet connection should also read Gibson's *Network Bondage*

page (grc.com/su-bondage.htm) for instructions on how to reduce exposure to snoops.

Next, install a personal firewall product such as Network ICE's \$40 BlackICE Defender (www.networkice.com), Symantec's \$70 Norton Internet Security 2001 (www.symantec.com), or Zone Labs' free ZoneAlarm 2.1 (www.zonelabs.com). All three do a good job of blocking access to your system's 65,000 network port addresses and even masking your computer's existence altogether. Most personal firewalls display probes into your system's ports in real time, and you may be disturbed by the number of probes you receive.

Or you may be pleasantly surprised to find that your service

provider has already set up a firewall for you. When I installed a copy of BlackICE Defender to monitor the cable connection that I'd had newly installed from AT&T@Home, I discovered to my delight that my PC didn't draw a single port probe or attack. Apparently, at least in my neck of the woods, AT&T takes security seriously enough to put up its own firewall. Still, I don't plan on taking any chances. Even though the only probes BlackICE has reported so far have come from my own computers, AT&T's, or the Shields Up site, I'm leaving my personal firewall up. Just as you can never have too much bandwidth, you can never have too much Internet security.

—Scott Spanbauer

Web. It promotes NBC programs, of course, but not exclusively or overzealously. You get the standard personalization features, along with local information for cities and towns across the United States. The videos are primarily news reports, plus interviews with business executives and entertainment personalities, though I found a handful of links to other video sites for short films and animation. The high-speed portion of the site doesn't run very deep, but it sure is broad.

Other news/information sites: **ON24 Financial Network's** (www.on24.com) video categories include roundtables and interviews with CEOs and strategists. At **Zatso** (www.zatso.com), you can see and hear video reports from any of several dozen local U.S. television news stations, as well as national news, weather, business, technology, and health reports.

FILM/VIDEO

Digital Film Festival (www.dfilm.com) would be even easier to like if it didn't have the name of its liquor-vending sponsor plastered on just about every page. Once you get to the films, though, you'll forget all about the Big Brand Name and obtrusive banner ad. You can either stream the videos using QuickTime or download them for later playback (often

with a choice of two or three resolutions). The lineup of films changes regularly. When I last visited, my favorites were *The Wedding* by Agnieszka Holland, who won an Academy Award for directing *Europa, Europa*, and *Shaken Not Stirred*, David

Veloz's account of a single man's night-long efforts to overcome the unkindness of strangers. Additional features: a rudimentary movie-maker that lets you create a custom video snippet, and a 90-minute traveling festival consisting of 20 ▶

The screenshot shows a Microsoft Internet Explorer browser window displaying the NBC website. The address bar shows <http://speed.nbc.com/>. The page features a red header with the NBC logo and navigation links for "Directory", "Local", "Personalize", and "Become a Member". A search bar is visible with a "Go" button. Below the header, there's a "Hot Video from 50 Degrees" section with a video player showing a man in a suit. To the right, there are "New Programs" and "Best on Show" sections. The bottom of the page has a blue banner with the text "Up-to-date headlines!".

NBC'S HIGH-SPEED VERSION offers a glimpse into the future of Web news, making its streaming video news reports and interviews available in several formats.

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short films or clips from longer films, all available for download. If you like video, especially the no-commercial-potential kind of video, you're going to love Dfilm.

Other film/video sites: **Ifilm** (www.ifilm.com) is trying to be the Amazon of Internet film, but it's too much *Hollywood Reporter* and not enough playable film for me. **On2** (www.on2.com) provides near-full-screen video playback. But first you must install the site's proprietary video player application, and on top of that you must have a broadband connection with a download speed of at least 256 kbps.

ANIMATION

THE ECLECTIC animations at **Wildbrain** (www.wildbrain.com) blur the line between cartoon and art (though some fans might argue that no such line has ever really existed). Wildbrain's short cartoons are available in both RealPlayer and Windows Media Player formats, and you can choose among three download speeds. I'm hooked on Romanov, a little guy with a yin/yang face whose adventures mix elements of Chaplin, Kafka, and Inspector Clouseau. Though this site has fewer animations than some of the others, you'll still find plenty of interesting content to amuse yourself with. And when you tire of them, you can spend some time with Wildbrain's assortment of games.

Other animation sites: The cartoons at **Heavy.com** (www.heavy.com) skewer any and every popular-culture icon. But scarcely concealed behind the wall of cynicism and biting satire is the radiant joy of life. (Just kidding.) **Nose Pilot** (www.nosepilot.com) is a 15-minute Flash romp that dances about, sings, and bounces, and then lets you play with a Rube Goldberg-like device. One word of caution: Neither Wildbrain nor Heavy.com is for the faint of heart—Heavy's Behind the

Broadband changes everything. Prepare for sites that move, talk, sing, and caress your psyche like a soft summertime breeze.

Music parody of the Smashing Pumpkins was so scathing that it touched off a boycott among infuriated fans of the band.

ART

IF YOU CAN EASILY spend entire afternoons in a world-class art museum, beware of **ArtMuseum.net** (www.artmuseum.net). Don't visit just before an important meeting or appointment, lest you get to mousing around and lose all track of time. Of the three exhibitions on the site as I

design. Other featured exhibitions are the Webby Award-winning 'Bill Viola: Selected Works 1972-1996,' 'Van Goghs: Masterpieces from the Van Gogh Museum, Amsterdam,' 'Refresh: The Art of the Screen-Saver,' and 'One Stop Warhol Shop.'

Other art sites: **Artchive.com** provides an alphabetical list of artists and periods represented, as well as a virtual exhibition and high-resolution photographs of the art images, including the ability to zoom in on each piece. **The National Gallery of Art** (www.nga.gov) lets you tour selected collections and search the 100,000 items in its collections by artist, title, subject, provenance, or accession number.

A WORD ABOUT PLAYERS

YOU MAY THINK your PC is equipped with all the latest media player programs. But visit the sites listed here or other broadband-specialty sites, and you'll quickly realize how many more players are out there, not to mention new versions of old players. So the question is: to download the player, or not to download the player? If a site prompts you to update your current version of QuickTime, Flash, RealPlayer, or Windows Media Player, it's probably a good idea to do so. On the other hand, installing one of the more-obscure players, such as Onz's proprietary video player, is probably not worth the bother unless you frequently visit sites that use it. And even an essential player such as RealPlayer can be a nuisance, putting its icons (see *Home Office*, page 43) all over your desktop and filling your in-box with spam. If possible, settle on a few favorite

media sites and stick with the players they require.

Dennis O'Reilly is a PC World senior associate editor.

The People's Voice: How Readers Rate Cable and DSL

WE ASKED 500 PC World readers with broadband connections* to tell us what they thought about their service. Neither form of high-speed access emerged as the clear winner—but all in all, most users were happy:

SETUP

ADVANTAGE: CABLE 54 percent of cable customers had the necessary equipment installed within a week of the time they placed the order; 91 percent got it within three weeks. Only 17 percent of DSL users were up and running that quickly; 15 percent were still waiting after six weeks.

RELIABILITY

ADVANTAGE: DSL 38 percent of DSL users said they notice significant connection slowdowns

no more than once a month. Just 22 percent of cable users see delays that rarely.

OVERALL SATISFACTION

TOSS-UP: 86 percent of DSL users say the service is worth the money that they spend for it; 87 percent of cable customers feel the same way.

MONTHLY COST

TOSS-UP: 93 percent of all respondents spend less than \$60 per month for either type of broadband service.

*Of survey respondents who have no broadband connection, 42 percent said the cost was too high; 37 percent said broadband wasn't available in their area. Only 6 percent said they didn't need a fast Net connection.

write this, my favorite is 'The American Century: Art & Culture, 1900-2000,' which juxtaposes American art and artists with each decade's cultural milestones. Its unifying timeline is a marvel of Web

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STAPLES

Sharing the Bandwidth

BY ALAN STAFFORD

ADDING BROADBAND ACCESS to your small office is a big step toward doing business effectively over the Internet. But

as soon as you fix your bandwidth problem, you run into another one: A low-cost DSL or cable modem supplies only a single port for hooking up a computer. In order to keep your ISP service costs

down, you will want to connect all of your PCs to that new broadband connection—and you'll want all those networked PCs to be safe from the incursions of hackers.

What you need is an Internet router—a hardware device that lets you network multiple computers, protect them with a firewall, and connect them to the Internet.

Before DSL and cable Internet connections became popular, routers were expensive pieces of equipment designed for large-office networks. Now, however, you can buy a router that connects four computers—perfect capacity for a home or small office—for less than \$200. If you already own a hub or a switch, you can purchase a less-expensive gateway product that adds firewall and connection-sharing capabilities. If you like to roam, you can connect a wireless hub to one of these routers or gateways and share bandwidth among ethernet-connected and wireless-enabled computers.

Alternatively, you could try Microsoft's Windows Internet Connection Sharing utility, but this approach requires that you keep a host computer on at all times for others to get onto the Net. In contrast, if you use a router, only that device must remain on for any of the computers it serves to access the Web.

Sharing files and printers are two obvious advantages of creating a small network, but with all your PCs connected

continuously to the Internet, firewall protection becomes quite important. Nearly all of these products include firewall functions that let you decide the permeability of the connection between your network

and the Internet. You can hide your PCs from the Net completely, or you can selectively open holes in the firewall to allow outside access to PCs on the internal network—a very useful capability if you want to run a Web server.

We looked at four small-office/home-office routers: Asanté's \$208 FriendlyNet FR3004LC, NetGear's \$161 RT314, SOHware's \$166 NBG600 Broadband Internet Gateway, and WatchGuard's \$340 SOHO. We also tested Farallon's \$154 NetLine Broadband Gateway, paired with a Farallon five-port switch (a \$70 product that supplies network ports but doesn't offer some features—such as a firewall—that the Broadband Gateway does). At one end of the spectrum, WatchGuard's SOHO

**ASANTÉ'S
FriendlyNet
FR3004LC.**

provides a number of security features for protecting small office networks, while remaining easy to configure. At the other end of the range, SOHware's NBG600 aims at the home market, with a strong focus on documentation, parental controls, and easy setup—but with less emphasis on security.

Our Best Buy is Asanté's FriendlyNet

FR3004LC. It's easier to configure than most of the competing routers, and it offers a backup modem port and an integrated print server (though we found that the print server didn't work with many printers). A less expensive version of Asanté's router, the \$175 FR3004, is identical except that it lacks the last two features; it may be a better alternative until Asanté can correct the more expensive model's print server problem. For buyers who need high security, WatchGuard's SOHO costs more but provides better protection against hackers.

NETWORK NECESSITIES

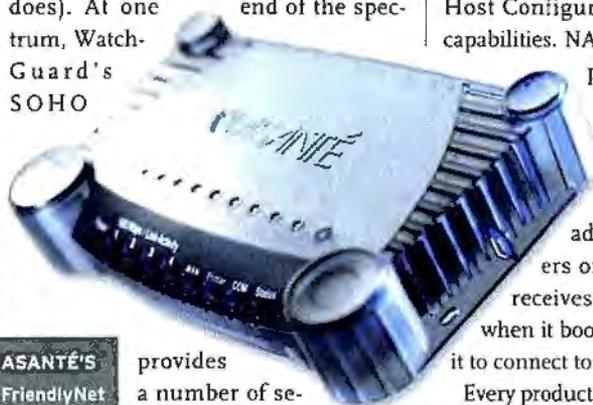
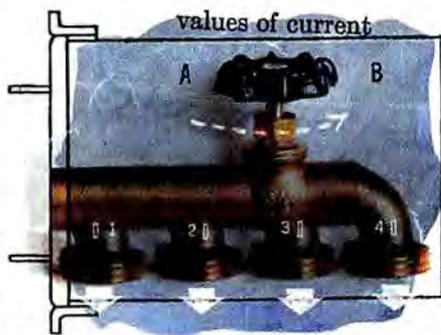
IN OUR INFORMAL TESTS, we saw little difference in download speed among the routers—all were powerful enough to cope with several computers browsing the Web at the same time. So your buying decision should come down to the features the different units offer.

To connect to the Internet, each computer must have a unique network address (known as an IP number). Typically, however, Internet service providers furnish you with only one IP address for an inexpensive Asymmetric Digital Subscriber Line (ADSL) or cable Internet account (though you can purchase additional ones). To solve this problem, all the routers we tested depend on Network Address Translation (NAT) and Dynamic Host Configuration Protocol (DHCP) capabilities. NAT permits multiple com-

puters to share a single external IP address.

DHCP lets the router automatically distribute hidden internal IP addresses among computers on the network: Each PC receives an assigned IP address when it boots up, thereby permitting it to connect to the Net.

Every product in our review can be used with either a static IP address (one that never changes) or a dynamic one based on a log-in routine. Most cable accounts require you to log in every time you go online; thus, they use a dynamic IP address. Many DSL accounts use a technique called PPPoE (Point to Point over Ethernet), which does the same thing. With a static IP address you can run a ▶



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Web server or office e-mail server—even using your own domain name, if you like.

Though these products function similarly, their internal architecture differs: The WatchGuard and SOHware routers use internal 10Base-T hubs, which allow you to transmit data at a maximum of 10 mbps; the Asanté, Farallon, and NetGear routers use more-sophisticated 10/100Base-T switches, which can transmit data at up to 100 mbps. Perhaps more important, a hub sends network data to all available ports, while a switch relays it only to the computer that is supposed to receive it. As a result, with a switch, data doesn't collide and thus slow down as much. Nevertheless, any of these products can share Internet bandwidth and still have plenty of headroom to spare, and most vendors agree that the architectural distinctions between the routers don't matter much unless your small office traffics in large files (as, for example, a graphics design studio would).

READY, SET, GO

MOST OF THE ROUTERS that we examined allow you to configure them via a Web browser from any computer on the LAN; the Asanté even lets you change settings from outside the firewall. The exception is NetGear's RT314: It uses a Web page wizard for basic setup, but then you must use Telnet—a text-based application—to configure its firewall. Telnet is available on many different operating systems, but it's a bear to use compared to Web-based configuration utilities. A NetGear representative told us that the company has plans



FARALLON'S NetLine Broadband Gateway (top), paired with a Farallon five-port switch.

to release a firmware update that will strengthen its Web-configuration capability, but this feature wasn't yet ready for us to test.

Some router vendors lean on their setup wizards just a bit too much, scrimping on documentation. Only the SOHware NBG600 and the Asanté FriendlyNet FR3004LC come with paper manuals, quick-start guides, and electronic manuals on CD-ROM; Netgear and Farallon



NETGEAR'S RT314.

supply quick-start pamphlets, but no comprehensive manual. Even so, Asanté's manual isn't exactly complete. For some settings, the text warns, "Note: This feature should only be used by users with an extensive knowledge of TCP/IP." It doesn't explain these matters further, though the settings involved are

important to the router's functions; for example, setting the router to allow remote administration is one task that receives this squib. Still, FriendlyNet is the easiest of the group to configure, and Asanté says that it's working to improve the manual.

The WatchGuard SOHO doesn't provide any documentation—paper or plastic (CD)—in the box. As a result, to set up the router, you must first use your existing setup to connect to the company's Web site, look up the appropriate settings, print them out, hook up the router, and then input the settings. Very convenient.

BUILDING A FIREWALL

ON THE INTERNET, a port number tells a computer what type of data it's receiving. For instance, Web traffic comes in on port 80, while e-mail is retrieved through port 110. Every router we tested ships with all ports hidden from outside access, but the router automatically allows inbound traffic through any port if the data was requested by a computer on your local network. So when you access a Web site or check your e-mail, the router allows the pages and messages to reach your computer, but if an outsider attempts to access a computer behind the firewall, the router won't be able to match the attempt with a computer (because no internal request was made).

In some instances, you may want to leave certain ports unhidden. For example, to let the outside world see your Web site (running on a server behind your firewall), you must configure the router to leave port 80 open. Thereafter, the ▶

INTERNET ROUTERS FEATURES COMPARISON

ROUTER/GATEWAY	Street price (10/15/00)	Ethernet ports	Internal architecture	VPN capability	Port forwarding	Support (hours/days, charge)	Comments
Asanté FriendlyNet FR3004LC 800/303-9121 www.asante.com	\$208	4	10/100Base-T switch	●	●	9/5, toll-free	Print server (limited to unidirectional printers ¹), and backup modem port; S175 model omits both.
Farallon NetLine Broadband Gateway 800/613-4954 www.farallon.com	\$154	1	10/100Base-T switch	●	●	8.5/5, toll-free	Requires separate switch or hub to serve multiple users—\$70 extra from Farallon.
NetGear RT314 408/907-8000 www.netgear.com	\$161	4	10/100Base-T switch	●	●	24/7, toll-free	Basic configuration via Web browser; text-based Telnet required for most advanced settings.
SOHware NBG600 800/632-1118 www.sohware.com	\$166	4	10Base-T hub	●	○	16/7, toll-free	Home focus; includes parental controls; lacks port-forwarding capabilities.
WatchGuard SOHO 800/734-9905 www.watchguard.com	\$340	4	10Base-T hub	Optional	●	24/7, toll call	Best choice for business; dynamic packet filtering; notification of security threats and software updates.



Best Buy

● Yes ○ No

¹ Or bidirectional printers configured to be unidirectional.

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router directs all incoming traffic arriving on port 80 to the server; this technique is commonly referred to as *port forwarding*. You may also need to establish open outgoing ports so computers on your local network can access streaming media, game servers, or videoconferencing. To guard against hackers, who sniff the Internet looking for unprotected computers, you must leave as few network ports exposed as possible.

Unfortunately, however, the SOHware NBG600 does not allow port forwarding. Instead, it lets you expose one computer to all inbound traffic (rendering it totally unprotected). SOHware calls this exposed area Gaming Zone; the other routers we looked at offer similar functions. Entirely exposing one computer does not necessarily create a network-wide security risk, as long as

you keep your sensitive files on computers that will remain secure. But it does mean that the NBG600 is less flexible than the other products, which allow you to expose all ports or selectively forward port requests to individual computers. SOHware says that the router is aimed at the family market, so it doesn't focus on sophisticated firewall configurations.

To heighten security further, WatchGuard's SOHO firewall adds enhanced dynamic packet filtering. SOHO examines each arriving packet of data to verify that it was sent in response to a request submitted from inside the firewall. If the packet wasn't requested, the router rejects it. The other products here rely solely on the inherent ability of NAT to hide computers behind one network address. To gain access to a hidden computer and inflict damage, a hacker must find a way to coax the router into translating the hidden address—not an easy task, though it can be done.

WatchGuard pairs the SOHO device with its LiveSecurity service, which alerts you to potential threats and provides technical support to help ensure security. You get a year's worth of service with the



router; it costs \$95 a year thereafter.

WATCHGUARD'S SOHO.

Our recommendation? NAT protection should suffice for most home and small-office users. But if you're guarding trade secrets or your clients' financial files, then paying more for a packet-filtering firewall might make sense. Bear in mind, however, that going

To guard against hackers, who sniff the Internet looking for unprotected computers, you must leave as few network ports exposed as possible.

for such a heightened level of security does carry with it some additional cost. The WatchGuard SOHO permits you to connect no more than 10 users at the base price; an upgrade to connect as many as 25 users costs \$199 more.

BUSINESS FEATURES

DESPITE THEIR RELATIVELY low cost, the routers we reviewed offer several advanced features that improve their suitability for small-office use.

All except the WatchGuard support Point-to-Point Tunneling Protocol (PPTP)—aka virtual private network (VPN) "pass-through" access—which allows computers on a network to access a company's VPN servers, but they cannot host a VPN server. The Asanté and NetGear products

also support an even more secure VPN protocol, IPsec. In its basic configuration, the WatchGuard SOHO does not support VPN access, but you can purchase a \$450 version of the router, the SOHOtc, that includes VPN; or you can add such support

as an option to the base model. For more information on how VPN works, consult our how-to, "Virtual Private Network" (www.pcworld.com/hereshow/vpn).

The Asanté FriendlyNet FR3004LC offers a built-in print server: Connect a printer to the router's parallel port, and you should be able to print from any Windows-compatible printer on the network (Mac and Unix boxes can't use this feature). Unfortunately, we couldn't get the feature to work with an Epson Stylus 800 printer. Neither the router's packaging nor its documentation mentions any limitations on the type of printer, but the company

has revealed that the feature works only with unidirectional printers. Some printers do allow you to disable bidirectional printing, but the Epson printer I tested would not. Furthermore, if you do turn bidirectionality

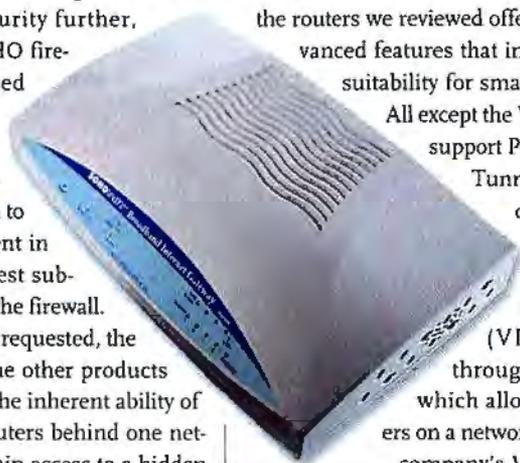
off, you may lose ink-level reporting, out-of-paper warnings, and other information that the printer returns to the computer. Asanté says a future firmware update (a software download that you can use to upgrade the router's capabilities) will fix the problem. The FR3004LC also lets you hook up a modem to use as a backup in case your DSL or cable line goes down.

All of the products can create access logs to help you troubleshoot your connection or show if you've become a hacker target. WatchGuard's router permits you to upload the log to a remote server, which makes the log more secure. SOHware's NBG600 logs Web sites—not IP addresses—so you can check on the kids' browsing habits. But the log is limited to 100 entries, and ours was clogged with entries for banner ads, not just for the pages themselves. WatchGuard offers a similar but stronger tool, WebBlocker, for an extra \$49.

These routers offer a great deal of value for their relatively low cost. In coming months, look for broadband routers that incorporate wireless, USB, and/or HomePNA phone-line networking.



Find files from this article at www.pcworld.com/hereshow/vpn. Alan Stafford is a senior editor for PC World.



SOHWARE'S NBG600.

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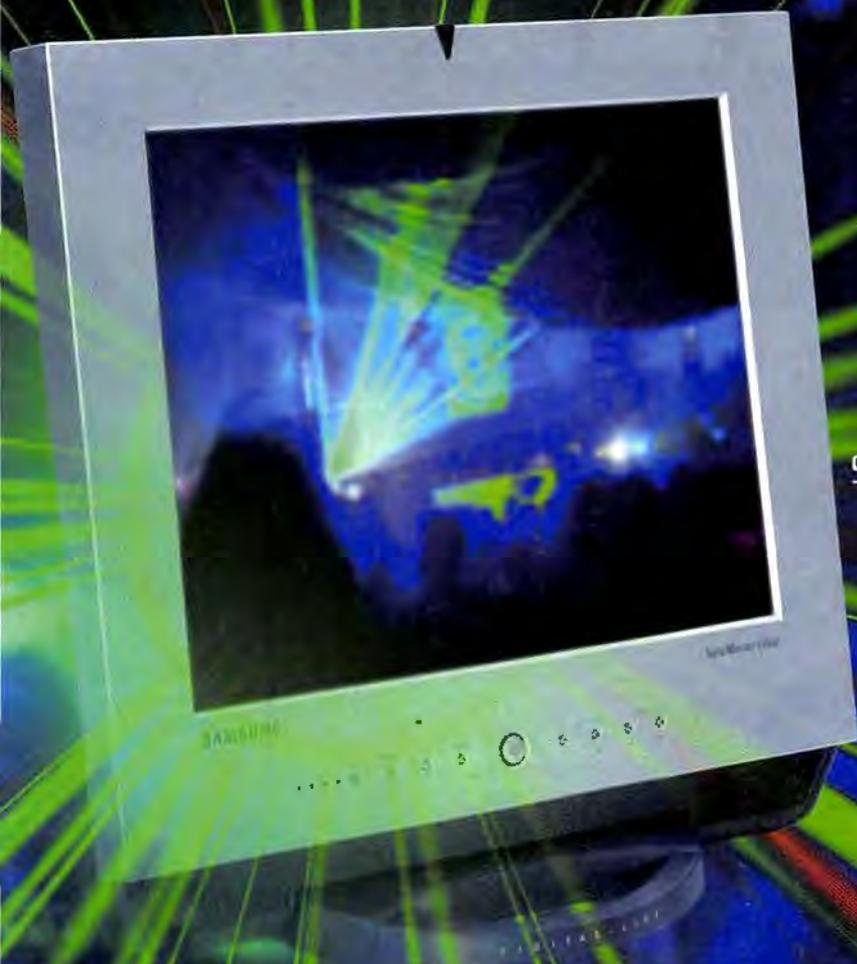
—Fortune

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In Search of Trouble- Free



PC ASSEMBLERS and diagnostic testers are seen here on Dell's factory floor in Nashville. Workers select components (right) and assemble systems (top). Laptops are shown undergoing final quality testing (center). Staffers prepare systems before shipping them to their destination (opposite page).





Are today's PCs too cheap?

We go behind the scenes to see if manufacturers are cutting corners, and survey 30,000 readers to find vendors that deliver solid systems and support. ▶

PCs

BY AOIFE McEVROY AND STEPHEN SWOYER



Too much of a good thing can make you suspicious.

If your kid offers to get you the newspaper and an iced tea, for instance, you wonder when he wants to borrow the Miata. And if prices at the meat market are too low, you might worry about the grade of the ground beef you're buying.

Plummeting PC prices can provoke a similar reaction. They've fallen so far so fast—35 percent in just three years, according to market research firm Dataquest—that some computer users wonder if manufacturers are using inferior components and laying off support technicians so they can sell PCs cheaply and still make a profit.

We would love to report that the results of our survey on the reliability and service of PCs show that the latest systems have few problems. But based on the responses of 30,490 *PC World* readers, we can't. To enrich this analysis, we combined the results of our latest survey with those from our July 2000 report (see pcworld.com/jul00/reliability) and compared these numbers with the previous year's worth of data (see www.pcworld.com/jan2000/reliability). The results for reliability—such as how many problems a PC has each year or how likely a component is to

fail—are mixed. While average scores were down for home PCs, work systems and notebook computers generally scored better. But in our measures of service—how long users waited on hold for a technician and whether their problem was ever resolved, for example—results were down across the board among home and work PCs, as well as notebooks. For a detailed breakdown of each company's ratings across our six reliability and six service measures, see our chart below for work PCs, as well as the charts on page 112 for home PCs and page 114 for notebook PCs.

PC WORLD

SERVICE WITHOUT A SMILE

SUE CARNEY KNOWS about service problems firsthand. A residential manager living in Southampton, New Jersey, Carney is fed up with the service she's getting from Toshiba—or rather, the lack of it. The screen on her Satellite 1605CDS notebook started to flicker soon after she bought it. In addition, the screen would suddenly go dark and the PC would freeze. Carney made four trips to an authorized Toshiba service facility, but it could not solve the problem. The service center sent the unit back to Toshiba three times. Even its maker couldn't fix the machine. "I've owned the laptop for nine months, and it's been in the shop for a total of

ILLUSTRATION: PETER COATES

WORK PC READERS RATE

AS IN OUR LAST survey, Dell earns our highest rating among work PC makers. The company gets top marks in reliability all around. Readers report few problems in the first place—owners of Dell PCs didn't often deal with dead machines or component failures. Dell's service ratings decline a little, however—most notably in the percentage of unresolved problems—but the company still merits an Outstanding rating overall.



Our survey results show that work systems tend on average to be slightly more reliable than home PCs and notebooks in some cases. For example, work machines have a smaller percentage of problems in general and fewer component failures.

IBM earns a Good rating despite a few reliability issues: For example, compared with our last full year of survey results, the average number of problems users experience in a year increased. Compaq earns only a Fair rating—though its customers experienced an impressively low percentage of component failures—in part because relatively few of our survey respondents were especially happy either with their PCs' reliability or with Compaq's service.

We also rate HP as Fair overall. Its PCs are dependable, but its service ratings are troubling. HP had a smaller group of owners who say they are very satisfied with support than most other PC makers.

DELL IS TOPS ALL AROUND; Hewlett-Packard falls in service.

Percent of PCs with problems

Rating	Company/Description	Percent of PCs with problems
★★★★★ OUTSTANDING	Dell Super-solid machines, yet some unresolved problems.	★★★★★
★★★★ GOOD	Gateway Dependable computers, service only mediocre.	★★★★
★★★★	IBM Sturdy components, fast resolution of problems.	★★★★
★★★★	Micron Few problems per year, terrific follow-through.	★★★★
★★★ FAIR	Compaq Owners' feedback is only lukewarm in certain areas.	★★★★
★★★★	Hewlett-Packard Machines are pretty dependable, yet owners aren't thrilled.	★★★★

WINNERS AND LOSERS

ONLY ONE PC manufacturer deserves an Outstanding rating, according to our survey of more than 30,000 *PC World* readers. Of the 11 companies in our rankings, Dell is at the top of the class again for its work and home PCs. Fortunately, our readers identified only one vendor—home PC maker EMachines—that deserves to be rated Poor overall.

We didn't receive enough reports from readers about their service experiences with some PC makers in our notebooks group to be able to rank those companies in our overall charts. We were able to rate their products' likelihood of mechanical problems, however. For the reliability ratings of Acer, HP, NEC, Sony, and WinBook laptops, visit www.pcworld.com/jan2001/reliability_extras.

Despite receiving sufficient responses

Work PCs	Home PCs	Notebooks
OUTSTANDING	OUTSTANDING	OUTSTANDING
Dell	Dell	None
GOOD	GOOD	GOOD
Gateway IBM Micron	IBM Micron	Dell IBM
FAIR	FAIR	FAIR
Compaq Hewlett-Packard	Acer Compaq Gateway Hewlett-Packard Sony	Compaq Fujitsu Gateway Micron Toshiba
POOR	POOR	POOR
None	EMachines	None

SOURCE: *PC World* Reliability and Service survey, based on online participants' responses recorded between December 1999 through January 2000, and June 2000 through August 2000. Companies are listed alphabetically within each rating tier.

from Quantex and CyberMax owners, we did not rank these companies. Last August, closely affiliated supplier Fountain Technologies filed for protection from creditors under Chapter 11 of the bankruptcy laws. Since that time, customers have deluged us

with complaints about both manufacturers. Because the companies are in such turmoil, we removed them from our Top 100 and this survey report. For info on how Quantex and CyberMax fared in our survey, go to the jan2001/reliability_extras page.

three months," says Carney. "I seem to be getting nowhere with my phone calls to Toshiba in seeking a replacement." At the time of this writing, Carney is pursuing redress through a mediator suggested by a consumer affairs bureau.

The combination of falling computer prices and our unimpressive survey scores got us wondering: How can PC manufacturers produce their machines so cheaply? And is the cost-cutting effort affecting the quality of their products and

the way the companies support them?

To find out, we visited the production plants of several major companies around the country, toured factory floors, and grilled PC makers about their manufacturing practices and service programs. ▶

Reliability						Service						
Problems per year	Problems on arrival	Dead on arrival	Component failure	High satisfaction with reliability	Overall reliability score	Short hold time	Quick resolution	No resolution	Knowledgeable tech support	Sincere effort by tech support	High satisfaction with service	Overall service score
★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★	★★★★★	★★★	★★★★	★★★★	★★★★	★★★★
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Listings within each rating tier (Outstanding, Good, and Fair) are alphabetical. Five stars is the best possible rating; one star, the worst.

Companies cut the number of hands needed to build PCs.

We found that PC companies are saving money in ways you might not expect—reducing the amount of time they keep supplies of parts in inventory, designing computers so that they require fewer workers to assemble them, and making shipping more efficient.

On the service front, manufacturers are aggressively trying to move technical support customers from the phones—where each call costs a company roughly \$10 or more—to the Web, where each query may cost just pennies.

“There’s a lot of pressure to cut the costs of the individual boxes,” says Rob Enderle, a senior analyst with research firm Giga Information Group. “Big vendors are

rethinking the ways that they build PCs, and they’re trying to make things as efficient as possible without sacrificing quality.”



United States, foreign assembly can still be cheaper because labor costs are up to ten times lower.

Manufacturers are also cutting costs by keeping parts on hand for as short a time as possible to save storage space and expenses. Large PC makers like Dell and Gateway require suppliers to build warehouses within a few hours’ drive of their factories. That means the PC companies hold on to parts for only a few hours before they need them. Gateway, for instance, has significantly cut the amount of time and space it uses to store supplies. “We used to put 30,000 miles per month on our forklifts and take up nearly a third of our facility in North Sioux City to store

THE MAKING OF YOUR PC

ONE FUNDAMENTAL way PC makers reduce costs is by building factories outside the United States. Acer, for example, closed its plant in San Jose, California, last September, and now does most of its manufacturing in Juarez, Mexico. HP makes most of its Pavilion home PCs and Vectra business PCs in Brazil. Almost all notebooks, regardless of maker, are made overseas. Even when you account for the added freight costs to get the units to the

ILLUSTRATION: PETER COATES

READERS RATE

ONLY DELL IS RATED Outstanding for its home PCs. Most of the other computer manufacturers in this category received decidedly mediocre reviews in our survey.

For example, Gateway is rated Fair. Readers tell us that the cow-themed computers are getting less reliable and service is declining. Compared to other makers, Gateway machines have a relatively high rate of problems, and a bigger percentage of Gateway customers say they were left with unresolved problems than in our last survey.

Acer—also rated Fair—has standard scores for the percentage of PCs with problems and the incidence of component failures. Conversely, Acer has improved its service, readers say. Sony, another company rated Fair, had mixed results. A high per-

centage of Sony owners say they had experienced at least one problem. But aside from that, Sony did well in our other measures of reliability. The company’s service is inconsistent, though. Sony techies were fairly quick to pick up the phone, but comparatively few readers were impressed with their technical knowledge.



And at the bottom of the heap is EMachines, rated Poor. Its reliability ratings are all over the map: Its PCs performed well when they first arrived and had few component failures overall, but EMachines owners report an average of almost three problems per year—the worst of the bunch. EMachines’ service is even more disturbing. A relatively high percentage of respondents tell us their problems were never resolved.

DELL SITS AT THE TOP in a class all its own, while EMachines ends up alone at the bottom.

Percent of PCs with problems



★★★★ OUTSTANDING	★★★★	
Dell Customers give a huge thumbs-up.	★★★★	
★★★★ GOOD		
IBM Super-reliable components, but service is only middling.	★★★★	
Micron Reasonably reliable PCs, but don't expect techies to pick up your call quickly.	★★★★	
★★★ FAIR		
Acer Spotty reliability, middle-of-the-road service.	★★	
Compaq Lots of unreliable machines, few customers are very happy.	★★	
Gateway So-so reliability, and lots of PCs with problems.	★★	
Hewlett-Packard Lots of problems per year, yet few components go south.	★★★★	
Sony Fairly reliable machines but some substandard support.	★★	
★★ POOR		
EMachines Need support? Good luck.	★★★★	

STAR A WORD ABOUT THE SCORES

STARS AWARDED CORRESPOND to the companies' relative rankings. Each icon here relates to a particular question we asked *PC World* subscribers in our survey. For specific details on stars and their corresponding scores, see www.pcworld.com/jan2001/reliability_extras.

parts," reports Gateway's Paul Eickhoff, corrective action manager, integration services. The company has cut those figures by about 75 percent, he says.

Some vendors, like Compaq, still use a Henry Ford-style assembly line. PCs zoom by on conveyor belts, and each person performs the same task over and over.

Legend

Reliability

- Percent of PCs with problems Did your PC have at least one problem needing repair attributable to the company?
- Problems per year How many problems did your PC have per year?
- Problems on arrival Did your PC work properly when you first turned it on?
- Dead on arrival Was your PC non-functioning when you first turned it on?
- Component failure Did your PC have one or more faulty components replaced?
- High satisfaction with reliability How satisfied were you with the reliability of your PC? (Measure: "Very satisfied.")

Legend

Service

- Short hold time How long did you have to wait on hold before reaching a technician? (Measure: 5 minutes or less.)
- Quick resolution How long did it take before the most recent problem was resolved? (Measure: Five days or less.)
- No resolution How long did it take before the most recent problem was resolved? (Measure: Never resolved.)
- Knowledgeable tech support How would you rate the knowledge of the service technician who helped you? (Measure: "Excellent" or "good.")
- Sincere effort by tech support How would you rate the sincerity of the service technician who helped you? (Measure: "Excellent" or "good.")
- High satisfaction with service How satisfied were you with the service you received for your most recent problem? (Measure: "Very satisfied.")

But increasingly, companies are using a newer "cell" method of production. At Acer, Dell, Gateway, IBM, and (for some systems) Compaq, small teams assemble a single PC from start to finish. In the past, Gateway needed five people to

assemble a PC. Now three can do the job. Dell uses just two workers, and each Acer "cell" consists of a single person.

Companies cut the number of hands needed by simplifying case design and integrating components, particularly ▶

Reliability						Service						
Problems per year	Problems on arrival	Dead on arrival	Component failure	High satisfaction with reliability	Overall reliability score	Short hold time	Quick resolution	No resolution	Knowledgeable tech support	Sincere effort by tech support	High satisfaction with service	Overall service score
★★★★	★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★	★★★★★	★★★★	★★★★	★★★★★	★★★★★	★★★★★
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★★★★	★★★★	★★★★★	★★★★	★★★	★★★★	★★★★	★★★	★★★	★★	★★	★★	★★★
*	★★★★	★★★★★	★★★★	★★	★★★	★★★	★★	*	★★	★★	*	★★

Company listings within each rating tier (Outstanding, Good, Fair, and Poor) are alphabetical. Five stars is the best possible rating; one star, the worst.

PC makers are aggressively trying to get customers off the phone.

on lower-end machines. With case design, the fewer the screws, the easier it is to pop a case on and off. The new designs speed up assembly while also making it easier for owners to upgrade their PCs. Some examples: Gateway's latest case has just a single screw, and the drives in Compaq's new Presario roll in and out on rails.

Integrated components help, too. Computer manufacturers make assembly quicker, for instance, by putting sound chips on the motherboard; workers don't have to insert a separate card. "When the components are integrated, they're actually more reliable," says Rick McKinnon, NEC's vice president of operations. That's because there's less of a chance that a worker could insert a component incorrectly. Also, integrated components tend

to include technology that's been around for a while, with most of the incompatibilities and kinks worked out.

TESTING 1-2-3

ONCE A SYSTEM is built, the next important step is to make sure it works. PC makers vow that they are still doing extensive quality testing, or *burn-in*. Compaq and Dell gave us their approximate burn-in times (4.5 hours and 3 hours, respectively), but other vendors wouldn't provide details. In some cases, the testing is no longer handled by a human. Gateway, for instance, hooks its PCs to a server, which installs the operating system and software and tests to make sure that the PC boots up and that components are working.

All companies focus on reducing the

number of "touches" a PC undergoes—that is, the number of times it's handled during the manufacturing process. "We know that the fewer people that handle our units, the better," says Roy Perry, Dell's vice president of manufacturing operations in the home and small-business group. "Movement and motion are lost time for us—it's waste."

At Dell, once a new PC is boxed, it's seldom touched again. Electronic eyes read bar codes on the boxes, and conveyer belts automatically route the boxes directly to a truck headed for their particular destination. The process reduces the number of employees needed to handle each unit. It also cuts shipping costs, since the company has already done much of the sorting that carriers like UPS would otherwise do.

Despite these innovations and vendors' assurances that they continue to do burn-in testing, we hear lots of horror stories

READERS RATES

NOTEBOOK COMPUTERS fare a tad better in some measures than home PCs and work PCs. For example, notebooks have a slightly smaller number of problems per year, on average; they're also less likely to be dead on arrival or have problems right out of the box. Dell and Big Blue earned the only Good ratings among notebook manufacturers. We rated the rest of them Fair.



Gateway's service ratings declined across the board compared to last year's. The company took the biggest tumble in the percentage of unresolved PC problems category, with a relatively high number of Gateway owners telling us they were left

high and dry. Micron had low spots in both reliability and service, although some of its reliability scores were strong: A relatively small percentage of Micron notebooks were dead on arrival. But readers say the rate of component failures was relatively high. On the service side, relatively few Micron customers got through to technical support in less than 5 minutes, and relatively few were very satisfied with the help they received. Along with its respectable ratings for reliability, Fujitsu got poor scores in almost all the service measures. For example, relatively few owners report that their computer problems were resolved.

FEW NOTEBOOK OWNERS are very happy with service.

★★★★ GOOD

Manufacturer	Percent of PCs with problems
Dell Both reliability and support are middling in spots.	★★★
IBM Impressive reliability with matching service.	★★★★★

★★★ FAIR

Compaq Shaky notebooks; owners are not jumping for joy.	★★
Fujitsu Good-quality PCs, but service is weak across nearly all measures.	★★★
Gateway Lots of unresolved problems.	★★★
Micron Tons of dead components; you may have to wait a while on hold.	★★★
Toshiba Customers weren't thrilled with the techies' knowledge.	★★★

ILLUSTRATION: PETER COATES

from readers. Take Nancy Hendryx, for instance. Working as a freelance writer in Concord, New Hampshire, Hendryx told us that her Gateway Essential 433C desktop had been riddled with problems ever since it arrived. "I had to replace the CD-ROM drive, the CPU, and a dead motherboard," she laments. "Then I needed to reformat my hard drive and reinstall the operating system." After three months, Hendryx had a PC that still didn't work properly. She settled for a refund.

IS YOUR PC BEING SERVED?

OUR SURVEY RESULTS show that fewer and fewer readers are very satisfied with the service they receive. Their tech support calls are less likely to be answered quickly than in the past. And not as many technicians are very knowledgeable, compared to last year.

During our visits to manufacturing plants, we tried to find out how vendors support today's PCs in the face of lower profit margins. Each company focuses a lot of energy on cutting costs, largely by trying to reduce the volume of calls it gets.

That effort starts even before the system leaves the factory. Companies strive to make their setup instructions clearer. For example, HP recently eliminated all words from its instructions, using just col-

orful pictures to illustrate the hook-up process. Many companies preload drivers for the most popular printers, scanners, and other peripherals. And when customers report software bugs or incompatibilities, manufacturers will ask the soft-

tomers like to talk to us; others hate to talk. The Web is good, but if your computer is down, then it's not an option."

But vendors are also committed to convincing as many people as possible as soon as possible to use Web support. Dell

METHODOLOGY

FROM DECEMBER 1999 through January 2000, and from June 2000 through August 2000, we invited *PC World* subscribers to take our Web-based Reliability and Service survey. In addition to the invitations included in the magazine, we also contacted some readers by e-mail. We received 30,490 reports from verified subscribers describing their PCs' reliability and their experiences, if any, in getting service. Using this data, a team of *PC World* editors and research experts analyzed the performance of each company's home, work, and notebook PCs, based on 12 measures. We determined a company's overall ranking based on the sum of its weighted reliability and service scores. For full details, visit www.pcworld.com/jan2001/reliability_extras.

ware makers to fix the problem for future computers. If a fix can't be made, companies may stop offering the bundle.

But the biggest push now is to get customers off the phone and onto the Web. Of course, PC makers stressed that they won't be cutting off their phone lines. "We're not doing anything to discourage customers from calling," contends Steve Young, vice president of worldwide customer support for Compaq. "Some cus-

CEO Michael Dell has told employees at his firm that he wants to see 80 percent of all tech support transactions handled solely through support.dell.com by early 2002, says a company spokesperson.

GROWTH OF WEB SUPPORT

VENDORS ARE TRYING to lure customers online by making the experience easier. In earlier days, the online-support customers went to the manufacturer's



Reliability

Problems per year	Problems on arrival	Dead on arrival	Component failure	High satisfaction with reliability	Overall reliability score
***	****	*****	****	****	****
*****	*****	*****	****	****	****
**	***	****	****	**	***
*****	***	****	****	***	***
***	****	****	***	****	***
*****	***	****	**	***	***
***	***	****	****	***	***

Service

Short hold time	Quick resolution	No resolution	Knowledgeable tech support	Sincere effort by tech support	High satisfaction with service	Overall service score
***	****	***	****	****	****	****
****	****	****	****	****	***	****
***	***	***	***	***	**	***
***	**	**	**	**	**	**
***	***	**	****	****	***	***
**	***	***	***	***	**	***
****	***	***	**	***	**	***

Company listings within each rating tier (Good and Fair) are alphabetical. Five stars is the best possible rating; one star, the worst.

