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Music Rocks the Web

MP3? You Ain't Heard Nothin' Yet. Here's What's Next

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Speakers	—	Advent 3-piece stereo system	Monsoon MM 700 3-piece speaker system
Communication	—	3Com USRobotics V.90 WinModem	3Com USRobotics V.90 WinModem
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On-site Warranty	5-yr./3-yr. Micron Power SM limited warranty	5-yr./3-yr. Micron Power limited warranty	5-yr./3-yr. Micron Power limited warranty
Software	Microsoft [®] Windows [®] 98 Microsoft Office 2000 SBE Norton AntiVirus	Microsoft Windows 98 Microsoft Office 2000 SBE Norton AntiVirus	Microsoft Windows 98 Microsoft Office 2000 SBE Norton AntiVirus Micron Easy Internet
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SEPTEMBER '99



Millennia MAX 550
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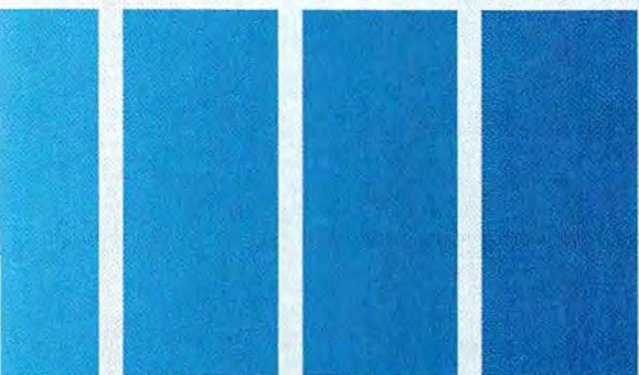


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118 THE LOWDOWN ON UPGRADES

HOW-TO Is your aging PC worth saving, or should you put the money toward a racy new model? If upgrading is in your future, check our superguide for tips on how to bring your computer into the present, including processor upgrades, memory augmentation, new hard drives, and an alphabet of hot technologies: DSL, DVD, LCD, and USB. Also, last call (almost) for Y2K readiness.

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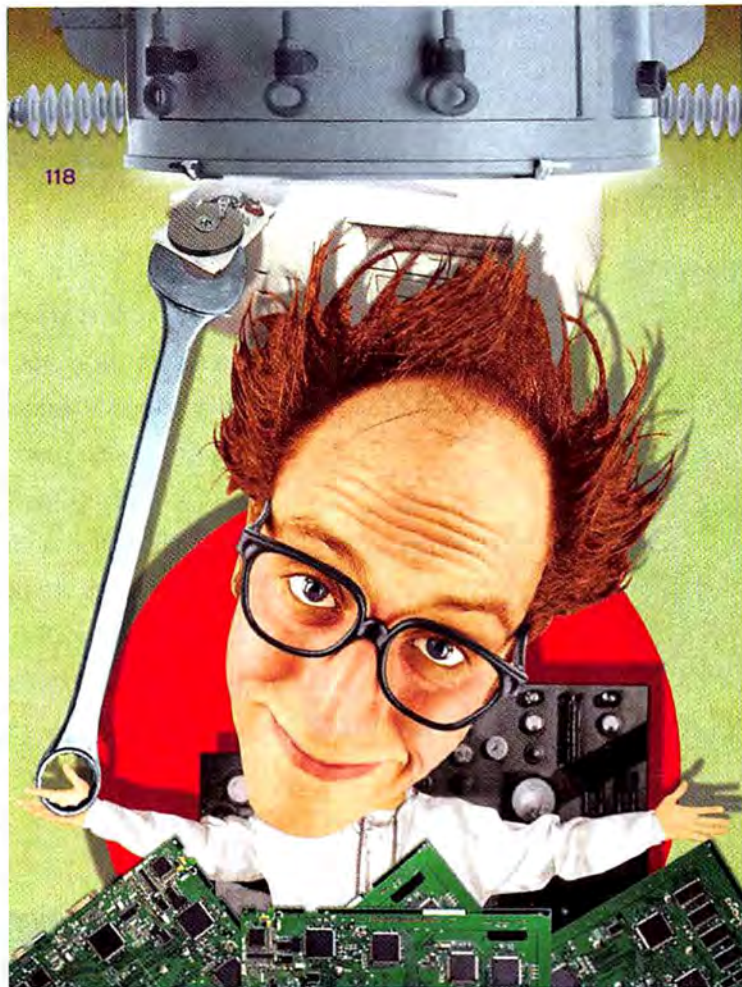
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REVIEW Think prices for good notebooks are still way too heavy for your wallet? We put 14 sub-\$1700 portables through their paces and found you can get a bargain with minimal compromises in performance.

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REVIEW This year's 17-inch monitors have a flatter, more compact profile and cost hundreds of dollars less than last year's models. We tested 24 units in search of the best combination of image quality, ease of use, and price. Turns out you can approach perfection for as little as \$349.



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

SPECIAL REPORT

THE WEB AND YOU

199 YOU SAY YOU WANT A REVOLUTION: MUSIC ON THE WEB

The tunes, they are a-changin'. MP3 and other new compression technologies make it easy to download CD-quality music from the Internet and to fit dozens of songs on a single customized CD. We sound out the new world order in music and explain what it all means for your listening pleasure.

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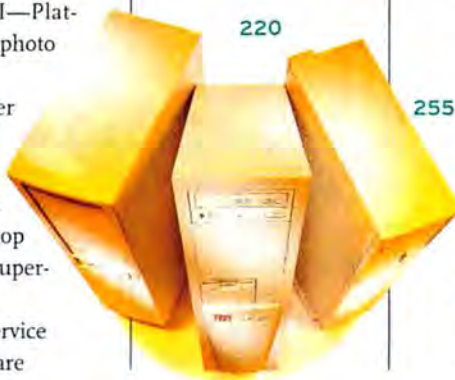
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HOW-TO Use it for talking to your buddies across the country, or just show the world how messy your desk is.

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RIOT OF COLOR: SOHO INK JETS

Lower prices, finer printouts, the holidays approaching—should you add a color ink jet to your wish-list? We pick two that will tickle you pink, one for the hearth and one for the small business.

15 PCs FOR THE HOME

Home doesn't have to mean homely. We rate 15 PCs in three price ranges, designed for small businesses and home offices; some have sleek cases and surprisingly high-end hardware.

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No Passwords Required

IF YOU'RE ONE OF THE 40 million-plus users of Hotmail, you'd better be fretting about what you've written in e-mail lately. The reason: Hotmail, Microsoft's free Web-based e-mail service, sustained serious breakdowns in security recently, including one that some call the biggest potential security breach on the Web to date.

The first problem occurred in mid-August, when a bug in the new MS Messenger chat software exposed Hotmail passwords. Anyone with physical access to an affected PC could surreptitiously access the authorized user's Hotmail account.

The second, more egregious problem occurred the following week. Several Web sites posted hacked pages that let anyone with a browser access anyone else's Hotmail account by typing in the account owner's name—no password, no physical access required. Microsoft shut down the Hotmail servers and fixed the offending code later that day.

In the interim, more than 40 million Hotmail accounts remained wide open to the public. With some accounts, intruders could see only a list of messages. With others, snoopers could read and send mail. Reports circulated about co-workers reading their colleagues' e-mail and parents rummaging through kids' messages. (An ethical question for the nineties: If you had known about the exposed accounts, what would you have done?)

Days later, a third security hole came to light. This time the potential problem originated with JavaScript, the code that programmers use to build Web applets. Exploiting this weakness, hackers could build Web pages that use JavaScript to steal Hotmail or other passwords or read e-mail. Until Microsoft completes a fix, it advises customers to disable JavaScript altogether, shut it down before using Hotmail, or refuse suspicious e-mail.

YOU'VE GOT MY MAIL

THE FIASCO WITH HOTMAIL is just the latest in a series of security flaws in widely used Microsoft software. First was a hole in Internet Explorer 5's ActiveX system that would let a hacker take control of a PC through an e-mail message or Web page (see *Bugs and Fixes*, page 55, for information on where to find patches).



Before **developing**
the next cool
interactive
shopping service,
fix the **security**
problem first.

Then came the problem that some experts called "Melissa on steroids," referring to the virus that rampaged corporate e-mail systems this spring. If exploited, this defect—found in Microsoft's Java Virtual Machine in Windows, Internet Explorer, Outlook, and other applications—would expose PCs to programs that could, say, install a virus, then propagate themselves as Melissa did.

Next was a security hole in IE 5's feature for importing and exporting bookmark Favorites. Exploiting this hole, hackers could build a Web page that uses the import-export feature to run destructive programs on PCs of anyone who visits that page. Microsoft is working on a patch and advises users to disable the browser's Active Scripting in the meantime.

In the midst of all this, America Online reported that approximately 200 users of its ICQ instant messaging software had their passwords stolen. These users received e-mail with an attachment that looked like a JPEG image file. Instead—got ya!—the attachment turned out to be a "password-fishing" program. ICQ has returned passwords to those affected and recommends that chatters steer clear of attachments in e-mails from unknown sources.

WE'VE GOT PROBLEMS

THE HOTMAIL MESS highlights one problem with all Web-based e-mail—one of the most popular applications on the Web. Web-based e-mail is inherently insecure, many security experts maintain, because it stores all e-mail on remote, easily compromised Web servers rather than on local hard drives. And as more types of Web-based applications flourish, the potential for security meltdowns takes on gargantuan proportions. Users are being enticed to keep personal appointments and other information on Web servers. Both Sun Microsystems and Microsoft plan to offer Web-based office applications that would let users access software from the Web and possibly store data and documents there as well. Do you want others browsing through *your* files?

Compounding the problems posed by a fundamentally insecure architecture are flaws in the software used to develop Web applications. Microsoft's software may be riddled with security holes, but little if any Web software is safe. Microsoft, Sun, and the hordes of Web developers hoping to cash in on the next billion-dollar Internet IPO should stop and retreat a step. Before developing the next killer Web-based app or the next cool interactive shopping service, fix the security problem first.

Cathryn Baskin is editorial director of PC World.

THE Computer PAGE.

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Get the biggest bang from Fireworks with the *Fireworks 2 Bible*. Everything you need to get the most from this explosive graphics program, from image compression and tweening to keyboard shortcuts (there's even a clip art catalog), is in this all-inclusive guide. (IDG)

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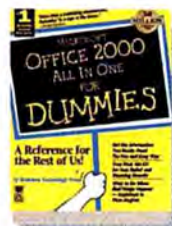
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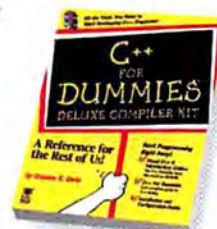
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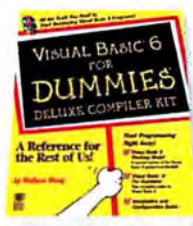
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by Bill McCarthy

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by David Pitts, Bill Ball et al.

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by Evan Callahan

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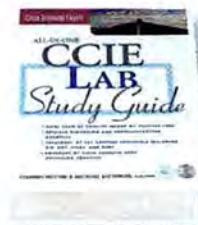


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by Stephen Hutnik & Michael Satterlee

Get certified by studying the comprehensive coverage found only in the All-in-One certification series. The CCIE certification lab test will be a breeze after you run through the countless configurations explained in extreme detail in this book and CD-ROM. (Osborne)

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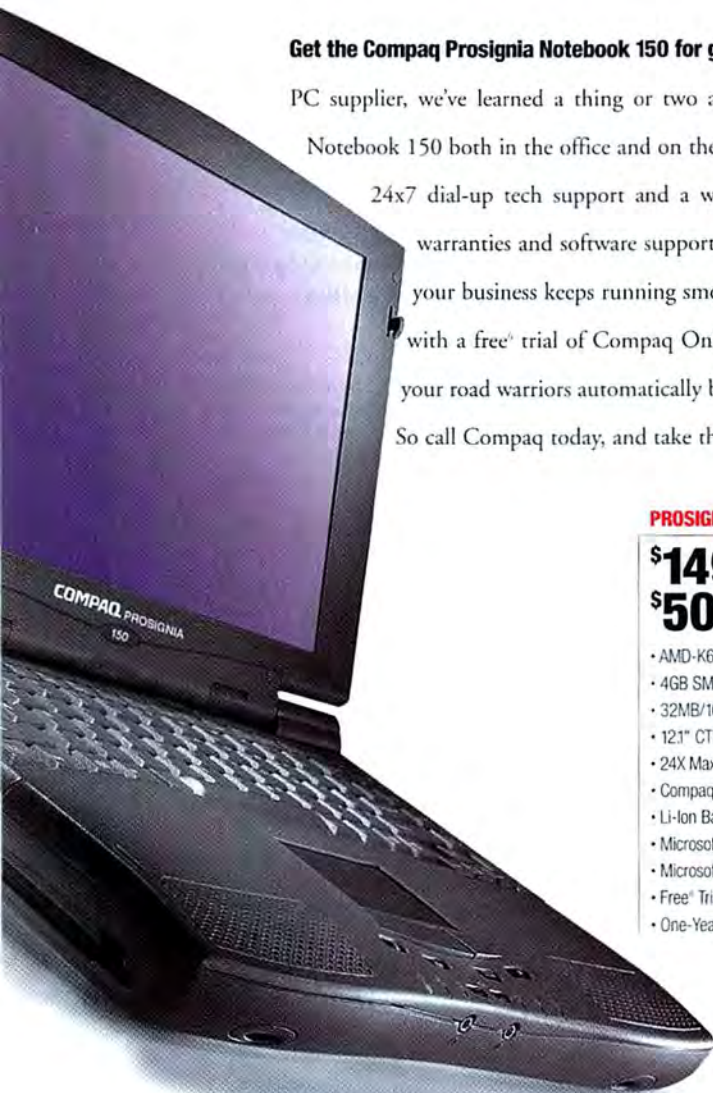
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YOUR TAKE ON: Windows utilities ♦ Web almost-info ♦ PCs in schools

UNFAIR TO PRICE WATCH

I'D LIKE to take issue with the conclusions of "Buy Scouts: Rating the Price-Comparison Services" in the September article "Where to Get the Best PC Deals Online." Your reviewer panned Price Watch with the comment, "Walk on by." This is a great disservice because the reviewer based his judgment on a very narrowly defined task, finding the best price for a name-brand PC. That's not one of Price Watch's strengths. Rather, this site excels at helping the Net surfer find the best price for parts and peripherals—a faster and larger disk drive, memory upgrades, CD-ROM burners, tape drives, media of all sorts, and any sort of component for building, maintaining, or upgrading a computer. Not all of your readers will have the skills or confidence to want a

resource like this, but many will, and Price Watch received a bum rap that ought to be corrected.

Ron Shook, Chicago

Author's response: Price Watch may very well be first-rate at finding components, but we evaluated it as part of a feature on buying PCs online, and we stand by our assessment that it is not very good at finding deals on systems. —Harry McCracken

ANOTHER WINDOWS UTILITY

I WAS VERY impressed with your article, "The Fix Is In: Top Windows Utilities" [August]. But I noticed you didn't mention Windows 98's best utility, the System File Checker. Although

it is probably best suited to advanced users, it's been a godsend for us technonerd. Thanks to the SFC, I've been able to keep my Win 98 PC virtually crash-free over five months of continuous use. This utility is also a good way to ensure that all your system files are intact after installing third-party software that overwrites some key files. With careful and timely use of Windows' own system utilities, most third-party OS utilities are unnecessary.

David M. Malkin
Norwalk, Connecticut

UNRELIABLE WEB INFORMATION

STEPHEN MANES's column "The Age of Almost-Information" [Full Disclosure, September] is on the ▶



HOT BUTTON

Do Wired Schools Mean Better Learning?

TRUE, ADDING a network of computers to a school will not turn today's classrooms into a high-tech, high-achievement wonderland ["Are Wired Schools Failing Our Kids?" September]. But Internet access can give teachers the raw materials needed to create engaging learning experiences. Of course, creating these experiences depends on effective staff development programs.

You might have mentioned the critical role computing plays in preparing students to excel in nontechnology areas. Recent advances in technology have shifted classroom learning from a passive mode to a new model in which students are doers as well as thinkers in every subject area. This can only benefit every student entering our increasingly technology-aware economy.

Joan Kuperstein,
education technology consultant
Miami Beach, Florida

AT MY SCHOOL, we cannot use the computer lab without a teacher's note. If you want to use your study hall to brush up on your typing skills or write a story for the school

magazine, you are out of luck. We are also only allowed to go to teacher-approved Web sites, and reports are difficult to finish at school with the limited computer time that the teachers give us.

Sara McKee, via the Internet

MY SUBURBAN SCHOOL district has tackled the problems you identify by establishing a Technology Integration Mentor program. All TIMs are full-time classroom teachers who have a (relatively) high level of computer expertise. We share that expertise with other teachers, helping them to integrate the use of technology into their curriculum.

Gary Nelson, Houston

SO THE KIDS want to learn about mealworms? There are these fantastic devices where you can look up all sorts of things in a jiffy, with pictures and further references. Compared to PCs, they cost just peanuts, and they don't go obsolete in a few years. They're called books, and schools once used them with a measure of success.

Why are teachers so faddish? Remember New Math and the "open classroom"?

Wolfgang Wiebach
Silver Spring, Maryland

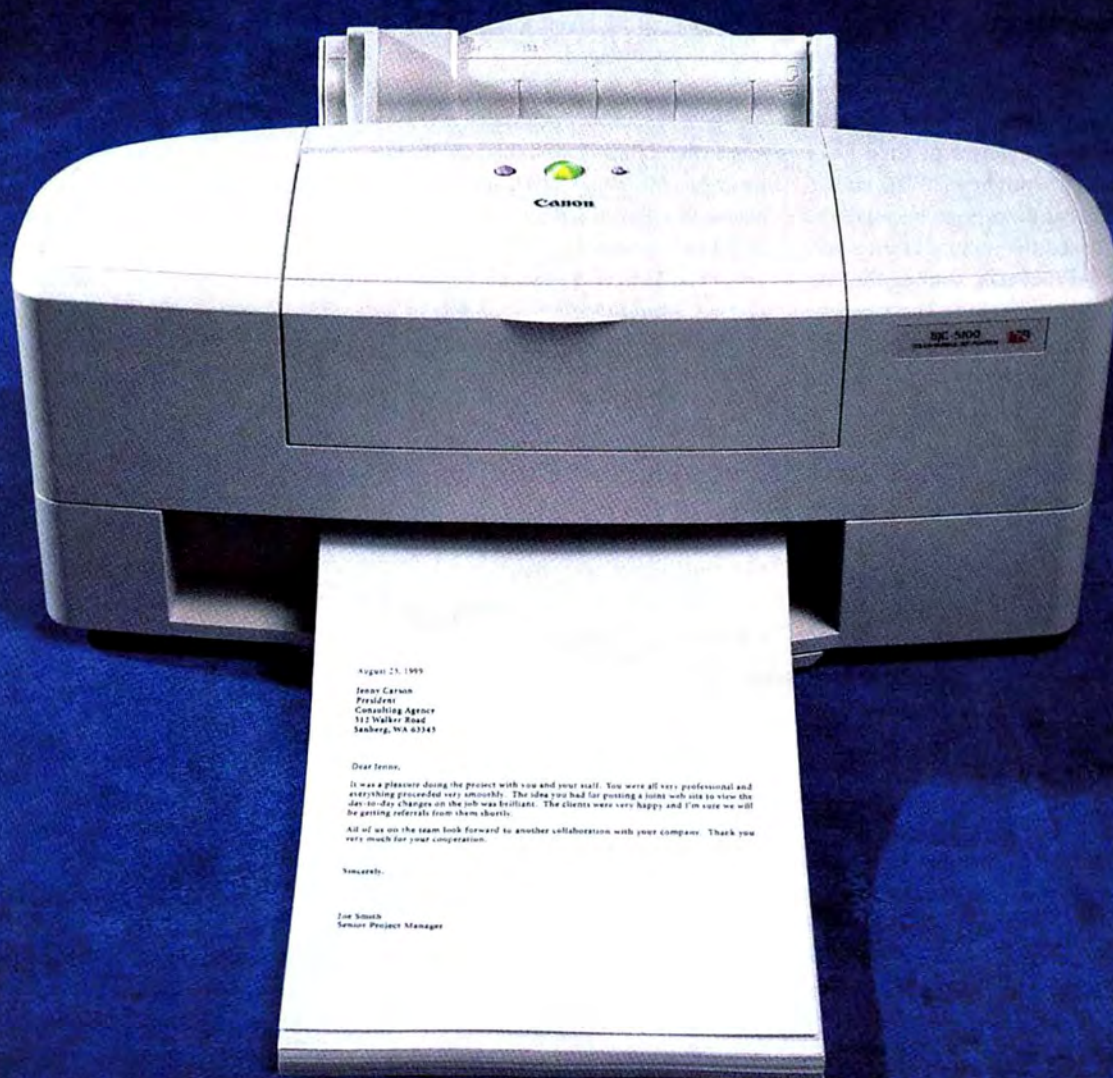
AT THE ELEMENTARY school in my town, each teacher was given four PCs for the kids to use in each classroom. Sounds good, right? The fact is, these were 25-MHz 486 PCs with 8MB of RAM; they ran Windows 3.1, had no network or Internet connection, and lacked any educational software. But they looked good at parent/teacher conferences.

Name withheld by request
Mokena, Illinois

EQUIPPING SCHOOLS with computers for Internet shopping and game-playing prostitutes and abuses a valuable tool for trivial and counterproductive pursuits. It seems little more than a corporate strategy to form habits early, thus ensuring and enhancing future business—even though less than half of those so hooked will have economic justification for such equipment.

S. Schmidt, Houston

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mark. The Internet flourishes despite inaccurate, misleading, confusing, and badly organized "facts." And currently, Web site operators have no real incentive to improve. They still get lots of hits no matter how bad their content.

The Internet experience is like the people we meet in life: You learn to sort out the trustworthy, the con artists, and the rest. For now, the only thing we can do is try out various sites and stop using those that don't deliver what they promise.

*Guy E. Fleming
Port Washington, New York*

I'M SURE everyone has had frustrations like those Manes describes, whether about online accounts that get updated just once a day or conflicting data from different search engines. Every Web (re)searcher should remember two simple things:

1. Just because somebody said it, doesn't mean it's true. Treat the Web like any other information medium (print, radio,

television), use common sense, and remember that the data you find may be inaccurate, incomplete, misleading, or simply devoid of value.

2. The quality of the answers you get often depends on the care with which you ask the question. Learn which search engines are good for what kinds of data—many engines have emphases or specialties. Keeping this in mind may help you use these search tools more effectively.

Wesly Moore, Pasadena, California

TAXATION WITHOUT...

I FIND *PC World's* defense of the E-Rate program [a federal fee-funded subsidy connecting schools and libraries to the Internet, mentioned in "Are Wired Schools Failing Our Kids?" September] troubling. It's a tax imposed by bureaucratic fiat, not the legislative process, aka "taxation without representation." If allowed to stand, any agency could impose a tax on anything it oversees for any reason it sees fit. I wonder if *PC*

World would be less sanguine on the issue if the tax had been levied on PC hardware and software, or perhaps PC magazines.

Richard J. Rydberg, Anoka, Minnesota

Y2K 2.0?

AM I JUST becoming risible in my old age, or am I the only one who finds it rather amusing that several of the Y2K utilities and tool kits reviewed in your September issue ("Get Smart! Control Your Y2K Chaos") had revision numbers on them? It makes me wonder if we'll need upgrades for these packages in 2001!

*Chris Bevers
Kaukauna, Wisconsin*

A SIMPLE SOLUTION

A TECHNICAL SUPPORT person recently offered me a solution to my PC's problems that was amazingly simple and seems worth passing on.

For months, I had experienced endless headaches configuring hardware and soft-



ware and spent many hours on the phone with the PC vendor's support staff. The problems apparently stemmed from the computer's failure to complete a restart.

The technician's solution? Switch the mouse and keyboard input plugs. A simple trick, but it worked!

This type of problem could occur if a user plugs the devices into the wrong ports by mistake. Certainly, I found the labeling on my PC ambiguous, and the manual was no help.

Robert J. Rosser
Rancho Mirage, California

ONLINE AUCTIONS

REGARDING YOUR article "Sold! How to Win at Web Auctions" [August]: I am both a seller and a buyer myself, and I always practice the following rules:

1. Before bidding, always check the comments about the seller. Avoid sellers with a minus rating, and buy from plus-rated sellers only.

2. Make sure the seller can respond to your inquiries. If you receive a "Cannot find" message from your e-mail program when you try to contact the seller, stay away. I always answer questions about my products for sale.

Nancy Beller, via the Internet

FTP VIA WINDOWS

AUGUST's *Internet Tips* discussed downloading via file transfer protocol and recommended the CuteFTP shareware utility. CuteFTP is a fine app, but Internet Explorer users don't have to download it.

The FTP functionality of IE 5.0 is dramatically improved over previous versions. Uploading and downloading is as simple as transferring files locally.

As a bonus, IE remembers the FTP locations that you've visited, just as it does with Web sites, and it's easy to save your log-in information.

Steven R. Hopkinson
Mt. Pleasant, Michigan

THANKS

BLESS YOU! BLESS YOU! For several months, my Win 95 Micron PII-233 has not been itself. When I opened a file in Word, the system would stall for 45 to 60 seconds. With Excel, 60 to 75 seconds passed before I could select, add, or edit.

After reading Steve Bass's September *Home Office* column, "Say Good-Bye to Windows Crashes," I followed his instructions to remove duplicate .dll files, and voilà! Word and Excel are back up to speed. Although page and print setup still take 30 to 60 seconds to activate or accept changes, I can now open and edit Word and Excel files without delay!

Catherine Monroe
Manassas, Virginia

"TROUBLESHOOTING Is My Business" [August] addressed a problem I'd been having. When my aging, out-of-warranty Zip drive started exhibiting signs of the dreaded "Click of Death," I thought ▶

Michael V.
Buford
30519

Only belongings we had left of seven years together were the clothes we were wearing. Emotionally, this was the most trying experience of my life. I was not prepared to start over, or to explain to my children why they suddenly had no toys or couldn't wear their favorite clothes. But you were there to assure me that even though we had lost everything, we were not going to be homeless or without our quality of life. The support we received during this crisis went beyond any paid premiums and simple customer relations. Toby, thank you for holding our hands through this process, and ensuring us that everything was going to be fine.

AT WORK

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Micha



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LETTERS

I'd never be able to use it again. But after I read your article, I contacted Iomega as you suggested—and the company is replacing my three-year-old Zip drive, and also covering shipping both ways! Your magazine has paid for itself ten times over.

Jerd Carpenter Luczynski
Los Angeles

PC World welcomes your letters to the editor. E-mail letters@pcworld.com.

CORRECTIONS AND CLARIFICATIONS

IN OUR SEPTEMBER article "Get Smart! Control Your Y2K Chaos," we stated that Micro 2000 gives its Centurion Year 2000 Test away, but "with a hidden agenda." We did not mean to imply that the company is acting maliciously; rather, we were referring to the fact that the free Year 2000 Test does not mention on its opening screen the other half of Micro 2000's solution, its \$69.95 Centurion Y2K hardware card. *PC World* did not review the card. There is some controversy among industry experts about whether Y2K compliance on a PC's real-time-clock chip is needed. Micro 2000's Centurion covers both the BIOS and RTC-related Y2K problems, but provides a level of compliance we feel is above and beyond the needs of most users. If, however, your company uses legacy applications or custom-written software that draw the date from the CMOS, you might need a hardware solution like the one Micro 2000 sells.

Contrary to a statement in September's *Top of the News* (page 64), only Pacific Bell is part of the SBC phone company; Ameritech and GTE are not, and are expected to offer G.Lite services soon. Also, contrary to the caption on the same page, microfilters must be interposed only between phones and jacks; they filter out G.Lite data signals carried on house phone wiring.

September's *Upgrade Guide* cited an incorrect form factor; there are no 3.5-inch DVD-ROM drives.

August's "Troubleshooting Is My Business" (page 130) should have said a separate volume control for audio CDs is available in Windows. Double-click the speaker icon in the System Tray, and look for a CD Audio volume control bar in the Volume Control dialog box.

PC World regrets the errors.

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I Pointed, I Clicked, I Shopped

It's not as daunting as fighting department store crowds, but holiday shopping on the Web has rules all its own.



IT'S THAT TIME OF YEAR: When the air turns crisp, the rain gear comes out, and panic sets in as I prepare for another series of nerve-racking trips to the mall to do my holiday shopping.

But this year is going to be different. This year, I'm going to munch on fudge and drink eggnog instead of downing aspirin and antacids. This year, I'm doing my shopping online.

From the Pokémon cards and games my son is crazy about to the music CDs, books, and clothes for everyone else—if I can't get it online, then it's not on my list. No more malls. No more crowds. And no more jockeying for a remote parking spot.

First, though, I went on a trial run to check out the selection and service at online stores before the hordes of holiday shoppers hit the Web. I visited more than two dozen sites—from book and music stores to clothing, electronics, and software shops. I perused the merchandise, studied the customer service policies, and then bought and returned a handful of items—the only real way to put an online store to the test.

The good news: My holiday shopping scheme will definitely work. In fact, if I could get my daughter to shop online, I could probably avoid malls forever (although a ten-year-old with a credit card might create an entirely different set of problems). But my shopping expedition was not exactly trouble-free. Along the way I encountered some hidden pitfalls and service snafus that had me longing for a Nordstrom salesperson (though I never once missed schlepping bags to and from the car).

TAXING MATTERS

BACK IN 1998 Congress imposed a three-year moratorium on new state and local taxation of sales on the Net. But that doesn't mean that all Web purchases are tax-free. Several Web sites I visited collect sales tax—it depends on whether they have a presence in your state. On a small order like a music CD, tax doesn't amount to much (about \$1 on a \$14 CD). But if you're shopping for big items, like computers and stereo equipment, the added cost can really hurt. Fortunately, in just about every product category, there are many merchants who don't charge sales tax. All else being equal, I buy from these sites. (But just because a vendor doesn't collect the tax at the point of sale, don't assume you are off the hook; ask your tax preparer.)

Online goods are competitively priced, but (procrastinators take note) shipping charges can break the bank, even in a tax-free zone. Unless you've got money to burn, don't plan on doing last-minute shopping online. You could spend more on shipping charges than on the gifts themselves. Just ask my husband, who, when it comes to shopping, is a bona fide member of Procrastinators Anonymous. Last year he bought me a video I wanted from Reel.com. But because he waited until the week before Christmas, he opted for expedited shipping. The charge: \$11 for next-day delivery—more than half the price of the movie. To make matters worse, we wound up sending the video back, since several people gave me copies. To be ►

fair, Reel.com is no worse than any other Web store I visited (or most catalogs, for that matter). Ground shipping is fairly reasonably priced, but the stores rake in the big bucks when you need to receive things sooner—like tomorrow.

So how do you avoid being gouged for shipping? The most obvious approach is to shop early. (Yeah, right.) I also take advantage of the gift-wrap service offered by many Web sites. For a small fee, I can send the gift directly to the recipient. No, it's not wrapped in my special paper and there's no card with a handwritten note. (Many sites will throw in a card—a nice touch, though a computer-generated note is still impersonal.) But the gift is on time and that's gotta count for something. And I don't have to pay twice for shipping—once to have the gift sent to me and again to get it to Aunt Martha.

Finally, study the shipping charges and options, which can vary considerably from one site to another. At CDnow (www.

cdnow.com), for example, by default everything is shipped first class, for arrival in four to eight days. If you need it sooner, your other options are Federal Express one- or two-day delivery—far costlier than first-class for one CD. CDworld (www.cdworld.com), on the other hand, gives you six shipping options. It charges more for first-class shipping than CDnow does, but it also offers a discounted rate on fourth-class shipping for early shoppers.

My favorite sites, though, are the ones that toss in first-class shipping for free as an incentive to buy from them. KBkids (www.kbkids.com) provides this much-appreciated service. Needless to say, if you come across a site that doesn't charge sales tax and offers free shipping, then you've hit the mother lode.

Amazingly, just about every product I ordered arrived on schedule or early—but again, that was before the holiday rush.

Although most Web stores provided me with a general time frame in which my

order would arrive, others have nifty tools that leave nothing to chance. REI.com (www.rei.com), for example, features the UPS Date Finder. Click an option and you can see the date your order will arrive, along with shipping fees. Sites like Shades.com and Dell provide even more order-tracking features: Just type in your customer number and up pops the status of your order, including the expected ship date and when the item was sent.

TAKING STOCK

WITHOUT FAIL, someone on my list will just *have* to have an item that is sold out everywhere. Last year it was the Air Hogs' Sky Shark, a cool airplane that's powered by compressed air. I made dozens of calls and dashed into toy stores once a week to see if a new shipment had arrived. This year, I'm going to a Web store like EToys (www.etoys.com), which has a handy e-mail notification service that lets you know when an item is back in stock. ▶

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Toys aren't the only things that sell out. I shopped for ski goggles in the off-season and found slim pickings. Most sites let me know an item was out of stock before I finished ordering. But not MountainZone.com (www.gearzone.com). Three days after I ordered, I got a call saying the distributor didn't have the goggles in stock. The site eventually found a pair, which I appreciated, but I wish I'd found out about the problem when I ordered.

On the plus side, MountainZone.com didn't charge my credit card until it actually shipped the goggles. In contrast, some merchants put the charge through as soon as the order is placed.

Every Web store I purchased from confirmed my order via e-mail (typically within a few hours). But these e-mails don't always mean the item is in stock. They're often automated responses. Some online stores, like Amazon.com, go a step further and send a second e-mail when the order does ship.

MANY HAPPY RETURNS

AT A MINIMUM, an online merchant should offer an unconditional money-back guarantee. No restocking fee. No hassles. No exceptions. And in many cases, that's exactly what you get. But numerous home electronics and computer stores I visited, including J&R Electronics (www.jandr.com) and Etown.com (www.ETOWN.COM), charge a 10 to 20 percent restocking fee in addition to the return shipping on high-ticket items.

Study the return policy carefully. Some stores require that you call to get a return merchandise authorization number; others put a time cap on returns (15 to 30 days after the invoice date is common). With gifts especially, you need to know this information before you buy.

Gap (www.gap.com) and Nordstrom (www.nordstrom.com), among others, let you return goods purchased online to their retail stores, which can save a bundle on return shipping. Other Web stores

make you pay the return shipping but will waive new shipping charges on all exchanges—perfect for items like clothing.

One store, Crutchfield Electronics (www.crutchfield.com), really makes returns a breeze. Included in its packages is all the paperwork you need to return merchandise. You just fill out the form, tape up the box, and back it goes. The company even pays the return freight.

BYE-BYE MALLS?

WILL I REALLY be able to avoid mall shopping this holiday season? Judging from my trial run, I think the answer is yes. Who knows? Maybe I'll even have enough time this year to dust off grandma's recipe and whip up a batch of fudge.

Roberta Furger is a PC World contributing editor. By the time you read this, she'll be completely finished with her holiday shopping. Send your online shopping tales to consumerwatch@pcworld.com. ■

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ComputerWorld, March 1999

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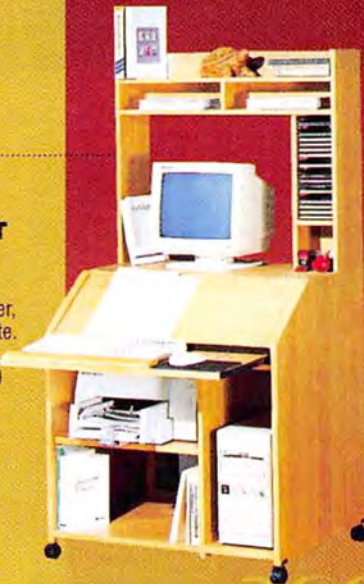
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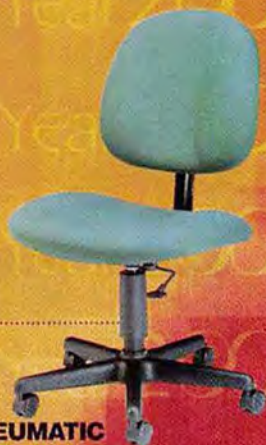
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HAVE YOU GOTTEN ONE OF those e-mails hawking Viagra? If not, a Web search will quickly turn up hundreds of sites selling it and other so-called lifestyle drugs—without requiring a prescription from your doctor. Just fill out an online form. Should you? Not on your life.

Don't get me wrong: I am all for those fantastically convenient sites like Drugstore.com that fill doctors' prescriptions for you. What I'm talking about are sites that prescribe and sell you drugs based solely on your answers on an online form, not on a live consultation with a doctor.

"How much information can physicians get on a patient when they prescribe over the Web?" asks Dr. Francis Palumbo, director of the Center on Drugs and Public Policy at the University of Maryland School of Pharmacy. "Obviously they can't do a physical exam, and the medical history [they have to go on] is solely patient-reported." These factors could lead a doctor to prescribe Viagra to a man without knowing that he takes heart disease medication—a deadly combination. As Dr. Herman I. Abromowitz of

the American Medical Association testified to Congress recently, "This type of practice can be very dangerous to patients."

While many experts agree that Web pharmacies provide a great service for consumers, most oppose sites that allow

doctors to prescribe drugs based only on information taken off a form. The Food and Drug Administration plans to work with states to bring action against such physicians.

If these concerns are not enough rea-

son for you to visit your doctor, how's this: "The Net is one more medium for selling counterfeit drugs," says Dr. Jeffrey Shuren, medical officer at the FDA's Office of Policy. Even if the drug you get is authentic, it may be contaminated or outdated.

If you're shy about buying drugs like Viagra in person, talk to your doctor first and then get the prescription filled online.



Heads Up...



"THE VERSION OF **Quicken Basic 98** that came with my computer is not Y2K compliant," says Scott Winship of St. Louis. "Do I have to pay to get an update?" No, you don't, says Intuit. You can download the Y2K-compliant Quicken Deluxe 98 for free at www.intuit.com/corporate/year2000/quicken/qwin.html. **Counterfeit software?** One reader wrote complaining that the copy of Microsoft Office he got at an auction site looks bogus. Well, chances are it is. According to a Microsoft spokesperson, "A significant percentage of the Microsoft software available on auction sites is counterfeit or unauthorized—mostly counterfeit." The problem is so rampant that the company monitors auction sites and reports fraudulent sales weekly so that the sites can take them down. If you buy from online auctions, always ask for a certificate of authenticity (found on the spine of the package or in the manual) and documentation—signs that the software is legit... **Hope for Hayes** modem owners: Zoom Telephonics bought the Hayes brand name and now offers limited support for some Hayes models that predate the acquisition. (Zoom is also developing and selling new Hayes modems.) Visit www.hayesmicro.com or call 900/555-2666 (95 cents per minute) to see if the techs can help with your modem.

LETTER OF THE MONTH



IN FEBRUARY OF 1997 I purchased a Dell Dimension XPS M200s with 64MB of RAM. Months later, I tried to upgrade the memory, but a technician told me that the motherboard design on the machine wouldn't allow it. That computer cost me \$3200 and I thought it could be upgraded. This isn't right.

Oscar Nieponice, Oakland, California

On Your Side responds: Liz Dean Hehmsoth of Dell Executive Services

confirmed that the motherboard in this older system cannot be upgraded to exceed 64MB of RAM. For a couple of months in 1997—just when Nieponice bought his PC—Dell mistakenly advertised that its memory could be upgraded. Because Hehmsoth figured Nieponice probably bought his PC at least partly in response to one of those ads, Dell exchanged it for a refurbished PII-450 with 128MB of RAM, an internal modem, and a 9.1GB hard drive. Nieponice is happy with the upgrade. ■

GOTTEN A RAW DEAL?

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

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BUILT-IN REMOTE MONITORING	Yes	No
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Surprised by the comparison? We're not. We've been busy perfecting color printing for more than 15 years, and developing breakthrough products such as the Tektronix Phaser® 740 color laser printer. It's the first workgroup printer to deliver amazing photo-quality color at an equally amazing price. Imagine, true 1200 dpi color output on everything from labels to letterhead. Dazzling color presentations and overheads. And a host of user-friendly features that make the Phaser 740 color laser as easy to use as it is to own. To learn more about the Phaser 740 color laser, or bringing color into your office, call 1-877-362-6567, ext. 1631 or visit www.tektronix.com/compare.

An Easy Fix for the Software Addict

PROBLEM *Your download habit has become insatiable—and it's corrupting your computer.*

SOLUTION *Use a disaster recovery utility to protect yourself from problem downloads.*



LARRY TULLOS ADMITS IT: He's a download junkie. "I try out a lot of shareware, often installing and uninstalling at least one program a week," says the director of quality and reliability for a semiconductor firm in the Dallas area.

With all this software juggling, Tullos is no stranger to Windows' error messages and to occasional booting hang-ups due to failed installation attempts or incompatibilities between new programs and something already in his system. "I've reinstalled Windows more times than I care to remember," he says with a laugh.

Fortunately, Tullos and software fiends like him don't have to kick the habit to save their computer. There are simple ways to revive your PC after a messy download binge. And if you're smart, you'll take precautions—like scanning for viruses and practicing good download habits—to ensure that your software fix doesn't become a monkey on your back.

AS YOU LIKED IT

THE BIGGEST CHALLENGE for any download junkie is learning how to fix glitches created by the habit. When problem downloads do wreak havoc, you can use various utilities to restore key configuration files (such as the Windows Registry, autoexec.bat, and config.sys).

Tullos chose Wild File's \$50 GoBack utility, which lets you undo software installations with only a few keystrokes. GoBack can restore not only configuration files, but any other files (including DLLs) that a program may overwrite.

Another option is ReSet Software's ReSet-2000 (also \$50), which saves a copy of the Registry and other key files each time you shut down. If new software later trashes your system, you can restore it from any of the prior five sets of copies. ReSet2000 also lets you save backups manually, so you can preserve configurations immediately before and after a new installation. Like GoBack, it also allows you to restore configurations each time you boot, permitting recovery even when Windows won't load.

You can achieve similar results with Windows 98's Registry Checker—after a fair amount of tinkering. Run scanreg from the DOS prompt, or see last December's *Hardware Tips* (www.pcworld.com/dec98/hardwaretips_registry).

While GoBack's ability to restore files other than configuration ones gives it an advantage over the other two utilities, it has limitations. It fences off 10 percent of your drive to make backups, and it can paralyze your system if used with any software that alters your drive's master boot record (such as FDISK, Ontrack Disk Manager, or EZ-Drive). An upcoming version warns you before this happens and disables GoBack if you tell it to do so, but it doesn't really solve the incompatibility problem.

PLAYING IT SAFE

BESIDES RECOVERY utilities, a good antivirus program is essential for importing foreign software. But be sure to update virus definitions regularly by downloading upgrades from ►

the program's Web site, and choose a program that automatically scans downloaded files (not all do). Symantec's Norton AntiVirus 5 and Network Associates' McAfee VirusScan 4 are two that do a good job; each sells for about \$50.

GETTING THE FAT OUT

IF YOU DOWNLOAD a lot of software, your hard drive can fill up quickly. But good downloading habits can prevent your software test runs from eating up storage. Download files into a separate subdirectory—such as c:\temp—created for that purpose, and install the software from that same directory. Make sure you empty this directory before installing additional software from it, though, to prevent new programs from using incorrect files during installation. If you think you may need to reinstall a program later, you can copy it to yet another subdirectory.

Deleting programs after you've sampled them is easy if they conform to Windows

standards: Simply run Add/Remove Programs within the Windows Control Panel, and you should be able to discard most (if not all) of the program's files. Uninstallers such as Symantec's excellent Norton CleanSweep 4.5 often perform a more thorough removal and can handle programs that the Windows applet cannot.

GIVE IT A TRY

LARRY TULLOS ESTIMATES that GoBack has bailed him out 20 times already, and he's happy with his arsenal of GoBack, McAfee VirusScan, and PowerQuest's Drive Image, which he uses to create a full backup. But the best solution for you will depend on your particular needs.

With just a few prudent steps, you can make your software habit safe, and be on the road to downloading with impunity.

Ethan Archer writes frequently about technology from his home in the Northwest. See page 14 for contact information. ■

Drive Image 2.0

Street price: \$69; PowerQuest; 800/379-2566; www.powerquest.com

PRODUCT INFO NO. 605

GoBack 2.1c

Street price: \$50; Wild File; 888/945-3345; www.goback.com

PRODUCT INFO NO. 606

McAfee VirusScan 4 for Windows 95/98

Street price: \$50; Network Associates; 888/712-1477; www.nai.com

PRODUCT INFO NO. 607

Norton AntiVirus 5, CleanSweep 4.5

Street prices: Norton AntiVirus 5, \$50; Norton CleanSweep 4.5, \$40; Symantec; 800/441-7234; www.symantec.com

PRODUCT INFO NO. 608

ReSet2000

List price: \$50; ReSet Software; 253/851-8264; www.resetsoftware.com

PRODUCT INFO NO. 609

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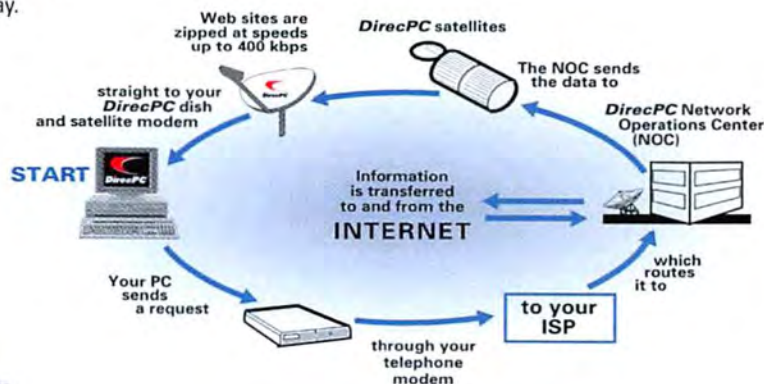
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How does it work?

The engineers at Hughes figured out that the real bottleneck in the speed of the Internet wasn't the request **out** to the Web — telephone modems handle that just fine. Everything slows down when the Web tries to use the telephone system to send you **back** the media-rich information you requested. So, we use a much faster satellite connection for sending you the Web content you want. Check out the diagram — this is the system that makes DirecPC the fastest Internet access available nationwide.



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On-Line Time (Hours of usage for Turbo Internet)	25 Hours/Month	100 Hours/Month	200 Hours/Month
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Free E-mail Accounts	1	1	4
Networking (Number of Seats)	N/A	N/A	4

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Move Over, Cable—DSL Has Arrived

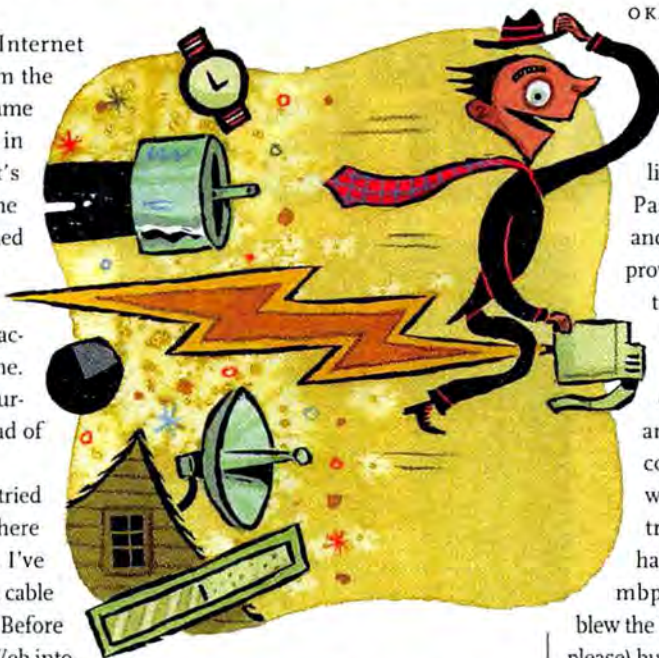
"WHAT HAPPENED TO the Internet connection?" It was a cry from the wilderness. Actually, the cry came from my wife, Judy, who was in her office down the hall. "It's faster than I've ever seen it," she said. I hadn't told her I'd switched the network from cable modem to DSL. It was a test—I wanted to get her unbiased reaction. (Don't you try this at home. Only qualified technoids can surprise a spouse with DSL instead of dinner and get away with it.)

Over the last few years, I've tried almost every whiz-bang way there is to connect to the Internet. I've zoomed through the Net with a cable modem for about a year now. Before that I had a satellite beam the Web into my home via a DirecPC Internet dish on my roof (fast, but a hassle). Back in the bad old days, I even tried an ISDN line (don't get me started on that one).

But I've given all that up for something that's better, quicker to say, and more impressive at parties: DSL. It stands for Digital Subscriber Line, and once I got a taste of it, it was *hasta la vista, cable*.

HOLD MY CALLS! I HAVE DSL

DSL IS FASTER THAN the leisurely 256-kbps cable modem speed I was used to. A typical DSL hookup offers 384-kbps downloads and 128-kbps uploads. (You can get cable connections that are faster, but it'll cost you.) Like cable, DSL is always connected. That means I don't have to wait to check my e-mail or browse the Web, because there's no dialing, and



Once I got a taste of Digital Subscriber Line, it was *hasta la vista, cable*.

there are absolutely no busy signals.

My guess is you have two phone lines, one for Internet surfing and the other for making calls. If you do, consider this: Some DSL providers will split your one existing copper phone line and use it for simultaneous browsing and voice or fax calls. (Just try *that* with cable.)