Improvements in Web support are outweighed by other service snags.

site, tried to diagnose the problem themselves, and hunted through the site for a solution. The newest versions of online support allow users to chat in real time with a technician. Thanks to the latest diagnostic software, the technician can "see" the sick system's configuration over the Internet, with the user's permission. The techie can then diagnose the problem, and in some cases electronically transmit a solution such as a BIOS update or driver fix directly onto the user's PC.

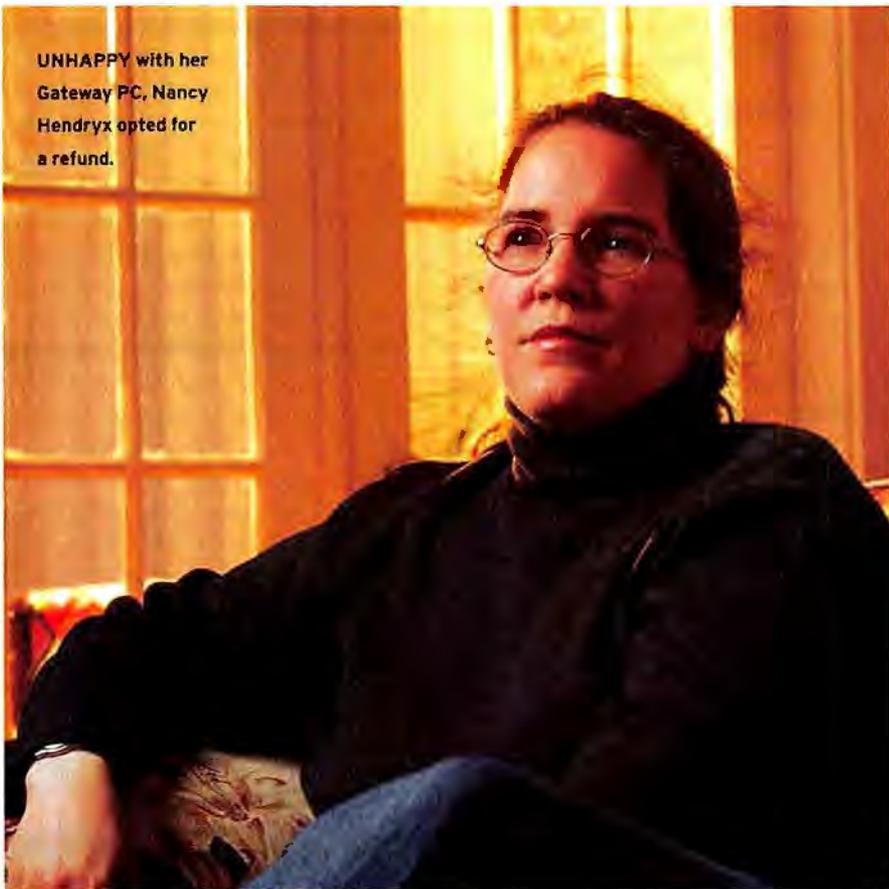
Many companies have offerings that embody some or all of those traits. Dell bundles Resolution Assistant, a new Web-based troubleshooting tool, with its latest PCs. The tool combines system diagnostics with online chat and lets Dell techies fix problems remotely. HP's tool EDiag, which comes with its Vectra line of business PCs, works the same way.

THE BIG PICTURE

IN OUR VISITS to manufacturers, we're relieved to report, we didn't find any instances of vendors cutting corners irresponsibly or blatantly ignoring customers' needs. (Of course, that's no surprise.)

On the manufacturing floor, a lot of the efficiencies we saw don't seem to harm consumers, and in fact some of them are a boon. Obviously, lower PC prices bene-

UNHAPPY with her Gateway PC, Nancy Hendryx opted for a refund.



fit customers' wallets. Our survey found fewer component failures overall this time, perhaps because of greater integration. And some of the efficiencies mean you could get your PC a day or two sooner. But based on our survey results, we haven't seen other dramatic improvements in reliability, and the average quality of home PCs slipped across the board.

We are seeing some positive developments for consumers on the support side. When companies work hard to prevent problems and make their Web support easier to use, all PC owners benefit. But our survey seems to show that whatever improvements vendors are making have been outweighed by service snags. Respondents—whether they use a work PC,

a home PC, or a notebook—just aren't as happy with the help they've received.

While companies are understandably attracted by the savings online support offers, they need to sustain a high level of support for the customer who will always want to reach for the phone. And on the manufacturing front, the use of cost-effective methods is all very well for PC companies, but we'd like to see reliability improve as quickly as the prices drop.

Stephen Swoyer is a freelance writer based in State College, Pennsylvania, and Aoife McEvoy is a senior associate editor at PC World. Shane Rau, former senior technical editor at PC World, also contributed to this article.

ONLINE SURVEY REPORT



FOR QUANTEX'S and CyberMax's ratings, reliability-only scores for notebook PCs from Acer, HP, NEC, Sony, and WinBook, and details on the star ratings, the scores, and our methodology, visit www.pcworld.com/jan2001/reliability_extras.

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DREAM SCREENS

Thinking of switching from a fat monitor to a flat one? We review new 15-inch LCDs. The best have cutting-edge designs, lower prices—and fantastic image quality.

BY LEIGH ANNE JONES

IT ISN'T EASY TO GET NOTICED IN LAS VEGAS, WHERE decorating often means covering a room in marble, installing an opulent candelabra, or wheeling in a rhinestone-studded baby grand piano. But even Las Vegas pays heed to the latest in technology. Washington Mutual Bank assistant vice president Greg Gopal recalls that when his company wanted to add pizzazz to its financial centers, it brought in flashy LCD monitors to replace its staid, bulky CRTs. The resulting look flat-out impressed ▶

PHOTOGRAPHS
BY MARC SIMON

AG Nuevo M15

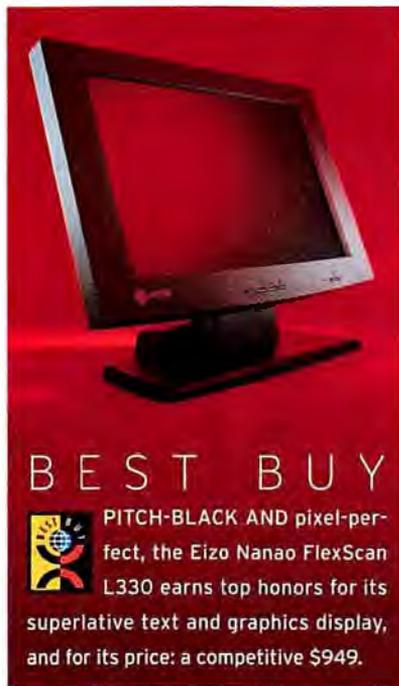
Sony SDM-N50PS

his customers—and his competition. “It looks like a high-tech machine,” marvels Gopal, an eager convert to the flat side.

THE FUTURE IS FLAT

LCDs HAVE found niches in environments like hospitals and as part of store kiosks. Their high prices have kept them from being widely adopted elsewhere. But analysts predict that, within the next decade, the LCD monitor will supplant the CRT as the top choice for both professional and personal use. LCDs are lighter, more space- and energy-efficient, and— even more important—better for your eyes than CRT monitors.

However, don't expect CRTs to disappear anytime soon. LCDs represented just 3 percent of the total monitor market in 1999, according to industry research group Stanford Resources. The initial costs necessary to manufacture these monitors are enormous—“a billion dollars” per product line, according to Sam Miller, ViewSonic's director of advanced display technology. Those costs have been passed on to customers as sky-high prices, limiting sales. Another factor: the lack of a standard digital interface. That issue was resolved with the adoption in fall 1999 of



the Digital Display Working Group's Digital Video Interface, or DVI.

Thanks partly to standards like DVI, the LCD scene is changing: More flat panels are appearing on the market, and the average price of a 15-inch LCD monitor these days has dipped to under \$1000.

It's been more than a year since our last

LCD roundup, so we decided to take a new look at the LCD monitor market. The LCDs we saw made a good impression: Almost all of them did exceptionally well at presenting crisp, legible text. Some were less effective with color graphics, however, struggling to render realistic skin tones, or displaying either faded and washed out or oversaturated colors.

The average street price of all the monitors we tested was \$1042, ranging from \$899 to \$1299. By comparison, the average street price of a 17-inch CRT—which has a viewing area equivalent to that of a 15-inch LCD—hovers around \$300 for a unit with acceptable image quality. So it's no wonder that cost-conscious shoppers have shied away from LCDs.

We collected a sample of 15 monitors for this review and evaluated how well they displayed routine business items such as text in word processing documents, a newsletter, and spreadsheets, as well as application windows, color and black-and-white photos, and Web pages. To distinguish image quality further, we tested the monitors' ability to display a plain white screen, text of varying sizes, gray-scale images, and a background image of very closely spaced, vertical black-and-white

TOP 10 LCD MONITORS

	PRODUCT	Street price (10/05/00)	Overall rating	Quality of text/graphics	Comments	Video board interface
1	 Eizo Nanao FlexScan L330 800/800-5202 www.eizo.com	\$949	85	Excellent/ Excellent	PRO: Gorgeous colors, razor-sharp text, competitive price. CON: Lacks pivot and swivel features; tech support hours not as generous as others'.	Analog
2	Philips Brilliance 150P 877/835-1838 www.pcstufil.philips.com	\$949	84	Very good/ Very good	PRO: Strong text and graphics, intuitive on-screen controls. CON: Comparatively tall and bulky; panel doesn't lock to base.	Dual ¹
3	AG Neovo M15 866/246-3686 www.neovo-usa.com	\$949	84	Very good/ Very good	PRO: Elegant design, equally crisp text and graphics, protective outer glass. CON: Tech support hours lag most others'; bulky depth.	Analog
4	CTX International PV510 877/857-7846 www.ctxintl.com	\$899	83	Excellent/ Excellent	PRO: Aggressive price, bold colors, laser-sharp text. CON: Backlight warranty shorter than most; no weekend tech support.	Analog
5	Toshiba Tekbright 60A 888/300-5545 www.toshiba.com	\$1149	83	Excellent/ Very good	PRO: Crisp text, brisk colors. CON: Pricey; clumsily designed controls hinder smooth picture adjustments; no swivel feature; limited vertical viewing angle.	Analog
6	Compaq TFT5010 800/345-1518 www.compaq.com	\$1249	81	Very good/ Excellent	PRO: Vibrant colors on Web pages and photos; includes touch-screen software. CON: Weighty; lacks key features found in other flat-panel monitors.	Dual ¹
7	Acer FP558 800/733-2237 www.acer.com	\$899	79	Very good/ Good	PRO: Sleek design, competitive price. CON: Image quality marred by dark blotches; tinny sound from speakers; one-year backlight warranty.	Analog
8	Samsung SyncMaster 150MP 800/726-5864 www.samsungmonitor.com	\$1119	79	Very good/ Good	PRO: Lightweight, connectable to video devices. CON: Small text looks fuzzy on spreadsheets and word processing documents; no swivel feature.	Analog
9	Sony SDM-N50PS 888/476-6972 www.sony.com/displays	\$1299	78	Very good/ Very good	PRO: Thinnest and lightest on chart; sleek design; sensors automatically adjust brightness levels. CON: Highest price here; short backlight warranty.	Analog
10	NEC MultiSync LCD1525X 888/632-6487 www.necmitsubishi.com	\$999	78	Good/ Good	PRO: Wide viewable angles, sports four downstream ports; lightweight. CON: Fuzzy text and pale colors.	Dual ¹



Best Buy

● Yes ○ No

¹Includes both an analog interface for use with conventional graphics boards and a DVI interface for use with graphics cards that work with digital monitors.

bars. Then we combined the results of these performance tests with rankings based on price and features to come up with our overall rating.

We awarded our Best Buy to the Eizo Nanao FlexScan L330. The FlexScan L330 combines the best overall image quality we saw with an appealing \$949 price tag. Honorable mention goes to the Philips Brilliance 150P, which offers a solid all-around package for the same low \$949 street price, and to the CTX International PV510, which offers impressive text and graphics performance as well as the lowest price on our chart (\$899), but is held back by its thin support and skinny feature set.

WHAT'S NEW IN FLAT PANELS

OUR TESTS SHOW that under-\$1000 LCDs perform so impressively that there's no compelling reason for you to spend more. That is, unless you really want the extra bells and whistles.

Pricier models include interesting new features: The Samsung SyncMaster 150MP, for example, has television tuner, video-in, and picture-in-picture (PIP)

capabilities, and the Compaq TFT5010 offers optional touch-screen functionality, making this monitor especially well suited to providing or collecting customized information in a public setting (like taking surveys, giving out visitor information, or listing product availability). New-

Our tests show that under-\$1000 LCDs perform so impressively that there's no compelling reason to spend more.

comer AG Neovo's M15 offers a wealth of extras, such as a unique protective outer glass and an unusual swiveling capability.

These add-ons complement another new feature: dual-interface LCDs, which allow you to use an analog interface to connect an LCD to your computer—just as you would a CRT—or use an all-digital interface. We've seen dual-input LCDs before, but in the past you couldn't be certain which digital specification the LCDs supported. The flat panels on our chart that feature dual inputs include the Philips Brilliance 150P, the Compaq TFT 5010, and the NEC MultiSync LCD1525X.

LCD monitors are—by their very design—digital devices, but most graphics adapters available today are intended for use with analog monitors. Digital-to-digital (or “pure digital”) transmission avoids the signal degradation or “noise” typical of analog-only LCDs and therefore is theoretically better. To run an LCD monitor in digital mode you'll need a digital graphics adapter (typically costing \$150 to \$300).

Is a “pure digital” interface worth paying for? Unfortunately, although companies

tout these interfaces as the wave of the future, it's not clear from our tests that digital LCDs deliver significantly better image quality than analog LCDs. (See “Does Digital Matter?” on page 123.)

Some LCDs offer landscape and portrait functionality. You must install special software to use it, however, and some companies, such as CTX, charge you for the software that enables you to switch. Additional features you should look for include built-in speakers—a practicality that fits an LCD's mission to free up desk-top space—and USB ports, which help you connect peripheral devices such ▶

FEATURES COMPARISON

Dimensions (width x depth x height, inches)	Weight (pounds)	Horizontal/vertical viewing angle (degrees, vendor specs)	Basic features							Support			
			Refresh rate at 1024 by 768 (Hz)	Swivel	Screen pivot	USB ports (upstream/downstream)	Anti-theft lock	Integrated speakers	Color/image adjustment software	Warranty (years)	Backlight warranty (years)	Daily tech support (hours)	Weekend support
15.3 x 6.6 x 14.4	13.2	70/60	75	○	○	0/0	●	○	○/○	3	3	10	○
15.9 x 7.7 x 15.7	11.9	60/60	75	●	●	1/4	○	●	●/●	3	3	24	●
18.6 x 9.1 x 16	11.5	75/55	75	●	○	1/4	○	●	○/●	3	3	12	●
15.5 x 6.9 x 16.3	13	70/60	60	●	Optional	Optional	●	○	○/○	3	1	24	○
15.2 x 6.7 x 15.6	16	60/40	75	○	●	0/0	○	●	○/●	3	3	24	●
15.4 x 9.4 x 15.9	18.7	60/50	75	●	●	0/0	○	○	○/○	3	3	24	●
14.7 x 6.6 x 14.7	12.1	60/55	75	●	●	Optional	●	●	○/○	3	1	24	●
15 x 7.4 x 15	9.9	70/60	60	○	○	Optional	○	●	●/●	3	3	24	●
10.7 x 5 x 14	5	70/60	85	●	●	0/0	○	○	○/●	3	1	24	●
14.6 x 6.2 x 14.2	9.9	80/80	75	●	●	2/4	○	○	●/●	3	3	24	●

TEST HOW WE TEST Ten judges rate an LCD's text and graphics quality. We evaluate each unit on how well it displays typical business letters, a newsletter, spreadsheets, Web pages, and scanned photos. The overall rating is based on text and graphics quality (25 percent each), price (25 percent), features and ease of use (15 percent), and service and support (10 percent). The best possible overall rating is 100. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

as printers or digital cameras more easily.

Our chart lists the backlight warranty for each LCD. Though an LCD's backlight is the one component most likely to fail, it has approximately twice the longevity of a CRT monitor's tube (20,000 to 30,000 hours versus 10,000 to 20,000 hours).

CRYSTAL-BLUE PERSUASION

LCDs save desktop space—you can count on saving at least 1 square foot, and sometimes much more. But there's more: LCD

monitors also use less electricity, generate less heat, and weigh much less than their bulky cathode-ray cousins—LCDs on our chart ranged from 5 to 20 pounds, compared to almost 40 pounds for a 17-inch CRT. And they're ideal for medical offices and hospitals because they don't emit the electromagnetic radiation that CRTs do, so they don't cause EMF interference in other high-tech medical devices.

What's more, they're easy on your eyes because they don't refresh their screens in

the same way as CRTs. If a CRT monitor's refresh rate is set too low, it causes noticeable screen flicker, which can cause eye-strain in some people. But LCD flicker is undetectable to the human eye and does not cause eyestrain.

On the downside, besides their high prices, you should also be aware of LCDs' limited viewing angles. The viewing angle is a measure of the angle at which you can view the screen from the sides and top and expect to see an image clearly. A typical LCD viewing angle is 60

degrees, though 70 degrees is preferable; CRTs typically allow a much wider viewing angle. The NEC MultiSync LCD1525X provides the widest viewing angles of any LCD on our chart, at 80 degrees. Wider viewing angles have been achieved with high-end developmental prototypes of LCD panels—advancements that will eventually trickle down to the consumer level. In the meantime, many of the LCDs we tested swivel and tilt—a low-tech but certainly not unreasonable way to address the problem.

IN UNLIVING COLOR

WITH FEW exceptions, the LCDs we tested produced crisp and extremely legible black-on-white text (typical of word processing documents and Web pages). But, although we calibrated all the monitors to the same contrast and brightness settings, we saw noticeable variations in the panels' abilities to display color images. Some had screen contrast that was too high—enough so that a battleship-gray toolbar in Windows looked almost white, and usually vivid icons looked either faded or, at the opposite extreme, oversaturated. Among our chart-makers, the number eight Samsung SyncMaster 150MP showed relatively tepid graphics, and the number seven Acer FP558 was plagued by screen blotchiness.

To help correct color quality, some vendors include image- or

MAKING THE SWITCH

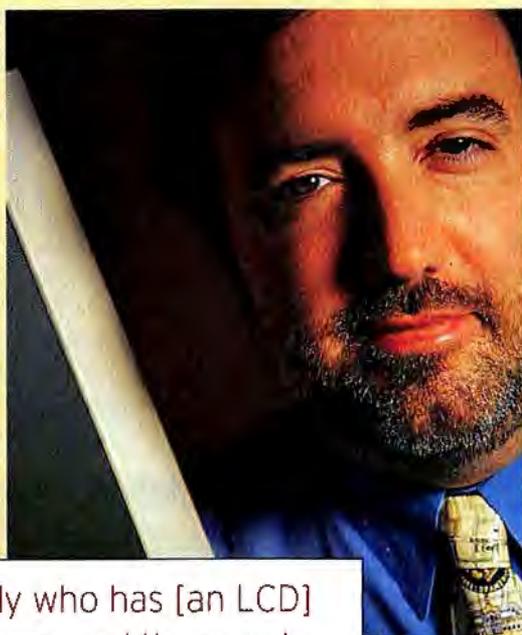
MOST GROWING companies eventually need to contend with cramped office space. Perhaps you are feeling the squeeze yourself, and wondering if it would be worth upgrading to LCD panels the next time your office plays monitor-go-round. Dan Shaughnessy, who leads the information technology team at the American Academy of Pediatrics' offices in Elk Grove, Illinois, faced a similar decision last year. To help ease the crowding, Shaughnessy ordered more than a dozen LCD monitors. He plans to keep ordering them in batches, until all 300-plus employees have converted to LCDs.

Predictably, it's a top-down process, from the CEO to the file clerks. But as luck would have it, "there was one model left over from testing, which just happened to end up on my desk," Shaughnessy chuckles.

In his first foray into the LCD market, Shaughnessy didn't stick to a single brand, instead ordering several different models to evaluate and compare their performance. His department has tried out half a dozen brands, including monitors from ViewSonic, Phillips, and NEC.

The desire to reclaim desk space was what prompted Shaughnessy and the AAP to consider LCD monitors. "We wanted to give people back some of their workspace," he explains. In addition to the smaller footprint, he finds that built-in speakers help keep the workspace neat.

The premium cost of LCDs, however, did give Shaughnessy's organization pause. "That was



"Everybody who has [an LCD] is very happy, and the people who don't have one are asking when they're going to get one."

Dan Shaughnessy, American Academy of Pediatrics

a concern," he admits; price "is why we haven't converted everybody yet." Shaughnessy

doesn't expect the LCDs to pay for themselves anytime soon, but he points out that they have important "soft benefits" that help compensate for the higher price: "People claim LCDs are easier on their eyes," he says, and they have a larger viewable area than they did with their 15-inch CRTs. He also hasn't yet seen any screen burn-in with the LCDs, which had proved to be a problem with the five-year-old CRTs that are gradually being replaced.

So what's the verdict? "Everybody who has one is very happy, and the people who don't have one are asking when they're going to get one," Shaughnessy reports.

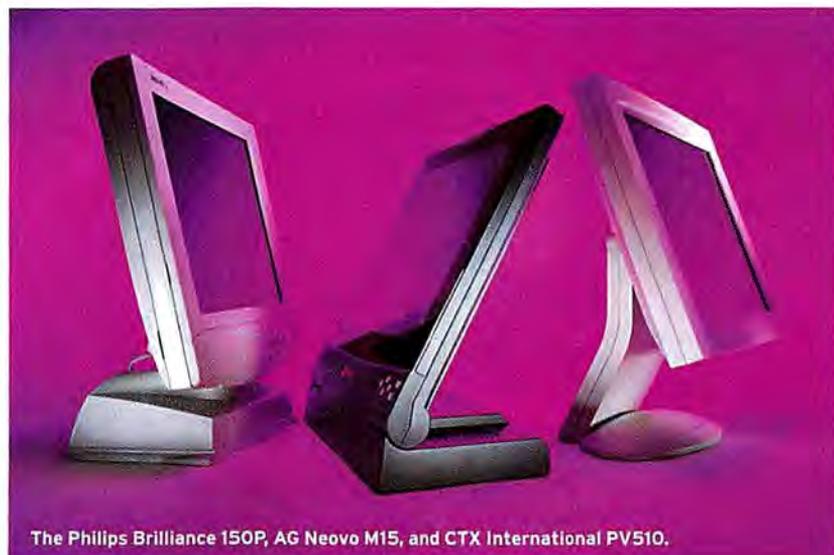
color-adjustment software with their LCD monitors (see the chart on page 120). But these consumer-grade applications don't offer the same power as the expensive color-calibration software graphics professionals use—although some of the latter packages can cost as much as the entire LCD monitor itself.

While some people will wait patiently for prices to come down even further, those of you who are ready to make the switch to a 15-inch LCD right now will find a generous number of excellent choices on our Top 10 chart. If high style is what you seek, check out the unusual case designs of Sony's SDM-N50PS or AG Neovo's M15; bargain hunters should consider CTX International's PV510.

1. Eizo Nanao FlexScan L330

WHAT'S HOT: This analog model earned our top spot as well as a Best Buy ranking thanks to its combination of outstanding text and graphics quality and an extremely attractive \$949 street price. The L330 panel earned our top cumulative score for rendering text, and also notched the top score for rendering graphics—beating the digital performance of every dual-interface monitor we tested.

WHAT'S NOT: The FlexScan L330's panel



The Philips Brilliance 150P, AG Neovo M15, and CTX International PV510.

cannot be oriented in portrait mode, and though you can tilt the panel, it cannot swivel from side to side as other panels can. In addition, its 10 hours of technical support per weekday seems stingy compared to the 24 hours offered by all but one other vendor on our Top 10 chart.

WHAT ELSE: The FlexScan L330, with its black casing, is a good-looking unit (you can also get it in gray). We noticed a short wait to bring up the menu for the on-screen controls.

BEST USE: Excellent image quality, a price

under \$1000, and a fetching design make Eizo's Nanao FlexScan L330 a terrific bargain for businesses and homes alike.

2. Philips Brilliance 150P

WHAT'S HOT: Like Eizo's FlexScan L330, the Brilliance 150P costs \$949, but this handsome panel comes primed to display images in either analog or digital mode. The 150P delivered solid image performance in our tests. In analog mode it ranked near the middle of the pack for both text and graphics, but in digital ▶

DOES DIGITAL MATTER?

CONVENTIONAL WISDOM holds that digital-to-digital signals produce better image quality than signals converted from analog to digital and then back to analog. But does that claim stack up? Since some of the LCD monitors we tested offer dual analog and digital interfaces, we compared their performance in both modes. We expected to see a marked difference, but that's not the way things turned out.

The five monitors we looked at for this roundup that offer both digital and analog output are the Compaq TFT5010, the NEC MultiSync LCD1525X, the Philips Brilliance 150P, the Princeton Senergy 560, and the ViewSonic ViewPanel VP150m. (The last two didn't make our Top 10 chart.)

Two of these five, the Philips and the Compaq, displayed text and graphics at about the same quality in both digital and analog modes. In a "blind" test, two teams of testers looked at these monitors in both analog and digital mode but voiced no real preference for either one. The NEC MultiSync LCD1525X achieved similar

results. In sum, you'd probably be just as happy with these LCDs' analog image quality as you would with their digital output.

On the other hand, two dual-input LCDs—the Princeton Senergy 560 and the ViewSonic VP150M—did show a noticeable difference in their digital and analog image quality. The VP150M earned an adequate score for the quality of its digital images—the same score earned by the Compaq TFT5010. But in analog mode, the VP150M delivered some of the lowest image scores we saw for both text and graphics.

The Princeton Senergy 560 showed the biggest difference. The 560's digital image quality captivated our testers, earning the highest image-quality score of all the dual-input LCDs. The monitor's analog image quality, however, was deemed the worst of the entire bunch. So, in the case of the Prince-



TO CONNECT a digital flat-panel monitor, your graphics card must provide a DVI port.

ton, a digital graphics adapter might just come in handy. Considering the 560's affordable \$899 street price, it could prove a sweet entrée to the world of pure digital display.

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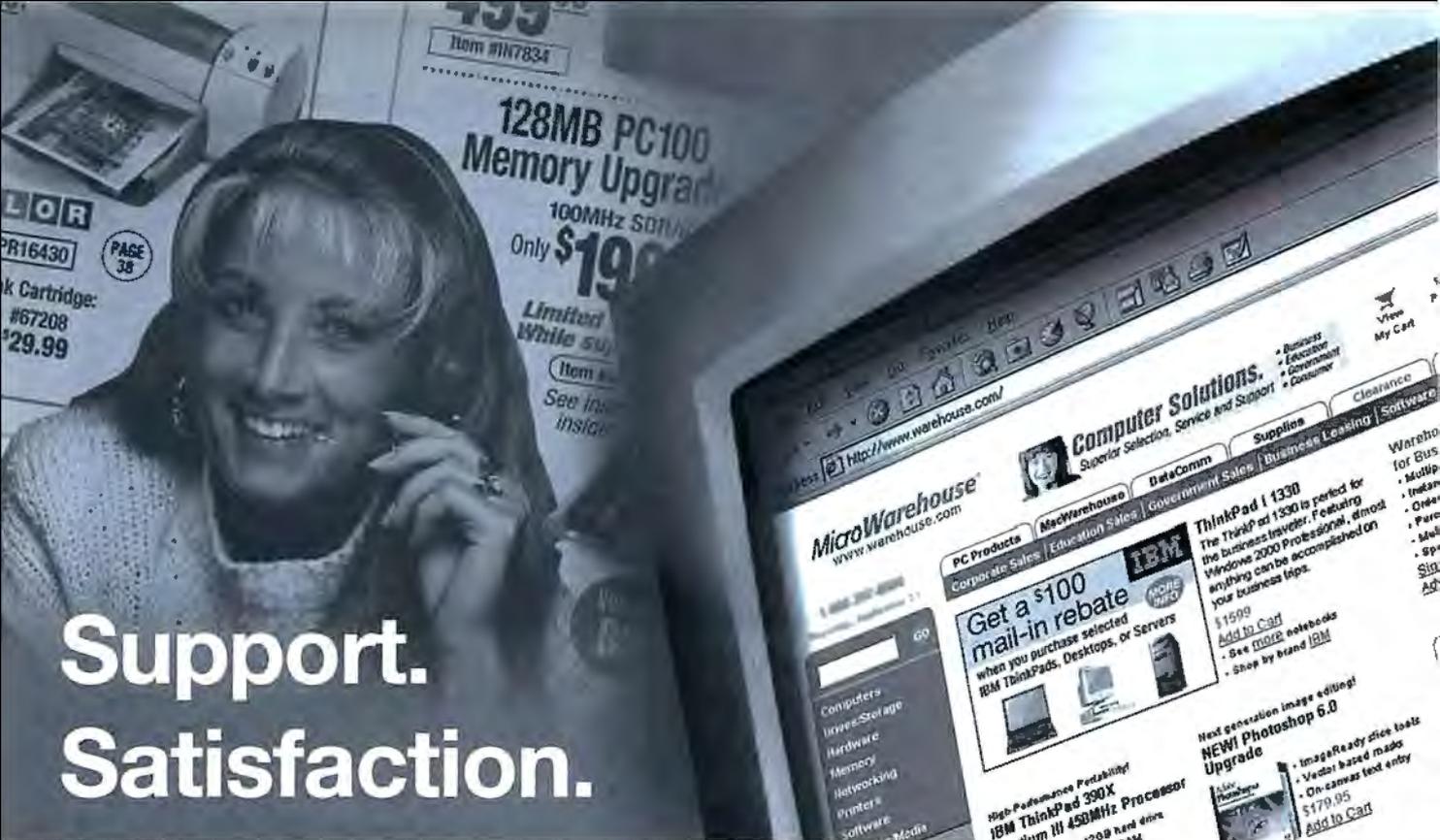
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mode it scored third highest in graphics, delivering sharp, striking colors. The panel can swivel and rotate to portrait setting. A three-year warranty that includes the backlight and 24-hour technical support help to protect your investment.

WHAT'S NOT: In its analog mode, the 150P suffered from an annoying horizontal interference pattern during one of our tests (though not in its digital mode). The 150P stands taller than most at 15.7 inches; you should measure your available vertical space before you consider a purchase.

WHAT ELSE: The 150P features just one upstream USB port. Chromelike buttons for screen adjustments are easy to locate and use. The unit's integrated microphone and speakers aid multimedia apps and videoconferencing, though the speakers won't make anyone sound good. The monitor's Kensington antitheft lock frees you from worrying about losing it.

BEST USE: With its fair price and competitive performance, the 150P would be an excellent presentation monitor.

3. AG Neovo M15

WHAT'S HOT: Seeing the M15 alongside other LCD monitors is like ogling a Ferrari in the parking lot. A sturdy glass overlay, which adds an illusion of polished lacquer, provides a measure of protection against sharp jolts to the pane. Angled wheels built into the bottom of the model's dark gray base allow you to twist, turn, or push aside the entire unit with very little effort. The AG Neovo M15 includes integrated speakers and a USB hub with one upstream port and four downstream. The M15's graphics look evenly saturated and brighter and cleaner than most that we review here.

WHAT'S NOT: Neovo offers fewer tech support hours than nearly every other vendor in this roundup. Like the other monitors we tested that have built-in speakers, the M15 produced tinny sound.

WHAT ELSE: The M15's speakers, along with its USB hub, are hidden behind the panel on the rear of the base. Experienced users will like the M15's advanced controls including a gamma setting for adjusting colors more precisely. The M15 is a lightweight 11.5 pounds, though a few other LCDs we review here are lighter.

BEST USE: Sleek, elegant lines and unique



The Toshiba Tekbright 60A, Compaq TFT5010, and Acer FP558.

maneuverability and connectivity features along with its protective glass overlay make this LCD a great choice for multimedia presentations and kiosk settings.

4. CTX International PV510

WHAT'S HOT: Costing \$899, the PV510 tied the Acer FP558 as the lowest-priced monitor on the chart. This analog model pulled in the fourth-highest scores for both text and graphics. Testers liked the PV510's vivid colors and natural skin tones in our test photos.

WHAT'S NOT: The PV510's one-year backlight warranty is short, compared to the three-year warranty that most vendors on our list offer. No weekend support means you may have to wait a couple of days to resolve a problem. At 16.3 inches, the PV510 is quite tall.

WHAT ELSE: The PV510 can rotate into portrait mode, but you'll have to shell out an additional \$40 for software to take advantage of it. This model's plain-Jane design won't win any beauty contests, but it tilts and swivels, though with a bit more stiffness than others.

BEST USE: Excellent text and graphics performance along with an affordable price make the PV510 a good choice for general business applications.

5. Toshiba Tekbright 60A

WHAT'S HOT: The Toshiba Tekbright 60A rendered small-point text in spreadsheets and word processing documents with razor-sharp clarity. The 60A was equally deft with graphics, especially in our Web

page test. The panel rotates effortlessly between landscape and portrait modes (some panels required substantial force to rotate). Toshiba's three-year parts-and-labor warranty, which includes the backlight, inspires confidence.

WHAT'S NOT: Except for the on/off button, the Tekbright 60A's screen controls are on the back of the panel, forcing you to turn the panel around to work the controls, or grope blindly. The panel tilts forward and back, but it doesn't swivel from side to side. Weighing in at 16 pounds, this model is a bit on the chunky side.

WHAT ELSE: The Tekbright 60A sells for \$1149 on the street, above average for the 15-inch LCDs we tested. The unit includes speakers built into the monitor base.

Best Use: Despite the 60A's clumsily designed controls, its combination of sharp text and graphics on Web pages and 24-hour tech support make this LCD a good choice for Web surfers.

6. Compaq TFT5010

WHAT'S HOT: The TFT5010 offers both digital and analog inputs, as well as optional touch-screen technology (available with the "opal"-colored monitor but not the "carbon"). Excellent graphics and very good text display helped boost the Compaq's score; our Windows 98 desktop test screen showed sharp icons and numbers. Compaq sweetens its three-year warranty on parts (including the backlight) and labor with a quick-exchange program. The unit also swivels, tilts, and rotates from landscape to portrait mode. ▶



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WHAT'S NOT: At \$1249, the TFT5010 costs more than most of the LCDs on our comparison chart, second only to the \$1299 Sony SDM-N50PS. For this price, USB ports would have added some value. It's also mighty hefty at 18.7 pounds—the heaviest monitor here.

WHAT ELSE: Test photos generated in analog mode had better colors than those rendered in digital mode, which tended to be muddy. When displaying text, however, its digital output outscored analog.

BEST USE: The touch-screen capability makes the TFT5010 ideal for kiosks. But even without the touch screen enabled, it's a good, all-purpose LCD monitor.

7. Acer FP558

WHAT'S HOT: The street price is a tempting \$899, tying CTX's PV510 for lowest on our chart. This unit also features built-in speakers and a Kensington lock port, which will discourage theft.

WHAT'S NOT: This screen produced an overall blue cast that darkened its output, whether it was displaying text, photos, a spreadsheet, or a gray-scale image; we couldn't compensate with the monitor's settings. The FP558's speakers, located on the bottom of the panel, sound tinny and don't work in power-saving mode.

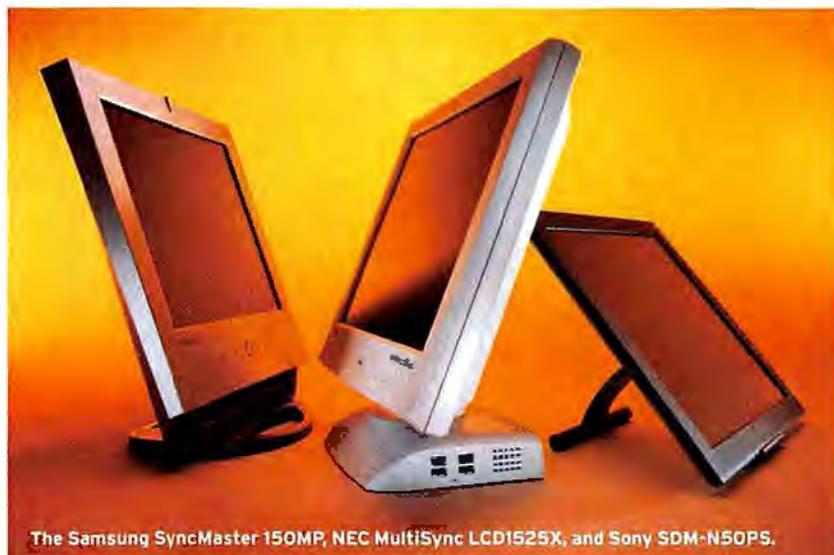
WHAT ELSE: A multifunction dial, located underneath the panel, controls speaker volume and can be used to adjust screen characteristics in tandem with the on-screen menus. It lacks USB ports, but an optional USB hub is available.

BEST USE: The FP558 would be adequate for hospitals and routine office work.

8. Samsung SyncMaster 150MP

WHAT'S HOT: Whether you prefer CNN or soap operas, this LCD takes a giant step toward convergence with its television tuner, video-in, and picture-in-picture (PIP) functions—the only monitor here to offer these features. You can switch between a television show, videotape or DVD, and a computer desktop. Housed in a metallic casing, the SyncMaster 150MP is more attractive than the putty-colored panels in our roundup.

WHAT'S NOT: The SyncMaster 150MP rendered icons and color graphics that looked a tad washed out in our tests. Text looked somewhat fuzzy on some test screens,



which weren't uniformly bright and which displayed a reddish cast.

WHAT ELSE: The \$1119 SyncMaster 150MP features integrated speakers and weighs 9.9 pounds, making it light even compared with other LCDs.

BEST USE: With its extra video functions, the SyncMaster 150MP would work well for financial analysts who want to keep one eye on the ticker, or for people in any profession who need to switch between desktop applications and other media.

9. Sony SDM-N50PS

WHAT'S HOT: The thinnest and lightest panel on our Top 10 chart, the wispy SDM-N50PS weighs just 5 pounds (only about half as much as the next-lightest monitor on the chart), and features light sensors that automatically adjust brightness levels—good if you work in a room that uses mostly natural light. The panel produced vivid colors and sharp text.

WHAT'S NOT: Its \$1299 street price is the highest on our chart, yet Sony skimps on the backlight warranty, which lasts a pal-

try one year. The panel's minimalist "photostand" looks like the beefy offspring of a coat hanger; unfortunately, it might be too flimsy for practicality—the panel is easy to knock over.

WHAT ELSE: You can rotate the monitor into portrait mode like a chalkboard slate.

BEST USE: This Sony would be a treat for style mavens looking to spruce up the workspace and create a high-tech look.

10. NEC MultiSync LCD1525X

WHAT'S HOT: Digital and analog connections are both possible with the MultiSync LCD1525X. In digital mode, the LCD1525X performed better with graphics, and produced much sharper text—jumping to third best from fourteenth. The LCD1525X also features four ports for USB devices such as printers, scanners, and digital cameras.

WHAT'S NOT: Judges noticed slightly uneven focus, smudgy text, and pale colors in photos when the panel was tested in analog mode.

WHAT ELSE: The \$999 MultiSync LCD1525X just barely hits the sub-\$1000 sweet spot. The three-year parts and labor warranty includes the backlight.

BEST USE: Consider this LCD monitor for use with a graphics card that has a digital output, but avoid it if your company is sticking to analog cards.

BEYOND THE TOP 10



We also tested five LCDs that missed the chart. For brief write-ups, visit www.pcworld.com/jan2001/lcd.

- Hitachi CML 151XW
- IBM T54H
- Iiyama TXA 3813MT
- Princeton Graphics Senergy 560
- ViewSonic ViewPanel VP150m

Leigh Anne Jones is a freelance writer based in Northern California. PC World Associate Editor Mick Lockey developed the chart for this article.

my new pc
doesn't raise
the bar. it
obliterates it.



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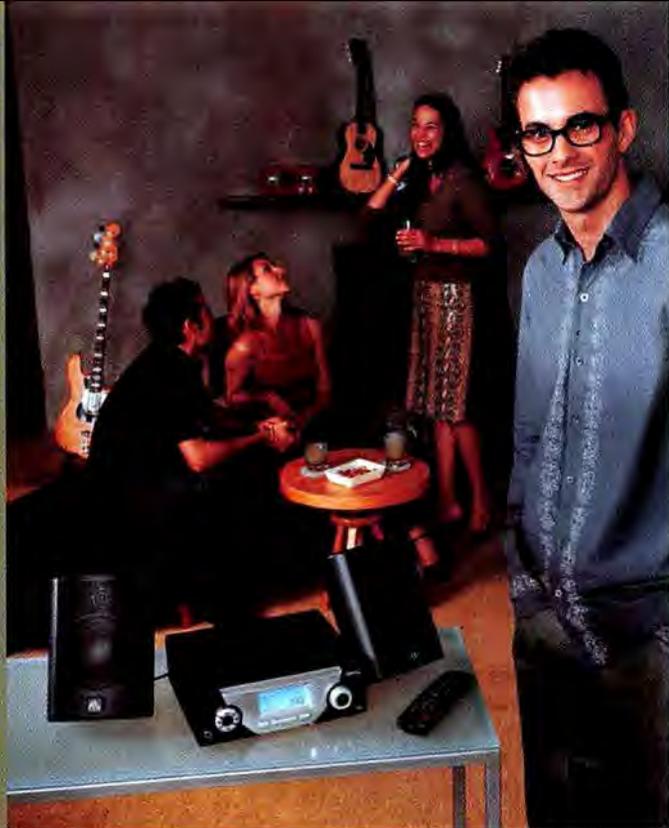
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How to pick the best products, shop for the best prices, and close the deal—all online.

**WEB
SHOPPING**
Bots & Beyond

BY GREGG KEIZER



FROM MY SPOT in the checkout line, the whole idea of shopping as entertainment is as flawed as most dot-com business plans. Drive through traffic, jostle strangers, stare at a Colosseum-size array of goods at a superstore—all to buy a camera? It's not my idea of fun.

For me, shopping is a job, not an adventure. The same applies to shopping online. You have to research items, compare prices, select a seller, and find the safest way to pay. Add to this the nightmares that can attend online shopping: goods that don't arrive, crummy customer service, and the hacker bogeyman trying to co-opt your credit card. But none of these concerns prevent me or millions of ►

others from buying on the Web. What's the attraction? Mostly, it's the 24/7 access and the ability to shop in your under-shorts. Three-fourths of buyers say convenience is their main reason for shopping on the Web, according to Astrid Van Dorst, senior analyst with the Gartner Group. Fewer than half of them are motivated by getting a great price.

And while online shopping does require some work, a host of tools and services can make spending your money easier than ever. You knew they'd find a way to help you do that, didn't you?

ARE YOU BEING SERVED?

AMONG THE SERVICES available to online buyers are product review sites that offer opinions from experts and consumers, shopping bots that provide price comparisons, and ratings sites that rank sellers based on consumer satisfaction.

To test these sites, I shopped for an array of business-related items—including a fax machine and a digital camera—and personal goodies, such as a Razor scooter (for my nephew, I swear), a fancy-shman-cy electronic Lego MindStorm set, a copy of the book *In the Heart of the Sea*, and a fleece pullover. We also asked a real expert—a professional shopper—to try the sites using her own clients' wish lists (see "Professional Shopper," page 135).

But would I be able to trust the advice I received in cyberspace? Would these sites save me time? The answer is, not always. I spent 1 to 2 hours shopping for each item—reasonable, perhaps, for a costly fax machine, but impractical for the Lego set or the pullover. So if you don't mind spending hours on research, these tools can help you find products, spot deals, and dig up reputable sellers. But they aren't the best choice for every item. Research tools and bots, for instance, work best for electronic goods with clearly defined features that are easy to rate—such as the pixel resolution of a digital camera. Clothes and toys, however, come in many variations, and are tougher for price bots to compare meaningfully. Still, when you have a list of items to buy and don't have time to battle the hordes at the mall, online shopping can be a blessing.

Review Sites

WHENEVER I'm looking for a good book, I call my bud Keith, who reads more tomes than a caffeinated college kid cramming for finals. If electronics are on the agenda, Brian's my man. And clothes? I consult

Emily, my teenage daughter, of course.

Unless you know exactly what you want when you shop, you probably also begin your task by asking friends for advice. The same applies to the Internet, where product review sites can serve as your shopping guides.

Product review sites cull assessments from experts or from real people who have used the product you want. They can help you deter-

TIP

SEARCH SPECIFICALLY

When searching at a review site or with a shopping bot, use specific terms, such as the brand name, model name, and model number if you know it. For instance, type 'Panasonic PVC 2780' instead of 'Panasonic VCR'. If these don't produce enough results, then try the brand name alone for more options.

mine which digital camera you need, or just help you research an item you plan to buy offline at a store. But the difference between an expert site and one that uses consumer reviews can be the difference between a well-written opinion full of facts and a vague endorsement or a flaming condemnation of a product.

Both types of sites have their pluses. Expert sites compare products and name the best in a category. Consumer review sites offer real-world evaluations of a specific product. One note about expert sites, however: Some of them have relationships with the merchants who sell the goods they evaluate. ConsumerSearch, for example, receives fees from vendors (disclosed in its FAQs) to include links to the vendors' sites alongside reviews.

Just as I started my spree, Productopia, my favorite pro review site, went belly-up. Productopia was my choicest pick because it covered more types of products than any other site. But now I had to switch gears and delve into multiple review sites, each covering a limited variety of products.

PICKING A PRODUCT

I WENT FIRST to Imaging Resource (www.imaging-resource.com), which specializes in digital camera reviews (you can also get *PC World's* product reviews at www.pcworld.com). What's the Best Fax Machine (www.whatsthebestfax.com) sounded like a good source for info about fax machines, and Outside Magazine (www.outsidemag.com), I thought, would cover fleece pullovers. But these two sites were no help. The fax site, for instance, offered advice about features to look for but gave no product recommendations. And the only clothing appraisal Outside offered was one on waterproof jackets.

So I turned to Active Buyers Guide (www.activebuyersguide.com), a product decision maker. Product decision makers are great when you don't know which brand suits your needs. Active Buyers Guide's digital camera wizard, for instance, helped me determine which features were important, such as the unit's picture resolution and the number of shots it could store in memory. Based on my designated criteria, the wizard recommended the Kodak DC-280.

For a second opinion, I went to ConsumerSearch (www.consumersearch.com), an expert site that aggregates reviews from publications such as *Consumer Digest*, *Consumer Reports*, and *PC World*. Editors at ConsumerSearch choose re-

views based on how current and comprehensive they are, and then tally the publications' votes for a product score. ConsumerSearch gave the Kodak DC-280 its top pick, based on reviews from four publications. By combining that recommendation with the product's high marks from Active Buyers Guide, I concluded that this was the camera for me.

CONSUMER RETORTS

WHEN IT COMES to buying advice, however, expert reviews suffer from one problem: Each judgment reflects the view of a few people at most. That's why it's helpful to visit a consumer site such as ConsumerReview (www.consumerreview.com), Deja (www.deja.com), or Epinions (www.epinions.com). Like the pro sites, these let you search by product name ('razor scooter'), type ('fleece pullover'), or category ('Business & Technology'). And both ConsumerReview and Deja list the top-ranked products in a category. Epinions doesn't show a best-of list, but it does let visitors rate reviewers, so you know whose opinion to trust.

Unfortunately, consumer reviews ►

WOULD A PROFESSIONAL shopper who spends her days searching for the best products and prices for her clients have anything to gain by using Web shopping tools? We asked Jennifer Butler, a personal shopper for Hollywood film studio execs and Top 40 musicians, to test-run some Web shopping agents to see if they could do her job.

Butler never knows what her clients will request: It could be the perfect teapot one day, a Rolex watch or designer duds the next. When we contacted Butler, her list included a TV/VCR for a busy executive who was tired of missing her must-see TV, a selection of wool winter coats for a client heading to upstate New York, and an antique end table for another executive.

Normally Butler would need a week to find all the items on her list, running from store to store and flipping through endless catalogs. "The Web has always seemed like a big catalog in some ways," she says, "but it's so big I thought it would be too hard to find anything."

In fact, her first try at Web shopping turned out to be deceptively easy.

Butler began with the TV/VCR at MySimon.com. Since the TV was destined for an armoire that the client already owned, it couldn't be larger than 28 by 27 inches, preferably with a 27-inch screen. Furthermore, it had to have front-end speakers, since the sides of the TV would be enclosed in the armoire, and the VCR had to have at least four heads. Finally, the unit had to cost no more than \$1200.

MySimon.com immediately led Butler to a Panasonic PVC 2780 at 800.com—a unit that met every one of her specifications. It also cost about half her asking price. Sold. That was easy. It looked like e-commerce had a new convert.

After printing out her purchase order, Butler optimistically went to StoreRunner.com in search of women's winter coats and an antique end table. But this round of research proved more difficult. After several tries, the only coat any of the bots found was a Burberry trench coat—not exactly the elegant wool version her client had in mind. And the query for the antique furniture turned up nothing at all. What's more, there were no fellow customers or salespeople around to direct her to stores where she might find what she wanted.

After spending 2.5 fruitless hours in front of the monitor, Butler grew weary. "It's interesting that I can spend all day walking into different shops, just looking around, but I've already had enough when I'm shopping [online]." While it had been fairly easy to navigate the various shopping agents, Butler was left with the feeling that there was a lot more on the Net than the bots were able to find. Clearly, she didn't have to worry about clients replacing her with a robotic shopping assistant in the near future.

"I provide a service that these sites don't," Butler said. "I've got...clients who don't like to shop, some who [need] help creating a particular image.... I'm like an interpreter of style and trends [for them]. So I see these sites as an added resource, rather than as competition."

Overall, her success with the TV/VCR was undercut by the unavailability of the other items on her list. "I would use online shopping as a supplementary service to offer my clients," Butler concluded, "but I don't see it becoming my sole means of shopping any time soon." —David Bock

Professional Shopper Tests the Web

Jennifer Butler, pro shopper



vary widely in quality. Some are as terse as a *TV Guide* blurb, while others ramble on like a drunken uncle. DeJa.com leans toward the former style. 'Warm and cozy!' for instance, didn't tell me much about a fleece pullover I was eyeing. Epinions is at the other end, with lengthy opinions that are rife with misspellings. ConsumerReview falls in the middle.

Consumer review sites are also sparse on categories. All three sites were swell for recommending electronic goods, but weak on clothes, toys, and books. None reviewed the Lego set, and only DeJa and Epinions offered a pullover suggestion. Epinions alone gave me reviews for the Razor scooter and the book.

My biggest complaint with these sites is what I call



CHECK SHIPPING AND SALES TAXES

Don't forget to factor in shipping costs and sales tax with your pricing results. Not all stores charge a sales tax, and those added costs can easily transform a steal into a poor deal. But many merchants hide these charges until you reach the checkout page or list them only in their FAQ section. If the costs aren't disclosed, head to another store.

the People's Choice syndrome: Products rate high not because they're great, but because many people buy them. For instance, ConsumerReview ranked the now-discontinued Nikon Coolpix 100 as top camera, but none of the 30 sources cited by ConsumerSearch rated it best.

I advise using expert sites to compile a list of the top goods, then heading to consumer review sites to read what real people think about those products. That's how I settled on the Kodak DC-280 camera and the HP LaserJet 3100 printer/fax machine for my small-business office.



Best Expert Review Site: *ConsumerSearch* aggregates professional reviews from trusted publications. **Best Consumer Review site:** *Epinions* has the largest selection of reviews, for more than 150,000 products.

Lots of Bots

ONCE YOU KNOW what you want to buy, you have to figure out who's got the best deal. That's where shopping bots earn their keep. These software agents scour the Web or their own massive databases

for products you designate. Then, like the Greek messenger Hermes on amphetamines, they zip back with a list of prices and places to buy. If they do the job right, bots spare you from visiting dozens of stores to collect prices and allow you to sniff out the steals from the so-so deals.

But even the best bots can't guarantee they'll find the lowest price or dig up all the vendors. (Call me paranoid, but I suspect there's always a lower price out there somewhere.) Since no two bots survey the same list of online merchants, it pays to employ a few of them for more results.

I found the general-purpose shopping agents most useful because they comb so many product categories. (There are also category-specific bots, such as Bookfinder.com and CDPriceCompare.com. And you can find a list of more bots at the Botspot www.botspot.com/s-shop.htm, and PCWorld.com also has a price comparison tool for products we review and other items.) MySimon (www.mysimon.com) and Yahoo Shopping (shopping.yahoo.com) both found prices and vendors for all the goods on my list. But only Yahoo Shopping spotted MyRazorScooter.com, which offered the lowest price on that item. As for other bots, Excite Shopping (shopping.excite.com) drew a blank on books; the shopping bot included in the newly expanded BizRate (www.bizrate.com) failed to find a men's pullover; and DealTime (www.dealtime.com) missed both my book and the pullover.

MySimon, DealTime, and BizRate produced lists that focused more tightly on what I wanted. That's because the sites let me select categories before they delivered results. After I typed in 'scooter', for instance, MySimon had me pick from five categories that included Skateboards

and Vehicles & Rideons. The result was a list with few irrelevant items. However, when I asked Excite to show me prices for the LaserJet 3100 (the printer/fax I'd picked), it listed over 180 items, from laptops to laser printer cartridges. Only one was the LaserJet I wanted.

SIMON SAYS "BUY"

ALL IN ALL, MySimon is my top draw. Its interface is easy to navigate, it lets you search dealers by criteria such as whether they charge restocking fees, and sends e-mail alerts when a product's price drops to a specified amount. BizRate's my second pick for its one-stop approach. It blends vendor ratings with a solid search bot and lists of the most popular products. My only gripe is that its search bot shows fewer vendors than MySimon's, perhaps because the feature is new.

Although comparison bots do a decent job of collecting



PRINT OUT YOUR ORDER FORM

Once you've filled out the order form, print a copy before sending it, to keep for your records. Most sites will e-mail you a confirmation for your order, with an account number. Be sure to save this for future reference.

prices on higher-priced electronics gear, they slip on lower-cost items that have endless variations, such as clothing and toys. RoboShopper (www.roboshopper.com) and CNet Shopper (www.shopper.com), for instance, handle electronics nicely, but they don't cover enough categories to be bots of first resort. And as with product finder sites, you should ►

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view their results with caution. Almost every bot skews its lists by offering preferred placement to sellers who advertise with them or pay a fee, and many place icons next to vendors who pay for the privilege. (PCWorld.com does not give vendors preferential placement but does let them pay for an icon near their listing.) When a bot's list isn't sorted alphabetically by vendor or by price, it's likely because vendors have paid for top spots. (One exception: BottomDollar lists results as they come in, so sellers at the top are simply those with the fastest Web servers.) Some bots with paid placement let you re-sort results by price. I won't use a bot that doesn't allow it. Excite is the only site mentioned here that doesn't allow you to re-sort.

There is one advantage to paid placement and icons: Vendors who partner with a price bot open their database to the bot, so the prices they deliver tend to be more current. Inviting vendors to pay for placement helps the pricing sites make money, but the practice should be disclosed. MySimon, BizRate, and Deal-Time mention deals they make with vendors, but RoboShopper doesn't.



Best Price Bot: MySimon is easy to navigate and does the best job at rooting out deals.

ONLY YAHDO SHOPPING FOUND MyRazorScooter.com, which had the lowest price on this Razor scooter.

MYRAZORSOOTER.COM

Best Quality At the Lowest Price
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RAZOR SCOOTER
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Vendor Verification

"TRUST, BUT VERIFY," President Ronald Reagan used to say. I agree with him when it comes to picking online merchants. After choosing a product and finding the best price, you'll want to confirm that the

seller you're dealing with is solid. This is crucial, since the lowest price might not always be the best deal in the end.

Nefarious online merchants are legion. The National Consumers League's Internet Fraud Watch reports that last year online scams cost consumers over \$3.2 million. So read the fine print on everything, including shipping fees and taxes, the vendor's debit policy (choose a store that won't charge your credit card until your item ships), and complaint policy (it should be clearly defined and should include both an e-mail address and a phone number for customer service).

VENDOR TRUST

ONE WAY TO VERIFY an online vendor's trustworthiness is through ratings services like Gomez (www.gomez.com) and BizRate (www.bizrate.com), which appraise vendors based on such criteria

as ease of use, on-time delivery, and customer feedback. Gomez bases its numbers not on user reports but on features included on a vendor's site—such as whether an online clothing store has a gift registry. The service does post a few user reports, but they're not always current. And Gomez strikes deals with some vendors, making suspicious shoppers like me wonder whether the

ratings are entirely objective. At least Gomez discloses this practice, saying it "may receive compensation from or have other business arrangements with some of the

TIP

USE A SHOPPING UTILITY

Shopping utilities interact with your browser to pop up instant price comparisons while you're on a product page. Our favorite, Clickthebutton.com, is great for pointing out savings on books, computers, and electronic goods, though it doesn't fare as well with toys and clothes.

businesses evaluated on the site."

BizRate takes the populist approach, collecting thousands of buyer surveys to score a store. Businesses voluntarily join BizRate's program by letting shoppers fill out a survey at the end of their transaction (BizRate also rates nonparticipating stores through an in-house panel of shoppers). But BizRate's ratings are very kind. The lowest-rated online electronics store, for example, still received a score of 6.7 out of 10. Grade inflation is rampant on all rating sites (see "Can You Trust E-Commerce Review Sites?" www.pcworld.com/jul2000/shopping_sites/), so be skeptical and give more than a cursory glance to ratings. BizRate, for instance, gives one site's product selection an impressive 8+ score, but the site's on-time delivery rating was a (relatively) pathetic 6.4—a big consideration if you're doing last-minute shopping. And BizRate's new shopping bot feature—which allows vendors to pay for top placement in search results—raises fur-

ther questions about the reliability of its ratings. But BizRate's CEO, Chuck Davis, says, "We rate no one.... Customers do. [Our ratings] are always unbiased."

THE LAST WORD

YOU CAN SEARCH for a specific online store or cruise the categories on either site to locate the dealers you're considering. I used Gomez and BizRate as tiebreakers when the cost-comparison bots delivered vendors that were close in price. For instance, my confidence about buying at Outpost.com—which offered the lowest price on the digital camera—soared when I found that the site received ratings of 9.1 out of 10 at BizRate. The rating services also warned me against one site that offered a very low price on a Razor. Gomez ranked the store 24th out of 30 in its category. And BizRate has a handy shopping toolbar add-on (for Internet Explorer only) that makes vendor comparisons one-click easy. The service isn't perfect, however, and sometimes differences between stores seem minor, even though one may be rated higher than the other on the chart.

But even though Gomez rates more than 6000 online firms and BizRate rates 5000, they do not cover every Tom, Dick, and Harry.com. Several small-scale sites (like MyRazorScoot-



VERIFY AVAILABILITY OF ITEM

If you need an item right away, make sure that it's in stock before you order it. Consider calling the e-store to verify this, since few sites provide real-time, in-stock indicators. Also, check with the merchant about delivery dates.

er.com) that appeared on price bot lists didn't appear on either service's rankings. That's when it becomes your call whether to entrust your purchase to an unfamiliar site or shop elsewhere.



Best Vendor Ratings: Although BizRate's ratings can be too kind, it ranks vendors based on the experiences of thousands of consumers.

Paying the Piper

EVER FILL UP your shopping cart in a grocery store only to abandon it when you see the long, slow-moving checkout lines? Well, according to a Boston Consulting Group study, approximately two-thirds of online

consumers are wont to do the same. Why? Because some sites frustrate them by demanding that they fill out too many forms of information or offer less-than-stellar guarantees about the security of their credit card transactions.

To help customers avoid repeatedly filling out information at sites they visit frequently, many online stores use browser cookies to remember your personal data (not always a good thing, in the mind of some consumers). Alternatively, you can use a digital wallet, which stores your purchasing information (including credit card numbers) and feeds it to online forms at your command. Jotter (www.jotter.com) is the best I've seen because it stores the data on your PC's hard drive (not on a remote server, as do Microsoft's Passport and Yahoo's Wallet). Once you've signed up, you can fill out all or part of virtually any online form in two clicks. Most important, Jotter promises not to divulge your data to anyone else.

SECURE YOUR CREDIT CARD

TO IMPROVE credit card security, American Express has developed a new plan called Private Payments that generates a one-time transaction number when you click on a link at the store or on a separate icon on your desktop (for additional information or to enroll, go to www.americanexpress.com/privatepayments). You can use this number in place of your regular credit card number to pay for purchases. American Express then matches the transaction number to your real credit card number to bill your card, but the vendor never receives your actual card number. The software (which you download from American Express's

Web site) works with both Internet Explorer and Netscape (though not with America Online).

Another alternative, PrivateBuy (www.privatebuy.com), generates anonymous MasterCard numbers from an account you set up. PrivateBuy will not work with e-tailers that don't ship to a non-billing address, and it charges \$4 each time you add funds to your account.



POST A USENET QUERY

Get one-on-one shopping recommendations from Usenet groups. At Deja.com's Discussions (www.deja.com/usenet), you can search multiple newsgroup archives by name or type of product. Don't waste time sifting through all the messages in the category; just launch a newsreader—either Outlook Express or Netscape Messenger serves well here—and enter the newsgroup name. Then post a message asking for suggestions.

(For more information on some of the online payment schemes mentioned here, check out "Smart Tools for Smart Buyers" in October 2000's *Top of the News* (www.pcworld.com/oct2000/shopping_tools).



Best Payment Service: American Express Private Payments generates a onetime transaction number to thwart thieves.

Gregg Keizer is a freelance writer living in Eugene, Oregon; David Bock is a writer in Los Angeles. ■

Presario 7000T Internet PC



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 56K ITU V.90 PCI Modem
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i800JB, i800JC, i800JD, i800JE, i800JF, i800JG, i800JH, i800JI, i800JJ, i800JK, i800JL, i800JM, i800JN, i800JO, i800JP, i800JQ, i800JR, i800JS, i800JT, i800JU, i800JV, i800JW, i800JX, i800JY, i800JZ, i800KA, i800KB, i800KC, i800KD, i800KE, i800KF, i800KG, i800KH, i800KI, i800KJ, i800KK, i800KL, i800KM, i800KN, i800KO, i800KP, i800KQ, i800KR, i800KS, i800KT, i800KU, i800KV, i800KW, i800KX, i800KY, i800KZ, i800LA, i800LB, i800LC, i800LD, i800LE, i800LF, i800LG, i800LH, i800LI, i800LJ, i800LK, i800LL, i800LM, i800LN, i800LO, i800LP, i800LQ, i800LR, i800LS, i800LT, i800LU, i800LV, i800LW, i800LX, i800LY, i800LZ, i800MA, i800MB, i800MC, i800MD, i800ME, i800MF, i800MG, i800MH, i800MI, i800MJ, i800MK, i800ML, i800MM, i800MN, i800MO, i800MP, i800MQ, i800MR, i800MS, i800MT, i800MU, i800MV, i800MW, i800MX, i800MY, i800MZ, i800NA, i800NB, i800NC, i800ND, i800NE, i800NF, i800NG, i800NH, i800NI, i800NJ, i800NK, i800NL, i800NM, i800NN, i800NO, i800NP, i800NQ, i800NR, i800NS, i800NT, i800NU, i800NV, i800NW, i800NX, i800NY, i800NZ, i800OA, i800OB, i800OC, i800OD, i800OE, i800OF, i800OG, i800OH, i800OI, i800OJ, i800OK, i800OL, i800OM, i800ON, i800OO, i800OP, i800OQ, i800OR, i800OS, i800OT, i800OU, i800OV, i800OW, i800OX, i800OY, i800OZ, i800PA, i800PB, i800PC, i800PD, i800PE, i800PF, i800PG, i800PH, i800PI, i800PJ, i800PK, i800PL, i800PM, i800PN, i800PO, i800PP, i800PQ, i800PR, i800PS, i800PT, i800PU, i800PV, i800PW, i800PX, i800PY, i800PZ, i800QA, i800QB, i800QC, i800QD, i800QE, i800QF, i800QG, i800QH, i800QI, i800QJ, i800QK, i800QL, i800QM, i800QN, i800QO, i800QP, i800QQ, i800QR, i800QS, i800QT, i800QU, i800QV, i800QW, i800QX, i800QY, i800QZ, i800RA, i800RB, i800RC, i800RD, i800RE, i800RF, i800RG, i800RH, i800RI, i800RJ, i800RK, i800RL, i800RM, i800RN, i800RO, i800RP, i800RQ, i800RR, i800RS, i800RT, i800RU, i800RV, i800RW, i800RX, i800RY, i800RZ, i800SA, i800SB, i800SC, i800SD, i800SE, i800SF, i800SG, i800SH, i800SI, i800SJ, i800SK, i800SL, i800SM, i800SN, i800SO, i800SP, i800SQ, i800SR, i800SS, i800ST, i800SU, i800SV, i800SW, i800SX, i800SY, i800SZ, i800TA, i800TB, i800TC, i800TD, i800TE, i800TF, i800TG, i800TH, i800TI, i800TJ, i800TK, i800TL, i800TM, i800TN, i800TO, i800TP, i800TQ, i800TR, i800TS, i800TT, i800TU, i800TV, i800TW, i800TX, i800TY, i800TZ, i800UA, i800UB, i800UC, i800UD, i800UE, i800UF, i800UG, i800UH, i800UI, i800UJ, i800UK, i800UL, i800UM, i800UN, i800UO, i800UP, i800UQ, i800UR, i800US, i800UT, i800UU, i800UV, i800UW, i800UX, i800UY, i800UZ, i800VA, i800VB, i800VC, i800VD, i800VE, i800VF, i800VG, i800VH, i800VI, i800VJ, i800VK, i800VL, i800VM, i800VN, i800VO, i800VP, i800VQ, i800VR, i800VS, i800VT, i800VU, i800VV, i800VW, i800VX, i800VY, i800VZ, i800WA, i800WB, i800WC, i800WD, i800WE, i800WF, i800WG, i800WH, i800WI, i800WJ, i800WK, i800WL, i800WM, i800WN, i800WO, i800WP, i800WQ, i800WR, i800WS, i800WT, i800WU, i800WV, i800WW, i800WX, i800WY, i800WZ, i800XA, i800XB, i800XC, i800XD, i800XE, i800XF, i800XG, i800XH, i800XI, i800XJ, i800XK, i800XL, i800XM, i800XN, i800XO, i800XP, i800XQ, i800XR, i800XS, i800XT, i800XU, i800XV, i800XW, i800XX, i800XY, i800XZ, i800YA, i800YB, i800YC, i800YD, i800YE, i800YF, i800YG, i800YH, i800YI, i800YJ, i800YK, i800YL, i800YM, i800YN, i800YO, i800YP, i800YQ, i800YR, i800YS, i800YT, i800YU, i800YV, i800YW, i800YX, i800YY, i800YZ, i800ZA, i800ZB, i800ZC, i800ZD, i800ZE, i800ZF, i800ZG, i800ZH, i800ZI, i800ZJ, i800ZK, i800ZL, i800ZM, i800ZN, i800ZO, i800ZP, i800ZQ, i800ZR, i800ZS, i800ZT, i800ZU, i800ZV, i800ZW, i800ZX, i800ZY, i800ZZ. 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CRUCIAL.COM: GETTING MEMORY RIGHT THE FIRST TIME

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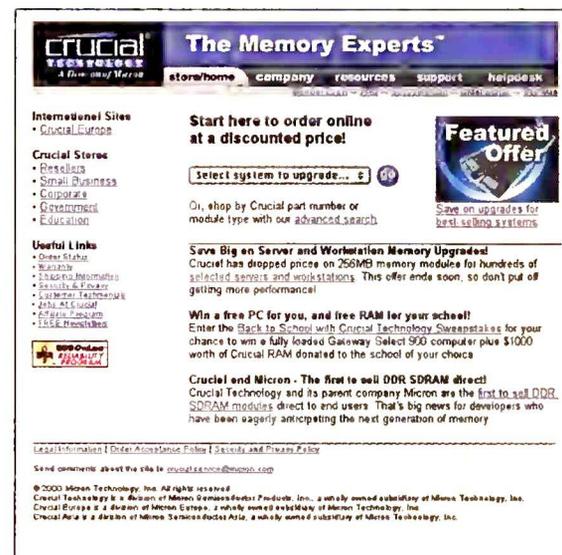
David Blevins makes his living in a place where few dare to tread, and that suits him just fine. He reckons he's living the good life, working as an IT administrator in Juneau, Alaska, surrounded by the mountains and pine trees that blanket the state's southeast panhandle. But Blevins works long hours, and even moonlights, to keep his family living comfortably. His second job, you see, is working as the Blevins family's IT director.

The Blevins wait out their winters on Douglas Island, in a geodesic dome set against a striking backdrop of evergreens and bay vistas. But even as snow blankets the island and daytime temperatures fall below freezing, clients keep calling and homework continues to beckon.

David's wife, a research analyst, "is always doing the number-crunching thing," he says. "And I like to be able to connect to my servers remotely, instead of having to rush into work in the middle of the night." David's teenage son and daughter, meanwhile, use their PCs to keep cabin fever in abeyance. "My son is really into burning CDs and recording MP3 music on his PC," David says. "And my daughter is also way into music and Web site development."

Before the Net came along, David had to shop for computer hardware at the local discount store. "If you were in hurry, you might as well forget about it," he says. "Back then, you had to order parts by mail. And it took several weeks for stuff to arrive by plane or boat."

Now David waits just days to get his family's PC upgrades, and—thanks to the Net—he can order hardware directly from leading manufacturers. For memory, David goes straight to Crucial Technology Inc., through its Web site,



Crucial.com. Crucial is a division of Micron, the largest DRAM manufacturer in the U.S. and the only chip maker that ships memory upgrades straight to end users.

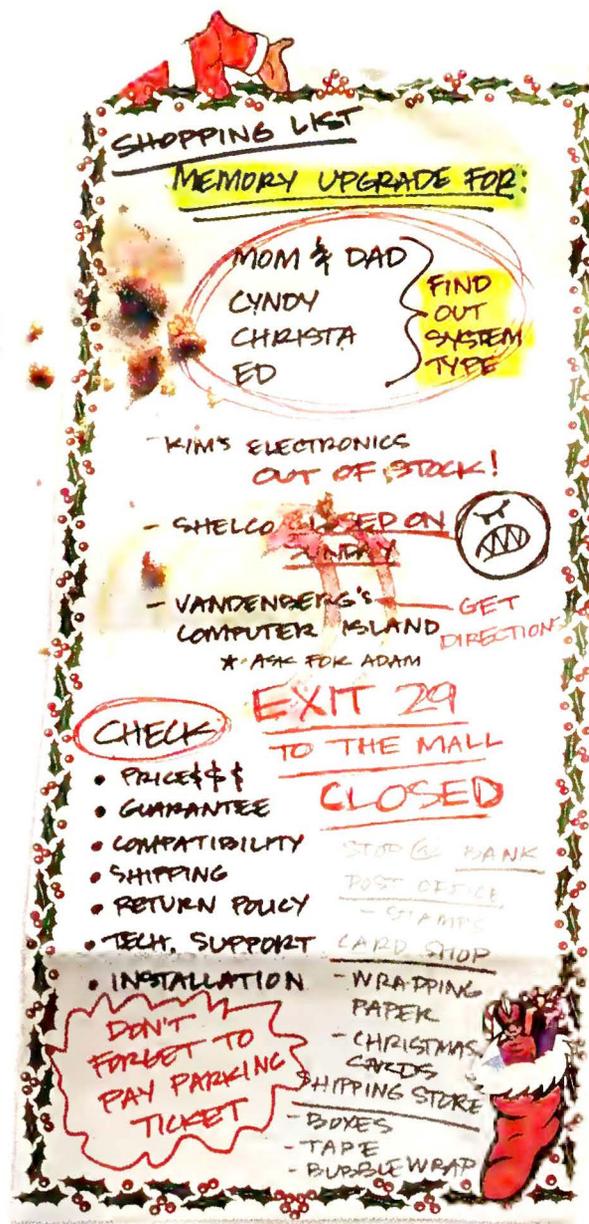
By shopping at Crucial.com, David often pays prices 50 percent lower than those charged by other vendors who buy their DRAM on the open market. "Price has always been a big factor, because we've had limited choices," David says. "But it's the fact that Micron is behind [Crucial] that is most important to me." Crucial, he says, only sends him top-notch modules that are guaranteed to work with his home systems.

David uses Crucial's Memory Selector tool to search through Crucial's selection of over 49,000 upgrade options for more than 10,000 PCs, servers, routers, and printers. He simply enters his computer's make and model information into the Memory Selector, and the Crucial site instantly returns a list of memory upgrades guaranteed to be compatible with that system.

David says the three 128MB DIMMs he bought recently from Crucial have boosted performance on the family PCs significantly. And Crucial.com articles predict the improvements the Blevins can expect with additional memory. "Out here," David says, "it's good to know what's coming. When even your basic necessities arrive by plane, boat, or barge, you want to be sure that you get your orders right the first time."



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If extra-terrestrials looking for high-performance PCs approach you with the order, "Take me to your leader," you'd do well to guide them to Alienware Corporation. Just look at some of the comments customers have posted on Alienware's web site:

"I just want to thank you for such a well-built product," says Marty. "My new Area 51 computer is truly 'all that and a bag of chips.'...I will be referring your excellent company to my friends who are looking for a computer system that is a cut above the rest."

Another user, David Shor, writes, "Thank you, guys, for building the best system money can buy! There are no false claims about performance level. The machine I got from you just smokes."



"Alienware, you are supreme," gushes Jack Powell. "I am now on my second Alienware system.... I fell in love with the first and am now in love with this one. There is no better-built computer on the market, and the components are absolutely cutting-edge.... I wouldn't consider buying a computer system from someone else."

"I have never had the pleasure of using a machine that was built to such perfection," Mario Viscardi adds. "The speed of the machine is amazing!"

Users aren't the only ones enthusiastic about Alienware's computer systems. "Alienware's top-of-the-line system packs a lot of brand-name punch into a reasonably priced package," writes *PC Gamer*, which has given Alienware its Editor's Choice award every year for the past three years. Alienware also won *Maximum PC's* "Kick-Ass Award" and was described by that magazine as "the fastest PC we've ever seen, bar none!"



Alienware's success is due in part to its vision of building high-performance computer systems that go beyond word-processing and Net-surfing capabilities to include full-blown multimedia options. The company strives to use the latest 3D accelerators and the best hardware possible, allowing users to custom-configure their systems by choosing the best brand-name components.

The South-Florida-based company, which was recently named a Microsoft System Builder Gold Member, prides itself on its customer service and support, which is also praised by its customers.

"The minute I began talking to your service reps, I knew I was in good hands," explains Michael Cooke. "They made me feel confident in the product I was purchasing, offered suggestions, and gave their input on the hardware.... Keep up the good work and keep setting the standards for what should be expected from any company."

Abraham Egnor says, "I love you guys. I sent you a message about losing the Software DVD player. I expected to get a reply sometime this week, maybe asking me for more info. Instead I got a reply the next day, with the software attached. Two words: jaw droppage. And it works. I'm not used to things going this well, especially where computer problems are concerned."

High performance, service, and support. It's no wonder many consider Alienware "out of this world."



ALIENWARE

GREY

AMD Duron 700MHz Processor
High-Performance Heatsink/Cooling System
VIA KT133 Chipset Motherboard
128MB SDRAM (PC-133)
Floppy Drive 1.44MB
15GB 7200RPM Hard Drive Ultra ATA100
NVIDIA GeForce 256™ 32MB DDR Video Card
SoundBlaster LIVE! 3D Sound Card
Cambridge FPS1000 4.1
Subwoofer/Speaker System
56X EIDE CD-ROM Player
White Hydraulic ATX Mid-Tower Case w/300 Watt
Microsoft Internet Keyboard PS/2
Microsoft Intellimouse PS/2
U.S. Robotics V.90 56K Voice/Fax/Modem
Microsoft Windows Millennium OS
1-Year Toll-Free 24/7 Technical Support
with Alienware On-Site Home Service
Personalized Technical Support Manual
Optimized & Configured for High-Performance
FREE FUNC Technical Surface Pad

\$1,199.00

Financing: \$33/MO., 48 MOS.

HIVE-MIND

AMD Thunderbird 1GHz Processor
High-Performance Heatsink/Cooling System
VIA KT133 Chipset Motherboard
128MB SDRAM (PC-133)
Floppy Drive 1.44MB
20GB 7200RPM Hard Drive Ultra ATA100
NVIDIA GeForce2 GTS™ 32MB Video Card
SoundBlaster LIVE! 3D Sound Card
Altec Lansing ACS 54 Gaming
5-Piece Subwoofer/Speaker System
Pioneer 16X/40X DVD Player
White Hydraulic ATX Mid-Tower Case w/300 Watt
Microsoft Internet Keyboard PS/2
Microsoft Intellimouse PS/2
U.S. Robotics V.90 56K Voice/Fax/Modem
Microsoft Windows Millennium OS
1-Year Toll-Free 24/7 Technical Support
with Alienware On-Site Home Service
Personalized Technical Support Manual
Optimized & Configured for High-Performance
FREE FUNC Technical Surface Pad

\$1,599.00

Financing: \$44/MO., 48 MOS.

AREA51: AURORA

AMD Thunderbird 1.2GHz Processor
High-Performance Heatsink/Cooling System
VIA KT133 Chipset Motherboard
Virtual Channel 256MB SDRAM (PC-133)
Black Floppy Drive 1.44MB
40GB 7200RPM Hard Drive Ultra ATA100
NVIDIA GeForce2 Ultra™ 64MB DDR Video TV-Out
Koolmaxx Video Cooling System
SoundBlaster LIVE! 3D Sound Card
Klipsch 4.1 ProMedia v.2 4.0 THX
400-Watt Subwoofer/Speaker System
Pioneer 16X/40X DVD Player
Plexwriter 12X/10X/32X CDR-W IDE
Black Hydraulic ATX Mid-Tower Case w/300 Watt
Black 107-Enhanced Keyboard PS/2
Microsoft Intellimouse Explorer
U.S. Robotics V.90 56K Voice/Fax/Modem
Microsoft Windows Millennium OS
1-Year Toll-Free 24/7 Technical Support
with Alienware On-Site Home Service
Personalized Technical Support Manual
Optimized & Configured for High-Performance
FREE FUNC Technical Surface Pad

\$2,799.00

Financing: \$77/MO., 48 MOS.

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MONITORS

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22" Viewsonic PF815 .25dp	\$845.00



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CTX: A SITE FOR SORE EYES



www.ctxint.com

A lot of people brag about their PC's hot new processor or massive RAM. But you can always tell that someone really lives at their PC when they rave about their monitor.

That's because a great monitor makes working at your desktop such a pleasure. It doesn't matter whether you're working with graphics software, staring at customer contact screens, or just cranking out Word documents and e-mails. A clean, crisp monitor with low distortion and reflection reduces eye fatigue—and the mental fatigue that goes with it.

"For today's knowledge worker, who puts in hour after hour in front of a PC screen, monitor quality is actually a tremendous factor in overall worklife quality," declares Stephanie Wang, product manager at CTX International, one of the world's leading designers and manufacturers of computer monitors. "Many people simply don't realize how much of their fatigue and discomfort at work is being caused by a monitor screen that's too curved and distorted, reflects too much ambient light, and lacks visual 'punch.'"

CTX's response to this pervasive problem is its unique Visual Comfort Technology, which alleviates the visual discomfort commonly associated with conventional curved screens. In particular, CTX offers the Professional PureFlat® Series of desktop monitors, which takes advantage of Sony's acclaimed FD Trinitron® CRT technology to deliver the ultimate in pixel brilliance and definition. Plus, CTX is the only manufacturer to offer this technology in a full selection of 15-inch to 21-inch screens.

"The PureFlat screen delivers the most comfortable, visually flat image that's ever been produced," says Wang. "There's simply nothing else like it on the market."



CTX's broad selection extends to its other product lines as well—including its FlatView® flat-panel LCD monitors, which are available in a wider range of sizes than competitive brands.

Flat-panel LCDs have become increasingly appealing to buyers, since they take up less space on the desktop, look great, and are very easy on the eyes. Flat-panel LCDs are also more expensive than conventional monitors. That's why CTX's selection is a big advantage for buyers.

"Our selection lets buyers make the choices that best suit their needs," explains Wang. "For example, if you want a larger display, we give you the option of selecting a 17-inch screen instead of a full 18 inches. That can save you a fairly substantial amount of money without making you go all the way down to a 15-inch model."



The exceptional quality of CTX's display solutions has garnered numerous awards from trade publications including *PC World*, *Computer Shopper*, and *PC Computing*. Just as importantly, research studies from IDC indicate that CTX is the top "non-captive" brand (i.e., chosen by the buyer rather than bundled by the manufacturer) among small- to mid-sized businesses.





LCD, CRT, Short-Length, PureFlat? CTX is Your Big Screen Answer

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Whatever type of big screen monitor you're looking for, look no further than CTX.

Our big screen monitors come equipped with the latest technology — Sony **FD Trinitron**® CRTs for undistorted, perfect images; self-powered 4+1 USB power hubs for instant Plug & Play of up to 127 USB peripherals¹; short-length CRTs for space savings; wide-angle viewing LCDs; TC099 and more*...all at great value. So whether you need a high-end, value-oriented, or space-saving large screen monitor, you know one thing's for sure...make it a CTX big screen for unmatched performance, quality, and affordability. CTX offers large screen sizes in its award-winning Professional PureFlat, Value SlimLine, Executive, and PanoView Series. Visit us at www.ctxintl.com for more details and product specs.

VL950SL	VL950ST	PR960F
<ul style="list-style-type: none"> • 19" / 18" VIS • Short-length CRT • 0.25 dot pitch • Flot Square • 1600 X 1200 max. res. • TC092 	<ul style="list-style-type: none"> • 19" / 18" VIS • Short-length CRT • 0.25 dot pitch • Flot Square • 1600 X 1200 max. res. • 4+1 USB power hub on swivel base • TC095 	<ul style="list-style-type: none"> • 19" / 18" VIS • Sony FD Trinitron® CRT • 0.24 mm aperture grille • 1600 X 1200 max. res. • 4+1 USB power hub • 8NC connectors • TC099
PR1400F	EX1300	PV880
<ul style="list-style-type: none"> • 21" / 19.8" VIS • Sony FD Trinitron® CRT • 0.24 mm aperture grille • 2048 X 1536 max. res. • 4+1 USB power hub • BNC connectors • TC099 	<ul style="list-style-type: none"> • 21" / 20" VIS • High Contrast Flot Square • 0.22mm horizontal dot pitch • 1800 X 1440 max. res. • 4+1 USB power hub • BNC connectors • TC099 	<ul style="list-style-type: none"> • Full 18.1" TFT Active Matrix Flot Panel • True 1280 X 1024 SXGA resolution • 160° horizontal & vertical viewing • Duol onolog input • 4+1 USB power hub • Tilt and swivel stand • TC095, Energy Stor®, VESA DPMS™



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ETHENTICA TOUCH VERIFICATION: THE ULTIMATE IN LAPTOP SECURITY



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For mobile knowledge workers and on-the-go executives, laptops aren't a convenience. They're sacred treasures. Actually, what's sacred is the data they contain. From confidential competitive analyses and strategic planning documents to personal e-mails and contact lists, corporate laptops quickly accumulate lots of highly sensitive information. With laptop loss and/or theft a growing phenomenon, securing that sensitive information is a major IT concern.

And passwords don't cut it. People forget them, which causes work delays and generates support calls. If they do pick a password that's easy to remember, it's probably easy enough to figure out—especially for someone who has stolen a laptop and has all the time in the world to crack it.

That's why biometric authorization can be so valuable to today's information-centric enterprises. By verifying laptop users' identities using their fingerprints, companies can fully protect themselves against the potential exposure of secure data as a result of laptop loss or theft. This approach also eliminates the support calls that password problems cause every year. According to Forrester Research, those support calls can cost a company \$200-\$340 per year per user. So a biometric solution can actually pay for itself within a few months.

And Lake Forest, Calif.-based Ethentica Inc. has such a solution: the MS 3000 Touch Verification PC Card. The MS 3000 is an easy-to-use PC card with a durable, self-contained touchpad that instantly recognizes the user's fingerprint. This fingerprint-based authentication can be used to replace the full range of passwords that users require in the course of a work day—including those for local files, corporate applications, and secure Web sites. In fact, the MS 3000 even provides a secure screen saver that's activated whenever the laptop isn't in use for a given period of time. A single touch on the MS 3000 is all it takes to get back to work.



Unlike other biometric cards, Ethentica's MS 3000 is completely hot-swappable and can work in a wide range of lighting conditions. It's compliant with Microsoft's BAPI standard, so it will integrate with future third-party biometric products. And its unique polymer surface can endure years of hard use without failure.

"Biometric authentication technology is mature, reliable, and extremely useful for mobile users," declares Bret Berg, Ethentica's director of product marketing. "When you look at the cost of our MS 3000 cards and the ease with which you can deploy them, it's pretty hard to come up with a reason not to roll them out."

And if the numbers alone aren't convincing enough, the sheer emotional logic should be. Just imagine someone tapping gleefully at your laptop, uncovering all your plans and inside information—and planning to use that information for their own nefarious purposes. Then imagine that same person cursing in frustration as they try to access your hard drive and can't—because they're not the owner of the necessary finger. For most of us, that sense of security is well worth the price of the Ethentica card.



One-touch passwords.



Fingertip access to all of your passwords. Improved protection for your data.

Networks, e-mail, websites – they all require passwords. Passwords you have to remember. Your dilemma: make your passwords easy to remember but simple to guess (compromising security), or, difficult to guess but nearly impossible to remember (compromising your sanity). The Ethenticator™ MS 3000 Touch Verification PC Card easily fits into your laptop and gives you memory-free password management *and* enhanced data protection. You create your passwords, link them to your unique fingerprint, and you'll never have to remember them again wherever you go.

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RACKSPACE: WEB HOSTING WITHOUT THE HEADACHES

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As the Internet economy enters its second phase, profitability is the order of the day. Not only do online businesses need to attract and retain customers, they also need to be sensible when making infrastructure decisions.

Most successful sites are now hosted on complex Web servers, which are expensive to purchase and maintain. From the up-front costs of buying the servers to the complexity of configuring them and obtaining a reliable connection to the Internet, hosting has become an expensive headache.

A Sensible Approach—Managed Hosting

Managed hosting offers a more sensible alternative, freeing businesses from the headaches of infrastructure. With all aspects of the hosting function included for a monthly fee, managed hosting relieves businesses of the investment and ongoing maintenance associated with server ownership. Today, web designers, application service providers (ASPs), and e-businesses all over the world benefit by leasing dedicated servers from managed hosting providers such as Rackspace Managed Hosting.

Having previously used a colocation facility that left him responsible for server maintenance, James Hong of AmlHotOrNot.com realized that only a managed hosting provider would be able to provide the expertise necessary to scale and run the servers his company needed at a price it could afford. "Rackspace saved our lives," Hong explained. "We needed to scale up, literally overnight, and all it took was one phone call."

Unlike virtual hosting, where numerous Web sites share space on a single server, managed hosting provides the security of a customized server dedicated to only one company. Unlike colocation, which requires companies to purchase, configure, and maintain their own servers, managed hosting decreases the cost of owning your own servers, while greatly increasing your flexibility. Managed hosting provides virtually instant access to the precise level of server resources needed to get the job done.