The clincher? Unlike my cable modem, DSL has never given me a minute of access trouble or downtime. Access speed has been consistent for months, because the connection doesn't meander through various switching stations. And unlike cable modem users, I don't share my bandwidth with others on a network. That makes DSL less prone to slowdowns as all my neighbors log on to BassCam.com.

Intrigued? Check out these DSL sites: www.dslreports.com and www.dsl.com.

Both will help you figure out if you can get DSL—or at least put you in touch with a provider in your area. If you want something you can sink your teeth into, grab a copy of David Angell's *DSL for Dummies* (IDG Books, 1999).

HASTA LA VISA

OKAY, YOU WANT to know how much DSL will set you back.

Answer: Not much more than cable. As always, prices vary depending on where you live and the speed you want. In Pasadena, California, EarthLink and Pacific Bell have teamed up to provide 384-kbps/128-kbps connections for \$50 per month with a \$198 installation fee.

Unfortunately, the duo didn't offer DSL service in my area yet and I had *shpilkes* (translation: I couldn't wait). So I got in touch with Concentric (www.concentricdsl.com), another ISP, and had it set up an extremely fast 1.1-mbps connection that practically blew the hair off my head (hold the jokes, please) but cost more than lease payments on a new Lexus—nearly \$400 a month. Hence Judy's wonder and amazement (wait till she sees the bill).

Naturally, I was worried about installation. When I had my ISDN line installed, Pacific Bell sent over a crackerjack team—Larry, Moe, and Curly. (Larry had never seen a computer before, Moe had never used a telephone, and Curly was their supervisor, so he knew even less than they did.) This time it was much better. Concentric handled everything, getting Pac Bell to check the lines and Covad, the actual DSL provider, to set up my PC and connect the DSL modem. In an hour, I was up and running.

Next month: Sharing your Internet connection and defending yourself against hackers trying to break into your PC.

Contributing Editor Steve Bass is a licensed marriage and family therapist and president of the Pasadena IBM Users Group. He can be reached at steve_bass@pcworld.com.

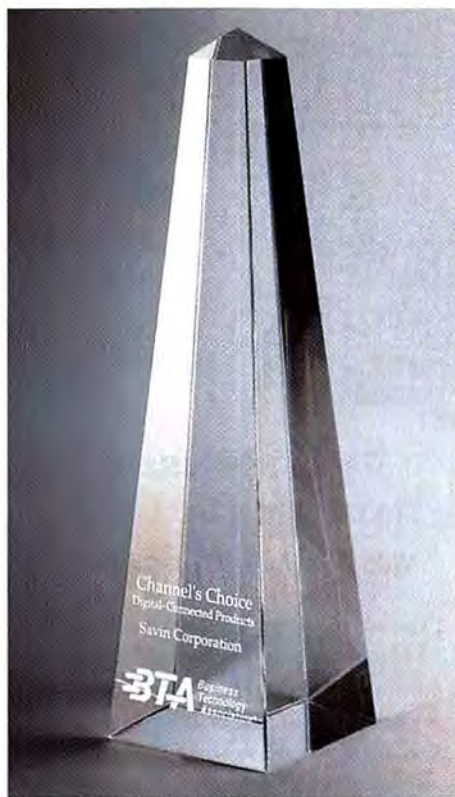
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Holey browser, Batman! ♦ Slick up your game ♦ WordPerfect Office 2000 patch

Microsoft Security Goes to the Dogs

MICROSOFT WOULD probably disagree that April is the cruelest month. No one ever said the company's core programs were bug-free, but August's string of embarrassing revelations has left little doubt that the software is less than secure when it comes to Net surfing. If you use Internet Explorer, Windows, Office, or MSN Messenger chat software, assume that your system is wide open to hackers. The sad details:

BUG Georgi Guninski, the Bulgarian browser-security expert who never sleeps, found yet another flaw in Internet Explorer 5's ActiveX system that could allow a malicious hacker to take full control of your computer through an HTML e-mail message or Web page.

FIX Microsoft promptly posted its "Scriptlet.typelib" and "Eyedog" vulnerability updates. You can find the patches at www.microsoft.com/windows/ie/security/default.asp. The fixes disable two flawed ActiveX controls that allow an attack.

BUG Java security experts at Xerox PARC report that Microsoft's Java Virtual Machine—the software that allows mostly Web-based Java programs to run under Windows, IE, and other apps, including Qualcomm's Eudora—is vulnerable to the same type of attack Guninski found. However, unlike the ActiveX hole, the Java problem exists in IE 4.x as well.

FIX Microsoft's Virtual Machine page has links to a 6.3MB patch for Windows 95/98 and a 4.4MB patch for Windows NT 4. Go to www.microsoft.com/java/vm/dl_vm32.htm.

BUG Office 97 and 2000 users are vulnerable to a security flaw in Excel's ODBC (Open Database Connectivity) driver. With the right embedded commands, an Excel spreadsheet attached to an e-mail message or downloaded from the Net could take virtually any action on the user's computer, says Microsoft.

FIX Find a link to a 2.8MB Excel 97 fix at officeupdate.microsoft.com/downloadDetails/excel97odbc.htm; the 2.8MB Excel 2000 patch is at officeupdate.microsoft.com/2000/downloadDetails/excel2000odbc.htm.

BUG If you use Microsoft's MSN Messenger 1 chat program, and you have a HotMail account, be careful about your



I N B R I E F

Windows 98 SE Shutdown Patch

IF YOUR PC has had problems shutting down since you upgraded to Windows 98 Second Edition, you probably need the 502KB patch at www.microsoft.com/windows98/downloads/contents/WURcommended/S_WUFeatured/Win98SE/Default.asp.

WordPerfect Office 2000 Service Pack

USING COREL'S SUITE? Service Pack 1 updates the Standard, Voice-Powered, and Professional versions. It fixes various problems in WordPerfect 9, Quattro Pro 9, and other apps. For details and a link to the 36MB patch, see www.corel.com/support/ftp/site/pub/wordperfect/wpwin/office2000/2000_service_pack_1.htm. If you'd prefer the update on CD, call 800/772-6735, and be prepared to pay \$10 for shipping and handling.

online activities. Anybody who has access to your computer and knows the right place to look can discover your HotMail password while you're in the loo.

FIX Visit messenger.msn.com/download/download.asp to download and install the latest version of MSN Messenger.

Get Your Game in Shape

WITH YOUR operating system, office suite, and browser momentarily patched into submission, it's time to take a break with your favorite computer game. But even fun stuff has bugs. Here are some recent patches for four popular games: **Activision Civilization: Call to Power 1.2:** Find numerous improvements to the game's editor and interface, along with dozens of crash-preventing fixes, at www.activision.com/support/show-patch.asp?patchID=136. **Sierra Studios Half-Life:** You'll find three patches for different versions of Half-Life at www.won.net/gamerooms/action/half-life. If you've got version

1.0.0.9, go to ftp://ftp.won.net/pub/half-life/english/10091010.EXE for a patch that adds server capabilities so you can play over a network or on the Internet.

Activision Heretic II: There are now four patches available at www.activision.com/support/show-patch.asp. One of them, the Enhancement Pack Version 1.06 Update, adds features known to Heretic II fanatics: Deathmatch maps, new skins, and a new Armageddon level.

MicroProse MechWarrior 3 1.1: The official MechWarrior site has a 2.5MB patch offering hundreds of bug fixes and enhancements. Find it at www.mechwarrior3.com/support/downloads.html.

B U G G E D ?

FOUND A HARDWARE or software bug? Tell us about it via e-mail at bugs@pcworld.com.



Find files mentioned in this article at www.fileworld.com/magazine. Scott Spanbauer is a contributing editor for PC World.

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TOP OF THE NEWS

What's a Buyer To Do?

New **chip sets and memory** make choosing a PIII PC more confusing than ever. Don't let a **slick sales pitch** lure you into buying more than you need.

By Yarden Arar



BUYING A high-performance PC used to be fairly straightforward: You chose the highest CPU speed available and added as much memory as you could afford. Not anymore. These days, a savvy shopper has to sort through a plethora of Intel and AMD processors—some of which carry the same clock speed but perform quite differently. Now

the PC industry is tossing you another curve: Two formerly humdrum items—chip sets and memory—are much more important today. Like it or not, you'll have to pay attention.

By the time you read this, Pentium-III PCs will be available with three types of memory (RDRAM, SDRAM, and

VC SDRAM) and at least four system chip sets: Intel's existing 440BX, its new 820 or

Editor's Note: At press time, Intel announced a delay in the launch of systems with the 820 chip set after discovering a still-undefined error in the product. Intel believes the error did not affect benchmark results. We will retest in future issues.

810e options, or Via Technologies' Apollo Pro133 4x.

Has the industry lost its collective mind? Does it want to

make buying PCs too complicated for all but the digerati? No. There's a reason for all

this change. The industry is trying to eliminate barriers to increased PC performance. Intel CPUs have

leaped from 400 to 600 MHz in 1999—but system performance hasn't kept pace. Memory speed and bus bandwidth

RANDOM NUMBER GENERATOR

FRONT
SIDE BUS

PC-100

RDRAM

VIRTUAL
CHANNEL RAM

CAMINO

have become bottlenecks, and this round of upgrades aims to correct those problems. Does it succeed? We'd like to say yes—but it's not that simple.

Not everybody will benefit right away. Our tests of the first systems with 820 chip sets (code-named Camino) show that everyday business tasks gain little, if anything, from the fastest memory and a 133-MHz system bus. But if

your work involves heavy-duty memory access—intensive multitasking, for example—you should notice a difference. And Intel says that a year from now, when processors run even faster, the new underpinnings will play an important role, especially if demanding apps such as streaming video become popular.

But if you need to buy a high-performance PC soon,

think carefully about timing. An AMD Athlon-based system delivers the best current combination of speed and price. Among Intel PIII machines, a system with an 820 chip set offers a bit of new investment protection, but older machines with BX chip sets deliver plenty of horsepower for most jobs, at a far better price. If you covet every bit of speed, however, waiting a bit longer should pay off handsomely. Another round of PIII chips, boasting significant improvements in technology, is due in late October, and machines built around them should markedly outperform 600-MHz PIII systems.

BEHIND THE HYPE

IT'S IMPORTANT to understand what today's new PIII-600 systems will do for you and what they won't. To see the technologies in action, we evaluated three preproduction PIII-600 systems: a Dell Dimension XPS B600 equipped with Intel's 820 chip set and 128MB of PC-800 RDRAM; a Micron Millennia Max 600/133 with the Via Apollo Pro133 4x chip set and 128MB of 133-MHz VC (virtual channel) SDRAM; and an NEC PowerMate VT PIII-600 with the 820 chip set and 128MB of PC-100 SDRAM. We measured them against a similarly configured Micron PIII-600 with the old 440BX chip set, two other PIII-600/BX systems, and several machines based on the AMD Athlon processor.

Despite their memory and bus differences, the PIII systems earned nearly identical PC WorldBench 98 scores, hovering at 250. This isn't ▶

JUST IN



Printer for Nothing, Ink's Not Free

TEKTRONIX, a maker of highly rated networkable color printers, plans to give away thousands of Phaser 840 10-ppm laser printers (normally priced at \$4600 each) to business users. To qualify, you complete an application (at www.freecolorprinters.com) and, if accepted, agree to buy all your ink through the Web from Tektronix (black ink is free, a color pack with one black and two color refills is \$79). Businesses selected must print a minimum number of pages per month—a quantity Tektronix will decide case-by-case—and must pay \$75 every month they fall short of the minimum. You can return the printer and back out of the deal at any time with no penalty. Meet the conditions for 36 months, and the printer is yours, no other strings attached. One printer per customer site.

Faster USB Devices

BY NOVEMBER 2000, Universal Serial Bus connections will be express routes: USB 2.0 will pump data between PC and peripherals at 360 to 480 megabits per second—30 to 40 times faster than today's USB 1.1 standard. Meanwhile, another fast peripheral interface, the IEEE 1394 bus standard (aka FireWire), could stall, despite several recent ▶



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Dell Dimension XPS B600

too surprising: Today's productivity apps, including those in our test suite, lean heavily on the processor's secondary cache to finish tasks quickly. As a result, they don't cry out for more system bus bandwidth or higher-speed memory. Also, the PIII machines still ran noticeably slower than the average AMD Athlon-600 and the one Athlon-650 machine we tested, which turned in PC WorldBench 98 scores of 278 and 290, respectively.

The 820/RDRAM memory combination didn't distinguish itself until the multitasking test. Here, machines performing file extraction in

the background also did tasks in Microsoft Word, Norton AntiVirus, and Adobe Photoshop. Dell's 820/RDRAM system completed the test in 243 seconds, about 37 percent less time than the Micron Millennium Max 600 with the BX chip set, and 14 percent less time than the Athlon-600 systems. In fact, multitasking is the only area where the PIII/820 combination beat the Athlon PCs by a noticeable margin.

KEY DIFFERENCES

THE TEST RESULTS don't tell the whole story: To plan what and when to buy, you need to understand what's happening

inside these new PCs. The new chip sets pave the way for some worthwhile changes.

With its 133-MHz system bus, the top-of-line 820 chip set can accelerate data transfer rates throughout the system. (AMD Athlon systems have a 200-MHz bus, but so far they haven't shipped with memory that fully capitalizes on it.) The 820 also supports 4X AGP graphics cards, which are designed to push information through the AGP bus twice as fast as today's 2X AGP boards can. Few applications can take advantage of this capability yet, but 4X-optimized titles should debut by the end of the year.

standard PC-100 as well, if a memory translator is added to the motherboard; the NEC PowerMate used this arrangement, which analysts say slows system performance a bit. The 820 supports UltraDMA/66 hard drives (used in all three machines we tested) designed to double the BX chip set's maximum 33-Mbps hard disk access rate. We have not fully tested access rates yet.



The **820/RDRAM** memory combination didn't distinguish itself **until** the **multitasking** test.

More notably, the 820 chip set enables RDRAM, the type of memory used in the Dell machine we tested. RDRAM can transfer data on the memory bus at speeds up to 1.6GB per second, about twice as fast as standard PC-100 SDRAM. The 820 can work with stan-

The 810e chip set wasn't ready in time for us to test; it will be used in budget PIII PCs. Like the 810 chip set for Celeron systems, it integrates adequate (but not stellar) AGP graphics to save cost. The 810e doesn't support RDRAM, and you can't upgrade graphics. It

Intel and Via Inside: What the New Chip Sets Mean to You

CHIP SET	Estimated system cost	CPU	System bus (MHz)			Disk interface		AGP	Memory			Who should look for it
			66	100	133	UDMA33	UDMA66		SDRAM ²	VC SDRAM ³	RDRAM	
Intel 440BX	\$1200-\$1500	PIII	●	●	○	●	○	2X	●	○	○	Mainstream users who may want to upgrade their graphics, but not their CPU.
Intel 810	\$800-\$1100	Celeron	●	●	○	●	●	*	●	○	○	Home or business users on a budget who need adequate but not top-speed performance.
Intel 810e	\$1000-\$1200	PIII	●	●	●	●	●	*	●	○	○	Value-conscious business users who may later want to upgrade their CPU, but not their graphics.
Intel 820	\$1700-\$3000	PIII	○	●	●	●	●	2X, 4X	●	○	●	Serious multitaskers; any user who's willing to pay top dollar for extra speed.
Via Apollo Pro133 4x	\$1500-\$2200	PIII	●	●	●	●	●	2X, 4X	● ⁴	●	○	Mainstream users who want high-end, upgradable graphics, a fast system bus, and CPU upgradability.

● Yes ○ No

¹ For hard drive.

² 100 MHz.

³ 100 or 133 MHz.

⁴ Integrated.

⁵ Also supports SDRAM at 133 MHz.

Intel's Hot Numbers Promise More Privacy

IF YOU CARE a lot about keeping your data private, you should be concerned about your PC's ability to produce random numbers. A PC uses random numbers to generate encryption keys, which are used to secure much of the data sent over the Internet. But a truly random number is hard to find. Most PCs today generate pseudo-random numbers, using an algorithm seeded with a number that isn't quite random—the system's time of day. Eventually, a determined hacker can

figure out the basis of the calculation and then grab the encrypted information—for example, data that's exchanged in the course of an online purchase.

TOUGH TO CRACK

INTEL'S 810, 810E, and 820 chip sets include hardware designed to foil even dedicated hackers. The so-called random number generator built into these chip sets derives a seed from the

system's thermal noise: tiny, unpredictable variations in electrical current due to very slight changes in heat. Thermal noise-based seeds are hard for hackers to crack.

But there's one catch: For the RNG to work, encryption programs must tap into it—and today's apps don't know that it exists. Software and Web site support should begin late this year and gather steam throughout the year 2000, Intel says.

(By then, all new Intel-based PCs will likely be shipping with hardware-based RNGs integrated on the motherboard.) As yet, AMD and Via do not incorporate an RNG in their system chip sets, but there's no reason they couldn't do this in the future. So while Intel deserves plaudits for its efforts to address longstanding security concerns, its RNG won't be an instant panacea for the many Internet security dangers. And you'll need a new PC to benefit from it at all.

supports a 133-MHz or older system bus, PC-100 memory, and UltraDMA/66 hard drives.

The 820, 810E, and 810 chip sets have a random number generator for better security (see "Intel's Hot Numbers Promise More Privacy," above).

But not all PIII systems will have Intel chip sets inside. Micron's Millennia models will use Via Technologies'

Apollo Pro133 4x chip set, which supports the 133-MHz system bus, 4X AGP, and UltraDMA/66 drives but not RDRAM. Micron says that it chose the Via Apollo chip set and 133-MHz VC SDRAM (designed to run slightly faster than standard SDRAM) to save money while delivering most of the 820's benefits. At \$2183, the Millennia Max 600/133 is

aggressively priced, considering that it packs a 17-inch monitor, a 34GB hard drive, an 8X DVD-ROM drive, a V.90 modem, and Microsoft Office 2000.

In our tests, the Millennia Max 600/133 performed a lot like the Micron PIII-600 BX system, which will soon be phased out. (Remember, we didn't see much difference between Intel BX and 820 systems, either. Our Micron 600/133 system cost more than its PIII-600 sibling only because it had a better configuration.) Micron's goal is 820/RDRAM-level performance at a price about \$300 lower.

THANKS FOR THE MEMORIES

WHAT'S SO GREAT about RDRAM memory? (The R in the acronym stands for *Rambus*, the firm that devel-

product introductions. Influential players like Intel are backing USB 2.0 as a better option.

Easy on the Eyes

READING DENSE masses of text on screen is no fun. But Microsoft's upcoming Reader software—based on the company's ClearType technology—promises to sharpen fonts and adjust layouts for easier reading on LCD screens (CRTs won't benefit as much). ClearType will improve only text formatted for it. You can expect to see stand-alone Reader software for desktops, laptops, and portables starting early next year; ClearType technology may be embedded in future versions of Windows. Microsoft hopes that ClearType will someday make electronic books as common as paperbacks.



Tidbytes

Face Off at 700 MHz: AMD will announce the first 700-MHz versions of its Athlon chip for desktops in early October. Later that month, Intel should announce its newest Pentium III chips. We'll report performance testing results in our December issue. **Holiday Shopping Bummer:** Higher RAM prices could mean less green and more red for you this holiday season. In mid-August, 64MB of SDRAM cost major PC makers about \$46. By mid-September, industry sources say, prices had hit \$71, with a projected peak of about \$106. As a result, buyers will find seasonal price cuts less generous than usual. The trend should reverse early next year.



NEC PowerMate VT PIII-600

New Chip Sets Are No Big Deal for Business

SYSTEM	CPU	RAM	System chip set	PC WorldBench 98 score	Faster
Dell Dimension XPS B600	Pentium III-600	128MB RDRAM	Intel 820	254	
Micron Millennia Max 600/133	Pentium III-600	128MB VC SDRAM	Via Apollo Pro133 4X	247	
Micron Millennia Max PIII-600	Pentium III-600	128MB SDRAM	Intel 440BX	250	
NEC PowerMate VT PIII-600	Pentium III-600	128MB SDRAM	Intel 820	249	
AMD Athlon-650 ¹	Athlon-650	128MB SDRAM	AMD 750	290	
Average of 2 systems	Athlon-600	128MB SDRAM	AMD 750	278	
Average of 2 systems	Pentium III-600	128MB SDRAM	Intel 440BX	254	

TEST HOW WE TEST All systems are equipped with 512KB of level 2 cache and are tested with PC WorldBench 98, PC World's application-based benchmark. A higher PC WorldBench 98 score is better. For more details on our benchmark and how we run it, see PC World Online (www.pcworld.com/testing). Data based on testing designed and conducted by the PC World Test Center. All rights reserved. ¹System tested was a demonstration PC made by AMD.

oped the technology.) Rambus memory modules, known as RIMMs, require a different slot and use a higher-speed memory bus than today's DIMMs. They come in three types: PC-600, PC-700, and PC-800, which support poten-

tial maximum data transfer speeds of 1.2GB, 1.4GB, and 1.6GB, respectively. (In contrast, PC-100 has a transfer rate of only 0.8GB.)

The top-performing PC-800 will command a high premium and may be difficult to

find initially. We haven't tested machines with PC-700 or PC-600 yet, but industry experts say PC-600 won't deliver a solid gain over SDRAM.

Right now, PC-800 memory sells for up to five times the price of SDRAM. That helps

explain why the Dell machine we tested seems a bit pricey (\$2802) for its configuration: 17-inch monitor, 20GB hard disk, 8X DVD-ROM drive, Zip 100 drive, V.90 Winmodem, and Microsoft Works 99. A similar Dell configured with SDRAM and the BX chip set cost \$2472 in September.

At press time, the corporate-minded NEC PowerMate was expected to carry a price tag of about \$2400 at its release in late October. The system is configured much like the Dell except that it has a 2X DVD-ROM drive, an ethernet card instead of a modem, and no productivity software.

TIMING IS EVERYTHING

BEFORE YOU reach a buying decision, remember that Intel has big changes in store for late October. That's when it is scheduled to introduce "Coppermine" Pentium III chips that take advantage of a more efficient 0.18-micron manufacturing process. These new processors will include an on-chip, 256KB L2 cache and will attain speeds in excess of 700 MHz. The combination of high clock speeds and on-chip L2 cache running at full speed will boost performance significantly. (Today's PIII chips have an off-chip, 512KB L2 cache that runs at half-speed.)

So if you're a high-end PC shopper, waiting just another month or two will pay big dividends. If you must buy now, Athlon systems are an excellent deal, even for tough apps like AutoCAD. Remember, multitasking is the only test where the Dell PIII/Rambus system beat the Athlon PCs by a meaningful margin.

Want to save a little more? If you normally buy a new PC

Rambus Memory Speeds Up Multitasking

SYSTEM	Multitasking (seconds)	AutoCAD 2000 (seconds)	Adobe Photoshop (seconds)	Rage Expendable (frames per second)	Caligari TrueSpace 4.1 (frames per second)	3DMark
Dell Dimension XPS B600	243	n/a ¹	8.26	64	27	5489
Micron Millennia Max 600/133	388	1227	9.42	58	24	5306
Micron Millennia Max PIII-600	385	1243	9.20	58	23	5360
NEC PowerMate VT PIII-600	326	1163	9.17	56	28	5296
AMD Athlon-650 ²	n/a ¹	929	n/a ¹	68	33	6268
Average of 2 Athlon-600 systems	282	988	9.59	65 ³	33	5962
Average of 2 PIII-600 systems	n/a ¹	1180	n/a ¹	59	28	5652

TEST HOW WE TEST In our multitasking test, we time tasks in Microsoft Word, Norton Antivirus, and Adobe Photoshop while the PC extracts a file in the background; for most of the test, two applications are active, while a third is open, but idle. In the AutoCAD 2000 test, we time the Autodesk User Group International's AUGI Gauge benchmark, which runs computer-aided drafting tasks. In Adobe Photoshop 5, we time a sequence of graphics file manipulations. In Rage Expendable, we measure the frame rate of a self-running demo. In Caligari TrueSpace 4.1, we measure the frame rate of a tutorial that uses AGP textures. In the 3DMark test, we run Futuremark's 3DMark 99 Max benchmark, which generates a composite score based on image quality, image rendering, and CPU capability. Tested applications do not make use of the AGP 4X bus. The Micron systems had 16MB of graphics memory; all others had 32MB. Data based on testing conducted by the PC World Test Center. All rights reserved. Numbers highlighted in red represent best scores on each test. ¹Data not available for these systems. ²Demonstration PC made by AMD. ³Test not run on one of the two systems.

Journey to the Center of Your PC

LOST IN THE lingo? Here are some essential terms.

CHIP SETS

- **System chip set** Soldered onto the motherboard, it manages communication between CPU, memory, and input/output devices.

MAIN MEMORY TYPES

- **PC-100** This is Intel's specification for SDRAM memory chips that support a 100-MHz system bus.
- **RDRAM** Rambus DRAM, a new variety of memory developed by Rambus Technology, is designed to function at higher speeds than SDRAM. The PC-800 type offers best performance.
- **SDRAM** Synchronous Dynamic Random Access Memory is today's most widely used type of DRAM.

- **VC SDRAM** Virtual Channel SDRAM is designed to operate more efficiently than existing SDRAM, and to cost less than RDRAM.

BUSES

- **Bus** This electrical pathway connects two or more devices and carries data between PC subsystems.
- **AGP bus** The Accelerated Graphics Port bus joins the graphics card's controller to main memory.
- **Frontside bus** Commonly referred to as the system bus, this connects the CPU and the system chip set.
- **Memory bus** This connects the main memory (RAM) and the system chip set. Rambus memory (RDRAM) makes use of a faster type of memory bus.

SOURCE: COMPUTER DESKTOP ENCYCLOPEDIA (COMPUTER SELECT)

every couple of years and are unlikely to upgrade your CPU, watch for bargain prices on BX-based Pentium III systems. For simple uses such as working with Microsoft Office apps

and browsing the Web, they provide plenty of power.

Next year, not surprisingly, you'll get even more for your dollar. Rambus memory prices should drop, and Rambus will

get some competition from Double Data Rate SDRAM, a memory type expected to run like PC-800, but cost less.

Unfortunately, the number of new options may make

even the most passionate PC fans groan. What's a buyer to do? Take time to educate yourself on the new chip sets, scrutinize the spec sheets—and be wary of any salesperson who tells you in mid-October that it's an ideal time to purchase.

Dell Dimension XPS B600

Street price: \$2802; Dell; 800/388-8542; www.dell.com

Micron Millennia Max 600/133 and PIII-600

Street prices: \$2183 for Millennia Max 600/133, \$1850 for Millennia Max PIII-600; Micron; 888/634-8799; www.micronpc.com

PRODUCT INFO NO. 761

NEC PowerMate VT PIII-600

Estimated price: \$2400; NEC; 888/632-8701; www.nec-computers.com

PRODUCT INFO NO. 762

Latest Speech Software Gets You Up and Running Faster



NOT VERY LONG ago, using a voice recognition package meant spending half an hour or more training the software—an endurance test for both your patience and your vocal chords. Even then, the results were often mediocre. But the advent of faster CPUs and more sophisticated programming has dramatically reduced training time and made the software a lot more useful. The newest releases from Dragon Systems and IBM, two key developers of voice recognition software, continue this forward momentum with significant updates to their flagship products.

The good news: You'll probably be talking productively to

either package after less than 10 minutes of training time. Moreover, both companies have made setup easier and have added new features, like voice-enabled Web browsing.

THE BAD NEWS

STAR TREK—QUALITY interaction is still a few light years away. Though accuracy continues to improve, both programs make too many mistakes to serve as full-time replacements for your keyboard and mouse.

We examined new, shipping versions of Dragon Systems' \$169 NaturallySpeaking Preferred Version 4 and IBM's \$179 ViaVoice Pro Millennium Edition, neither of which was released in time to review in



our October voice recognition roundup (see "Speak Easy," www.pcworld.com/oct99/voice). Dragon's entry, which earned Best Buy laurels in our last two roundups, remains the overall accuracy champ.

Both new products require a Pentium II-333 with 64MB of RAM as a realistic minimum; a faster CPU and 128MB of

RAM are even better. You'll need substantial disk space, too. NaturallySpeaking occupies 171MB, ViaVoice 310MB.

To determine whether the faster PIII and its SIMD (single-instruction multiple-data) extensions improved performance, we tested the packages on a Pentium II-333 MidWest Micro system and again ▶

on a Pentium III-550 Gateway system, both equipped with 128MB of RAM. (The Dragon package has special SIMD support; neither product uses the 3DNow instructions included in AMD's Athlon processor.) Both packages displayed dictated words a bit faster on the PIII system than on the PII, but the PII was very usable. More important, the change in CPU didn't affect accuracy or training time.

OUT OF THE BOX

OVER THE PAST year, voice recognition software companies have slashed the amount of coaching their software requires. Earlier, setup meant reading to your PC for 30 minutes or more to teach it to recognize your voice. Products reviewed for our October story shortened training time markedly, and the newcomers continue this trend: In our tests, NaturallySpeaking 4 required about 5 minutes of training, and ViaVoice about 8 minutes. Your results may vary.

But accuracy is the crucial test in voice recognition. And while the vendors claim small

improvements in these new versions, the programs continue to miss a lot of words. So if you're dictating a long document, you can expect to spend some time correcting errors.

Correcting typos by voice remains an ordeal. Moving a cursor by voice command is frustratingly time-consuming, and a small vocabulary of prescribed editing jargon needs to be mastered ("scratch that," "correct that," and so on). Voice control of menus and dialog boxes is still cumbersome as well. Barking commands like "click file" and "click save" or intoning a file name can be an awkward way to interact with your PC.

Both products we reviewed let you use voice commands to browse the Web. To navigate in NaturallySpeaking, you say the name of the link. ViaVoice assigns a number to each link on the Web page you're visiting, and you invoke the link by saying the number. We prefer Dragon's approach because the IBM method can clutter Web pages with the superimposed numbers. We found both packages' Web-browsing features quite useful for activities like communicating in chat rooms.

DRAGON ROARS

IN DICTATION tests, Dragon NaturallySpeaking was the clear winner, consistently topping 95 percent on accuracy—which means it missed about 1 in 20 words. Throughout our

ket's other major competitor, Lernout and Hauspie's VoiceXpress. In our dictation tests, IBM's package achieved a respectable accuracy rate of just over 90 percent—missing about one word in ten.



HELP IS ON THE WAY: IBM ViaVoice Pro Millennium Edition opens a Wizard when it detects a problem.

ViaVoice Pro Millennium Edition bears an improved interface. In particular, we liked the Recognition Wizard. This automatic help tool pops up whenever ViaVoice detects problems, such as repeated misrecognition of the same words. Previous versions of ViaVoice inte-

grated with a wide variety of other applications but often had problems distinguishing between commands ("delete that," for example) and dictated text. This particular snag occurs far less frequently in the latest version.

Despite key improvements, voice recognition technology has farther to go before you should consider hanging up your keyboard. But that day could come within the next three years, Gartner Group analyst Jackie Fenn says. Fenn expects a more interactive interface in future products to reduce navigating and editing errors. You might be able to say, for example, "Open the spreadsheet I worked on yesterday." And the program might reply, "You worked on three spreadsheets yesterday, which one do you want?"

IBM: MUCH IMPROVED

IN ACCURACY, IBM continues to play catch-up with NaturallySpeaking and the mar-

ket's other major competitor, Lernout and Hauspie's VoiceXpress. In our dictation tests, IBM's package achieved a respectable accuracy rate of just over 90 percent—missing about one word in ten.

Until that day, however, we'll just have to emulate Captain James T. Kirk of the starship *Enterprise*: enunciating clearly and practicing forbearance.

—Stan Miastkowski ▶



VOICE PRODUCTS

FEATURES

Speech Apps: Tell Me More

PACKAGE	List price	Estimated training time	Recognition accuracy/ Web browsing	Comments	Product info number
Dragon NaturallySpeaking Version 4 800/437-2466 www.dragonsystems.com	\$169	Under 10 minutes	Very good/ Good	Fast setup, few recognition errors, low price.	759
IBM ViaVoice Pro Millennium Edition 800/825-5263 www.software.ibm.com/speech	\$179	Under 10 minutes	Good/ Very good	Many extras; still trails Dragon in accuracy.	—



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New Portables: All Dressed Up and Ready to Go

ANALYSIS

THE OLD GRAY laptop ain't what it used to be. In fact, it might be clothed in Tangerine, Tahoe Blue, or Mars Red. And it has new accessories ranging from an antenna for wireless Web surfing to a built-in night-light.

Inspired by Apple's multi-hued iMacs, notebook makers are jazzing up their products just in time for the holidays. We checked out preproduction versions of new, refreshingly style-conscious laptops from Dell, IBM, NEC, and Sony, as well as from Apple

itself. Even if jazzy isn't your thing, these products deserve a look, thanks to their competitive pricing. Apple's iBook, a new low-end notebook aimed at students and home users, costs a moderate \$1599. The most expensive unit, Sony's \$3499 PCG-XG9, will include a nice 13-inch screen, the fastest Intel processor available at ship time, and a roomy 18GB hard drive.

A COLORFUL FASHION STATEMENT

WITH ITS translucent keys and Tangerine or Blueberry case, the Apple iBook looks more like a toy than an office tool. But this oval-shaped 6.6-pound notebook with a foldaway handle offers more than playful looks. Designed mainly for students, it's built to be sturdier than a traditional



COLORFUL snap-on screen backs (A) let you doll up the ThinkPad I Series 1480

for \$30 each. The included night-light illuminates the keyboard (B) just enough to let you take notes during presentations.

laptop. The iBook features a rubberized front edge and a clamshell-style screen that has no latches to break off.

It may also be the first notebook with fast, inexpensive, built-in wireless computing. The iBook comes with antennas embedded in either side of the 12.1-inch screen. By adding Apple's optional AirPort 10-mbps wireless internal adapter card (\$99) and the base station (\$299), you can check e-mail or browse the Internet from any room in the house.

NEC'S VERSA FX offers the first stand-alone CD-ROM drive—it can play CDs without being plugged into the notebook.



Beyond such special features, the iBook is expected to be quite fast. Apple claims the iBook's 300-MHz PowerPC G3 processor outperforms a Pentium II-400 mobile processor, one of the fastest mobile CPUs available from Intel at press time. On the other hand, the iBook is



not equipped with a floppy drive or serial and parallel ports—the notebook relies on wireless networking or its single USB port to share files or access a printer or other peripheral. The iBook, like the other portables we evaluated for this story, was a preproduction unit not suitable for PC World-Bench 98 testing.

LET THERE BE LIGHT

IF YOU'VE EVER tried hunt-and-peck typing on a notebook in a darkened meeting room, you know the light from the screen isn't bright enough. In some of its latest ThinkPad I Series notebooks, IBM has addressed this problem with the ThinkLight, a tiny LED built into the top inside edge of the screen. Working with the Celeron-466-based ThinkPad I Series 1480 (which sells for \$2399), we put the ThinkLight feature to the test in a pitch-black office. Our findings: You can't read a book by it, but the ThinkLight illuminates the keyboard enough to permit squint-free typing.

You can also play dress-up with the new set of ThinkPad notebooks. Snap-on plastic screen backs, which are available in seven eye-catching colors ranging from bright green to Mars Red, allow you to change the appearance of your notebook as often as Dennis Rodman dyes his hair. A full wardrobe of screen backs doesn't come cheap, however; each cover costs \$30. ▶

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NEC'S BREAKAWAY CD PLAYER

NEC'S 3.5-POUND, silver-and-gray, Celeron-333-based Versa FX doesn't traipse down any high-fashion runways, but its design is far from frumpy. The Versa FX's external CD-ROM drive can double as a stand-alone CD player. While other CD-ROM drives must be connected to a computer, the FX's can run independently when plugged into a wall outlet, just like any other portable CD player. (Eventually, NEC plans to offer a battery pack to make the CD player truly portable.) Unfortunately, the controls are basic, and there's no LCD to show which track is playing. NEC expects the \$1899 Versa FX to be available for direct sale by early November and to arrive in retail stores with a

consumer-oriented software bundle by early next year.

Sony pioneered daring computer colors with its light-purple VAIO line of multimedia desktops and notebooks. The full-size, \$3499 VAIO PCG-XG9 notebook, due out by the end of October, adds an interesting navigational device: a programmable dial, built into the right side of the keyboard, that lets you launch applications and files. This notebook boasts a massive 18GB hard drive and leading-edge technology, two reasons for its relatively high price.

Other notebook vendors plan to make fashion statements of their own. Dell's new Inspiron 3700 C433GT, a consumer and small-business multimedia notebook that replaces the Inspiron 3500,

will come in Tahoe Blue and Storm Grey. Eraserheads are available in a variety of colors. Pricing for the new line starts at \$1899 for a Celeron-433 with dual pointing devices and a 14.1-inch screen. Early next year, Compaq will introduce PC notebooks with wireless networking. This new family of Presarios will be available in two shades of blue.

If you believe notebooks should dress conservatively in blacks, grays, and tans, don't

worry—most vendors, including many of the ones mentioned here, will continue to sell plenty of sober laptops that accessorize well with a no-nonsense white collar. But if you're ready to loosen up for casual Friday, these notebooks are a good place to start.

—Carla Thornton

ThinkPad I Series 1480

Street price: \$2399; IBM; 800/772-2227; www.ibm.com/pc/us/thinkpad/iseries

VAIO PCG-XG9

Street price: \$3499; Sony; 888/315-7669; www.sony.com/pc

PRODUCT INFO NO. 757

Versa FX

Street price: \$1899; NEC Computer Systems; 888/632-8701; www.nec-computers.com

PRODUCT INFO NO. 758

iBook

Street price: \$1599; Apple Computer; 800/538-9696; www.apple.com/ibook

PRODUCT INFO NO. 756

Inspiron 3700 C433GT

Street price \$1899; Dell; 800/388-8542; www.dell.com

AOL and Microsoft Have a Spat Over Chat

ANALYSIS

IF YOU'RE ONE of the country's millions of chat addicts, you're probably all too aware of instant messaging's fatal flaw: Users of an instant messaging system—America Online's Instant Messenger, for example—can chat only with people on the same system. The AOL software blocks chatters who use Microsoft Messenger or ICQ. And as the mavens of messaging—specifically, AOL and Microsoft—press their squabble like teens in a chat room, the situation seems unlikely to improve anytime soon.

Trouble arose this summer, when Microsoft rewrote its MSN Messenger software so HotMail users could success-

fully swap messages with the estimated 45 million people who use Instant Messenger. For weeks the two companies played out a high-tech low comedy: First AOL would

digital doors. Other chat vendors have joined Microsoft in the hacking action: The next version of Tribal Voice's PowWow software will interoperate with Instant Messenger—whether AOL likes it or not.

MEET THE IMPP

AT THE SAME time, Microsoft has called on AOL to collaborate in developing a common instant messaging protocol that would enable all users to message each other, regardless of whose software each happened to be using. AOL claims it supports messaging standards, but says Microsoft's hacking efforts aren't the way to establish them.

Just such a standard—the Instant Messaging and Presence Protocol—is under devel-

opment by the Internet Engineering Task Force. But a final draft of the IMPP specification isn't expected until next year, and widespread adoption may take another two to four years.

Not long after its chat war with Microsoft erupted, AOL rushed out a new version of its messaging software. Instant Messenger 3 adds file-transfer features and news ticker windows—both of which MSN Messenger lacks. On the other hand, at a svelte 320KB, MSN Messenger makes for an easier download than the 2.4MB Instant Messenger.

The new features in Instant Messenger 3 could foreshadow a day when all messaging tools comply with the IMPP. If that ever comes to pass, instant messaging vendors will be forced to compete on the basis of features, not on their number of registered users.

—Jim Heid ►



block MSN Messenger from its system, and then Microsoft would respond with a new version that skirted AOL's block.

By early September, Microsoft had changed its code a dozen times, as AOL continued to change the locks on its

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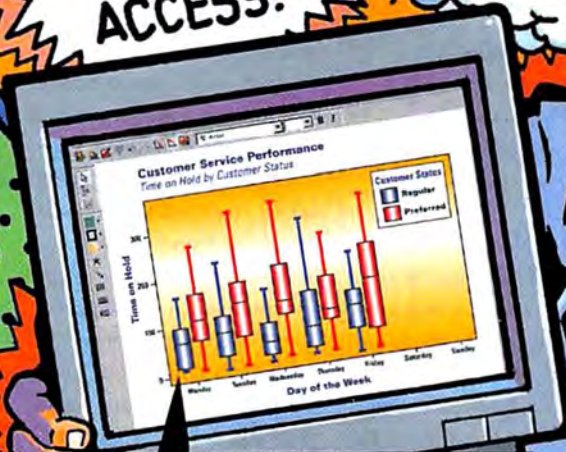
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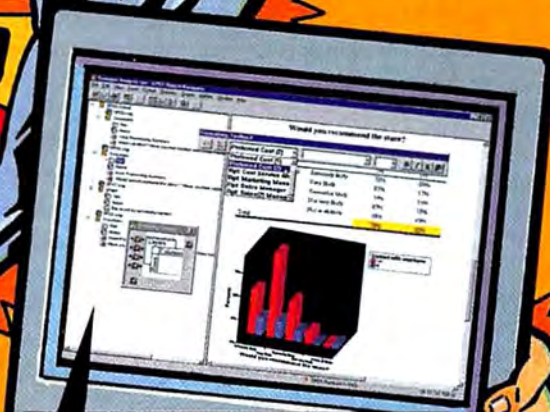
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Works Suite 2000: Microsoft Adds Smarts and Style to Home Package



FOR YEARS, SERIOUS computer users have turned up their noses at Works. Microsoft's application suite for home customers has lived in the shadow of Office, its bigger, more powerful, more businessy sibling. But even the most demanding users could benefit from taking a sober look at the latest Works Suite.

No longer just a pale shadow of Office, Works Suite 2000 is surprisingly powerful yet easy to use, with a focus on making home tasks simpler. Its excellent collection of tools integrate nicely via a slick interface. And because it comes with a copy of Microsoft Word 2000, Works Suite 2000 can serve as a viable alternative to Microsoft Office for business users who don't need an industrial-strength spreadsheet or database program.

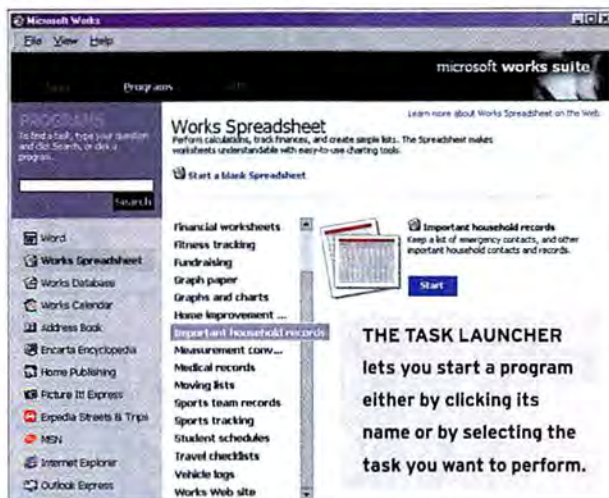
SUITE INSIDE A SUITE

WORKS SUITE 2000 is a suite surrounding a suite. It's built around Works itself—which has been upgraded from Works 4.5 to Works 2000. Like Works 4.5, Works 2000 includes basic spreadsheet,

database, and calendar applications. The spreadsheet in Works 2000 shares much of Excel's basic functionality—including built-in formulas and charting—but lacks such sophisticated tools as filtering

templates to get you started on typical household tasks. You also get a no-frills appointment-and-address book.

Top vendors including Compaq, Dell, Gateway, Hewlett-Packard, and Sony will bundle



and pivot tables. You can save spreadsheets either in Works' native format or as Excel or 1-2-3 files. The easy-to-set-up, flat-file database allows you to save data files in dBASE or CSV (comma-delimited) format and is suitable for such relatively straightforward jobs as keeping track of your home inventory or stamp collection. Both the spreadsheet and the database are accompanied by

Works 2000 with their home systems. Meanwhile, Works Suite 2000 and its watered-down cousin, Works Basic Suite 2000 (which leaves out Word), are sold in retail stores.

Works Suite 2000 adds a lot to its Works 2000 base. The most impressive addition: a full-blown version of Word 2000, the Web-enabled incarnation of the hugely popular word processor. According to

a Microsoft spokesperson, Word is the number one reason consumers buy Works.

Besides Works and Word, Works Suite 2000 includes a slew of home-specific components, among them Money 2000 Standard (not contained in the beta version that we reviewed). You can maintain a home budget and pay your bills with this standard version of Money, but it lacks some investment tools active traders might want. For those, you'll need Money 2000 Deluxe.

NOTHING FANCY

THE NEW SUITE also packs elementary publishing tools. Home Publishing 2000 lets you create greeting cards, calendars, banners, and simple multimedia projects. And the program includes 100,000 or so clip-art images (organized through the searchable Clip-Art Gallery), plus a battery of sound clips and animations. Picture It Express 2000 is a basic photo imaging tool that lets you retouch digital photos (to remove scratches or correct colors, for example).

Finally, Works Suite 2000 provides a small avalanche of home-oriented content, including Encarta Encyclopedia 2000, which consists of some 36,000 searchable entries, articles, video clips, and animations. Owners of the software are entitled to download updated content every month until December 2000 (be sure to set aside a megabyte of hard disk space for each download). Expedia Streets and Trips 2000 lets you find addresses, plan trips, and go online to get current information on weather conditions and even road construction. Money 2000 Standard, Home Publish- ▶

What Works for You? Four Suite Flavors

PRODUCT	Street price	Components
Works Suite 99	\$85	Works 4.5, Word 97, Encarta Encyclopedia 99, Money 99 Basic, Graphics Studio Greetings 99, Expedia Streets 98
Works 2000	\$30	Basic word processor, spreadsheet, database, and calendar (these versions are, however, more advanced than the ones in Works 4.5); files can be saved in HTML
Works Basic Suite 2000	\$65	Works 2000, Encarta Encyclopedia Standard, Money 2000 Standard
Works Suite 2000	\$90	Works 2000, Word 2000, Encarta Encyclopedia 2000, Money 2000 Standard, Home Publishing 2000, Expedia Streets and Trips 2000, Picture It Express 2000

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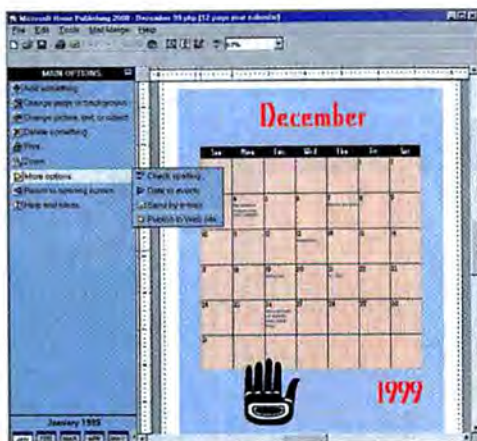
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ing 2000, and Encarta Encyclopedia 2000 all have similar links to Microsoft Web sites for additional updated information.

SOLID INTEGRATION

BRINGING ALL these individual elements together is the Task Launcher, with which you can select either a task (such as 'Household management' or 'Travel information') or a specific program. As in previous editions of Works, the individual programs are nicely integrated—when you



MICROSOFT HOME PUBLISHING 2000 is adequate for calendars and other basic publishing projects.

are creating a form letter in Word, for example, you can import database addresses for the mail merge.

Works Suite 2000 does have its faults. For one thing, the Setup module doesn't give you the option of working with Word 97 instead of Word 2000. You can elect not to install Word 2000, but in that case Word 97 won't show up in Task Launcher. The suite is greedy, too, gobbling 785MB to 1.4GB of disk space and at least 32MB of RAM. But given the power of today's home computers, those requirements should not be overwhelming. Works Suite 2000 is a bona

fide productivity suite, specifically tailored for home users. The question is whether it's robust enough to do the job in a business setting. The inclusion of Word 2000 means that Works Suite 2000 has all the productivity applications many users need. But if your work requires sophisticated spreadsheet, database, or publishing tools, Office will remain your suite of choice.

—Yael Li-Ron

Works Suite 2000

Street price: \$109;

Microsoft; 800/426-9400;

www.microsoft.com/works

PRODUCT INFO NO. 760

Signed, Sealed, Delivered...Online

ANALYSIS

TRADING STOCKS online is nothing new. But until recently you couldn't open an online brokerage account without signing and mailing sheafs of paper. You could file your taxes online, but you still had to sign and deliver a paper copy afterward. New laws are giving electronic documents the same legality as their paper counterparts.

LEGAL GRAY AREA

OF COURSE, electronic contracts have been in use for years—think of the 'I Agree' buttons you click when registering software. But those agreements have been happening in a gray area of the law. "Everything you're seeing now in the courts and the legislatures is aimed at making the Internet a legally viable medium," according to Harry Rubin, head of the Internet

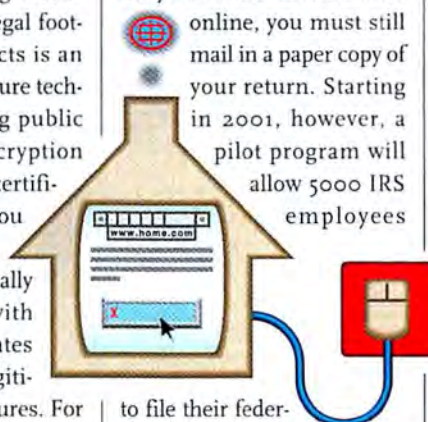
law group at Shaw Pittman in Washington, D.C.