Rackspace Is Ready When You Are

At Rackspace, we begin by assessing your hosting needs... and from there, we hit the ground running. We guarantee we'll have your customized server online in less than 24 hours. And we don't stop there:

Start with what you need, and grow whenever you need to. With Rackspace Managed Hosting, there's no need to buy more capacity than you need just in case you experience a surge in traffic. Rackspace can scale your server capacity in hours, ensuring no downtime or lost customers without the need to invest in extra capacity during slow times.

Get exactly what you want. There are no package deals from Rackspace. Every server is custom-built according to your specifications (to choose your options, visit our online configurator at www.rackspace.com.) And, we offer a variety of value-added services, such as global content distribution, streaming servers, load balancing, advanced DBA, and managed security offerings. There's no infrastructure need we can't handle.

Minimize your maintenance burden. With Rackspace, there's no need to have someone on-site to monitor your servers. That's part of our fanatical commitment to customer service and support. The Internet is up 24 x 7, and so are we. Call us, and you'll get an expert technician live on the phone.

Guaranteed uptime, or we pay you back. It is crucial that your Web site runs reliably to attract and retain customers. Rackspace guarantees 99.999% network uptime, so you can be sure your site is open for business, all the time.

It's time to get sensible. End your headaches with managed hosting from Rackspace.



Guaranteed.

Will I have 99.999% network uptime?

Can you increase my capacity as quickly as my business grows?

Is a tech expert available instantly if I call at 3 a.m.?

Will my server be up and running in less than 24 hours?

Do you offer the flexibility of month-to-month contracts?

Will I be able to sleep at night?



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Technology
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The Rackspace Advantage

Guaranteed Uptime: 99.999% uptime supported by five premium backbones from our world-class Cisco-powered data centers.

Unmatched Speed: We guarantee to have your custom-configured server online in 24 hours or less. Standard servers can be up and running in less than one hour.

Fanatical Support: Our Linux, NT/W2000 and Solaris specialists are available instantly 24 hours a day.

Unlimited Flexibility: With no long-term commitments, you have the flexibility to increase or decrease your capacity anytime.

A Few Options

Rackspace Starter:

- 600MHz Processor
- 256MB RAM
- 20GB EIDE Drive
- 10GB Burstable Data Transfer
- 24x7 Support
- Monthly: \$299

Rackspace Advanced:

- 800MHz Processor
- 18GB SCSI Drive
- 256MB RAM
- 12/24GB Tape Drive
- Offsite Tape Storage
- 50GB Burstable Data Transfer
- Advanced Monitoring
- 24x7 Support
- Monthly: \$859

Rackspace Cluster

(Two servers with the following):

- Dual 750MHz Processor
- 2x9GB SCSI Drive with RAID 1
- 512MB RAM
- 12/24GB Tape Drive
- Offsite Tape Storage
- 50GB Burstable Data Transfer (per server)
- Advanced Monitoring (on each server)
- 24x7 Support (on each server)
- Load Balancing
- Monthly: \$2999

* All configurations priced for Red Hat Linux 6.2 and exclude one-time setup fee.

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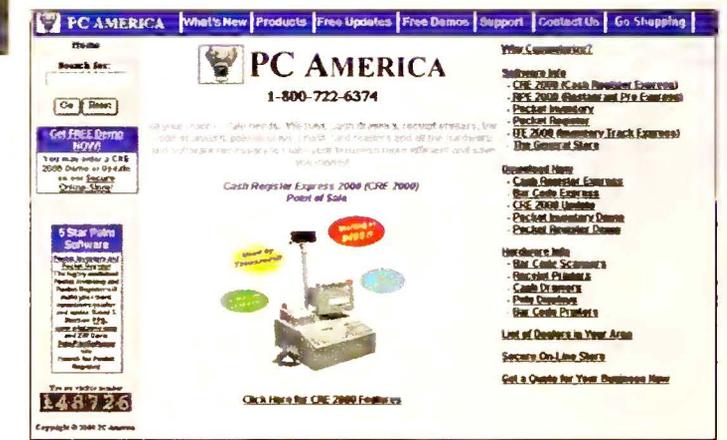
While many motorists in Dimondale, Mich. say the family-owned Windmill Truck Stop is a home away from home, its controller, Kevin Edelmann, says it's been more like a house of accounting horrors. Besides monitoring retail fuel sales in the truck stop's "truckers only" area, he also has to keep an eye on commuters' and travelers' purchases in the king-sized complex's convenience store, family restaurant, motel, and auto service center. "Keeping track of all of that inventory has been a nightmare," Edelmann says.

The Point of Sale (POS) system that the Windmill had been using since 1982 did a fine job of ringing up sales, but it couldn't tell store managers anything about what was on the shelf. "The system only broke sales down by department," Edelmann says. "So it couldn't tell the difference between a tube of toothpaste and a bottle of shampoo."

Edelmann found only a few POS solutions that were easy to use, Microsoft Windows-based, and able to support multiple input devices. And none of them could manage the 20,000-plus items in the Windmill's convenience store and restaurant. "We desperately needed a solution that could bring all of these components of our business together," he says.



Things finally turned around at the Windmill once Edelmann deployed PC America's Cash Register Express (CRE 2000), a Windows-based POS program that works with ordinary PCs and peripherals, as well as barcode scanners, receipt printers, and pole displays (which show charges at the checkout counter). Now all of the Windmill's cashiers can use touch screens and barcode scanners to enter orders and update inventory. And setting up CRE 2000 could not be easier, says Edelmann. "PC America did



The home page for PC America speeds you to the point-of-sale products you need.

an excellent job pulling all of the hardware together initially. But the great thing about their software is that I can grab any component I want off the shelf and throw it together in no time. This is one slick program."

The Windmill has processed more than half a million transactions with CRE 2000 and PC America's Restaurant Pro Express (RPE 2000) since October 1999. And Edelmann predicts that PC America will continue to develop the software he needs to keep things running smoothly. "PC America is constantly improving upon their products," he says.

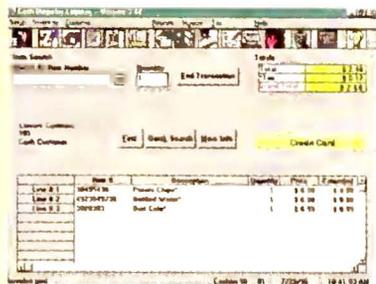
Now PC America is helping retailers like the Windmill to move beyond the sale itself to increase revenues. A new feature in CRE 2000 gives businesses the ability to print coupons on the bottom of sales receipts on an Epson TM-T88II receipt printer. They can use the coupons to advertise specials on slow business days (e.g., "10 Percent Off All Purchases Every Tuesday"), or to give their customers discounts on overstock items (e.g., "Get a Free Six-Pack of Pepsi on Your Next Visit").

CRE 2000's couponing feature promises retailers an excellent route to a crucial dimension in retail sales. "Repeat business is the most important aspect of any business," says PC America's president, Howard Gosman. "With this addition to our POS package, we are giving our customers a quick and easy-to-use method for creating it."



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All PC America Software requires Microsoft Windows. The software was written in Visual Basic using Microsoft Access Files. The source code is available.

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TOP 100

158 Power PCs



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181 Scanners



scaling new heights



PEDAL TO THE METAL: The mid-range Gateway Select 1100 offers first-rate speed.

AMD DELIVERS A POWERFUL punch with its latest-generation Athlon processor, the Athlon-1100. Systems based on this speed demon strut their way through our charts this month with astounding PC WorldBench 2000 scores. We looked at three new Athlon-1100-based PCs, all running Windows 98 SE, and they all posted scores higher than any systems we've seen thus far running that operating system. But as both Intel

and AMD gear up for new CPU releases in the new year, we expect that these processor giants will continue to duke it out for speed bragging rights.

The Xi Computer 1100K MTower SP, third on our *Top 10 Power PCs* chart, earned an outstanding PC WorldBench 2000 score of 180, the highest of the Win 98 SE group, likely because it uses two 30GB hard drives in a RAID configuration and a high-end Hercules 3D Prophet II GTS graphics board with 64MB of DDR SDRAM.

Another newcomer—Gateway's Select 1100, second on our *Top 10 Midrange PCs* chart—posted an impressive PC WorldBench 2000 score of 175. But speed isn't its only asset. Working inside of it is a snap because you don't need tools to open the case, add hard drives, or install PCI cards; finger-released switches take the place of screws. A few other systems offer such tool-less features—for example, Dell's OptiPlex GX300 on the power chart—but they aren't common.

REPLACEMENT KILLERS

THIS MONTH WE also took a second look at five systems that use the "enhanced" Athlon processor with on-die Level 2

 POINT YOUR browser to www.pcworld.com/top400 for late-breaking reviews of desktop computers. In the Top 400 section, you'll find comprehensive reviews and ratings. You'll also find details on the PC WorldBench 2000 test suite at www.pcworld.com/benchmark.

cache. We had tested all of these systems before, but their prior incarnations used the "classic" Athlon processor, which depended on slower, off-die L2 cache.

While we haven't yet tested enough of the new processors to make sweeping comparisons, we can point to one case that supports the speed-boost claim for the enhanced Athlon. The Sys Performance 850A that we originally looked at for our June 2000 issue came

equipped with a classic Athlon-850 and Windows NT 4.0, and it earned a great PC WorldBench 2000 score of 198. Great, that is, until we got a look at the Sys Performance 850T—number four on our midrange chart—which came with an enhanced Athlon-850 but otherwise had the same configuration. The 850T blew the older system away

with a WorldBench score of 217. Bear in mind that systems running Windows NT always score higher than those running other operating systems.

Other performance increases so far have been less striking (just a few points here and there), so we'll have to watch these upgraded systems over the next few months to test the theory that "enhanced" really applies to performance.

Elsewhere in the Top 100, Dell's Inspiron 3800, the new budget Best Buy on the *Top 15 Notebook PCs* chart this month, is the first Celeron-600 notebook that we've tested. It performed impressively, earning a score of 113 on our PC WorldBench 2000 tests. And it's no one-trick pony: This notebook sports an S-Video

port for watching video on a TV, and an internal bay that can hold up to eight different devices. Not bad for a laptop that will set you back only \$1349.

Freelance writers Richard Jantz, Dan Littman, Joel Strauch, and Carla Thornton, along with PC World editors Richard Baguley, Seán Captain, Lisa Cekan, Rebecca Freed, Mick Lockey, Kalai Murugesan, and Alan Stafford contributed to the articles in this month's Top 100. Testing was performed by Curt Buehler, Ulrike Diehlmann, Matt Halloran, Robert James, Elliot Kirschling, Jeff Kuta, and Thomas Luong of the PC World Test Center. See page 14 for contact information. ▶

YOUR GUIDE TO THE TOP 100

QUESTIONS ABOUT OUR CHARTS? The following information should answer them.



How do the charts work? Each month

we test a large number of PCs, printers, monitors, graphics boards, and scanners, and compare them with previously reviewed products. Only the best products land on the Top 10 and Top 15 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.



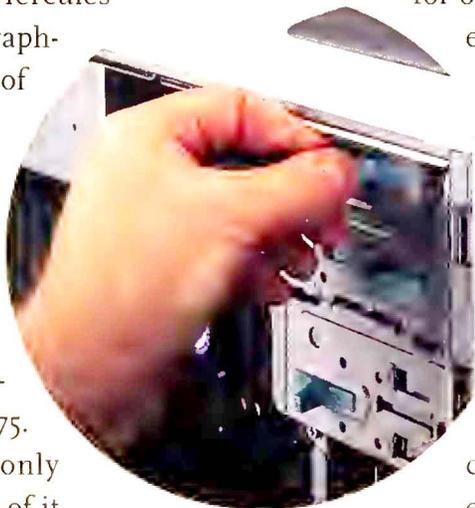
What does the PC WorldBench 2000 score mean? It's a measure of how

fast a PC can run a mix of common business applications as compared with our baseline machine, an HP Pavilion 8380 with a PII-400 CPU, 96MB of RAM, and an 8GB hard drive. For example, a PC that scores 200 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 on anonymous support calls made by *PC World* staff. The policies score is based on vendor support policies.



SWITCHES LET you pop drives in and out of the Select 1100.

TOP 10 POWER PCs

	SYSTEM: \$2400 AND OVER	Month tested	★ Overall rating	Street price (10/13/00)	PC WorldBench 2000 performance score ¹	Base configuration
1	Dell OptiPlex GX300 800/388-8542 www.dell.com	Nov 00	97	Average: \$2566	179	Outstanding: Pentium III-866, 128MB of RDRAM, 256KB L2 cache, 20GB hard drive, 19-inch monitor, Windows 2000
2	Dell Dimension XPS B1000r Special Edition 800/388-8542 www.dell.com	Aug 00	95	Expensive: \$2819	178	Outstanding: Pentium III-1000, 128MB of RDRAM, 256KB L2 cache, 40GB hard drive, 19-inch monitor, Windows 2000
3	Xi Computer 1100K MTower SP 800/432-0486 www.xicomputer.com		95	Inexpensive: \$2462	180	Very good: Athlon-1100, 128MB of SDRAM, 256KB L2 cache, two 30GB hard drives with RAID card, 19-inch monitor, Windows 98 SE
4	Sys Performance 1100T 800/613-9963 www.sys.com	Dec 00	91	Expensive: \$2818	229	Outstanding: Athlon-1100, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows NT 4.0
5	Tangent Medallion Pro 800/342-9388 www.tangent.com		91	Average: \$2594	201	Very good: Pentium III-1000, 256MB of SDRAM, 256KB L2 cache, 30GB hard drive, 17-inch monitor, Windows 2000
6	HP Vectra VL400 800/752-0900 www.hp.com/desktops	Oct 00	90	Average: \$2569	188	Outstanding: Pentium III-933, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows 2000
7	Premio Apollo 820R 800/677-6477 www.premiopc.com	Dec 00	88	Average: \$2669	168	Outstanding: Pentium III-1000, 128MB of RDRAM, 256KB L2 cache, 41GB hard drive, 19-inch monitor, Windows 98 SE
8	Systemax Venture PVO-T10 800/262-6622 www.systemaxpc.com	Dec 00	87	Inexpensive: \$2490	170	Outstanding: Pentium III-1000, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows 2000
9	Polywell Poly K7-1000A 800/999-1278 www.polywell.com	Oct 00	85	Average: \$2775	169	Outstanding: Athlon-1000, 256MB of SDRAM, 256KB L2 cache, two 40GB hard drives with RAID card, 19-inch monitor, Windows 98 SE
10	Kingdom Royale PIII-933 800/385-3436 www.kingdomcomputers.com	Sept 00	75	Very expensive: \$3199	171	Good: Pentium III-933, 128MB of SDRAM, 256KB L2 cache, 27GB hard drive, 15-inch LCO monitor, Windows 2000
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 157.

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).



OUR BEST BUYS—both Dells—hold tight against Xi Computer's 1100K MTower SP, the new number three. Xi's powerhouse used its Athlon-1100 processor to earn the highest PC WorldBench 2000 score we've seen for a system running Windows 98 SE. Tangent's Medallion Pro debuts in fifth place.

1 DELL OPTIPLEX GX300

WHAT'S HOT: With a \$63 price cut, this Pentium III-866 system holds on to the top spot. The OptiPlex GX300 earned a PC WorldBench 2000 score of 179—about 5 percent above the average for similarly configured systems running Windows 2000 Professional. Opening the wide midsize tower case proves simple, thanks to a release button on the front of the system. A swing-out power supply allows easy access to the three open, tool-less drive bays, and the five open PCI slots are totally clear of obstructions. Dell's 19-inch Ultra-

Scan P991 monitor produces bright, rich colors and crisp text at all resolutions short of astronomical.

WHAT'S NOT: The OptiPlex GX300 comes with RDRAM (128MB of it), which means that future memory upgrades won't be cheap. Unfortunately, the performance benefits of RDRAM aren't that impressive. Our August story "Money for Nothing? Rambus Performance Falls Short" notes only a very slight speed increase for RDRAM over PC133 SDRAM (see www.pcworld.com/aug2000/rambus).

WHAT ELSE: The bundled Microsoft Natural Keyboard enables smooth, comfort-

able, and quiet typing, while the 8X/4X/32X CD-RW drive adds a backup option. A case lock, a network interface card (with Wake-on-LAN), chassis-intrusion detection, and the included OpenManage Client remote-administration software round out the corporate features.

BEST USE: For businesses that want fast, managed Windows 2000 systems, this OptiPlex offers substantial power.

2 DELL DIMENSION XPS B1000R SPECIAL EDITION

WHAT'S HOT: This PIII-1000 Dell system posted a strong score of 178 on our PC WorldBench 2000 tests. The system sports both a 12X DVD-ROM drive and an 8X/4X/32X CD-RW drive, and its Dell NVidia GeForce 256 graphics card with DDR memory offers both analog and digital video output. That output looks very nice indeed—the 19-inch UltraScan P991 flat-screen CRT

Extra features	Design and expandability ¹	Vendor's system reliability	Tech support quality/policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)
Very good: OEM NVidia GeForce+ NV10 graphics card with 32MB of SDRAM, 8X/4X/32X CD-RW drive, network card, Microsoft Natural Keyboard, OpenManage Client, case lock	Good: tool-less slots and bays; midsize tower; 3 open drive bays, 5 open slots	Outstanding	Good/Outstanding	24/7, toll-free	3/3
Outstanding: OEM NVidia GeForce 256 graphics card with 64MB of DDR SGRAM, 12X DVD-ROM drive, 8X/4X/32X CD-RW drive, V.90 modem, network card, Microsoft Office 2000 SBE	Good: case easy to remove; midsize tower; 3 open drive bays, 2 open slots	Outstanding	Good/Good	24/7, toll-free	3/1
Good: Hercules 3D Prophet II GTS graphics card with 64MB of DDR SDRAM, 16X-40X CD-ROM drive, V.90 modem, Microsoft Office 2000 Professional	Good: spacious interior; midsize tower; 3 open drive bays, 4 open slots	1	Fair*/Outstanding	24/7, toll-free	3/3
Good: Matrox Millennium G400 dual-head graphics card with 32MB of SGRAM, 8X/4X/32X CD-RW drive, network card	Very good: cluttered but roomy case; midsize tower; 5 open drive bays, 3 open slots	1	Good*/Good	24/7,* toll-free	Varies */5
Good: Gainward Cardexpert NVidia GeForce2 MX graphics card with 32MB of SDRAM, 12X DVD-ROM drive, network card, Microsoft Office 2000 SBE	Good: difficult to access interior; midsize tower; 5 open drive bays, 5 open slots	1	Fair*/Outstanding	24/7, toll-free	3/3
Good: Matrox Millennium G400 dual-head graphics card with 16MB of SGRAM, 4X/4X/32X CD-RW drive, network card, HP EDiagTools and ProtectTools 2000 administration software	Good: easy to access memory; midsize tower; 2 open drive bays, 5 open slots	Good	Fair/Good	24/7, toll call	3/3
Very good: ELSA Gladiac-32 graphics card with 32MB of SGRAM, 12X DVD-ROM drive, 8X/4X/32X CD-RW drive, network card, Microsoft Office 2000 SBE	Good: roomy case; midsize tower; 4 open drive bays, 3 open slots	2	Fair*/Fair	10/5, toll-free	3/3
Very good: Creative Labs Graphics Blaster GeForce2 GTS graphics card with 64MB of SDRAM, 8X/4X/32X CD-RW drive, V.90 modem, network card, Microsoft Office 2000 Professional	Good: plenty of expansion room; midsize tower; 3 open drive bays, 3 open slots	1	Fair*/Good	24/7, toll-free	Varies */3
Outstanding: Leadtek WinFast 3D GeForce 256 graphics card with 32MB of DDR SGRAM, 12X DVD-ROM drive, 8X/4X/32X CD-RW drive, V.90 modem, Corel WordPerfect Office 2000	Satisfactory: cordless mouse; midsize tower; 2 open drive bays, 3 open slots	1	Fair*/Good	24/7, toll-free	3/5
Very good: Cardex NVidia TNT2 M64 graphics card with 32MB of SDRAM, 40X-52X CD-ROM drive, LS 120 drive, V.90 modem, Microsoft Office 2000 Professional, McAfee VirusScan	Good: good expansion possibilities; midsize tower; 3 open drive bays, 4 open slots	1	Good*/Fair	12.5 */6, toll-free	Varies */1
Extra features: 10 percent	Design and expandability: 15 percent	Reliability: 15 percent	Support and warranty: 15 percent		

¹ 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.

* Support hours drop to 9 hours M-F after one year.

† Six years on CPU and main RAM, three years on other parts.

‡ Five years on CPU and main RAM, three years on other parts.

§ Nine hours on Saturday.

delivers richly saturated colors and ultra-sharp text, even at resolutions higher than the standard 1280 by 1024.

WHAT'S NOT: Despite the system's \$180 price drop this month, you'll still pay a substantial \$289 for the privilege of having speed and top-notch components.

WHAT ELSE: Getting the midsize tower up and running is a snap, thanks to Dell's detailed setup guide and well-labeled rear ports. Among the bundled goodies, Dell includes a microphone as well as the Microsoft Office 2000 Small Business Edition suite as standard at this price. The side of the case slides off easily after you release two latches, making access to the innards quick and painless. The fairly cluttered interior offers two open PCI slots and three open drive bays for future expansion. A handsome Harman Kardon HK595 three-speaker set with subwoofer pumps out well-rounded sound and is a highlight of the multimedia features.

BEST USE: This Dimension will please those who are looking for a speedy, tricked-out 1-GHz system.

New on the Chart

3 XI COMPUTER 1100K MTOWER SP

NEW **WHAT'S HOT:** With an impressive score of 180 on our PC WorldBench 2000 tests, Xi's Athlon-1100-based 1100K MTower SP performed better than any system we've seen running Windows 98 SE. The MTower might owe this achievement to its hard drive configuration—it uses two 30GB drives connected to an IDE RAID card, which should speed disk-intensive tasks. Or perhaps credit lies with its Hercules 3D Prophet II GTS graphics board with 64MB of DDR video memory.

WHAT'S NOT: Loose stickers identifying the



ORANGE YOU LOVELY: The XI Computer 1100K MTower SP's colorful front follows the iMac's lead.

rear ports could fall off during use.

WHAT ELSE: The 1100K MTower SP ships with a 19-inch Optique Q95 monitor, which delivered deep, rich colors and crisp text at resolutions of 1024 by 768 and 1280 by 1024. A 16X-40X CD-ROM drive, DVI and S-Video output, and an ▶

Altec Lansing ADA880 five-speaker set with remote control offer excellent presentation capabilities. The tower's flexible side comes off easily without tools; the spacious, uncluttered interior has four open PCI slots and three open bays for your cards and drives. The Logitech Internet keyboard features 17 programmable multimedia buttons, allowing quick access to the Web and system applications. With an orange panel placed on its white midsize tower, this Xi PC looks somewhat like an iMac pretender.

BEST USE: The Xi 1100K MTower SP would make a fine system for businesses that need both power and presentation options.

5 TANGENT MEDALLION PRO

NEW **WHAT'S HOT:** This Medallion takes home a gold with its PC World-Bench 2000 score of 201.

Not only is that figure 14 points above the average for PIII-1000 systems with 256MB of RAM, it's the highest we've seen for a system running Windows

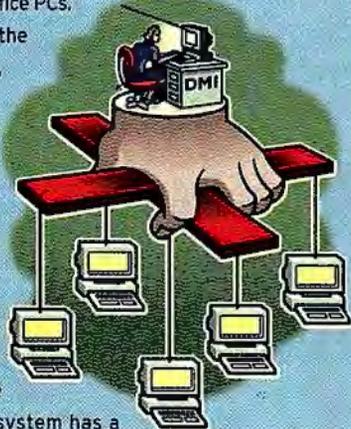
What Can DMI Do For Me?

TECH TREND IF YOU'RE AN information technology manager in a tangle over maintaining numerous PCs, don't stress: DMI-compliant systems can help your networked environment run smoothly and efficiently. DMI, or Desktop Management Interface, enables network administrators to remotely troubleshoot, upgrade, and catalog office PCs.

The DMI standard was created by the Distributed Management Task Force, an industry organization concerned with simplifying PC management. Management software, such as Intel's LANDesk Client Manager, HP's TopTools, and Dell's OpenManage, can communicate with a DMI-compliant system's motherboard, hard drive, and network card to determine processor temperature or potential hard drive failure. If a DMI-compliant client system has a Wake-on-LAN-capable network card, an IT manager can start it up remotely and perform diagnostics. And that's just the beginning.

Stacy Hand, group product manager of managed desktops at Gateway, describes how a DMI-compliant system with a blank hard drive can be plugged into a department LAN, booted from a drive image on a server, then directed to download an operating system and applications. DMI-compliant systems can also allow an IT manager to upgrade multiple PCs during off-hours.

Not long ago, says Hand, there weren't enough managed PCs in most offices to make remote management effective. However, we're seeing more systems with management software vying for our charts. This month, our power chart hosts two such systems: the Dell OptiPlex GX300 and the HP Vectra VL400.



motherboard's Intel 815E chip set; instead, it opted for a Gainward CardExpert NVidia GeForce2 MX graphics card, whose digital vibrance control maintains rich colors in poorly lit environments. Front-mounted USB ports allow users to connect USB peripherals, such as scanners or digital cameras.

BEST USE: The Medallion Pro isn't cheap—it'll set you back \$2594—but it's powerful, making it a reasonable value for small-business owners.

Also of Note

UNFORTUNATELY, all-in-one systems lack the punch and expandability that are needed to climb our charts. A case in point: NEC's latest all-in-one, the PowerMate 2000, which couldn't quite muster the muscle. The compact system's PIII-600E processor nudged it to a lackluster score of 125 on our PC

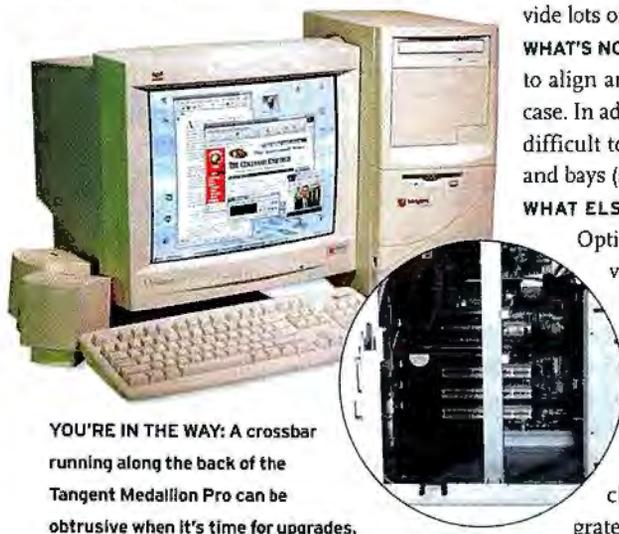
WorldBench 2000 tests—8 points below the average for similarly configured systems running Windows 98 SE. And don't expect much expandability: You get a single open memory slot and no empty expansion slots or drive bays. However, the PowerMate 2000's management software, including LANDesk Client Manager, makes it a possible contender for a corporate environment, while its sleek size makes it a good choice for small work spaces. If you're interested, be ready to shell out some clams: The PowerMate 2000 will set you back \$2699. ▶

MORE REVIEWS ONLINE



THE FOLLOWING system didn't score high enough to reach the Top 10 Power PCs chart. For a write-up, visit PCWorld.com/t10pcs.

◆ NEC PowerMate 2000



YOU'RE IN THE WAY: A crossbar running along the back of the Tangent Medallion Pro can be obtrusive when it's time for upgrades.

2000. A simple switch lets the sturdy side of Tangent's standard midsize tower case come off without tools. The Medallion's five open PCI slots and five open bays provide lots of expansion possibilities.

WHAT'S NOT: It takes a bit of fiddling to align and replace the side of the case. In addition, a crossbar makes it difficult to access the interior slots and bays (see inset photo, below).

WHAT ELSE: Colors on the 17-inch Optiquest Z70 monitor shone vibrantly in our test images, though text blurred slightly at 1024 by 768 resolution, and more prominently at the maximum resolution of 1280 by 1024. Tangent chose not to use the integrated video supplied with the

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TOP 10 MIDRANGE PCs

	SYSTEM: \$1400 TO \$2399	Month tested	★ Overall rating	Street price (10/13/00)	PC WorldBench 2000 performance score ¹	Faster	Base configuration
1	 Dell Dimension 4100 800/388-8542 www.dell.com	Oct 00	91	Inexpensive: \$1659	Very good 154		Very good: Pentium III-800EB, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
2	 Gateway Select 1100 800/315-2536 www.gateway.com	NEW	90	Average: \$1991	Outstanding 175		Very good: Athlon-1100, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
3	Micro Express MicroFlex 1100B 800/989-9900 www.microexpress.net	NEW	89	Very inexpensive: \$1499	Outstanding 173		Good: Athlon-1100, 128MB of SDRAM, 256KB L2 cache, 15GB hard drive, 17-inch monitor, Windows 98 SE
4	Sys Performance 850T 800/613-9963 www.sys.com	NEW	89	Average: \$1940	Outstanding 217		Outstanding: Athlon-850, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows NT 4.0
5	ABS Performance Athlon 1 800/876-8088 www.buyabs.com	NEW	86	Average: \$1799	Very good 152		Outstanding: Athlon-900, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows Millennium Edition
6	Micron ClientPro Cn 800/642-7667 www.micronpc.com	Oct 00	86	Average: \$1978	Very good 158		Good: Pentium III-933, 128MB of SDRAM, 256KB L2 cache, 15GB hard drive, 17-inch monitor, Windows 98 SE
7	NuTrend Business Athlon 1 888/482-6678 www.nutrend.com	NEW	86	Very inexpensive: \$1499	Very good 149		Very good: Athlon-800, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 17-inch monitor, Windows Me
8	Compaq Deskpro EX 800/345-1518 www.compaq.com	Nov 00	84	Inexpensive: \$1705	Very good 193		Outstanding: Pentium III-733, 128MB of SDRAM, 256KB L2 cache, 15GB hard drive, 19-inch monitor, Windows NT 4.0
9	HP Vectra VL400 800/752-0900 www.hp.com/desktops	Dec 00	82	Average: \$1908	Good 165		Good: Pentium III-733, 128MB of SDRAM, 256KB L2 cache, 15GB hard drive, 17-inch monitor, Windows 2000
10	Systemax PVW-1000A Excite PC 800/262-6622 www.systemaxpc.com	Oct 00	81	Expensive: \$2119	Very good 176		Very good: Athlon-1000, 128MB of SDRAM, 512KB L2 cache, 30.7GB hard drive, 17-inch monitor, Windows 2000
 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 157.

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).



IT'S A WHOLE NEW midrange ballgame this month.

Five freshman systems, all sporting AMD processors, surge onto the chart—four of them landing in the upper half. The Gateway Select 1100, a new Best Buy at number two, and the Micro Express MicroFlex 1100B, in the third spot, posted impressive scores on our PC WorldBench 2000 tests, thanks to their Athlon-1100 processors. Dell's Dimension 4100 holds the top spot for a fourth month.

1 DELL DIMENSION 4100

 **WHAT'S HOT:** The Dimension 4100 scored a healthy 154 on our PC WorldBench 2000 tests, 4 percent above average for its Pentium III-800EB processor class. The system has several useful extras not often found at this midrange price, including an NVidia GeForce2 graphics board and a 17-inch Dell M780 monitor, which delivered vivid colors and sharp text (albeit with some blur at the maximum resolution of 1280

by 1024). In our most recent survey of PC World readers, Dell received outstanding marks for system reliability (see page 108). **WHAT'S NOT:** Dell hacked another \$60 off the Dimension 4100's price this month, but you'll still have to pay for some extras: You get only a plain 20X-48X CD-ROM drive at the \$1659 price.

WHAT ELSE: A large guide for reference and troubleshooting provides lots of detailed system information, and a setup poster makes assembling the PC a snap.

But even with thumbscrew access, removing the side panel of this lanky midsize tower takes some work. Though a bit cluttered, the interior offers three open PCI slots and four open bays for expansion. **BEST USE:** Offering excellent performance for the price, this Dell would fit well into almost any office.

2 GATEWAY SELECT 1100



 **WHAT'S HOT:** From its sleek mid-size tower case, which opens and shuts via simple sliding switches, to its tool-less-access PCI slots and bays, the Select 1100 has many well-designed features. Even the power supply can be removed sans tools. Drives slide in and out of the four open bays smoothly, and a thumbscrew at the rear of the system (which takes a bit of work to remove) offers access to the two available expansion slots. With its Athlon-1100 processor providing the muscle, the Select 1100

Extra features	Design and expandability ¹	Vendor's system reliability	Tech support quality/policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)
Good: OEM NVidia GeForce2 GTS graphics card with 32MB of DDR SGRAM, 20X-48X CD-ROM drive, V.90 modem, Microsoft Office 2000 Professional	Good: plenty of expansion room; midsize tower; 4 open drive bays, 3 open slots	Outstanding	Good/Good	24/7, toll-free	3/1
Very good: Creative Labs CT5823 graphics card with 32MB of SDRAM, 20X-48X CD-ROM drive, V.90 modem, network card, Microsoft Office 2000 SBE	Good: tool-less drive bays and slots; midsize tower; 4 open drive bays, 2 open slots	Good	Fair/Outstanding	24/7, toll-free	3/3
Very good: ELSA Erazor X2 graphics card with 32MB of SGRAM, 12X DVD-ROM drive, V.90 modem, network card	Very good: spacious interior; midsize tower; 4 open drive bays, 3 open slots	"	Fair ² /Outstanding	24/7, toll-free	4/4
Very good: Matrox Millennium G400 graphics card with 32MB of SGRAM, 8X/4X/32X CD-RW drive, network card, case lock	Very good: easy to upgrade; midsize tower; 5 open drive bays, 3 open slots	"	Good ³ /Good	24/7, ⁴ toll-free	Varies ⁵ /5
Outstanding: Leadtek WinFast GeForce2 MX graphics card with 32MB of SDRAM, 16X DVD-ROM drive, 8X/4X/32X CD-RW drive, V.90 modem, network card	Good: well-organized interior; midsize tower; 3 open drive bays, 2 open slots	"	Fair ² /Fair	11/5, toll-free	3/lifetime
Good: VisionTek NVidia TNT2 M64 graphics card with 32MB of SDRAM, 20X-48X CD-ROM drive, network card, Microsoft Office 2000 SBE, LANDesk Client Manager	Very good: tool-less case removal; midsize tower; 5 open drive bays, 5 open slots	Good	Fair/Outstanding	24/7, toll-free	Varies ⁵ /1
Good: Leadtek WinFast GeForce2 MX graphics card with 32MB of SDRAM, 40X-52X CD-ROM drive, V.90 modem, network card, Microsoft Office 2000 SBE	Good: roomy case allows for easy expansion; midsize tower; 4 open drive bays, 2 open slots	"	Fair ² /Good	24/7, toll-free	3/lifetime
Good: Mitac NVidia TNT2 M64 graphics card with 16MB of SDRAM, 20X-48X CD-ROM drive, network card, Compaq Intelligent Manageability	Satisfactory: roomy interior; midsize tower; 2 open drive bays, 2 open slots	Good	Fair/Good	24/7, toll-free	3/1
Good: integrated Intel 815 graphics, 8X/4X/32X CD-RW drive, network card, TopTools administration software, power protection device, Wake-on-LAN, case lock	Good: easy access to memory; midsize tower; 2 open drive bays, 5 open slots	Good	Fair/Good	24/7, toll call	3/3
Very good: VisionTek NV994.0 graphics card with 32MB of SDRAM, 12X DVD-ROM drive, 4X/2X/24X CD-RW drive, V.90 modem, network card, Microsoft Office 2000 SBE	Good: plenty of room to expand; midsize tower; 3 open drive bays, 3 open slots	"	Fair ² /Good	24/7, toll-free	Varies ⁵ /1
Extra features: 10 percent	Design and expandability: 15 percent	Reliability: 15 percent	Support and warranty: 15 percent		

¹ 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.

² Support hours drop to 9 hours Monday-Friday after one year.

³ Six years on CPU and main RAM, three years on other parts.

⁴ Five years on CPU and main RAM, three years on other parts.

posted a score of 175 on our PC World-Bench 2000 tests, making it one of the most powerful systems we've tested running Windows 98 SE.

WHAT'S NOT: Despite its user-friendly interior design, the Select 1100 lacks a reset button, so if the system hangs, you may have to pull the plug.

WHAT ELSE: The 17-inch Gateway EV700 monitor produced rich colors in our test images and sharp text at 1024 by 768 resolution. Text began to get fuzzy at the highest resolution of 1280 by 1024. Two front-mounted USB ports augment the standard two in back. The system manual contains lots of helpful upgrading information. The attractive bundle includes Microsoft Office 2000 Small Business Edition and a microphone.

BEST USE: Small-office users looking for a powerful all-around system with excellent tool-less upgradability should consider this Gateway.

New on the Chart

3 MICRO EXPRESS MICROFLEX 1100B

NEW **WHAT'S HOT:** A helpful setup poster and color-coordinated rear ports make setting up the MicroFlex 1100B as easy as putting together a ten-piece jigsaw puzzle. To open the system you must remove a single thumbscrew mounted on the top, after which you can pop off a panel on either side of the case. Inside, the bundled wiring and cabling has been taped back, allowing the user unobstructed access to the unit's three open PCI slots and four open drive bays.

WHAT'S NOT: Though the 17-inch Impression 7VX monitor displays lifelike colors (the fruit in our test images looked good enough to eat!), the text it produces leaves much to be desired. At the monitor's normal resolution of 1024 by 768, characters



ROCK SOLID: In recent PC World surveys, Dell has received outstanding marks for its PCs' reliability.

blurred noticeably—we definitely recommend an upgrade. Many business systems don't include speakers at all, but don't let the MicroFlex's Pro Juster Air-Wave 317 three-speaker set sway your decision: These large, ugly soundboxes are no treat for the eyes or the ears. ▶



FOR THE POWER HUNGRY: Micro Express's MicroFlex 1100B earned an impressive 173 WorldBench score.

WHAT ELSE: Powered by an Athlon-1100 processor, the MicroFlex 1100B earned a 173 on our PC WorldBench 2000 tests—average for the few similarly configured systems we've tested thus far, but impressive nonetheless. Typing is smooth and silent on the comfortable Microsoft Natural Keyboard. The ELSA Erazor X2 graphics board with an S-Video-out port lets you send a presentation out to a TV screen.

BEST USE: The MicroFlex 1100B would be a useful high-performance system in a small office; but if you decide to buy it, get a higher-quality 17- or 19-inch monitor.

4 SYS PERFORMANCE 850T

NEW WHAT'S HOT: Armed with a second-generation Athlon-850 processor, the \$1940 Sys Performance 850T earned a score of 217 on our PC WorldBench 2000 tests—the second-highest score we've seen among systems running Windows NT 4.0, trailing only a Sys equipped with an Athlon-1100. The Performance 850T's 19-inch Optique Q95 monitor really shines, displaying vibrant colors in our test images and sharp text up to its maximum resolution of 1600 by 1200.

WHAT'S NOT: Though Sys includes documentation for various system compo-

nents, the Performance 850T lacks a system manual, unduly complicating setup and troubleshooting for less-experienced users.

WHAT ELSE: You must remove two screws to take off the sturdy metal side, which slides on and off smoothly on guide rails. A case lock affords some protection against thievery, though it's just a basic, provide-your-own-padlock loop. The system also includes a Wake-on-LAN-capable network card, but that feature goes to waste because the motherboard isn't

DMI compliant. The network card occupies one PCI slot—three open slots and five open bays remain. The 850T's keyboard allows smooth, quiet typing, with buttons for Sleep, Wake Up, and Power.

BEST USE: Its excellent performance makes the Sys Performance 850T worth a look, but less-experienced users would benefit from better documentation.

5 ABS PERFORMANCE ATHLON 1

NEW WHAT'S HOT: Its 8X/4X/32X CD-RW drive gives the Performance Athlon 1 a convenient backup option. The 19-inch Lite-On B1996NSL monitor produced brilliant colors and crisp text with only a slight blur at the maximum resolution of 1600 by 1200. A handy setup poster and color-coded rear ports simplify assembly of this gray-on-beige system.

WHAT'S NOT: Before you can lift off the unit's sturdy side panel, you must remove two screws. The keyboard features 17 extra programmable buttons; however, the keyboard's keys wiggle slightly during typing.

WHAT ELSE: Using an Athlon-900 processor, the Performance Athlon 1 earned a 152 on our PC WorldBench 2000 tests—that's an impressive score, but we haven't tested enough similarly configured systems to make a processor-specific comparison. Within the machine's well-organized interior, all the cables are neatly pulled back, and two open PCI slots and three open bays are available for expansion. The PC's Leadtek WinFast GeForce2 MX graphics board sports an S-Video-out port for sending signals to a multimedia TV.

BEST USE: Any small office should look into this reasonably priced ABS—especially if backup options are a must.

7 NUTREND BUSINESS ATHLON 1

NEW WHAT'S HOT: Equipped with both a V.90 modem and a network interface card, the Business Athlon 1 offers several connectivity options. It ships with Microsoft Office 2000 Small Business Edition. Another bonus: You get a high-quality Leadtek WinFast GeForce2 MX graphics board, which offers color compensation for dimly lit environments.

WHAT'S NOT: The 17-inch ViewSonic E771 monitor produced unreadably fuzzy text at the highest resolution of 1280 by 1024, though it did offer rich colors. Still, we'd recommend upgrading to a better display. The system ships with a plain, 40X-52X CD-ROM drive that's a shade darker than the midsize tower's light beige—a negative if you're color-conscious.

WHAT ELSE: On our PC WorldBench 2000 tests, the Business Athlon 1, using an Athlon-800 processor and running Windows Me, earned a score of 149—average for similarly configured systems. You must remove two screws to open the side of the midsize tower; the side panel then comes off and goes back on smoothly. The spacious interior offers easy access to two open PCI slots and four open drive bays. The Microsoft Internet Keyboard permits smooth and silent typing.

BEST USE: Small-business users could do worse than this \$1499 Business Athlon 1, though we recommend paying extra to upgrade to a 19-inch monitor. ▶



BACK THAT DATA UP: The Performance Athlon 1 from ABS offers a CD-RW drive as a backup option.

MORE REVIEWS ONLINE



THE FOLLOWING SYSTEMS didn't score high enough to reach the Top 10 Midrange PCs chart. For write-ups, visit PCWorld.com (www.pcworld.com/t10pcs).

- ◆ Acer Veriton 7100
- ◆ IBM NetVista A40-6649 NBU
- ◆ IBM NetVista X40

Hearing the phrase
"essential resource"
makes most people think of water.

We think of printers.

Color printers to be exact. Maybe we're obsessive, but consider the upside. Who better to buy a printer from than a fanatic.

Case in point: the **MINOLTA-QMS** magicolor® 2200 desktop color laser printer. It prints color and monochrome in one printer, 20 ppm monochrome and 5 ppm in color, and offers multiple language support. The magicolor® 6100 also prints monochrome and color, plus it can print in 11"x17" and larger. And both the 2200 and the 6100 come with Crown® II, a patented technology that improves printing performance and reduces network traffic.