The key to putting e-contracts on the same legal footing as paper contracts is an array of digital signature technologies—including public and private key encryption and authentication certificates—that enable you to prove you're you without being physically present. Starting with Utah in 1995, 45 states have passed laws legitimizing digital signatures. For example:

- A California law that was passed in August allows online brokers to accept electronically submitted brokerage agreements.
- Pilot programs underway in Utah allow citizens to file court documents and review records online. In the near future, they'll also be able to renew their driver's licenses

and pay fees and fines online.

- Though you can currently file your federal income taxes online, you must still mail in a paper copy of your return. Starting in 2001, however, a pilot program will allow 5000 IRS employees



to file their federal returns without sending a hard-copy follow-up.

VALID SIGNATURES

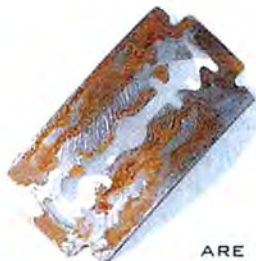
SEVERAL BILLS pending in Congress would extend the validity of electronic signatures. The most promising may be H.R. 1714, from House Commerce Committee chair Tom Bliley (R-Virginia). The law would give states five years

to legalize digital signatures and standardize their laws around the Uniform Electronic Transactions Act. H.R. 1714 would let you e-mail a contract from any state to any other state, or "sign" it on a Web site; the resulting contract would be legally valid.

Laws regulating digital contracts still have a ways to go, however. For now, the legal status of an electronic contract created by parties in different states is unclear. "That issue is going to remain an open question for some time to come," says attorney Tom Lebens of San Diego, who characterizes the potential conflict-of-laws ramifications as "a quagmire." Furthermore, mortgage law and the rules that govern wills and estates have been explicitly excluded from coverage under most new state laws, so don't plan on using www.willandtestament.com anytime soon to settle your estate. The simple verdict: Don't write off that pen just yet.

—Rick Overton ►

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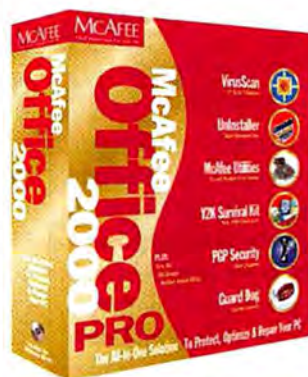
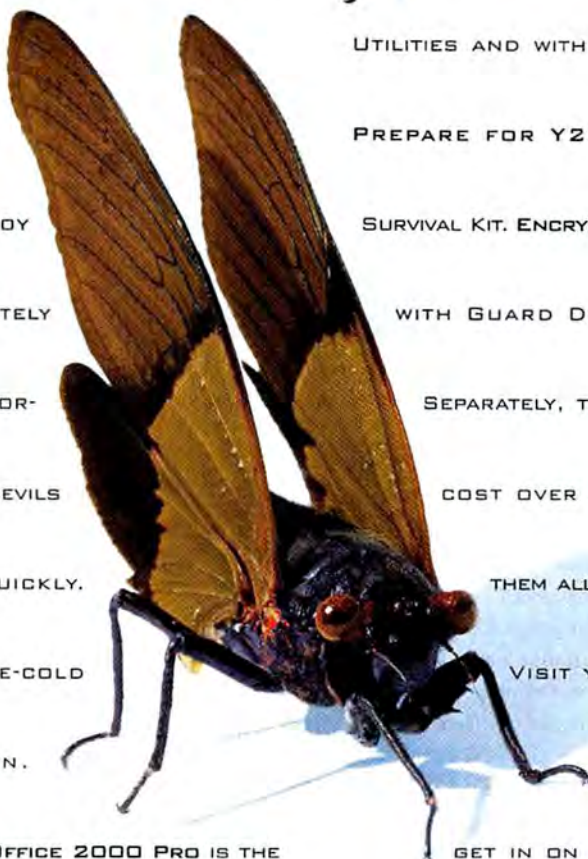
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Whose Cable Is It Anyway? AT&T, AOL Brawl Over Broadband

ANALYSIS

WHO'S GOING TO connect AT&T's millions of cable customers to the Internet? AT&T says that it should decide. But an alliance of ISPs—including AOL and GTE—and some local governments disagree, and are trying to force the communications giant to open its cable lines to competing ISPs. The battle is raging in court and in Congress, and it may soon be coming to a ballot box near you.

AOL and friends—who've created the OpenNet Coalition to argue their case—contend that multiple ISPs should be allowed to offer Internet service via AT&T's cable lines. Right now, cable customers must use Excite@Home—in which AT&T owns a majority stake—as their ISP. Open-access advocates argue that letting cable customers connect via other ISPs would maximize consumer choice and keep fees reasonable. Closing the cables to competition, they say, is tantamount to endorsing a cable-access monopoly.

NOT PLAYING MONOPOLY

AT&T DOESN'T OPPOSE open access per se, according to the company's vice president for congressional and regulatory affairs, Kevin Joseph. Instead of renewing the company's contract with Excite@Home when it expires in 2002, Joseph says, AT&T might opt to open the cables to other ISPs. But he contends that in the meantime, closed cables



REP. EARL BLUMENAUER (D-Oregon) has introduced legislation that would lay the groundwork for opening cable lines to competing ISPs.

have clearly benefited consumers by forcing local phone companies to accelerate their rollout of Digital Subscriber Line services.

The Federal Communications Commission shares Joseph's opinion. According to Deborah Lathen, the FCC's cable services bureau chief, a recent study found that DSL was rolled out more promptly and cost substantially less in markets where both cable and DSL were available than in markets that didn't have competition from cable. Citing America Online's recent investment in Hughes (which provides high-speed satellite services), Lathen says the FCC's hands-off policy regarding cable access encourages service providers to explore alternative technologies. The FCC worries that

local regulation will discourage cable companies from investing in cable access or will coerce them into offering it

All parties to the cable access debate claim to agree that maximum consumer choice is a good thing.

only in unregulated markets—leaving many potential users out in the cold.

OPEN WIDE

REPRESENTATIVE Earl Blumenauer, a Democrat from Portland, Oregon—where officials at the county level recently made renewal of AT&T's cable franchise contingent on the company's opening its lines to other ISPs—agrees with AOL and its allies that open access is the best way to

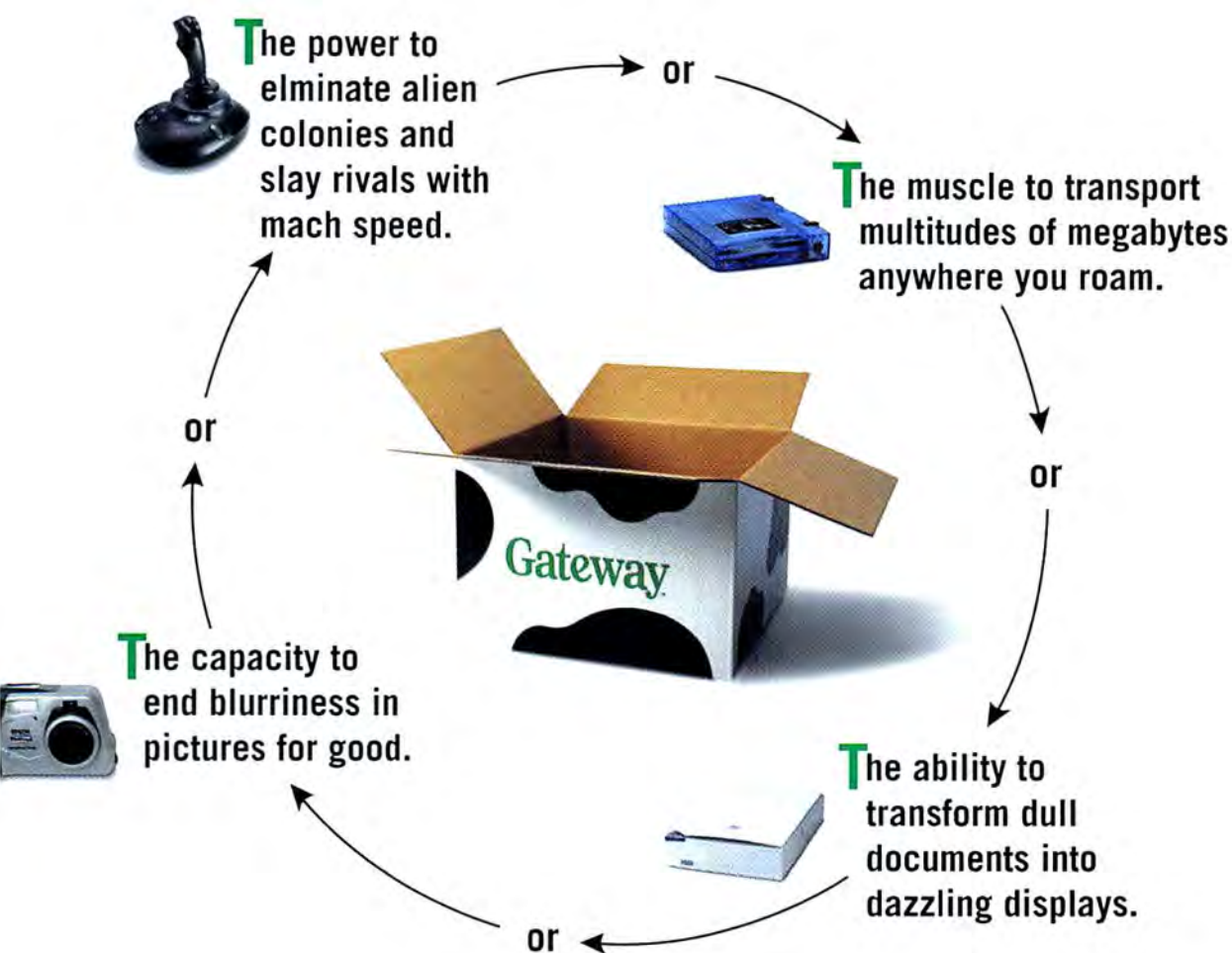
ensure optimum service and choice for consumers. That's why he's introduced a bill in Congress that would require the FCC to establish technical standards for connecting cable systems to the Net. The best-case scenario, according to Blumenauer: "The FCC clears away roadblocks [to open access] and all ISPs end up on a level playing field." The bill would also ask the commission to write rules whereby cable owners could charge ISPs for use of the network.

The controversy will only intensify. AT&T's merger with cable operator MediaOne is now lumbering through the approval process. If the merger goes through, local jurisdictions all over the country will have to approve the transfer of franchises from MediaOne to AT&T, putting those local governments in the same position as Portland and Broward County, Florida (which also tried to tie franchise renewal to an open-access mandate).

Petitions are circulating in Colorado and Massachusetts to put open access on state ballots in 2000, and other bills are gestating in Congress. The U.S. Ninth Circuit Court of Appeals is expected to rule in the case of *AT&T v. City of Portland* by the end of the year (Portland won the first round of the suit).

All parties to the cable access debate claim to agree on two underlying philosophical points: that maximum consumer choice is a good thing and that broadband services should expand as quickly as possible. They simply—and bitterly—disagree on how to make it happen.

—Anush Yeghazarian ►



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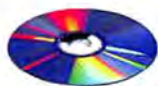
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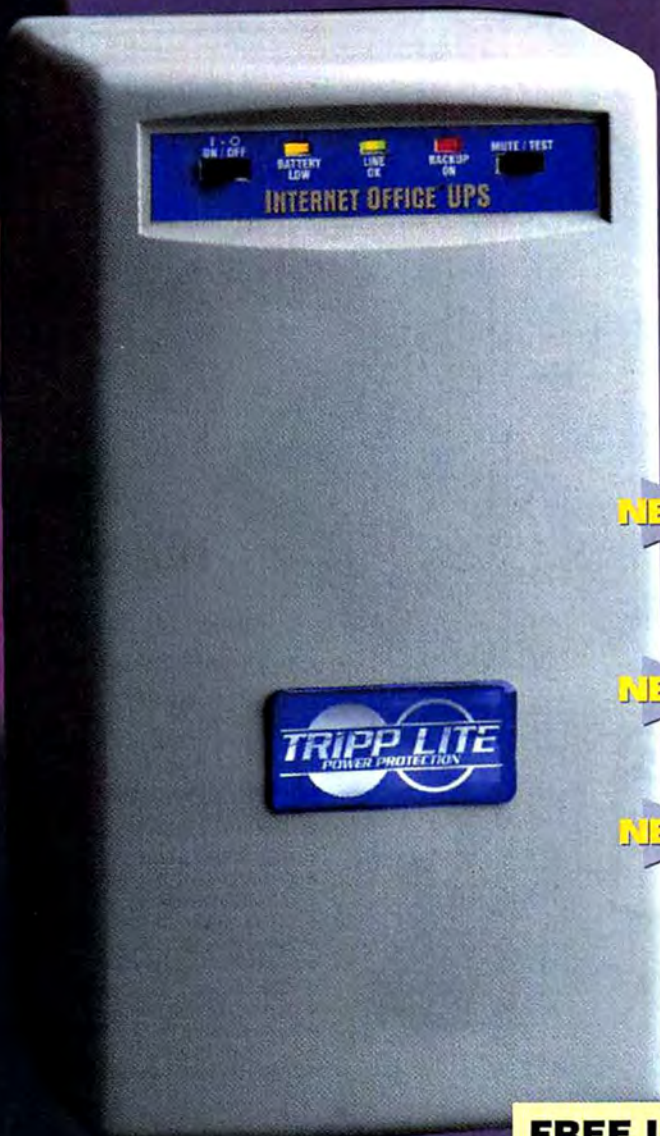
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THE ENTERTAINING PC

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You maximize satisfaction with your PC experience when all the pieces are humming along at maximum speed, from the hardware to the network. Here's how to burn.

AS PART OF THEIR transformation from productivity engines in business offices to entertainment appliances in finished basements, multimedia-enhance computers have made huge strides in performance and ease of use. Now more than ever before, if you want graphics with colors so intense that they look like an exploding crayon factory and audio so sweet that it could melt the heart of a tax collector, today's technologically advanced systems will deliver it.

But the technology defines the route, not the destination. "People buy fun; they don't buy technology," says Tom Dusenberry, president of Beverly, Mass.-based Hasbro Interactive. "They want an entertaining and fulfilling experience, something that gives them enjoyment."

Some of the forces driving the computer's transformation from its enterprise-centric focus to an entertainment focus include MP3's wildly escalating popularity. MP3 has revolutionized the way digital music is delivered and has opened the door to thousands of recording artists who may never have otherwise scaled the walls surrounding the traditional distribution channels.

"MP3 and the Internet have turned the audio world upside down," says Michael Arrington, public relations

Carol Goldberg, Ph.D.,
clinical psychologist
and president of
Getting Ahead
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It accelerates Aureal's new

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COMPUTER

BY THE WORLD

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manager for Aureal Inc., Fremont, Calif., the manufacturer of the room-filling Vortex A3D audio adapters. Aureal's SQ1500 and its newer SQ2500 PCI-based positional 3D audio deliver full-duplex, 48Khz digital recording and playback. Ports include front and rear speaker connections plus MP3-compatible inputs. The list of advanced features in Aureal's Vortex2 SuperQuad Digital PCI card will please even the most demanding of audiophiles. The impressive suite includes a professional wavetable synthesizer and 10-band equalizer. The cards' TOSLINK/PDIF optical digital output enables you to route the cards' signals into standalone audio and home entertainment devices such as Dolby Digital receivers, DAT, CD recorders, and MiniDiscs.

Another impetus for change includes Internet audio. Surveys from the Consumer Electronics Manufacturers Association (CEMA) reveal that more than one-quarter of computer users regularly listen to audio—music and radio—through their PCs.

"More than ever, people are playing audio CDs through their CD-ROM drives," says Todd Thibodeau, an econo-



Mindscape Entertainment's *Myst* offers game players digitally mastered music and spellbinding graphics that transport the mind to a land of enchantment.

mist with CEMA. Vendors of multimedia-enhancing products credit the improvement in game and entertainment software with increasing the demand for better sound clarity—without impacting the system's overall performance.

"In the real world our ears let us hear everything in three dimensions. Why should it be any different with computer audio systems?" asks Arrington. Aureal's award-winning technology, based on more than a decade of psycho-acoustic research, closely simulates the way sounds are generated in the real world. As a result, it enhances the realism of interactive entertainment by recreating the multitude of auditory cues that shape the way you hear sounds in your everyday environment. The Vortex A3D supports such special effects as sounds that encircle you and appear to dynamically "move" around the room. Positional 3D sound, a listening adventure you need to experience for yourself, can transform any sound source into a multidimensional acoustic feast. According to Arrington, positional 3D sound is the next logical step up from stereo. More than 100 A3D-en-

abled games are currently available, with new titles appearing every month.

IN SEARCH OF SPEED

Twenty years have passed since Atari introduced the first video game system at the 1979 New York Toy Fair. Then as now, the slowest component of any computer system is still the user. Since most of the computer's communication takes place close to the speed of light, that's undeniably true. Besides typing or "mousing" a little faster, however, the next best course of action to improve that situation is to have the hottest hardware to help compensate for comparative sluggishness.

Whether you use your computer to play games, design a garden, or simply surf the Internet, you want to have the best-of-breed components. Computer manufacturers know which components will work together and leverage off one another's strengths to provide you with a reliable, robust, and speedy system.

CyberMax Computer's 3Daredevil Complete 5, powered by AMD's exciting new 600MHz Athlon CPU with enhanced 3DNow! technology (formerly code-named the K7), combines a 200MHz front-side bus, 128 MB of PC100 RAM, and a 21-inch high-resolution monitor to deliver true seventh-generation features. This well-oiled combination delivers richer images, faster frame rates, and more accurate theater-quality sound than the previous-generation processors could, providing you with the ultimate multimedia experience.

For the very best in video performance, the Allentown, Pa.-based manufacturer now offers the new Voodoo3 3500 16MB AGP (Accelerated Graphics Port), from 3dfx Interactive, to lift graphic performance to stratospheric heights. The 3500 features a TV tuner, video capture, and TV out ports on a single AGP board that will satisfy the entertainment demands of hard-core game enthusiasts and cutting-edge multimedia entertainment consumers.

YOU'VE GOT GAME

Even if you're not ready for a totally new system, you can benefit from interim upgrades to maximize the hardware you currently have. Ted Toll, network services coordinator for Spokane Computer in Spokane, Wash., recommends upgrading your PC's RAM.

continued on page 6

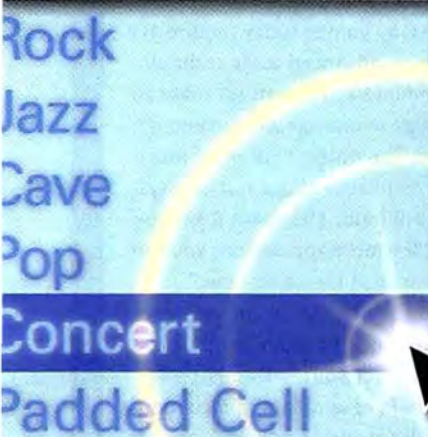


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ONLINE GAMING RESOURCES

Whether you check fan sites to read candid reviews before you buy a game, or afterwards for hints, you'll find a collection of helpful, like-minded players ready to become a virtual friend—or playtime enemy.

PCFAN ► www.pcfan.com/pcfan

A site dedicated for die-hard PC game fans, who want all the early news, rumors, and commentary on the latest PC games. Easy to navigate thanks to its logical interface; so what if it includes caricatures of Silent Bob and Jay from the Kevin Smith films (*Clerks*, *Mallrats*, *Chasing Amy*)? This site is dedicated to the latest news surrounding PC games, boasting a list of headlines and short synopses of goings-on in the PC gaming industry.

I PLAY GAMES ► www.iplaygames.com

A more sophisticated fan site than PCFAN, this site focuses on the games distributed by Interplay and its affiliates. It delivers a wide variety of news, notes, and interviews touching on all aspects of the computer games world along with numerous downloads of previews, demos, and trailers for the gaming enthusiast. As if you couldn't already spend a week here, it offers links to other gaming sites, as well as links to studios that are developing the latest in PC gaming technology.

ONLINE GAMES LIBRARY ► www.oglibrary.com

A more eclectic, indeed, cerebral site delivering the latest news about a variety of online interactive games. It will allow you to play and download your favorite games. It offers a wide variety of games, including sports-oriented, action strategy, and role playing, along with the latest betas for some hot new games. The latest game added, as of press time, was *VirtualCup*, a 3-D sailing simulation. Like many of the other games, this one is a free download.

CRASIWORLD ► www.craseworld.com

A site designed for the hard core (AKA cyberpunk) gamer, crasiworld offers high-quality, mostly fee-based interactive online games played on the Internet. Its three main sections include a soccer game, a fantasy role playing "crasiworld," and a cyberpunk adventure. As the site says, "Click on one of the game icons to pass through that gateway." Keep a grip on something solid, however, because once you join, things are going to get weird. *

continued from page 4

"Many games today require 3D graphics, advanced audio technology, and interactive features that can be tough to manage without enough speed," he notes. "Put in as much RAM as you can afford and your system will hold. The more RAM you have, the more applications you can have open at the same time."

Toll, a bit of a performance hound, says that your monitor can also impact your system's performance. For example, a 14-inch monitor will not refresh as quickly as a 17-inch one.

Another expert suggests that you can boost your capabilities by simply using an old computer you may have lying around the house. Chris Lent, Adjunct Professor at The Cooper Union for the Advancement of Science and the Arts, and a manager at the Brooks Engineering Design Center in New York City, says that connecting to the Internet through another computer running Linux can take a load off your primary computer. Lent also suggests installing an Ethernet card to network the two systems to "hand off the intense job of encoding and decoding information."

WHAT DRIVES YOU?

Electronic gaming is a \$10 billion industry that touches people of all ages and gender, says CEMA surveys. Why do people spend such vast sums on digital entertainment software and hardware?

Carol Goldberg, Ph.D., a clinical psychologist and president of the New York-based Getting Ahead Pro-

continued on page 12



Aureal

SONY



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IMAGES IN AN INSTANT

Whether you take photos to preserve the memories of families and friends, or to help your business grow, today's affordable point-and-shoot, megapixel digital cameras give you plenty of reasons to switch from silver to silicon.

DIGITAL CAMERAS OFFER significant advantages when compared to film-based cameras, starting with the colossal convenience of their fast turnaround time (often just seconds), ease of editing and touch-ups, elimination of chemical processing, and all around reduced image acquisition costs.

"Digital cameras can suffice for most picture-taking tasks," says Kristi Holch, an analyst with InfoTrends Research Group in Boston. "And for most people, the convenience more than offsets any of the technology's limitations."

What are the limitations? There are just two. Digital images verge on, but do not quite equal, the highest qual-



Olympus D-450 Zoom

ity resolution available from film-based cameras. In addition, digital cameras initially cost more than low-cost, single-use cameras.

But then, you get much more. For example, the designed-for-fun DC215 from Kodak, Rochester, N.Y., delivers bright, color-rich pictures. The special Millennium 2000 Edition of the DC215, with its USB connectivity, enables you to download pictures into your computer up to 10 times faster than a serial interface can.

The DC215's 1.8" color LCD lets you preview and re-



Kodak DC215 Zoom

view your pictures so you get just the shots you want to keep. Both the standard and the Millennium models provide one million (1152 x 864) pixels, enough to generate crisp pictures up to 5" x 7".

CULTURAL CHANGES

Initially, digital cameras appealed primarily to casual photographers, promising to save them time. As image quality increased, consumers and businesses benefited from the added convenience and control that digital imaging delivered.

According to Holch, pictures are an integral component of human nature. Aside from the technology, people like pictures and photographs.

"Digital photography is part of a change in our culture that will result in our using more images in our lives and in our workspace," she says.

"Humans are visually oriented, and we want the instant gratification that comes from viewing, printing, or exchanging those images immediately."

Instant gratification could be synonymous with digital. What other imaging technology could enable you to lift a new camera out of its box and have photos in your hand just 10 minutes later?

The D-450 Zoom and the D-340R fixed-focus cameras from Olympus America Inc., headquartered in Melville, N.Y., incorporate such advanced technology that you can

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D-450 ZOOM: \$499

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Canon PowerShot A50

be snapshotting in minutes.

The D-340R's 1.3 megapixel, five-element all-glass aspherical f/2.8 lens consistently delivers sharp images, and its four-mode intelligent flash provides the greatest versatility, even in low light conditions. Removable SmartMedia cards, available in 2MB, 4MB, 8MB, and 16MB capacities, give you unlimited storage capability.

Olympus's 9.5-ounce D-450 compact camera offers point-and-shoot simplicity with a 3X optical zoom lens, through-the-lens-focusing so you get the picture you want, and a new LCD display with easy viewing, even in bright light and from any angle.

SPANNING THE DIGITAL DIVIDE

Vendors continue to close the once-significant gap between the quality of digital imaging and that of film media. For example, the PowerShot S10 (www.powershot.com) from Canon U.S.A. Inc., Lake Success, N.Y., offers an astounding 2.1 megapixel resolution, combining the benefits of digital imaging with features and functions traditionally found only in conventional 35mm cameras.

The S10's advanced features ensure ease of use while delivering first-rate image quality. The S10's timesaving features include an Image Selector button, a dual interface that allows users to connect the camera directly to USB or RS-232C serial ports, and five picture-taking modes. Because the S10 is compatible with Type I and Type II CompactFlash memory cards, it will safely hold hundreds of high-resolution images and upwards of 1,000 lower-resolution images.

Canon's shirt-pocket-sized PowerShot A50 offers a high-clarity 1.3 megapixel resolution. Its low-distortion, all-glass, f/2.6-4.0 lens incorporates three aspherical elements in a seven-element formula along with a

versatile 28-70mm retractable power zoom lens. Its high-speed, high-precision through-the-lens-auto-focus system enables you to consistently acquire those hard to take spectacular snapshots.

SECURE MEMORIES

Modern digital cameras store their images on a variety of removable media, including PCMCIA cards, a hard drive, or flash memory cards. The new Digital Mavica cameras from Sony Electronics, Park Ridge, N.J., use a special algorithm to compress and accelerate recording images onto standard 3.5-inch diskettes, a convenient and fast method to transfer images from the Mavica to the computer.

Sony's top-of-the-line Digital Mavica, the MVC-FD88, gives you your choice of Super XGA (1280 x 960), XGA (1024 x 768), and VGA (640 x 480) resolution options plus an 8x optical/16x Precision Digital Zoom lens with auto macro.

In addition to producing high-resolution images, the FD88's MPEG Movie Mode captures up to 60 seconds of motion video and audio. Its Voice Memo Mode enriches still images with narration.

With today's digital cameras, technology poses no limitations on your creativity. The only boundaries are those imposed by your imagination. As high as your imagination can soar, digital imaging will carry you there. *

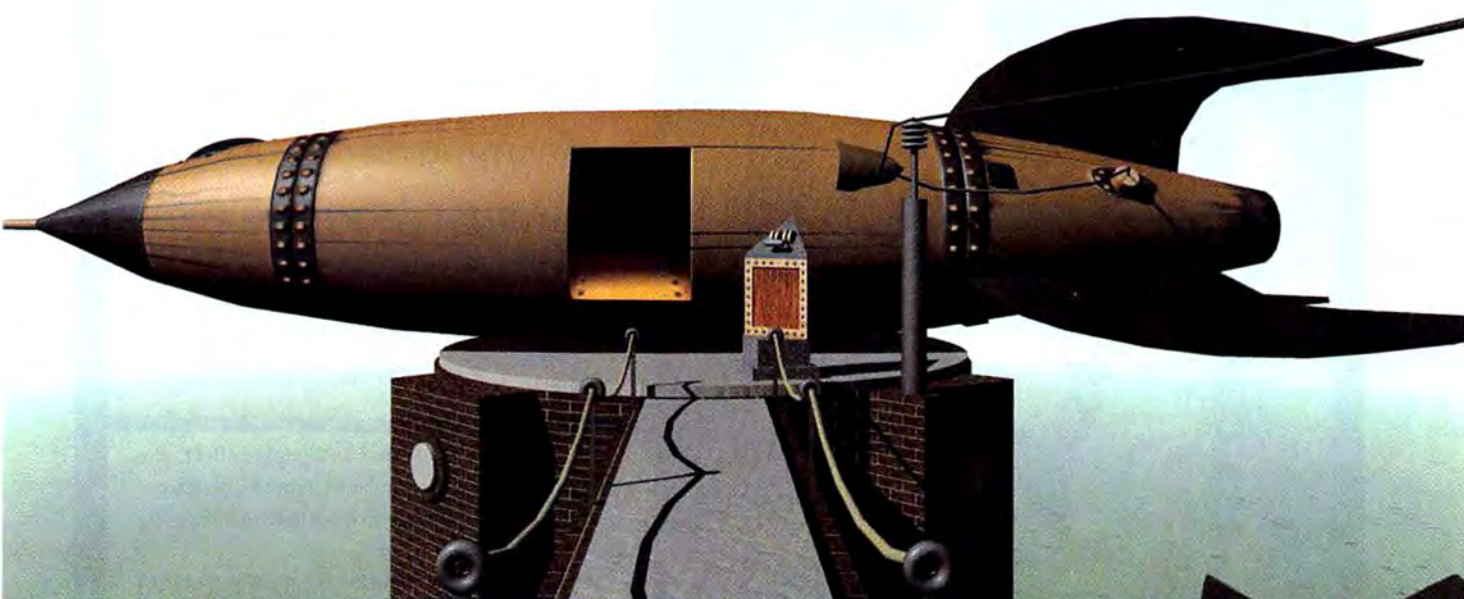


Sony Mavica

"Humans are visually oriented, and we want the instant gratification that comes from viewing, printing, or exchanging those images immediately."

— Kristi Holch, analyst, InfoTrends Research Group

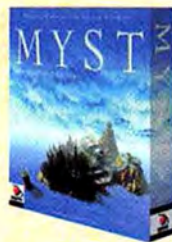
Get Away



Since 1993, over 5 million people have forgotten their everyday worries, finding themselves captivated by *Myst*'s intriguing adventure and stunningly beautiful environments. In doing so, they have made *Myst* the best-selling computer game of all time.

Now this timeless classic has been revamped with a host of new and improved features. *Myst: Masterpiece Edition* includes stunning graphics in all new 24-bit color, digitally remastered audio and video, and, most importantly, the addition of our proprietary DigitalGuide™ help technology. The DigitalGuide makes the game playing experience more accessible and less intimidating for players of any skill level.

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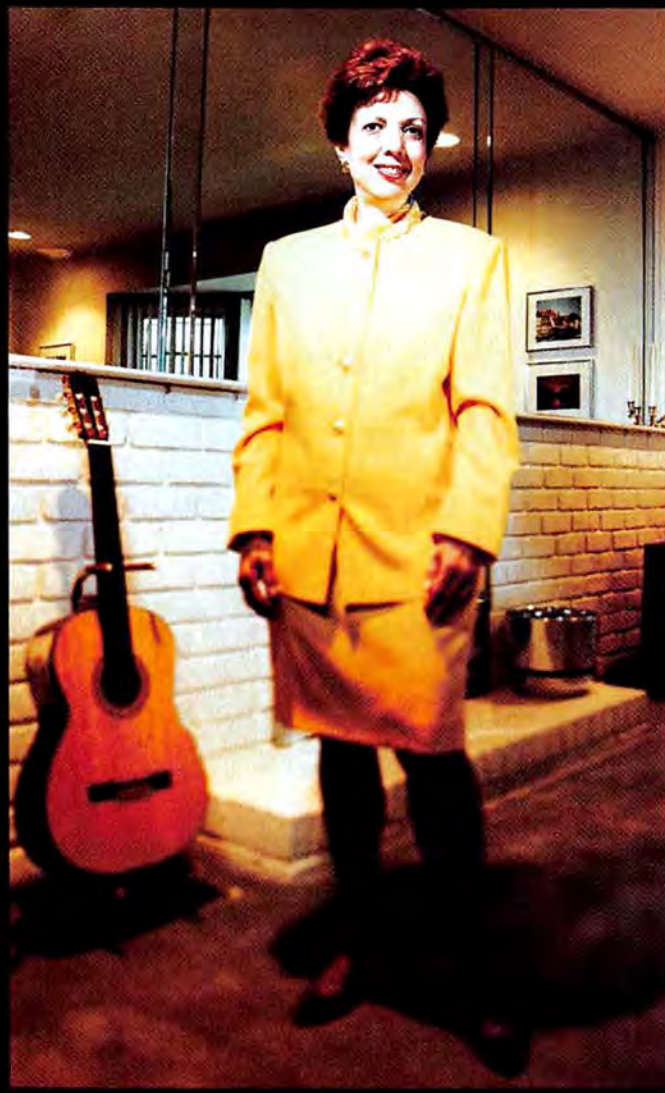
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"Games can help people get comfortable with the computer and help them to overcome their overwhelming fear that they can't learn how to use a computer."

—Carol Goldberg, Ph.D.,
clinical psychologist

Outside of its structured anti-phobic effect, she notes the necessity for regular therapeutic diversion. "It's important for people to have leisure time every day," she adds.

While some game players take mental refuge in fast-paced action games, others "chill out" by immersing themselves in strategy games. Novato, Calif.-based Mindscape Entertainment's newly released 3D fantasy game, *Prince of Persia 3D*, promises to escalate the heart-pounding action and stunning graphics that have made passion-filled fighting games universally popular. Spend some time with Mindscape's *Myst*—with its almost hypnotic, digitally mastered music, exciting sound effects, and spellbinding graphics—and you'll know why it's the world's best-selling computer game. Animated cut

scenes further enhance this game's mystical ability to transport your mind to a land of enchantment.

"Games are a form of New Age meditation. This is especially true when playing intense games. They can relax you because you don't think of much else when playing the game," says William Beacher, an Irvington, N.Y. psychologist. *

continued from page 6

grams, compares those expenditures to why someone buys a Corvette instead of riding the Metro.

"Some people want to be noticed. For them, fast computers are a status symbol," says Goldberg. "The implication is that owning the fastest and the best demonstrates their skill and affluence. It says that they are smart enough to buy it and smart enough to know how to use it."

Others buy the hottest technology to experience and exploit its latent horsepower. "That group buys it for themselves; they want the best that's available," she says.

Goldberg, who admits to using the computer for diversion, offers a pragmatic perspective on computer games. She uses them to help overcome computer phobia in some of her patients.

"Games can help people get comfortable with the computer and help them to overcome their overwhelming fear that they can't learn how to use a computer or they will somehow break it," she says.



Myst



Olympus D-340R



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USB connectivity for lightning-fast downloading that's 10 times faster than serial connections—it's a must-have for working with larger high-resolution pictures.

AUTOMATE YOUR WORKFLOW

The DC290 can be customized to tell you which shots to take in which order. It's a must for businesses that rely on pictures for documentation, like insurance agencies and construction firms.

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Looking for a way to be more productive? Effective? Fun? Consider our new DC290 Zoom Digital Camera. Beyond its uncanny intelligence, the DC290 offers performance that can only be called, well, eye-opening. Like razor-fine 2.1 megapixel resolution—enough detail for striking 8" x 10" pictures. Or 3.3 megapixel *Ultra* resolution for even sharper pictures. And burst, audio and time-lapse abilities make it even more valuable for business. The DC290 Zoom Digital Camera. Intelligence, power, speed—and Kodak's proven eye for color.

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ZOOM
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NEW PRODUCTS

Hot-Rod PCs From Micron and Polywell Race for the Flag



MICRON'S MILLENNIA

Max PIII-600 delivers solid performance for a good price.

DESKTOPS

WHEN WE WERE younger, many among us dreamed of sleek, fast cars with engines that would howl deliciously whenever we stomped on the gas. The closest most of us got to those dream machines was in the pages of a magazine. In real life, we souped up our old square-box sedans so they could burn rubber when peeling out at stoplights.

The Micron Millennia Max PIII-600 and the Polywell Poly 800-K7-650 show a similar split. The Millennia Max is a powerful thoroughbred of a system—a muscle machine that displays Micron's engineering

from the ground up. In contrast, the Poly appears to have begun life as a typical beige box. But Polywell installed numerous high-performance parts capped by a big-time power plant, AMD's Athlon-650, to transform a dumpy sedan into a blazing hot rod.

Small-business users who focus on graphics apps or who require top processing power will love the speed and prowess of the Polywell system. They will pay for it, though: The unit costs \$600 more than Micron's. Corporate buyers who want

the security of a market leader—and don't mind saving a few bucks—may opt for the very capable Micron.

TRY ATHLON

THESE NEW systems employ the two fastest Windows-compatible processors available. The Millennia Max PIII-600's PC WorldBench 98 score of 250 demonstrates the ample power of the Pentium III-600 CPU and falls very near the average of the six PIII-600 systems we've tested running Windows 98.

We reviewed a shipping unit. The Poly 800K7-650 is the first in-production PC we've tested that carries AMD's Athlon-650; its PC WorldBench score of 277 shows an advantage of nearly 11 percent over the Micron—a detectable dif-

ference in real-world use.

You'll definitely notice how the systems' case designs differ. Micron's understated case features a toolless side panel; it's a bit rough on the fingers, but all the parts line up well. Unfortunately, the Micron's interior is a snake pit of cables. The lines are tied in a bundle in several places, but from there they slither every which way. The Polywell, on the other hand, wears a tacky coat of silver paint, which does a disservice to the orderly layout within. (Polywell even silver-washed the Iomega Zip drive and the DVD-ROM drive—except for the latter's eject button, which retains its primeval beige-ness.) Removing the case turned out to be easier than with the Micron, however, and we found the cabling inside neatly organized.

The included monitors also differ. The 17-inch Micron 700Vx supports a maximum resolution of 1280 by 1024, with a refresh rate that hovers at a flickering 60 Hz. Text is



THE POLYWELL

Poly 800K7-650 provides top power for CPU-intensive applications.

PHOTOGRAPHS: MARC SIMON

Millennia Max PIII-600

PRO: Inexpensive, excellent documentation, solid performance.

CON: Monitor below par, messy interior.

VALUE: A bare-bones powerhouse suitable for most business needs.

Street price: \$1850

Micron

888/634-8799

www.micronpc.com

PRODUCT INFO NO. 751

fuzzy at all resolutions, although images don't look too bad. Upgrading to a 17-inch Trinitron monitor costs \$99 additional. (Our advice: Pay it.) The DecaView 700 19-inch monitor accompanying the Polywell can display 1600 by 1200 maximum resolution at

Poly 800K7-650

PRO: Muscle-car power, good case serviceability.

CON: You pay for every ounce of performance.

VALUE: A souped-up hot rod for demanding power users.

Street price: \$2450

Polywell

800/999-1278

www.polywell.com

PRODUCT INFO NO. 752



THESE PRODUCTS have been evaluated using tests designed by the PC World Test Center.

a refresh rate of 85 Hz, although text and images blur significantly at that resolution. Text looks a bit fuzzy in the corners at lower resolutions, but it's still quite readable.

Both monitors displayed

unnaturally dark DVD movie images, which we were able to correct by adjusting the DVD playback software. But don't butter the popcorn yet—the speakers included with both systems made us long for the squawk boxes we used to clip to our windows at the drive-in.

FINISH LINE

THE POLY INTEGRATES its off-the-shelf components well, and its Athlon CPU should be collecting trophies. On the other hand, despite a few stumbles, the Millennia Max PIII-600 remains a good value. Spending just a few more dollars on optional upgrades for it will ensure a better ride than the one we had.

—Alan Stafford

Norton SystemWorks 2000 Smoothly Integrates New Features

UTILITY SUITE

COMPLEX operating systems and applications, ubiquitous Internet connections, and hardware-packed PCs have made utility programs more important than ever—and full-service suites are the most cost-effective way to get them. Unfortunately, leading suites have evolved into compendia of often-unrelated programs that look and act different, presenting users with a steep learning curve. **Norton SystemWorks 2000** changes all that. Symantec has taken the disparate parts of its best-selling suite, integrated them under a new interface, and added a group of useful new features.

SystemWorks 2000's Standard Edition includes Anti-

Virus 2000, Utilities 2000, CleanSweep 2000, and Web Services (a subscription service that provides an online locus for upgrades to popular software). The Professional Edition adds the Norton 2000 Y2K utility, and Ghost (for backing up and cloning disks). Both versions come with a Bonus Pack that contains basic compression, encryption, fax, and Web design utilities.

Right out of the box, installing SystemWorks is a single integrated process. At installation, you have the option of enabling portions of the utilities, arranged by varying protection levels. The levels go from full-time automatic monitoring of hardware and software to a minimal degree with

only antivirus protection enabled; and you can customize at any point after installation. You will need plenty of hard disk space, though—reserve about 120MB.

ONE INTERFACE

THE HEART of SystemWorks is the Integrator, a central location for accessing and tracking all parts of the suite. Individual utilities are visually and functionally alike, option menus are common, and a single, common rescue disk now covers the whole suite.

Norton has also updated each component of SystemWorks. For example, the new Norton Utilities includes hardware diagnostics, and Norton AntiVirus actively scans e-mail

- 92 Micron Millennia Max PIII-600 and Polywell Poly 800K7-650
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- 98 Handspring Visor; Epson PhotoPC 800
- 100 MGI PhotoSuite III—Platinum Edition, Microsoft Picture It 2000, Ulead PhotoImpact 5
- 104 Microsoft IntelliMouse Explorer
- 105 C-Pen 200
- 108 Brøderbund Print Shop Pro Publisher 2000, Canon Publishing Suite; Imation SuperDisk
- 110 NetLedge
- 111 FileMaker Pro 5.0



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attachments. Although utility suites can create problems with some combinations of hardware and software, even the prerelease version worked flawlessly for me. The latest incarnation of Symantec's suite remains an essential—and now fully integrated—tool kit for nearly every PC.

—Stan Miastkowski ►

Norton SystemWorks 2000

PRO: Excellent integration, helpful new features.

CON: Requires a lot of disk space.

VALUE: Covers all essential bases, much cheaper than buying the individual programs.

Street price: Standard Edition \$60, Professional Edition \$100

Symantec

800/441-7234

www.symantec.com/us.index.html

PRODUCT INFO NO. 753

HP's Flat-Panel LCD Swings Both Ways

LCD MONITOR

HEWLETT-PACKARD'S 15-inch (viewable) **Pavilion FX70 Flat Panel Display** straddles the two main camps in today's LCD market: It has one conventional analog port, so it can work with any current PC, and a second connection that supports all three leading digital standard candidates (DFP, DVI, and PanelLink). As a result, no matter which digital standard eventually wins, this monitor will be able to run it—at most, you'll need to add an inexpensive adapter plug to your setup. On the other hand, if you're unwilling to invest in a digital card until a standard emerges, you can stick with your current card and the analog connection and not sacrifice much quality.

In my tests of a shipping unit set to its native 1024 by 768 resolution, images and text produced with both digital and analog hookups were impressively crisp, bright, and pleasing—and nearly identical. I detected only very slight improvements in sharpness with the digital video card. At lower resolutions, the built-in

Arithmos IQSync technology helped minimize the blurriness typical of LCDs set to nonnative resolutions.

HP builds decent speakers into the base of the unit, but

people who care about audio should opt for an external speakers-subwoofer set. At \$1199, the Pavilion FX70 is one of the pricier 15-inch flat-panel displays available; you

can find analog-only models for under \$1000. HP is offering a \$100 rebate on the unit, which lowers the price to \$1099. But even without the rebate, the FX70's overall quality and dual-input capability justify the premium.

—Yardena Arar

Toshiba's All-Star Portégé

ULTRAPORTABLE

IF YOU NEED a powerful notebook outside the office but don't want to lug a brick, the Toshiba **Portégé 3110CT** is a good solution—a stylish notebook that's roughly the size of two videocassettes and about as easy to carry.

The 3.1-pound, 0.8-inch-thick 3110CT comes tastefully packaged in a sleek, high-tech, silver-and-gray magnesium alloy case. Add a powerful 300-MHz Mobile Pentium II processor, a 6.4GB hard drive, 64MB of SDRAM, and a built-in V.90/K56flex modem, and you have a definite mobile contender.

I tested a shipping unit; and aside from some problems getting USB hardware to hot-sync properly, I found the Portégé to be a near-perfect ultraportable. True, its PC WorldBench 98 score of 146 is about 13 percent below the average score for the three other Pentium II-300PE systems we've tested. You'll notice the difference, but you won't be hamstrung by it. I particularly liked the almost-full-size, reactive keyboard—superior to the one on Sharp's new Actius—that let me get my work done with minimal typos. The lithium ion battery

provided an adequate life of just over 2 hours.

The \$2300 Portégé, like other ultraportables, sacrifices some of the creature comforts that you would expect in a standard notebook, including parallel and serial ports, video out, and PS/2 mouse and keyboard ports. The included port adapter also has an Intel 10/

100 ethernet connector and a second USB port (the first is on the notebook chassis). Users who are accustomed to larger screens may think that the 10.4-inch TFT display is cramped, but I found it easy to read and perfectly acceptable for most applications; large spreadsheets will require a bit of extra scrolling. (If you need a bigger screen, look to the Sharp Actius, which comes with a crisp 11.3-incher. See our review of that notebook in October's *New Products*, www.pcworld.com/oct99/actius.) An optional \$249 PC Card CD-ROM drive is available from Toshiba; the standard Portégé system comes with an external floppy drive.

BELLYING ITS slim profile and trim 3.1-pound weight, Toshiba's Portégé 3110CT packs plenty of features and adequate battery life.



Weary business users and consumers alike will appreciate the 3110CT's light weight and abundant features.

—Michael S. Lasky ▶

Portégé 3110CT

PRO: Light weight, adequate power, comfortable keyboard.

CON: Intermittent and balky USB connections; required port adapter adds bulk and weight.

VALUE: Great for true road warriors who want good power.

Street price: \$2300

Toshiba

800/867-4422

www.toshiba.com

PRODUCT INFO NO. 755



THIS PRODUCT has been evaluated using tests designed by the PC World Test Center.

Pavilion FX70 Flat Panel Display

PRO: 15-inch LCD monitor produces excellent images with either analog or digital interface.

CON: Expensive.

VALUE: Worthwhile for users who want an LCD that will look great with current and future video adapters.

Street price: \$1199

Hewlett-Packard

800/724-6631

www.hp.com

PRODUCT INFO NO. 754



*Actual weight/thinness may vary due to vendor components, manufacturing process and options. Weight includes battery. †Supports NT, not preloaded. ‡Estimated reseller price for model 24021U. Actual prices may vary. mhz denotes microprocessor internal clock speed only, other factors may affect application performance. PCs referred to in this ad include an operating system. IBM product names are trademarks of International Business Machines Corporation. Microsoft, Windows and Windows NT are trademarks of Microsoft Corporation in the United States and/or other countries. Intel and the Intel Inside logo are registered trademarks and Celeron is a trademark of Intel Corporation. © 1999 IBM Corporation. All rights reserved.



the new thinkpad 240.take note

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One Good Brother Deserves Another

PRINTER

TAKING A QUICK look at Brother's new low-cost laser, the HL-1240, you'd be hard-pressed to tell it from the printer it replaces—the HL-1040, a *PC World* Best Buy in July. The new model has the

Brother HL-1240

PRO: Good speed, sharp text, USB connectivity, and a low price.

CON: Graphics can look fuzzy.

VALUE: Good for small or home offices that don't have a need for color printing.

Street price: \$299

Brother International

800/276-7746

www.brother.com

PRODUCT INFO NO. 707

same low price as the old one (\$299) and reassuringly similar quality and features. So what's new? Not much, but little needed improving. We reviewed a shipping model.

Like its predecessor, the **Brother HL-1240** produces crisp text quickly—a text-only page emerged in less than 20 seconds. Graphic images took just 30 seconds; though a bit fuzzy in spots (like output from the HL-1040), they're still adequate for all but the fussiest graphics users.

The HL-1240 does look different from its predecessor. Whereas the old laser fed its paper above and spat it out below, the boxy new model

has a paper tray beneath that feeds prints upward. With this design, the HL-1240 can hold 50 more pages—both input and output. The arrangement has just one drawback: The legal-size paper tray sticks out 2 inches beyond the back of the printer.

Setting up the HL-1240 and installing its toner cartridge are both just as idiot-proof as they were with the HL-1040, and the new unit comes standard with USB connectivity. An instructional video on the printer's CD-ROM can even show you exactly how to get started. Small changes never looked so good.

—Karen Silver

Dymo LabelWriter Turbo

DYMO-COSTAR's **Dymo LabelWriter**

Turbo prints out mailing labels—and stamps, too, so you can use it with the new downloadable Internet postage. The shipping unit that I tested (street price \$250) printed labels at twice the speed of other label printers. It also makes changing rolls of labels a snap—and with no loss of labels. The included software contains some 40 predefined label templates and is customizable. The Turbo's print quality on bar codes and on graphics looked sloppier than that of the company's earlier models, but if your printing involves primarily text, it will do the job flawlessly. Dymo-CoStar; 888/296-8552; www.dymo.com/info

PRODUCT INFO NO. 720

—Michael S. Lasky

Agfa's SnapScan Touch: Fun and Simple

SCANNER

SUDDENLY THE computer industry is going color-crazy. The latest example: Agfa's new 36-bit flatbed scanner, the \$129 **SnapScan Touch**. The SnapScan comes with interchangeable handles in six trendy, translucent colors (blue, red, orange, purple, lime, and green) as well as the traditional gray. Change your mood or décor, and you can change your handle to match.

Colorful as it is, the SnapScan Touch has more going for it than playful marketing gimmickry. Offering a convenient USB interface and capable 600 by 1200 resolution, this speedy unit delivers images with fine detail and accurate color. The scanner's tidy bundle of software includes



THE FASHION-CONSCIOUS SNAPSCAN TOUCH: Push a button and send your scan to one of four different applications.