We do obsess about printers so you probably don't want to get stuck in an elevator with us. But you'll certainly appreciate what a little obsession has done for our product. To learn more, call: **1-800-49COLOR** or visit us online at: www.minolta-qms.com



The essentials of imaging

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TOP 10 BUDGET PCs

	SYSTEM: UNDER \$1400	Month tested	★ Overall rating	Street price (10/13/00)	PC WorldBench 2000 performance score ¹ 	Base configuration
1	 Micro Express MicroFlex TB850B 800/989-9900 www.microexpress.net	Dec 00	98	Inexpensive: \$1049	Outstanding 155	Outstanding: Athlon-850, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
2	 Dell Dimension L800r 800/388-8542 www.dell.com		96	Inexpensive: \$1099	Very good 143	Very good: Pentium III-800EB, 128MB of SDRAM, 256KB L2 cache, 10GB hard drive, 17-inch monitor, Windows Me
3	Dell OptiPlex GX100 800/388-8542 www.dell.com	Sept 00	96	Very inexpensive: \$957	Satisfactory 111	Good: Celeron-600, 64MB of SDRAM, 128KB L2 cache, 10GB hard drive, 17-inch monitor, Windows 98 SE
4	NuTrend Athlon Special 2 888/482-6678 www.nutrend.com		94	Inexpensive: \$1129	Outstanding 152	Very good: Athlon-850, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 17-inch monitor, Windows Me
5	Sys TaskMaster 750D 800/613-9963 www.sys.com		90	Average: \$1184	Outstanding 169	Outstanding: Duron-750, 128MB of SDRAM, 64KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 2000
6	ABS Multimedia VL 800/876-8088 www.buyabs.com	Aug 00	90	Inexpensive: \$1149	Very good 143	Outstanding: Athlon-700, 128MB of SDRAM, 512KB L2 cache, 20.5GB hard drive, 17-inch monitor, Windows 98 SE
7	Polywell Poly 830KX-750D 800/999-1278 www.polywell.com	Dec 00	84	Average: \$1195	Good 134	Very good: Duron-750, 128MB of SDRAM, 64KB L2 cache, 20GB hard drive, 17-inch monitor, Windows Me
8	Compaq Deskpro EXS 800/345-1518 www.compaq.com	Nov 00	83	Inexpensive: \$1090	Satisfactory 106	Good: Celeron-566, 64MB of SDRAM, 128KB L2 cache, 10GB hard drive, 17-inch monitor, Windows 98 SE
9	HP Brio BA410 800/752-0900 www.hp.com/desktops	Dec 00	82	Average: \$1186	Satisfactory 132	Very good: Celeron-700, 128MB of SDRAM, 128KB L2 cache, 15GB hard drive, 15-inch monitor, Windows 2000
10	Toshiba V3300D 800/867-4422 www.toshiba.com	Dec 00	79	Expensive: \$1324	Very good 138	Very good: Pentium III-800EB, 128MB of SDRAM, 256KB L2 cache, 15GB 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 157.

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).



THE DELL Dimension L800r snags second place this month, thanks to its strong performance. Micro Express's MicroFlex TB850B retains the top spot, but two other new systems, NuTrend's Athlon Special 2 and Sys's TaskMaster 750D, make upper-echelon debuts, in the fourth and fifth spots, respectively.

1 MICRO EXPRESS MICROFLEX TB850B

 **WHAT'S HOT:** The MicroFlex TB850B scores with expandability. To open this basic midsize tower, you remove a single thumbscrew from the back of the top panel and then smoothly slide out the sturdy side panel. A cavernous and tidy interior offers five open PCI slots and four open bays. The accompanying spiral-bound system manual contains a handy list of manufacturers' tech-support phone numbers and lots of illustrative screen shots.

WHAT'S NOT: Though the 17-inch Impres-

sion 7VX monitor handily rendered rich colors, it displayed fuzzy text at just 1024 by 768 resolution. At at the maximum resolution of 1280 by 1024, text blurred heavily. No business software came bundled with our test system.

WHAT ELSE: Powered by an 850-MHz Athlon CPU, this system earned a PC WorldBench 2000 score of 155—just 1 point below the only other Athlon-850 system running Windows 98 SE we've tested. Once you get used to it, the Microsoft Natural Keyboard allows smooth, quiet, and comfortable typing.

BEST USE: Any budget-minded small-

office buyer looking for minimal features and solid performance should appreciate this \$1049 package.

2 DELL DIMENSION L800R

 **WHAT'S HOT:** Colors shine on the 17-inch Dell M781S monitor, and text appears crisp at 1024 by 768 resolution (with only slight blurring when bumped up to the maximum resolution of 1280 by 1024). Tool-less entry into the standard beige minitower and tool-less loading bays make adding new drives simple. A sturdy cardboard box houses lots of helpful documentation, including a hefty reference and troubleshooting manual, a setup poster, and a quick-setup guide. In our most recent reader survey (see page 108), Dell was the only vendor to receive an Outstanding grade for system reliability.

WHAT'S NOT: The minitower lacks a reset button, and replacing the flexible plastic

Extra features	Design and expandability ²	Vendor's system reliability	Tech support quality/policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)
Very good: OEM NVidia GeForce+ NV10 graphics card with 32MB of SDRAM, 8X/4X/32X CD-RW drive, network card, Microsoft Natural Keyboard, OpenManage Client, case lock	Good: tool-less slots and bays; midsize tower; 3 open drive bays, 5 open slots	Outstanding	Good/Outstanding	24/7, toll-free	3/3
Outstanding: OEM NVidia GeForce 256 graphics card with 64MB of DDR SGRAM, 12X DVD-ROM drive, 8X/4X/32X CD-RW drive, V.90 modem, network card, Microsoft Office 2000 SBE	Good: case easy to remove; midsize tower; 3 open drive bays, 2 open slots	Outstanding	Good/Good	24/7, toll-free	3/1
Good: Hercules 3D Prophet II GTS graphics card with 64MB of DDR SDRAM, 16X-40X CD-ROM drive, V.90 modem, Microsoft Office 2000 Professional	Good: spacious interior; midsize tower; 3 open drive bays, 4 open slots	3	Fair¹/Outstanding	24/7, toll-free	3/3
Good: Matrox Millennium G400 dual-head graphics card with 32MB of SGRAM, 8X/4X/32X CD-RW drive, network card	Very good: cluttered but roomy case; midsize tower; 5 open drive bays, 3 open slots	3	Good¹/Good	24/7, ⁴ toll-free	Varies ⁵ /5
Good: Gainward Cardexpert NVidia GeForce2 MX graphics card with 32MB of SDRAM, 12X DVD-ROM drive, network card, Microsoft Office 2000 SBE	Good: difficult to access interior; midsize tower; 5 open drive bays, 5 open slots	3	Fair¹/Outstanding	24/7, toll-free	3/3
Good: Matrox Millennium G400 dual-head graphics card with 16MB of SGRAM, 4X/4X/32X CD-RW drive, network card, HP EDIagTools and ProtectTools 2000 administration software	Good: easy to access memory; midsize tower; 2 open drive bays, 5 open slots	Good	Fair/Good	24/7, toll call	3/3
Very good: ELSA Gladiac-32 graphics card with 32MB of SGRAM, 12X DVD-ROM drive, 8X/4X/32X CD-RW drive, network card, Microsoft Office 2000 SBE	Good: roomy case; midsize tower; 4 open drive bays, 3 open slots	3	Fair¹/Fair	10/5, toll-free	3/3
Very good: Creative Labs Graphics Blaster GeForce2 GTS graphics card with 64MB of SDRAM, 8X/4X/32X CD-RW drive, V.90 modem, network card, Microsoft Office 2000 Professional	Good: plenty of expansion room; midsize tower; 3 open drive bays, 3 open slots	3	Fair¹/Good	24/7, toll-free	Varies ⁶ /3
Outstanding: Leadtek WinFast 3D GeForce 256 graphics card with 32MB of DDR SGRAM, 12X DVD-ROM drive, 8X/4X/32X CD-RW drive, V.90 modem, Corel WordPerfect Office 2000	Satisfactory: cordless mouse; midsize tower; 2 open drive bays, 3 open slots	3	Fair¹/Good	24/7, toll-free	3/5
Very good: Cardex NVidia TNT2 M64 graphics card with 32MB of SDRAM, 40X-52X CD-ROM drive, LS 120 drive, V.90 modem, Microsoft Office 2000 Professional, McAfee VirusScan	Good: good expansion possibilities; midsize tower; 3 open drive bays, 4 open slots	3	Good¹/Fair	12.5 ⁷ /6, toll-free	Varies ⁸ /1
Extra features: 10 percent	Design and expandability: 15 percent	Reliability: 15 percent	Support and warranty: 15 percent		

¹ 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.

⁴ Support hours drop to 9 hours M-F after one year.

⁵ Six years on CPU and main RAM, three years on other parts.

⁶ Five years on CPU and main RAM, three years on other parts.

⁸ Nine hours on Saturday.

delivers richly saturated colors and ultra-sharp text, even at resolutions higher than the standard 1280 by 1024.

WHAT'S NOT: Despite the system's \$180 price drop this month, you'll still pay a substantial \$2819 for the privilege of having speed and top-notch components.

WHAT ELSE: Getting the midsize tower up and running is a snap, thanks to Dell's detailed setup guide and well-labeled rear ports. Among the bundled goodies, Dell includes a microphone as well as the Microsoft Office 2000 Small Business Edition suite as standard at this price. The side of the case slides off easily after you release two latches, making access to the innards quick and painless. The fairly cluttered interior offers two open PCI slots and three open drive bays for future expansion. A handsome Harman Kardon HK595 three-speaker set with subwoofer pumps out well-rounded sound and is a highlight of the multimedia features.

BEST USE: This Dimension will please those who are looking for a speedy, tricked-out 1-GHz system.

New on the Chart

3 XI COMPUTER 1100K MTOWER SP

NEW **WHAT'S HOT:** With an impressive score of 180 on our PC WorldBench 2000 tests, Xi's Athlon-1100-based 1100K MTower SP performed better than any system we've seen running Windows 98 SE. The MTower might owe this achievement to its hard drive configuration—it uses two 30GB drives connected to an IDE RAID card, which should speed disk-intensive tasks. Or perhaps credit lies with its Hercules 3D Prophet II GTS graphics board with 64MB of DDR video memory.

WHAT'S NOT: Loose stickers identifying the



ORANGE YOU LOVELY: The XI Computer 1100K MTower SP's colorful front follows the iMac's lead.

rear ports could fall off during use.

WHAT ELSE: The 1100K MTower SP ships with a 19-inch Optique Q95 monitor, which delivered deep, rich colors and crisp text at resolutions of 1024 by 768 and 1280 by 1024. A 16X-40X CD-ROM drive, DVI and S-Video output, and an ▶

Altec Lansing ADA880 five-speaker set with remote control offer excellent presentation capabilities. The tower's flexible side comes off easily without tools; the spacious, uncluttered interior has four open PCI slots and three open bays for your cards and drives. The Logitech Internet keyboard features 17 programmable multimedia buttons, allowing quick access to the Web and system applications. With an orange panel placed on its white midsize tower, this Xi PC looks somewhat like an iMac pretender.

BEST USE: The Xi 1100K MTower SP would make a fine system for businesses that need both power and presentation options.

5 TANGENT MEDALLION PRO

NEW **WHAT'S HOT:** This Medallion takes home a gold with its PC World-Bench 2000 score of 201.

Not only is that figure 14 points above the average for PIII-1000 systems with 256MB of RAM, it's the highest we've seen for a system running Windows

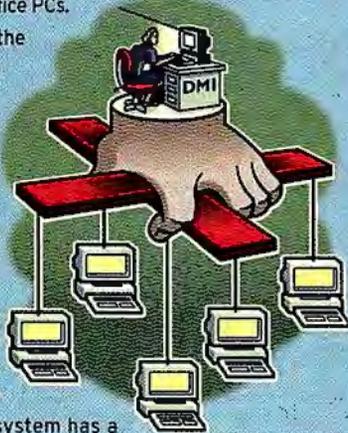
What Can DMI Do For Me?

TECH TREND IF YOU'RE AN information technology manager in a tangle over maintaining numerous PCs, don't stress: DMI-compliant systems can help your networked environment run smoothly and efficiently. DMI, or Desktop Management Interface, enables network administrators to remotely troubleshoot, upgrade, and catalog office PCs.

The DMI standard was created by the Distributed Management Task Force, an industry organization concerned with simplifying PC management. Management software, such as Intel's LANDesk Client Manager, HP's TopTools, and Dell's OpenManage, can communicate with a DMI-compliant system's motherboard, hard drive, and network card to determine processor temperature or potential hard drive failure. If a DMI-compliant client system has a Wake-on-LAN-capable network card, an IT manager can start it up remotely and perform diagnostics. And that's just the beginning.

Stacy Hand, group product manager of managed desktops at Gateway, describes how a DMI-compliant system with a blank hard drive can be plugged into a department LAN, booted from a drive image on a server, then directed to download an operating system and applications. DMI-compliant systems can also allow an IT manager to upgrade multiple PCs during off-hours.

Not long ago, says Hand, there weren't enough managed PCs in most offices to make remote management effective. However, we're seeing more systems with management software vying for our charts. This month, our power chart hosts two such systems: the Dell OptiPlex GX300 and the HP Vectra VL400.



2000. A simple switch lets the sturdy side of Tangent's standard midsize tower case come off without tools. The Medallion's five open PCI slots and five open bays provide lots of expansion possibilities.

WHAT'S NOT: It takes a bit of fiddling to align and replace the side of the case. In addition, a crossbar makes it difficult to access the interior slots and bays (see inset photo, below).

WHAT ELSE: Colors on the 17-inch Optiquest Z70 monitor shone vibrantly in our test images, though text blurred slightly at 1024 by 768 resolution, and more prominently at the maximum resolution of 1280 by 1024. Tangent chose not to use the integrated video supplied with the

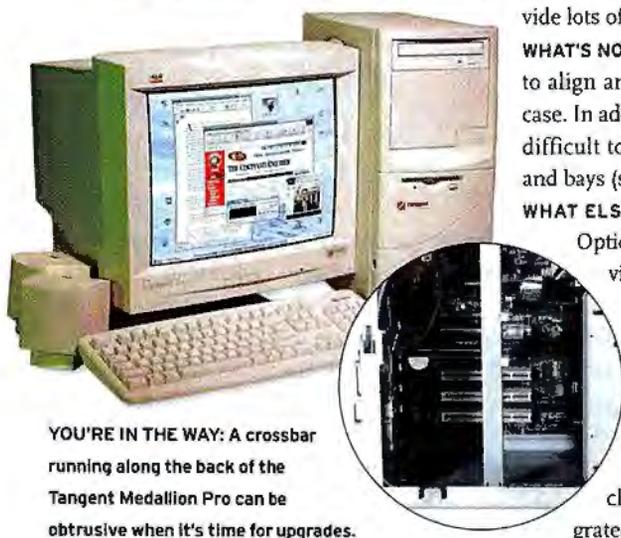
WorldBench 2000 tests—8 points below the average for similarly configured systems running Windows 98 SE. And don't expect much expandability: You get a single open memory slot and no empty expansion slots or drive bays. However, the PowerMate 2000's management software, including LANDesk Client Manager, makes it a possible contender for a corporate environment, while its sleek size makes it a good choice for small work spaces. If you're interested, be ready to shell out some clams: The PowerMate 2000 will set you back \$2699. ▶

MORE REVIEWS ONLINE



THE FOLLOWING system didn't score high enough to reach the Top 10 Power PCs chart. For a write-up, visit PCWorld.com/t10pcs.

◆ NEC PowerMate 2000



YOU'RE IN THE WAY: A crossbar running along the back of the Tangent Medallion Pro can be obtrusive when it's time for upgrades.

motherboard's Intel 815E chip set; instead, it opted for a Gainward Cardexpert NVidia GeForce2 MX graphics card, whose digital vibrance control maintains rich colors in poorly lit environments. Front-mounted USB ports allow users to connect USB peripherals, such as scanners or digital cameras.

BEST USE: The Medallion Pro isn't cheap—it'll set you back \$2594—but it's powerful, making it a reasonable value for small-business owners.

Also of Note

UNFORTUNATELY, all-in-one systems lack the punch and expandability that are needed to climb our charts. A case in point: NEC's latest all-in-one, the PowerMate 2000, which couldn't quite muster the muscle. The compact system's PIII-600E processor nudged it to a lackluster score of 125 on our PC

IT'S NOT JUST
A MAILBOX,

IT'S AN ENTIRE
SUPPORT STAFF.



MAIL BOXES ETC.

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TOP 10 MIDRANGE PCs

	SYSTEM: \$1400 TO \$2399	Month tested	★ Overall rating	Street price (10/13/00)	PC WorldBench 2000 performance score ¹ Faster	Base configuration
1	 Dell Dimension 4100 800/388-8542 www.dell.com	Oct 00	91	Inexpensive: \$1659	Very good 154	Very good: Pentium III-800EB, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
2	 Gateway Select 1100 800/315-2536 www.gateway.com	(NEW)	90	Average: \$1991	Outstanding 175	Very good: Athlon-1100, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
3	Micro Express MicroFlex 1100B 800/989-9900 www.microexpress.net	(NEW)	89	Very inexpensive: \$1499	Outstanding 173	Good: Athlon-1100, 128MB of SDRAM, 256KB L2 cache, 15GB hard drive, 17-inch monitor, Windows 98 SE
4	Sys Performance 850T 800/613-9963 www.sys.com	(NEW)	89	Average: \$1940	Outstanding 217	Outstanding: Athlon-850, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows NT 4.0
5	ABS Performance Athlon 1 800/876-8088 www.buyabs.com	(NEW)	86	Average: \$1799	Very good 152	Outstanding: Athlon-900, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows Millennium Edition
6	Micron ClientPro Cn 800/642-7667 www.micronpc.com	Oct 00	86	Average: \$1978	Very good 158	Good: Pentium III-933, 128MB of SDRAM, 256KB L2 cache, 15GB hard drive, 17-inch monitor, Windows 98 SE
7	NuTrend Business Athlon 1 888/482-6678 www.nutrend.com	(NEW)	86	Very inexpensive: \$1499	Very good 149	Very good: Athlon-800, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 17-inch monitor, Windows Me
8	Compaq Deskpro EX 800/345-1518 www.compaq.com	Nov 00	84	Inexpensive: \$1705	Very good 193	Outstanding: Pentium III-733, 128MB of SDRAM, 256KB L2 cache, 15GB hard drive, 19-inch monitor, Windows NT 4.0
9	HP Vectra VL400 800/752-0900 www.hp.com/desktops	Dec 00	82	Average: \$1908	Good 165	Good: Pentium III-733, 128MB of SDRAM, 256KB L2 cache, 15GB hard drive, 17-inch monitor, Windows 2000
10	Systemax PVW-1000A Excite PC 800/262-6622 www.systemaxpc.com	Oct 00	81	Expensive: \$2119	Very good 176	Very good: Athlon-1000, 128MB of SDRAM, 512KB L2 cache, 30.7GB hard drive, 17-inch monitor, Windows 2000
 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 157.

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).



IT'S A WHOLE NEW midrange ballgame this month.

Five freshman systems, all sporting AMD processors, surge onto the chart—four of them landing in the upper half. The Gateway Select 1100, a new Best Buy at number two, and the Micro Express MicroFlex 1100B, in the third spot, posted impressive scores on our PC WorldBench 2000 tests, thanks to their Athlon-1100 processors. Dell's Dimension 4100 holds the top spot for a fourth month.

1 DELL DIMENSION 4100

 **WHAT'S HOT:** The Dimension 4100 scored a healthy 154 on our PC WorldBench 2000 tests, 4 percent above average for its Pentium III-800EB processor class. The system has several useful extras not often found at this midrange price, including an NVidia GeForce2 graphics board and a 17-inch Dell M780 monitor, which delivered vivid colors and sharp text (albeit with some blur at the maximum resolution of 1280

by 1024). In our most recent survey of PC World readers, Dell received outstanding marks for system reliability (see page 108). **WHAT'S NOT:** Dell hacked another \$60 off the Dimension 4100's price this month, but you'll still have to pay for some extras: You get only a plain 20X-48X CD-ROM drive at the \$1659 price. **WHAT ELSE:** A large guide for reference and troubleshooting provides lots of detailed system information, and a setup poster makes assembling the PC a snap.

But even with thumbscrew access, removing the side panel of this lanky midsize tower takes some work. Though a bit cluttered, the interior offers three open PCI slots and four open bays for expansion. **BEST USE:** Offering excellent performance for the price, this Dell would fit well into almost any office.

2 GATEWAY SELECT 1100

 **WHAT'S HOT:** From its sleek midsize tower case, which opens and shuts via simple sliding switches,  to its tool-less-access PCI slots and bays, the Select 1100 has many well-designed features. Even the power supply can be removed sans tools. Drives slide in and out of the four open bays smoothly, and a thumbscrew at the rear of the system (which takes a bit of work to remove) offers access to the two available expansion slots. With its Athlon-1100 processor providing the muscle, the Select 1100

Extra features	Design and expandability ²	Vendor's system reliability	Tech support quality/policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)
Good: OEM NVidia GeForce2 GTS graphics card with 32MB of DDR SGRAM, 20X-48X CD-ROM drive, V.90 modem, Microsoft Office 2000 Professional	Good: plenty of expansion room; midsize tower; 4 open drive bays, 3 open slots	Outstanding	Good/Good	24/7, toll-free	3/1
Very good: Creative Labs CT5823 graphics card with 32MB of SDRAM, 20X-48X CD-ROM drive, V.90 modem, network card, Microsoft Office 2000 SBE	Good: tool-less drive bays and slots; midsize tower; 4 open drive bays, 2 open slots	Good	Fair/Outstanding	24/7, toll-free	3/3
Very good: ELSA Erazor X2 graphics card with 32MB of SGRAM, 12X DVD-ROM drive, V.90 modem, network card	Very good: spacious interior; midsize tower; 4 open drive bays, 3 open slots	,	Fair*/Outstanding	24/7, toll-free	4/4
Very good: Matrox Millennium G400 graphics card with 32MB of SGRAM, 8X/4X/32X CD-RW drive, network card, case lock	Very good: easy to upgrade; midsize tower; 5 open drive bays, 3 open slots	,	Good*/Good	24/7,* toll-free	Varies */5
Outstanding: Leadtek WinFast GeForce2 MX graphics card with 32MB of SDRAM, 16X DVD-ROM drive, 8X/4X/32X CD-RW drive, V.90 modem, network card	Good: well-organized interior; midsize tower; 3 open drive bays, 2 open slots	,	Fair*/Fair	11/5, toll-free	3/lifetime
Good: VisionTek NVidia TNT2 M64 graphics card with 32MB of SDRAM, 20X-48X CD-ROM drive, network card, Microsoft Office 2000 SBE, LANDesk Client Manager	Very good: tool-less case removal; midsize tower; 5 open drive bays, 5 open slots	Good	Fair/Outstanding	24/7, toll-free	Varies */1
Good: Leadtek WinFast GeForce2 MX graphics card with 32MB of SDRAM, 40X-52X CD-ROM drive, V.90 modem, network card, Microsoft Office 2000 SBE	Good: roomy case allows for easy expansion; midsize tower; 4 open drive bays, 2 open slots	,	Fair*/Good	24/7, toll-free	3/lifetime
Good: Mitac NVidia TNT2 M64 graphics card with 16MB of SDRAM, 20X-48X CD-ROM drive, network card, Compaq Intelligent Manageability	Satisfactory: roomy interior; midsize tower; 2 open drive bays, 2 open slots	Good	Fair/Good	24/7, toll-free	3/1
Good: integrated Intel 815 graphics, 8X/4X/32X CD-RW drive, network card, TopTools administration software, power protection device, Wake-on-LAN, case lock	Good: easy access to memory; midsize tower; 2 open drive bays, 5 open slots	Good	Fair/Good	24/7, toll call	3/3
Very good: VisionTek NV994.0 graphics card with 32MB of SDRAM, 12X DVD-ROM drive, 4X/2X/24X CD-RW drive, V.90 modem, network card, Microsoft Office 2000 SBE	Good: plenty of room to expand; midsize tower; 3 open drive bays, 3 open slots	,	Fair*/Good	24/7, toll-free	Varies */1
Extra features: 10 percent	Design and expandability: 15 percent	Reliability: 15 percent	Support and warranty: 15 percent		

¹ 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.

² Support hours drop to 9 hours Monday-Friday after one year.

³ Six years on CPU and main RAM, three years on other parts.

⁴ Five years on CPU and main RAM, three years on other parts.

posted a score of 175 on our PC World-Bench 2000 tests, making it one of the most powerful systems we've tested running Windows 98 SE.

WHAT'S NOT: Despite its user-friendly interior design, the Select 1100 lacks a reset button, so if the system hangs, you may have to pull the plug.

WHAT ELSE: The 17-inch Gateway EV700 monitor produced rich colors in our test images and sharp text at 1024 by 768 resolution. Text began to get fuzzy at the highest resolution of 1280 by 1024. Two front-mounted USB ports augment the standard two in back. The system manual contains lots of helpful upgrading information. The attractive bundle includes Microsoft Office 2000 Small Business Edition and a microphone.

BEST USE: Small-office users looking for a powerful all-around system with excellent tool-less upgradability should consider this Gateway.

New on the Chart

3 MICRO EXPRESS MICROFLEX 1100B

NEW **WHAT'S HOT:** A helpful setup poster and color-coordinated rear ports make setting up the MicroFlex 1100B as easy as putting together a ten-piece jigsaw puzzle. To open the system you must remove a single thumbscrew mounted on the top, after which you can pop off a panel on either side of the case. Inside, the bundled wiring and cabling has been taped back, allowing the user unobstructed access to the unit's three open PCI slots and four open drive bays. **WHAT'S NOT:** Though the 17-inch Impression 7VX monitor displays lifelike colors (the fruit in our test images looked good enough to eat!), the text it produces leaves much to be desired. At the monitor's normal resolution of 1024 by 768, characters



ROCK SOLID: In recent PC World surveys, Dell has received outstanding marks for its PCs' reliability.

blurred noticeably—we definitely recommend an upgrade. Many business systems don't include speakers at all, but don't let the MicroFlex's Pro Juster Air-Wave 317 three-speaker set sway your decision: These large, ugly soundboxes are no treat for the eyes or the ears. ▶



FOR THE POWER HUNGRY: Micro Express's MicroFlex 1100B earned an impressive 173 WorldBench score.

WHAT ELSE: Powered by an Athlon-1100 processor, the MicroFlex 1100B earned a 173 on our PC WorldBench 2000 tests—average for the few similarly configured systems we've tested thus far, but impressive nonetheless. Typing is smooth and silent on the comfortable Microsoft Natural Keyboard. The ELSA Erazor X2 graphics board with an S-Video-out port lets you send a presentation out to a TV screen.

BEST USE: The MicroFlex 1100B would be a useful high-performance system in a small office; but if you decide to buy it, get a higher-quality 17- or 19-inch monitor.

4 SYS PERFORMANCE 850T

NEW **WHAT'S HOT:** Armed with a second-generation Athlon-850 processor, the \$1940 Sys Performance 850T earned a score of 217 on our PC WorldBench 2000 tests—the second-highest score we've seen among systems running Windows NT 4.0, trailing only a Sys equipped with an Athlon-1100. The Performance 850T's 19-inch Optique Q95 monitor really shines, displaying vibrant colors in our test images and sharp text up to its maximum resolution of 1600 by 1200.

WHAT'S NOT: Though Sys includes documentation for various system compo-

nents, the Performance 850T lacks a system manual, unduly complicating setup and troubleshooting for less-experienced users.

WHAT ELSE: You must remove two screws to take off the sturdy metal side, which slides on and off smoothly on guide rails. A case lock affords some protection against thievery, though it's just a basic, provide-your-own-padlock loop. The system also includes a Wake-on-LAN-capable network card, but that feature goes to waste because the motherboard isn't

DMI compliant. The network card occupies one PCI slot—three open slots and five open bays remain. The 850T's keyboard allows smooth, quiet typing, with buttons for Sleep, Wake Up, and Power.

BEST USE: Its excellent performance makes the Sys Performance 850T worth a look, but less-experienced users would benefit from better documentation.

5 ABS PERFORMANCE ATHLON 1

NEW **WHAT'S HOT:** Its 8X/4X/32X CD-RW drive gives the Performance Athlon 1 a convenient backup option. The 19-inch Lite-On B1996NSL monitor produced brilliant colors and crisp text with only a slight blur at the maximum resolution of 1600 by 1200. A handy setup poster and color-coded rear ports simplify assembly of this gray-on-beige system.

WHAT'S NOT: Before you can lift off the unit's sturdy side panel, you must remove two screws. The keyboard features 17 extra programmable buttons; however, the keyboard's keys wiggle slightly during typing.

WHAT ELSE: Using an Athlon-900 processor, the Performance Athlon 1 earned a 152 on our PC WorldBench 2000 tests—that's an impressive score, but we haven't tested enough similarly configured systems to make a processor-specific comparison. Within the machine's well-organized interior, all the cables are neatly pulled back, and two open PCI slots and three open bays are available for expansion. The PC's Leadtek WinFast GeForce2 MX graphics board sports an S-Video-out port for sending signals to a multimedia TV.

BEST USE: Any small office should look into this reasonably priced ABS—especially if backup options are a must.

7 NUTREND BUSINESS ATHLON 1

NEW **WHAT'S HOT:** Equipped with both a V.90 modem and a network interface card, the Business Athlon 1 offers several connectivity options. It ships with Microsoft Office 2000 Small Business Edition. Another bonus: You get a high-quality Leadtek WinFast GeForce2 MX graphics board, which offers color compensation for dimly lit environments.

WHAT'S NOT: The 17-inch ViewSonic E771 monitor produced unreadably fuzzy text at the highest resolution of 1280 by 1024, though it did offer rich colors. Still, we'd recommend upgrading to a better display. The system ships with a plain, 40X-52X CD-ROM drive that's a shade darker than the midsize tower's light beige—a negative if you're color-conscious.

WHAT ELSE: On our PC WorldBench 2000 tests, the Business Athlon 1, using an Athlon-800 processor and running Windows Me, earned a score of 149—average for similarly configured systems. You must remove two screws to open the side of the midsize tower; the side panel then comes off and goes back on smoothly. The spacious interior offers easy access to two open PCI slots and four open drive bays. The Microsoft Internet Keyboard permits smooth and silent typing.

BEST USE: Small-business users could do worse than this \$1499 Business Athlon 1, though we recommend paying extra to upgrade to a 19-inch monitor. ▶



BACK THAT DATA UP: The Performance Athlon 1 from ABS offers a CD-RW drive as a backup option.

MORE REVIEWS ONLINE



THE FOLLOWING SYSTEMS didn't score high enough to reach the Top 100 Midrange PCs chart. For write-ups, visit PCWorld.com (www.pcworld.com/t10pcs).

- ◆ Acer Veriton 7100
- ◆ IBM NetVista A40-6649 NBU
- ◆ IBM NetVista X40

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We do obsess about printers so you probably don't want to get stuck in an elevator with us. But you'll certainly appreciate what a little obsession has done for our product. To learn more, call: **1-800-49COLOR** or visit us online at: www.minolta-qms.com



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TOP 10 BUDGET PCs

	SYSTEM: UNDER \$1400	Month tested	★ Overall rating	Street price (10/13/00)	PC WorldBench 2000 performance score ¹	Faster	Base configuration
1	 Micro Express MicroFlex TB850B 800/989-9900 www.microexpress.net	Dec 00	98	Inexpensive: \$1049	Outstanding 155		Outstanding: Athlon-850, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
2	 Dell Dimension L800r 800/388-8542 www.dell.com	(NEW)	96	Inexpensive: \$1099	Very good 143		Very good: Pentium III-800EB, 128MB of SDRAM, 256KB L2 cache, 10GB hard drive, 17-inch monitor, Windows Me
3	Dell OptiPlex GX100 800/388-8542 www.dell.com	Sept 00	96	Very Inexpensive: \$957	Satisfactory 111		Good: Celeron-600, 64MB of SDRAM, 128KB L2 cache, 10GB hard drive, 17-inch monitor, Windows 98 SE
4	NuTrend Athlon Special 2 888/482-6678 www.nutrend.com	(NEW)	94	Inexpensive: \$1129	Outstanding 152		Very good: Athlon-850, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 17-inch monitor, Windows Me
5	Sys TaskMaster 750D 800/613-9963 www.sys.com	(NEW)	90	Average: \$1184	Outstanding 169		Outstanding: Duron-750, 128MB of SDRAM, 64KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 2000
6	ABS Multimedia VL 800/876-8098 www.buyabs.com	Aug 00	90	Inexpensive: \$1149	Very good 143		Outstanding: Athlon-700, 128MB of SDRAM, 512KB L2 cache, 20.5GB hard drive, 17-inch monitor, Windows 98 SE
7	Polywell Poly 830KX-750D 800/999-1278 www.polywell.com	Dec 00	84	Average: \$1195	Good 134		Very good: Duron-750, 128MB of SDRAM, 64KB L2 cache, 20GB hard drive, 17-inch monitor, Windows Me
8	Compaq Deskpro EXS 800/345-1518 www.compaq.com	Nov 00	83	Inexpensive: \$1090	Satisfactory 106		Good: Celeron-566, 64MB of SDRAM, 128KB L2 cache, 10GB hard drive, 17-inch monitor, Windows 98 SE
9	HP Brio BA410 800/752-0900 www.hp.com/desktops	Dec 00	82	Average: \$1186	Satisfactory 132		Very good: Celeron-700, 128MB of SDRAM, 128KB L2 cache, 15GB hard drive, 15-inch monitor, Windows 2000
10	Toshiba V3300D 800/867-4422 www.toshiba.com	Dec 00	79	Expensive: \$1324	Very good 138		Very good: Pentium III-800EB, 128MB of SDRAM, 256KB L2 cache, 15GB 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 157.

¹ 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).



THE DELL Dimension L800r snags second place this month, thanks to its strong performance. Micro Express's MicroFlex TB850B retains the top spot, but two other new systems, NuTrend's Athlon Special 2 and Sys's TaskMaster 750D, make upper-echelon debuts, in the fourth and fifth spots, respectively.

1 MICRO EXPRESS MICROFLEX TB850B

 **WHAT'S HOT:** The MicroFlex TB850B scores with expandability. To open this basic midsize tower, you remove a single thumbscrew from the back of the top panel and then smoothly slide out the sturdy side panel. A cavernous and tidy interior offers five open PCI slots and four open bays. The accompanying spiral-bound system manual contains a handy list of manufacturers' tech-support phone numbers and lots of illustrative screen shots.

WHAT'S NOT: Though the 17-inch Impres-

sion 7VX monitor handily rendered rich colors, it displayed fuzzy text at just 1024 by 768 resolution. At at the maximum resolution of 1280 by 1024, text blurred heavily. No business software came bundled with our test system.

WHAT ELSE: Powered by an 850-MHz Athlon CPU, this system earned a PC WorldBench 2000 score of 155—just 1 point below the only other Athlon-850 system running Windows 98 SE we've tested. Once you get used to it, the Microsoft Natural Keyboard allows smooth, quiet, and comfortable typing.

BEST USE: Any budget-minded small-

office buyer looking for minimal features and solid performance should appreciate this \$1049 package.

2 DELL DIMENSION L800R



WHAT'S HOT: Colors shine on the 17-inch Dell M781S monitor, and text appears crisp at 1024 by 768 resolution (with only slight blurring when bumped up to the maximum resolution of 1280 by 1024). Tool-less entry into the standard beige minitower and tool-less loading bays make adding new drives simple. A sturdy cardboard box houses lots of helpful documentation, including a hefty reference and troubleshooting manual, a setup poster, and a quick-setup guide. In our most recent reader survey (see page 108), Dell was the only vendor to receive an Outstanding grade for system reliability.

WHAT'S NOT: The minitower lacks a reset button, and replacing the flexible plastic

Extra features	Design and expandability ¹	Vendor's system reliability	Tech support quality/policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)
Good: VisionTek NVidia GeForce2 GTS graphics card with 32MB of SGRAM, 8X DVD-ROM drive, V.90 modem	Very good: neat, spacious interior; midsize tower; 4 open drive bays, 5 open slots	,	Fair ¹ / Outstanding	24/7, toll-free	4/4
Satisfactory: integrated Intel 810 graphics with UMA, 17X-48X CD-ROM drive, V.90 modem, Microsoft Works Suite 2000, Norton AntiVirus	Satisfactory: cramped interior; minitower; 1 open drive bay, 2 open slots	Outstanding	Good/ Good	24/7, toll-free	3/1
Satisfactory: integrated Intel 810 graphics with UMA, 20X-48X CD-ROM drive, network card, chassis-intrusion detection, Wake-on-LAN	Satisfactory: sturdy case, easy access to memory; midsize tower; 3 open drive bays, 4 open slots	Outstanding	Good/ Outstanding	24/7, toll-free	3/3
Very good: Leadtek WinFast 3D S325 graphics card with 32MB of SDRAM, 12X DVD-ROM drive, V.90 modem, network card, Corel WordPerfect Office 2000	Good: open bays easily accessible; midsize tower; 4 open drive bays, 2 open slots	,	Fair ¹ / Good	24/7, toll-free	3/lifetime
Good: Gigabyte GA-622-16 graphics card with 16MB of SDRAM, 17X-40X CD-ROM drive, network card, Wake-on-LAN, Norton Utilities 2000, Norton AntiVirus	Good: small, neat interior; minitower; 2 open drive bays, 2 open slots	,	Good ² / Good	24/7, ⁴ toll-free	Varies ⁵ /5
Good: Hercules 3D Prophet graphics card with 32MB of DDR SGRAM, 40X-52X CD-ROM drive, V.90 modem, Corel WordPerfect Office 2000	Very good: roomy interior; midsize tower; 4 open drive bays, 3 open slots	,	Fair ¹ / Fair	11/5, toll-free	3/lifetime
Good: Micro-Star MS-8808 graphics card with 32MB of SDRAM, 22X-48X CD-ROM drive, V.90 modem, Lotus SmartSuite 9.0 Millennium Edition	Good: cramped interior; midsize tower; 4 open drive bays, 2 open slots	,	Fair ¹ / Good	24/7, toll-free	3/5
Good: integrated Intel 815 graphics with 4MB AGP display cache, 20X-48X CD-ROM drive, network card, Microsoft Office 2000 SBE, Compaq Intelligent Manageability	Satisfactory: tidy interior; compact; 2 open drive bays, 2 open slots	Good	Fair/ Good	24/7, toll-free	3/1
Good: integrated Intel 815E graphics with UMA, 17X-48X CD-ROM drive, network card, Microsoft Office 2000 SBE	Satisfactory: swing-out power supply; minitower; 1 open drive bay, 2 open slots	Good	Fair/ Good	24/7, toll call	3/3
Satisfactory: integrated S3 Savage 4 graphics with UMA, 17X-48X CD-ROM drive, network card, Norton AntiVirus, Norton Internet Security, Wake-on-LAN	Satisfactory: crowded interior; desktop; 2 open drive bays, 2 open slots	,	Good ² / Good	24/7, toll-free	1/1
Extra features: 10 percent	Design and expandability: 15 percent	Reliability: 15 percent	Support and warranty: 15 percent		

¹ 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.

⁴ Support hours drop to 9 hours Monday-Friday after one year.

⁵ Six years on CPU and main RAM, three years on other parts.

side of the tower involves more maneuvering than a limo on Lombard Street. Though 128MB of RAM comes installed, it must be shared with the integrated video (blame the Intel 810 motherboard), which can lead to slowdowns during graphics-intensive tasks.

WHAT ELSE: Using a PIII-800EB processor and running Windows Me, the Dimension L800r earned a PC WorldBench 2000 score of 143—average for its configuration, but impressive for a budget system. The software bundled with the system includes Microsoft Works Suite 2000 and Norton AntiVirus. Despite its name, the sturdy Dell QuietKey keyboard allows smooth but not terribly quiet typing. Two open PCI slots and one open drive bay create room for expansion options.

BEST USE: At its low price (\$1099), the Dell Dimension L800r offers ample performance for any cost-conscious small-business user.

New on the Chart

4 NUTREND ATHLON SPECIAL 2

NEW **WHAT'S HOT:** The NuTrend Athlon Special 2, powered by an Athlon-850 CPU and running Windows Me, scored 152 on our PC WorldBench 2000 tests. That's impressive, especially for a budget system that sets you back only \$1129. And upgrades are a breeze: To reach the interior, you must remove two screws, but the two open PCI slots and four open bays are readily accessible in the large, spacious interior. All cabling is neatly bundled—even the audio cable that stretches from the sound card to the DVD-ROM drive.

WHAT'S NOT: Though the 17-inch ADI MicroScan M700 monitor produced rich colors in our test images, text blurred at 1024 by 768 resolution and was hard to



DELL'S DIMENSION L800r offers small-business users speedy performance at a reasonable price.

read at the maximum resolution of 1280 by 1024. Faint icon labels on the rear ports could slow setup for beginners.

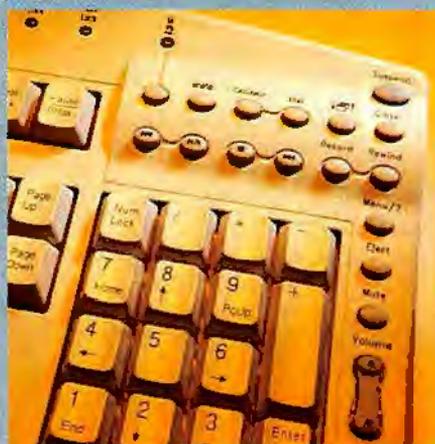
WHAT ELSE: A helpful binder holds all the software—including Corel WordPerfect Office 2000—as well as the setup poster and the somewhat generic system ▶

Multimedia Keyboards: Launch Me to the Internet!

TECH TREND A FEW YEARS ago, keyboards provided the letters of the alphabet, a few function keys, and numbers across the top and on the side in a number pad. Well, the plain old keyboard has grown up. Nowadays, fancy new keyboards offer multimedia and Internet-access buttons as well. These hot keys let you reach your e-mail client or other favorite applications quickly, control CD-ROM playback, and even power up your PC.

Initially, the new-style keyboards came from third-party manufacturers such as Microsoft (with its Natural Keyboard Pro) and Logitech (the Internet Keyboard). Now, many system vendors supply their own added-functionality keyboards. Sys, for example, puts Sleep, Wake Up, and Power buttons on all of its keyboards. This month's new Acer Veriton 7100, a contender for the midrange chart, has 12 multimedia keys, including a volume control knob, media player buttons, and five programmable buttons that can bring up applications or documents.

These buttons may not make revolutionary waves in the PC industry, but we like seeing a trend that simplifies our everyday computing.



manual. The sturdy NuTrend keyboard has an attachable wrist rest and 17 programmable buttons, but the basic keys wiggle noticeably during typing.

BEST USE: The Athlon Special 2's notable performance and budget price should appeal to SOHO users, but we recommend upgrading to a better monitor.

5 SYS TASKMASTER 750D

NEW **WHAT'S HOT:** AMD's Duron processor continues to prove its mettle. This Duron-750-based TaskMaster, running Windows 2000, earned a 169 on our PC

WorldBench 2000 tests. This is only the second system with a Duron-750 processor we've tested, but its score is 5 points above the average for computers equipped with a PIII-733 CPU and running the same operating system. The TaskMaster 750D also sports a network interface card with Wake-on-LAN capability—a rare feature for a budget system.

WHAT'S NOT: Like other Sys PCs, the TaskMaster 750D comes without an overall system manual; it does have documentation for individual components such as the motherboard and monitor, however.

The system has no reset button and offers only a basic 17X-40X CD-ROM drive at its \$1184 price.

WHAT ELSE: You must remove two screws to lift off the side of the TaskMaster's mundane minitower case. Unlike midsize Sys models, the TaskMaster 750D has a flexible plastic side that is difficult to reposition properly. The system includes a loop-style case lock that permits you to attach a small padlock for security. The small but neat interior features two open PCI slots and two open drive bays for

expansion. The 17-inch Optiquess Q71 monitor produces washed-out colors and text that blurred somewhat at the monitor's maximum resolution of 1280 by 1024; at lower resolutions, text looked clear. The software bundle contains no business applications, but it does include Norton Utilities and Norton AntiVirus.

BEST USE: The TaskMaster 750D would meet the needs of small-business users.

Also of Note

THREE OF THE four budget systems we tested this month managed to climb onto the chart. The one that didn't, NuTrend's Athlon Force2, used an Athlon-800 processor and Windows Me to earn a PC WorldBench 2000 score of 149—average for systems of its configuration. The Force2's spacious interior accepts upgrades with ease. And like all NuTrend systems, the Force2 comes with a handy binder that houses system software disks and all of the manuals.