Corel PrintHouse Magic for image editing and Caere's OmniPage LE 5.0 for OCR and PageKeeper for document management.

The shipping version of the SnapScan Touch I tested was a breeze to install and painless to use. The unit looks and operates much like a copy machine: Pop a document under its lid, push one of the

four buttons on the outer shell—for scan, print, OCR, or e-mail—and it jumps into action, completing the task or launching the application you selected. I also found it easy to use the accompanying Agfa ScanWise 1.10 scanner software for tweaking images. But missing are more-advanced image-control features like exposure, gamma, highlight,

and shadow adjustment tools found in similarly priced competitors such as the Microtek ScanMaker X6.

The SnapScan Touch is best for novices and casual users, but its apt combination of accessible features and good scanning quality make it a worthy choice for the average small-office or home user. And those cute little handles don't hurt, either.

—Richard Jantz ▶

SnapScan Touch

PRO: Fine-quality scans, easy to use, one-touch buttons.

CON: Lacks advanced image-control features.

VALUE: Simple controls, high-quality images for a great price.

Street price: \$129

Agfa

888/281-2302

www.agfahome.com

PRODUCT INFO NO. 708

PC 300GL

price

specs

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Handspring Visor Somersaults Over Palm

PDA

HANDSPRING'S Visor is the best PDA to come down the pike since the Palm itself—not much of a surprise since the team behind the original PalmPilot created it. The Visor mimics the Palm's size and shape as well as its OS, so I was able to use all the software that works with my Palm IIIx. I tested a preproduction unit.

Where the Visor differs

Visor

PRO: Runs Palm applications, attractively priced, easy expandability, color case options.

CON: Snap-off lid easy to misplace.

VALUE: Great deal for entry-level users, Deluxe model makes appealing upgrade if expandability matters. Street price: cradle-less Solo model \$149, 2MB standard model \$179, 8MB Deluxe model \$249

Handspring

650/230-5000

www.handspring.com

PRODUCT INFO NO. 709



PALM PLUS: HANDSPRING'S COLORFUL VISOR can run all Palm applications and improves on the bundled basics.

from the Palm, it almost always outdoes it. The datebook offers three views that the Palm doesn't provide (weekly, annual, and appointment list), the calculator adds advanced functions, and the HotSync cradle's USB connection moves data approximately four times faster than the Palm's serial hookup. The Visor's approach to expand-

ability is impressively elegant: The top back of the device comes off easily, exposing a small bay that accepts plug-in modules about two-thirds the size of a PC Card. (Installing expansion cards on a Palm III, IIIx, V, or VII means fiddling with tiny screws.) Handspring itself will deliver memory, backup, and golf game modules at product launch; other

modules, including a music player, a wireless modem, and a GPS unit, will be available through Handspring's Web site later this year. The only thing I like better about my Palm is the flip-up cover; Visor's cover snaps off and is too easy to lose.

Visors will be sold only through Handspring's Web site through year's end. The \$149 Visor Solo is attractively priced but lacks a sync cradle, a serious drawback. Entry-level users are better off paying \$30 more for the basic Visor with 2MB of memory. It's still a great deal: The basic Palm IIIe costs \$229 and accepts no expansion cards. The \$249 Visor Deluxe has 8MB of memory (like the more expensive Palm IIIx), and its case comes in iMac-inspired translucent colors in addition to gray. Happy Palm IIIx, V, or VII users have no cause to switch. But owners of earlier models may find Visor Deluxe a very versatile upgrade.

—Yardena Arar

Epson's Picture-Perfect Value

DIGITAL CAMERA

THOUGH LATE to the market, Epson's first 2-megapixel (millions of pixels) digital camera—the new Walkman-size PhotoPC 800—offers the best mix of features and price in its class. The unit has an optical resolution of 1600 by 1200, enough to produce 11-by-14-inch prints. It comes with four rechargeable NiMH batteries and a recharger, plus serial and USB cables for PC connections—all for just \$699.

Weighing a little over half

a pound with batteries, the PhotoPC 800 is light and easy to carry. It's easy to use, too. A glance through the reference pamphlet will familiarize you with the camera's basics, and one press of a button easily changes the resolution or flash mode. Adjusting some manual settings, such as panorama picture-taking mode and white balance, requires a closer look at the documentation.

The camera's design isn't perfect. The LCD is so close to the viewfinder, I ended up

pressing my nose against the LCD when snapping shots, and smeared the display.

The camera offers up to 10 seconds of voice annotation, Sierra Imaging's Image Expert software, and photo printing directly from the camera to an Epson printer. The unit's 8MB CompactFlash card can store up to 120 snapshots in standard mode (640 by 480 resolution) or 12 prints in superfine mode (1600 by 1200). Though it lacks a bundled AC adapter (Epson sells

one for \$49), the feature-rich PhotoPC 800 is a bargain—but better carry some tissues along for smudge removal.

—Grace Aquino ►

PhotoPC 800

PRO: Lots of features, good-looking pictures, compact.

CON: Lacks bundled AC adapter, and it's easy to smudge the LCD when taking photos.

VALUE: Well-priced, easy-to-use, USB-compatible camera suitable for first-time and business users.

Street price: \$699

Epson America

800/463-7766

www.epson.com

PC 300PL

price

from \$1,619*

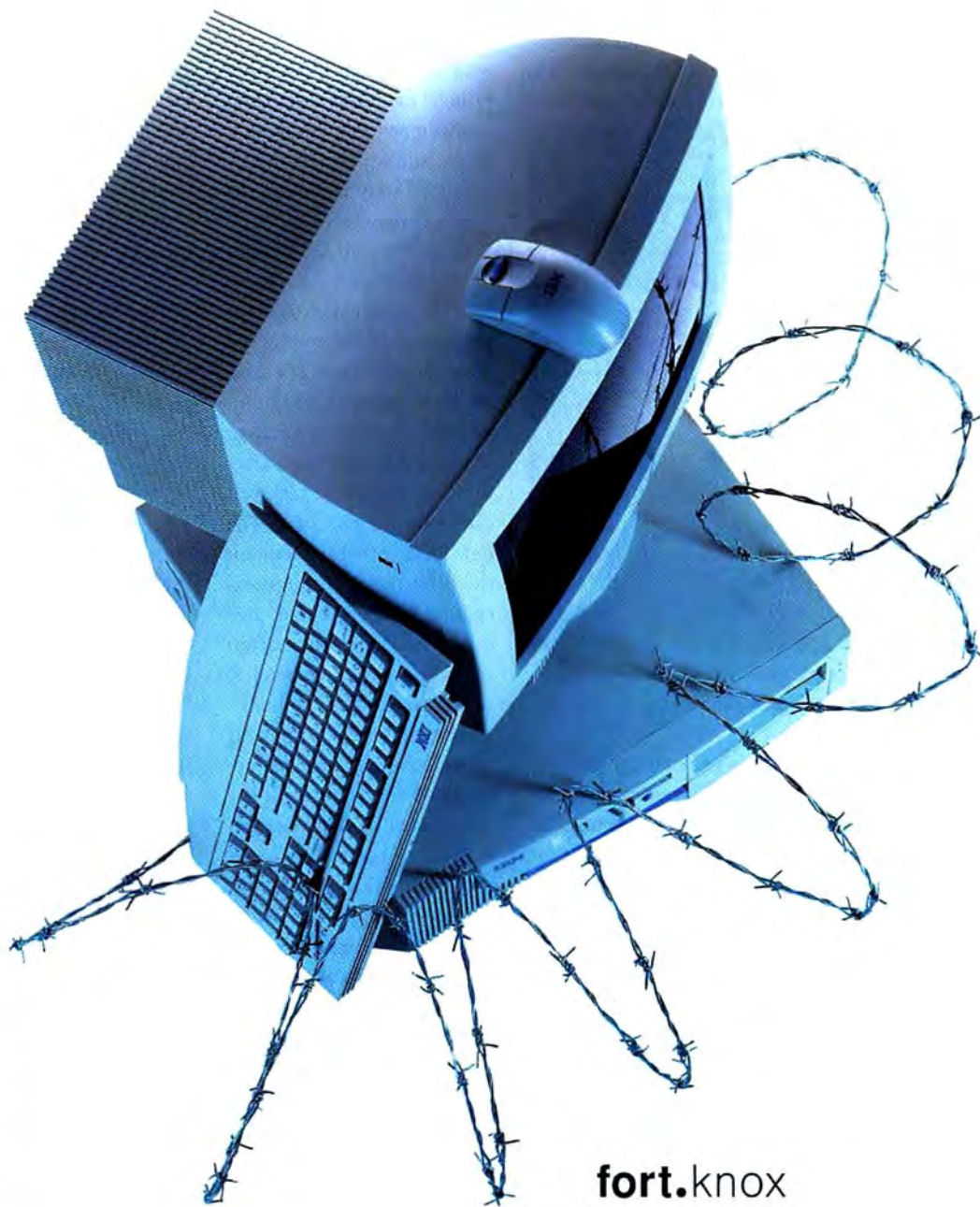
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*Estimated reseller price for model 65844-7U (CPU), including monitor (6546U-MN). Actual prices may vary and do not include options. nHz denotes microprocessor internal clock speed; other factors may also affect application performance. gb = 1 billion bytes; for HDD capacity. PCs in this ad include an operating system. IBM product names are trademarks of International Business Machines Corp. The Intel Inside logo and Pentium are registered trademarks of Intel Corporation. © 1999 IBM Corp. All rights reserved.



PL Options by IBM

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Photo Editors Storm the Web

PHOTO EDITORS

THE WEB made designers of us all. Not all of us are prepared to learn Adobe Photoshop, however, so some simpler graphics packages have emerged to help us churn out HTML quickly and easily. I

PhotoImpact can control brightness, saturation, and color for each color channel, allowing you to fine-tune each characteristic. That's PhotoShop stuff. Another pro-style PhotoImpact feature lets you hide objects in your design so

some prior knowledge of video and animation to get the most out of this application.

FOR HOME SHUTTERBUGS

MGI's NEW \$50 PhotoSuite (which I examined in shipping form) comes with lots of templates and other design elements, an array as good as Picture It's impressive collection. You can also grab photos right off the Web and drag them into the image database—a unique capability among the three packages here. The newest PhotoSuite also remembers the elements of a collage or composite photo, so after moving to another task you can return to edit them. The new Photo Stitching tool, on the other hand, though exceptionally easy to use, produced erratic results, often mangling photos instead of seamlessly combining them.

Microsoft's \$55 Picture It 2000 is the least changed upgrade of the three. Still, the preproduction copy I examined showed several enhancements, notably new layout aids (including rulers and a command for aligning multiple elements) and the ability to batch-correct photos. The new Photo Stroke tool proved charming. It offers various brush strokes shaped to make lines of paper clips or chilies, for example, and lets you pick any photo to use as the brush color. You can't create new brush stroke types, but Microsoft's assortment is good. Picture It now supports multiple undos, too, though you have to step back one change at a time.

Unfortunately, the new 3D text and special effects just don't cut it; my laboriously created textures were lost when I extruded the text into 3D.

Like most photo-editing packages in their class, Picture It 2000 and Photo Suite III are rigid and contain many special effects of dubious aesthetic value. Ulead's software will support your creativity long beyond the others, but I didn't find getting started with PhotoImpact easy, and you probably won't either.

—Dan Littman ▶



COLOR QUICK: Microsoft Picture It's Touchup command offers lots of quick fixes, such as Correct Tint for better flesh tones.

tested recent upgrades to three such packages: MGI Software's PhotoSuite III-Platinum Edition and Microsoft's Picture It 2000, which both improve on prior versions while maintaining a beginner focus; and Ulead's PhotoImpact 5, which goes beyond its roots to serve a more intermediate audience.

AHEAD OF THE PACK

AT \$80, PhotoImpact 5 costs \$25 to \$30 more than the other two but has features otherwise available only in the pro packages. With these features comes complexity, so keep PhotoImpact's manual handy. I looked at a late beta version of the software.

you can work on one part of a complex image without affecting the rest. Conveniently, the undo feature lists all recent actions and lets you back up to any previous unsaved version in one step. With PhotoImpact's 3D features and new vector drawing capabilities, I created frighteningly complex text blocks using tricks of a midrange 3D surface modeler.

Ulead GIF Animator 3, a separate application included with PhotoImpact, lets you create Web animations and includes pixel-level layer control and special lenses to gladden a video hound's heart. As with the whole PhotoImpact package, however, you need

PhotoImpact 5

PRO: Very rich feature set includes good 3D and animation tools.

CON: Hard to figure out.

VALUE: Worth the cost and the effort, but not for beginners.

Street price: \$80

Ulead Systems

310/858-5323

www.ulead.com

PRODUCT INFO NO. 710

PhotoSuite III-Platinum Edition

PRO: Very easy to use; can grab photos off Web sites.

CON: Weak special effects control.

VALUE: Inexpensive and good for beginners, but easy to outgrow.

Street price: \$50

MGI Software

888/644-7638

www.mgisoft.com

PRODUCT INFO NO. 711

Picture It 2000

PRO: Dimwit-proof; includes tremendous amount of content.

CON: 3D text effects fall short.

VALUE: Beginners will like it, especially for adding text to photos and layouts, but it lacks staying power.

Street price: \$55

Microsoft

800/426-9400

www.microsoft.com

PRODUCT INFO NO. 712

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PC Computing



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PNotePro3

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This Mouse Is Not on the Ball—And That's Good

INPUT DEVICE

MICROSOFT has scrapped the ball and moved on to optics. In place of the rubber tracking ball that appears in con-

ventional pointing devices, the new \$75 **IntelliMouse Explorer** incorporates an optical sensor technology that Microsoft calls IntelliEye. The result: a more accurate pointing device.

The optical mouse uses a digital camera with a lens that focuses light onto the surface beneath it. The camera takes an amazing 1500 shots per second and processes them in order to track movement from picture to picture. By comparing the pictures, the mouse determines exactly where it is going and where it has been, delivering far more precision than conventional mice can.

In testing a near-final ver-

sion of the Explorer, I was impressed by its ease of installation on either USB or PS/2 ports. Sculpted to fit your right hand (an ambidextrous version is also available), the mouse seems to be a close copy of Logitech's award-winning MouseMan Wheel.

Microsoft didn't quite match the ergonomic comfort of Logitech's device, however. Also, some of the customizable buttons are situated right above the spot where your thumb naturally rests—a convenience, right? But I ended up clicking these buttons inadvertently on more than one occasion—not so convenient.

My score for the Microsoft IntelliMouse Explorer: Technology 10, Comfort 4. Your mileage may vary.

—Michael S. Lasky

IntelliMouse Explorer

PRO: Optical sensor technology vastly improves precision of pointing and eliminates repair and cleaning hassles of conventional mice.

CON: Right-handed device is less comfortable than competing Logitech device; auxiliary button placement can cause data entry errors.

VALUE: Revolutionary technology may be upstaged by low comfort.

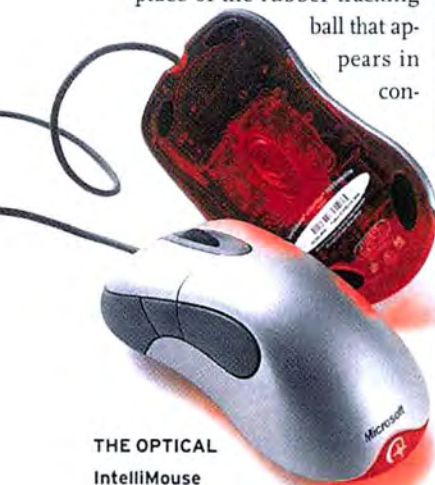
Street price: \$75

Microsoft

800/426-9400

www.microsoft.com/mouse

PRODUCT INFO NO. 714



THE OPTICAL IntelliMouse Explorer offers greater precision.

PRINCETON DISPLAYS



Scan and Store With the Touch of a Pen

PORTABLE SCANNER

THE \$200 C-Pen 200 makes note taking from most printed text a snap. Weighing in at less than 3 ounces, the device scans printed words, stores them in memory, and can transfer that text to any PC or notebook via an infrared port. But don't throw away your pad and paper yet.

In our tests of a shipping model, the C-Pen performed its limited functions extremely well. It can't scan handwriting, and it had a hard time with underlined or italic text, or with anything red. But the device excelled at reading normal, printed text from letters,

business cards, and magazines. With a couple of exceptions (the unit frequently confused certain letters such as i

and l), it scanned dozens of lines of a presentation with letter-for-letter accuracy.

You can organize scanned documents within the unit. Saved as plain text files, the scans take up very little room; and using the included software, you can transmit the files to a laptop PC in seconds. The pen can also dump just-scanned text directly into the document you're working on, in any Windows application.

The C-Pen comes with 2MB of nonvolatile flash memory, half of which is available for storage (the unit's operating software uses the rest). The scanner can handle 100 pages

of single-spaced text, and its two AAA batteries deliver up to a month of regular use.

The C-Pen has limitations, but what it does, it does well and affordably. Give it a roll.

—Andrew Brandt ▶



THE LIGHTWEIGHT C-Pen 200 easily scans standard text.

C-Pen 200

PRO: Accurate handheld OCR, light weight, long battery life.

CON: Has difficulty reading underlined or italic text, or anything printed in red; confuses some letters.

VALUE: An excellent tool for mobile professionals, students, and anyone who collects lots of notes on scattered pieces of paper.

Street price: \$200

C Technologies

www.cpen.com

PRODUCT INFO NO. 713

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3MAX+

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- Microsoft Outlook® 98
- Microsoft Word® 97
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- Softlink® in Chorus™
- Sony DVgate™ Motion
- Sony DVgate Still
- Sony Media Bar
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- Sony Smart Capture
- Sony Smart Connect
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- Sony Smart Write
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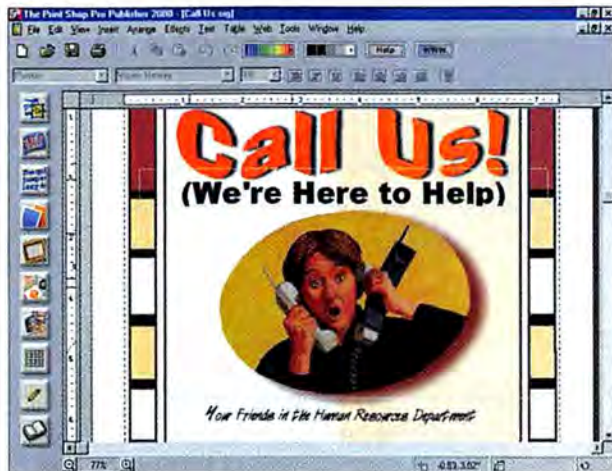
Publishing's Cheap With Print Shop and Canon

DESKTOP PUBLISHING

DESKTOP-PUBLISHING bundles don't have to cost you a bundle. Two new packages from Brøderbund and Canon deliver potent collections of publishing tools for well under \$100 apiece. I tested beta versions of both of these desktop publishing suites.

Brøderbund's Print Shop products are synonymous with home printing, but the new **Print Shop Pro Publisher 2000** is aimed primarily at small businesses. The easy-to-use \$80 package comes with 9000 templates, including forms for presentations, newsletters, business cards, and fax cover sheets, plus a staggering 175,000 pieces of clip art. Besides the desktop publishing application, the suite includes serviceable drawing and photo-editing programs, a media organizer for cataloging image files, TextBridge software for converting scanned documents into editable text, and some surprisingly rich tools for publishing Web sites.

This package is a fine, fun



PRINT SHOP PRO PUBLISHER 2000's tools are great for one-page creations but handle multipage documents less adroitly.

choice for casual users, but despite the "Pro" in its name, it lacks certain capabilities that advanced users need. Designing complex multiple-page documents is a chore because Print Shop Pro can't display left- and right-hand pages side by side. Also, the program doesn't support Pantone color palettes or other features needed to prepare a document for commercial printing.

The \$90 **Canon Publishing Suite** has fewer elements than

Brøderbund's offering—it lacks OCR and an image organizer, for instance, and includes a relatively modest 20,000 pieces of clip art. But it's more suitable for ambitious publishing projects because its typographical tools are more precise, it handles multipage creations more easily and capably, and it lets you set up documents for commercial printing. The Canon package also includes a basic draw program and image editor that work within the publishing application—handy features lacking in Microsoft's similar Publisher 2000. (To its credit, Publisher's slick templates give documents a more professional look than do the templates included with the Canon and Brøderbund packages.)

Though the Canon suite's Internet tools are less full-featured than those in Print Shop Pro and Publisher, it can output documents in a Java-based format for high-fidelity reproduction on the Web.

Print Shop Pro Publisher 2000

PRO: Packed with features, templates, and clip art; easy to use; good Web tools.

CON: Templates aren't top-notch, weak tools for viewing multipage documents and preparing commercial printing.

VALUE: Fun, simple business publishing for beginners.

List price: \$80

Brøderbund

888/829-3343

www.brøderbund.com

PRODUCT INFO NO. 715

Canon Publishing Suite

PRO: Good tools for intermediate-level publishing, includes image editor and draw program.

CON: Templates could be better looking, fewer features than Print Shop Pro, provides limited Web-publishing tools.

VALUE: Worthwhile alternative to Microsoft Publisher.

List price: \$90 (\$40 rebate for users of competing products)

Canon Software Publishing

800/385-2155

www.software.canon.com

PRODUCT INFO NO. 716

SuperDisk Faster but Still Falls Short

IMATION HAS answered LS-120 speed complaints by releasing a faster family of **SuperDisks**, available in three interfaces: an internal IDE drive (\$100 street price), an external USB drive (\$170), and an external parallel-port model (\$150). But despite peppy performance, the new models seem unlikely to dethrone Zip. Previous SuperDisk drives read data from their native 120MB media about 10 times faster than a floppy drive. In our tests, the fastest of the new drives—the IDE version—wrote data about 22 times faster than a standard floppy and read it about 15 times faster. The USB version was nearly as swift, but the parallel-port model took twice as long as its siblings to write data. All three drives were easy to install. The USB model works only with Windows 98; to use the IDE version as a boot drive, you will need an LS-120-compatible BIOS (found in most newer PCs). SuperDisk poses a viable alternative to Zip only if fast performance and high capacity are not your top priorities—or if you want to save a bay and still have backward compatibility. Imaison; 888/466-3456; www.imaison.com

PRODUCT INFO NO. 721

—Jon L. Jacobi

Ultimately, most users of Microsoft Publisher won't find enough in Canon Publishing Suite to warrant a switch. But if your business is new to professional-level desktop publishing, this package deserves a look. Beginners whose printing aspirations are more modest will be satisfied with Print Shop Pro.

—Harry McCracken ►

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

— Fred Lugano, weatherization.com, Vermont

8 million computer users can't be wrong about APC power protection

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

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- Easy overload recovery
- Site Wiring Fault indicator

- Audible and visible alarms alert you to power events as they occur
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[†]See policy for details
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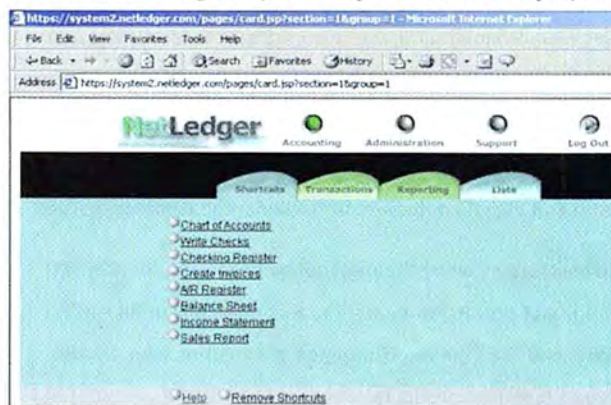
Bookkeeping on the Web

ACCOUNTING

ACCOUNTING IS rarely fun, but it doesn't have to be costly and cumbersome. Easy to use and inexpensive, **NetLedger** is an Internet-based accounting service tailored to the simple needs of a small business with up to 50 employees. You can create invoices, pay bills, and print financial statements from the accounting data you

program upgrades, and sundry other maintenance issues. The service handles all that, for an affordable monthly fee of \$5.

To print checks and invoices, you'll need Internet access, a recent Web browser, and the free Adobe Acrobat Reader software that NetLedger provides. I had problems accessing NetLedger using Internet Explorer, but the company has



NETLEDGER'S Web site is clear and offers easy-to-follow menus.

store with the NetLedger service, hosted by Oracle Business Online. And someone else takes care of many of the thankless administrative tasks.

NetLedger competes with small-business accounting software like Intuit's QuickBooks and Peachtree's Complete Accounting. But even though NetLedger runs on the powerful Oracle database, it can't match QuickBooks' features. For example, NetLedger doesn't currently support budgeting, customized invoice forms, time tracking, or other niceties. And entering transactions online is slower than using a standard program.

On the other hand, using NetLedger frees you from worrying about data backup, pro-

gram upgrades, and sundry other maintenance issues.

If you're currently filing receipts in a shoe box or working with an unduly complicated accounting program, you'll benefit from NetLedger.

—Richard Morochove

NetLedger

PRO: Easy administration with no program installation or data backup.

CON: Elementary and relatively inflexible accounting functions.

VALUE: Low price makes it attractive for small businesses with simple accounting needs.

List price: \$5 per month for up to 1000 transactions.

NetLedger

650/462-7200

www.netledger.com

PRODUCT INFO NO. 717

36-24-36

Enter FileMaker Pro 5

DATA MANAGER

EVER WISH posting a detailed and well-laid-out database on your Web site were as easy as uploading a graphic? If you

er can see your database-enhanced pages. FileMaker expects Netscape 5 will soon support the necessary standards, too. An alternative file



FILEMAKER PRO 5 LETS YOU CHOOSE A LAYOUT and will display your database on the Web with all formatting preserved.

want to post a product catalog online, for example, you'll welcome FileMaker's \$249 **FileMaker Pro 5**.

Click a few buttons, choose which layout you want to display, and your database will appear on the Web with font, field, and label formats; radio buttons; and drop-down lists all preserved from the original layout. I looked at a late beta version of the product.

At present, however, only visitors using Internet Explor-

format lets you share the database information with people using other browsers, but the layout appears as a stock list, not as a copy of the original.

Version 5 finally gets Excel imports right. It converts column headings to field labels, matches field types to cell formats, and creates some basic layouts so you can use the converted file at once. Other new features include pop-up data-entry lists based on the contents of a field in another file; the ability to synchronize office, home, and laptop copies of the same database; and a built-in ODBC (Open Database Connectivity) driver.

FileMaker 5's changes continue to increase its ease of use. But FileMaker 4 users may find the \$149 upgrade price too steep: The new version still lacks items such as data-entry masks and data validation during imports.

—Robert Lauriston ■

FileMaker Pro 5

PRO: WYSIWYG Web publishing, smooth Excel spreadsheet imports, cross-file pop-up lists.

CON: Costly upgrade doesn't address common user complaints.

VALUE: Still the easiest data manager for average users.

List price: \$249, upgrade \$149

FileMaker

800/325-2747

www.filemaker.com

PRODUCT INFO NO. 718

01101010



The Intellimouse Explorer® looks different because it is. Optical tracking turns the slightest movement into precise cursor action, without the use of a mouse ball—on Macintosh or Windows®-based PC. It's like a perfect ten with a 1600 on the SAT's.

Microsoft
Where do you want to go today?*

www.microsoft.com/mouse

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Compaq V1000 21" monitor

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For Windows 95, 98 and NT

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Simple Technology
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Castlewood ORB 2.2GB
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The Compaq AP200 is a workhorse workstation with 600MHz Intel® Pentium® III processor, 9.1GB hard drive, 10/100 Ethernet, and Windows NT. With support for AGP graphics solutions that offer both fast 2D and 3D performance, the AP200 is the ideal solution for entry-level CAD, financial trading, software development, Web creation, and land or asset management applications.


COMPAQ

Professional Workstation AP200
towerable desktop computer

\$2689.47

CDW 180646

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Sony VAI0 PCG-Z505RX Notebook Computer

\$2996.00

CDW 179642

This combination of a powerful, ultralight notebook with a digital camera and printer is perfect for realtors, insurance adjusters and photo enthusiasts. For more detailed information on this solution, just call your CDW account manager or use  SmartCode SC#10350 in the search engine at www.cdw.com.

Good things come in small packages. Not only does the **Sony Cyber-Shot F55** weigh a mere 10 ounces, it stores sharp 1600 x 1200 images and MPEG movies on the tiny Memory Stick™.

Sony Cyber-Shot F55 digital still camera

\$899.00

CDW 162555

Options are what it's all about. With the **Sony MS300** dye-sublimation printer, you get brilliant photos from Memory Stick™, PC Card, Smart Media or Compact Flash memory cards or even from any NTSC video source. It's your choice!

Sony MS300 Memory Stick Printer

\$469.02

CDW 176849

What could be better protection for your Sony notebook and accessories than the leather on the outside and air-pockets and detachable compartments on the inside of the **Sony VAI0 505 Carrying Case**?

Sony VAI0 505 Carrying Case

\$149.99


CDW 158775

When you need support for e-business or enterprise applications or you need to network your small business, the value-priced **IBM Netfinity 5000** delivers serious power and manageability with 500MHz Intel Pentium® III processor, 128MB of RAM, 10/100 Ethernet, room for extra expansion and support services.

IBM Netfinity 5000

\$2776.45

CDW 150907

When you have to choose between networking or not working, the choice is obvious. But it can also be easy—just ask your dedicated CDW networking account manager or see this solution on CDW's Web site with  SmartCode SC#10344.

IBM®



A really productive day at the office means nothing if what you accomplished doesn't get backed up for future use. Be safe and be sure with the stable, high performance **Seagate TapeStor DAT DDS-3 drive**.

**Seagate TapeStor DAT
24GB external DDS-3 drive**

\$1299.81

CDW 106799

Don't settle for slow file transfers—eliminate your reliance on network ports with the advanced stackability and 10/100Mbps switching of the **3Com SuperStack II Switch 3300**.

**3Com Superstack II Switch 3300
24-port 10/100 Ethernet switch**

\$1698.13

CDW 106636

Here is your cost-effective solution to Fast Ethernet or VLANs for a branch office. The **Cisco 2621 Modular Router** provides two integrated 10/100 autosensing 10/100 Ethernet ports with leading-edge Cisco technology and reliability.

Cisco 2621 Modular Router

\$2329.16

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56K modems are capable of 56Kbps downloads, however, current regulations limit download speed to 53Kbps. Internet connectivity requires access services from an Internet access provider. Contact your local access provider for rates, terms and conditions.

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- Windows NT Simple Device Installation via HP Network Printer Installer for Windows NT V4.0
- Embedded Web server for status and configuration using a Web browser
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- Simple installation and management via HP Web JetAdmin and network peripheral management software
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HP LaserJet 4050N printer

HP's versatile, 17 ppm black-and-white printer for small-to medium-size workgroups.

- Resolution: HP ProRes 1200 (true 1200 dpi) at engine speed
- Print speed: 17 ppm
- RAM: 16MB std. with HP Memory Enhancement technology (MET), 200MB max.
- Print language: HP PCL 6 and PostScript Level 2
- Tray 1 is a 100-sheet/10-envelope multipurpose tray for automatic and manual feeding
- Tray 2 is a 500-sheet input tray for letter, A4 and legal size
- Includes HP JetDirect 600N 10/100BASE-TX internal print server
- 1-year return-to-HP warranty
- HP C4253A

\$1397.89

CDW 159495



HP Vectra VEi8

Monitor sold separately

Desktop computer

If you're looking for a top-performing business PC that's also easy to manage, the HP Vectra PC is the right choice for you.

- 450MHz Intel® Pentium® III processor
- 64MB RAM (32MB std., 32MB FREE!)
- 4.3GB hard drive
- Windows 95
- 3-year limited warranty

\$939.28

CDW 176592



June 22, 1999



HP NetServer E60

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- 450MHz Intel® Pentium® II processor
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- 32X CD-ROM
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- Easy to set up, backup, troubleshoot and expand
- 3-year limited warranty

\$2299.89

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Tecra 8000

Notebook computer

- 400MHz Intel® Pentium® II processor
- 64MB RAM
- 10GB hard drive
- 24X Max CD-ROM
- 56Kbps (V.90) modem
- Windows® 95
- 14.1" active-matrix display
- 1.69" thick
- 6 lbs.

\$3399.89

CDW 173532



IBM

IBM ThinkPad 570

Notebook computer

- 300MHz Intel® Pentium® II processor
- 64MB RAM
- 4GB hard drive
- 56Kbps (V.90) modem
- Windows 98
- 12.1" active-matrix display
- 1" thin
- 3.96 lbs.

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*\$70 mail-in manufacturer upgrade rebate; certain restrictions apply; call your CDW account manager for details (while supplies last)



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Upgrade **\$50 rebate** **\$379.90*** CDW 158720

Upgrade with IntelliMouse Pro **\$50 rebate** **\$399.90*** CDW 158722

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THE LOWDOWN ON UPGRADING

ILLUSTRATIONS BY FRANCISCO CACERES

In the era of free PCs, should you overhaul your old machine? Our superguide offers 14 worthy ways to make your system run better and faster.

IT SEEMS LIKE yesterday. You'd just plunked down more than two grand on a new PC with all the trimmings: a blazing 166-MHz Pentium processor, a generous 16MB of RAM, and a humongous 2GB hard disk. Sure, it wasn't cheap, but you'd bought yourself all the computing power anyone could ask for. ►

BY STAN MIASTKOWSKI AND ANUSH YEGYAZARIAN



Flash forward to late 1999. A different set of adjectives comes to mind when you work with your computer: plodding, cramped, and insufficient. Plainly, your aging machine lacks the oomph to keep pace with today's ever-more-demanding applications, let alone take on the even greater demands of Windows 2000.

What's more, computer stores are practically giving away new systems that run rings around yours.

In the era of cheap, nearly free, and pseudo-free PCs, why should you bother upgrading what you've got? For one thing, today's upgrade products, like new systems, are better buys than ever. Besides,

the computer you *really* covet may cost \$1500, \$2000, or more. Even now, cutting-edge systems equipped with the newest CPUs and most lavish features aren't exactly impulse items.

In short, the best low-cost PC could turn out to be the one you already own, once it's decked out with the right upgrades.

THE ultimate PC MAKEOVER

WHAT WOULD IT TAKE to turn yesterday's tired old PC into today's fully loaded speedster? For us it took about \$1464 in products and about four hours' labor. We ended up with a reborn system that, in performance and features, rivals models on our *Top 10 Budget PCs* chart. But the same \$1464 could buy you a fast new Pentium III or

Celeron system with 64MB of RAM, at least 13GB of disk space, a DVD-ROM drive, and a 17-inch monitor—making a top-to-bottom renovation project like this a waste of money and time. Still, carefully chosen upgrades can breathe new life into an old PC for a reasonable price. Here's our component-by-component analysis.

OUR OLD SYSTEM, a Hewlett-Packard Vectra VL 5 Series 5, had a Pentium-166 CPU, 16MB of RAM, integrated graphics with 2MB of RAM, a 2.5GB hard drive, a 28.8-kbps modem, an 8X CD-ROM drive, a 15-inch monitor, a Sound Blaster 16 sound card, and basic desktop speakers.

CPU:
PowerLeap K6-III-400
CPU upgrade
Cost: \$199
No substitute for a new PC, but worth considering.

RAM:
64MB total (48MB upgrade)
Cost: \$100
Bump your PC to at least 32MB; 64MB's better still.

Speakers/sound card:
Altec Lansing ACS45.1/Creative Labs Sound Blaster Live Value
Cost: \$200
Only for audiophiles and gamers.

Monitor:
17-inch OptiQuest V73
Cost: \$295
Your eyeballs will appreciate it.

Optical storage:
6X Creative Labs DVD-ROM drive
Cost: \$250
Not unless you want to watch movies on your PC.

Hard drives:
17.2GB Seagate Medalist
Cost: \$210
Real estate was never so cheap.

Graphics card:
3dfx Voodoo3 with 16MB of RAM
Cost: \$130
A must for gamers, but not for business users.

Modem:
56-kbps Digicom Systems Modem Blaster Flash PCI
Cost: \$50
A necessity (unless you can get cable or DSL).

USB ports:
Entrega 2-Port USB Upgrade
Cost: \$30
If you use Windows 98 and plan to add devices such as a scanner or external drive, go for it.

Spend your money on the right components, and you can keep your old system chugging for another year or two—until new machines are even brawnier, cheaper, and harder to resist.

Don't overdo it, though. A general rule of thumb: If you have to pay more than about \$400 to eke another year's use out of your PC, or you have to add more than three components, it's probably not worth the money and effort it will take. (This rule applies to internal components such as the CPU, RAM, and hard drive, not to external peripherals like monitors, printers, or scanners. It's easy enough to move these devices to any new system you buy down the road.)

Smart upgrading, then, takes thought and planning. Our annual upgrade guide will fill you in on everything from RAM and replacement CPUs to storage options, fast modems, and newfangled ports such as USB and IEEE 1394. We'll tell you when these upgrades make sense, and when they don't. We'll even help you make sure your old machine is ready to sail into the new millennium without suffering Y2K-related woes.

Screwdrivers ready? Let's get started.

PICK UP THE pace



RAM and CPU Upgrades

If your goal is to wring faster performance out of an aging computer, additional memory and a replacement CPU remain the two upgrades that will do the most good. RAM is cheap and easy enough to install that boosting your memory to a comfortable level—64MB, if you want to run Windows 98 or Office 2000 at a reasonable clip—isn't a major decision. At press time, typical RAM

prices ranged between \$1.50 and \$4 per megabyte, depending on the memory type, size, and vendor.

Processor upgrades are a trickier matter. If the system you really want costs more than \$1000, and that's more than you're willing to spend, a new CPU (supplemented with more RAM, if needed) can be an effective stopgap. The cost? Anywhere from \$90 to \$400. But upgrading the processor makes little fiscal sense if you'd be just as content with a new sub-\$1000 PC. And the upgrade won't boost your PC's speed to rival that of systems based on the fastest Pentium III and Athlon processors; for that, you'll have to replace your motherboard (see "The Mother(board) of All Upgrades," www.pcworld.com/nov99/upgrade).

THANKS FOR THE MEMORY

UPGRADING YOUR RAM won't deliver the dramatic performance improvement you can get with a processor upgrade, but you'll notice a difference, especially if you work with more than one application at a time. The upgrade itself—popping one or more memory modules into sockets on your motherboard—is easy; the challenge is making sure you get the right modules for your PC. Consult your system manual or the PC maker's Web site for help, or buy your RAM from a memory vendor whose Web site lets you look up the proper upgrade for a particular system, such as Crucial (www.crucial.com) or ►

TEST REPORT

Faster Performance, for a Price

A huge \$639 upgrade more than doubled a Pentium-166 PC's speed.

DRIVE	PC WorldBench 98 score	Percentage faster than base system	Cost
Base system ¹	78	n/a	n/a
Base system with 64MB of RAM	90	15%	\$100
Base system with Evergreen AccelerPCI (Celeron-433, 64MB of RAM)	158	103%	\$399
Base system with PowerLeap PL-K6-III (AMD K6-III-400) and 64MB of RAM	169	117%	\$299
Base system with PowerLeap PL-K6-III, 64MB of RAM, 3dfx Voodoo3 graphics card with 16MB of RAM, and 17.2GB Seagate Medalist hard drive	198	154%	\$639
Average of 10 Celeron-433 PCs with 64MB of RAM	195	150%	\$1100 ²
Average of 6 Pentium III-450 PCs with 64MB of RAM	214	173%	\$1500 ²

n/a = not applicable

¹HP Vectra VL 5 Series 5 with Pentium-166 CPU, 16MB of RAM, integrated graphics with 2MB of RAM, and 2.5GB EIDE hard drive, running Windows 95. For details on PC WorldBench 98, see PC World Online (www.pcworld.com/testing).

²Price is approximate.

Kingston (www.kingston.com). Bear in mind that you may need to add memory modules in pairs. (See July's *Hardware Tips*, www.pcworld.com/jul99/hwtips, for additional advice on choosing RAM.)

We upgraded a Hewlett-Packard Vectra VL 5 Series 5 PC—a circa-1996 machine powered by a Pentium-166 (non-MMX) CPU—from 16MB of RAM to 64MB. The job cost around \$100, took just 10 minutes, and boosted the system's PC World-Bench score from 78 to 90—a 15 percent increase. Although that's not a huge improvement (the new score is still less than half of what you'd get from a typical new system on our *Top 10 Budget PCs* chart), it's worth the modest cost and hassle—especially if you regularly toggle between applications, wrangle large spreadsheets or graphics files, or do other memory-intensive tasks.

If 64MB of RAM is good, then 128MB is even better, right? Not necessarily. With our HP Vectra system, we actually saw a performance *decrease* when we upgraded to 128MB—and if you're running a PC with Intel's old 430FX, 430HX, 430VX, or 430TX chip set, so will you. These chip sets have a memory-caching limitation that can degrade performance if memory is increased beyond 64MB. Newer system chip sets and motherboards that use non-Intel chip sets don't have this problem. But even then, the performance gain over 64MB is usually small.

If you're mulling over an upgrade to Windows 2000, though, you might want 128MB of RAM. We haven't done performance testing on the new operating system yet, but its memory management is superior to that of Windows 95 and 98,

and may take better advantage of amounts over 64MB (assuming the PC doesn't use one of the chip sets mentioned earlier). However, a RAM upgrade alone is unlikely to bring your old system up to Win 2000 specs—you'll probably want at least a Pentium II-class PC, and the older your current system, the greater the chances that its motherboard, video card, or other

upgrades aren't much trickier than RAM upgrades. They do come with more caveats, however. As a case in point, one size definitely does not fit all. Before buying a CPU upgrade, check the vendor's site to see if it's compatible with your PC, and even if it is, be prepared for problems. For instance, neither Kingston's \$149 TurboChip 233 nor its \$209 TurboChip

366 upgrade worked with our HP Vectra Pentium-166 test PC. Kingston's Web site listed our system as being incompatible with the TurboChip 366, but the company couldn't explain why the TurboChip 233 didn't work.

If your system won't operate with a particular CPU

upgrade, you may be able to make it compatible by changing its BIOS via a flash upgrade. Unicore offers BIOSs ranging in price from \$60 to \$70 that take care of many compatibility problems. Be aware, though, that in those rare instances when the BIOS flash goes awry—for example, if the power goes out while the flash utility is performing the upgrade—the motherboard will no longer work. Nothing short of replacing the BIOS chips with new ones will bring it back to life, and the cost of doing so may not be covered by your computer's warranty.

• **BIOSs:** \$60 to \$70 list; Unicore; 800/800-2467; www.unicore.com

PRODUCT INFO NO. 684

• **TurboChip 233 and 366:** \$149 and \$209 list; Kingston Technology; 877/546-4786; www.kingston.com

PRODUCT INFO NO. 685

THE TIP TOOLBOX NO TOOLS REQUIRED



If you lack the time, inclination, or technical savvy needed to perform an upgrade yourself, don't fret. Many computer stores will install the items you purchase for a fee, typically \$30 to \$100 per component.

components won't be fully compatible with the new OS. The bottom line: If you plan to adopt Windows 2000 in the near future, and your computer would need massive upgrading to run it, your smartest move might be to simply buy a new PC with Windows 2000 preinstalled.

I WANT A NEW BRAIN

PROCESSOR UPGRADES ARE NO longer the high-profile items they were back in the days when Intel's OverDrive products made headlines. Still, three vendors—Evergreen Technologies, Kingston Technology, and PowerLeap—offer CPU upgrades based on a variety of processors, including AMD's K6-2 and K6-III and Intel's Celeron. (You can't plug a new Pentium III or even a Pentium II into your current Pentium motherboard—those newer chips are packaged on plug-in cards that are not compatible with the sockets used by older CPUs.)

Though more intimidating, most CPU

EVERGREEN'S CARD TRICK

EVERGREEN'S AcceleraPCI is a new kind of CPU upgrade. Because it's a PCI card, it can use an Intel Celeron chip (Celerons can't otherwise be retrofitted into older computers). The card also holds its own SDRAM; drop it into any free PCI slot in your system, and its CPU and memory take over for those on your PC's motherboard (which, although disabled, must remain in the computer).

If you're considering the AcceleraPCI, download and run the handy prequalifying software utility from Evergreen's Web

RAM AND CPU TRANSPLANTS

UPGRADE	What it delivers	Cost	Difficulty	Comments
More RAM	Faster performance, especially for multitasking	\$1.50-\$4 per megabyte	Moderate	64MB is ideal for Windows 95/98; Win 2000 users may want more.
Replacement CPU	Faster performance, CPU extensions such as MMX and 3DNow (useful for voice recognition and games)	\$90-\$400	Moderate to difficult	Your system won't be as fast as a new PC with the same chip; upgrade not possible on all systems.

site; it'll tell you in minutes whether the card will work in your PC. As long as your system has the PCI bus, there's a chance that it will, but Evergreen doesn't recommend using the card with 486 or Pentium II machines.

We tested the \$399 AcceleraPCI 433/64, which comes with a 433-MHz Celeron and 64MB of RAM (other configurations are available). This upgrade-on-a-card is a bit easier to install than traditional CPU upgrades, since you don't have to swap chips in and out of your PC's CPU socket. We had our upgraded system up and

running within 15 minutes, and the improvement was dramatic: Our HP machine achieved a WorldBench 98 score of 158, just over double its original score with 16MB of RAM, and 76 percent faster than its performance with 64MB of RAM but no CPU upgrade.

Still, the upgraded PC was 19 percent slower than an average Celeron-433 PC. That's because those new systems benefit from other speed-enhancing technologies that our old system lacked, such as newer memory types, faster hard disks, and beefier graphics subsystems.

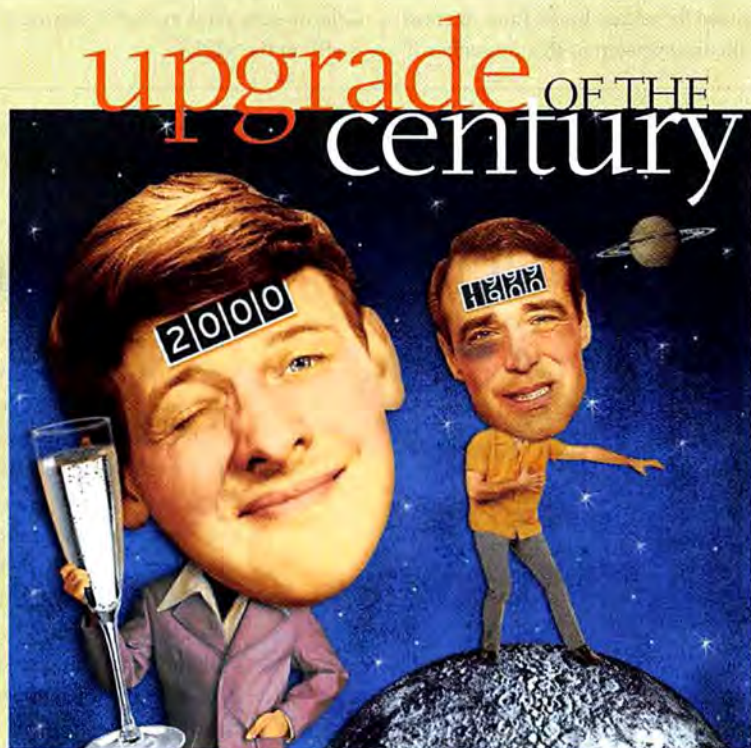
We did run into one odd glitch with the AcceleraPCI, possibly related to the graphics chip set or driver: The upgraded system refused to shut down completely via the Windows Start button. Anytime we tried to shut it down, it rebooted.

• **AcceleraPCI 433/64**; \$399 list; Evergreen Technologies; 541/757-0934; www.everttech.com
PRODUCT INFO NO. 687

POWERLEAP: SOCKET TO ME

COMPARED TO Evergreen's innovative PCI card design, PowerLeap's \$199 PL-K6-III takes a more traditional approach to CPU upgrades. It provides a 400-MHz AMD K6-III processor, along with a power and voltage regulator, in the form of a module that replaces your current CPU. You can use it to upgrade PCs with Pentium, Pentium MMX, AMD K5 and K6, and Cyrix CPUs.

Although the PL-K6-III requires you to remove your PC's existing CPU and replace it with the new one, installation isn't radically more complex than with the AcceleraPCI card. Most CPUs have a lever you pull to release the CPU from its socket. You then insert the new CPU into the socket, ensuring that no pins get misaligned or bent; lower the lever to lock it in place; and connect the PC's power ►



Year 2000 Fixes for Old PCs

THIS IS YOUR FINAL Y2K WARNING—well, one of the last ones you'll get from us. Assuming that we're all still here and have electrical power on January 1, you need to get your PC ready for the year 2000. And a major part of that is making sure its BIOS—the low-level software that resides in ROM on the motherboard—will flip over to 2000 (not 1900 or 1980) at midnight on December 31.

First, check whether your computer's BIOS is Y2K-ready (the older the system, the less likely that it is). Symantec offers Norton 2000 Bios Test and Fix, a free BIOS test utility, which you can download either from PC World Online's FileWorld or from www.symantec.com/sabu/n2000/n2000_corp/features.html. The program will tell you whether your system will roll over properly on New Year's Day, and it will even fix some minor Y2K problems.

If your system fails Symantec's test, check your PC maker's Web

site for a BIOS update. (Besides ensuring Y2K compatibility, a new BIOS may add support for large hard drives and fix bugs.) A BIOS upgrade usually involves copying the BIOS upgrade to a bootable floppy and restarting with the floppy in the drive. Read the directions carefully; a botched upgrade can cripple your PC, forcing you to buy new chips from its maker.

With some systems—especially older ones—you won't be able to upgrade the BIOS by software. Or the PC's maker may have gone out of business. In these cases, you'll need to replace the BIOS chips with new ones from a company such as Unicore (www.unicore.com). The cost is usually around \$50 to \$75.

Finally, make sure your PC's software is safe. For Windows 95 and 98 Y2K fixes, try the Windows Update site (www.windowsupdate.microsoft.com). Check your other software vendors' Web sites (especially those for financial packages and other date-dependent apps) for updates. Finally, consider a Y2K utility (such as Symantec's Norton 2000 2) and check out "Get Smart: Control Your Y2K Chaos" (www.pcworld.com/sep99/Y2K_chaos). —Stan Miaszkowski

• **Norton 2000 2**; Symantec; \$50; 800/441-7234; www.symantec.com
PRODUCT INFO NO. 706

supply to the upgrade unit. The process should take about 15 minutes, unless the CPU is blocked by a component such as the drive-bay cage. In that case, you must remove the obstruction first.

Unlike Evergreen, PowerLeap doesn't offer a utility that checks to see if your PC is compatible with the upgrade. If your system isn't listed on the roster of compatible and incompatible machines on the company's Web site, you'll have to take your chances. Also, PowerLeap's installation guide could stand an upgrade itself: It confuses matters by listing a profusion of dip-switch settings for various CPUs—without making it clear that they apply to the upgrade processor, not your computer's original CPU.

Such quibbles aside, this upgrade can provide quite a speed boost. When we installed it in our HP Vectra Pentium-166 test system, which we'd already upgraded to 64MB of RAM, the system's PC World-Bench 98 score jumped to 169—88 percent higher than its score with the 64MB upgrade alone, and more than double that of the original system with 16MB of RAM. The new score falls 18 percent below the mark of the only new K6-III-400 system with 64MB of RAM we've tested, Polywell's Poly K6-3 400. That's no surprise given that the Polywell sports such other speed-enhancing features as an AGP graphics card with 16MB of RAM.

As with the Evergreen upgrade, our PC had a bit of difficulty with the Windows Start button's "off" commands, refusing to shut down completely. (The problem vanished when we installed a new graphics card.) PowerLeap says that's common with HP units like ours, and its Web site offers a utility that fixes the problem.

• **PowerLeap PL-K6-III**; \$199 list; PowerLeap; 877/278-5327; www.powerleap.com

PRODUCT INFO NO. 688

MOTHERBOARD ON A CARD

TWO INTRIGUING new processor upgrade products weren't available in time for us to test. PowerLeap will offer a card that includes the works: CPU, graphics subsystem, sound, 56-kbps modem, eth-

THE TIP TOOLBOX TAKE IT EASY



For smooth upgrading, work at a leisurely pace. As a general rule, allow two to three times the amount of time you think the job will take, and never do an upgrade when you're stressed out or pressed for time.

ernet networking, and disk connections—essentially a replacement motherboard that you install by simply plugging it into one of your current motherboard's slots. Scheduled for release by the time you read this, the first version of this upgrade will

be an ISA card that costs less than \$300 and includes an AMD K6-III running at 400 MHz or above, 64MB of RAM, a Trident 3D graphics adapter with 8MB of RAM, and VIA's Apollo chip set. A PCI card version will follow.

Evergreen, meanwhile, is readying replacement CPUs meant for early Pentium II systems such as the original 233-MHz models that debuted two and a half years ago. The first, the Performa 400, will use a Celeron-400 and list for \$199. A \$300 Celeron-500 version, the Performa 500, is also in the works.

DISK space: THE FINAL FRONTIER



Storage Upgrades

you're still using one of yesterday's 1GB to 3GB drives, a new hard drive is the essential upgrade, no matter what else you improve. But hard drives aren't the only storage options available; a removable-media, CD-R/CD-RW, or tape drive may be better suited to your needs.

Plentiful and inexpensive, hard disks have become true commodities in the PC realm. And as prices have tumbled, drives have become almost ridiculously large. Capacities of 4GB to 8GB

Hot new processors and heaps of RAM can turbocharge your old PC, but to get work done, you need hard disk space—and lots of it. A typical installation of Windows 98 takes about 125MB of drive space; Microsoft Office 2000 consumes another 190MB to 650MB. And if you're getting ready for Windows 2000, set aside 650MB for the OS alone.

Of course, you'll also need room on your hard disk for documents and other files, and if you work with digital images, video, or audio, your files can quickly turn from megabytes into gigabytes. Clearly, if

are smallish these days, while those in the 13GB to 18GB range are considered garden variety, and 20GB to 28GB models are increasingly common. About the time you read this, IBM will be shipping a 37GB drive for around \$420.

At the low end, a drive like the 8.4GB Seagate U8 is available for an incredibly cheap \$105. But to reserve enough room for future applications, you're better off getting a drive in the 17GB to 20GB range, such as Seagate's \$219 20.4GB Barracuda ATA. Or you could opt for one of the Best Buys from our hard drive ►

Part Professor. Part Ginger.



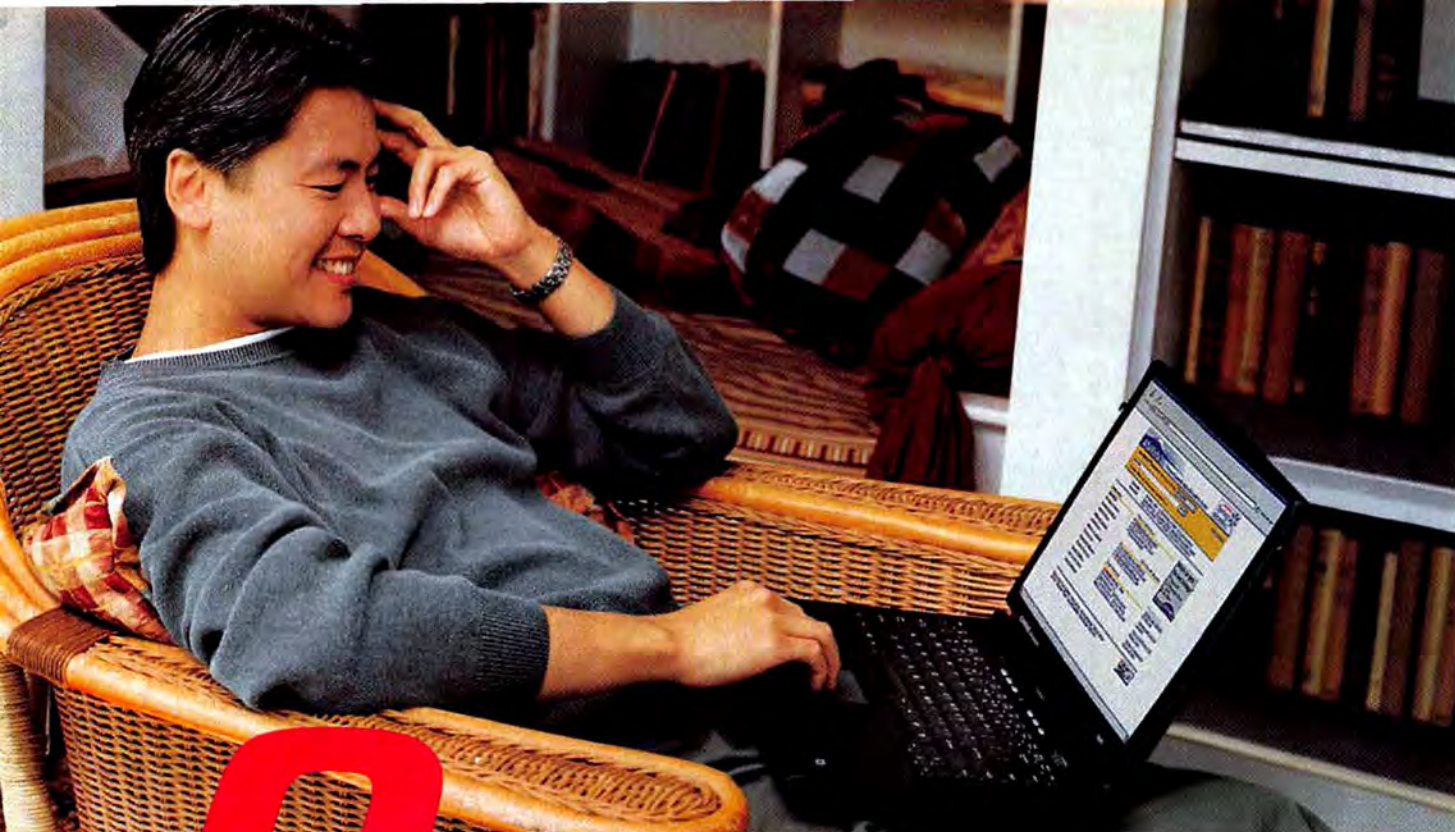
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Shown here: Presario 1800T Internet Notebook PC.

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STORAGE BOOSTERS

UPGRADE	What it delivers	Cost	Difficulty	Comments
New hard drive	More storage space	\$100-\$400	Moderate	17GB-20GB models hit the sweet spot right now.
Removable-media disk drive (Jaz, Orb, SuperDisk, Zip)	More storage space; file backup, portable data	\$100-\$350	Easy (external) to moderate (internal)	Go with an internal model for optimum speed.
CD-R/RW drive	File backup, portable data, ability to make and play music and video CDs	\$150-\$350	Easy (external) to moderate (internal)	Cheap, easy-to-share media is a big plus.
Tape drive	Quick and easy hard-drive backup	\$175-\$300	Easy (external) to moderate (internal)	Best insurance against full-tilt hard disk failure.

review last month (www.pcworld.com/oct99/hard_drives): Western Digital's WD Caviar or Maxtor's DiamondMax Plus 5120. Both store 20.4GB; the pricier Maxtor delivers better performance.

• **DiamondMax Plus 5120**; \$350 street; Maxtor; 800/262-9867; www.maxtor.com

PRODUCT INFO NO. 689

• **Seagate U8 and Barracuda ATA**; \$105 and \$219 list; Seagate; 877/271-3285; www.seagate.com

PRODUCT INFO NO. 690

• **WD Caviar**; \$279 street; Western Digital; 800/275-4932; www.westerndigital.com

PRODUCT INFO NO. 692

drive, a step-by-step manual, and software that analyzes your PC's configuration and then prints customized instructions.

Any PC made after 1994 should have a standard EIDE hard disk interface on the motherboard, so you'll be able to install any of the latest generation of EIDE hard drives. High-performance SCSI drives, which usually cost at least \$100 more than comparably sized EIDE drives and require an extra-cost add-in card, are designed for applications such as network file servers. You won't notice much—if any—performance boost when running typical desktop apps from a SCSI drive.

DMA/66 or UltraATA/66, which can theoretically transfer data at up to 66 megabits per second. But only the newest PCs have UltraDMA/66 support on the motherboard; most PCs made in the past three years support UltraDMA/33. And PCs older than that usually support Mode 4 EIDE, which runs at about half the speed of UltraDMA/33.

Fortunately, all UltraDMA/66 drives work with older EIDE interfaces, and the speed penalty isn't as dramatic as you might think. For instance, a drive connected via UltraDMA/33 is typically about 20 percent slower than one connected via UltraDMA/66. But if you want all the speed you can get, install an UltraDMA/66 add-in board along with your new hard drive. Promise Technology's Ultra66 board costs about \$59, and because it's Plug and Play, it's relatively easy to install.

• **Ultra66**; \$59 list; Promise Technology; 800/888-0245; www.promise.com

PRODUCT INFO NO. 693

ZIP, ORB, AND ALL THAT JAZ

ONCE UPON A TIME, if you needed a truly mammoth amount of data storage, you bought a removable-media drive and

a stack of discs. The advent of huge, cheap hard drives has changed all that, but there are still lots of reasons to invest in a removable-storage drive: They're great for sharing files too big for a floppy, backing up and archiving documents and other data, and protecting confidential information

(just lock up the disk when it's not in use).

The selection of removable-media drives has expanded greatly since Iomega's original Zip drive made a splash a few years ago. Iomega alone has over a half-dozen models, ranging from the original 100MB parallel port Zip (about \$100) to the 2GB SCSI Jaz drive (about \$350). Castlewood Systems' Orb drive (\$200) is an excellent value for a drive that holds 2.2GB per cartridge—which costs just \$30 each. (By way of comparison, 2GB Iomega Jaz cartridges sell for about \$125 individually or \$100 each in a three-pack.)

Installing an internal removable- ▶

SLIPPING IN A DISK

INSTALLING A NEW hard drive is a popular upgrade, but it's not a job for beginners. Set aside 2 or 3 hours for the process. Not only do you need to open your computer's case, but you also must also wrangle with cables, set jumpers, and mount the drive inside the PC (often in cramped quarters). If that sounds onerous, consider paying a computer store (usually around \$50 to \$75) to install the drive for you.

If you do tackle the project yourself, make sure the drive you buy is packaged in a retail kit that includes cabling, a manual, and software that will copy the contents of your old hard drive to your new one (see the May *Upgrade Guide*, www.pcworld.com/may99/upgrade_guide). Seagate's drives make installation particularly easy: Each comes with basic installation instructions printed right on the

THE TIP TOOLBOX NEW DRIVE, OLD DRIVE



Newer hard drives are faster hard drives.

So when you add a new hard disk, install it

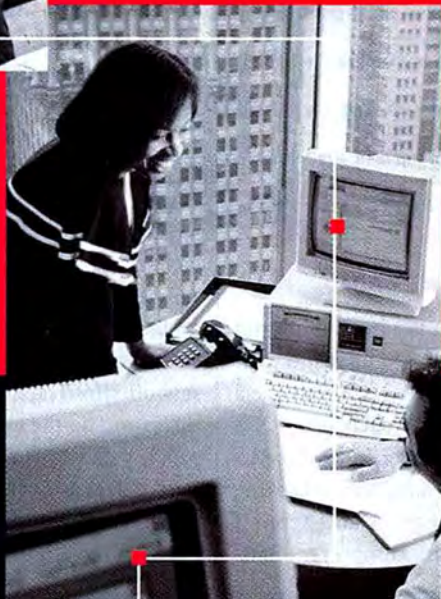
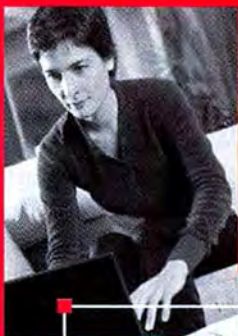
as your primary (C:) drive. As for your old

drive, keep it in your PC and use it for extra

storage or quick data backups.

If your PC is more than three years old, chances are its BIOS can't directly handle drives larger than 8.4GB. Fortunately, virtually every drive comes with installation software that works around this limitation. But you might want to upgrade the BIOS anyway. A BIOS upgrade will not only let you install a large drive, it'll also ensure that your PC will handle dates correctly come January (see "Upgrade of the Century," page 123).

Don't expect top performance from a new hard drive when you install it in an old PC. New drives have the latest version of the EIDE interface, known as Ultra-



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but their work

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storage drive is about as difficult as replacing a standard hard drive. (To accommodate the drive, your computer must have a free externally accessible bay.)

You can also opt for an external model that simply plugs into your computer's parallel port. But such drives are always much slower than their internal counterparts. For better performance, choose an external drive that connects via your PC's USB port (see "USB, DVD, and the Kitchen Sink," page 136). Our tests showed Iomega's Zip USB 100MB External to be nearly four times as fast as its parallel port cousin. (For more on removable-media drives, see June's "Floppy Killers?" www.pcworld.com/jun99/removable.)

• **Zip and Jaz drives;** \$100 to \$350 street; Iomega; 800/697-8833; www.iomega.com

PRODUCT INFO NO. 694

• **Orb 2.2GB;** \$200 street; Castlewood Systems; 925/461-5500; www.castlewood.com

PRODUCT INFO NO. 695

CD-RW AT WORK AND PLAY

FOR EASY-TO-SHARE removable storage and really cheap media, you can't beat recordable CDs. Even with their relatively modest maximum capacity of 650MB (about 620MB for CD-RW), they're ideal for keeping readily accessible backups of your data files, or for storing files you need only occasionally. And we can't forget their most popular use: burning your own music CDs.

Almost all recordable CD drives these days are rewritable, which means that they can record on both write-once blank CD-Rs (about a buck each) and on CD-RW discs (\$10 each). Prices for CD-RW drives begin at under \$200. Check the drive's system requirements before you shell out your dough—usually, you'll need at least a Pentium-166, 32MB of RAM, and an UltraDMA/33 hard drive to deliver data fast enough to create CDs. And figure on setting aside at least a gigabyte of hard-disk space for the process.

Recordable DVD, or DVD-RAM, drives are another option. They can hold 4.7GB of data, but with prices in the \$750 range, they're not exactly cheap. More impor-

tantly, the industry hasn't agreed on a standard, so DVDs recorded on one maker's DVD-RAM drive may not play on another's. Our advice: Wait a year for a standard to surface and prices to drop.

backing up a full 10GB hard drive would probably take three Orb cartridges.

Instead, consider a tape drive with enough capacity to back up your entire hard drive onto a single cartridge. If you've got a big hard drive or plan to buy one, a high-capacity tape drive like Hewlett-Packard's HP Colorado 14GB is your best option. The Colorado goes for \$235 for an internal EIDE version or \$289 for a slower external parallel port version; cartridges cost approximately \$40 each.

Note that taking full advantage of a tape drive requires discipline. Almost all tape drives can be set up to back up files automatically, but you still must change tapes, and it's best to store backup sets off-site. Then, if a hard-disk crash leaves you up the creek, you'll be able to paddle your way back.

• **HP Colorado 14GB;** \$235 to \$289 list; Hewlett-Packard; 800/826-4111; www.hp.com

PRODUCT INFO NO. 696

THE TIP TOOLBOX BACKUP, BACKUP, BACKUP



Just in case disaster strikes, always do a

complete backup before fooling with your

PC's hardware. And have an up-to-date Win-

dows Startup disk available—you may need

it if your PC won't boot after an upgrade.

GO TO THE TAPE

IF YOU'RE MOVING to a mammoth hard drive, it makes sense to upgrade your backup system, too. Sure, you can use a removable-media drive such as an Orb, but those drives are better suited to selective backups of vital data than to backing up an entire drive. For instance, even if your backup software compresses data,

• IMPROVE YOUR image



Display Upgrades

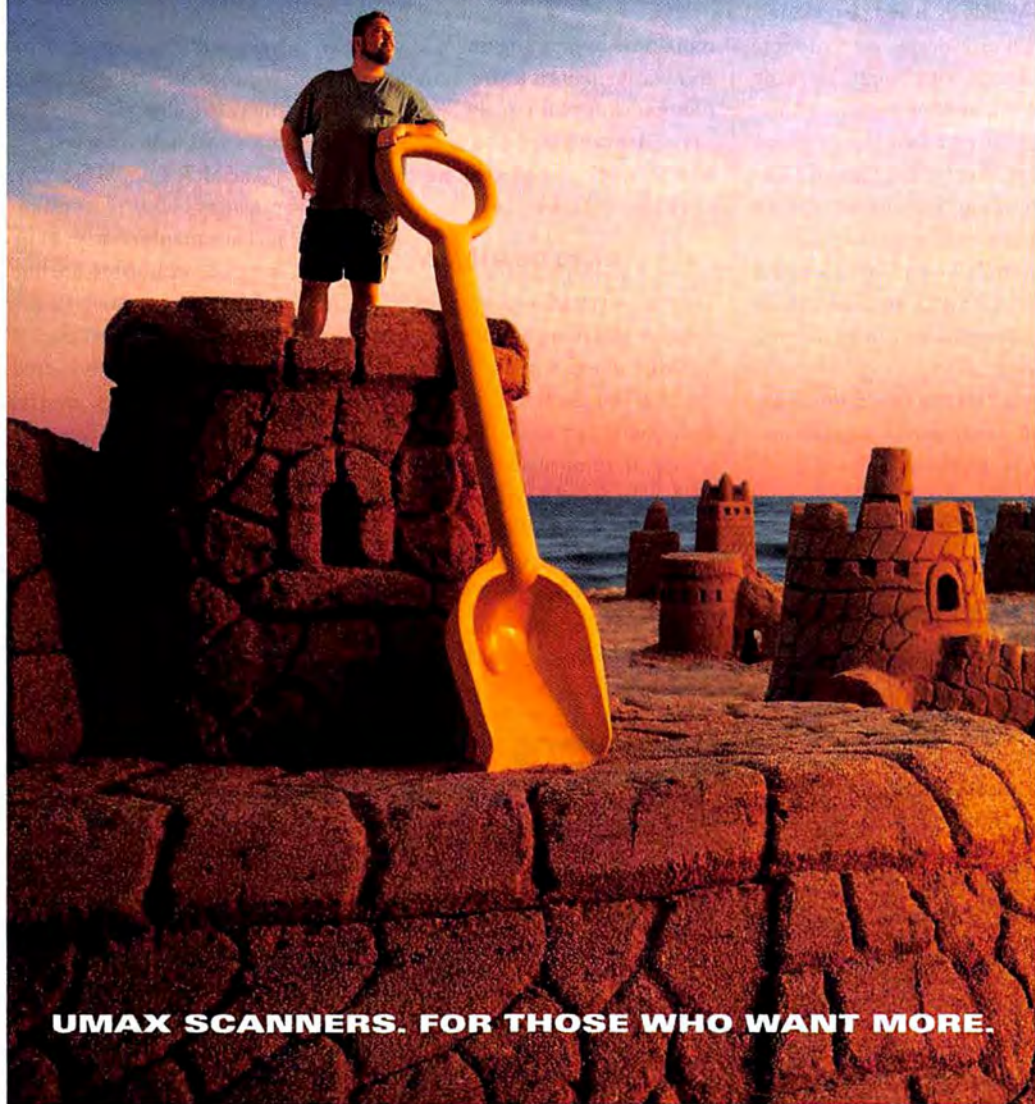
When it comes to your PC, what you see really is what you get. And ultimately, what you see depends heavily on your system's monitor and graphics card. Although not every older computer cries out for display upgrades, they can be

worthwhile for everyone from spreadsheet hotshots to gamers.

If your old computer is attached to an equally long-in-the-tooth 14- or 15-inch monitor, a big, bright display can give you a whole new way of looking at things. ►

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New, larger monitors generally provide sharper and crisper pictures than their forebears. Moreover, monitors install in seconds, without tools, and if you buy a new one now, you can quickly move it to any new PC you buy later.

For an upgrade, we'd bypass the 15-inch models and set our sights on a 17-inch such as Mitsubishi's \$369 Diamond Plus 71, a Best Buy in this month's monitor roundup ("Eyes on the Price," page 187). With a monitor that large, you can comfortably run Windows at 1024 by 768 resolution, which provides 63 percent more pixels than 800 by 600 mode, allowing far more information on screen at once. That's a plus for just about any application, and almost essential for tasks like desktop publishing. Even better, 19-inch monitors are becoming increasingly affordable—Iiyama's VisionMaster 450 will set you back just \$459. Just make sure you have the desk space such an oversize model demands.

• **Diamond Plus 71**; \$369 street; Mitsubishi; 800/843-2515; www.mitsubishi-display.com

PRODUCT INFO NO. 697

• **VisionMaster 450**; \$459 street; Iiyama; 800/394-4335; www.iiyama.com

PRODUCT INFO NO. 698

LCDs: THIN, TRENDY, EXPENSIVE

AS LONG AS you're shopping for a new monitor, you may be tempted to go for one of those sexy flat-screen LCDs. Their sleek footprints conserve space, the best models display uncommonly bright, crisp images, and...well, they're just cool. But manufacturing complexities have kept LCD prices on the high side, where they're likely to stay for a while.

Unless your wallet is bottomless, you'll have to settle for a midsize screen if you opt for an LCD: 15-inch models cost between \$1000 and \$1200. The Princeton DPP560, a Best Buy in our latest LCD roundup (www.pcworld.com/aug99/lcd_monitors) sells for \$1085. Like an increasing number of LCDs, the DPP560 is a digital model, so it requires (and comes with) a special digital graphics card that you must install. That makes for a

GRAPHIC IMPROVEMENTS

UPGRADE	What it delivers	Cost	Difficulty	Comments
New CRT monitor	Bigger screen, higher resolution, less eyestrain	\$250 and up	Easy	Even 19-inch models are cheap enough to consider.
LCD monitor	Compact footprint, bright picture, bragging rights	\$1000 and up	Easy to moderate	Still a luxury item that everyone wants but few can justify.
Graphics card	Higher resolution, faster performance, more realistic 3D games	\$80-\$200	Easy to moderate	Great for gamers and graphics types; overkill for most business users.

more time-consuming upgrade, and may complicate matters if you want to use the monitor with your next PC.

• **Princeton DPP560**; \$1085 street; Princeton; 800/747-6249; www.princetonongraphics.com

PRODUCT INFO NO. 699

CARD QUANDARY

LIKE MONITORS, new graphics cards are cheaper and more advanced than ever—but that doesn't mean you should upgrade. If you use your PC mainly to create documents in a word processor, crunch numbers in spreadsheets, or surf the Web, your current card should be fine.

However, if you often work with heavy-duty 3D graphics applications, such as animation software, or if you play a lot of games, you'll want a card with one of the latest 3D graphics chips. If your PC lacks a dedicated AGP slot, you need a PCI

today's hottest games. If you're running Windows 98 and you have two monitors, the G400 also lets you spread your desktop across both displays.

The Millennium G400's 32MB of RAM provides better performance and more realistic graphics on cutting-edge games, but cards with 16MB are fine for business applications, most games, and even heavy-duty image editing. When considering a card, note the speed of its RAMDAC, the chip that converts a PC's graphics into the red, green, and blue analog signals used by the monitor. The faster the RAMDAC, the smoother the image will be. (Again, this quality is most beneficial for games.) For the best performance, look for a RAMDAC that runs at a minimum of 250 MHz.

One caveat: PCs with very early versions of PCI and AGP slots may have problems with current graphics cards. Your PC will need to be compatible with the PCI 2.0 or PCI 2.1 specification or the 2x AGP specification. How can you tell what you have? Your PC's manual or the manufacturer's Web site may (or may not) say. A PCI-equipped system that is four to five years old probably

supports PCI 1.0. And an AGP-equipped PC more than two years old probably supports AGP 1X. Most current AGP boards will work in AGP 1X slots, but they won't run at full speed.

• **3D Blaster Banshee**; \$80 street; Creative Labs; 800/998-1000; www.soundblaster.com

PRODUCT INFO NO. 700

• **Millennium G400**; \$199 street; Matrox; 800/361-1408; www.matrox.com/mga

PRODUCT INFO NO. 701

THE TIP TOOLBOX WHEN THE LIGHTS GO OUT



If you use the wrong driver for your new

graphics card, your screen may go blank. To

recover, hold the <F8> key while you reboot

your PC. Windows will start up with a gener-

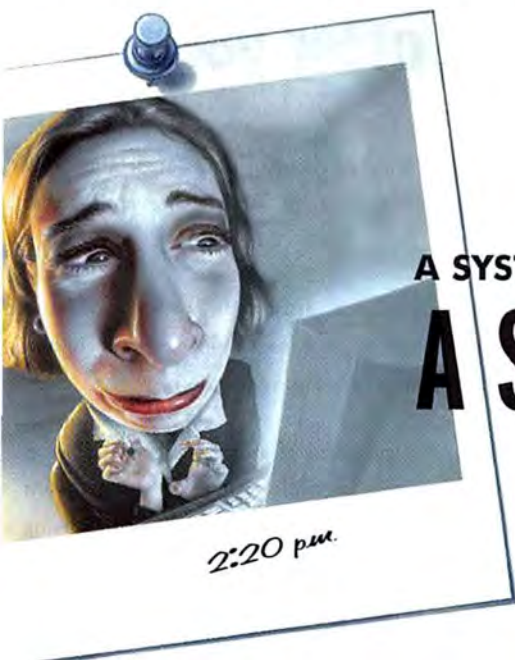
ic driver, letting you install the right one.

graphics card such as Creative Labs' 3D Blaster Banshee. This card delivers excellent 3D performance for just \$80, making it a no-brainer upgrade for gamers.

You say your PC has an AGP slot? A new graphics card with a hot processor and lots of RAM can elevate your old PC's graphics to the level of a brand-new system's. With a new graphics processor and 32MB of RAM, Matrox's \$199 Millennium G400 card has the power to take on

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A SYSTEM CONFLICT...

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WinList
Prosignia Desktop 320

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PC World
Top 20 Power Desktops
Prosignia Desktop 330

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Windows Magazine
WinList — Fastest Performer
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- Prosignia Internet Keyboard
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- Creative Labs SBS 2-piece Speakers
- Diamond nVIDIA VANTA 16MB Graphics
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- 24X Max CD-ROM Drive²
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- Compaq PremierSound
- Integrated AC Adapter
- 1 Li-Ion Battery
- Microsoft Windows 98
- Microsoft Office 2000 Small Business
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- 3-Year Limited Warranty⁴

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- 3-Year Limited Warranty⁴

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- Compaq UPS T700: \$343
- 4/8GB DAT Tape Drive: \$714
- 9x5, Next-Business-Day, On-Site Service: \$199

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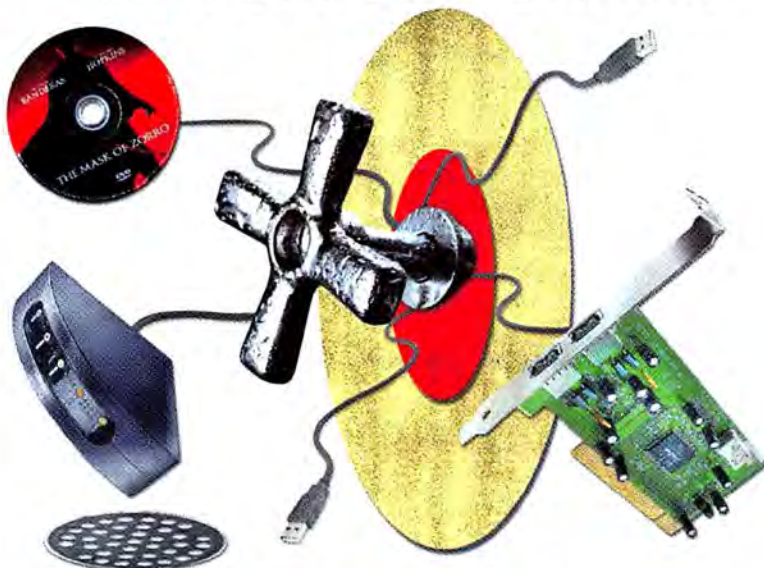
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DRIVERS ARE KEY

INSTALLING A NEW graphics card is generally simple. Since all of today's graphics cards are Plug and Play, Windows will (usually) recognize your new card after you install it and lead you through the steps to install the required driver.

Before you install the card, though, download the newest driver from its maker's Web site. Don't assume that the driver packed with the card is current; the card may have sat on a store shelf for eons, and card makers continually tweak drivers for better, less buggy performance.

USB, DVD, AND THE kitchen sink



New Technology for Old PCs

Even if you upgraded your old PC's processor, jacked up its RAM, installed a huge hard drive, and added a new graphics card and a big new monitor, your system still wouldn't be completely *au courant*. Other technologies separate new PCs from yesterday's models: USB ports, DVD-ROM drives, 56-kbps modems, and more. You can add any of these items to your current computer, but move carefully: While some are must-haves, others are more like don't-bothers.

USB GETS REAL

AFTER YEARS on the sidelines, Universal Serial Bus is finally hitting its stride. Mice, keyboards, modems, printers, external drives, speakers, and scanners based on the standard are readily available, with more devices on the

way. USB offers lots of advantages, including excellent speed (up to 12 mbps per second), true Plug and Play, and hot-swapping (the ability to connect and disconnect peripherals without turning off your PC).

If your PC was made within the past three years, it probably has built-in USB ports (look for a pair of small rectangular jacks on the system's rear panel). If not, you can add USB support through an inexpensive upgrade. First, check your

PC's manual to see if the system has USB support on the motherboard. If it does, contact the maker for the adapter (\$10 to \$20) needed to link the motherboard connector to the rear panel. If it doesn't, you'll have to buy an add-in card such as Entegra's 2-Port USB Upgrade (around \$30).

Keep in mind that you'll need Windows 98 to really take advantage of USB. While Windows 95 OSR2 (the version shipped with most PCs for about a year before the release of Win 98) supports USB in theory, it's an iffy proposition. And many USB peripherals, such as the Iomega USB Zip drive, just won't work with Windows 95.

One high-speed interface you probably don't need is IEEE 1394. Also known as FireWire (Apple Computer's trademark for the technology) and i.Link (Sony's version), IEEE 1394 transfers data at blistering speeds—up to 25 MBps. For now, the interface is available mainly on digital camcorders and certain high-end hard drives. Other peripherals, such as scanners, are promised for the future, but very few PC users need this technology just yet. Current IEEE 1394 adapter cards are on the expensive side, too: Adaptec's HotConnect 8920 1394 costs about \$300.

• **2-Port USB Upgrade**; \$30 street; Entegra; 949/859-8866; www.entegra.com

PRODUCT INFO NO. 702

• **HotConnect 8290 1394**; \$300 street; Adaptec; 800/957-7274; www.adaptec.com

PRODUCT INFO NO. 703

THE DVD DILEMMA

FOR MOST USERS, even the fastest new CD-ROM drives, such as 52X models from Kenwood and HiVal, don't deliver enough of a speed boost to justify the upgrade. So when it comes to CD-ROM upgrades, the real question is whether you should add a DVD-ROM drive. But DVD-ROM still hasn't blown away CD-ROM.

The main reason: Except for movies, few DVD titles are available, in part because most software does not need DVD's 4.7GB capacity. One exception is *The Complete National Geographic*, all 109 years of the magazine, which is available as 31 CD-ROMs—or just 4 DVDs. ▶

THE TIP TOOLBOX LABEL THOSE CABLES



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- Integrated SoundPro PCI 3D Wavetable Audio
- Altec Lansing ACS22 Speakers
- 56K V.90 PCI Voice/Fax/Data Modem
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- 512K L2 Cache
- 1.44MB 3.5" Floppy Drive
- ATI Xpert Rage 128 16MB AGP 3D Graphics Accelerator
- Integrated SoundPro PCI 3D Wavetable Audio
- Altec Lansing ACS22 Speakers
- 56K V.90 PCI Voice/Fax/Data Modem
- Microsoft Windows 98, 2nd Edition
- 104 Keyboard, Microsoft Intellimouse
- 3 Year Parts & Labor Warranty
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K6-III Processor 500MHz \$999

AXISTERRAMX12

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- w/ 3DNow! Technology
- **128MB** 100MHz SDRAM
- **10.1GB** Ultra DMA Hard Drive
- **10X DVD-ROM** Drive
- 512K L2 Cache
- 1.44MB 3.5" Floppy Drive
- ATI Xpert Rage 128 16MB AGP 3D Graphics Accelerator
- Creative Labs Sound Blaster PCI 128 3D Wavetable Sound Card
- Altec Lansing ACS33 Speakers with Subwoofer
- 56K V.90 PCI Voice/Fax/Data Modem
- Microsoft Windows 98, 2nd Edition
- 104 Keyboard, Microsoft Intellimouse
- 3 Year Parts & Labor Warranty
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K6-2 Processor 400MHz \$859
K6-2 Processor 450MHz \$899
K6-2 Processor 500MHz \$929
K6-III Processor 400MHz \$929
K6-III Processor 450MHz \$979

AXISORIONLXC/VE

- Intel® Celeron™ Processor **433MHz**
- **64MB** SDRAM
- **8.4GB** Ultra DMA Hard Drive
- 128K L2 Cache
- 1.44MB 3.5" Floppy Drive
- Intel i740 8MB AGP 3D Graphics Accelerator
- 48X Max CD-ROM Drive
- Yamaha SoftSynth PCI 3D Wavetable Sound Card
- Altec Lansing ACS22 Speakers
- 56K V.90 PCI Voice/Data/Fax Modem
- Microsoft Windows 98, 2nd Edition
- 104 Keyboard, Microsoft Intellimouse
- 3 Year Parts & Labor Warranty
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- **10.1GB** Ultra DMA Hard Drive
- 128K L2 Cache
- 1.44MB 3.5" Floppy Drive
- Intel i740 8MB AGP 3D Graphics Accelerator
- 48X Max CD-ROM Drive
- Yamaha SoftSynth PCI 3D Wavetable Sound Card
- Altec Lansing ACS33 Speakers with Subwoofer
- 56K V.90 PCI Voice/Data/Fax Modem
- Microsoft Windows 98, 2nd Edition
- 104 Keyboard, Microsoft Intellimouse
- 3 Year Parts & Labor Warranty
- 1 Year On-Site Service, Lifetime Toll Free 24/7 Tech Support
- Year 2000 Compliant

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Celeron™ Processor 400MHz \$899
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Celeron™ Processor 466MHz \$959

AXISORION100C

- Intel® Pentium® III Processor **450MHz**
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- 512K L2 Cache
- Intel 440BX AGP Set
- 1.44MB 3.5" Floppy Drive
- Intel i740 8MB AGP 3D Graphics Accelerator
- 48X Max CD-ROM Drive
- Yamaha SoftSynth PCI 3D Wavetable Sound Card
- Altec Lansing ACS22 Speakers
- 56K V.90 PCI Voice/Data/Fax Modem
- Microsoft Windows 98, 2nd Edition
- 104 Keyboard, Microsoft Intellimouse
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- 1 Year On-Site Service, Lifetime Toll Free 24/7 Tech Support
- Year 2000 Compliant

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Pentium III Processor 600MHz \$1199



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Add a 19" (18.0vis) .26 Monitor, \$359
Add a 15" LCD Flat Panel, \$999

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Add a 3Com 100Mbit Network Adapter, \$69
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Upgrade from 128MB to 256MB, \$199

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Call for Optional Software Bundles and Accessories

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- **128MB** 100MHz SDRAM
- **10.1GB** Ultra DMA Hard Drive
- 512K L2 Cache
- 1.44MB 3.5" Floppy Drive
- Intel i740 8MB AGP 3D Graphics Accelerator
- 48X Max CD-ROM Drive
- Yamaha SoftSynth PCI 3D Wavetable Sound Card
- Altec Lansing ACS22 Speakers
- 56K V.90 PCI Voice/Data/Fax Modem
- Microsoft Windows 98, 2nd Edition
- 104 Keyboard, Microsoft Intellimouse
- 3 Year Parts & Labor Warranty
- 1 Year On-Site Service, Lifetime Toll Free 24/7 Tech Support
- Year 2000 Compliant

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- **10X DVD-ROM** Drive
- 512K L2 Cache
- 1.44MB 3.5" Floppy Drive
- ATI All-in-Wonder 128 128-Bit 16MB AGP 3D Graphics Accelerator w/TV Tuner/Video Capture and TV-Out
- Creative Labs Sound Blaster Live! Value 3D Wavetable Sound Card
- Altec Lansing ACS33 Speakers with Subwoofer
- 56K V.90 PCI Voice/Data/Fax Modem
- Microsoft Windows 98, 2nd Edition
- 104 Keyboard, Microsoft Intellimouse
- 3 Year Parts & Labor Warranty
- 1 Year On-Site Service, Lifetime Toll Free 24/7 Tech Support
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Pentium III Processor 500MHz \$1299
Pentium III Processor 600MHz \$1599

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- Intel® Pentium® III Processor **600MHz**
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- **10X DVD-ROM** Drive
- 512K L2 Cache
- 1.44MB 3.5" Floppy Drive
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- Creative Labs Sound Blaster Live! Value 3D Wavetable Sound Card
- Creative Labs Cambridge SoundWorks FourPointSurround 1000 4-Piece Speakers with Subwoofer
- 56K V.90 PCI Voice/Data/Fax Modem
- Microsoft Windows 98, 2nd Edition
- 104 Keyboard, Microsoft Intellimouse
- 3 Year Parts & Labor Warranty
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Should you add a DVD-ROM drive? Not unless you want to watch DVD movies or play elaborate games (some of which, such as *Riven*, are starting to appear on DVD-ROM). But even for movies, you might be better off buying a DVD player for your home entertainment center. Stand-alone players offer better playback quality than PC-based systems, and their prices are falling toward the \$200 mark.

If you do buy a DVD-ROM drive, get a kit like Creative Labs' PC-DVD Encore 6X with Dxr3. Such kits include a hardware MPEG decoder board, which makes a DVD movie's compressed content watchable. (DVD drives with software-based decoders cost as little as \$99 but require a high-end CPU such as a Pentium III, and suffer in image quality.) You'll also want a decent sound card and speakers.

Adding a DVD kit can be complex, especially if you're also installing a new sound card and keeping your current CD-ROM drive. You have to connect many cables and install lots of software, and you may encounter compatibility glitches with your PC's other components. So read the kit's instructions carefully, give yourself an afternoon for the task, and keep the tech support number handy.

• **PC-DVD Encore 6X with Dxr3;** \$249 list; Creative Labs; 800/998-1000; www.soundblaster.com

PRODUCT INFO NO. 704

56K: A WORTHWHILE BOOST

IF YOU'RE STILL using a modem that connects at a paltry 28.8 or 33.6 kbps, it's time to step up to 56 kbps (unless you plan to move to something even faster, such as cable or DSL—more on those in a moment). Almost all Internet service

NEW ADDITIONS, FROM USB TO DVD

UPGRADE	What it delivers	Cost	Difficulty	Comments
USB add-in card	Ability to use Plug and Play USB peripherals	\$30-\$40	Easy to moderate	Worth it only if you have Windows 98.
IEEE 1394 add-in card	Ability to download video from a digital camcorder	\$300	Easy to moderate	Wait for more peripherals to hit the market.
DVD-ROM drive kit	Plays DVD movies; also handles high-capacity discs and CD-ROMs	\$100-\$250	Moderate to difficult	Great technology, but where are the titles?
56-kbps modem	Faster Internet access	\$50-\$100	Easy (external) to moderate (internal)	Your best option if you can't get (or afford) cable or DSL.

providers are set up for 56 kbps these days, and a 56-kbps modem can noticeably speed up your surfing, though real-world connections typically hover in the 40- to 45-kbps range.

Before you buy a new modem, visit the Web site of your current modem's maker to see if an upgrade is available. In some cases, upgrading to 56 kbps is a relatively

BANDWIDTH GALORE

DIAL-UP MODEMS are not going to achieve speeds higher than 56 kbps, so if you crave a fatter pipeline to the Internet, your best bet is a cable-modem or DSL connection. To subscribe to either of these services, however, you must be lucky enough to live in one of the (mainly metropolitan) areas where the technology you want is available.

Both types of connection can outperform 56-kbps dial-up connections by 1000 percent or more in real-world situations, and they usually provide an "always on" connection—so you don't have to dial out every time you want to surf the Web or check your e-mail.

Monthly charges typically run from \$40 to \$80. (For more on DSL, see this month's *Home Office*, page 53.)

Upgrading to cable or DSL is simple, since you don't do the job yourself—the work is usually performed by a technician from the service provider. (Expect to shell out \$75 to \$200 for the installation if you can't take advantage of a free or reduced-cost installation offer.) In the future, new standards should enable manufacturers to sell DSL and cable modems you can buy at a computer store and install yourself. For now, though, your biggest challenge with either technology may be clearing your schedule and waiting for the phone or cable guy to show up.

Stan Miastkowski is a contributing editor and Anush Yeghazarian a senior associate editor for PC World.

THE TIP TOOLBOX GO UNPLUGGED



To avoid damage to your PC, always unplug it before opening the case. Switching it off isn't enough, since some motherboards have low voltage running through them even when turned off.

simple matter of "flashing" the memory inside your modem by running some software. But that's usually not an option for modems that are more than three or four years old. Alternatively, you may be able to upgrade your older modem's firmware for a fee (around \$25 to \$50), or trade in the old model for a new one.

Then again, new modems are quite affordable. For example, Zoom Telephonics' internal FaxModem 56K Dualmode sells for about \$70. Like any internal modem, it can be tricky to install if it conflicts with existing COM ports in your PC. For easier setup, opt for a slightly more expensive modem that plugs into a serial or USB port, such as Zoom's \$90 external Dualmode model.

• **FaxModem 56K Dualmode;** \$70 to \$90 street; Zoom Telephonics; 800/631-3116; www.zoom.com

PRODUCT INFO NO. 705

Board Games



ARE YOU READY for the ultimate upgrade project—replacing your PC's motherboard? We weigh the pros and cons in "The Mother(board) of all Upgrades" at www.pcworld.com/nov99/upgrade.

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* Results based on a PC Magazine (July 99) "Desktops and Notebooks Service and Reliability" survey in which Quantex received an "A" rating in the desktops—Overall Use category, beating out Gateway and Compaq which received ratings of "C" and "D" respectively. Quantex received an "A" rating by scoring significantly higher than average in all 5 test categories. See PC Magazine July 99 for details.

† \$30 BJC-1000 printer rebate available directly from Canon. Offer expires 1/29/00.



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Common Features: ✓ 512KB Secondary Cache ✓ 3.5" 1.44MB Floppy Drive ✓ US Robotics 56K V.90 Winmodem w/Telemetry ✓ Quantex ATX Mid Tower Case
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New 8x Max Variable Speed DVD-ROM Drive
Aureal Vortex2 Sound, A3D 2.0 Technology
New Altec Lansing ACS-33 PowerCube Speakers, Subwoofer
MS Windows 98 Second Edition
Corel WordPerfect Office 2000
New Software Essentials Titles Included!
Intel® AnyPoint® Home Networking Kit, add \$149

\$1899

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QUANTEX SM500

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96MB PC100 SDRAM Memory
New 20GB 7200rpm Ultra ATA Hard Drive
17" Monitor (16" vis, 25dp, 1600x1200 max res.)
3Dfx Voodoo3 3000 AGP Graphics w/16MB, TV-Out
Internal 100MB Zip Drive
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Corel WordPerfect Office 2000
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Business lease: \$54/Mo., 36 Mos. \$0 Money Down

Q-QUOTE NUMBER: pcw11s03

QUANTEX SM450

Intel® Pentium® III Processor 450MHz
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New 20GB 7200rpm Ultra ATA Hard Drive
17" Monitor (16" vis, 25dp, 1600x1200 max res.)
3Dfx Voodoo3 3000 AGP Graphics w/16MB, TV-Out
New 8x Max Variable Speed DVD-ROM Drive
Aureal Vortex2 Sound, A3D 2.0 Technology
New Altec Lansing ACS-21W Speakers
MS Windows 98 Second Edition
Corel WordPerfect Office 2000
New Software Essentials Titles Included!
Optional Mustek VDC-300 Digital Camera, add \$199

\$1349

Business lease: \$49/Mo., 36 Mos. \$0 Money Down

Q-QUOTE NUMBER: pcw11s14

VALUE DESKTOPS

Common Features: ✓ 512KB Secondary Cache (128KB Cache w/Intel® Celeron® Processor-based PCs) ✓ 3.5" 1.44MB Floppy Drive
✓ Quantex ATX Mid Tower Case ✓ 2 USB ports ✓ 104-Key Keyboard ✓ MS Mouse ✓ 3-Year Limited Warranty ✓ 24/7 Toll-Free Technical Support

QUANTEX M550

Intel® Pentium® III Processor 550MHz
96MB PC100 SDRAM Memory
17GB Ultra ATA Hard Drive
19" Monitor w/on-screen display (18" vis)
Intel 2D/3D Graphics Accelerator
3rd Generation DVD-ROM Drive
56K V.90 Fax/Modem
Dynamic Wavetable Stereo Sound
3-piece Dynamic Stereo Speakers, Subwoofer
MS Windows 98 2nd Ed, Corel WordPerfect Office 2000
New Software Essentials Titles Included!

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Intel 2D/3D Graphics Accelerator
Internal 100MB Zip Drive
3rd Generation DVD-ROM Drive
56K V.90 Fax/Modem
Dynamic Wavetable Stereo Sound, Speakers
MS Windows 98 2nd Ed, Corel WordPerfect Office 2000
New Software Essentials Titles Included!