The lower half of the budget chart remains unchanged from last month. The Multimedia VL from ABS continues to hold down the sixth spot, with help from a \$130 price drop. Polywell's Poly 830KX-750D retains its spot—seventh place—without a price change. That system and the new, fifth-place Sys TaskMaster 750D are the only two budget systems here that use Duron processors.

HP's Brio BA410, at number nine, is the only system here powered by a Celeron-700 processor. We expect Celeron and Duron-driven systems to remain popular in the budget category; but as the Pentium 4 appears and the price of the PIII processor drops, we also expect that more PIII budget systems will vie for spots on the chart. The trend is already starting: This month, the chart includes two PIII-800 systems—the Dell Dimension L800r and the Toshiba V3300D. ▶

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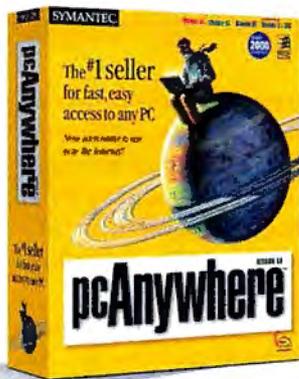
THE FOLLOWING SYSTEM didn't score high enough to reach the Top 10 Budget PCs chart. For a write-up, visit PCWorld.com/t10pocs.

◆ NuTrend Athlon Force2



GO DURON GO: The Sys TaskMaster 750D's Duron-750 processor helped it blaze through our WorldBench tests.

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SYMANTEC.

TOP 15 NOTEBOOK PCs

	POWER NOTEBOOK: \$2700 AND OVER	Month tested	★ Overall rating	Street price (10/13/00)	PC WorldBench 2000 performance score <small>Faster</small>	Base configuration
1	Dell Inspiron 4000 800/388-8542 www.dell.com	Dec 00	95	Very inexpensive: \$2737	Outstanding 164	Outstanding: Pentium III-750/600, 14.1-inch active screen, touchpad, eraserhead, 128MB of SDRAM, 20GB hard drive, Win 2000
2	Dell Inspiron 8000 800/388-8542 www.dell.com	Dec 00	91	Expensive: \$3646	Outstanding 167	Outstanding: Pentium III-850/700, 15-inch active screen, touchpad, eraserhead, 128MB of SDRAM, 20GB hard drive, Win 2000
3	Gateway Solo 5300XL 800/846-2000 www.gateway.com	NEW	91	Inexpensive: \$2772	Very good 155	Good: Pentium III-750/600, 14.1-inch active screen, touchpad, 128MB of SDRAM, 20GB hard drive, Windows 2000
4	IBM ThinkPad T20 888/746-74261 www.ibm.com/thinkpad	Sept 00	88	Average: \$3149	Satisfactory 136	Satisfactory: Pentium III-700/550, 14.1-inch active screen, eraserhead, 128MB of SDRAM, 12GB hard drive, Windows 98 SE
5	Gateway Solo 9300XL 800/846-2000 www.gateway.com	Sept 00	87	Average: \$3370	Good 145	Outstanding: Pentium III-700/550, 15.7-inch active screen, touchpad, 128MB of SDRAM, 20GB hard drive, Windows 2000
MIDRANGE NOTEBOOK: \$2000 TO \$2699 Percent of overall rating ▶ Price: 14 percent Performance: 20 percent Base configuration: 5 percent						
1	HP OmniBook 6000 800/462-8947 www.hp.com	Sept 00	87	Average: \$2499	Good 129	Good: Pentium III-600/500, 14.1-inch active screen, touchpad, eraserhead, 64MB of SDRAM, 6GB hard drive, Windows 2000
2	Acer TravelMate 602TER 800/733-2237 www.acer.com	Sept 00	86	Average: \$2400	Good 127	Very good: Pentium III-650/500, 13.3-inch active screen, touchpad, 128MB of SDRAM, 12GB hard drive, Windows 98 SE
3	Chem USA Chembook 8200B 800/866-2436 www.chemusa.com	Sept 00	85	Inexpensive: \$2059	Good 127	Satisfactory: Pentium III-650/500, 13.3-inch active screen, touchpad, 128MB of SDRAM, 6.4GB hard drive, Windows 98 SE
4	Gateway Solo 9300LS 800/846-2000 www.gateway.com	June 00	84	Expensive: \$2578	Satisfactory 119	Satisfactory: Pentium III-650/500, 15-inch active screen, touchpad, 64MB of SDRAM, 6GB hard drive, Windows 98 SE
5	HP OmniBook XE3 800/462-8947 www.hp.com	NEW	83	Average: \$2499	Good 133	Very good: Pentium III-700/550, 15-inch active screen, touchpad, 64MB of SDRAM, 10GB hard drive, Windows 2000
BUDGET NOTEBOOK: UNDER \$2000 Percent of overall rating ▶ Price: 17 percent Performance: 17 percent Base configuration: 5 percent						
1	Dell Inspiron 3800 800/388-8542 www.dell.com	NEW	94	Inexpensive: \$1349	Very good 113	Satisfactory: Celeron-600, 12.1-inch active screen, touchpad, eraserhead, 64MB of SDRAM, 5GB hard drive, Windows 98 SE
2	Dell Latitude CPT S500ST 888/812-3355 www.dell.com	Oct 00	87	Average: \$1658	Good 109	Satisfactory: Celeron-500, 12.1-inch active screen, touchpad, eraserhead, 64MB of SDRAM, 6GB hard drive, Windows 98 SE
3	Gateway Solo 1150cl 800/846-2000 www.gateway.com	Dec 00	85	Inexpensive: \$1299	Good 96	Satisfactory: Celeron-550, 12.1-inch active screen, touchpad, 64MB of SDRAM, 6GB hard drive, Windows Millennium Edition
4	Sceptre Soundx 7300 800/788-2878 www.sceptre.com	Nov 00	83	Expensive: \$1909	Very good 115	Good: Pentium III-600/500, 13.3-inch active screen, touchpad, 64MB of SDRAM, 6GB hard drive, Windows 98 SE
5	Fujitsu LifeBook i-4177 877/372-3473 www.fujitsu.com	NEW	83	Average: \$1399	Good 99	Satisfactory: Celeron-500, 12.1-inch active screen, touchpad, 64MB of SDRAM, 6GB hard drive, Windows 98 SE
Best Buy Percent of overall rating ▶ Price: 20 percent Performance: 14 percent Base configuration: 5 percent						

¹ Unless otherwise noted, all notebooks come with a lithium ion battery.

² Includes computer; adapter; power cord; and floppy, DVD-ROM, or CD-ROM drive.

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.



NO MATTER WHAT kind of laptop you seek—decked out or budget priced, touchpad- or eraserhead-equipped, super-sonic or slower—we have one word for you this month: Dell.

Buoyed by generous speed, features, and manufacturer support, Dell notebooks swept first- and second-place Best Buys in both power and budget categories. Pick what's best for you: the built-for-business \$2737 Inspiron 4000 or the new budget-priced \$1349 Inspiron 3800. Both

have cases in eye-catching colors such as purple, accommodate lots of different add-in extras, and offer dual pointing devices. The Inspiron 4000 achieved a Very Good rating in our battery tests, lasting over 4 hours; the Inspiron 3800 has the best keyboard on the chart.

In addition to the Inspiron 3800, three other new notebooks made our list. At only 5.1 pounds with a 14.1-inch screen

Extra features ¹	Design and ease of use	Battery life (hours:min)	Travel weight (pounds) ²	Vendor's system reliability	Tech support quality/policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)
Good: multipurpose bay, 10X-24X CD-ROM drive, built-in modem, Microsoft Office 2000 Small Business Edition	Very good: great choice for sharing; optional color palm rests and screen back dress up looks	Very good/ 4:10	Average/ 7.9	Good	Good/ Good	24/7, toll-free	1/1
Very good: multipurpose bay, 8X DVD-ROM drive, built-in modem and NIC, IEEE 1394 port, Office 2000 SBE	Outstanding: customizable color panels and headphones plus stereo speakers	Good/ 3:24	Heavy/ 9.3	Good	Good/ Good	24/7, toll-free	3/3
Good: multipurpose bay, 10X-24X CD-ROM drive, built-in modem and NIC	Very good: easy to upgrade, but keyboard could be steadier; few internal add-ins are available	Good/ 3:10	Average/ 7.1	Fair	Fair/ Good	24/7, toll-free	3/3
Very good: multipurpose bay, 6X DVD-ROM drive, built-in modem and NIC	Very good: travel ThinkPad adds Bluetooth port, network jack, and great electronic manual	Good/ 3:21	Light/ 6.5	Good	Good/ Fair	24/7, toll-free	3/3
Very good: two multipurpose bays, 10X-24X CD-ROM drive, LS-120 drive, built-in modem, PC Card NIC	Outstanding: drive-in-movie-size screen dominates fast SUV of desktop replacements	Good/ 3:24	Heavy/ 9.6	Fair	Fair/ Good	24/7, toll-free	3/3
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: multipurpose bay, 12X-24X CD-ROM drive, built-in modem and NIC	Outstanding: Bluetooth-ready, dual-pointing devices, security Smart Card, lots of add-in options	Good/ 3:30	Light/ 6.8	Good	Good ³ / Fair	24/7, toll call	3/3
Good: multipurpose bay, 4X/2X/20X CD-RW drive, built-in modem and NIC, Microsoft Works 2000	Very good: LAN-ready lightweight with quiet keyboard; CD-RW drive replaces floppy	Very good/ 4:21	Light/ 6.7	Fair	Good ³ / Fair	24/7, toll-free	1/1
Satisfactory: multipurpose bay, 12X-24X CD-ROM drive, built-in modem and NIC	Satisfactory: takes fewer add-ins than other laptops, and modem requires extra cable	Very good/ 4:13	Light/ 6.3	.	Fair ³ / Fair	24/7, varies ⁴	1/3
Very good: two multipurpose bays, 10X-24X CD-ROM drive, built-in modem, Microsoft Office 2000 SBE	Outstanding: two modular bays offer a wide range of configuration options	Outstanding/ 4:46	Average/ 8.6	Fair	Fair/ Good	24/7, toll-free	3/3
Satisfactory: 8X DVD-ROM drive, built-in modem and NIC	Average: business laptop has improved CD player controls, cursor lock; Bluetooth-ready	Good/ 3:26	Average/ 8.2	Good	Good ³ / Poor	24/7, toll call	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: multipurpose bay, 10X-24X CD-ROM drive, Microsoft Works 2000	Excellent: thinnish, adaptable business laptop comes in different colors	Outstanding/ 3:17	Average/ 8.3	Good	Good/ Good	24/7, toll-free	1/1
Good: multipurpose bay, 10X-24X CD-ROM drive, built-in modem	Outstanding: flexible; includes touchpad and eraserhead; bay can hold any of eight devices	Satisfactory/ 2:02	Average/ 7.4	Good	Good/ Good	24/7, toll-free	1/1
Limited: 10X-24X CD-ROM drive, built-in modem	Satisfactory: boombox-worthy built-in speakers top off sleek iBook-reminiscent design	Satisfactory/ 2:27	Average/ 7.8	Fair	Fair/ Good	24/7, toll-free	3/3
Satisfactory: 10X-24X CD-ROM drive, built-in modem and NIC	Satisfactory: full set of ports; slice adds internal bays and IEEE 1394 ports	Good/ 3:07	Light/ 6.8	.	Good ³ / Fair	9/5, toll-free	1/1
Satisfactory: multipurpose bay, 8X DVD-ROM drive, built-in modem, Microsoft Works 2000	Very good: boxy legacy-light portable's multimedia features include 8X DVD-ROM drive	Satisfactory/ 2:19	Average/ 7.7	Good	Poor ³ / Fair	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		

¹ Support toll-free from 8:30 a.m. to 5:30 p.m. PST; toll call at other times.

(and a weight saver that takes the place of the CD-ROM drive), Gateway's \$2772 Solo 5300XL proves you don't have to pay top dollar for a portable with a big display.

FULL REVIEWS ONLINE



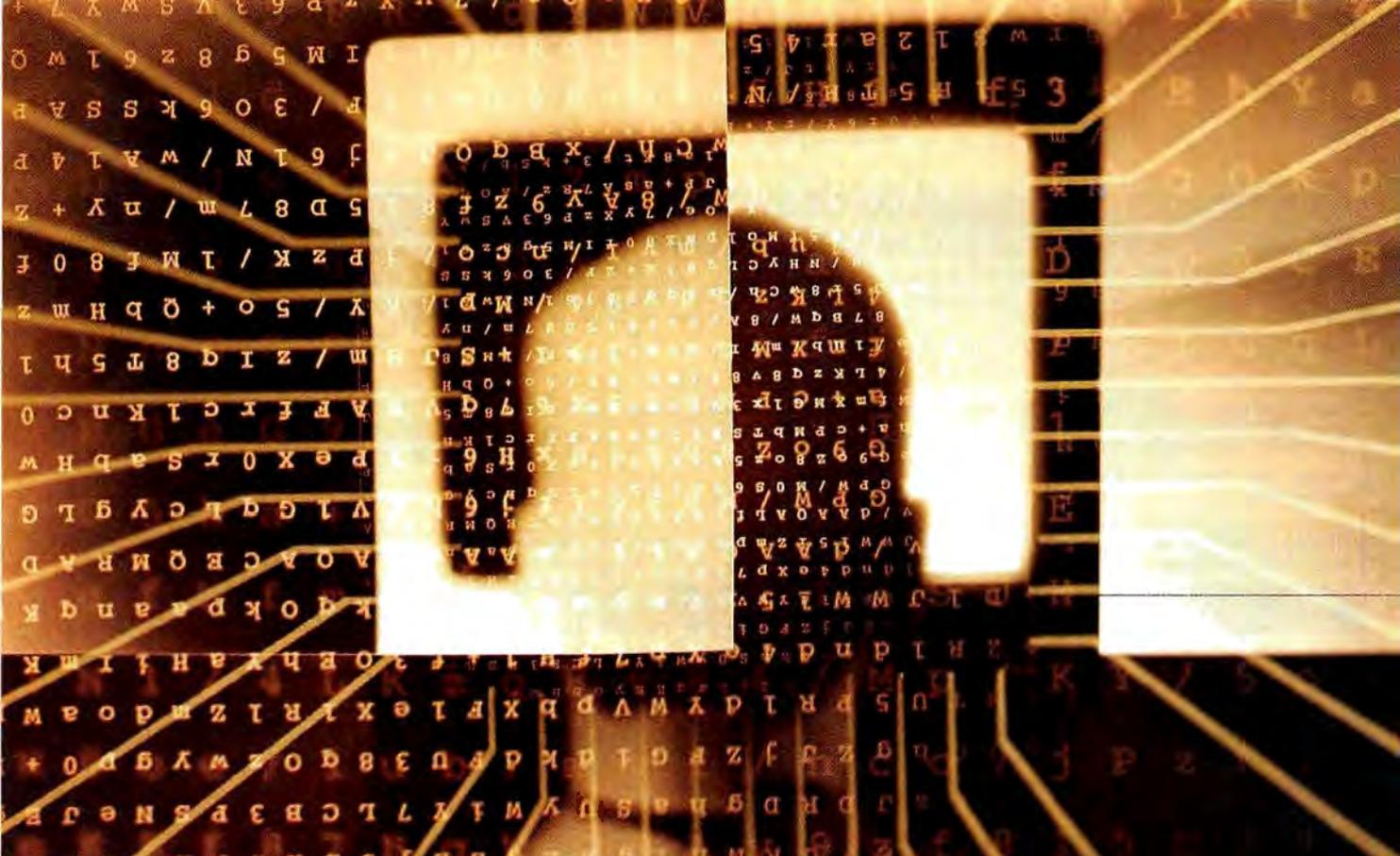
FOR DETAILED write-ups of all the new notebooks that we tested this month, visit PCWorld.com (www.pcworld.com/top400).

The \$2499 HP OmniBook XE3 offers a more casual case design and easier-to-use audio CD controls than the old XE2. Fujitsu's funky off-white, USB-reliant LifeBook i-4177 might appeal to students and others looking for a \$1399 laptop that can download tunes to a minidisc player.

Contributing Editor Carla Thornton regularly covers notebooks for PC World. ▶

DELL INSPIRON 3800: Impressive performance in a svelte, affordable package.





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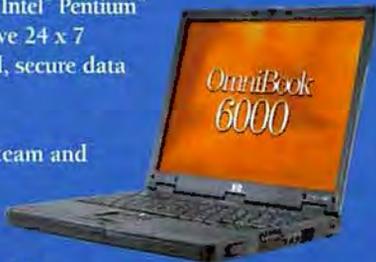
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TOP 15 HOME PCs

POWER SYSTEM: \$2000 AND OVER		Month tested	★ Overall rating	Street price (10/13/00)	PC WorldBench 2000 performance score ¹ Faster	Base configuration ²
1	 Dell Dimension XPS B1000r 800/388-8542 www.dell.com	Nov 00	92	Average: \$2570	Good 158	Very good: Pentium III-1000, 128MB of RDRAM, 256KB L2 cache, 30GB hard drive, midsize tower, 19-inch monitor, Windows Me
2	Gateway Select 1100 Deluxe 800/315-2536 www.gateway.com	Nov 00	87	Very expensive: \$2938	Very good 164	Very good: Athlon-1100, 128MB of SDRAM, 256KB L2 cache, 46GB hard drive, midsize tower, 19-inch monitor, Windows Me
3	Polywell Poly 830 KR-1000 800/999-1278 www.polywell.com	Dec 00	85	Inexpensive: \$2299	Outstanding 167	Outstanding: Athlon-1000, 256MB of SDRAM, 256KB L2 cache, dual 30GB SCSI hard drives, midsize tower, 19-inch monitor, Windows Me
4	Sony VAIO Digital Studio RX280DS 888/315-7669 www.sony.com/pc	Dec 00	84	Expensive: \$2700	Very good 164	Good: Pentium III-1000, 128MB of SDRAM, 256KB L2 cache, 61GB hard drive, minitower, 17-inch monitor, Windows Me
5	Compaq Presario 7000T 800/345-1518 www.compaq.com	Dec 00	83	Expensive: \$2816	Good 155	Very good: Pentium III-1000, 128MB of SDRAM, 256KB L2 cache, 75GB hard drive, midsize tower, 19-inch monitor, Windows Me
MIDRANGE SYSTEM: \$1200 TO \$1999		Percent of overall rating ▶		Price: 10 percent	Performance: 20 percent	Base configuration: 10 percent
1	 NuTrend Athlon Ultra 2 888/482-6678 www.nutrend.com	Dec 00	89	Average: \$1629	Very good 154	Very good: Athlon-850, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, midsize tower, 19-inch monitor, Windows 98 SE
2	Micron Millennia Max 733 800/642-7667 www.micronpc.com	July 00	88	Very expensive: \$1965	Very good 150	Very good: Pentium III-733, 128MB of SDRAM, 256KB L2 cache, 20.5GB hard drive, midsize tower, 19-inch monitor, Windows 98 SE
3	ABS Multimedia System 2 800/876-8088 www.buyabs.com	Dec 00	87	Inexpensive: \$1489	Outstanding 160	Very good: Athlon-950, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, midsize tower, 19-inch monitor, Windows 98 SE
4	Gateway Performance 866 800/315-2536 www.gateway.com	Dec 00	87	Expensive: \$1814	Very good 157	Good: Pentium III-866, 128MB of SDRAM, 256KB L2 cache, 40GB hard drive, midsize tower, 17-inch monitor, Windows Me
5	HP Pavilion 87051 ⁴ 800/752-0900 www.hpshopping.com	Dec 00	85	Average: \$1797	Good 145	Good: Pentium III-866, 128MB of SDRAM, 256KB L2 cache, 40GB hard drive, midsize tower, 17-inch monitor, Windows Me
BUDGET SYSTEM: UNDER \$1200		Percent of overall rating ▶		Price: 15 percent	Performance: 15 percent	Base configuration: 10 percent
1	 HP Pavilion 8705B 800/752-0900 www.hpshopping.com	NEW	84	Very expensive: \$1199	Outstanding 143	Very good: Pentium III-800EB, 64MB of SDRAM, 256KB L2 cache, 30.7GB hard drive, midsize tower, 17-inch monitor, Windows Me
2	HP Pavilion XE763 800/752-0900 www.hpshopping.com	Dec 00	83	Inexpensive: \$898	Satisfactory 104	Satisfactory: Celeron-700, 64MB of SDRAM, 128KB L2 cache, 15GB hard drive, minitower, 15-inch monitor, Windows Me
3	NuTrend Duron Power 2 888/482-6678 www.nutrend.com	Oct 00	83	Average: \$999	Very good 133	Very good: Duron-700, 128MB of SDRAM, 64KB L2 cache, 20GB hard drive, minitower, 17-inch monitor, Windows 98 SE
4	Polywell Poly 700KD 800/999-1278 www.polywell.com	Oct 00	81	Expensive: \$1188	Very good 131	Very good: Duron-700, 128MB of SDRAM, 64KB L2 cache, 20GB hard drive, midsize tower, 17-inch monitor, Windows 98 SE
5	Kaypro 4100 888/352-9776 www.kaypro.com	Dec 00	68	Average: \$1029	Good 121	Good: Pentium III-650, 64MB of SDRAM, 256KB L2 cache, 13GB hard drive, minitower, 17-inch monitor, Windows 98 SE
 Best Buy	Percent of overall rating ▶		Price: 20 percent	Performance: 10 percent	Base configuration: 10 percent	

¹ Performance word scores reflect comparisons of PCs in the same price category running the same operating system. For more details, see "Your Guide to the Top 100" on page 157.

² Vertical cases are towers (over 20 inches), midsize towers (15.5 to 20 inches), or minitowers (under 15.5 inches). Horizontal cases are desktops (5 inches or taller) or compacts (under 5 inches).



BUDGET KEEPS getting better. This month's low-end Best Buy, the HP Pavilion 8705B, packs components that would have made a strong showing in our midrange lineup just a few months ago—a Pentium III-800EB processor, a 17-inch monitor, and a 16X DVD-ROM drive. At 64MB, the memory is a bit skimpy, but the system still managed an impressive PC WorldBench 2000 score of 143, within striking distance of midrange systems. In contrast to the

8705B is its stripped-down cousin and last month's Best Buy, the Pavilion XE763, which delivers much slower performance, but at a significantly lower price.

Three other newcomers vied unsuccessfully for spots on our midrange chart. The ABS Performance 3 and NuTrend Athlon Mega 2 performed respectably, but they failed to offer anything over their nearly identical siblings, the ABS Multi-

Extra features	Setup/ease of use	Graphics	Reliability/support	Comments
Very good: OEM GeForce2 GTS graphics board with 64MB of DDR SDRAM, 12X DVD-ROM drive, 8X/4X/32X CD-RW drive, V.90 modem	Outstanding/Good	Very good	Outstanding/Outstanding	PRO: Smooth graphics and good color; \$259 price drop. CON: Speakers aren't first-rate, monitor lacks the crispness we expect from Dell.
Very good: OEM GeForce2 GTS graphics board with 64MB of DDR SDRAM, 16X DVD-ROM drive, 8X/4X/32X CD-RW drive, V.90 modem	Good/Very good	Very good	Fair/Fair	PRO: Excellent monitor and sound system, latches provide easy access to drive bays. CON: Premium processor imposes premium price.
Very good: Leadtek WinFast GeForce2 GTS graphics board with 32MB of DDR SGRAM, 8X/4X/32X CD-RW drive, V.90 modem	Good/Good	Good	*/Fair*	PRO: Fastest home system we have seen; reasonable price for the performance. CON: No DVD-ROM drive; minimal documentation.
Outstanding: Asus AGP-V7100 graphics board with 32MB of SDRAM, 16X DVD-ROM drive, 8X/4X/32X CD-RW drive, NIC, V.90 modem	Satisfactory/Good	Good	Good/Fair	PRO: Fast, stylish system with a beautiful monitor, ideal for video and graphics fans. CON: Includes only a chintzy sound system.
Outstanding: Creative Labs GeForce2 GTS graphics board with 64MB of DDR SDRAM, 16X DVD-ROM drive, 8X/4X/32X CD-RW drive, NIC, V.90 modem	Good/Good	Very good	Poor/Fair	PRO: Fast, fully loaded system drops \$260 this month. CON: Slowest PC in this power lineup; second-rate speakers.
Extra features: 10 percent	Setup/ease of use: 5 percent	Graphics: 15 percent	R & S: 30 percent	
Very good: Leadtek WinFast GeForce2 MX graphics board with 32MB of SDRAM, 16X DVD-ROM drive, 8X/4X/32X CD-RW drive, V.90 modem	Satisfactory/Outstanding	Very good		PRO: Fast for its processor class; great four-channel sound; \$110 less this month. CON: Movies look dark; monitor flickers at high resolution.
Good: OEM NV990 graphics board with 32MB of DDR SGRAM, 12X DVD-ROM drive, V.90 modem ⁴	Outstanding/Good	Very good	Good/Good	PRO: Strong graphics performer with plenty of room for upgrades. CON: Seems well overdue for a price reduction.
Good: Leadtek WinFast 3D S325 graphics board with 32MB of SDRAM, 10X DVD-ROM drive, V.90 modem	Satisfactory/Satisfactory	Good	*/Fair*	PRO: \$110 cheaper this month; speakers and subwoofer deliver full, rich sound. CON: Low frame-rate scores on game tests; DVD movies appear dark.
Good: OEM TNT2 graphics board with 32MB of SDRAM, 16X DVD-ROM drive, V.90 modem	Satisfactory/Good	Good	Fair/Fair	PRO: fast for its processor class; lots of room for upgrades. CON: \$105 extra this month, due to a modest 10GB increase in hard drive capacity.
Very good: Asus AGP-V3800 graphics board with 16MB of SDRAM, 12X DVD-ROM drive, 8X/4X/32X CD-RW drive, V.90 modem	Outstanding/Good	Good	Fair/Fair	PRO: Comes with handsome monitor and network card; \$88 price drop. CON: Slowest system we've seen for its processor class.
Extra features: 10 percent	Setup/ease of use: 10 percent	Graphics: 10 percent	R & S: 30 percent	
Good: Asus AGP V-3800SD graphics board with 16MB of SDRAM, 16X DVD-ROM drive, V.90 modem	Satisfactory/Good	Satisfactory	Fair/Fair	PRO: Midrange performance and features for a budget price. CON: Cramped case is extremely difficult to work in for upgrades.
Very good: integrated Intel 810 graphics with UMA, 8X DVD-ROM drive, V.90 modem, ink jet printer	Good/Outstanding	Limited	Fair/Fair	PRO: Surprisingly good monitor and sound system for the price. CON: Slow machine, poor graphics; available only at Wal-Mart.
Good: Leadtek WinFast TNT2 M64 graphics board with 32MB of SDRAM, 10X DVD-ROM drive, V.90 modem, ink jet printer	Satisfactory/Good	Satisfactory		PRO: Great speed for the price, quality sound system. CON: Monitor blurs text at high resolutions; DVD playback was a bit dark.
Good: Micro-Star MS-8808 graphics board with 32MB of SDRAM, 10X DVD-ROM drive, V.90 modem	Very good/Satisfactory	Good	*/Fair*	PRO: Good performer; ample expansion room. CON: Speakers sound a bit muddy; game play is somewhat choppy at high resolution.
Satisfactory: integrated ATI Rage Pro Turbo graphics with UMA, 22X-48X CD-ROM drive, V.90 modem	Satisfactory/Good	Limited		PRO: Good expansion options and easy access to them. CON: Integrated graphics lead to poor game performance; sound system is weak.
Extra features: 10 percent	Setup/ease of use: 10 percent	Graphics: 10 percent	R & S: 30 percent	

¹ Insufficient data to give a rating.

⁴ Due to insufficient data from survey, score is based on responses to anonymous calls for tech support.

⁵ Now equipped with an OEM RIVA M64 graphics board with 32MB of RAM.

⁶ Same configuration as last month's Pavilion 8700i; vendor changed model name.

media System 2 and NuTrend Athlon Ultra 2. The latter rises to the top spot in place of Dell's Dimension 4100 P111-800, which Dell has discontinued in favor of

FULL REVIEWS ONLINE



FOR WRITE-UPS on all the systems we reviewed this month, visit PCWorld.com (www.pcworld.com/top400/newhomepcs).

models with faster processors. We'll evaluate new Dimension 4100 systems in coming months. Meanwhile, Tiny's Millennium Power Image 800 failed to make the chart because it couldn't deliver performance commensurate with its price.

Finally, PC World's latest reader survey (see page 108) shows modest gains in PC reliability and service—with Dell, Micron, and Sony posting improved ratings. ▶



OUR BUDGET Best Buy: HP's Pavilion 8705B.

Stranded by traditional delivery systems?



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TOP 10 PRINTERS

	SMALL-BUSINESS/HOME-OFFICE LASER	Street price (10/5/00)	Overall rating	Speed for plain text/full-page graphics (ppm)	Print quality for text/gray-scale graphics	Comments
1	 Minolta-QMS PagePro 1100L 800/276-7746 www.minolta-qms.com	\$189	87	8.6/4.7	Very good/ Adequate	FEATURES: Rated 10 ppm. Standard 4MB of RAM, 600-by-600-dpi maximum resolution, 150 sheets input, 100 output. SUMMARY: The Minolta-QMS PagePro 1100L is the lowest-priced model on the SOHO list, as well as the speediest at printing graphics. Text appears solid, sharp, and clean, but gray-scale images are so dark they lose large chunks of detail.
2	Brother HL-1240 800/358-6661 www.brother.com	\$299	86	8.2/3.0	Very good/ Good	FEATURES: Rated 12 ppm. Standard 2MB of RAM, 600-by-600-dpi maximum resolution, 250 sheets input, 150 output. SUMMARY: The HL-1240 produces terrific-looking text and smooth gray-scale images at respectable speeds and for a reasonable price. It's also small and quiet—big pluses in crowded office spaces.
3	IBM Infoprint 12  800/358-6661 www.ibm.com/printers	\$399	83	9.5/3.1	Very good/ Good	FEATURES: Rated 12 ppm. Standard 4MB of RAM, 1200-by-1200-dpi maximum resolution, 350 sheets input, 350 output. SUMMARY: The Infoprint 12 comes in with the fastest text speed on the SOHO list and produces sharp, dark text. Gray-scale graphics print reasonably fast, with good detail, but they also appear somewhat dotted and choppy.
4	NEC SuperScript 1400  800/632-4636 www.nectech.com	\$349	82	6.9/3.0	Very good/ Good	FEATURES: Rated 12 ppm. Standard 4MB of RAM, 1200-by-1200-dpi maximum resolution, 350 sheets input, 350 output. SUMMARY: The SuperScript 1400 uses the same engine as the IBM Infoprint 12 and prints the same clean text and light but choppy gray-scale graphics. Text speed is slower than the IBM's, but graphics speed is almost identical.
5	Samsung ML-4500  888/887-8536 www.samsungusa.com	\$199	81	5.6/2.6	Very good/ Adequate	FEATURES: Rated 8 ppm. Standard 2MB of RAM, 600-by-600-dpi maximum resolution, 150 sheets input, 100 output. SUMMARY: Samsung's ML-4500 is among the least-expensive new monochrome lasers we've seen. Text speed is slow and gray-scale images appear dotted, but letters look just as sharp and solid as many more-expensive lasers.
CORPORATE LASER						
1	 NEC SuperScript 1800N 800/632-4636 www.nectech.com	\$999	87	11.3/3.7	Excellent/ Good	FEATURES: Rated 17 ppm. Standard 20MB of RAM, 1200-by-1200-dpi maximum resolution, 1100 sheets input, 250 output. SUMMARY: The SuperScript 1800N produces perfectly clean, sharp text and detailed, though slightly dark, gray-scale images. It offers speedy graphics performance, and best of all it comes with ethernet and a duplexer for about a thousand bucks.
2	Lexmark Optra M412 800/539-6275 www.lexmark.com	\$799	86	13.0/0.7	Very good/ Good	FEATURES: Rated 17 ppm. Standard 4MB of RAM, 1200-by-1200-dpi maximum resolution, 350 sheets input, 270 output. SUMMARY: This nonnetworked model has the quickest text speed on the chart but prints graphics slowly. Output quality is sharp and smooth, and the Optra M412's price is right. The networked model costs \$300 more and comes with 8MB of RAM.
3	Xerox DocuPrint N2125 877/362-6567 www.xerox.com	\$1399	86	11.7/3.7	Very good/ Very good	FEATURES: Rated 21 ppm. Standard 32MB of RAM, 1200-by-1200-dpi maximum resolution, 650 sheets input, 500 output. SUMMARY: The N2125 offers reasonable performance and very sharp print quality, but it's the most expensive printer on the chart. Paper options for adding up to 1750 sheets make it a nice addition for larger offices.
4	IBM Infoprint 21 800/358-6661 www.ibm.com/printers	\$1179	86	12.2/1.5	Very good/ Good	FEATURES: Rated 21 ppm. Standard 32MB of RAM, 1200-by-1200-dpi maximum resolution, 550 sheets input, 500 output. SUMMARY: IBM's Infoprint 21 delivers speedy text printing and crisp output quality for a moderate price. Text looks especially sharp, and gray-scale graphics, though light, appear smooth and detailed.
5	Minolta-QMS PagePro 4100W  800/264-6658 www.minolta-qms.com	\$589	85	11.0/4.9	Very good/ Good	FEATURES: Rated 18 ppm. Standard 2MB of RAM, 1200-by-600-dpi maximum resolution, 250 sheets input, 250 output. SUMMARY: This basic, nonnetworked model is the least expensive on the corporate chart and produces graphics the fastest. Text speed is somewhat slow, but letters appear clean and dark.
 Best Buy  Windows 95-certified Plug and Play  For reviews of printers we tested this month, visit www.pcworld.com/t10printers .						



HOW WE TEST The overall rating for both small-business/home and corporate monochrome laser printers 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.



IT'S A GOOD TIME FOR new, inexpensive monochrome lasers—all four we tested this month made the chart. On the SOHO list, IBM's \$399 Infoprint 12 and NEC's \$349 SuperScript 1400

offer similarly strong print quality. Samsung's ML-4500 is a basic laser at one of the best prices we've seen—\$199. On the corporate side, the \$589 Minolta-QMS PagePro 4100W climbs aboard, thanks to its ultralow price and quick graphics printing. ▶

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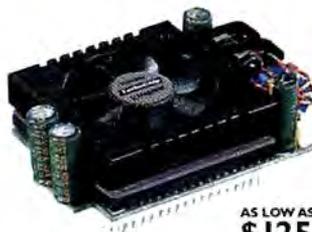
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TOP 10 MONITORS

	17-INCH MONITOR	Month tested	Street price (10/5/00)	Overall rating	Quality of text/graphics	Comments
1	 ViewSonic EF70 800/888-8583 www.viewsonic.com	Sept 00	\$265	87	Very good/ Excellent	FEATURES: 16.1-inch viewable area, .25mm stripe-pitch Diamondtron NF tube, ¹ up to 87-Hz refresh rate, ² Plug and Play ready, ³ three-year warranty, 24-hour daily toll-free support. SUMMARY: Deep, saturated color in graphics keeps this model at the top. Sophisticated on-screen control menu is easy to navigate with standard buttons on the front bezel.
2	 Samsung SyncMaster 700NF 800/726-7864 www.samsungmonitor.com	July 00	\$284	87	Very good/ Very good	FEATURES: 16-inch viewable area, .25mm stripe-pitch Diamondtron NF tube, ¹ up to 85-Hz refresh rate, ² Plug and Play ready, ³ TCO'99 compliant, three-year warranty, 24-hour daily toll-free support. SUMMARY: Radiant colors and fine detail make this a good choice for heavy graphics work. Easy-to-use on-screen controls are set on a retracting panel. A \$28 price drop sweetens the deal.
3	CTX PR705F 800/888-9052 www.ctxintl.com	Retested	\$269	87	Very good/ Excellent	FEATURES: 15.9-inch viewable area, .24mm stripe-pitch FD Trinitron tube, ¹ up to 85-Hz refresh rate, ² Plug and Play ready, ³ TCO'99 compliant, three-year warranty, 12-hour weekday toll-free support. SUMMARY: After its price shed \$50, we retested the PR705F and found smoother graphics but slightly fuzzier text. On-screen menus are especially easy to use, with well-labeled icons.
4	NEC MultiSync FE700 800/632-6487 www.nectech.com	Feb 00	\$279	86	Very good/ Very good	FEATURES: 15.6-inch viewable area, .25mm stripe-pitch Diamondtron NF tube, ¹ up to 87-Hz refresh rate, ² Plug and Play ready, ³ TCO'99 compliant, three-year warranty, 11.5-hour weekday toll-free support. SUMMARY: A \$20 price drop boosts this model up the chart. It displays rich colors, but text in word processing documents and spreadsheets could be sharper.
5	LG Flatron 795FT-Plus 800/243-0000 www.lgeus.com	Sept 00	\$310	85	Very good/ Very good	FEATURES: 15.9-inch viewable area, .24mm stripe-pitch LG Flatron tube, ¹ up to 120-Hz refresh rate, ² Plug and Play ready, ³ TCO'99 compliant, three-year warranty, 12-hour daily toll-free support. SUMMARY: Bright, saturated color makes this model a good choice for extensive graphics work. The small, sophisticated on-screen controls on the front bezel are simple to use and navigate.
6	Eizo Nanao FlexScan T561 800/800-5202 www.eizo.com	Nov 00	\$489	85	Excellent/ Excellent	FEATURES: 15.9-inch viewable area, .25mm stripe-pitch Diamondtron NF tube, ¹ up to 118-Hz refresh rate, ² Plug and Play ready, ³ TCO'99 compliant, three-year warranty, 8-hour weekday toll-free support. SUMMARY: Superb image quality sets this model apart from the others—but for a pretty penny. Meager support hours; confusing on-screen controls make using the manual essential.
7	Iiyama I70A 800/394-4335 www.iyamadirect.com		\$269	85	Very good/ Excellent	FEATURES: 16.1-inch viewable area, .25mm stripe-pitch Diamondtron NF tube, ¹ up to 85-Hz refresh rate, ² Plug and Play ready, ³ three-year warranty, 12-hour weekday toll-free support. SUMMARY: Rich graphics, fine text, and a reasonable price mark this new addition to the chart. Easy-to-use controls include a zoom feature and well-marked menus.
8	Sony Multiscan CPD-G200 888/476-6972 www.sony.com/displays	July 00	\$400	85	Very good/ Excellent	FEATURES: 16-inch viewable area, .24mm-.25mm stripe-pitch FD Trinitron tube, ¹ up to 85-Hz refresh rate, ² Plug and Play ready, ³ TCO'99 compliant, three-year warranty, 24-hour daily toll-free support. SUMMARY: Colors are vivid and text is razor-sharp, but you can find comparable image quality at a lower price. On-screen controls are extremely difficult to navigate.
9	HP P700 800/752-0900 www.hp.com	Nov 00	\$349	84	Excellent/ Very good	FEATURES: 16-inch viewable area, .24mm stripe-pitch LG Flatron tube, ¹ up to 85-Hz refresh rate, ² Plug and Play ready, ³ TCO'95 compliant, three-year warranty, 11-hour weekday toll-free support. SUMMARY: The P700 creeps onto the chart this month. Text is especially sharp, and graphics—though less impressive—remain strong. Support hours could be better, however.
10	EPI AOC7Glr 888/838-6388 www.epius.com	July 00	\$199	84	Satisfactory/ Very good	FEATURES: 16-inch viewable area, .25mm dot-pitch tube, up to 85-Hz refresh rate, ² Plug and Play ready, ³ TCO'92 compliant, three-year warranty, 10-hour daily toll-free support. SUMMARY: A good choice for price-conscious buyers who are willing to overlook the display's merely average text quality. Colors on Web pages look bright. On-screen menu has some advanced controls.



Best Buy

For reviews of products that didn't make the chart, visit www.pcworld.com/t10monitors.

TEST CENTER **HOW WE TEST** Ten judges rate a monitor's text and graphics quality. We evaluate each unit on how well it displays typical business letters, a newsletter, spreadsheets, Web pages, and scanned images. The overall rating is based on text and graphics quality (25 percent each), 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 the PC World Test Center. All rights reserved. ¹ Uses an aperture grille whose parallel wires near the sides of the screen are strung farther apart than those at the middle. ² Maximum refresh rate at 1024 by 768 resolution. ³ Plug and Play monitors and graphics cards can communicate bidirectionally. However, Windows 95 does not fully utilize monitor Plug and Play.



VIEWSONIC'S EF70 and Samsung's SyncMaster 700NF stand at the top of the chart this month. The number three position goes to CTX's PR705F—after a \$50 price drop and a second look

by our lab. The \$269 Iiyama I70A pops onto the chart at number seven, with rich graphics display capabilities and some high-end controls. HP's P700, which missed the Top 10 when it debuted in November, comes in at number nine. ▶

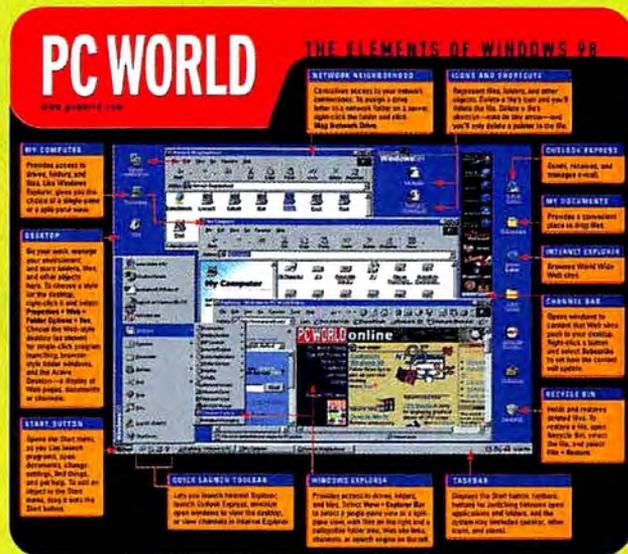
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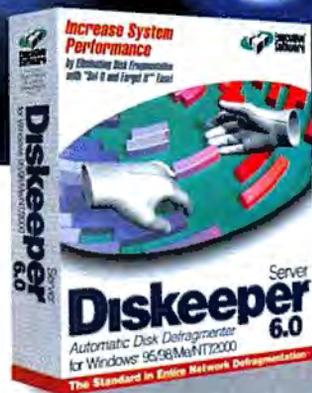
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TOP 10 GRAPHICS BOARDS

	AGP BOARD	Month tested	Street price (10/20/00)	Overall rating	Mixed-media business rating	3D games rating	Features rating	Comments
1	 Cardexpert GeForce2 MX 800/539-2273 www.gainward.com	Dec 00	\$129	95	Excellent	Excellent	Very good	FEATURES: 4X AGP, NVidia GeForce2 MX chip, 32MB SDRAM, 350-MHz RAMDAC. SUMMARY: Retains top spot with forceful performance and the lowest price we've seen for GeForce2 MX chip. Its elder sibling, the \$210 GeForce 256 DDR, performs well too and adds a 3D games bundle and extras such as TV-out.
2	 Hercules 3D Prophet II MX 877/484-5536 www.hercules.com	Nov 00	\$150	91	Excellent	Excellent	Very good	FEATURES: 4X AGP, NVidia GeForce2 MX chip, 32MB of SDRAM, 350-MHz RAMDAC, bundled 3D games—Quake 3 Arena, Rayman 2, and more. SUMMARY: Moves up one notch. Offers brisk performance and ample games at an alluring price. A fine choice for cost-conscious gamers.
3	Asus AGP-V7100 Pure 32MB 510/739-3777 www.asus.com	Dec 00	\$139	90	Excellent	Very good	Excellent	FEATURES: 4X AGP, NVidia GeForce2 MX chip, 32MB of SDRAM, 350-MHz RAMDAC. SUMMARY: Offers solid 3D performance at a competitive price. A good choice for mainstream businesses. The \$189 AGP-V6600 Deluxe adds video capture, TV-out, 3D glasses, and overclocking utilities.
4	Leadtek Winfast GeForce 256 DDR 888/532-3835 www.leadtek.com	May 00	\$249	90	Excellent	Excellent	Very good	FEATURES: 4X AGP, NVidia GeForce 256 chip, 32MB of DDR SGRAM, 350-MHz RAMDAC, TV-out, Asymetrix 3D/FX and Digital Video Producer, bundled color-calibration tools. SUMMARY: Ample software bundle complements zippy 3D performance. Good choice for image pros.
5	ATI Rage Fury Pro 905/882-2600 www.ati.com	Feb 00	\$119	89	Good	Good	Very good	FEATURES: 4X AGP, ATI Rage 128 Pro chip, 32MB of SDRAM, 350-MHz RAMDAC, TV-out, bundled 3D games—Activision's Heavy Gear 2 and GT Interactive's Need for Speed IV. SUMMARY: Price drops \$20 further on bargain board. Performs impressively in every game but Quake 3; a good choice for casual gamers.
6	Matrox Millennium G400 800/361-1408 www.matrox.com/mga	Feb 00	\$179	89	Excellent	Very good	Very good	FEATURES: 4X AGP, Matrox G400 chip, 32MB of SGRAM, 300-MHz RAMDAC, bundled Micrografix Picture Publisher and Simply 3D, plus 3D game—Rage Software's Expendable. SUMMARY: Top-notch speed and dual-head functionality make this a fine choice for businesses. Matrox's \$299 Marvel G400-TV offers TV tuning.
7	ATI Radeon 32MB 905/882-2600 www.ati.com	NEW	\$150	88	Very good	Excellent	Excellent	FEATURES: 4X AGP, Radeon chip, 32MB of SDRAM, 350-MHz RAMDAC, no bundled software. SUMMARY: Lacks software, but offers brisk 3D performance. Its 32MB DDR sibling (\$169) is slightly slower. ATI's generous five-year warranty is a nice extra. Includes video capture, TV-out, and hardware MPEG decoder.
8	ELSA Gladiac 32MB 800/272-3572 www.elsa.com	Aug 00	\$299	85	Excellent	Excellent	Very good	FEATURES: 4X AGP, NVidia GeForce2 GTS chip, 32MB of DDR SGRAM, 350-MHz RAMDAC, TV-out, no bundled applications. SUMMARY: Price drops \$30. This swift performer renders lovely images and features digital output. Lighting effects look good in Quake 3. Tops our online gaming board chart.
9	Creative Labs 3D Blaster Annihilator 2 800/998-1000 www.creativelabs.com	Sept 00	\$300	85	Very good	Excellent	Very good	FEATURES: 4X AGP, NVidia GeForce2 GTS chip, 32MB of DDR SGRAM, 350-MHz RAMDAC, bundled color-calibration tools. SUMMARY: Has high-powered 3D performance and carries a reasonable price for NVidia's GeForce2 GTS chip set. Sky effects look blotchy in Quake 3, as is typical of boards that use this chip.
10	3dfx Voodoo5 5500 AGP 888/367-3339 www.3dfx.com	Sept 00	\$299	84	Very good	Very good	Very good	FEATURES: 4X AGP, dual 3dfx V5A-100 chip, 64MB of DDR SDRAM, 350-MHz RAMDAC, bundled color-calibration tools. SUMMARY: This eagerly awaited card pulled in slightly lower 3D performance than cards with the GeForce2 GTS chip. Still, it earned the highest score in Unreal Tournament.



Best Buy

For reviews of other new graphics boards that we tested this month, visit www.pcworld.com/t10graphics.

TEST 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 Pentium III-600 CPU and 128MB of RAM. Overall rating is based on performance (42.5 percent), features (27.5 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'S GEFORCE2 MX chip set drives the top three boards this month. Cards using this chip set are proving to be a great choice for those who want breakneck speed but can't afford pricier

models. The ATI Radeon 32MB, another low-cost unit, debuts at number seven. The Matrox Millennium G400 Max, which had been at or near the top of the chart since its debut, has been discontinued. Next month, we update our test suites. ▶

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TOP 10 SCANNERS

	SOHO SCANNER	Month tested	Street price (10/25/00)	Overall rating	Scan quality	Scan speed (seconds per page)		Comments
						B&W	Color ¹	
1	 Epson Perfection 1200S 800/463-7766 www.epson.com	Aug 00	\$299 ¹	95	Good	17 @ 300 dpi	249 @ 1200 dpi	FEATURES: SCSI, 1200 by 2400 dpi, 11.3-by-16.8-by-3.5-inch case, ² 9.9 pounds, 8.5-by-11.7-inch scanning area; optional transparency adapter and automatic document feeder. SUMMARY: Epson's SCSI unit offers sharp resolution and high-quality color and runs a bit faster than the USB model—but costs \$100 more.
2	Microtek ScanMaker 4700 800/654-4160 www.microtekusa.com	Dec 00 ³	\$249	94	Good	29 @ 300 dpi	263 @ 1200 dpi	FEATURES: USB, 1200 by 2400 dpi, 11.4-by-20-by-4.6-inch case, ⁴ 8 pounds, 8.5-by-11.7-inch scanning area; includes transparency adapter; no optional ADF. SUMMARY: Versatile performer offers 42-bit color, high resolution, quick-start buttons, and generous software, and it scans transparencies right out of the box.
3	Canon N1220U 800/652-2666 www.ccsi.canon.com	Dec 00 ³	\$199	93	Good	37 @ 300 dpi	298 @ 1200 dpi	FEATURES: USB, 1200 by 2400 dpi, 10.1-by-14.7-by-1.3-inch case, ⁴ 3.3 pounds, 8.5-by-11.7-inch scanning area, no optional transparency adapter or ADF. SUMMARY: Ultrathin color image sensor unit produces good-quality images and comes with a strong selection of software, including robust OCR.
4	HP ScanJet 5370Cse 800/722-6538 www.scanjet.hp.com	Oct 00 ³	\$299	92	Fair	37 @ 300 dpi	243 @ 1200 dpi	FEATURES: Parallel and USB, ¹ 1200 by 2400 dpi, 11.9-by-19.9-by-4.1-inch case, ² 10.7 pounds, 8.5-by-11.7-inch scanning area; includes transparency adapter; ADF optional. SUMMARY: Versatile unit has two interface options and four quick-start buttons, but its overall scan quality is less than stellar.
5	Microtek ScanMaker V6USL 800/654-4160 www.microtekusa.com	Oct 00 ³	\$129 ²	91	Good	50 @ 300 dpi	82 @ 600 dpi	FEATURES: USB and SCSI, ⁴ 600 by 1200 dpi, 11.8-by-21.5-by-3.2-inch case, ² 11.5 pounds, 8.5-by-14-inch scanning area; includes transparency adapter; no optional ADF. SUMMARY: Legal-document-capable model offers small transparency unit plus SCSI card/cable combo. A USB/parallel unit can be had for \$129 too.
6	Agfa SnapScan e50 888/281-2302 www.agfahome.com	Oct 00 ³	\$179	91	Good	60 @ 300 dpi	416 @ 1200 dpi	FEATURES: USB, 1200 by 2400 dpi, 13.3-by-19.7-by-3.7-inch case, ² 14.5 pounds, 8.5-by-11.7-inch scanning area; includes transparency adapter; no optional ADF. SUMMARY: With high resolution and four push buttons, this two-in-one unit delivers good-looking reflective and transparent scans.
7	Umax Astra 6450 800/562-0311 www.umax.com	Nov 00	\$299	91	Good	39 @ 300 dpi	50 @ 600 dpi	FEATURES: IEEE 1394, 600 by 1200 dpi, 12.2-by-18.4-by-3.9-inch case, ² 8.5 pounds, 8.5-by-11.7-inch scanning area; includes transparency adapter; no optional ADF. SUMMARY: Our first IEEE 1394 (FireWire) unit; card and cable included; delivers ultrafast 600-dpi scans with 42-bit color. Color quality could be better.
CORPORATE SCANNER								
1	 Epson Perfection 1640SU Office 800/463-7766 www.epson.com		\$499	96	Good	17 @ 300 dpi	423 @ 1600 dpi	FEATURES: USB and SCSI, ⁴ 1600 by 3200 dpi, 11.4-by-17.4-by-9.2-inch case, ² 14.8 pounds, 8.5-by-11-inch scanning area; includes ADF; transparency unit optional. SUMMARY: This 1600-dpi, 42-bit powerhouse debuts with snappy performance and sharp, colorful scan quality. A \$299 version omits the ADF.
2	Microtek ScanMaker X12USL 800/654-4160 www.microtekusa.com	Aug 00	\$359 ¹	96	Good	31 @ 300 dpi	438 @ 1200 dpi	FEATURES: USB and SCSI, ⁴ 1200 by 2400 dpi, 11.9-by-21.4-by-2.8-inch case, ¹ 12.1 pounds, 8.5-by-14-inch scanning area; optional transparency adapter and ADF. SUMMARY: Legal-document-capable unit boasts a great price, solid scan quality, and excellent software. Without a SCSI card, the unit costs \$40 less.
3	Epson Expression 1600 Artist 800/463-7766 www.epson.com	Aug 00	\$899 ¹	92	Good	18 @ 300 dpi	495 @ 1600 dpi	FEATURES: USB and SCSI, ⁴ 1600 by 3200 dpi, 13-by-22.2-by-5.2-inch case, ² 18.7 pounds, 8.5-by-11-inch scanning area; optional transparency adapter and ADF. SUMMARY: Strong performance and color accuracy; an industrial-strength transparency adapter (\$299 extra) would make this unit a top choice for graphics work.



For expanded reviews of this month's scanners, visit www.pcworld.com/t10scanners.

HOW WE TEST All scanners are tested with default settings under Windows 98 on a Gateway GP7-550 (Pentium III-550) PC with 128MB of RAM, using each unit's bundled software. Overall score is based on scanned image quality (25 percent), scanning speed (SOHO 22 percent; corporate 25 percent), ease of use (SOHO 17 percent; corporate 10 percent), features (SOHO 16 percent; corporate 20 percent), support (10 percent), and price (10 percent). Speed tests are timed from start of scanning until cursor control is regained. Data based on tests designed and conducted by the PC World Test Center.

¹ Color scan speed is at unit's maximum optical resolution. ² Priced with SCSI adapter. ³ In order: width, depth, height. ⁴ Online-only chart. ⁵ Tested with USB interface. ⁶ Tested with SCSI interface.



EPSON'S PERFECTION 1640SU Office, our new Best Buy, causes a shakeout among the corporate scanners. Replete with an automatic document feeder (ADF) and OCR software, this latest

addition to Epson's small-office line should please businesses that need a scanner to grab text accurately but quickly. The big picture indicates that companies today are popularizing their base models by including an ADF or a transparency unit. ■

HERE'S HOW


WINDOWS TIPS

SCOTT DUNN

Make Windows More Energy-Efficient



SO YOU TRY TO DO YOUR BIT to conserve energy by shutting down your computer at the end of each day—only to find yourself drumming your fingers impatiently while waiting for Windows to give permission to turn off the PC. The next day you wait all over again for the system to boot and Windows to launch. Then you open your applications and arrange your active windows just the way

you like them. By this time you've been at your desk several minutes and have accomplished very little. There's a better way, at least for most Windows users.

The trick is to send your computer into a state of hibernation after a period of inactivity, either on demand or automatically. It's just like shutting down except

that your current Windows state is saved on your hard disk. You still have to boot up, but Windows will start faster, and all the apps that were running when the snooze began will open automatically in the same position. But first, you have to find out if your PC supports hibernation and understand your options if it does.

Determine compatibility: Whether your computer supports hibernation depends on various hardware and software issues. In Win 9x, the feature is not available if your hard disk uses the FAT32 format. To find out if hibernation is available, choose *Start•Settings•Control Panel•Power Options* and look for the Hibernate tab. If you don't see it, you're out of luck. Even if you do see it, you must have enough hard disk space on your boot drive to store your current Windows state. To see if you have sufficient space, click the *Hibernate* tab and look in the box labeled 'Disk space for hibernation' (see **FIGURE 1**). If you don't have enough, do some housekeeping and, if necessary, move files to another drive.

If you're using Windows 2000 on a network, check to see whether you can actually enable hibernation. Log on as the administrator and return to the Hibernation tab in the Power Options Properties dialog box. Check *Enable hibernate support*, then click *Apply*. If you receive an error message, your system may be on a network whose policies conflict with this feature. Otherwise, you're all set.

New shutdown/start-up options: Once the hibernation feature is enabled, you may notice several new options on various menus and dialog boxes. For example, when you click *Start•Shut Down*, you'll see the Hibernation option has been added to the Shut Down Windows dialog box. You will probably want to choose this method of powering down your computer. The next time you boot up, Windows will resume more quickly, and all your apps will be just as you left them. You may have to enter a password, depending on how your system is configured, but the process is still quicker than going through the standard Windows start-up.

The power-button option: Another hibernation option gives you more control over shutdowns. Return to the Power Options

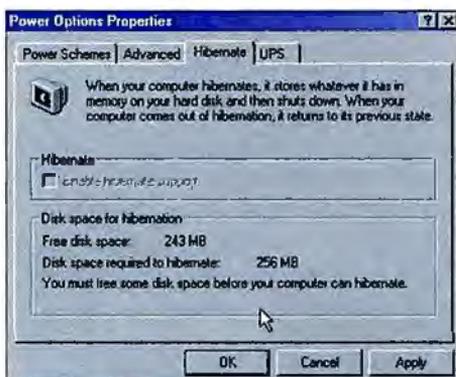


FIGURE 1: WINDOWS' HIBERNATE feature requires enough free disk space to save your Windows state.

Properties dialog box (via Control Panel, as noted) and click the *Advanced* tab. Under 'Power buttons', choose *Hibernate* in the 'When I press the power button on my computer' drop-down list.

Hibernate automatically: If you tend to wander away from your computer for hours at a time, you can save energy and trouble by setting Windows to hibernate automatically after a period of inactivity. Return to the Power Options Properties sheet and click the *Power Schemes* tab. At the bottom of the Properties sheet, choose a time period from the 'System hibernates' drop-down list. Skip the low amounts on the list and choose something more reasonable—for example, *After 2 hours*. Since restarting after hibernating takes longer than canceling a screen saver or using the standby mode (a low-power state in which the hard disk and monitor are shut down), you'll want an option that shuts your system down after a significant period of time. For shorter intervals, use standby and other System settings in this panel.

Make your schemes come true: If you want your system to hibernate automatically only at specific times or after a different interval, try one of the canned 'schemes' from the 'Power schemes' drop-down list



FIGURE 2: MANAGE POWER via a custom power scheme available on the tray icon pop-up menu.

at the top of the Power Options Properties' Power Schemes tab. The schemes are most useful when you're switching between battery and plugged-in mode with a portable PC, but they work with desktop hibernation as well. (Users of Windows Me and 2000 needn't settle for one of the prepackaged schemes, however. Set up the options you want in this Properties sheet, click *Save As*, type a name, and click *OK*. Repeat these steps for each situation you need.) To simplify switching from one scheme to another, click the *Advanced* tab and check *Always show icon on taskbar*. Click *OK*. Any time you want to change to another scheme, click the taskbar icon (near the clock) and choose the one you want (see FIGURE 2). To open the Power Schemes Properties dialog box at any time, double-click the icon (or right-click it and choose *Adjust Power Properties*).

Deal with the downside: If your computer is set up for multiple users, hibernation is pointless. Only the last user's Windows settings will be restored, and only if that user's password is entered at restart. When the administrator logs on, the last user's window settings and unsaved work will be lost. Windows can't store hibernation settings for more than one user.

START OUT ON THE RIGHT FONT



IN THE SEPTEMBER issue, I told you how to adjust fonts for Windows Help and for Internet Explorer 4 and 5 (www.pcworld.com/sep00/wintips). Unfortunately, the programs sometimes forget your font-size settings. To ensure that they use the same font size each time you start Windows, even if you (or others using your computer) change the font sometime during that session, make Windows import one Registry setting with every start. You don't need to dig through Registry Editor settings, however. All you need is a text file.

Choose *Start>Programs>Accessories>Notepad*. In the Notepad window, type **REGEDIT4** and press **<Enter>** twice. If you use Internet Explorer 5 or later, type **[HKEY_CURRENT_USER\Software\Microsoft\Internet Explorer\International\Scripts\3]** (including the brackets) and press **<Enter>**. If you use IE 4, type **[HKEY_CURRENT_USER**

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ANSWER LINE

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WORD PROCESSING

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UPGRADE GUIDE

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Find out about PC and Palm games, from Internet Pong to space operas, at www.pcworld.com/heres_how/pcgames.

TweakUI is Microsoft's best freebie download for Windows. See how to use TweakUI to customize your desktop at www.pcworld.com/heres_how/tweakui.

Software\Microsoft\Internet Explorer\International\1252] (including the brackets) and press **<Enter>**. Finally, type **"IEFontSize"=hex:02,00,00,00** and press **<Enter>** (see FIGURE 3) to apply the Medium font size to IE and Windows Help. Change the '02' to **00** to get the Smallest font size, **01** for the Smaller font size, **03** for the Larger font size, or **04** for the Largest font size.

Make sure the quotation marks in the last line are the straight (not curled) typewriter quotes. Notepad uses these quotation marks by default. Microsoft Word and some other word processors substitute curled quotation marks, which the Registry doesn't understand. If you have Notepad's Word Wrap feature turned on (choose *Edit>Word Wrap* to toggle it), the lines may break automatically (as in Figure 3), but that's okay as long as you didn't press **<Enter>** to add manual line breaks.

To save the document as a Registry entry file with the .reg extension, se- ▶

lect *File*•*Save As* and browse to a place where the file won't be disturbed (such as the Windows folder or a folder that holds batch files). In the 'File name' box, type a name such as "fontsize.reg" (including the straight quotation marks) so that Notepad will use your .reg extension and not its own .txt extension. Then click *Save*.

Right-click the *Start* button and choose *Open* or *Explore*. Navigate to the StartUp folder in the Programs folder. Right-click an empty area of the StartUp folder and choose *New*•*Shortcut*. In the command-line box, type `regedit /s c:\Windows\fontsize.reg`, changing this example to match your own path and .reg file name. Click *Next* and type a name for your shortcut, such as *Reset Font Size*, then click *Finish*. The font will return to this size whenever you start Windows or choose the *regedit* command from the StartUp menu.

If your fix doesn't work, adjust the path in your .reg file (it begins [HKEY_CURRENT_USER]). Choose *Start*•*Run*, type `regedit`, and press <Enter>. Choose *Edit*•*Find*, type `IEFontSize`, and click *Find Next*. Look in the left pane to see what folder `IEFontSize` is in. Locate and right-click your .reg file, choose *Edit*, change the path in Notepad to match the one in the Registry Editor, and select *File*•*Save*. If you have problems, go to the Registry Editor



FIGURE 3: USE NOTEPAD to reset your Windows Help and Internet Explorer font size.

window and choose *Edit*•*Find Next* until you find each occurrence of this path. You may have to edit your .reg file and test it many times before you find the best path.

ONE-CLICK EXITS, RESTARTS

A PAST ISSUE explained how to shut down Windows from a shortcut icon, but I can no longer find the instructions. Can you help me set up this useful feature for Windows 98?

Jim Wiemer, via the Internet

THE TIP IN QUESTION, from the July 1998 *Windows Tips* (www.pcworld.com/

July98/wintips), illustrated how a command line for exiting and restarting Windows eliminates those bothersome confirmation prompts. It also allows automation via the Task Scheduler and makes it possible to create keyboard shortcuts for these common operations.

With Windows 98, you can take this shortcut further by using various commands to exit or restart Windows without rebooting, or to reboot the system. This procedure won't work in Windows NT or 2000.

To create a shortcut for exiting Windows 9x, navigate to the folder the shortcut will be stored in. If you would like the commands to be available on the Start menu, right-click the *Start* button and choose *Open*. Then right-click the desired folder window and choose *New*•*Shortcut*. In the command-line box, type `rundll.exe user.exe,exitwindows`

to create a shortcut that exits Windows (Windows 9x and Windows Me) or `rundll.exe user.exe,exitwindowsexec` to create a shortcut that restarts Windows without rebooting (Windows 9x only). Click *Next*, type a name for your icon, and click *Finish*. You can customize this feature even further by <Alt>-double-clicking the icon to display its Properties. Then click the *Shortcut* tab (if needed), and use the *Shortcut* key box to type a keyboard shortcut; or you can click the *Change Icon* button to select a new appearance for the shortcut icon. Click *OK* as many times as necessary to close all the open dialog boxes. If you have any difficulty getting the restart command to function, open the shortcut's *Properties* box and type a space followed by a 0 or a 1 at the end of the *Target* line.

In Windows 98 or Windows Me, you

Give Your Body and Mind a Breather With Stretch Break

STIFF NECK? SORE BACK? Repetitive strain injuries? Welcome to the computer age. But you don't have to wait for these and other symptoms to occur. Give yourself a break with *Stretch Break* shareware from Para Technologies. This handy program sits quietly in your system



tray until you summon it, or you can set it to activate itself after a specific interval (every half hour, for example). Its many helpful animations demonstrate stretching and other exercises you can do unobtrusively at your desk. You're able to control which exercises appear, their order, and how many repetitions you want to perform during a break. If the prompt comes at an inopportune time,

you can click to delay your stretch 1 minute or 5 minutes, or to cancel that session altogether. *Stretch Break* is truly the pause that refreshes. Be nice to yourself and shell out the \$45 registration fee. An evaluation version is available from PCWorld.com's Downloads. You can contact Para Technologies at www.paratec.com.

can create an icon that reboots the system (as opposed to merely restarting Windows) or that logs off the current account. Follow the same steps as above, but type this command line: `rundll32.exe shell32.dll, SHEXitWindowsEx 2` (it's case-sensitive, so watch capitalization following the comma). The '2' parameter causes a reboot. If you change it to 0, you will log off and on with a different account, and if you change it to 1, you'll get the 'exit Windows' command explained above.



Find files mentioned in this article at www.pcworld.com/downloads and more tips at www.pcworld.com/heres_how. Send questions and tips to scott_dunn@pcworld.com. We pay \$50 for published items. Scott Dunn is a contributing editor for PC World. ■

YOUR QUESTIONS ON: Searching for duplicate files ♦ Faster modem speeds

Is It Time for You to Flash-Upgrade Your BIOS?



MY PC IS OVER two years old. Would upgrading my BIOS make it more compatible with newer programs? Is flashing my BIOS worth the risk?

Joe Stelzer, Delaware, Ohio

TAKING THE STEPS you ask about makes sense only if you have something to gain. If you can't get a piece of hardware to work—especially one that's newer than your PC—carefully upgrading your BIOS may be worthwhile.

The Basic Input/Output System chip on your PC's motherboard has program code necessary to run your computer. The BIOS chip is almost always flash RAM, so it is simple to upgrade using a program that "flashes" it with new code. Things can go wrong during the upgrade process, however, and the new version may introduce incompatibilities.

Before you decide on an upgrade, weigh the benefits against the effort involved and the risk entailed. The first step is to determine the manufacturer, number, and date of your BIOS. You can find this information in Windows by clicking *Start*•*Programs*•*Accessories*•*System Tools*•*System Information*. Then click the plus sign next to 'Components' and select *System*. Select *Advanced Information* in the top-right window pane, scroll down to 'System board', and look for BIOSDate and BIOSVersion. Alternatively, you may obtain the BIOS information when you boot your computer. Press <Pause> as soon as text appears on the screen; on most computers you'll see the BIOS manufacturer, number, and

date. Write down the information, and then press any key to resume booting.

Your next step is to go to your system vendor's Web site and look for BIOS information for your PC model. (If you have a no-name clone, go to the motherboard manufacturer's Web site.) The information usually appears in a section of the site labeled 'Technical Support', 'Free Downloads', or something similar. If a BIOS upgrade is available for your system, read the description provided.

The upgrade file is usually a .zip or self-extracting .exe file. Instructions for the upgrade are probably stored in a 'readme' file or somewhere on the Web site. Follow the instructions very carefully.

You'll probably have to put all the files required for the upgrade onto a bootable floppy disk. Then reboot, follow the vendor instructions for backing up your existing BIOS, and run the program that does the actual upgrade.

A power outage or other unexpected interruption in the flash process can corrupt the BIOS code. If you end up with a half-written BIOS, you'll have to use the backup copy you just made to reinstall the original. If your system won't boot, you'll need a BIOS-flashing machine or a new BIOS.



Print Folder Directories

HERE'S AN EASY WAY to print a list of the files contained in a folder from inside Windows Explorer. Launch Notepad, then type `dir %1 >|pt1:` and press <Enter>. Now type `cls` on the second line, but don't press <Enter>.

There must be nothing—not even a blank line—after 'cls'. Save the two-line file in your 'C:\Windows\SendTo' folder as `printdir.bat`. Now when you want a printout of the files in a folder, make sure your printer is on, right-click the folder in Windows Explorer, and select *Send To*•`printdir.bat`.

FIND DUPLICATE FILES AUTOMATICALLY

IS THERE AN automated way to search for duplicate files on Windows 98 systems?

Gary Jordan, Bellingham, Washington
WINDOWS CAN'T MANAGE it, but other programs can. One such product is Chris Rosa's free Double Trouble utility, which you can download from PCWorld.com's Downloads. The author's site is at rosa.simplenet.com/software/dtrouble.

Unfortunately, you can't delete files from within Double Trouble, which is a serious inconvenience. If you don't mind a modest expenditure, Steve Evans's \$15 Duplic8 will let you delete files directly (see **FIGURE 1**). It also displays file sizes in bytes and is easier to use than Double

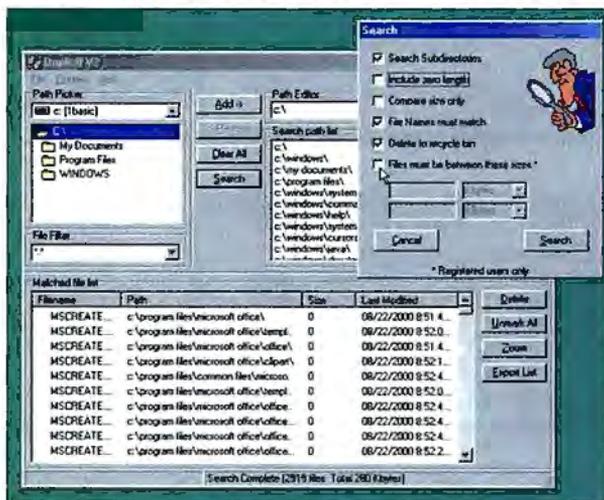


FIGURE 1: THE DUPLIC8 SHAREWARE UTILITY from Steve Evans makes it much easier to find duplicate files on a Windows machine.

Trouble. Duplic8 is available at PCWorld.com's Downloads. The author's site is at www.bigwig.net/silicon/duplic8.

If you own Norton SystemWorks, you already have a tool for finding duplicate files: the CleanSweep uninstaller. Simply click *Duplicate File Finder*, which is found on CleanSweep's Advanced screen in some versions of SystemWorks, and on the Cleanup tab in others. Years ago SystemWorks also included the Space Wizard, which could walk you through searches for duplicate files as well as other files you might want to delete. Unfortunately, Symantec removed this utility from more-recent editions of SystemWorks.

LEAVE YOUR SURGE PROTECTOR ON



I HAVE MY PC set to shut itself off after I exit Windows. Should I turn off the surge protector as well?

Elizabeth Turner, New York

LEAVE IT ON. Your CMOS chip needs a small, constant flow of electricity to keep its settings and to track the time. Your motherboard's battery supplies this power when the computer is off, but many computers made in the past three years also use a tiny bit of AC power—if it's available—to handle this job. When you shut off the surge protector, you cut off the supply of AC power, and your computer must rely on its battery instead. If you keep the surge protector on, your battery will probably last longer.

You may wonder whether you should use the switch on your surge protector to turn the power to your computer, monitor, and peripherals on and off in one fell swoop. With most of today's computers, that's not an option because the on/off power switch has been replaced with a power button that the user must press to start the computer. Your PC probably shuts off when you exit Windows, and there's no way to turn it on again without hitting that button. If you can power up your computer by turning on the surge protector, go ahead. Just be sure the monitor is on before Windows starts to load, or it may not be recognized.

And, of course, you should never turn off a surge protector—or a PC—while Windows is running.

SPEED UP A 56-KBPS MODEM



I RECENTLY bought a 56-kbps modem, but it connects at only 28 kbps. Is there anything I can do?

Josh Pyles, Gladstone, Oregon

FIRST, 56-KBPS modems never run at 56 kbps. The Federal Communications Commission won't allow it because of concerns about telephone-line interference. Second, if conditions are less than ideal, the modem's transmission speed will be far below 56 kbps. Nonetheless, if your 56-kbps modem runs slower than 44 kbps, you should be able to improve its performance without too much hassle.

The simplest, least-expensive potential solution is to replace the phone cord between your modem and the telephone wall jack. If you run multiple cables between your modem and wall jack so the

modem's Web site for new drivers or known problems. If you can't find anything useful there, demand a replacement modem.

If the source of the trouble isn't the phone cord, other telephone devices in the house, or the modem, it probably lies with your phone company. You can submit a complaint, but don't expect any miracles. Just as you can't get a DSL or cable line installed everywhere, you can't always get a good 56-kbps connection.

HOW MUCH RAM IS EACH PROGRAM USING?



HOW CAN I FIND out how much memory is being used by each of the programs I'm running?

Billy Ching,

South San Francisco, California

WINDOWS DOESN'T include a program to show you this information, but such programs are available from third parties.

Norton Utilities has one called System Information, though it's not installed by default (see FIGURE 2). To install it, insert the Norton CD-ROM and follow the prompts. When the setup program asks you to select an installation type, pick *Complete*. Once System Information is up and running, click the *Memory* tab.

For a free solution, try SiSoft Sandra Standard—a terrific program for viewing all sorts of system information. You can download SiSoft Sandra Standard from PCWorld.com's Downloads. The vendor's site is at www.sissoftware.co.uk.

The Sandra module that has the information you're looking for is called Processes Information. It features pull-down menus that provide all sorts of statistics on each program running. You'll have to scroll down a bit to find 'Total Process Memory Used', but that's the one that'll answer your question.

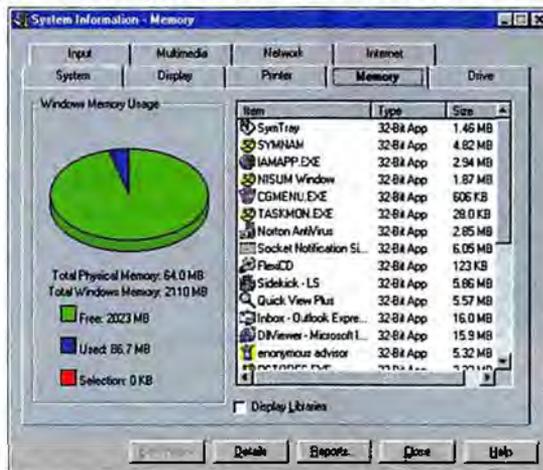


FIGURE 2: HOW MUCH RAM DOES EACH program use? Norton Utilities' System Information will tell you.

modem can share the connection with an answering machine or phone, replace them with a single line to the wall jack.

If that tactic doesn't work, unplug all your phones, fax machines, and any other devices that use the phone line.

To test your modem, find someone who has a satisfactory 56-kbps connection and trade modems for a day. If you suddenly get a fast connection and the other person gets a slow one, the problem lies with your modem. Check your modem ven-



Find files from this article at PCWorld.com's Downloads. Send your questions to answer@pcworld.com. Answer Line pays \$50 for published items. You'll find Contributing Editor Lincoln Spector's humorous writing at www.thelinkinspector.com.

Wireless Web portals ♦ Unplug the Disconnect dialog ♦ Free WAP browsers

For Best Results, Can the Spam Yourself

IT'S TIME TO fight back (nicely) against spammers. Consider this your introductory lesson in digital assertiveness.

I usually ignore junk e-mail. I get spammed about a half-dozen times a day, and it seems easiest simply to delete the unsolicited e-mail and be done with it. But over the course of a year, I spend hours downloading, reading, and deleting junk e-mail, and I want the onslaught to stop. The filters in e-mail programs and third-party utilities try to foil junk mail by looking for any spam-like message content. In my experience, these tools aren't worth the time and effort they require. Anyone who's ever tried to use Microsoft Outlook's junk e-mail filter knows what I'm talking about. It uses a static list of suspect keywords (I can't add to the list), so the filter misses about half the obvious spam that bombards my in-box. Worse, it misidentifies many legitimate messages as junk mail. I'm better off simply deleting the spam manually.

To stamp out spam for good, you have to go to its source. All e-mail messages start from a mail server, and most spam originates either from a server whose administrators knowingly allow spammers to disseminate their garbage, or from a server that is not properly secured, allowing spammers to use it as a relay. You can help stop spam by adding spam-loving ISPs to the "black hole" lists described here, and by encouraging hapless network administrators to close any existing security holes in their mail servers.

The nonprofit Mail Abuse Prevention System (MAPS; www.mail-abuse.org) maintains several lists of spam source. MAPS's Realtime Blackhole List (RBL) identifies known junk e-mail servers, so ISPs can block traffic from those servers and filter spam before it arrives at their customers' e-mail in-boxes. Thousands of ISPs use the RBL database, and it's also incorporated into a number of secure mail-server applications. The MAPS Relay Spam Stopper (RSS) database lists unsecured servers. ISPs can also consult the database of the nonprofit Open Relay Behaviour-modification System (ORBS; www.orbs.org) to reduce the amount of spam their customers receive. If you're flooded with junk e-mail, ask your Internet service provider to consider using one of these services. They can't stop all spam from getting through, but they will reduce the volume noticeably.

TRACKING SPAMMERS

ISP ADMINISTRATORS do much of the work needed to keep RBL, RSS, and ORBS up-to-date, but you can assist antispam organizations by complaining directly to the ISP that spawned the spam. To determine this, look at



Precious Few WAP Portals

IF YOU'VE GONE wireless-Web and are looking for sites written in the WAP wireless markup language, check these three: WaPortal (wap.waportal.com) is decidedly Eurocentric, but it offers links to news, sports, shopping, and other topics. Tribesman.com (www.tribesman.com) has e-mail, stock prices, weather, currency converters, guides to U.S. and European cities, and a WAP search engine. Yahoo's country-specific WAP sites at wap.yahoo.com offer finance, weather, and news. Don't leave home without them.

the spam's header information. Most e-mail programs have a command that displays the headers, though it might not be obvious. In Outlook, open the spam message in its own window, then choose **View>Options**. In Netscape's Messenger e-mail client, the command is **View>Headers>All** (see **FIGURE 1**).

Once you've displayed the message's headers, look for the lines that start with the word 'Received'—you'll probably find several occurrences, the last of which shows the ISP domain name from which the mail originated. Server addresses are usually constructed in this manner: 'servername.domainname.domainsuffix'. Here's an example of a spam header:

```
Received: from spam ([123.45.67.89])
  by mailserver.somewhere.com (8.8.8/
  8.8.8) with SMTP id DAA89705;
  Mon, 15 Jan 2001 03:21:24 -0400
  Someone using a computer called
```



FIGURE 1: YOU CAN SNIFF OUT SPAMMERS by using the View Headers settings in the Netscape Messenger e-mail client.

WAPping Within Windows

LET'S WAP—*wappiamo*, as they say in Italy, where every other person is reportedly equipped with a Wireless Application Protocol (WAP)-capable phone. Of course, it's hard to *wappare* if you haven't gone wireless yet. Fortunately, industrious developers quickly realized that lots of folks might want to preview WAP sites on their PCs.

Now you can choose from several free WAP browsers, whether you want to preview your own wireless markup language (WML) pages or just see whether WAP lives up to the hype.

Apache Software's free Klondike WAP Browser for Windows and Slob-Trot (really) Software's WinWAP 3 (free 30-day demo) both do the job. They're probably most useful to WAP developers looking for versatile WML preview tools, but neither product gives you as

authentic a Web-phone feel as Mobile Media Mode Gate from Russian developer Numeric Algorithm Laboratories. The screen in FIGURE 3 shows that the 1.4MB M3Gate is handset-down the most realistic WAP emulator around (it also offers a faux-Palm skin). And it's lots cheaper (it's free, actually) than the real Nokia 7100 series phone it emulates.

All three of these programs are available from the Downloads area of PCWorld.com. You can contact Apache Software at www.apachesoftware.com; Slob-Trot Software is at www.winwap.com; and Numeric Algorithm Laboratories is at www.m3gate.com.

nect when connection may no longer be needed, and finally click OK three times to save the change. The next time you're done browsing, there'll be one less box to click.



Find files from this article at www.pcworld.com/downloads. Send your questions and tips to nettips@spanbauer.com. We pay \$50 for published items. Scott Spanbauer is a contributing editor for PC World.



FIGURE 3: THE MOBILE Media Mode Gate WAP emulator: You can almost reach out and touch it.

list. Keep your e-mail address off public mailing lists and Web pages. If you want to include your address in an e-mail signature or Web page, *munge* it. Munging will make it unreadable by the address-harvesting applications that spammers use to build their e-mail databases, but (with luck) it will still be understandable to humans. Here's a munge primer:

The key is to change an element on either side of the 'at' sign (@) to render the address invalid while making it clear to people that a small, obvious change to the address will validate it. For example, you can munge the address 'myname@domain.com' to 'my name NOSPAM@domain.com', or 'myname at domain dot com', or perhaps 'myname@REMOVETHISdomain.com'. If you've come up with a munge that is even trickier or easier to understand, I'd appreciate it if you would send me an e-mail describing it. You can address it to me at scott@NOSPAMspanbauer.com.

SAY GOOD-BYE TO DISCONNECT DIALOGS



EVERY TIME I close Internet Explorer, a box pops up asking me if I want to close my connection to the Internet. How can I stop this box from appearing every time I close IE?

Matt Zentgraf, Annapolis, Maryland
THIS FEATURE makes sense if you want to minimize your time online because your ISP's number is a toll call, the ISP

charges you by the minute, or you don't want to miss incoming calls—among other reasons. But most of the time, it's just an annoyance. To banish the box, choose *Tools>Internet Options*, click the *Connections* tab, and select your dial-up account from the 'Dial-up settings' list. Then click the *Settings* button and the *Advanced* button under 'Dial-up settings'. (Hold on, we're almost there.) Now uncheck *Discon-*

'spam' sent this message through a server called 'mailserver' at an ISP named 'somewhere.com'.

Are you feeling empowered yet? Having deduced the domain, send a polite message to 'postmaster@domain' or 'abuse@domain' (where *domain* is the actual name and suffix of the spam's originating domain) asking that the spammer's access to the site's mail servers be curtailed. In some cases, you'll get an answer back saying that the ISP is looking into it or has already curtailed the spammer's access. In most cases, though, you won't get a reply. That doesn't mean your actions are in vain. If anything, the ISP's administrator is probably too swamped with similar messages to respond. If you continue to receive spam from the same ISP, report the ISP to MAPS (see the organization's thorough Reporting E-Mail Abuse FAQ at www.mail-abuse.org/rbl/notifyfaq.html to find out when and when not to do so), or you can report it to ORBS (www.orbs.org/report_1.html).

For details on how to find and contact a spam's source ISP, see the page 'How To Complain To The Spammer's Provider' at spam.abuse.net/howtocomplain.html. Other sites that can help you finger spammers include SpamCop at spamcop.net and Sam Spade at samspade.org/ssw (see FIGURE 2). To listen in on veteran spam hunters, subscribe to the *news.admin.net-abuse.email* newsgroup.

Of course, you can also take other steps to prevent spam. The most important tactic is not to respond to spam, even when the message asks you to reply or click on another link to be removed from the spam

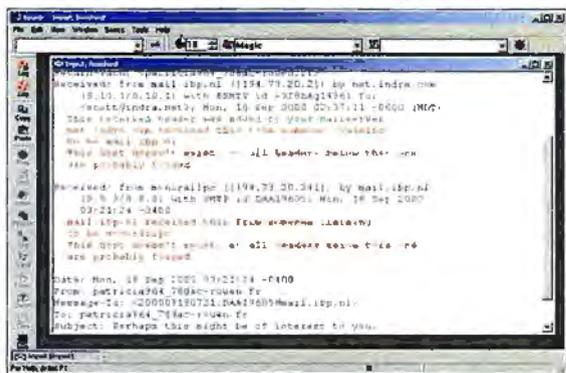


FIGURE 2: LET BOGEY DECIPHER THOSE HEADERS: Sam Spade helps you track down the source of spam.

Isn't That Special? Paste Without Formatting

HOW OFTEN DOES this happen to you? You copy text from one Word or WordPerfect document to another, but the text you move doesn't match the font, size, or color of the destination document. So you reselect the text you just pasted and reformat it—and you do this time after time after time. There's a much simpler option: Think 'Paste Special'.

First, remove the formatting from the text you want to copy. Select the block of text in the source document and choose *Edit•Copy* (or press **<Ctrl>+C**) to copy it to the clipboard as usual. Switch to the destination document, position the cursor where you want the text to appear, and select *Edit•Paste Special*. Choose *Unformatted Text* in the Paste Special dialog box, then click *OK*. All applied formatting disappears, leaving the text in the default style of the destination document.

Hint: You can use this technique to unfor-

Paste Special•Unformatted Text to restore the URL without the blue type and underlining that indicate a link.



QUICK TAB OPTIONS

YOU CAN install a tab stop and choose its characteristics in one operation. (If the horizontal ruler isn't visible, choose *View•Ruler* in Word or WordPerfect.)

Word 97 and 2000: To set a new tab stop and tab options, double-click where you want the tab to be (use the lower portion of the ruler). This displays the Tabs dialog box (see **FIGURE 1**). Choose an Alignment and a Leader (if desired), adjust the 'Tab stop position', and click *OK*.

To modify the settings of an existing tab stop, move the mouse pointer over the tab marker on the ruler and wait to see a box identifying the tab type. Then, in Word 97, double-right-click to display the Tabs dialog box. In Word 2000, double-click with either mouse button. To remove an existing tab, position the mouse pointer over the tab marker on the ruler, then click and drag the marker off the ruler and onto the document window.

WordPerfect 8 and 9: To set a new tab stop, right-click anywhere in the tab area of the ruler, pick the type of tab you want from the context menu, and click where you want the tab stop to appear. To modify an existing tab, right-click to set a new tab type as described above, and click the tab. To remove a tab stop, click and drag it off the ruler and onto the document window.

SAVE PAPER IN WORD 2000

IF YOU WANT to create a reference copy of a long document, why not print several pages on a single sheet of paper? Here's how to diminish your load and save a tree.

Get More Editing Space

IF YOU NEED just a bit more editing space in a Word or WordPerfect document window, two quick fixes will add it without affecting the word processing features you use most. If the rulers are displayed, select *View•Ruler* to shut them off. If you're using Word, hide the status bar: Select *Tools•Options*, and under the *View* tab, deselect *Status bar*; then click *OK*. In WordPerfect, you can hide the Application bar at the bottom of the window by right-clicking it and selecting *Hide Application Bar* in the context menu.

Open the document in Word 2000 and select *File•Print*, just as you normally do. When the Print dialog box appears, drop down the 'Pages per sheet' list in the bottom-right corner, choose *4 pages*, then

TO INSERT...	Press...
Degree symbol (°)	<Ctrl>+@+Space>
Copyright symbol (©)	<Ctrl>+Alt+C
Trademark symbol (®)	<Ctrl>+Alt+R
Spanish initial question mark (¿)	<Ctrl>+Alt+?
Spanish initial exclamation point (¡)	<Ctrl>+Alt+!
Cent mark (¢)	<Ctrl>+ / C
Left double chevron («)	<Ctrl>+ <
Right double chevron (»)	<Ctrl>+ >

FIGURE 2: USE KEYBOARD shortcuts to access these frequently used special characters.

click *OK*. Your document will print with four pages on each sheet. (More than that per sheet is difficult to read.)

LITTLE-KNOWN CHARACTER SHORTCUTS IN WORD

WHEN YOU NEED a special character, it's fairly easy to choose *Insert•Symbol* and select the character in the resulting dialog box. But if you use a particular special character frequently, you can save time and effort by using one of Word's built-in keyboard shortcuts. The table presented in **FIGURE 2** shows the shortcut keystrokes of several commonly used characters.