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Business lease: \$47/Mo., 36 Mos. \$0 Money Down

Q-QUOTE NUMBER: pcw11m08

QUANTEX M500c

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New 48x Max Variable Speed CD-ROM Drive
56K V.90 Fax/Modem
Dynamic Wavetable Stereo Sound, Speakers
MS Windows 98 Second Edition
Corel WordPerfect Office 2000
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Q-QUOTE NUMBER: pcw11m22

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Intel® Celeron® Processor 466MHz
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Intel 2D/3D Graphics Accelerator
New 48x Max Variable Speed CD-ROM Drive
56K V.90 Fax/Modem
Dynamic Wavetable Stereo Sound, Speakers
MS Windows 98 Second Edition
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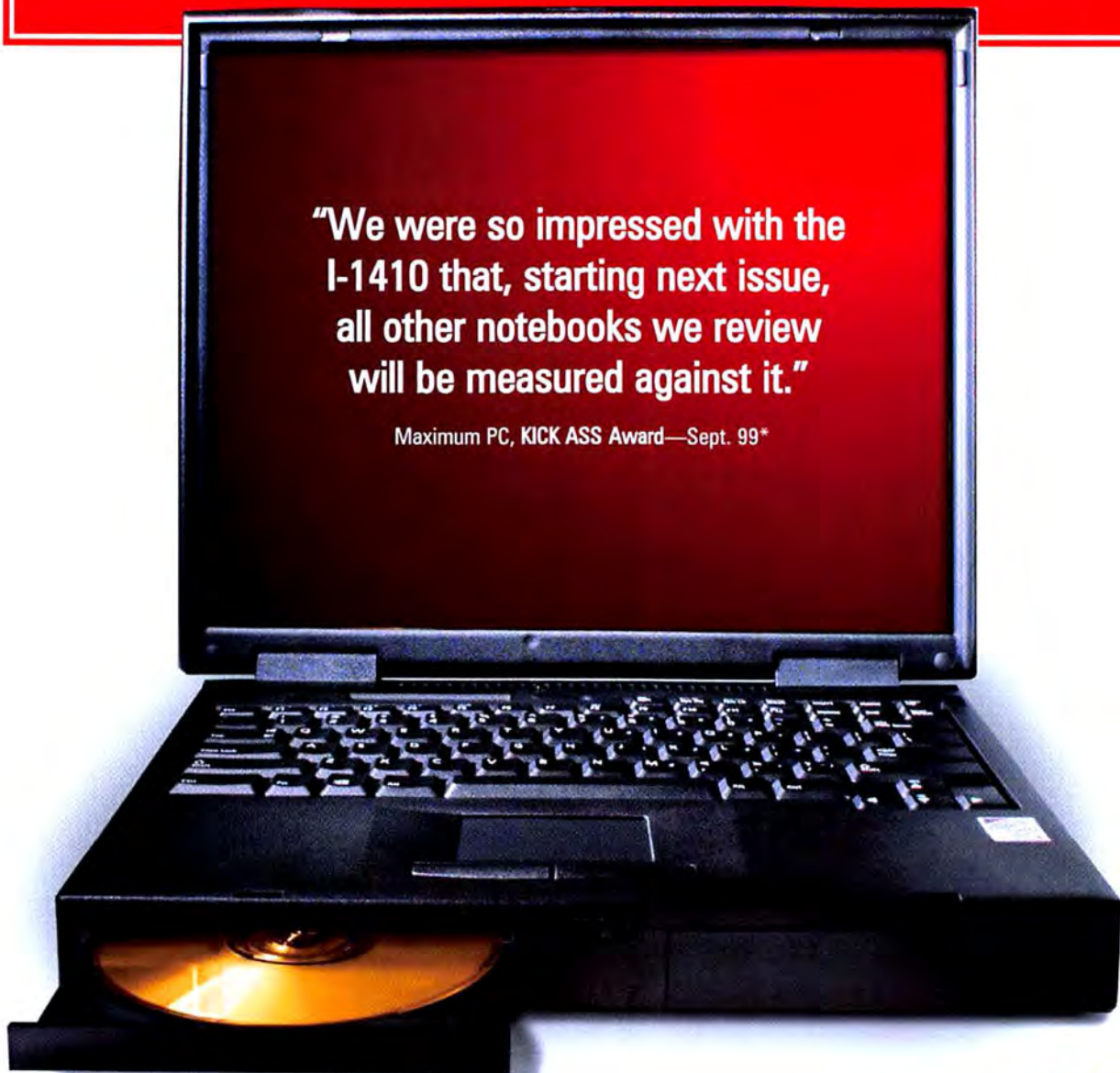


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ATI 3D AGP Graphics, TV-Out
MS Windows 98 Second Edition
Corel WordPerfect Office 2000
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ATI 3D AGP Graphics, TV-Out
MS Windows 98 Second Edition
Corel WordPerfect Office 2000
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New 10GB Ultra ATA Hard Drive
Modular 4x Max Variable Speed DVD-ROM Drive
56K V.90 Fax/Modem
128-bit AGP Graphics
MS Windows 98 2nd Ed., Microsoft Office 2000 SBE

\$2399

Business lease: \$87/Mo., 36 Mos. \$0 Money Down

☎️-QUOTE NUMBER: pcw11116

QUANTEX T-1401

Mobile Intel® Pentium® II Processor 333MHz
Ultra-Thin Design (12.44"x9.84"x1.43")
14.1" XGA TFT Active Matrix Display
64MB SDRAM Memory
6GB Ultra ATA Hard Drive
Modular 24x Max Variable Speed CD-ROM Drive
56K V.90 Fax/Modem
128-bit AGP Graphics
MS Windows NT Workstation 4.0

\$1999

Business lease: \$73/Mo., 36 Mos. \$0 Money Down

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56K V.90 Fax/Modem
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MS Windows 98 Second Edition
Corel WordPerfect Office 2000

\$1599

Business lease: \$58/Mo., 36 Mos. \$0 Money Down

☎️-QUOTE NUMBER: pcw11a09

QUANTEX B-1200

Mobile Intel® Celeron® Processor 333MHz
12.1" SVGA TFT Active Matrix Display
32MB SDRAM Memory
4GB Ultra ATA Hard Drive
Built-In 24x Max Variable Speed CD-ROM Drive
56K V.90 Fax/Modem
NeoMagic NMG5 128-bit AGP Graphics
MS Windows 98 Second Edition
Optional Corel WordPerfect Office 2000, add \$49

\$1299

Business lease: \$47/Mo., 36 Mos. \$0 Money Down

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5 Hot-Swap Drive Bays; 4 Fans
Intel® EtherExpress™ Pro 100 Ethernet Adapter
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Intel L440GX+ Server Board
128MB ECC SDRAM (2GB Max)
9GB 10,000rpm Ultra2/LVD SCSI Hot Swap Hard Drive
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Dual Peer PCI Buses; 6 PCI, 1 ISA Slots
5 Hot-Swap Drive Bays; 4 Fans
Intel® EtherExpress™ Pro 100 Ethernet Adapter
Chassis-Intrusion Switch; Drive Bay Lock
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Spam!

How It Happens, and How to Beat It

Any way you slice it, spam e-mail is annoying, time-consuming, and expensive. Find out what you can do to avoid becoming an easy mark.

BY ROBERTA FURGER

YOU DON'T KNOW Pete Larson. But if you're active online, chances are he knows you. Or at least your e-mail address. Maybe he gleaned it from a chat room or a message board you frequent. Maybe he got it from your home page or company Web site. Or maybe he simply bought it from another list broker.

Larson (not his real name) is an e-mail harvester. Working from a nondescript office park on the East Coast, he and his staff of six run a sophisticated operation—complete with state-of-the-art computers and a host of T1 lines—designed to track down your e-mail address and sell it to spammers. They work the Internet 24 hours a day, seven days a week. And they're good at what they do.

ILLUSTRATIONS BY LANCE JACKSON

In the last two years Larson and his colleagues have sold hundreds of copies of their CD-ROM containing e-mail addresses to spammers around the world. Like clockwork, they release an updated version every two months. And orders for their services keep coming in. Their customers, professional and not-so-professional, hawk everything from diet fads to investment schemes. They send spam for a living. And thanks to Larson and his associates, they have your address.

SPAM IN THE MACHINE

SPAM BORROWS ITS NAME FROM a classic Monty Python sketch in which singing Vikings repeat the name of the notorious pork by-product over and over. But spam is anything but a laughing matter to most people.

The Internet generation first appropriated the word to describe the practice of posting the same message repeatedly in chat rooms. Since then, spam has become a catchall term for any unwanted marketing pitch or announcement that finds its way to your electronic mailbox.

Spammers claim they're simply using another form of direct marketing—no different than telemarketers who call at dinnertime or banks that cram your mailbox with preapproved credit applications. But the reality is quite different. Spam clogs networks, slows delivery of mail, and on occasion even crashes servers. Ever been frustrated by your ISP's sluggish mail response? There's a good chance the slowdown was caused by artery-clogging spam, which settles into systems like the fattiest bacon.

"I watched as a spammer took down a machine that could handle 40,000 to 50,000 pieces of mail in a minute," says David O'Donnell, an antispam consultant and former principal postmaster for America Online. His experience is not unique. Last year, a deluge of spam from multiple sources knocked out Pacific Bell Internet's e-mail services for four days.

According to AOL, some 40 percent of the 15 million pieces of e-mail it processes daily is spam. The Gartner Group, a research and analysis firm in Stamford, Connecticut, estimates that one out of ten e-mails sent in the world are junk mail, double the percentage of just a year ago. And David Kramer, a Palo Alto, Califor-

You've Got Spam: AOL Delivers

LOOKING TO GET SPAMMED? Simply enter a chat room on America Online and watch the pork begin to fly.

AOL has a long-standing reputation as a favorite spot for spammers to ply their trade (see *Consumer Watch*, August, www.pcworld.com/aug99/consumer_watch). Just how bad is it? To find out, we set ourselves up as bait on the world's largest online service provider.

Spam Sting

FIRST, WE OPENED a new account on AOL and established five screen names. Then we created fictional profiles in the AOL member directory for three of our subjects: a female in her mid-30s who owns a small home-based business; a 40-something male executive who enjoys sports, managing his finances, and computers (of course); and a retired male with a wide range of interests. We also set up two accounts without profiles. Using these personae, we surfed chat rooms, posted on message boards, and waited for the junk mail to flood in.

At first, it was barely a trickle. In the course of a month we received only one piece of spam: an ad for golf balls, sent to our 40-something executive.

But once we began visiting chat rooms,

the spam poured in. Just minutes after our adult female entered the astrology chat room, we received two pieces of mail—both directing us to adult Web sites. A few minutes in the "Hey Girlfriend" chat room netted 11 messages—again, all related to pornography. In much of the mail, the spammers didn't bother to hide the "to" list, providing an easy clue as to how the addresses were harvested: Everyone on the list had been in the chat room with us.

Judging by our experience, not all chat rooms receive the same level of scrutiny. Of particular interest are rooms for teens and women. Seconds after entering a "Back Street Boys" chat room filled with preteens, we received several pieces of junk mail. In contrast, after 15 minutes in rooms related to cars, the arts, parenting, computers, and gardening, we hadn't received any spam.

Though e-mail addresses can be culled just as easily from Internet newsgroups as from AOL, the newsgroup turnaround on spam wasn't nearly as immediate. More than three weeks after posting messages on various newsgroup forums, we received only two pieces of junk e-mail. By all accounts, though, we were lucky. Frequent contributors to

newsgroups and message boards report receiving anywhere from a dozen pieces of spam a week to more than 100.

David O'Donnell, former AOL postmaster, says AOL is especially attractive to harvesters and spammers because of its huge member list (some 20 million names) and the ease with which they can amass thousands of addresses from its system in a short time. And, O'Donnell says, "AOL's Terms of Service staff is woefully inadequate for dealing with online abuse, so spammers know they can get away with it for...a long period of time before being caught and terminated."

But AOL spokesperson Rich D'Amato says that AOL has teams of people working daily to combat junk e-mail through technology, legal means (taking spammers to court), and public policy (to strengthen antispam legislation). "I don't think any other ISP has been as aggressive as AOL in trying to combat junk mailers," he says.



antispam tips!

FIGHT BACK Most ISPs have a special e-mail address for reporting spam. Be sure to forward the junk mail's entire header. To display it in Eudora, hit the *Blah Blah* button. In Netscape Messenger, select *View-Headers-All*. In Outlook Express, open the message, select *File-Properties*, and click *Details*. You'll need to cut and paste the header into the message you forward. On America Online, send messages to tossspam@aol.com. Or mail your spam to the **Spam Recycling Center** (spamrecycle@ChooseYourMail.com), which will forward the message to state and federal authorities, and to software companies to help them improve their filtering tools.

nia, attorney who has battled spammers on behalf of ISPs, sees the problem only growing worse "as more and more people get on the Internet. Now every Johnny-come-lately yahoo thinks he can send out e-mail at no cost to himself, but at considerable cost to the Internet community."

SPAM, SPAM EVERYWHERE

ISPS AND other businesses have spent millions to stop spam. The costs include new servers to handle the increased flow of mail, filtering software to block the mail, and legal fees to track down spammers and prosecute them. This last task is not easy. Spammers go to great lengths to thwart tracking, from forging headers and return addresses to relaying their spam through unprotected and unsuspecting third-party servers, many of which are located offshore.

A less obvious—but no less costly—expense to businesses are the labor hours that are lost to dealing with junk e-mail. A 1997 study conducted at AT&T and Lucent Technologies found that e-mail administrators spent 4 to 20 hours a week updating spam

filters. But filters don't catch all the spam. By one company's estimate, the time its staff spends identifying and deleting junk e-mail costs the business \$1 per employee each day.

Consumers, too, pay a price. Identifying spam takes time, particularly when subject lines are disguised and return addresses forged. And as attorney Kramer notes, many people still pay hourly rates for Internet access, including those who use wireless Internet services and business travelers who download e-mail on airplanes and in hotels. "All of these [people] are paying an incremental charge for the time they spend dealing with spam," he says. "There's nothing more frustrating than sitting on a plane and downloading a 50K message—at \$2 a minute—that's telling me how to 'get rich quick'."

Then there's the nature of spam that disturbs so many people. According to the Gartner Group, one in four junk e-mails hawks pornography; much of this mail finds its way into the mailboxes of kids surfing the Net. Ian Oxman, president of

ChooseYourMail, a partner in the Spam Recycling Center advocacy site, says no matter what parents do to monitor their children's Internet activity, illicit mail still gets through. "It's not a matter of simply putting up a Web nanny [to block pornography sites]; it's a matter of checking their [children's] e-mail box every day."

Less disturbing but just as annoying is the spam that sells get-rich-quick schemes. Of nearly 100,000 pieces of spam that consumers forwarded to the Recycling Center recently, 35,000 were get-rich plans. Among those, Oxman noticed a new trend: spam selling spam—junk mail marketing spam software and e-mail lists to encourage others to become spammers. "Spamming has evolved," says Oxman. "Companies that set up large bulk-mail operations in the beginning have largely shut down. Now [the practice of spamming has passed] to everyday PC users. For \$90, anyone can get a list of addresses and off [they] go."

BAD FOR YOUR HEALTH

SPAM THREATENS more than your pocketbook and free time. It may exact a toll on

your personal privacy as well. As with traditional junk mail, most spam is sent out in bulk with no regard to the identity or interests of the people who receive it. But as marketers and their tools become more sophisticated, the business of targeted e-mail advertising is growing.

Let's say, for example, a sales rep wants to market a new exercise machine. Using harvesting software, he can type in the keywords *exercise*, *weight loss*, or *fitness* and search Web sites, newsgroups, and chat rooms pertaining to those subjects. Within minutes, he'll have thousands of e-mail addresses for his targeted mailing.

"There's a great deal of pent-up demand for [targeted mailing lists]," says Regina Brady, the vice



There's always going to be someone who sees spam as a way to do direct marketing with free stamps and free printing.

JASON CATLETT, *president of Junkbusters, a developer of privacy tools for Web surfers in Green Brook, New Jersey*

president of interactive services for Acxiom Direct Media of Greenwich, Connecticut. Acxiom is one of the world's largest data brokers, with information about more than 140 million people. It now offers businesses a "matching" service: It tries to match the names of consumers on a client's traditional mailing list (such as a catalog subscription list) with e-mail addresses in Acxiom's own database. Companies can then execute more targeted marketing campaigns based on Acxiom's information about the owners of these addresses.

While marketers love the service, this method of merging online and offline activities scares privacy advocates like Jason Catlett, president of Junkbusters, a developer of privacy tools for Web surfers in Green Brook, New Jersey.

Marketing companies, Catlett says, now use e-mail addresses as unique identifiers, much like Social Security numbers, to track consumers and compile comprehensive lifestyle and behavior data about them. While offline marketers have been limited to collecting data such

antispam tips!

JUST SAY NO Review the privacy policy of any Web site before offering your e-mail address (or any personal information), and be sure to "opt out" if you don't want to receive marketing e-mail. If no privacy policy is posted, take your business elsewhere.

as your birth date, credit information, and purchasing habits, online marketers can build a much more detailed profile based on the Web sites you register with, the lists you join (support groups for alcoholics or people with Alzheimer's disease, say), the messages you post on Usenet or in chat rooms, and even the information you put on your personal Web page.

"There's so much more data online that is much cheaper to collect, and it's more easily used," says Catlett. "[Online-data collection] is very invasive and has serious connotations for consumer privacy."

NOWHERE TO HIDE

HOW DO SPAMMERS get ahold of your e-mail address? The process is actually quite simple.

List compilers use highly automated software programs, which they often write themselves, to scour Web pages and online communities for e-mail addresses. The more active you are online, the more likely your name will appear on a spammer's list. But sometimes the simple act of establishing a profile on AOL is enough to garner unwanted mail. (For more on this, see July's "Spam Me, Scam Me" sidebar, www.pcworld.com/jul99/spam.)

For nontechie spammers who can't write their own programs, the market offers numerous do-it-yourself kits to help turn any e-marketing neophyte into a virtual spam machine. For \$100 to \$400, would-be spammers can buy 1 million e-mail addresses or a full-featured program that includes tools for harvesting additional addresses from Web pages, newsgroups, and AOL chat rooms. For the same price, they can also buy software that will automatically send out 250,000 pieces of spam per hour and forge the headers to boot.

"By far the easiest way to collect addresses is to create an account on AOL and then use a software program to

We Asked for It

BE CAREFUL what you ask for. That's what we learned when we signed up with over 120 Web sites to see whether they'd honor our opt-out request, or if they'd sell our address to any spammers. We registered at sites representing everything from news agencies (The New York Times on the Web) to retail shopping (Gap Online, CDNow) to political campaigns (Gore 2000, Republican National

When we did ask for mail, however, boy, did they deliver. Our most prolific correspondent was the White House (whitehouse.gov), which didn't let a day go by without filling our inbox with press releases—233 in all over four weeks. Another frequent mailer was Motley Fool, an investment advice site. The Fool sent chatty breakfast greetings each day (172 pieces of mail total). While most sites sent fewer than a dozen messages, at least six sent 50 or more, including Microsoft's SideWalk (58) and our very own TipWorld (85). Of course, this is partly due to the sheer number of newsletters these sites offer.

As for Ethel, other than an initial greeting from a dozen or so sites to welcome her aboard, the rest of the sites left her alone.

Please Delete Me, Let Me Go

AT THE END of the month, Fred Jr. returned to the sites where he'd registered to choose the opt-out function and stop the flow of mail. While many marketers say that they support a consumer's right to opt out, we discovered, not surprisingly, that adding your address to a mailing list is easier than removing it. Some of the mail we'd received included a URL where we could go to "unsubscribe" from a site's mailings—but the address usually just delivered us to the site's registration or home page, and we had to surf for several minutes to find the correct page for unregistering. Even when we did manage to sign off, the request sometimes took days or weeks to go into effect. In fact, as we went to press, a handful of sites were still sending us mail. —Kim Zetter



Committee), computing corporations (Hewlett-Packard, Apple), and even betting operations (Gambling.com).

At each site, we registered two accounts: one for Fred Mertz Jr., opting to receive any newsletter, marketing promo, or press release the site wanted to send us; the other for Ethel Ball, who asked not to receive anything. Surprisingly, we received only one piece of real spam—mail we didn't request—after our account was sold to a list broker. The broker, in fact, spammed us with a promo inviting us to join the league of spammers.

methodically go to each chat room, call up the list of members present [a list of e-mail accounts], and collect addresses," says former AOL postmaster O'Donnell. Often, using the same program, spammers then immediately send mail to these harvested addresses while the users are still likely to be online. Some spammers employ fraudulent schemes to trick unsophisticated members into revealing their passwords. Once they have access to a member's account, they use it to launch bulk mailings with no fear that the spamming will be traced back to them.

The routine is much the same on AOL message boards, where similar software programs scour messages to extract the sender's address. "It's slower than chat rooms," says O'Donnell, "but because people who post to message boards tend to want responses, chances are good that those accounts

some cases, the mere act of signing up gains a spammer access to all list members. List administrators are growing wise to this practice, however, and have begun to hide member addresses.

While the real cash cows are newsgroups, chat rooms, and Web pages, every now and then a harvester hits on a new technique.

Nick Nicholas, executive director of the Mail Abuse Prevention System and former head of mail abuse for Pacific Bell Internet Services, remembers the time when a couple of savvy spammers brought that company's mail server "to its knees" and collected thousands of e-mail addresses in the process.

Nicholas recalls their mode of operation: "Two people were dialing in to our mail server and sequentially trying to hit every single e-mail address from aa000 to zz999. [Valid] addresses were stored for later use, and if the server reported back that there was no such address, the program would move on to the next one."

Pacific Bell wrote a custom program that would alert staffers the

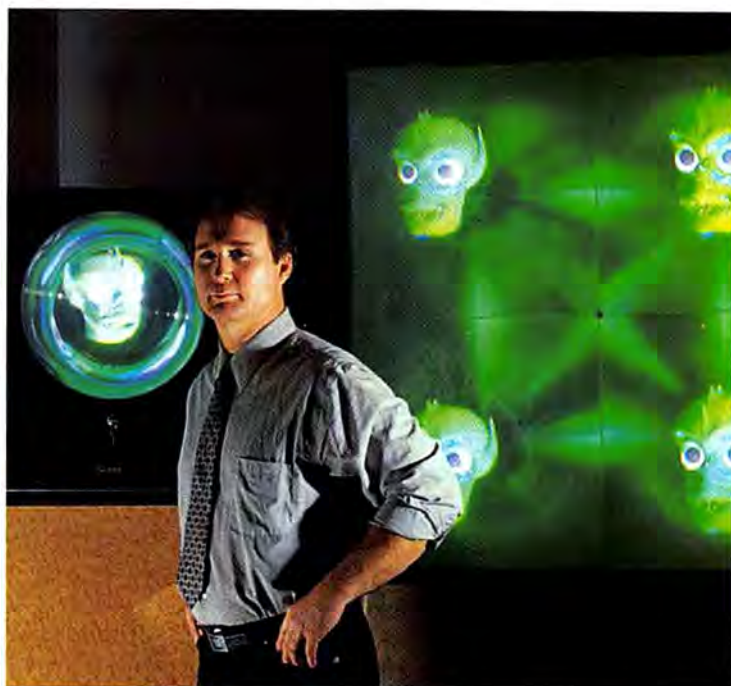
next time harvesters made a similar attempt, but Nicholas says that many ISPs are still vulnerable to this kind of covert attack.

SPINNING SPAM INTO GOLD

WHILE MOST companies shun spam as a marketing tool, there are some legitimate businesses for whom the potential profits from spamming outweigh the complaints, ridicule, or even death threats that their messages might provoke. At the other end of the spectrum are unscrupulous spam factories and other fly-by-night operators—from porn-site purveyors to diploma mills—that send out millions of messages a day to any address they can find. Be-

tween these two extremes you'll find every kind of business imaginable.

Don Schulze, national accounts manager for California Laser Company in Van Nuys, California, recently used spam to promote his company's 3D video image projector system. For \$325 he contracted with a bulk mailer to send 500,000 e-mail solicitations to addresses harvested online. Sure, the unsolicited e-mail produced harassing phone calls, Schulze says, but all he needs is one successful sale to make the spam pay off. In fact he's close to signing a big deal as a result. "I gained international exposure because of that one ▶



I gained international exposure because of that one little stupid spam mail. That was worth taking a few death threats.

DON SCHULZE, national accounts manager for California Laser Company in Van Nuys, California, a maker of 3D video image projectors

antispam tips!

OPEN A SPAM ACCOUNT Foil spammers by using a free Web-based e-mail address (like Yahoo or HotMail) or a different AOL screen name for public postings and Web site registration, saving your private address for friends and associates. When the spam account fills up, simply dump the trash.

will be around for a while." Equipped with an efficient program and a fast connection, a harvester can collect between 30,000 and 50,000 addresses in 24 hours, O'Donnell estimates.

Outside of AOL, harvesters use similar programs to systematically pick through articles on thousands of Internet newsgroups to cull addresses. Or they subscribe to any of the 50,000 or so mailing-list groups on the Web, which cover every topic from automobiles to zoology. In

antispam tips!

ALTER YOUR NEWSGROUP ADDRESS If you must use your regular e-mail address when posting to newsgroups, insert no-spam in the From: or Reply-to: fields—for example, no-spam-jane_smith@bigisp.com. Any junk mail sent to that address will be returned to the sender, and those who wish to reply to your message can simply delete 'no-spam' from the address.

little stupid spam mail. That was worth taking a few death threats," he says.

Still, Schulze is clearly conflicted. He acknowledges that he doesn't like receiving spam himself and admits that he uses a filter to block unwanted solicitations from his own e-mail box.

While Schulze isn't doing anything illegal—his company is legitimate, doesn't forge headers, and clearly states its identity in its mail—the same can't be said of scam spammers. Roughly 10 percent of fraud-related complaints received by the National Consumers League's Internet Fraud Watch involve e-mail scams. In the last few years, the Federal Trade Commission, the Securities and Exchange Commission, and several state attorneys general have taken action against fraud operators who use spam to scam.

But spam doesn't have to push a phony scheme to be illegal. In California, it's against the law simply to send spam in violation of an ISP's no-junk-mail policy; a Virginia law makes it illegal to forge headers in e-mail solicitations; and in a handful of states, spammers must identify

themselves in their mailings and include explicit opt-out provisions that let recipients ask to be removed from mailing lists (granted, this last rule doesn't stop the first spam from coming through, and sometimes spammers simply use the opt-out function to confirm your address and pass it on to other spammers). What's more, courts increasingly find that relaying mail through third-party servers is akin to trespassing—and levy hefty fines for violations. State and federal legislators have also introduced bills that would outlaw the sale of spamming software, and another bill pending in Congress would mirror the California junk-mail law.

But spam-related laws go only so far, says Sunil Paul, founder and CEO of Bright Mail, an antispam service (see "Can the Spam," below). "Unlike every other junk medium that legislators have regulated," he says, "spam is a global medium," which makes prosecuting foreign spammers difficult. Indeed, one U.S. spammer we spoke with moved his operations out of the country to avoid any legal complications.

SPAM SPADE

IT'S A CAT-AND-MOUSE game that the ISP police play in tracking spammers down. For some, it's a full-time job ►

antispam tips!

BE ANONYMOUS Set your browser so it doesn't provide your e-mail address as the password when you download files from anonymous FTP connections. In Netscape Messenger 4.5, go to *Edit*Preferences* and click *Advanced*. Delete the check mark next to *Send e-mail as anonymous FTP password*. Click *OK*. In Internet Explorer 5, head to *Tools*Internet Options* and click the *Security* tab. Highlight the *Internet* icon under the content zone box, and then click the *Custom Level* button. In the *Security settings* box, scroll down to *User Authentication/Logon* and click *Anonymous logon*.

Can the Spam: Utilities and Services

YOU PROBABLY CAN'T shield yourself from all junk e-mail, but you can slow the flow to a trickle. Here are a number of tools and services to make the task easier.

Antispam software is becoming increasingly effective, though no solution is perfect. Webster Image's \$23 **SpamScan97** (www.webster-image.com) and Contact Plus's \$20 shareware **Spam Buster** (www.contactplus.com) are good choices. These filters work in conjunction with your e-mail software to winnow out multilevel marketing scams, get-rich-quick schemes, and other offal, as well as messages from known spammers. For reviews of more spam filtering software, see "Say No to Spam," September 1998 (www.pcworld.com/sep98/defenders_spam).

If your ISP doesn't filter spam and you'd rather not mess with your mail software, try registering with the free spam-screening service **Bright Mail** (www.brightmail.com). The service retrieves your e-mail from your ISP,



screens out junk, then forwards the rest to you. The drawback: You must give Bright Mail your ISP mail password, and the service works only with POP3 mail accounts, not with Web TV, AOL, or firewall-shielded accounts. In our experiment with Bright Mail, some spam still found its way to our account.

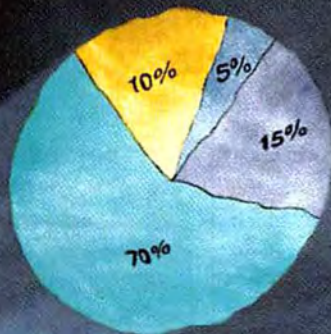
If you post to newsgroups, consider using

an anonymous remailer like **Nymserver** (www.nymserver.com), which costs \$35 a year. The service keeps your real address secret when you post but will forward you any e-mail replies. Other remailers may not

let you post to newsgroups (only send anonymous e-mail) or may not permit you to receive replies. If you don't expect replies, forget the remailer and use your newsreader or browser to set bogus From: and Reply to: headers in Usenet messages.

In order to trace junk mail to its source, the \$15-a-year **SpamCop** service (spammcop.net) will parse the header for you and do some checking to determine where the message originated. It will also

create a letter of complaint you can send to the originating ISP. To find out how to trace headers on your own, see *Internet Tips*, February (www.pcworld.com/hh_internet). The **Network Abuse Clearinghouse** (www.abuse.net) will also forward a letter of complaint for you to the service from which the spam was sent. —Judy Heim



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Installation
VPL - FE100U



Personal VPL - PX1



SONY

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comparable to the task of federal DEA agents. The goal for trackers is ultimately to cement up any holes that spammers use or devise for quick guerrilla attacks on network systems. Some liken it to the "Whack a Mole" arcade game, in which players use a mallet to beat back rodent-like creatures that pop up from holes.

Sanford Wallace, a "reformed spammer," was one such mole. At the height of his career, the self-proclaimed King of Spam mailed out 25 million messages a day for 12,000 clients. But that was before a barrage of protracted legal battles brought on by AOL and other ISPs shut his business down in 1997.

Before Wallace's reign ended, then-postmaster O'Donnell spent nearly every waking hour trying to thwart Wallace's persistent spamming activity on AOL. "Every time we blocked one domain," he says, "[Wallace] would come back with another. Then he began to use AOL as a return address, making it look as if we were supporting him. That's when we got really serious about stopping his attacks."

Where conventional spam-fighting methods haven't worked, consumers have fought back with vigilantism, publishing names, addresses, and home phone numbers of spammers on the Internet; bouncing bundles of spam back to the spammer's domain or service provider; or hacking into their computers to delete

antispam tips!

DON'T RESPOND Many consumers unwittingly confirm their e-mail address by responding to the "remove" option included in junk e-mail. Although some marketers do honor such requests, you're more likely to wind up on a spammer's CD of live accounts and generate even more mail.

files and steal client lists in order to harass the people who hire spammers.

Indeed, tempers run high in the battle between spammers and spammees. The war on spammers has sometimes resembled the war on pedophiles. In one case, antispammers published a spammer's

Social Security number and employer's phone number, encouraging people to ruin his credit and get him fired from his job. Antispam organizations disavow such tactics, but that doesn't stop rogue elements from waging their own version of guerrilla warfare.

One spammer moved into a high-security building in response to death threats

business wants to alienate its customers."

Working under the assumption that many consumers want to receive e-mail about products that interest them, several businesses have been formed around opt-in lists. Companies like Postmaster Direct and Choose Your Mail encourage consumers to sign up with them for information about specific products, then

contract with the product makers to send targeted e-mail to these people. As these services expand their lists, more companies will no doubt choose this

There's nothing more frustrating than sitting on a plane and downloading a 50K message—at \$2 a minute—that's telling me how to 'get rich quick'.

DAVID KRAMER, an attorney in Palo Alto, California, who battles spammers on behalf of ISPs.

and expresses disbelief that people could want to harm him over "something as small as a piece of e-mail."

PLAY IT AGAIN, SPAM

ALTHOUGH THE VAST majority of junk e-mail currently comes from obscure or fly-by-night outfits, many concerned observers warn that more established companies and organizations may join the solicitation wave.

Last fall in his testimony before the House Subcommittee on Telecommunications, Trade, and Consumer Protection, Jerry Cerasale, senior vice president of the Direct Marketing Association, urged Congress not to enact any law that would impede e-mail solicitations. "Our members want to preserve the freedom to test and integrate unsolicited commercial e-mail," said Cerasale. He concedes, though, that the image of direct e-mail marketing will have to improve substantially before the majority of companies will choose to use unsolicited e-mail for marketing purposes. "Right now it makes consumers angry," Cerasale says, "and no

marketing method. But don't expect spamming to stop soon.

"We're always going to have spammers," says Junkbusters' Catlett. "There's always going to be someone who sees it as a way to do direct marketing with free stamps and free printing."

The methods for countering spam are neither perfect nor always easy to implement. As antispammers create filtering software to thwart spam, bulk mailers will devise increasingly sophisticated ways to crash into systems and cover their tracks.

But there's a ray of hope: The patchwork of state and federal laws, together with teams of aggressive lawyers fighting for ISPs and the public, are starting to reduce the economic appeal of spamming. Just ask Sanford Wallace. In the last year of business, his spamming operation raked in more than \$1 million, but after paying his legal fees, he wound up with nothing.

"The richest people on the Internet are our lawyers," says Wallace.

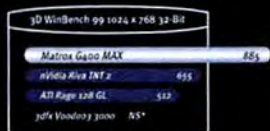
Roberta Furger and Judy Heim are contributing editors and Kim Zetter is an associate editor for PC World.

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Hard Drive	4.3GB hard drive ²	8.4GB Ultra ATA hard drive ²	13.6GB Ultra ATA hard drive ²
DVD/CD-ROM	40X var. ³ speed CD-ROM drive	40X var. ³ speed CD-ROM drive	40X var. ³ speed CD-ROM drive
Graphics	8MB nVidia Riva AGP graphics	8MB nVidia Riva AGP graphics	8MB nVidia AGP graphics
Sound	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound
Monitor	15" Micron 500Vx (13.8" display)	17" Micron 700Cx (15.9" display)	17" Micron 700Cx (15.9" display)
Micron University	1-year free ⁴ online training	1-year free ⁴ online training	1-year free ⁴ online training
On-site Warranty	5-yr./3-yr. Micron Power limited warranty	5-yr./3-yr. Micron Power limited warranty	5-yr./3-yr. Micron Power limited warranty
Software	Microsoft Windows 98 Microsoft Office 2000 SBE Norton AntiVirus	Microsoft Windows 98 Microsoft Office 2000 SBE Norton AntiVirus	Windows NT [®] 4.0 workstation (Free Windows 2000 upgrade ⁵) Microsoft Office 2000 SBE Norton AntiVirus
Factory Direct Price	\$27/mo. Business Lease 48 mos. ⁶ \$889	\$33/mo. Business Lease 48 mos. ⁶ \$1123	\$40/mo. Business Lease 48 mos. ⁶ \$1338

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— Web Host Dir., E-Commerce Hosts Category; Sept., 1999



Celeron C400
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Model Name	TransPort TREK ² C400	TransPort TREK ² C400	TransPort NX 400
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RAM	32MB SDRAM	96MB SDRAM	128MB SDRAM
Hard Drive	4.3GB hard drive ¹ (removeable)	6.4GB hard drive ¹	6.4GB hard drive ¹ (removeable)
Monitor	12.1" SVGA TFT display	14.1" XGA TFT display	15.0" XGA TFT display
Graphics	8MB AGP graphics accelerator	8MB 3D AGP graphics	3D AGP graphics accelerator
CD-ROM	24X var. ² speed CD-ROM drive	4X var. ² speed CD-ROM drive	4X DVD-ROM drive
Extra Storage	3.5" floppy disk drive	3.5" floppy disk drive	3.5" floppy disk drive
Communications	—	56K 3Com Eclipse Lite modem card	56K 3Com Eclipse Lite modem card
Software	Microsoft Windows 98 MS Office 2000 SBE Norton AntiVirus	Microsoft Windows 98 MS Office 2000 SBE Norton AntiVirus	Microsoft Windows 98 MS Office 2000 SBE Norton AntiVirus
Micron U	1-year free ³ training online	1-year free ³ training online	1-year free ³ training online
Factory Direct Price	\$53/mo. Business Lease 48 mos. ^{4,5} \$1799	\$74/mo. Business Lease 48 mos. ^{4,5} \$2499	\$86/mo. Business Lease 48 mos. ^{4,5} \$2899



TransPort NX 366
June '99



TransPort NX 366
June '99



TransPort TREK² C400
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Model Name	NetFRAME 3101	NetFRAME 3101	NetFRAME 5201
Processor	Intel Pentium III processor 500MHz	Intel Pentium III processor 600MHz	Dual Intel Pentium III Xeon™ processors 550MHz
RAM	128MB ECC 100MHz SDRAM	256MB ECC 100MHz SDRAM	256MB ECC 100MHz SDRAM
Hard Drive	9GB Ultra-2 Wide LVD SCSI hard drive ^o	2X 9GB (18GB total) Ultra-2 Wide LVD SCSI hard drive ^o	3X 9GB (27GB total) Ultra-2 Wide LVD SCSI hard drive ^o
Cache	512KB internal L2 ECC	512KB internal L2 ECC	512KB internal L2 ECC
CD-ROM	40X var. ^o speed CD-ROM drive	40X var. ^o speed CD-ROM drive	40X var. ^o speed CD-ROM drive
Network	Integrated Intel PRO/100+ server adapter	Integrated Intel PRO/100+ server adapter	Integrated Intel PRO/100+ server adapter
Service	5-yr./3-yr. Micron Power limited warranty	5-yr./3-yr. Micron Power limited warranty	5-yr./3-yr. Micron Power limited warranty
Software	Intel LANDesk server manager	Intel LANDesk server manager	Intel LANDesk server manager
Other Features	Hot-swap hard drives	Hot-swap hard drives	Mylex 16MB RAID controller Optional hot-swap redundant power
Factory Direct Price	\$65/mo. \$2199 <small>Business Lease 48 mos.¹⁰</small>	\$89/mo. \$2999 <small>Business Lease 48 mos.¹⁰</small>	\$206/mo. \$6999 <small>Business Lease 48 mos.¹⁰</small>



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BY CARLA THORNTON

Educator

Peter Lafford has seen his share of skinny, expensive notebook PCs with large screens and the latest Intel processors, and he's not impressed. The director of the Computing Language Lab at Arizona State University says he'd take a no-frills, 7-pound unit with a slower Pentium chip, a passive screen, and a rock-bottom price any day.

"Why spend an extra \$1000 for something you don't really need?" asks Lafford, who purchased a Toshiba Satellite 2535CDS last February for \$1299. He and his wife, Barbara, also an educator, use their Toshiba at the office for PowerPoint presentations and at home for word processing, e-mail, and light database work. The laptop's 300-MHz Pentium processor, 32MB of RAM, dual-scan passive-matrix 13.3-inch screen, and 4.3GB hard drive suit them just fine. "Frankly, if I hadn't stumbled upon this notebook at CompUSA, I would have looked for an even cheaper one at some online site," says Lafford.

Lafford isn't alone in his sentiments. As powerful notebooks get less expensive in order to compete head to head with desktops, people feel less inclined than ever to dole out big bucks for a portable, says International Data Corporation analyst Randy Giusto. ►

Notebooks for Cheapskates

Not every laptop needs to cost you \$3000. We found great buys—
with some compromises—for half that price.

PHOTOGRAPHS BY PIERRE-YVES GOAVEC

Currently, notebooks costing more than \$2000 claim the lion's share of sales. But by the year 2002, IDC predicts, sub-\$2000 notebooks will account for almost 51 percent of units sold, with portables priced at under \$1500 making up 28 percent. "More expensive notebooks have more bells and whistles, to be sure," acknowledges Giusto, "but there's very little difference between the quality of a \$1500 notebook and one that costs \$3000." Inexpensive notebooks are not necessarily flimsier or less reliable, though they do run slower, have fewer features, and are less upgradable.

The economy notebook has been around for a long time, appealing to big corporations as well as individuals on a tight budget, notes Ken Dulaney, an analyst with the Gartner Group. But notebook makers see the latter group—including students and first-time PC buyers—as a growing market segment for portables in the next few years, Dulaney says. The reason: Notebooks are cheaper than ever, and wide-

spread use of the Internet and computing technology in general is convincing more people to buy a computer.

BOTTOM DOLLARS

DECIDING YOU want to pay less for a notebook is the easy part. How cheap do you dare to go? The \$1400 laptop you snap up today

may have everything you require of a portable. But will it keep pace with your needs down the road? Cheap notebooks have long been widely viewed as a dubious investment—they've had an often-deserved reputation for being slow, unreliable, and obsolete right out of the box.

Is this perception still accurate? To find out what you get (and what you don't) with the current crop of inexpensive notebooks, we rounded up a bargain hunter's selection of superlow-cost machines. To

cater to the serious discount buyer, we focused on notebooks priced at less than \$1700. If you find the capacity of these models too limited, consider the offerings in this month's *Top 10 Notebook PCs* section on page 242, which features budget notebooks that sell for under \$2300.

We tested 14 notebooks in all, from vendors including Compaq, IBM, Sony, and Hewlett-Packard. (Dell, Micron, and NEC Packard Bell did not offer any sub-\$1700 notebooks in time for our deadline; a

Best Buy



COMPAQ'S PROSIGNIA Notebook 150 beats Toshiba's fast Satellite 2595CDS in our superlow-cost shoot-out. The \$1499 Prosignia 150 prevails with a terrific price and pretty good performance. The unit includes high-quality built-in speakers that deliver the best sound here, with great bass and exceptional clarity.

TOP 10 SUB-\$1700 NOTEBOOKS

SUB-\$1700 NOTEBOOK		Street price (as of 8/20/99)	PC WorldBench 98 performance score	Faster	Base configuration
1	Compaq Prosignia Notebook 150 800/345-1518 www.compaq.com	Average: \$1499	Very good	153	Very good: AMD K6-2-380, 12.1-inch active screen, touchpad pointing device, 64MB of RAM, 4GB hard drive
2	Toshiba Satellite 2595CDS 800/867-4422 www.toshiba.com	Average: \$1499	Outstanding	170	Very good: Celeron-400, 13-inch passive screen, eraserhead pointing device, 64MB of RAM, 4.3GB hard drive
3	IBM ThinkPad I Series 1412 800/426-7255 ext. 4212 www.ibm.com/pc/us/thinkpad	Expensive: \$1699	Very good	162	Good: Celeron-366, 12.1-inch active screen, eraserhead pointing device, 32MB of RAM, 4.8GB hard drive
4	Gateway Solo 2500SE 800/315-2536 www.gateway.com	Expensive: \$1699	Very good	154	Good: Celeron-366, 12.1-inch active screen, touchpad pointing device, 32MB of RAM, 4.3GB hard drive
5	Chem USA ChemBook 7200 800/866-2436 www.chemusa.com	Average: \$1499	Very good	165	Good: Celeron-333, 12.1-inch active screen, touchpad pointing device, 64MB of RAM, 4.8GB hard drive
6	Fujitsu LifeBook c352 888/466-8434 www.fujitsu-pc.com	Inexpensive: \$1299	Very good	159	Good: Celeron-333, 12.1-inch active screen, ErgoTrac pointing device, 32MB of RAM, 4.3GB hard drive
7	Acer TravelMate 512T 800/733-2237 www.acer.com/aac	Average: \$1499	Very good	166	Very good: Celeron-366, 12.1-inch active screen, touchpad pointing device, 64MB of RAM, 4.1GB hard drive
8	Sony VAIO PCG-F250 888/315-7669 www.sony.com/pc	Average: \$1499	Good	144	Good: Celeron-366, 13-inch passive screen, touchpad pointing device, 32MB of RAM, 4.3GB hard drive
9	Sceptre Soundx 5200 800/788-2878 www.sceptre.com	Average: \$1399	Good	141	Good: AMD K6-2-380, 12.1-inch active screen, touchpad with synaptics pointing device, 32MB of RAM, 4.3GB hard drive
10	HP OmniBook XE2 800/322-4772 www.hp.com	Expensive: \$1699	Very good	166	Very good: Celeron-333, 12.1-inch active screen, touchpad pointing device, 64MB of RAM, 4GB hard drive
Best Buy		Percent of overall rating	Price 20 percent	Performance 14 percent	Base configuration 5 percent

* Includes computer, adapter, power cord, and floppy or CD-ROM drive.

* For more information about all the products listed in this table, select number 902 on the product information card or visit www.pcworld.com/productinfo.

* Insufficient data to give a rating.



notebook from Transmonde was pulled from the review after the company went out of business in mid-August.) We tested performance (on the PC WorldBench 98 test suite) and battery life, and we evaluated features and design to come up with ten portables that are worth considering. At press time, we learned that the AMS Tech

performance and quality and include all the basic features most of us will ever need. For about half the price of a crème-de-la-crème \$3000 notebook, you can buy something that's a lot better than half as good. Even the cheapest units provide the essentials for decent portable computing: a floppy drive, a CD-ROM drive, and all

notebook we tested, the Roadster 15CXA 380 (see page 182), had been replaced by the Roadster 15CTA 380, which sports a smaller 12.1-inch active-matrix screen (the 15CXA 380's was 13.3 inches) and costs \$100 less.

The verdict? Well, notebooks at this price are a bit stripped down, but we found them robust enough to get the job done.

They offer good per-

the connections you need for adding a mouse, monitor, and full-size keyboard. The processors in these units ranged from an AMD K6-2-380 up to a Celeron-400, and system performance varied greatly from one machine to another.

The best of the bargain laptops gives a little extra. Our Best Buy, the \$1499 Compaq Prosignia Notebook 150, boasts the finest built-in stereo sound of any model here. IBM's jet-black \$1699 ThinkPad I Series 1412, in third place, distinguishes itself with one of the most comfortable keyboards on a notebook, at any price.

THE TRADE-OFFS

WHAT DO YOU sacrifice in return for such low prices? With their budget chips, inexpensive laptops don't perform as impressively as their higher-priced rivals. Screens and hard drives fall several sizes short of the largest available, and components tend to be more of a hassle to upgrade—if they can be upgraded at all. Some low-budget notebooks rely on ►

FEATURES COMPARISON

Extra features	Design and ease of use	Battery life (hours:min)	Travel weight (pounds) ¹	Vendor's system reliability	Tech support quality/policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)	Product info number
Satisfactory: 12X-24X CD-ROM drive, V.90 modem, docking connection	Very good	Satisfactory: 2:19	Average: 8.1	Fair	Fair/Good	24/7, toll-free	3/1	625
Satisfactory: 12X-24X CD-ROM drive, V.90 modem, lithium ion battery	Average	Good: 3:12	Average: 7.7	Fair	Fair/Fair	24/7, toll-free	1/1	626
Satisfactory: 10X-24X CD-ROM drive, V.90 modem, lithium ion battery, docking connection	Average	Good: 3:07	Average: 7.9	Good	Good/Fair	24/7, toll-free	1/1	—
Satisfactory: 10X-24X CD-ROM drive, V.90 modem, docking connection	Average	Satisfactory: 2:31	Average: 7.8	Good	Good/Good	24/7, toll-free	3/3	627
Satisfactory: 10X-24X CD-ROM drive, V.90 modem, lithium ion battery	Average	Good: 3:20	Light: 6.9	✓	Fair ✓/Fair	24/7, toll-free	1/3	628
Satisfactory: 12X-24X CD-ROM drive, V.90 modem, lithium ion battery	Average	Satisfactory: 2:33	Heavy: 8.6	Good	Fair ✓/Fair	24/7, toll-free	1/1	629
Satisfactory: 10X-24X CD-ROM drive, V.90 modem, lithium ion battery, docking connection	Average	Good: 3:02	Average: 7.8	Fair	Fair ✓/Fair	24/7, toll-free	1/1	630
Satisfactory: 10X-24X CD-ROM drive, V.90 modem, lithium ion battery, modular bay, docking connection	Very good	Satisfactory: 2:12	Average: 8.1	✓	Fair ✓/Good	24/7, toll call *	Varies ✓/1	631
Satisfactory: 10X-20X CD-ROM drive, V.90 modem, docking connection	Average	Satisfactory: 2:22	Average: 8.1	✓	Good ✓/Fair	9/5, toll-free	1/1	632
Satisfactory: 12X-24X CD-ROM drive, V.90 modem, docking connection	Average	Satisfactory: 2:36	Average: 7.5	Good	Good ✓/Poor	24/7, toll call	1/1	633
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			

* Due to insufficient data from survey, score is based on responses to anonymous calls for tech support.

¹ Toll-free support for the first year only.

² Screen covered for two years, other parts for one year.

cheaper, but less durable, nickel-metal hydride batteries. A few companies cut costs by using passive-matrix screens, which have improved recently but still don't match the crispness of active matrix. None of the units we tested came standard with a DVD-ROM drive. See "What's the Difference?" below, for a summary of some typical differences between the cheap and the pricey.

CHEAP FIX

FEW SUB-\$1700 notebooks can hold a second battery or any other add-in device (like a second hard drive). That's because most of them come with fixed CD-ROM and floppy drives, a design configuration that costs less to build. This arrangement can be convenient, preventing users from forgetting to pack up external peripherals, but it also reduces the unit's flexibility.

Only one laptop we looked at, Sony's VAIO PCG-F250, has a modular bay.

Most notebooks selling for under \$1700 are all-in-one units, heavier than expensive ultrathin portables but lighter than feature-rich desktop replacement models. One-third of the devices we evaluated lack a docking connection, severely limiting their appeal as desktop replacements. Without a docking option, you'd have to go through the hassle of attaching your printer, monitor, mouse, and keyboard to the notebook every time you worked at your desk, and unplugging them every time you wanted to move the laptop.