Send your questions and tips to george_campbell@pcworld.com. We pay \$50 for published items. Visit Contributing Editor George Campbell at www.osomin.com. ■



FIGURE 1: SET TAB STOP OPTIONS by double-clicking the lower portion of the ruler.

mat an entire document. Press **<Ctrl>+A** to select the whole shebang, then copy and paste it into a blank document using the same *Edit•Paste Special* option. This technique can also be used to remove unwanted HTML formatting from URLs. Highlight the URL and choose *Edit•Cut*. Then, without moving the cursor, select *Edit•*

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Surviving a Disk Crash: An Emergency Checklist

A DAY LIKE any other: You turn on your PC, but instead of the familiar Windows logo you see nothing. You think, "My hard disk crashed!" You're frantic. Have you lost weeks of work, hours of free time, and maybe even your job? What do you do?

Exactly the same thing a well-trained pilot does when facing a serious problem: Take out your emergency checklist and try to set things right—one step at a time.

1. Don't panic. Sit back, take a deep breath, and relax. A blank screen or a failure to boot up doesn't always mean you have a crashed hard drive. Today's hard disks often outlast all other key PC components, and running system utilities unnecessarily or removing and re-installing your hardware can do more harm than good.

2. Try to restart. Turn your computer off, wait 10 seconds, and turn it back on. This resets the computer—which is often all that's required to solve the problem.

3. Check the obvious. If your screen stays blank, check all power cords, cables, and connectors to make sure they're firmly attached. Check your surge protector to make sure it hasn't blown a fuse or been destroyed by an errant voltage spike. And make sure the brightness and contrast settings on your monitor haven't been turned all the way down.

4. Listen for clues. As your PC starts up, you should hear (and maybe feel) the power-supply fan rev up. You should also hear your hard disk spinning merrily. If all is quiet on the hardware front, you may have a bad power supply or a loose power connection. Open up your PC's case and

make sure all the power-supply cables to your hard drive and motherboard are attached properly. (Remember:

Always use an antistatic wrist strap or other antistatic protection before touching any of your PC's internal components.)

If you hear a series of beeps before your system locks up, note their number and whether the beeps are long or short. This audio error message from your system's BIOS provides information about a problem it has detected. Check with the manufacturer of your system to identify your particular error.

5. Look for clues. When your PC starts, it runs a Power-On Self Test that confirms the presence of such essential hardware components as memory chips, video cards, and hard drives. Watch for error messages as the results of each check appear on the monitor. (Pressing <Pause> will freeze the screen to prevent messages from disappearing too quickly.)

You may also see confirmation or error messages as your system initializes such higher-level devices as the CD-ROM drive. You don't always need an error message, however. If your system locks up while configuring such a peripheral, then chances are that's the culprit.

If your system launches Win-



Pesky Printer Warning

YOU HIT THE PRINT BUTTON or icon and that pesky warning box pops up telling you the printer's offline—and keeps telling you every five seconds unless you cancel the print job. It may not rank with the high price of gasoline or the popularity of Kid Rock, but at least this annoyance is easier to resolve. To increase the time between warnings, go to *Start>Settings>Printers*, right-click your printer's icon, and select *Properties*. Under the Details tab, simply enter a longer timeout setting in the *Not Selected* box.

dows, your disk is at least partially functional. Windows 95 and 98 still use the DOS autoexec.bat and config.sys files to load drivers for some old hardware. If your PC locks up while loading these drivers, press <F8> after you see 'Starting Windows 9x'. This allows you to run the files one line at a time to see what device is loading when trouble occurs.

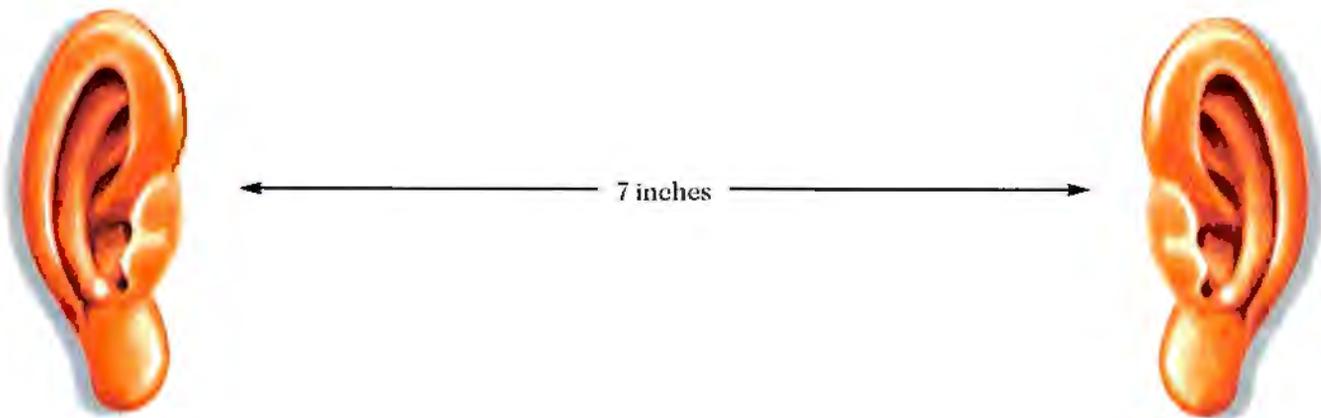
If you get a 'Boot disk failure' or 'Operating system not found' error instead of a 'Starting Windows 9x' message, your PC can't load Windows from the hard disk. This may indicate a badly damaged drive.

6. Boot from a floppy. This process bypasses the hard drive and confirms that your computer is otherwise healthy. Use the Windows start-up disk that came with your system. (If you don't have a start-up disk, it's a good idea to make one before you need it: Insert a blank floppy disk, click *Add/Remove Programs* in Control ▶



FIGURE 1: BE PREPARED FOR HARD-DRIVE trouble by creating a Windows start-up disk from a blank floppy.

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Panel, select the *Startup Disk* tab, and click *Create Disk*, as shown in **FIGURE 1**.)

Restart your system with the start-up disk in the floppy drive. If your system successfully boots and displays the A:\> prompt, your PC is working properly. Try accessing your hard disk by typing C: at the prompt and pressing <Enter>. If you get a C:\> prompt, change directories and try to copy a small file to the floppy.

If that works, then you're able to write to the disk, and your disk may still have some life in it (sometimes disks die a slow death). Take the opportunity to back up any important files you need to, and then run a hard-disk diagnostic utility such as ScanDisk, which is ready to run from the start-up disk, or Norton Disk Doctor.

7. Check your CMOS settings. If you get an error message saying 'Drive C: not found' (or something similar), your PC may not recognize the hard disk because it lost all its CMOS settings, which happens when the CMOS battery starts to die. To fix this, enter the CMOS setup program: While your PC boots, press <Delete>, <F1>, <F10>,

recovery (www.ontrack.com) are two data-recovery services that may be able to retrieve data on your dearly departed drive.

(INK) JET-SET SAVVY



AS A SERVICE authorization instructor for Hewlett-Packard, I am writing to correct information on cleaning ink-jet printheads in *July's Hardware Tips*. HP does not recommend cleaning printheads, especially not with isopropyl alcohol. Why? Because using isopropyl alcohol can accelerate printhead decay. Instead, use a lint-free cloth dampened with distilled water. Place the bottom of the printhead on the cloth for a few seconds to soften the ink, then very gently wipe the surface and pads.

Jeff Tardie,

Hewlett-Packard Tech Data

Customer Education

THIS VALUABLE insight from a service professional underscores an important rule about working with any cleaning liquids and electronic equipment: Never apply any liquid directly to an electronic component. An errant droplet of water, alcohol, or other cleaning agent can damage the delicate circuits, coatings, and adhesives used in electronic devices.

Pour or spray the solution onto a lint-free wipe or swab, then very carefully clean the printhead's surface and *only* that surface.

Many ink-jet printer manufacturers make more on replacement parts and supplies than on printers, so despite Mr. Tardie's good advice, be practical. If distilled water doesn't work, try the isopropyl alcohol. As long as you're careful not to damage other parts of the printer, you have little to lose trying to save an otherwise-useless printhead.

YOU SAY POTÄTO



I'M GOING TO spend a large part of the new year working in my company's office in Switzerland, and I'm working to improve my German-language skills. Up to now I've used Windows' Charac-

ter Map utility to insert foreign-language characters into a non-English document, but that's becoming less practical. Can I configure my keyboard to enter these characters?

Emma Innes, Boston

WINDOWS 98 OFFERS keyboard support for more than 60 languages, including 20 dialects of Spanish and five of German.

To change your keyboard layout, open the *Keyboard* applet in Control Panel and click the *Language* tab. Then click the *Add* button to display a list of all the supported languages. You'll have to choose between standard and Swiss German, for example (see **FIGURE 2**). And you'll probably need to



FIGURE 3: SWITCH KEYBOARD LAYOUTS by clicking on the icon in the Windows system tray to display a menu.

have your Windows CD handy to install the foreign-language layout if it isn't currently available on your system.

If you're not ready for a new keyboard layout, you have other options. Instead of a German character set, you could choose to install the 'United States English-International' character set using the same procedure given above. This lets you type international characters using <Ctrl>-<Alt>-key keyboard combinations.

You can also switch between U.S. English and German layouts. Windows lets you place an icon in the system tray whenever multiple-keyboard layouts are installed (see **FIGURE 3**). To activate this feature, just check the *Enable indicator on taskbar* box at the bottom of the Keyboard Properties Language tab.



For more hardware tips, see www.pcworld.com/heres_how. Send questions and tips to kirk_steers@pcworld.com. We pay \$50 for published items. Kirk Steers is a PC World contributing editor.

Norton Disk Doctor

\$49, as part of Norton Utilities 2001 for Windows 2000/NT/Me/98/95, Symantec, 800-497-6180, www.symantec.com



FIGURE 2: CONFIGURE YOUR KEYBOARD for over 60 languages through the Keyboard applet in Control Panel.

or whatever key your PC uses (check your documentation). If no hard disk is listed, you need to reenter the disk's settings. You can do this manually (the settings are usually found printed on the hard drive's case), but most PCs will reenter them for you by using the CMOS setup program's hard-drive autoconfigure utility.

If you've taken all these steps and your hard drive is still as useful as a trailer hitch on a Maserati, then it's time to consult the experts. Drive-Savers (www.drive-savers.com) and Ontrack Data Re-

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* Weight includes battery and WeightSave module; weight will vary due to vendor components, manufacturing process and options.

The Mother(board) of All Upgrades

A NUMBER OF different upgrades can boost your computer's performance, but for turbocharging your old PC, nothing beats a full motherboard transplant. A new motherboard, coupled with a high-speed processor and a generous amount of RAM, can dramatically improve system performance. It's not a job for a beginner, but if you're comfortable doing major poking around in your PC (or have a computer-savvy friend to help), the operation isn't too difficult.

Most motherboards today retail for \$100 to \$150. Midspeed processors, meanwhile, cost from about \$100 (for a Celeron-500) to \$200 (for a Pentium III-600 or Athlon-700). Don't skimp on RAM, either. Go for 128MB (about \$140). For a total investment of between \$350 and \$500, you'll have a powerhouse PC. If your budget is smaller, consider 64MB of RAM (about \$70) and a lower-end CPU like AMD's K6-2-500 (about \$60), dropping the bottom line to about \$300.

THE TOP DOWN

Benefits: Improved system performance.

Costs: \$300 to \$500

Expertise level:

Advanced

Time required:

4 to 6 hours

Tools required: Phillips screwdriver, needle-nose pliers, masking tape, antistatic wrist strap

Vendors: Asus (www.asus-usa.com), Motherboards Direct (www.motherboardsdirect.com), Motherboards.com (www.motherboard.com), Soyo (www.soyo.com), Supermicro (www.supermicro.com), Tyan (www.tyan.com)



Most computers made in the past four years have cases that require a motherboard with an ATX form factor. If you're replacing an ATX motherboard, you can choose from a wide variety of boards, differing mainly in the processor types and speeds they support. Your best bet is to choose the processor you want and then

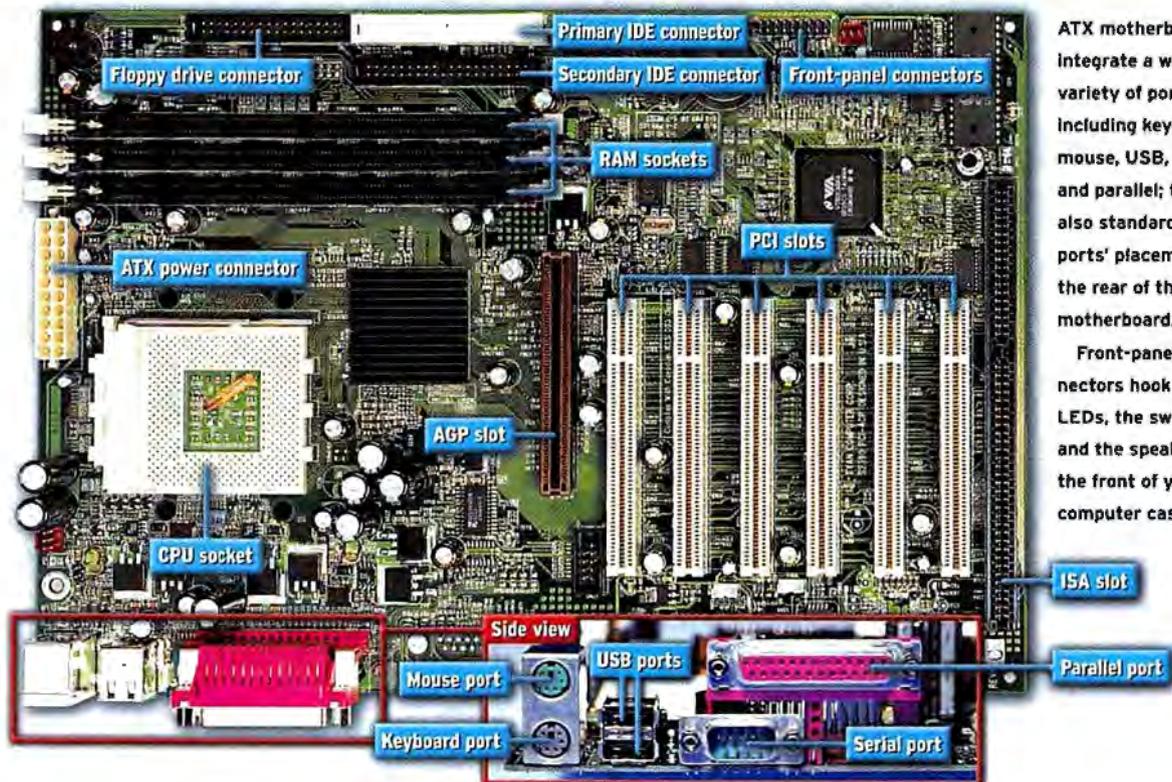
purchase a motherboard that supports it.

If your PC is older, its case probably requires a board with an AT form factor. Check your system manual to be sure, but if your serial and parallel ports aren't built into the side of the board, you probably have an AT motherboard. If so, consider buying a bare-bones ATX system—essentially a motherboard (usually with CPU and RAM) installed in a case with a power supply—and then transfer the drives and cards from your old system to it. Watch out, however, if you have lots of ISA add-in boards. Most new motherboards have few (or no) ISA slots.

The occasion of replacing your motherboard is also a good time to upgrade other components in your system, such as the hard drive or the graphics card. Before you start your motherboard transplant, of course, run a full system backup.

Stan Miastkowski is a PC World contributing editor.

TYPICAL ATX MOTHERBOARD COMPONENTS



ATX motherboards integrate a wide variety of ports, including keyboard, mouse, USB, serial, and parallel; they also standardize the ports' placement on the rear of the motherboard.

Front-panel connectors hook up the LEDs, the switches, and the speaker at the front of your computer case.

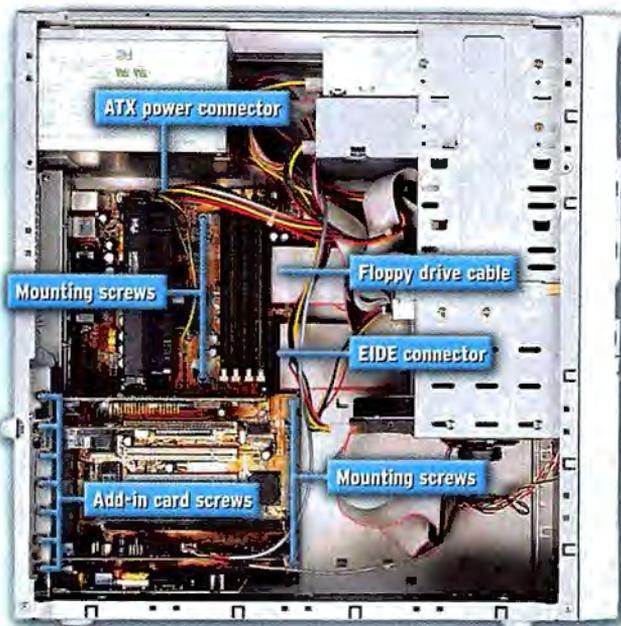
1 Remove the cards and cables. Turn off your PC; unplug it from the wall; and disconnect the mouse, keyboard, monitor, printer, and any other external cables (such as USB). Remove the PC's cover, and carefully look at what you need to remove or disconnect to reach the motherboard. In some cases, you'll have to remove a hard drive or other hardware to get to the motherboard.

Before you begin working under your PC's hood, put on an anti-static wrist strap (available from a local electronics supply store such as Radio Shack) and clip it to a grounded metal object.

Remove the screws holding the add-in cards, carefully remove the cards, and lay them on a clean, flat surface, preferably in the order in which you removed them.

Label each cable with masking tape and write down each connection as you remove it. Unplug the power connector, the floppy disk cable, and the EIDE connectors. Make sure to note which cable is connected to the primary and which to the secondary EIDE connector (sometimes they're marked Channel A and B, or 1 and 2).

Finally, unplug the small connectors attached to the front-panel switches and LEDs (not shown at right).



2 Remove the old motherboard. Most motherboards are attached to the case with a handful of screws—usually about five, but the number can vary. Find them, carefully remove them, and set them aside in a handy container, such as a coffee cup or that ashtray you don't use any more.

Remove the old motherboard by sliding it slightly toward the front of the case (so the connectors at the rear are clear of the case) and then pivoting it upward.

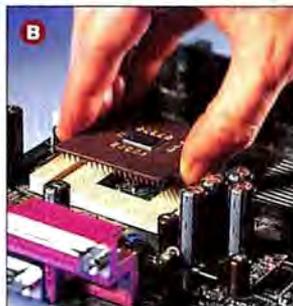
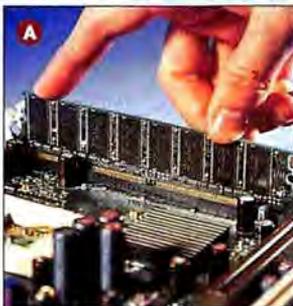
4 Install the new motherboard. Slide the new motherboard into the case. You'll know it's in the correct position when the mounting holes align.

Mount the motherboard, using the screws you removed in step 2. Just "snug up" the screws; screwing them in too tightly can damage the motherboard.



3 Install the RAM and processor. Before you mount the motherboard in the case, insert your new RAM module (or modules) into the RAM socket (A), beginning with the socket marked "Bank 0." DIMM modules fit only one way. Slide them firmly into their sockets. Brackets on each side will snap into place automatically when the module is correctly seated.

Most of today's CPUs fit into sockets. To install a socketed processor, lift the lever on the socket and carefully insert the CPU (B), making sure that Pin 1 on the CPU matches Pin 1 on the socket. Hold the processor firmly in place and lock the lever down. If you're installing an older CPU that



fits in a slot, carefully insert it until it's firmly seated.

A reminder: All CPUs need cooling. If a heat-sink or fan isn't built in, purchase and install one. Without it, your new CPU will self-destruct in minutes.

5 Reinstall cards and cables. Reinstall the cards and cables that you removed. Don't rush through this step! Work slowly and carefully, avoid bending pins, and double-check to see that everything is correctly connected.

IMPORTANT: Don't forget to connect the CPU fan's power cable to the motherboard.

Reinstall your PC's add-in cards, securing them with the screws you removed earlier.

Reconnect the mouse, keyboard, monitor, printer, and any other external devices you may have, but don't put the cover back on your PC until you're absolutely sure that everything's working.

Finally, plug in the AC power cable.

6 Start it up. Turn on your PC. If it beeps and you see messages on the screen, that's a positive sign. Expect the new hardware to confuse Windows initially. The OS should automatically reconfigure itself, but don't be surprised if Windows restarts itself several times during the process.

If nothing happens—or if your PC hangs part of the way through start-up—turn off your PC, disconnect the AC power, recheck all the connections, and start the system up again. If it hangs again, contact your motherboard maker's tech support. Dead-on-arrival motherboards, CPUs, and RAM modules are rare, but they do occur.

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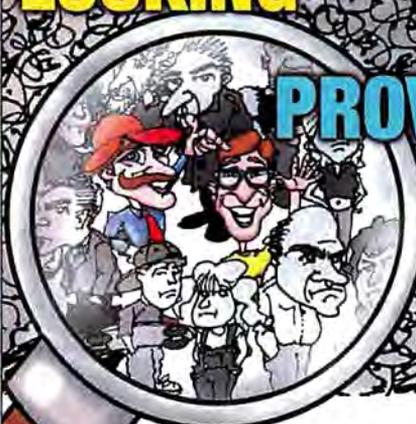
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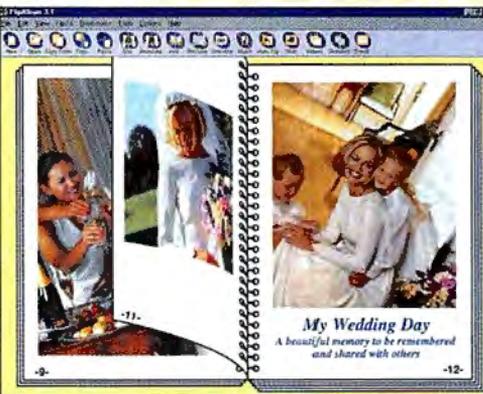
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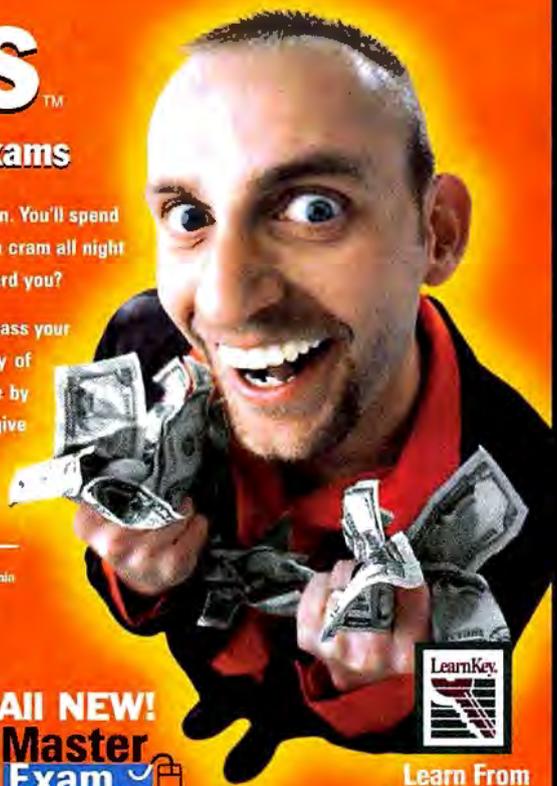
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IN THE CIRCUIT COURT
FOR TUSCALOOSA COUNTY, ALABAMA

CAROL L. WHITAKER and RONALD W. HEIBY,
on their own behalf and on behalf of
all persons similarly situated,

Plaintiffs,

-against-

INTERNATIONAL BUSINESS MACHINES
CORPORATION,
Defendant.

CV2000-1326

CLASS ACTION

SUMMARY NOTICE OF PENDENCY AND SETTLEMENT OF CLASS ACTION

TO: ALL PERSONS IN THE UNITED STATES WHO PURCHASED AN IBM APTIVA PERSONAL COMPUTER OR IBM THINKPAD NOTEBOOK COMPUTER CONTAINING AN "MWAVE" COMBINATION MODEM AND SOUND CARD.

THIS SUMMARY NOTICE IS GIVEN TO INFORM ALL POTENTIAL CLASS MEMBERS OF A PROPOSED SETTLEMENT OF THIS LITIGATION. IF YOU ARE A MEMBER OF THE CLASS DESCRIBED BELOW, YOUR RIGHTS ARE AFFECTED BY THIS LITIGATION AND BY THE PROPOSED SETTLEMENT. PLEASE READ THIS SUMMARY NOTICE CAREFULLY AND IN FULL.

Plaintiffs in this action (the "Alabama Action") allege that the Mwave combination modem and sound cards installed in certain IBM Aptiva and IBM ThinkPad computers suffer from a design defect that prevents such Aptiva and ThinkPad computers from properly providing modem and/or sound functionality and that IBM made false and inaccurate statements and representations concerning the sound and/or modem functionality of the subject computers. IBM vigorously denies all liability with respect to the plaintiffs' allegations and denies that it has engaged in any wrongdoing. A settlement has now been proposed.

Definition of the Class

The Court has preliminarily ruled that this Action may proceed, for purposes of settlement only, on behalf of a class (the "Class") defined as:

- (i) all persons and entities in the United States, excluding resellers of the subject computers, who, during the period September 1, 1994, through November 1, 2000, purchased a new Qualifying Aptiva (defined below) from IBM or from any entity authorized by IBM to sell such Qualifying Aptivas, excluding IBM employees and those such persons and entities who have executed releases releasing IBM from liability concerning or encompassing any or all claims that are the subject of the Alabama Action; and (ii) all "consumers" (defined as individuals buying primarily for home or personal use) in the United States who, during the period September 1, 1994, through November 1, 2000, purchased a new Qualifying ThinkPad (defined below) from IBM or from any entity authorized by IBM to sell such Qualifying ThinkPads, excluding IBM employees and those such consumers who have executed releases releasing IBM from liability concerning or encompassing any or all claims that are the subject of the Alabama Action.

The Aptivas Covered By The Settlement

The following IBM Aptiva personal computers designated by the IBM machine types and model numbers are Qualifying Aptivas affected by the Settlement: 2144-M30, 2144-M31, 2144-M35, 2168-M40, 2168-M41, 2144-M50, 2144-M51, 2144-M52, 2168-M53, 2168-M54, 2168-M55, 2168-M56, 2168-M57, 2168-M58, 2168-M60, 2168-M61, 2168-M62, 2168-M63, 2168-M70, 2168-M71, 2168-M72, 2168-M91, 2144-A10, 2144-A12, 2144-A14, 2144-A15, 2168-A40, 2168-A44, 2168-A45, 2168-A50, 2168-A51, 2168-A52, 2168-A90, 2168-A92, 2168-A94, 2134-C21, 2176-C23, 2176-C31, 2176-C33, 2176-C35, 2176-C55, 2176-65, 2176-C67, 2176-C73, 2176-C77, 2176-C6D, 2176-C6Y, 2176-C66, 2176-C32, 2176-C6Z, 2176-C53, 2176-C6E, 2176-C6X, 2176-C5X, 2176-C6X, 2176-C6B, 2159-S64, 2159-S66, 2159-S74, 2159-S76, 2159-S7H, 2159-S78.

The ThinkPads Covered By The Settlement

The following IBM ThinkPad computers designated by the IBM series designations, machine types and model numbers are Qualifying ThinkPads affected by the Settlement: 755CD (9545 9BD), 755CD (9545 9BE), 755CD (9545 FBK), 755CD (9545 FBL), 755CE (9545 7BD), 755CE (9545 7BE), 755CE (9545 7BC), 755CV (9545 8BJ), 755CV (9545 EBK), 755CV (9545 EBL), 755CX (9545 HBE), 755CX (9545 HBD), 755CX (9545 HBL), 755CDV (9545 ABK), 755CDV (9545 ABJ), 755CDV (9545 GBL), 755CDV (9545 GBK), 755CSE (9545 6BD), 755CSE (9545 6BE), 755CSE (9545 6BC), 760C (9546 U21), 760C (9546 U22), 760C (9546 U2A), 760C (9546 U2B), 760C (9546 U27), 760C (9546 U2H), 760C (9546 U1C), 760C (9546 U13), 760C (9546 U1J), 760C (9546 U11), 760C (9546 U1A), 760C (9546 U3L), 760E (9546 U3B), 760E (9546 U4A), 760E (9546 U4B), 760E (9546 U9B), 760ED (9546 U3A), 760ED (9546 U9A), 760XD (9546 U9E), 765D (9546 U9H), 765D (9546 U28).

Note: All purchasers of the Qualifying Aptivas are affected by the Settlement. "Consumer" purchasers (individuals who purchased primarily for personal or household use) of the Qualifying ThinkPads are affected by the Settlement.

IBM has not sold Qualifying Aptivas or Qualifying ThinkPads since at least early 1998. The machines types and model numbers of the Qualifying Aptivas, and the series designations, machines types and model numbers of the Qualifying ThinkPads are shown on the respective computers themselves. If you need assistance locating these on your Qualifying Aptiva or Qualifying ThinkPad, please contact the Settlement Administrator.

Summary of Settlement Benefits

There are four different categories of benefits provided for by the Settlement. With respect to each Qualifying Aptiva or Qualifying ThinkPad, each Class Member is eligible to receive, may request and may receive only one of these categories of benefits. No benefits will be distributed to Class Members until the Settlement is finally approved by the Court, becomes final and nonappealable and the deadline for submitting claims expires.

Category One. If you purchased a Qualifying Aptiva and you have purchased, or purchase within the time specified below, a Qualifying Modem (defined below), or Qualifying Sound Card (defined below), or both, for use in the Qualifying Aptiva, you are eligible to receive the following benefits:

1. A cash payment of the amount you actually paid for the Qualifying Modem (defined below) or Qualifying Sound Card (defined below), or both, including sales taxes and shipping charges paid, up to a maximum total payment of \$100; and
2. A Discount Certificate redeemable for a 10% discount of up to \$100 off the combined purchase price, exclusive of applicable sales taxes and shipping charges, of any one or more IBM Computer Products (but only one Aptiva, ThinkPad or other computer system unit) that you purchase contemporaneously by calling a toll-free number which IBM shall establish for this purpose and which will appear in your Discount Certificate. "IBM Computer Product" means any product (including, without limitation, personal computers and handheld computing devices and related products, peripheral devices and accessories) that is offered for sale by IBM directly to end users through ShopIBM (<http://www.ibm.com/shop>), or any successor service, at the time you redeem your Discount Certificate.

Category Two. If you are a "consumer" (defined as an individual who purchased primarily for personal or household use) who purchased a Qualifying ThinkPad and you have purchased, or purchase within the time specified below, a Qualifying Modem (defined below) or Qualifying Sound Card (defined below), or both, for use in the Qualifying ThinkPad, you are eligible to receive the following benefits:

1. A cash payment of the amounts you actually paid for the Qualifying Modem, Qualifying Sound Card, or both, including sales taxes and shipping charges paid, up to a maximum total payment of \$50; and
2. A Discount Certificate redeemable for a 10% discount of up to \$50 off the combined purchase price, of any one or more IBM Computer Products (but only one Aptiva, ThinkPad or other computer system unit) that you purchase contemporaneously by calling a toll-free number which IBM shall establish for this purpose and which will appear in your Discount Certificate. "IBM Computer Product" is defined under Category One above.

Category Three. If you purchased a Qualifying Aptiva and you have not purchased, or do not purchase within the time specified below, a Qualifying Modem (defined below) or Qualifying Sound card (defined below) for use in the Qualifying Aptiva, you are eligible to receive a Discount Certificate redeemable for a 10% discount of up to \$150 off the combined purchase price, exclusive of applicable sales taxes and shipping charges, of any one or more IBM Computer Products (but only one Aptiva, ThinkPad or other computer system unit) that you purchase contemporaneously by calling a toll-free number which IBM shall establish for this purpose and which will appear in your Discount Certificate. "IBM Computer Product" is defined under Category One above.

Category Four. If you are a "consumer" (defined as an individual who purchased primarily for personal or household use) who purchased a Qualifying ThinkPad and you have not purchased, or do not purchase within the time specified below, a Qualifying Modem (defined below) or Qualifying Sound card (defined below) for use in the Qualifying ThinkPad, you are eligible to receive a Discount Certificate redeemable for a 10% discount of up to \$100 off the combined purchase price, exclusive of applicable sales taxes and shipping charges, of one or more IBM Computer Products (but only one Aptiva, ThinkPad or other computer system unit) that you purchase contemporaneously by calling a toll-free number which IBM shall establish for this purpose and which will appear in your Discount Certificate. "IBM Computer Product" is defined under Category One above.

"Qualifying Modem" means any (i) external modem, (ii) PCMCIA (PC Card) modem, or (iii) internal (ISA) modem that you purchase(d) no later than May 27, 2001, for use in your Qualifying Aptiva or Qualifying ThinkPad. "Qualifying Sound Card" means an audio (sound) card that you purchase(d) no later than May 27, 2001 for use in your Qualifying Aptiva or Qualifying ThinkPad.

In order to receive benefits under this Settlement, you must obtain and submit a completed Claim Form and the documentation called for in the Claim Form. You should refer to the Notice of Pendency and Settlement of Class Action ("Notice") for a complete description of the benefits that may be available to you under the Settlement and the procedures on how to submit a Claim Form. A copy of the Notice and a Claim Form may be obtained from the Settlement Administrator as indicated below.

Your Claim Form(s) must be returned postmarked no later than May 27, 2001.

You may exclude yourself from the Settlement or object to its final approval by following the procedures that are set out in the Notice. If you exclude yourself from the Settlement, you will not be bound by its terms and will not be eligible to receive any of the Settlement benefits. However, you may pursue your claims individually. If you are a member of the Class and you do not request exclusion from the Settlement and the Settlement is finally approved by the Court, you will be bound by its terms and will give up certain rights, including the right to bring any claim or lawsuit against IBM that are our could have been pleaded in the Alabama Action regarding the sound (audio) and/or modem (communications) functionality of the Qualifying Aptivas and Qualifying ThinkPads that are the subject of the Alabama Action. An Exclusion Form may be obtained from the Settlement Administrator as indicated below. All requests for exclusion from the Settlement must be returned postmarked no later than Dec. 26, 2000. All objections to the Settlement must be filed with the Court and postmarked no later than December 18, 2000.

Notice of Fairness Hearing

The Court will conduct a Fairness Hearing on December 27, 2000 at 9:00 A.M. in Courtroom 2 at the Tuscaloosa County Courthouse, 714 Greensboro Ave., Tuscaloosa, Alabama 35401, to determine whether to finally approve the Settlement as fair, reasonable and adequate and to rule on an application by Plaintiffs' Counsel for an award of attorney's fees to be paid by IBM.

This is only a summary of the Settlement, claims procedures and other procedures concerning the Settlement, which are described in detail in the Notice.

To obtain a copy of the formal Notice, a Claim Form, and other relevant documents and information, log onto www.ibmwave.com or call 1-866-363-5044 or write to the Settlement Administrator
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12-13	Crucial Technology	www.crucial.com	38	Orange Micro	www.orangemicro.com
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127	dotTV Corporation	www.tv.com	34	Ricoh Corporation	www.ricoh-usa.com
32-33	Epson America, Inc.	www.epson.com	107	Samsung America	www.samsungmonitor.com
151	Ethentica, Inc.	www.ethentica.com	36	Sohoware	www.sohoware.com
171B	Everdream Corporation	www.everdream.com	99	Sony Electronics Inc.	www.sony.com
178	Executive Software	www.diskeeper.com	59-61	Sony VAIO Direct	www.sonydirect.com/pwp
117	FrontRange Heat Division, Inc.	www.frontrange.com	169	Symantec	www.symantec.com
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42	Fujitsu PC Corporation	www.fujitsupc.com	103	Tiny Computer	www.tiny.com
65-67	Gateway	www.gateway.com	18-19	Toshiba America	www.toshiba.com
195-197	Gateway	www.gatewayatwork.com	39	Toshiba America Electronics Components, Inc.	http://www.toshiba.com/taec/
8	Handspring	www.handspring.com	29	Umax Technologies	www.umax.com
40-41	Hughes Network Systems	www.directpc.com	31	Viewsonic	www.ViewSonic.com
174	Hughes Network Systems	http://bizinfo.directpc.com	69	Winbook	www.winbook.com
200	Hughes Network Systems	http://bizinfo.directpc.com	101	Xerox Corporation	www.xerox.com/inkjet
75-77,79,81	IBM Direct	ibm.com/smallbusiness7055			

Get Ready for Even Shabbier Service

IN THE DIGITAL AGE, it's an ironclad law: Companies claim they're improving customer service, but it only gets worse.

It's Friday morning, and my cable Internet access is dead again. From previous episodes, I guess that the modem's blinking lights mean the problem lies in the outside network. But it would be nice to get a definitive diagnosis, not to mention an idea of whether I'll be

facing trouble for an hour or a day. So I call AT&T@Home, work my way through the phone prompts, hang on the line, and eventually reach a service rep. He says the system was down for maintenance in the wee hours, but it's supposedly back up now.

Last time around, the outage was a by-product of work being done on the lines in my neighborhood. I ask if that could be the problem now. The rep has no idea.

Of course not. AT&T's Internet cable guys in my neighborhood don't talk to their TV counterparts. As one technician explained to me, "It's a matter of communication, and there's not much of it, unfortunately, between different crews. I'm strictly on the Internet side; and maintenance, they're a whole 'nother crew. We won't even know that there's an outage until we get to the neighborhood and see that people aren't getting signal."

I sigh and follow the service representative's instructions to unplug the modem, shut down my system, replug, and reboot. Of course, these tricks don't work, so we schedule a "truck roll" appointment for the following Wednesday, the earliest possible date—not service at the speed of the Internet, but service with all the swiftness of a hand-cranked phone.

I think to ask: If the network happens to restore itself before Wednesday, how should I cancel the service appointment? Just call back, comes the reply. Ever heard of e-mail? The technician sheepishly admits that as far as he knows, you can't cancel an appointment that way.



Technology is making live, knowledgeable humans disappear from service desks everywhere.

By evening, everything is back in working order, though a couple of my TV channels are fuzzier than before. All I've lost is time—and a day's worth of the service I pay for.

This isn't my first run-in with AT&T. Alas, my location a few too many feet from the nearest telephone office makes DSL service unavailable to me, so I'm subject to what amounts to a neighborhood monopoly for (sometimes) high-speed Internet access.

Judging from my experience, this company has no clue what customer service is all about. But it's not just AT&T. Technology is making live, knowledgeable humans disappear from service desks everywhere. When you call for help now, the first thing you hear is a recording urging you to try even more recorded information or visit a Web page you've already found to be useless.

Every few days I see a press release promising great strides in automating service desks—in other words, further distancing the customer from human beings who might actually be able to help. Maybe these developments will improve some irritating aspects of today's service lines, like being asked for an account number after you've already entered it twice. But a company that doesn't understand customer service in the first place won't improve things for customers by throwing software at the problem.

Already some companies are adopting sophisticated software systems that can rate you as a high roller who deserves special care and feeding, or as a whiny loser who keeps asking for favors and who would be better off wasting a competitor's time. Do you buy 1000 computers at once, or keep a few jillion dollars in the bank? Why, what can we do for you, sir or madam, and would you like some bowing and scraping

with that? The rest of us poor souls might as well get our speakerphones ready and prepare for prolonged battles with machine-generated voices even less responsive than the phone-drones we have to deal with today.

"Welcome to our completely automated support system. If you'd like to speak with a live, efficient customer service representative, press 7 to hang up now."

PC World Contributing Editor Stephen Manes is a cohort of Digital Duo, a series appearing on public television stations nationwide. For program information, see www.digitalduo.com. ■



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 - SoundBlaster 64V Integrated Sound
 - Integrated Intel® 10/100 NIC
 - MS® Windows® Me & MS® Works Suite 2001 & Norton® AntiVirus™ 2001
 - 3-Yr Ltd Warranty³ ■ 1-Yr NBD On-site Service⁴

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- Intel® Celeron™ Processor at 600MHz
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 - 32MB SDRAM ■ 5GB¹ Ultra ATA HD
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 - MS® Works Suite 2001
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 - 1-Yr NBD On-site Service⁴

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BUSINESS LEASE: \$34/MO., 48 MOS.⁵

- Upgrade to 14.1" XGA Display, only \$200
- Add Internal 56K Capable⁶ Modem, only \$39
- 3-Yr NBD On-site Service⁴, add \$149
- Upgrade to CompleteCare™ Service⁷ from 3-Yr NBD On-site Service⁴, add \$169

DELL™ INSPIRON™ 4000

- NEW—Style, Freedom, Simplicity Notebook**
- Intel® Celeron™ Processor at 600MHz
 - 14.1" XGA Display
 - 64MB SDRAM ■ 5GB¹ Ultra ATA HD
 - Modular 24X Max Variable CD-ROM
 - 8MB AGP 2X ATI Rage Mobility™ 128 3D² Video
 - Smart Li-Ion Battery
 - MS® Office 2000 Small Business
 - MS® Windows® Me
 - 1-Yr NBD On-site Service⁴

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BUSINESS LEASE: \$43/MO., 48 MOS.⁵

- Upgrade to 10GB¹ HD, only \$100
- Upgrade to 128MB Memory, only \$150
- 3-Yr NBD On-site Service⁴, add \$149
- Upgrade to CompleteCare™ Service⁷ from 3-Yr NBD On-site Service⁴, add \$169

DELL™ LATITUDE™ CPT

- Network-Optimized Notebook**
- Intel® Celeron™ Processor at 600MHz
 - 12.1" SVGA Active Matrix Display
 - 64MB SDRAM ■ 6GB¹ Ultra ATA HD
 - Modular 24X Max CD-ROM/Floppy Drive
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 - Li-Ion Battery w/ExpressCharge™ Technology
 - Dual Pointing – Touchpad and Pointing Stick
 - Internal 56K Capable⁶ SoftModem
 - 1-Yr NBD On-site Service⁴

\$1499  **E-VALUE CODE**
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BUSINESS LEASE: \$41/MO., 48 MOS.⁵

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 - 48X Max IDE CD-ROM
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 - 7x24 Phone Tech Support

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BUSINESS LEASE: \$28/MO., 48 MOS.⁵

- 2nd 10GB¹ (7200 RPM) IDE HD, add \$109
- 2nd Intel® Pentium® III Processor at 800MHz, add \$499

DELL™ POWEREDGE™ 1400

- NEW—Small Business Value Solution**
- Intel® Pentium® III Processor at 800MHz (up to 1GHz)
 - Dual Processor/RAID Capable
 - 128MB 133MHz ECC SDRAM (up to 2GB)
 - 9GB¹ (7200 RPM) Ultra3 (Ultra 160) SCSI HD (up to 36GB² 10K RPM)
 - Up to 144GB Internal Storage Capacity
 - Integrated NIC/SCSI Controllers
 - 48X Max IDE CD-ROM
 - Dell™ OpenManage™ Server Management Solutions
 - 3-Yr NBD On-site Service⁴
 - 7x24 Phone Tech Support

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BUSINESS LEASE: \$39/MO., 48 MOS.⁵

- 2nd 9GB¹ (7200 RPM) Ultra3 SCSI HD, add \$219
- Small Business Bundle Upgrade, add \$1879

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 - Dual Processor/RAID Capable
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 - 7x24 Dedicated Workstation Phone Tech Support

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- MS® Works Suite 2001 ■ MS® Windows® Me
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- Internal V.90 56K Capable® FaxModem
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- Modular 4X Max CD-RW
- NEW 32MB AGP 4X ATI Rage Mobility™-M4 3D® Video
- Internal V.90 56K Capable® FaxModem
- 59Whr Li-Ion Battery with ExpressCharge™ Technology
- harman/kardon® Audio
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