IT'S MONEY THAT MATTERS

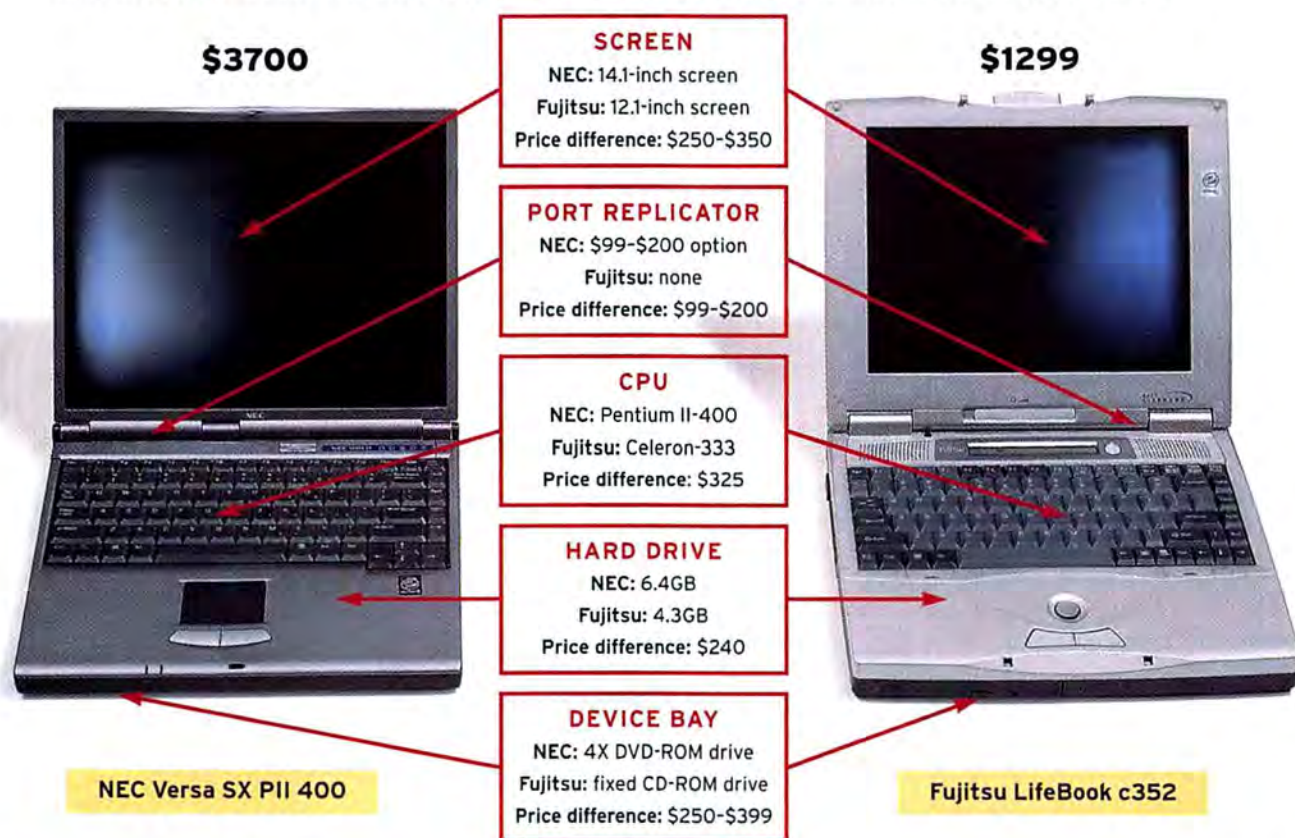
OF COURSE, a sub-\$1700 price alone doesn't make a notebook a good value. We found AMS Tech's \$1595 Roadster 15CXA 380 and WinBook's \$1599 XL 400 TFT a

bit overpriced for what they offer, and both failed to make the Top 10 chart. TigerDirect's \$1049 TigerBook Z3 nearly got on; it's one of only two new models we've seen for under \$1050 (the other, WinBook's \$999 XL 400i, wasn't available in time for this review). However, the TigerBook's low price doesn't get you a modem—a deal breaker for many consumers—and the passive-matrix screen is too hazy to permit comfortable viewing. For reviews of the Roadster, TigerBook, and WinBook XL 400 TFT, go to www.pcworld.com/nov99/cheap_notes.

If your heart is set on buying a new sub-\$1000 notebook, you have extremely limited choices. If your computing needs are very basic, consider a Windows CE-based device, like the \$899 Sharp Mobilon Pro PV-5000. (For more information on Win CE devices, see our May feature, "The ▶

What's the Difference?

What does a \$3700 notebook have that a \$1299 notebook doesn't? A lot. Here are just some of the trade-offs you'll encounter.



A man and a woman are roller skating on a paved path in a park. The man, wearing a blue polo shirt and white shorts, is pushing the woman. The woman, wearing a pink tank top and colorful shorts, is holding three balloons (yellow, pink, and blue) and has one leg kicked high in the air. They are both smiling and looking towards the camera. The background shows green grass and trees.

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THE SONY VAIO (top) offers a modular bay; **Toshiba's Satellite (right)** takes the speed honors; and **Acer's TravelMate** boasts a long battery life.

Prosignia 150, the fastest non-Celeron unit, turned in a PC WorldBench 98 score of 153—about 6 percent behind the Celeron-366-powered IBM ThinkPad I Series 1412. WinBook's XL 400 TFT, the lone K6-2-400 portable we tested and the only K6-2 here that used three levels of cache, performed a hair slower than the Prosignia. The TigerBook Z3, which comes with a K6-2-350 processor, was the slowest of all. Its PC WorldBench 98 score of 123 places it somewhere between a Pentium MMX-266- and a Pentium II-300-based notebook on the performance scale.

Skinny on Ultraportables," www.pcworld.com/may99/ultraportables.) And don't miss "Budget-Buying Tips" on page 180.

How Much Speed Is Enough?

Best performance: Toshiba Satellite 2595CDS

Worst performance: TigerDirect TigerBook Z3

IF YOU WRANGLE multimegabyte databases, spreadsheets, or graphics files for a living, a supercheap notebook will be out of its depth. You'll be much happier springing for a Pentium II-400 notebook stoked with 64MB or more of memory. Typically found in notebooks costing \$2500 to \$3500, the fastest processors coupled with plenty of RAM can shave precious seconds or even minutes off demanding tasks, like recalculating a 2MB spreadsheet. For example, the

Compaq Prosignia 150, a K6-2-380 notebook, took 4 minutes and 23 seconds to complete our automated Excel benchmark test, which reformats, recalculates, and sorts four worksheets. Compaq's Prosignia 165, a Pentium II-400, completed the same task 58 seconds faster.

Bargain notebooks typically ship with less expensive processors, such as Intel's Celeron and AMD's K6-2. They won't churn through tasks quite as quickly as the newest Pentium II systems, but machines with the top budget chips come close. The fastest model in our group, Toshiba's \$1499 Satellite 2595CDS, a Celeron-400, boasts a PC WorldBench 98 score of 170, hard on the heels of some Pentium II-333 portables we've tested.

We tested five notebooks with K6-2 chips, but all performed slower than their Celeron-equipped counterparts. For example, Compaq's K6-2-380-based

Battery of Decisions

Longest battery life: Chem USA ChemBook 7200

Shortest battery life: AMS Tech Roadster 15CXA 380

UNLIKE PERFORMANCE, battery life is not appreciably worse on bargain notebooks than on premium models. The average sub-\$1700 portable in our roundup ran for 2.7 hours, only about 10 minutes less than the average of all units tested for our monthly *Top 10 Notebook PCs*, which has no price limit. The reason: Although ultracheap notebooks sometimes have less powerful batteries than their high-toned counterparts, they also use less-demanding processors that draw less power.

Even so, you shouldn't brush off the type of battery a budget laptop uses. ►

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Inexpensive notebooks are more likely to contain the older nickel-metal hydride type of battery instead of a lithium ion power supply. NiMH batteries are typically about \$100 cheaper, but they last 20 to 40 minutes less on one charge and weigh almost half a pound more. In addition, NiMH batteries are said to handle only about 500 recharges (as opposed to 1000 for lithium ion power packs) before wearing out. And to prevent buildup of crystalline deposits, which can reduce battery life and capacity, users should completely discharge them occasionally. On the other hand, lithium ion batteries age quickly and must be replaced after a year or so, regardless of use.

Some notebooks permit you to use either NiMH or lithium ion batteries. If you have a choice, take your work habits into consideration before making a decision. Even though a lithium ion battery costs substantially more, it makes a better choice if you plan to use it every day.

The longest-running sub-\$1700 portables we tested came with lithium ion batteries. The stamina king, Chem USA's \$1499 ChemBook, ran for 3.3 hours on a single charge. The Acer, IBM, and Toshiba notebooks also lasted more than three hours. Most of the others survived for at least 2.2 hours. The AMS Tech's Roadster 15CXA 380, however, guzzled its nickel-metal hydride battery, pooping out after only 1.7 hours.

The Small View

Best screen: Toshiba Satellite 2595CDS
Worst screen: TigerBook Z3

IF YOU'VE BEEN ADMIRING the latest 14.1-inch and 15-inch notebook screens, too bad. You'll just have to live with pixel envy if you've got a firm

Staying Active on a Budget

ONE WAY FOR NOTEBOOK manufacturers to keep prices down is to build units with passive-matrix (dual-scan) screens. Active-matrix screens, common on more expensive models, always look sharp and bright, with no ghosting or washed-out edges. Unlike passive displays, they incorporate tiny transistors into each pixel. These transistors hold the voltage on the pixels continuously, so the screen doesn't have to be constantly refreshed. The design also allows manufacturers to use a different type of liquid crystal material that permits a wider viewing angle, making active-matrix screens a better choice for

informal presentations. Nevertheless, today's passive-matrix screens have come a long way:

- **Passive Improvements** Passive-matrix screen quality has improved dramatically over the last few years. Of the three laptops in our roundup with passive-matrix screens, the Toshiba Satellite 2595CDS's 13-inch display came closest to matching the quality of active matrix, with nary a faded or splotchy patch. Toshiba says its proprietary dual-scan technology uses a thinner design than most, including a less-goopy LCD fluid, to improve redraw time, the key to better image quality. The only trade-off is faint cursor ghosting, which occurs when the screen can't redraw the motion quickly enough.
- **Looking Better** Many vendors now use a type of second-generation passive-matrix technology called high-performance addressing. The Sony VAIO PCG-F250's screen is an example: Display quality was adequate, though not as good as the Toshiba's; the cursor disappeared temporarily whenever we moved it too quickly. But worse is the TigerBook Z3's older passive screen, which strained our eyes.



budget. Most notebook screens in the sub-\$1700 category top out at 12.1 inches, with a maximum resolution of 800 by 600 pixels. Only two machines on our Top 10 chart—the Toshiba Satellite 2595CDS and the Sony VAIO PCG-F250—pack screens as large as 13 inches.

Smaller screens make working with big spreadsheets and other panoramic documents a bit more challenging. They also require extra scrolling when you're Web surfing or reading a long file. But even those of us who look at a desktop PC's 17-inch monitor all day quickly got used to a 12.1-inch notebook screen and found it more than adequate for most tasks.

And petite screens have one advantage: They fit better in confined work spaces, such as on an airline tray table—even when the passenger in front of you has reclined his or her seat all the way back.

Screens on today's inexpensive notebooks look much better than their predecessors did just a few years ago. Until recently, buying a cheap laptop meant you had to endure a pale, streaked passive-matrix display that could not be viewed from oblique angles. These days, most ultracheap notebooks use the same sharp, bright active-matrix screen technology as their higher-priced siblings (see "Staying Active on a Budget," above). And all active-matrix displays produce the same high-quality output.

Advanced Graphics Port, the bus that promises to deliver more-sophisticated high-end graphics by giving a PC's video chip set access to main memory, is rarely found in inexpensive laptops. Only three portables here have it. Eventually, AGP will become standard on all notebooks.

Continued on page 179 ►

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Continued from page 170
but until that time don't worry if you can't afford it. Unless working with 3D graphics is a big part of your laptop use, you probably won't miss this feature.

Cramped Quarters

Largest hard drive: IBM ThinkPad, Chem USA ChemBook

Smallest hard drive: TigerBook Z3, WinBook XL 400 TFT

THE TYPICAL budget notebook comes with a 3.2GB or 4.3GB hard drive—a far cry from the 8GB, 10GB, and 14GB behemoths you can get in powerful notebooks like Dell's \$2874 Inspiron 7000 A366LT and Micron's \$3599 TransPort NX. Among sub-\$1700 units, all ten notebooks that made the chart have 4GB or larger hard drives.

If you regularly generate multimegabyte files—like digital photographs, large spreadsheets, or massive databases—space can disappear quickly on a smallish

hard drive. Windows 98 alone can take up as much as 300MB. Figure in another 100MB to 200MB for a productivity suite like Microsoft Office 97, plus the space you'll need to run a few other applications, files downloaded from the Internet, and files you create, and you've lost a good chunk of storage without even trying.

But if you're an average user with modest computing needs—for example, a little word processing, some e-mail, and a handful of other small applications—a 4.3GB hard drive should give you plenty of room. (Our Best Buy, the Compaq Prosignia Notebook 150, comes with an adequate 4GB hard drive.)

You'll also save some money by sticking with a smaller drive; each incremental increase (from 3.2GB to 4.3GB to 6.4GB, and so forth) costs about \$200. Even so, you'd probably be unwise to settle for less than 3.2GB. Hard drives with 1.2GB or 2.3GB of space are rapidly disappearing, for good reason: With today's software, they're just too claustrophobic.

Gateway Support Leads the Pack

Best vendor support: Gateway
Worst vendor support: TigerDirect

IN MOST CASES, companies provide the same basic support plan for all their notebook lines. If a company's \$3000 laptop comes with unlimited toll-free 24-hour technical support, so does its \$1400 model. You'll also get the same generous—or skimpy—documentation.

Beyond the basics, however, low- and high-end notebooks may lose some of that parity. For instance, none of the sub-\$1700 notebooks in this review come standard with on-site service. Such service can be purchased as an option (ranging from \$99 to \$278) on notebooks from Compaq, Fujitsu, Hewlett-Packard, IBM, and Toshiba. You're more likely to receive on-site service as a standard feature on these vendors' higher-end units.

Different vendors have different support policies, some imposing restrictions on when you can get help or charging extra for service. Most of the notebooks here come with free, unlimited, around-the-clock tech support on a toll-free line. Of the exceptions, HP offers 24-hour support but makes you pay for long-distance calls, and Sceptre's lines are open for just 9 hours on weekdays.

If you're worried about the high cost of repairing a laptop, then you'll be interested to know that of the vendors here, only Gateway provides a three-year parts and labor warranty at no extra cost. TigerDirect's parts and labor warranty lasts just one year. ▶



THE IBM ThinkPad (right) had the most comfortable keyboard; the Gateway Solo 2500SE comes with a three-year warranty on parts and labor.

Budget-Buying Tips

A BARGAIN IS IN THE EYE of the beholder. If you simply can't afford to spend much money, even a \$999 notebook might seem like an extravagant purchase. Good news: You can pay less, as long as you're willing to make a few concessions. Here are some tips on hunting for bargain-basement notebooks:

- **Buy a remanufactured or refurbished notebook.** Some notebook companies, including Dell, Gateway, and IBM, resell systems that have been returned by customers. The notebooks are retested, then offered for resale at prices usually hundreds of dollars below their original cost. The drawbacks: Standard warranties may not apply, so check to see how long the vendor guarantees its refurbished equipment. Also, you won't be able to configure the notebook the way you want it, and the selection is often limited to older models.

- **Check out garage sales.** If you're an adventurous type willing to forgo the safety net of a warranty, you may be able to get an even better deal from a fellow user who has a laptop to unload. If an auction site like EBay (www.ebay.com) seems too intimidating, try Dell's Dellauction.com (www.Dellauction.com), which also has listings for other vendors' products.

- **Sign up for Internet service.** You need an Internet service provider *and* a cheap notebook? Solve both problems at once by looking for a special rebate program linked to a specific ISP. At least that's what the companies want you to do. Compaq, for instance, offers a \$400 rebate on its Prosignia notebooks when you order a three-year subscription to CompuServe Internet Service (at \$22 per month). By signing up with CompuServe, you can slash the cost of the Prosignia Notebook 150 to as little as \$1099. While the immediate savings are undeniable, beware of going this route: Besides settling for a notebook that you may not be in love with, you may regret committing to one ISP for such a long time.



IBM Keyboards Rule

Best keyboard: IBM ThinkPad

Worst keyboard: none

CHEAP DESKTOP PCs often come with cheap keyboards. But the keyboards on standard-size portables from the same company don't vary much, regardless of price. Keyboards on a \$1200 notebook and a \$3000 one from the same vendor should have similar (if not identical) layouts and comfort levels.

Pointing devices follow the same general rule. Most of our bargain notebooks come with touchpads that are comparable to those available on more expensive models. A few, notably IBM and Toshiba, include the costlier eraserhead-style pointers. None of the sub-\$1700 models, however, offer both eraserhead and touchpad pointing devices, an ergonomic extra found on some pricier machines.

Keyboards on all the budget portables we tested felt comfortable, with a few standouts. The IBM ThinkPad features the best mouse buttons. Instead of a stiff,

hard plastic button, the ThinkPad offers two soft, red-accented buttons plus a large scroll bar. The Toshiba Satellite 2595CDS also makes clicking comfortable, with two stacked, rubbery-feeling mouse buttons that are crescent-shaped.

Want the quietest, softest-feeling keyboard? Consider the ChemBook 7200: The weary traveler in the next seat can go right on snoozing while you type throughout the flight without a qualm. The noisiest, loosest-feeling keyboard belonged to the \$1699 Gateway Solo 2500SE.

Only a few keyboard layouts gave us trouble. The <Page Up> and <Page Down> keys on the Acer TravelMate 512T are aligned horizontally instead of vertically, the standard and more intuitive arrangement. The HP OmniBook XE2 uses icons and symbols instead of standard text labels for many keys—such as an x-ed-out arrow for <Backspace>—adding to the learning curve. Some testers liked the Fujitsu's ErgoTrac, a large rocking button that replaces the touchpad, while others found it hard to get used to. We recom-

mend that you try out the keyboard, if at all possible, before buying a notebook.

The most versatile keyboards in the group belong to the Acer, Compaq, Sceptre, Sony, and Toshiba mod-

els. All of them can be programmed to launch your favorite application or most frequently used document when you press a key or mouse button. The Compaq's keyboard supports a winning total of eight shortcuts—two function keys, both mouse buttons, and four proprietary buttons at the bottom of the wrist rest. Once set up, they may save you from ever having to create another desktop shortcut or visiting the Start menu.

Now Playing

Best multimedia: Compaq Prosignia

Worst multimedia: TigerBook Z3

IN GENERAL, budget notebooks don't make great multimedia machines. Most have too little video RAM or too weak a graphics chip to support an external DVD-ROM drive you must add later through a PC Card; and none of the notebooks here offers ports for plugging in a joystick or music synthesizer.

Still, you can occasionally find an economy model with a multimedia bonus ►

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or two. For instance, the Gateway Solo 2500SE and the WinBook XL have TV-out jacks—ports that let you connect the notebook to a TV via an inexpensive cable and then use the big screen for presentations.

The Acer TravelMate 512T is one of several notebooks we looked at for this review that can act as a stand-alone CD player, another nice option for after-hours entertainment. Like the HP and IBM, it comes with external buttons for controlling volume and starting, stopping, and changing tracks on music CDs. IBM boasts the slickest implementation, including an LCD that displays the current track.

Buy Now, Upgrade Later—Maybe

Best expandability: Chem USA

ChemBook 7200

Worst expandability: Fujitsu

LifeBook c352

NERVOUS ABOUT committing to a bargain notebook? You can quell some of your fears by choosing one that permits upgrades later. And if you pick a model that allows you to do the upgrading yourself, you won't lose precious time taking the notebook to a service center or shipping it to the vendor and waiting for it to be returned to you.

sending the unit back to the vendor or taking it to a local service center.

A multipurpose bay gives your notebook numerous upgrade options, such as a second battery, an LS-120 drive, or an Iomega Zip drive. But it also ratchets up the price, so this feature is predictably rare in low-end notebooks.

GOOD BUYS

THE DREAM PORTABLE of skinflints is a sub-\$1000 notebook. But laptops at that price won't have many extra—or basic—features. The high demand for LCD panels, which can account for a third of the cost of a laptop, will probably continue to outpace supply well into next year and keep notebook prices from plummeting. But as Pentium III notebooks hit store shelves en masse in 2000, you can expect to see increasingly better bargains.

Sub-\$1700 notebooks run slower, have fewer features, and are less upgradable.

Strictly speaking, Compaq's Prosignia doesn't qualify as a stand-alone CD player, since you must turn on the notebook before using the CD-ROM drive. But it offers very nearly the same convenient audio controls as the others. Function keys let you stop, start, eject, or pause the CD and change tracks. Two buttons on the protruding bottom edge of the wrist rest let you control sound volume with the lid closed. In contrast, the Sceptre's controls were the least convenient to operate: You can't pause a track, and the controls are interspersed with system status lights at the top of the keyboard (on the other laptops, the controls sit on the case front).

Compaq Prosignias are the only notebooks we've found that support truly high-quality audio—by notebook standards. The Prosignia 150's booming speakers, embedded in the thick wrist rest, pump out strong distortion-free sound with plenty of bass, making it a terrific low-cost presentation machine. IBM's ThinkPad and the Sceptre produced the next-best sound. The TigerBook, WinBook XL, and AMS Tech Roadster sounded the worst.

The Sony wins points for including the most unusual multimedia extra: an IEEE 1394 port that lets you plug in a digital camcorder or camera and save images and video on the notebook.

Adding memory is the easiest way to boost performance, especially if you're starting with only 16MB or 32MB. Doubling the amount of RAM can increase speed by as much as 8 percent—about the same improvement you'd get by upgrading to the next higher processor. With a couple of exceptions, our roundup notebooks make it fairly easy for users to upgrade RAM—they need only remove a few screws to reach the memory compartment. The TigerBook Z3 and the AMS Tech Roadster require you to also take out the heat sink and fan to access memory—which can be an unwelcome extra step for some people.

Few notebooks under \$1700 have user-upgradable hard drives, though this is a common feature in top-of-the-line models. Of those here, ChemBook 7200's hard drive is the easiest to remove; it's held in place by a single, large screw that can be taken off with a coin. Upgrading the Sony's hard drive involves the biggest hassle, since you must remove multiple tiny screws and lift the keyboard out. The hard drives for the Acer, Fujitsu, and IBM notebooks can't be upgraded at all. The other laptops in this review can be upgraded only by

For now, though, the best deals to be had sell for between \$1200 and \$1700. And if you, like ASU's Peter Lafford, aren't too fussy, you'll find that the pickings are good at the low end of that scale.

"Our Toshiba is great for just about anything," Lafford says. He adds, "At some point I might throw some more memory into it, but we're doing fine with 32MB for the moment. The only thing I'm sort of interested in is a new Toshiba with DVD-ROM, but I don't have any DVD-ROM applications yet, so that's just gadget envy."

Carla Thornton regularly covers notebooks for PC World. Testing was conducted by Elliott Kirschling and Nancy Miller of the PC World Test Center.

More Online



WE EVALUATED these systems along with the others, but they didn't score high enough to make the chart. Visit PC

World Online (www.pcworld.com/nov99/cheap_notes).

- AMS Tech Roadster 15CXA 380
- TigerDirect TigerBook Z3
- WinBook XL 400 TFT

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CYRIX MII™-366 Processor	\$348
AMD-K6™-2/400	
w/3DNow!™ Technology	\$378
AMD-K6™-2/350	
w/3DNow!™ Technology	\$348

VOYAGER XV AMD-K6™-2/400 \$818

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- MS® Windows® 98
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CYRIX MII™-366 Processor	\$788
CYRIX MII™-333 Processor	\$778
AMD-K6™/450	
w/3DNow!™ Technology	\$948
AMD-K6™/400	
w/3DNow!™ Technology	\$888
AMD-K6™-2/450	
w/3DNow!™ Technology	\$828
AMD-K6™-2/350	
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- 3D Sound System with SubWoofer
- ATX Mid Tower Case
- 104 Win 98 Keyboard, Microphone
- MS® Windows® 98 & Intelli-Mouse
- Corel WordPerfect Office 2000 w/Print Office
- 3 Year Limited Warranty
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CYRIX MII™-366 Processor	\$1178
CYRIX MII™-333 Processor	\$1168
AMD-K6™/400	
w/3DNow!™ Technology	\$1248
AMD-K6™-2/450	
w/3DNow!™ Technology	\$1228
AMD-K6™-2/400	
w/3DNow!™ Technology	\$1218
AMD-K6™-2/350	
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- 44X CD-ROM Drive
- Aureal A3D™ PCI Sound Card
- 56K v.90 Voice Fax Modem
- 1.44MB Floppy Drive
- Power 3D Speaker System
- ATX Mid Tower Case
- 104 Win 98 Keyboard, Microphone & Mouse
- MS® Windows® 98
- Corel WordPerfect Office 2000 w/Print Office
- 3 Year Limited Warranty
- 1 Year On-Site Service/24x7 Tech. Support

Pentium® III Processor 600MHz	\$1428
Pentium® III Processor 550MHz	\$1158
Pentium® III Processor 533MHz	\$1048
Pentium® III Processor 500MHz	\$918
Pentium® III Processor 450MHz	\$818
Celeron® 500MHz with 128KB	\$778
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Celeron® 400MHz with 128KB	\$678

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- 44X CD-ROM Drive
- Aureal A3D™ PCI Sound Card
- 56K v.90 Voice Fax Modem
- 1.44MB Floppy Drive
- 3D Sound System with SubWoofer
- ATX Mid Tower Case
- 104 Win 98 Keyboard, Microphone & Mouse
- MS® Windows® 98
- Corel WordPerfect Office 2000 w/Print Office
- 3 Year Limited Warranty
- 1 Year On-Site Service/24x7 Tech. Support

Pentium® III Processor 600MHz	\$1648
Pentium® III Processor 550MHz	\$1388
Pentium® III Processor 533MHz	\$1278
Pentium® III Processor 500MHz	\$1148
Celeron® 500MHz with 128KB	\$998
Celeron® 433MHz with 128KB	\$958
Celeron® 400MHz with 128KB	\$918
Celeron® 366MHz with 128KB	\$898

ENDEAVOR GX Pentium® III 533MHz \$1678

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- TNT 16MB AGP Video Graphics
- 3dxfx Voodoo12MB 2X AGP Video
- 6X DVD-ROM Drive
- Aureal A3D™ PCI Sound Card
- 56K v.90 Voice Fax Modem
- 1.44MB Floppy Drive
- 3D Sound System with SubWoofer
- ATX Mid Tower Case
- Multimedia Keyboard
- MS® Windows® 98 & Intelli-Mouse
- Corel WordPerfect Office 2000 w/Print Office
- 3 Year Limited Warranty
- 1 Year On-Site Service/24x7 Tech. Support

Pentium® III Processor 600MHz	\$2058
Pentium® III Processor 550MHz	\$1798
Pentium® III Processor 500MHz	\$1548
Pentium® III Processor 450MHz	\$1458
Celeron® 500MHz with 128KB	\$1398
Celeron® 433MHz with 128KB	\$1358
Celeron® 400MHz with 128KB	\$1318
Celeron® 366MHz with 128KB	\$1298

ENDEAVOR SX Pentium® III 550MHz \$1898

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- 2 High Speed Serial, 1 Game, 1 Parallel, 2 USB
- 256MB 100MHz SDRAM
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- 19" .26dp 1600x1200 Digital Monitor
- ATI Fury 32MB
- 6X DVD-ROM Drive
- Aureal A3D™ PCI Sound Card
- 56K v.90 Voice Fax Modem
- 1.44MB Floppy Drive
- 3D Sound System with SubWoofer
- ATX Mid Tower Case
- Multimedia Keyboard
- MS® Windows® 98 & Intelli-Mouse
- Corel WordPerfect Office 2000 w/Print Office
- 3 Year Limited Warranty
- 1 Year On-Site Service/24x7 Tech. Support

Pentium® III Processor 600MHz	\$2198
Pentium® III Processor 533MHz	\$1828
Pentium® III Processor 500MHz	\$1698
Pentium® III Processor 450MHz	\$1598
Celeron® 500MHz with 128KB	\$1548
Celeron® 433MHz with 128KB	\$1498
Celeron® 400MHz with 128KB	\$1458
Celeron® 366MHz with 128KB	\$1438



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Eyes on the Price

17-Inch

Monitors for *Under* \$400

Sporting flatter screens and smaller cases, the latest models sell for hundreds of dollars less than last year.

BY SUSAN SILVIUS

TWIN GEMS: Mitsubishi's Diamond Plus 71 (left) and Dell's UltraScan P780 deliver great image quality without breaking the bank.

as

an IT purchaser at Fireman's Fund, a Northern California-based insurance carrier, Don Moriguchi used to find his work a pain in the neck.

The source of his problem wasn't his boss or his responsibilities—it was his undersize PC monitor. "I got neck aches from leaning in and squinting at the screen," he says. "My company approved a 17-inch monitor for me, and since I've been using it, my neck problems have gone away."

Even if your monitor isn't putting the hurt on you, now's a great time to consider buying a larger model. As consumers demand larger screens, and improved CRT technologies have become cheaper to implement, the average price of a 17-inch display has dropped 23 percent over the past year. During that time, ViewSonic slashed the price of its PT775 from \$649 to \$398. Your dollar also buys you a better product these days—one with a flatter screen, sharper focus, and a shorter picture tube (allowing for a smaller case). But be aware that inexpensive can still mean inferior. You'll compromise image quality and/or features on 17-inches priced under \$315—the lowest price in our Top 10.

KEEPING UP APPEARANCES

WE LOOKED AT TWO DOZEN 17-inch displays, including 16 new models and eight past Top 10 units (the longtime Best Buy IBM P72 has been discontinued). To meet the challenge of today's sharper, smaller-pitch tubes, we made it harder than ever for a display to achieve a top score. We looked for accurate, consistent,

deep colors; perfectly square geometry; and the ability to clearly display 6- to 48-point black and colored text on white and colored backgrounds. We also adjusted our evaluation criteria to give more weight to price and less to features.

Our higher image-quality standards and increased emphasis on price led to some surprises. On the strength of its competitive price—and much-improved picture quality—the Mitsubishi Diamond Plus 71 rose from the pack to become the top-ranked Best Buy. A new version of an older model, this \$349 monitor earned the only Excellent score on our text quality tests, and was one of only three to ace the graphics tests.

The newcomer Dell UltraScan P780 snapped up our second-place Best Buy, thanks to its terrific image quality (Very good text and Excellent graphics), reasonable price, advanced controls, and Dell's long-overdue increase in the warranty period from one to three years. The P780 didn't quite match the Mitsubishi in text quality, but it's a fine choice even for text-heavy applications.

Each of the next four monitors in our Top 10, models from Iiyama, Samsung, Compaq, and ViewSonic, earned Very good scores on both text and graphics. ViewSonic's inexpensive, all-purpose GF775 takes seventh place, and is followed by the shallow-cased CTX PR711. Sony's snappy, slate-blue, multimedia HMD V200/L earns the ninth spot thanks to a stylish design and terrific graphics. DecaView's sophisticated PA 380 rounds out the Top 10.

Among the also-rans, Sampo's AlphaScan 712U came closest to making the list. Its terrific \$289 price was offset by mediocre

Best Buys



A LOW PRICE and the best overall image quality earn the **Mitsubishi Diamond Plus 71** a Best Buy, while **Dell's UltraScan P780** grabs another with vivid graphics and an almost perfectly square screen.

TOP 10 MONITORS

FEATURES COMPARISON

	17-INCH MONITOR	Street price (8/15/99)	Overall rating	Quality of text/graphics	Tube manufacturer	Pitch type (mm)	Rated/tested viewable area (inches)	Max. refresh rate at 800 by 600/1024 by 768 (Hz)	Depth (inches)	BNC ports *
1	 Mitsubishi Diamond Plus 71 800/843-2515 www.mitsubishi-display.com	\$349	90	Excellent/Excellent	Mitsubishi Diamondtron	.25 stripe	16/15.9	110/85	16.7	○
2	 Dell UltraScan P780 800/388-8542 www.dell.com	\$374	86	Very good/Excellent	Sony FD Trinitron	.24-.25 variable stripe *	16/15.9	135/100	16.5	○
3	Iiyama VisionMaster Pro 410 800/394-4335 www.iiyama.com	\$429	85	Very good/Very good	Mitsubishi Diamondtron NF	.25-.27 variable stripe *	15.9/15.7	140/115	16.5	●
4	Samsung SyncMaster 700p Plus 800/726-7864 www.samsungmonitor.com	\$359	85	Very good/Very good	Samsung	.26 dot	16/15.6	152/120	17.5	○
5	Compaq P700 800/345-1518 www.compaq.com/monitors	\$469	85	Very good/Very good	Sony FD Trinitron	.24-.25 variable stripe *	16/16	120/110	16.7	○
6	ViewSonic PT775 800/888-8583 www.viewsonic.com	\$398	85	Very good/Very good	Mitsubishi SonicTron	.25-.27 variable stripe *	16/15.9	154/117	17.1	●
7	ViewSonic GF775 800/888-8583 www.viewsonic.com	\$369	83	Good/Good	LG Electronics FlatTron	.24-.27 variable stripe *	16/16	146/116	17.8	○
8	CTX PR711 800/888-9052 www.ctxintl.com	\$315	83	Very good/Good	Sony Trinitron	.25 stripe	16/15.9	135/117	15.6	○
9	Sony HMD V200/L 800/352-7669 www.sony.com/displays	\$500	83	Good/Excellent	Sony FD Trinitron	.24-.25 variable stripe *	16/15.8	85/85	16.5	○
10	DecaView PA 380 888/707-6688 www.decaview.com	\$469	82	Very good/Good	Mitsubishi Diamondtron	.25 stripe	16.9/15.7	85/85	16.2	●



Best Buy

● Yes
○ No

* Ten judges rate a monitor's text and graphics quality. We evaluate each unit on how well it displays typical business letters, a newsletter, spreadsheets, Web pages, and scanned images. The overall rating is based on text and graphics (25 percent each), price (25 percent), features and ease of use (20 percent), and service and support (5 percent). The best possible overall rating is 100. Data based on tests designed and conducted by PC World Test Center. All rights reserved.

graphics quality, though it does do a better-than-average job of displaying text, so it's worth a look if you primarily view spreadsheets or text documents. Older models suffered the most from our newly revamped tests and adjusted ratings. The AcerView 79g slipped eight spots to 17th place, the NEC MultiSync E750 fell from 10th to 18th, and the Optquest V73 plummeted from 4th to 16th.

SEEING DOUBLE

TO TARGET A RANGE of users, most vendors offer two or more 17-inch models. We ordered two different monitors from five vendors: Compaq, Mitsubishi, NEC, Samsung, and ViewSonic. Only the ViewSonic pair both made the Top 10. We noticed significant differences in image quality between the other vendors' two monitors, especially the Compaqs. The \$469 P700 takes 5th place thanks to crisp text and rich graphics quality, while the \$329 S700 languishes in 22nd due to subpar text and graphics.

Vendor service and support have improved as monitor prices have fallen. Dell recently increased its warranty period from one year to three. Most companies, now including ViewSonic, offer around-the-clock telephone technical support, and all the vendors included in this roundup except for Sony cover their displays for at least three years. To extend the one-year warranty period on the Sony HMD V200/L, you have to pay extra.

HERE'S THE PITCH

THANKS TO FLATTER and smaller-pitch tubes, today's displays have finer degrees of focus and detail than their predecessors. But monitor specifications can be confusing. In particular, be wary of horizontal pitch measurements, which are not directly

comparable to conventional dot or stripe pitch specs. Horizontal dot or stripe pitch measures a shorter distance from one red dot to another or one blue stripe to another than conventional diagonal measurements, which might lead you to think you're getting a finer-pitched tube than you are. A .22mm or .24mm horizontal dot pitch is roughly equivalent to a .26mm or .28mm diagonal dot pitch. Some companies report both numbers, adding to the confusion. When you're looking at different monitors' pitch specs, make sure you're comparing apples to apples. ▶

THE SOLID Compaq P700 (left) has high-end controls, while **Sony's HMD V200/L** can add some 21st-century flair to your dreary desktop.

USB connectors installed/optional	On-screen controls						Compliance		Support			Product info number ¹
	Screen position/size	Pincushion/barrel	Trapezoid/keystone	Focus/convergence	Image tilt/manual degauss	Color temperature/RGB control	MPR-II low emission	TCO shielding ('95/'99)	Warranty (years)	Toll-free support hours	Weekend support	
O/O	●/●	●/●	●/●	O/O	●/●	●/●	●	'95	3	12	●	610
O/●	●/●	●/●	●/●	O/●	●/●	●/●	●	'99	3	24	●	-
O/●	●/●	●/●	●/●	O/●	●/●	●/●	●	'95	3	12	○	611
O/O	●/●	●/●	●/●	O/O	●/●	●/●	●	'95	3	24	●	612
O/●	●/●	●/●	●/●	●/●	●/●	●/●	●	'95	3	24	●	613
●/O	●/●	●/●	●/●	●/●	●/●	●/●	●	'95	3	24	●	614
O/O	●/●	●/●	●/●	O/●	●/●	●/●	●	'99	3	24	●	615
O/O	●/●	●/●	●/●	O/●	●/●	●/●	●	'92	3	12	○	616
O/●	●/●	●/●	●/●	O/●	●/●	●/●	●	'95	1	24	●	617
O/O	●/●	●/●	●/●	●/●	●/●	●/●	●	'95	3	10	○	618

¹ Specialized connector used with some high-end graphics cards for complex graphic design and publishing.

² For more information about all products in this table, select product information number 901.

³ Uses an aperture grille tube with a variable stripe pitch that is smaller at the center than around the perimeter.

How much difference does pitch really make? According to our test results, a whole lot. Because a smaller pitch (whether dot or stripe) usually translates to sharper focus and finer detail, it's no surprise that larger-pitch tubes no longer stack up in our image quality tests. All the monitors with a pitch of greater than .25mm turned in comparatively weak image quality scores. Displays that use stripe pitch tubes of .25mm or smaller dominate the Top 10, in which only the fourth-place Samsung SyncMaster 700p Plus uses a dot pitch tube.

In addition, all but three of the Top 10 monitors use new flat Diamondtron or Trinitron tubes, which produce crisp text, squarer pictures, and pronounced 3D effects on photographic images—a marked improvement over earlier generations of flat CRTs. You can still see razor-thin wires across the screen, which are most noticeable on screens with lots of white space, but we quickly became used to them during our tests.

WHITHER USB?

CONSUMER ENTHUSIASM for monitors equipped with Universal Serial Bus connectivity seems to have died on the vine—less than 10 percent of all new models sold these days include that option. Among those in our Top 10, only the ViewSonic PT775 arrived with integrated USB; four others offer it as an option ranging from \$49 to \$99 extra. USB allows you to tweak the monitor's adjustment controls from within Windows, but to take advantage of the technology's daisy-chaining connectivity, your peripherals (such as printers, external hard drives, and joysticks) must have a USB connector as well. For that reason, USB makes sense only if you're starting from scratch or replacing outdated peripherals. If the monitor you want doesn't integrate USB ports into its base, you can always add a stand-alone hub. Not surprisingly, with such hubs selling for \$60 or less, fewer consumers have found integrated USB a compelling option. ▶

Focus on Ergonomics

AFTER WORKING in front of your computer screen for more than an hour or two, you might find you have a headache, a sore neck, blurred vision, or dry, watery, or red eyes. If so, you're probably suffering from eyestrain. According to the American Optometric Association, eyestrain is the leading health-related complaint among computer users. The AOA coined the term *Computer Vision Syndrome* to describe the painful symptoms that affect up to three-fourths of all computer users.

Though there's no concrete evidence that eyestrain leads to permanent damage, the AOA considers many computer-related vision problems to be repetitive strain injuries whose long-term effects have not yet been assessed. Luckily, a growing awareness of

the problem in the medical community has spawned a variety of free and accessible information about how to prevent and treat such injuries.

GET EDUCATED

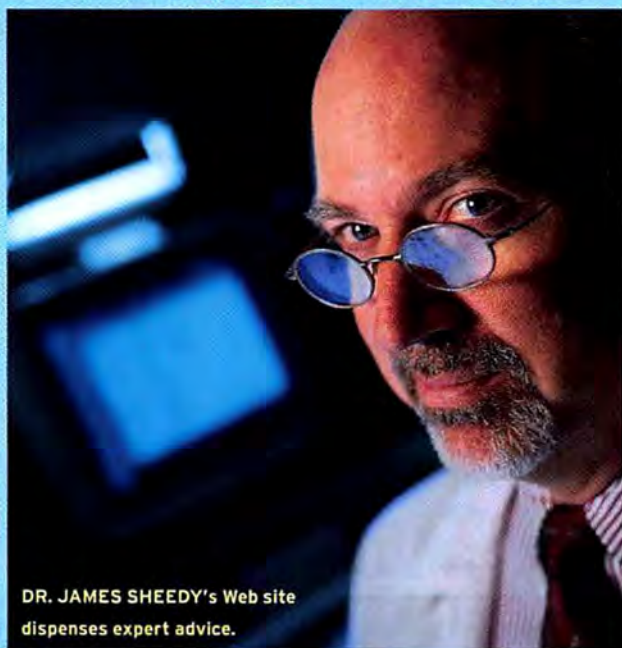
ONCE YOU'VE rested your eyes, read up on eyestrain on the Web. One of the most comprehensive and useful resources on the topic is www.doctorergo.com, which dispenses expert advice on visual ergonomics and includes a self-evaluation survey that relates your symptoms to problems in your work area. Designed by Dr. James Sheedy, a clinical professor at the University of California, Berkeley's, School of Optometry and founder of the

school's Computer Eye Clinic, the free test offers quick but sound advice. The Mayo Clinic (www.mayohealth.org) and American Optometric Association (www.aoanet.org) also provide free electronic newsletters that describe advanced symptoms of computer-related eyestrain, such as delayed focusing and altered color perception, and provide tips for minimizing visual stress by changing your work habits, the design of your

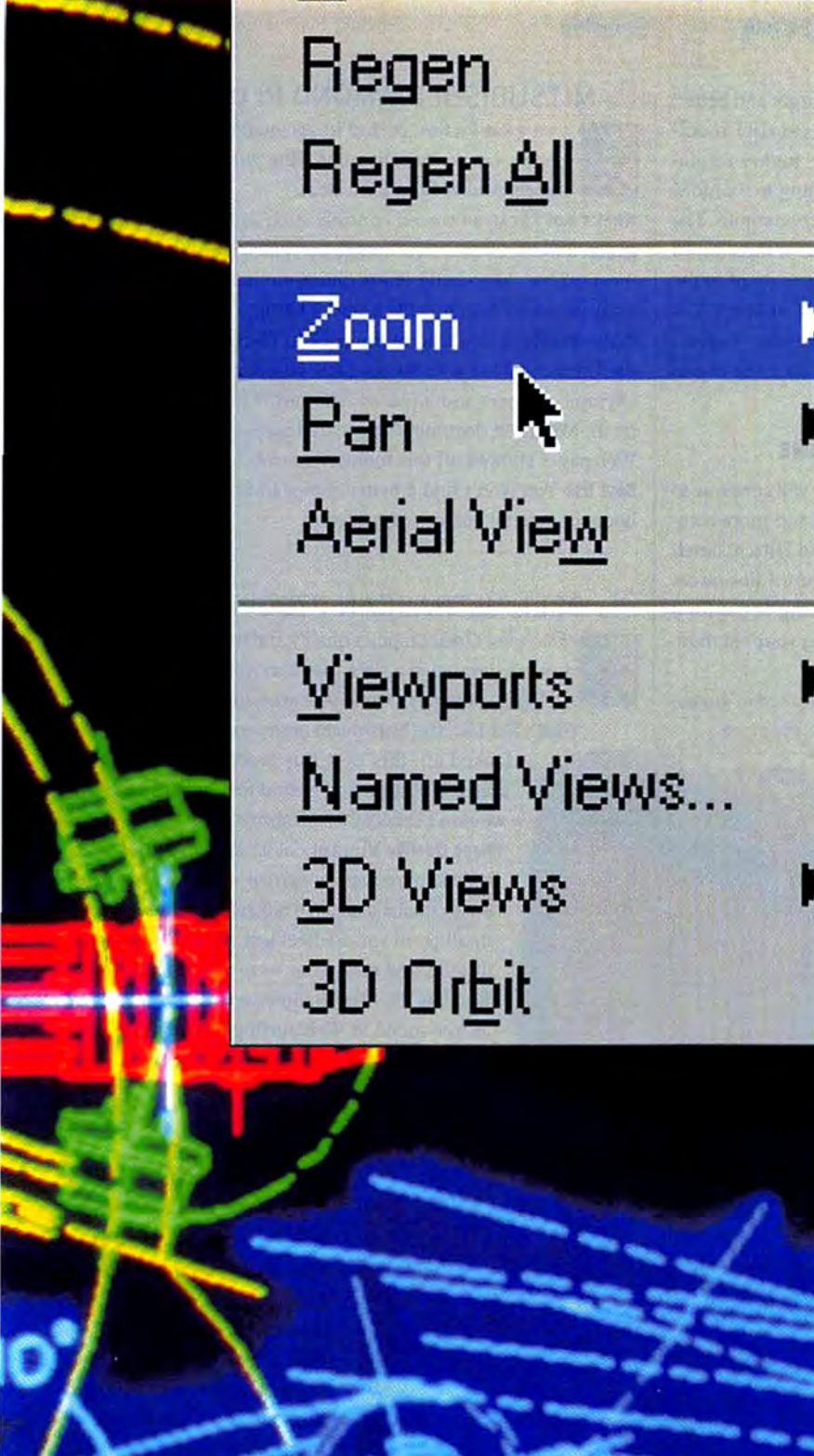
workspace, and maybe your glasses prescription.

GET TESTED

REPUTABLE eye-care organizations offer three suggestions to computer users: Have your eyes checked by a certified eye care practitioner who tests for computer-related eyestrain; if possible, obtain an ergonomic assessment of your workspace; and take frequent breaks when using your computer for long periods.



DR. JAMES SHEEDY's Web site dispenses expert advice.



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Liquid crystal displays, which continue to get larger and better, might eventually succeed conventional tube-based CRT monitors. But as long as CRTs cost less and provide higher resolutions, they'll continue to dominate sales, according to Stanford Resources, a San Jose, California-based research institute. The average 15-inch LCD sells for around \$1000—two or three times the price of a similar-size CRT. Though road signs point to the proliferation of different types of digital displays, analog CRTs won't be left in the dust soon. For one thing, vendors haven't reached an all-encompassing agreement on the form the digital connector should take.

THE SHAPE OF THINGS TO COME

FOR NOW, BOTH ANALOG and digital monitors will continue to improve. CRT monitors should become lighter and more compact as tube makers such as Mitsubishi, Sony, and Hitachi develop lighter glass and smaller electron guns. Stanford Resources says CRT prices are about as low as they're going to get for a while. So if you've been thinking about replacing your old monitor, now might well be the time to buy.

As you shop, don't underestimate the importance of image quality, as blurry or uneven focus can strain your eyes (see "Focus on Ergonomics," page 190). Though even the best displays can't prevent eyestrain, you can lower your risk by choosing a sharply focused monitor that you can adjust to fit your needs.

1. MITSUBISHI DIAMOND PLUS 71



What's Hot Picture-perfect image quality on both text and graphics make the Diamond Plus 71 the best all-around choice. And at \$349 it's a steal.

What's Not Lacks advanced controls such as focus and convergence, and its refresh rates, though acceptable, top out well below most others'. Mitsubishi offers phone support for just 12 hours a day (most vendors provide 24-hour help).

Image Quality Well ahead of the pack in both text and graphics, the Diamond Plus 71 delivered accurate colors in our photos of Olympic runners and a glazed fruit tart, which looked bakery-fresh. Multifont documents appeared laser-sharp, and colorful Web pages showed off this monitor's assets to the fullest.

Best Use You won't find a better choice in this category for any home or general business application.

2. DELL ULTRASCAN P780



What's Hot Great graphics quality and easy-to-navigate controls are housed in a sleek case that will fit in tight spaces. Dell now provides a three-year warranty.

What's Not Like the Mitsubishi (and most other models we looked at), this Best Buy lacks BNC ports, integrated USB connectors, and focus control, but we wouldn't expect those features at this price point.

Image Quality Vibrant colors and an almost perfectly square picture earned the P780 an Excellent graphics score. We noticed blurriness on our small-point spreadsheet test, but our Word documents and newsletter were crystal clear.

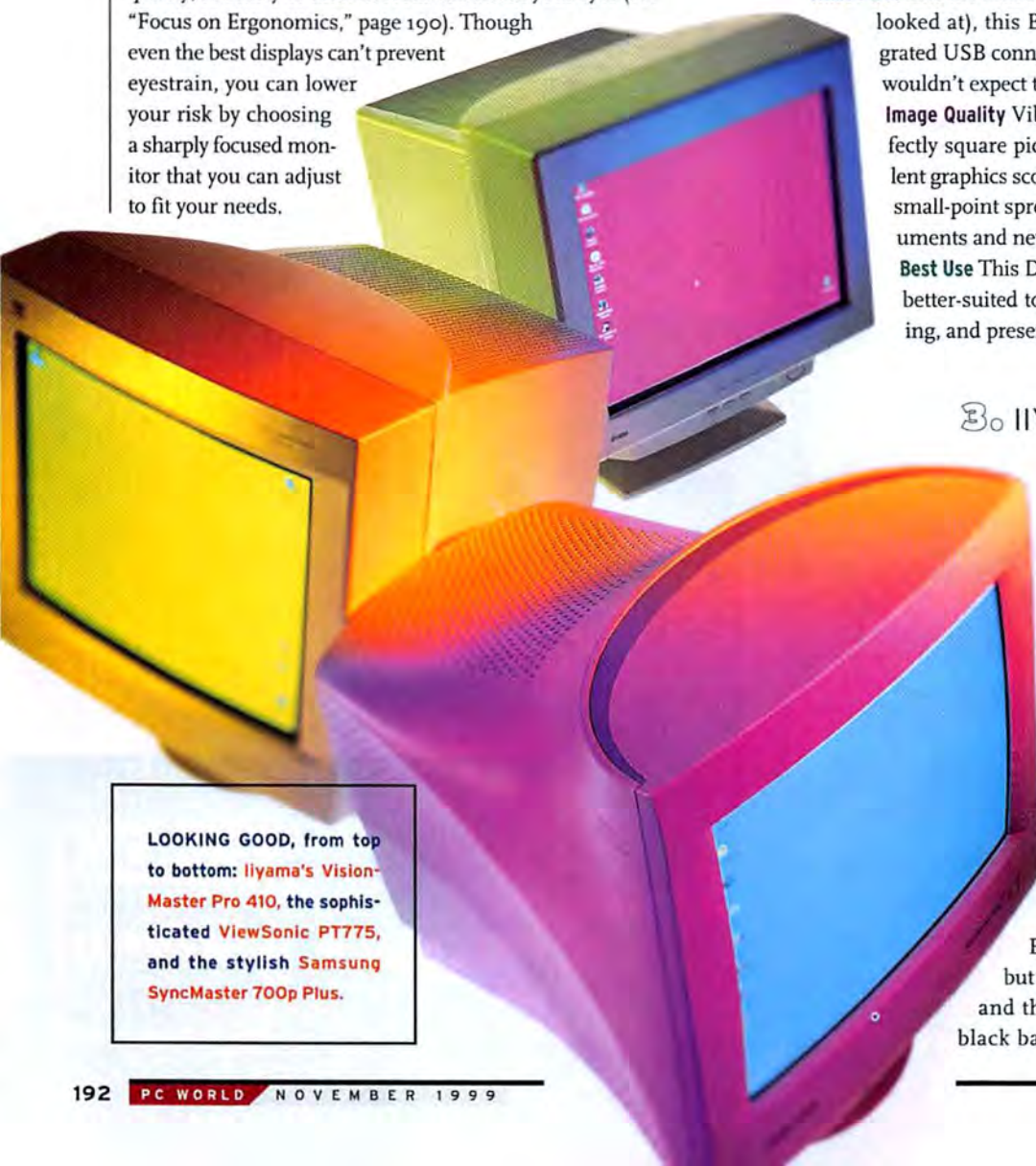
Best Use This Dell handles text well, and is even better-suited to Web surfing, basic image editing, and presentation graphics work.

3. IIYAMA VISION-MASTER PRO 410

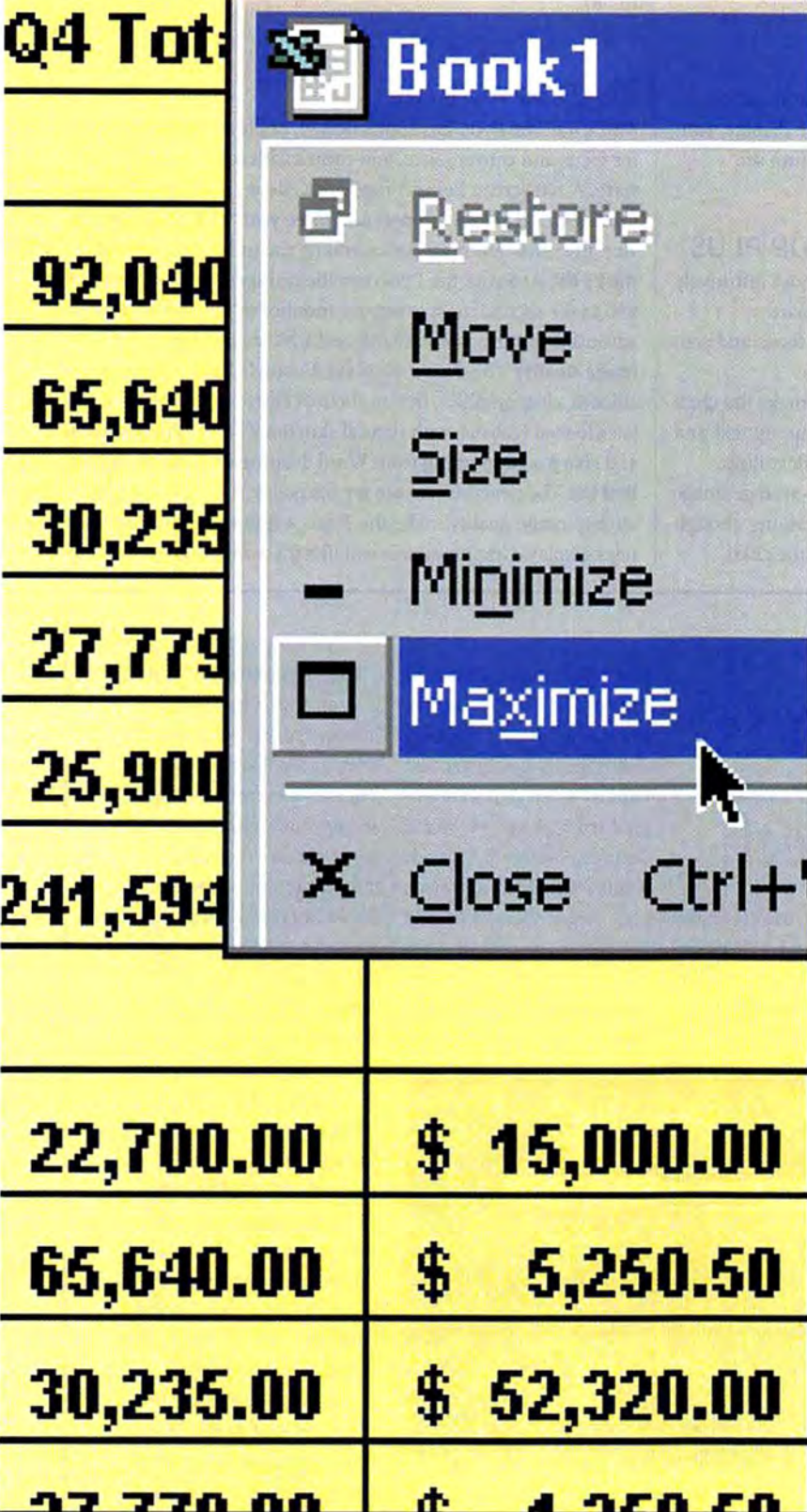
What's Hot Crisp colors and sophisticated features such as BNC ports and a flat screen put the VisionMaster Pro 410 near the top of our list.

What's Not The \$429 price is slightly higher than average, and you can't get technical support by phone on weekends. Also, you have to scroll through submenus to reach some of the controls.

Image Quality Strong on text and graphics, the VisionMaster Pro 410 approaches Best Buy quality. Colors look true but don't exactly leap off the screen, and the brightly colored text on the black background of our test Web ►



LOOKING GOOD, from top to bottom: Iiyama's VisionMaster Pro 410, the sophisticated ViewSonic PT775, and the stylish Samsung SyncMaster 700P Plus.



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page was softer and less readable than on our Best Buys.

Best Use A good, if somewhat pricey, general-use display, with above-average image quality and an extensive feature set.

4. SAMSUNG SYNCMASTER 700P PLUS

What's Hot A two-toned case and some of the most intuitively designed controls we've seen set this Samsung apart.

What's Not You don't get all the goodies (such as focus and convergence controls) the ViewSonic PT775 provides.

Image Quality The only dot pitch tube monitor to make the chart beats some of its cheaper competitors by producing text and graphics that are just a notch below those of the Best Buys.

Best Use The 700p Plus's easy controls and above-average image quality make it a good choice for general applications, though you can get more for less from other displays on the chart.

5. COMPAQ P700

What's Hot The P700 has sophisticated, easily adjustable controls for focus and convergence, and comes with color-matching software. A flat screen helps it render excellent 3D effects. Compaq provides 24/7 phone support and three years of free on-site service, the most generous policy among the units we reviewed.

What's Not At \$469, the P700 ties the number ten DecaView PA 380 as the second most expensive monitor in the Top 10. It lacks advanced features such as USB and BNC connectors.

Image Quality The P700 displayed colorful Web pages with smooth, clear graphics. In our photo of Olympic runners, the athletes looked realistic, with natural skin tones. Text appeared crisp and sharp on everything from Word documents to spreadsheets.

Best Use The generous on-site service policy, flat CRT screen, and strong image quality make the P700 a fine multipurpose business display. Graphics users will like the accurate colors. ▶

Picture Perfect

FEW MONITORS produce perfect images right out of the box. Fortunately, all 17-inch monitors come with a set of on-screen adjustment controls that can correct narrow or dark images, straighten out curved edges, and so on. Here's how to use them.

Brightness and contrast: These basic controls adjust an image's black-to-white ratio. Too much brightness, for example, often leads to "blooming," which scatters light into dark areas (such as text characters) and obscures focus. To set the optimal levels for your display, bring up a black screen (a full-screen DOS prompt or black PowerPoint slide, for example). Next, set the brightness and contrast to maximum, and then gradually reduce the brightness until the screen is the darkest shade of gray

possible. If you can detect the background raster (the pixel pattern) in the corners, continue to decrease brightness until the raster is gone.



IMPROVE YOUR IMAGE: Tweaking your monitor's controls can transform a distorted picture (left) into a vivid, accurate one.

Shape: When you're working on spreadsheets or graphics applications such as those involving page layout, adjusting the horizontal and vertical

controls to fill to the edges of the screen will exaggerate the image. To override that distortion, try the Master Test Pattern, which you can download from either PC World Online's FileWorld or www.displaymate.com/patterns.html. Adjust the vertical and horizontal size controls until all five of the pattern's circles look perfectly round rather than oval or elliptical. If you

Edge adjustments: To adjust just all four edges of your image, launch Windows to bring up the familiar desktop. The four edges of the screen should look straight and run perpendicular to each other. If the left and right sides curve inward or bulge outward, use the pincushion (pin balance) or barreling control. Then use the tilt and rotate controls to ensure that the rectangular image runs parallel to the monitor's bezel.

Focus: This final basic control adjusts the sharpness of your image. Professional-class displays, such as the ViewSonic PT775, include controls that influence focus. In addition to a focus option, horizontal and vertical convergence settings align the screen's red and blue electron beams relative to the green. Many displays (including some in our Top 10) exclude some of these controls. Note that because focus tends to shift over time with normal use, a monitor that includes focus and convergence controls is more likely to retain a sharp picture longer.

Color Range...

Feather... Alt+Ch

Modify

Grow

Similar



Transform Selection

Load Selection...

Save Selection...

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6. VIEWSONIC PT775

What's Hot A longtime Top 10 model, the PT775 is equipped with the most sophisticated set of controls of any 17-inch monitor we've reviewed, including focus, convergence, and even vertical alignment to straighten the sides of your screen image.

What's Not The \$398 price, down from \$649, is still slightly higher than average for a 17-incher.

Image Quality Precise text on spreadsheets and true colors in photographs earn the PT775 scores of Very good in both text and graphics.

Best Use The PT775 is a fine choice for business professionals who require above-average text and color clarity, or for anyone who wants to connect a monitor to two computers at the same time (through the unit's BNC connectors).

7. VIEWSONIC GF775

What's Hot This cheaper, simpler version of the PT775 also comes with a three-year warranty and around-the-clock phone support.

What's Not Lacks the PT775's horizontal and vertical focus adjustments and trails other models that also have flat CRTs in image quality.

Image Quality Spreadsheet and word processing documents were legible at 10 points and above (at 1024 by 768 resolution), but got blurry at smaller sizes. Graphic images were clean and bright but lacked sparkle.

Best Use Suitable for nondemanding users with enough desk space, but look elsewhere if you do intensive graphics work.

8. CTX PR711

What's Hot At \$315, the PR711 is the least expensive monitor in the Top 10, and its case is more than an inch shallower than average. Clear text and high refresh rates help reduce eyestrain.

What's Not CTX offers no phone support in the evenings or on weekends. On-screen controls took some time to get used to.

Image Quality Small-point text looked crisp on our spreadsheets, but less so on our Web pages. Though acceptable, the PR711's graphics weren't as rich as those of other Top 10 monitors.

Best Use The CTX is a low-price option for demanding users of word processing documents and spreadsheets. Because of its shallow case, it's also worth a look if space is tight.

9. SONY HMD V200/L

What's Hot The HMD V200/L displays rich graphics, and its built-in speakers deliver good sound quality. The stylish slate-blue case is a welcome departure from the usual gray.

What's Not This Sony is the most expensive monitor in the Top 10. It stumbled on text tests, generating slightly fuzzy fonts at all

TRIO CON BRIO: The **Deca-View PA 380** (top) has more advanced controls—and a steeper price—than the all-purpose **ViewSonic GF775** (middle) and **CTX PR711**.

point sizes on our Word document and spreadsheet tests.

Image Quality Superb graphics balance so-so text. The HMD V200/L renders lifelike photographic images with luscious colors.

Best Use Spectacular graphics make it a fine choice for graphics-intensive applications. Its high style may not suit offices where beige boxes are the norm.

10. DECAVIEW PA 380

What's Hot The PA 380 sports high-end features such as BNC connectors, focus and convergence controls, and a flat CRT screen. Clear text and streamlined controls also stand out.

What's Not At \$469, the PA380 is expensive. Tech support is available only on weekdays, and for just 10 hours a day.

Image Quality Strong on text, but colors looked dull. Even with contrast turned all the way up, our photos looked bland.

Best Use Those who specialize in text-intensive applications rather than graphics might want to take a look, but models higher up the chart offer better image quality for less money.



For write-ups of monitors that failed to make the Top 10, visit www.pcworld.com/t10monitors. Susan Silvius is a freelance writer living in the San Francisco Bay Area. ■



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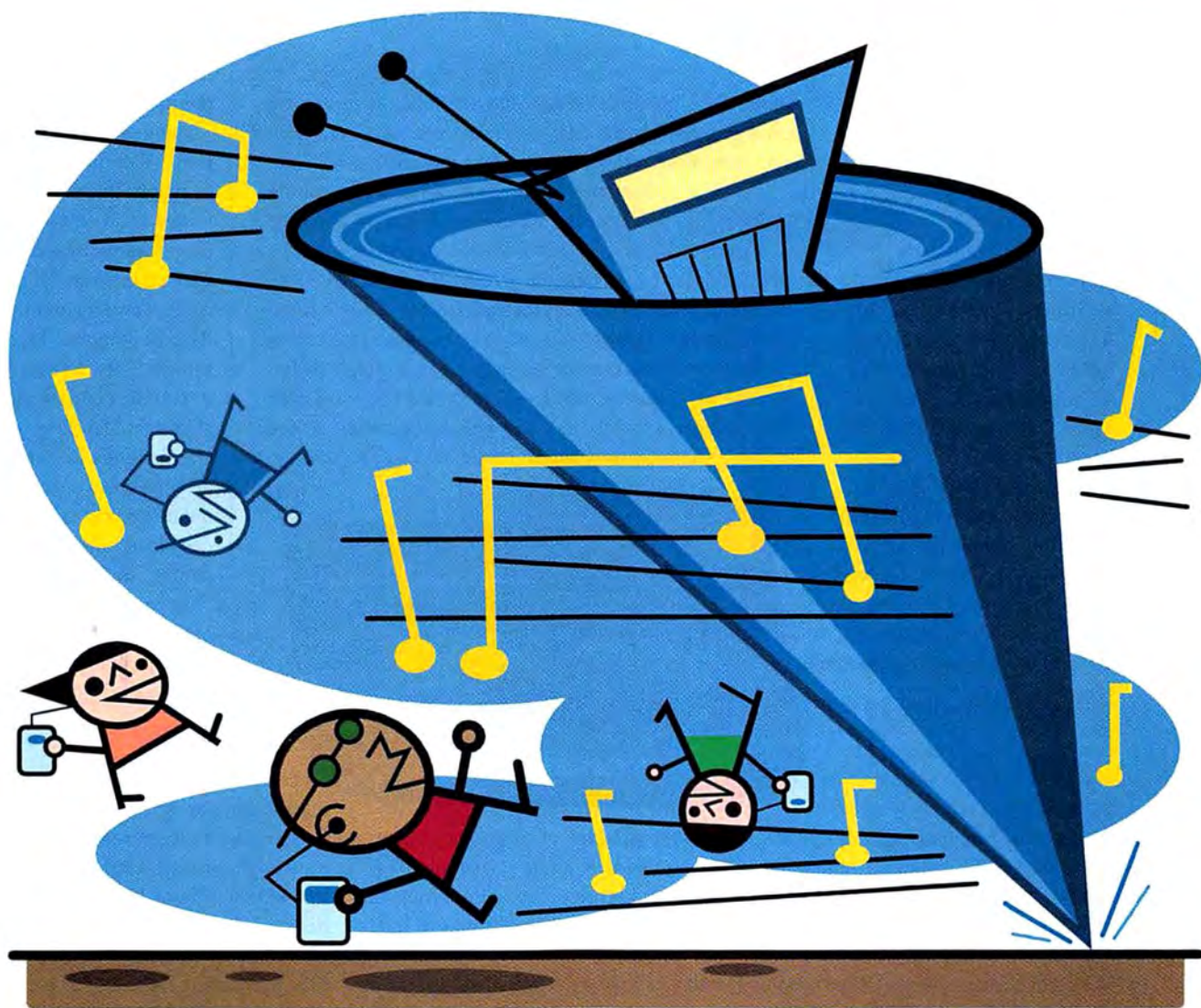
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You Say You Want a Revolution

By Cameron Heffernan
with additional
reporting by
Cameron Crotty

Music on the Web

Internet-based technologies are radically changing the way the **recording** industry delivers music to you. But after the dust settles, will **consumers** be the big winners? ►





Music keeps getting lighter. No, that's not the crotchety complaint of an aging hipster who can't hang with *The Miseducation of Lauryn Hill*. Music is literally getting lighter. Twenty years ago, helping a musically inclined friend move meant wrestling with multiple 50-pound boxes of vinyl albums. Ten years ago, those same cardboard boxes labeled "Music" contained compact discs in plastic jewelboxes—and weighed half as much. And in five years? Your friend may hand you a 1-ounce hard drive and say, "Take this out to the car and don't drop it. Those are my tunes."

Over the years, advances in computer technology have changed popular culture. A wave of computer games drew kids and adults to their home PCs. Computer-generated special effects revolutionized filmmaking. Now it's the recording industry's turn to face an assault. MP3 is altering the way we consume music—changing how artists release their work and how record companies sell it. MP3 may not prevail over other compressed audio formats in the long run, but it has shaken the music world to its foundations.

As the music industry keeps mutating at warp speed, we'll help you figure it out. Wonder which portable player has the features you need? We'll tell you. Want to compress your CDs into small files? We know how. Curious about the way encoding works? Read on. Looking for the best sources for online music? We've got maps. Nobody knows just when you'll be able to keep your entire music collection on a hard drive, but that moment is rapidly approaching.

THE ARTIST KNOWN AS MP3

DIGITAL MUSIC encoding technology has swept the Internet faster than you can say ♪. Thanks mostly to the encoding format MP3—officially called MPEG 1, Layer 3—music files that two years ago would have consumed 30MB to 50MB can be compressed to a fraction of their original size while maintaining good audio fidelity. What used to sound like a clock radio playing under-

water has metamorphosed into audio that approaches CD quality. That's enough to make folks stand up and take notice. In recent surveys, the Searchterms.com site (www.searchterms.com) has consistently pegged MP3 as the most searched-for term on the Web, surpassing even *sex*.

This boom in consumer interest has

music (see "Why Don't We Do It on the Road?" page 202), whereas last year their only option was Diamond Multimedia's Rio. A huge number of Web sites now offer downloadable audio players and music. And record companies, which have fought MP3 tooth and nail, are embracing compressed music formats other than MP3 that incorporate digital rights management and preserve their profits.

Many people forget that a lot of Web music in MP3 format is illegal. It gets uploaded to sites for unlimited downloading by users who have no intention of paying content owners for the privilege of doing so. Incorporating rights management into audio content will enable record labels to release single songs or complete albums from major stars online, so fans can find and download music legally. Of course, under this model you'll have to pay for the recordings—either with your credit card or by providing demographic information to the record labels.

SQUEEZE BOX

THOUGH THE MP3 spec was developed in 1992 by the Fraunhofer Institute in Germany, the technology didn't take off until 1998, when 56-kbps modems came into widespread use. Previously, efforts to deliver high-quality media online kept choking due to bandwidth limitations. MP3 and similar formats—such as Windows Media Audio and Liquid Audio—

MUSIC ISN'T THE ONLY TYPE OF ONLINE AUDIO. There are also talk shows, news broadcasts, sportscasts, and many other varieties of streamed media. Hundreds, if not thousands, of radio stations around the world broadcast an astonishing array of different types of programming (including music, of course) in real time; and that doesn't even take into account the myriad Web-only radio stations (online outposts that lack traditional radio station counterparts). In addition, users may download audio clips to their hard disks and listen to speeches, audio books, and press conferences at their leisure. For tips on how to find the best online radio stations and how to optimize their playback, check out "The Web Is Alive With the Sound of Music," in *Internet Tips*, page 276.

Radiohead



won the attention of consumer electronics companies, content-oriented Web sites, and large record companies, all eager to ride the crest of the newest Internet phenomenon. As a result, listeners today can choose from a wide array of portable devices that play compressed

Play That Funky Music, Web Boy

can shrink music files with minimal loss of audio quality. Hogging space on your hard drive at a rate of 10MB per minute, a standard uncompressed hour-long CD requires about 600MB of storage space. But MP3 and other formats can squeeze that same disc into just 60MB of disk space, without significantly degrading its quality. At this level of compression, the resulting sound is "near-CD quality." Users can encode tracks at any of several sampling rates and corresponding levels of audio fidelity, ranging from transistor radio to CD quality.

At the heart of compressed-audio formats lie *codecs*—coders/decoders—that compress and play back audio files. Each format has its own proprietary codec, usually incompatible with other formats. You can store and replay these small music files through a cheap (or free) player on your PC. Currently, only MP3 files can be played back on a portable device, like RioPort's Rio 500 and Creative Labs' Nomad, though we'll soon see other formats on these and other devices. Such major players as AT&T, Dolby Labs, Lucent Technologies, and Microsoft have developed their own codecs that compete with MP3.

Encoders shrink sound files by removing redundant data from them. "If you play the game right, you can throw away a surprising amount of data," says Amir Majidimehr, Microsoft's director of audio/video compression. Microsoft's Windows Media Audio encoder is a case in point: "At 64 kbps, we toss out 96 percent and keep the 4 percent we want," says Majidimehr. Yet to the human ear, the clip sounds nearly identical to the original.

IT'S ONLY MP3, BUT I LIKE IT

BUT THESE ADVANCES come at a price. When you compress an audio file with an encoder, you lose some data irretrievably. The process also introduces a certain amount of noise—known as *artifacts*—into the audio signal. Do these changes significantly degrade the output? The answer depends on whom you ask. Many listeners swear that MP3 sounds as good as CD. Others disagree. The key question is, does it sound good enough to you?

When evaluating the quality of en- ▶

COUNTLESS WEB SITES offer music files and other audio content. Here are some of our favorite audio portals (static sources) and streaming audio sites (live content).

AUDIO PORTAL	Description
A2bmusic.com www.a2bmusic.com	Heaps of free tunes for playback on your A2b music player.
Amazon.com www.amazon.com	Has full tracks from some big names in both MP3 and Liquid Audio.
AtomicPop www.atomicpop.com	Best choice for hip-hoppers.
Audible.com www.audible.com	Audio versions of news from <i>WSJ</i> , <i>NY Times</i> , <i>The Economist</i> , and others.
CDNow.com www.cdnow.com	Free music for Liquid Player; also, mail-order CDs.
Emusic.com www.emusic.com	Thousands of MP3 tunes, free or to buy; includes some big names.
Epitonic www.epitonic.com	Strong on electronica and indie MP3 music; plenty of opinion.
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MP3.com www.mp3.com	Still one of the best—over 100,000 tunes, some top-tier.
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MTV S-Track www.mtv.com	MTV soundtrack player allows for user remixing; music links.
MusicMaker.com www.musicmaker.com	Sample and purchase single tracks for \$1 on Microsoft site.
Riffage.com www.riffage.com	Large selection of tunes from aspiring independent artists.
RioPort www.rioport.com	Wide selection of music and spoken-audio content.
Rolling Stone www.rollingstone.com	Includes area dedicated to tracks from unsigned artists; multiformat.
Songs.com www.songs.com	Download 25 new MP3 tunes each month for \$5/month.
Tunes.com www.tunes.com	Includes useful song ratings, reviews from other users.
Windows Media.com www.windowsmedia.com	Free downloads for your Windows Media Player.
STREAMING AUDIO SITE	Description
Broadcast.com www.broadcast.com	The best: radio, TV, news, sports, entertainment—it's all here.
Live365.com www.live365.com	A virtual broadcast radio station; free promotional coverage.
Live Radio www.live-radio.net	Contains links to more than 2000 radio stations worldwide.
QuickTime Player www.apple.com	Great player for news, information, entertainment, and more.
RealPlayer G2 www.real.com	Comes with presets built into player, or you can add more.
Shoutcast.com www.shoutcast.com	Indie radio: Listen to or broadcast your own stream on Winamp.
Spinner.com www.spinner.com	AOL acquisition has over 175,000 songs on 120-plus channels.

coded audio, keep three factors in mind. First, consider the kind of music the file contains. Such instruments as clarinets, violins, and human voices carry subtle, complex overtones that are extremely difficult to encode efficiently. Noisy pop tunes tend to survive encoding better than elegantly rendered classical music.

Second, take your hardware into account. Most PCs deliver mediocre sound at best anyway, so if that's what you are working with, you probably won't notice the shortcomings of compressed music.

Finally, take into account your wet-

ware—the stuff between your ears. Are you a connoisseur of audio acoustics, or do you just bop to the beat? A highbrow audiophile may deplore the damage MP3 does to tone and phrasing. But if you prefer the Ramones Fan Club to the Musical Heritage Society, chances are compressed audio will serve you nicely.

NO TURNTABLES AND NO MICROPHONE

MP3 JOCKEYS NEED the right equipment, but today they can choose from among several alternatives: a stand-alone

audio player for playing back compressed music, a recording program (known as *ripper*) for converting the contents of compact discs to a compressed format (like MP3), or an all-in-one jukebox.

Audio players such as MusicMatch, RealJukebox, Sonique, XingMP3 Player, and Winamp not only play compressed files, but also can take the place of the Windows CD Player—and then some. Using an audio player is easy: While connected to the Internet, simply insert your audio disc into the CD player as you ordinarily would; your audio player will auto-

Why Don't We Do It on the Road?



THE 1999 holiday season should be a very prosperous one for the makers of portable playback devices. Built-in memory is likely to increase from 32MB to 64MB—which translates into a full hour of CD-quality compressed audio in MP3 format. It takes about 10

Rio Audio Manager software that lets it search, encode, and replay audio. RioPort claims you can get 13 hours of playback from one AA battery. Pine Technology and Creative Labs have recently released similar devices (see October's *New Products*, www.pcworld.com/oct99/mp3).

We also listened to the \$270 RaveMP2100 from Sensory Sci-

Play and Volume) are inconveniently small for people who have large hands.

DRIVE MY CAR

THE MARKET is about to get even more crowded, as Philips, RCA, Toshiba, and other big companies release portable playback devices. And before too long, you'll be listening to compressed music in your car. Empeg (www.empeg.com), a

compressed music at 128 kbps. The AudioRequest player also connects to your PC through the parallel port, so you can download compressed music from your system or the Web.

Where to Buy

AudioRequest

Price: \$599; Request; www.audiorequest.com

PRODUCT INFO NO. 619

D'music

Street price: \$188; Pine Technology USA; 510/668-0378; www.pineusa.com

PRODUCT INFO NO. 620

Empeg Car

Price: \$1099 for 4GB version; Empeg; www.empeg.com

PRODUCT INFO NO. 621

Nomad

Street price: \$250; Creative Labs; 408/428-6600; www.nomadworld.com

PRODUCT INFO NO. 622

RaveMP2100

Price: \$270; Sensory Science; 480/609-9200; www.sensoryscience.com

PRODUCT INFO NO. 623

Rio 500

Price: \$270; RioPort; 800/468-5846; www.rioport.com

PRODUCT INFO NO. 624



minutes to transfer an hour of CD-quality audio to a portable device across a serial port.

BLAME IT ON RIO

WE TESTED A preproduction version of the \$270 Rio 500 from RioPort (www.rioport.com). The company upped the unit's built-in memory to 64MB and added USB connectivity and Mac support. The new model has

ence. The unit ships with 64MB of memory, expandable to 96MB through flash memory cards. The lightweight, silvery, plastic unit allows up to 4 hours of recording via a built-in microphone and can store up to 64,000 telephone numbers. You can drag and drop files between your PC and the RaveMP2100 via the parallel port. Unfortunately, the unit's function buttons (such as

start at \$1099 for the 4GB version—with enough space to hold about 65 hours of music. Mp3car.com, a U.S. reseller, offers several mobile audio players for use on the road or at home. Finally, Request should be selling the AudioRequest home stereo MP3 player by the time you read this. Hook up the \$599 base unit to your home stereo, and you can store up to 150 hours of



THE SUDDEN popularity of compressed digital music has stirred up a hornets' nest of intellectual property issues. Suppose you download an MP3 file from

cate copyrighted material for personal, noncommercial use are immune from lawsuit if they use a digital audio recording device as described in the Audio Home Recording Act of 1992. Such single-purpose digital audio recording devices—the kind you hook up to your stereo system—have a copyright protection scheme built into their hardware, and their man-

theless supports the view that such copying constitutes "fair use" and is not actionable. And because the AHRA doesn't expressly apply to devices that make digital recordings from data stored on multipurpose computer hard disks, the door is open to manufacturers to sell some types of digital recording devices that don't contain copyright protection mechanisms.

computers so they could get the legislation passed."

So it is probably legal for you to rip MP3 files from your own CDs for personal, noncommercial use. But the issue may soon be moot anyway. With the passage of the SDMI's rights management specifications, digital music and audio CDs alike will contain digital watermarks that identify the owner of the original copyright and specify whether the file is an original or a duplicate. The watermark will also incorporate "usage rules" that dictate where and how the file can be moved and played. All SDMI-compliant hardware or software will automatically "screen" (that is, refuse to play) files that were copied or moved in violation of the prescribed usage rules. So if you try to break the rules in the future, you may be out of luck.

Copyright or Copy Wrong?

the Web and listen to it on your portable playback device. Or you rip a track from an audio CD that you own, save it on a Zip disk, and listen to it at work. Are you a copyright-violating desperado or just a citizen exercising your rights? The answer depends on whom you ask.

According to the Recording Industry Association of America's Web site, users who dupli-

ufacturers pay money back to the music industry to make up for revenue theoretically lost due to copying. But the AHRA doesn't apply to multipurpose computers and computer components; so, according to the RIAA, users who copy with a computer or computer component may be subject to litigation for copyright infringement.

Much court precedent never-

TELL IT TO THE JUDGE

DIAMOND MULTIMEDIA relied on this argument in successfully fighting off the RIAA when the latter sued Diamond last spring to prevent it from shipping the original Rio player. "It's a huge, huge loophole," says Seattle attorney Glenn Schroeder, who specializes in intellectual property law. "Apparently, the record industry made a deal with the computer industry to exclude

matically initialize in place of the standard Windows CD Player, if you've chosen the former as the default. The software then reads the disc's unique ID number and compares it to the massive CD archive of more than 400,000 albums and 4.5 million songs maintained by CD Database (www.cdcd.com). If the site has information on the album you're playing, CDDDB supplies the album name, track title and length, and other data to your audio player. In our testing, we stumped CDDDB's database only on smaller independent U.S. releases (such as Specialty Records' *Bad, Bad Whiskey* compilation), brand-new albums (like *The Y2K Album*, compiled by Decca and *PC World*), and obscure foreign CDs.

Audio players let you create playlists that sort compressed audio files into a play order, with pointers to their locations (for the benefit of the player software). The songs themselves may reside either on your hard drive or on the Internet. A playlist entry may even point to a streaming broadcast (a live, running audio feed).

RIP IT GOOD

THOUGH STAND-ALONE audio players do an excellent job of compiling playlists, they don't allow you to copy tracks from an audio CD and then compress them as MP3 files. For that series of operations, you need a CD ripper. In the past, audio

Come one, come all, to the
download ball... I chose my
philosophy three years
ago—**Internet first,**
everything else second.

—PUBLIC ENEMY'S CHUCK D

In the freeware arena, MusicMatch Jukebox and RealJukebox are the most widely used combination players/rippers. These applications do it all: Besides extracting, compressing, and encoding, they let you create libraries of your music, sorted by album, artist, or genre. Both also



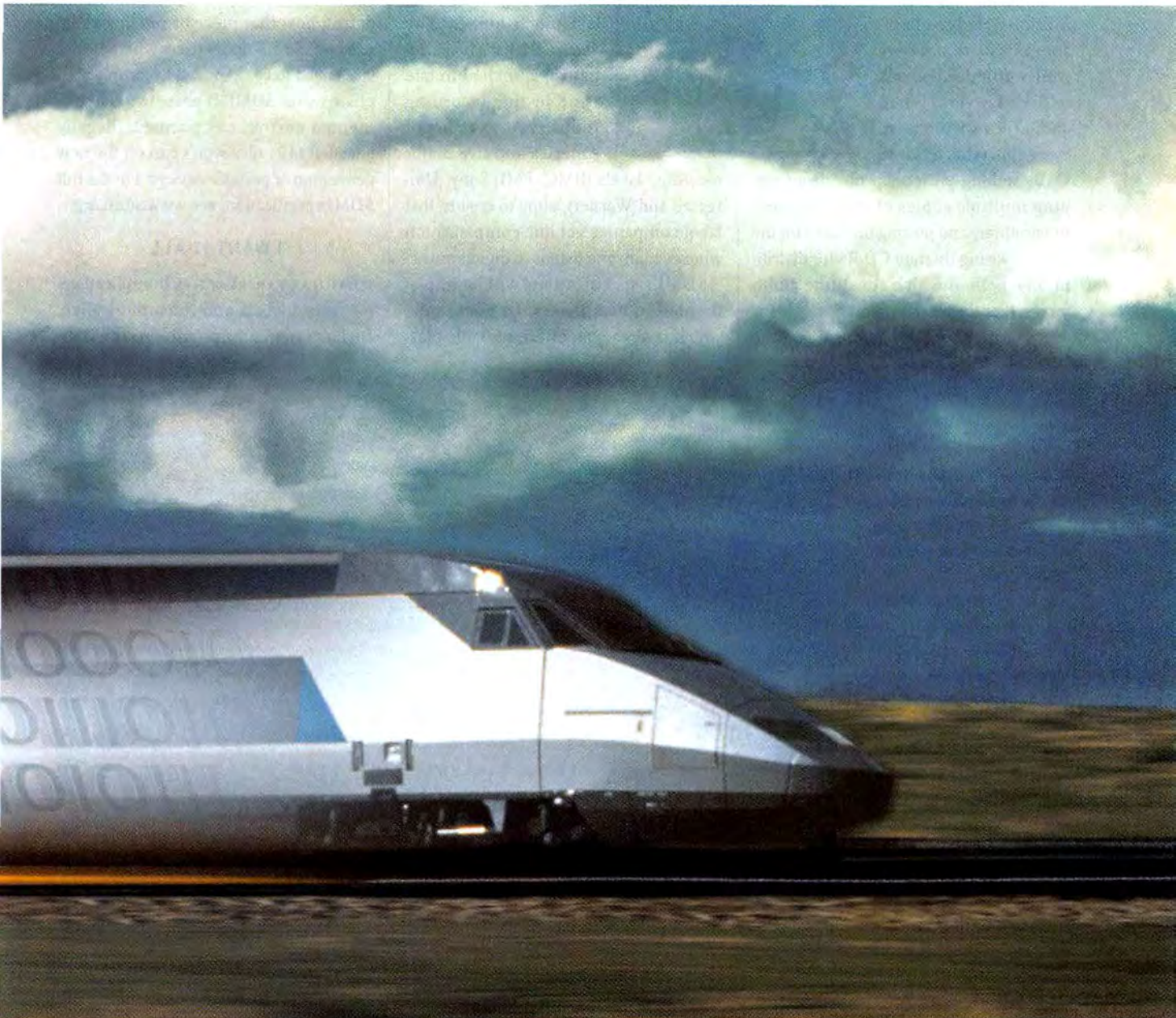
enthusiasts had to store their ripped material in the form of a .wav or other similarly bloated digital file. But these days, rippers have the ability to encode an audio file as they extract it. Audio Catalyst, Audiograbber, CD Copy, and HyCD Play&Record 2.1 are four highly regarded stand-alone shareware rippers.

contain direct links from the player to content. A few factors—the speed of your PC and the read speed and stability of your CD-ROM drive—help determine how long it takes to rip tracks. We ripped a 60-minute album at 44.1 KHz in 16-bit stereo (which yields CD-quality sound) in just 27 minutes on a Pentium II-333 system. ►



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I FOUGHT THE LAW

WHILE USERS by the millions pledge allegiance to MP3, record companies grumble and talk to their lawyers. When audio files shrink to an easily portable 4MB to 5MB, nothing prevents people from ripping multiple copies of their personal music library and posting the tunes on the Web or saving them to CD-Rs for distribution—both of which constitute audio piracy. (For the legal implications of MP3, see "Copyright or Copy Wrong?" on page



203.) But the frontier-style free-for-all may not last much longer. The Secure Digital Music Initiative, launched in late 1998 by the Recording Industry Association of America and five major recording labels (BMG, EMI, Sony, Universal, and Warner), aims to ensure that label companies get due compensation whenever anyone listens to digital music.

SDMI's specifications will be implemented in two phases. In phase one, which is already in effect, portable play-

back devices search for a digital watermark—a digital tag on a song or CD mandating how that piece of music can be used—that will notify users when the devices need to be upgraded to comply with phase two of SDMI. If phase two is implemented next year as planned, illegally encoded MP3 files won't run on the new generation of portable devices. For the full SDMI specification, see www.sdmi.org.

I WANT IT ALL

SDMI HAS FAR-REACHING implications for record labels and consumers alike. Digital watermarks promise record com-

M-P-3, Simple as Do-Re-Mi

To become a digital DJ, you don't have to be a technical wizard. Here are the ABCs for ripping MP3 files from your own audio CDs—it's easy.

Select your MP3 encoder/player (such as MusicMatch Jukebox) ¹ as the default CD audio player. While connected to the Web, insert the CD containing the tracks you want to rip to MP3. ²

MusicMatch Jukebox will query the CDDb database, ³ which will transfer information to your player about the contents of the CD (if CDDb has info on the disc in its database), including track titles and times. ⁴ To see track times, select *Options•View•Show Recorder*.

Click on the track(s) you want to compress ⁵ and hit the *Start* button. MusicMatch Jukebox will begin compressing the tracks into MP3 files, shrinking them at about a 10:1 ratio. When it has finished, the track(s) will be added to your music library. ⁶ From there you can add the track to a playlist according to your preferences by right-clicking the track's title. If you want to go mobile, you can transfer the MP3 files to a Creative Nomad ⁷ through the included docking station.





Jagged Little Internet

WEB-SAVVY ARTISTS include Alanis Morissette (left), who participated in a series of concerts cosponsored by Mp3.com in exchange for stock options in the company's pre-IPO days, and David Bowie, who in 1996 became one of the first major stars to release a single online before making it available at traditional retail outlets.



THE FUTURE'S SO BRIGHT, I GOTTA WEAR SHADES

ONLINE MUSIC RETAILERS are expecting to ramp up digital audio sales for the holidays, and some labels plan to deliver

at least some of their music online. Still, few observers think major industry players will make much of their catalog available for digital download anytime soon. Record companies face a dilemma:

They want to take advantage of the Internet as a delivery system, but they don't want to risk torpedoing the existing sales model, which has been highly lucrative over the years. Under Sony's Digital-On-Demand program, consumers will be able to walk into a traditional retail music store and download albums onto a CD, DVD, MiniDisc, or SDMI-compliant portable digital player. Since July, Virgin has been providing downloadable tracks by some of its artists on a trial basis in one of its Ohio megastores.

Don't doubt it: The way you purchase and listen to music is about to change radically. The only question is when, and we suspect that it will happen a lot sooner than you think.

Cameron Heffernan is a senior associate editor at PC World. Cameron Crotty is a San Francisco-based freelance writer. ■

panies unprecedented control over rights to their music as well as new ways to sell music, including rent to own, try before you buy, and subscription.

Thanks to SDMI, you'll see digital downloadable music from top-tier artists fairly soon. Right now, legal MP3 tunes on the Web generally come from little-known artists trying to make a name for themselves by providing free downloadable music. With SDMI in place, the record labels will make music by major artists available for download—at a fee, of course. But SDMI also raises many new questions. The standard lays down the framework for the industry, but the task of actually implementing the specifications for managing digital rights will be left to the individual companies.

From the consumer side, other issues loom menacingly on the horizon. For instance, what happens when your hard drive crashes and data gets corrupted? You can reinstall software, but what do you do about the lost folder full of music files that cost \$500? And if you back up your music to a removable drive and then try to reinstall those music files, will your player reject the files as pirated? No one we spoke to in the industry could tell us how individual sites would handle these types of problems.

SO YOU WANNA BE A ROCK AND ROLL STAR?

ONLINE DISTRIBUTION may forever change the way musicians deliver their recordings. With listeners downloading

one or two tracks at a time, the whole concept of the long-playing album may go the way of the eight-track tape, as artists instead deliver a few tracks per month through their record label or directly to listeners who subscribe to a service. Online pioneers like Alanis Morissette, David Bowie, Public Enemy, and the Beastie Boys have already entered the digital arena by making some of their songs available for downloading on MP3.com and other sites. Public Enemy's most recent album, *There's a Poison Goin' On*, was released to the Internet a full month before the group's fans could buy the CD or cassette in record stores. Customers had the option of downloading the album from Atomic Pop (www.atomicpop.com) or ordering it through Amazon.com long before it hit retail shelves.

Where to Buy

A2b Music Player

Free; AT&T; www.a2bmusic.com

Audio Catalyst

Price: \$30; Xing; www.xingtech.com

Audiograbber

Free; www.audiograbber.com-us.net/download.html

CD Copy

Price: \$20; cdcopy.a-d-n.com

HyCD Play&Record 2.1

Price: \$60; HyCD; www.hyacd.com

Liquid Player

Free; Liquid Audio; www.liquidaudio.com

MusicMatch Jukebox

Free; MusicMatch; www.musicmatch.com

RealJukebox

Free; RealNetworks; www.real.com

Sonique

Free; Mediastance; www.sonique.com

Virtuosa Gold

Price: \$30; AudioSoft; www.audiosoft.com

Winamp

\$10 registration; Nullsoft; www.winamp.com

Windows Media Player

Free; Microsoft; www.microsoft.com/windows/mediaplayer

XingMP3 Encoder

Price: \$20; Xing; www.xingtech.com

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Creative Labs 3D Blaster 32 MB TNT-2 Ultra Graphics Accelerator		Voodoo 3 1000 2X AGP Graphics Card with 16 MB		Voodoo 3 1000 2X AGP Graphics Card with 16 MB		2X AGP with 64-bit Hardware Accelerated 3D Graphics	
Sound Blaster Live! PCI Audio		Sound Blaster Live! PCI Audio		ESS Solo PCI Audio		ESS Solo PCI Audio	
6.0Mb Max Digital Modem ⁴		56K ITU V.90 Modem		56K ITU V.90 Modem ⁴		56K ITU V.90 Modem ⁴	
JBL Pro Amplified Speakers		Klipsch v.2-400 Watt Speaker System		JBL Pro Amplified Speakers		JBL Pro Amplified Speakers	
Digital Creativity Imaging Center ⁵		Digital Creativity Imaging Center ⁵		Digital Creativity Imaging Center ⁵		Creativity Action Center	
Microsoft Office 2000 SBE		Microsoft Office 2000 SBE		Home Phoneline Networking ⁶		Microsoft Featured Home Collection	
Microsoft [®] Word		Microsoft Windows98		Microsoft Featured Home Collection+ MS Word		Microsoft Word	
Microsoft Windows98		Compaq CV715 17" Monitor (16.0" VIA)		Microsoft Windows98		Microsoft Windows98	
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ATI Mobility Hardware Accelerated 3D Graphics with 8 MB Video Memory		ATI Rage LT Pro Hardware Accelerated 3D Graphics with 8 MB Video Memory		ATI Mobility Hardware Accelerated 3D Graphics with 8 MB Video Memory		ATI Rage LT Pro Hardware Accelerated 3D Graphics with 8 MB Video Memory	
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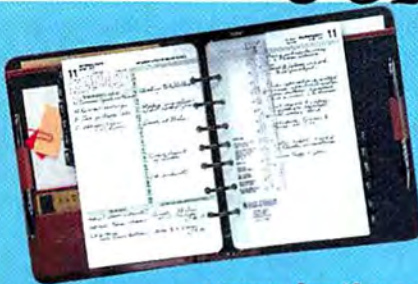
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Once, while standing in the middle of a furniture showroom, Paul Smith, chief of staff at the State University of New York at Brockport, thought, "This stuff looks great, but I wonder if we can get it cheaper somewhere else." Smith surfed the Internet for savings, and found them at FurnitureOnline.com. "FurnitureOnline.com was the site that had the prices and convenience I was looking for," Smith says. "Even with the cost of shipping, their prices were better."

FurnitureOnline.com is the Internet's largest online furniture resource. The company behind it, Advanced Furnishing Concepts, LLC, based in Danville, Calif., has been in the furniture business for over 15 years. You can search for furniture in FurnitureOnline.com's

extensive online catalogue by brand name or product category. FurnitureOnline.com also offers its customers secure online payment, and welcomes phone and fax orders. The company's customer service representatives are available 9 a.m. to 6 p.m. PST, Monday through Saturday.

"FurnitureOnline.com's telephone support is really good—they always follow up with me," says Muna Issa, treasurer for Kingston, Jamaica-based SuperClubs Resorts International Ltd. When the company was moving some of its people to a new 2,500 square foot office space in nearby Ocho Rios, Issa sent FurnitureOnline.com a copy of the floor plan. "They called us right back, and told us exactly what we needed," Issa says.

"FurnitureOnline.com offered me discounts on large orders where the office superstores could not," Issa adds. "They were able to send me what I needed, when I needed it, and at a lower price." 

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Top Movie Web Site

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Movies have been at the center of popular culture since the beginning of the century. And the world's love affair with film shows no signs of diminishing as we enter a new one. That puts top online movie retailer Reel.com in a very enviable position — a position that it continues to strengthen with new consumer features and technology platform enhancements.

With revenue growth of over 450% this year, Reel.com, based in Emeryville, Calif., has proven that it knows what customers want. More than a simple online store, Reel.com has striven to become the ultimate movie site. It offers approximately 100,000 titles — compared to the 5,000 or so available at a typical neighborhood store — including foreign, cult, and hard-to-find classics. The site fully engages visitors with content that includes a Hollywood Confidential "buzz" column, up-to-the-minute movie news, exclusive interviews with filmmakers, and comprehensive reviews of movies available in theaters, on tape, and DVD. Reel.com's "Movie Matching" feature is particularly helpful for site visitors, guiding them to movies based on those that they've already enjoyed. With searchable databases, streaming video clips, and other selection-support features, Reel.com continues to attract both browsers and buyers in ever-growing numbers.

To meet rising traffic levels, Reel.com has recently deployed an enhanced technology platform — one that will not only scale to meet the company's projected growth, but will also pave the way for even more advanced services in the future. The site's infrastructure has been re-architected from the ground up using Compaq Proliant servers, networking hardware from Cisco, and Microsoft's portfolio of electronic commerce tools. The company has also upgraded its back-end interfaces for improved merchandising, customer service, fulfillment, and reporting. And it has revamped its customer database management system to

allow closer tracking of customer activities, a faster check-out process, and refined relationship marketing programs.

Ticket to Stardom

Reel.com provides an excellent example of how a virtual retailer can exploit synergies with a bricks-and-mortar counterpart — which, in this case, is Hollywood Video, the second largest video store chain in the United States, with over 1,465 stores in 42 states and around 27 million customers. Reel.com is a subsidiary of

Hollywood Entertainment Corp., dba Hollywood Video. Reel.com customers can buy previously viewed copies of tapes that have only been on Hollywood Video store shelves for a few weeks. Because

these used movies are available at deep discounts, Internet shoppers are snapping them up. At the same time, they represent a high-margin sale for the company.

But Reel.com's long-term business strategy encompasses a lot more than selling VHS tapes and DVDs. As it builds a loyal community of movie-lovers, the company is moving into sales of soundtracks and other hot movie-related items. And ultimately, as Internet multimedia technology evolves, Reel.com will be ideally positioned to capitalize on the enormous potential market for the digital delivery of video-on-demand.

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Everyone knows what it's like to try to get to the bank to make a deposit to cover the check to pay the bill that was due yesterday. Or what it's like to wait on a drive-up line and end up behind someone who seems to be doing some complex estate planning with the teller while your take-out order is getting cold.

Well, Net.B@nk is out to eliminate such phenomena. The Alpharetta, Ga.-based company opened its virtual doors in October 1996, and has rapidly become the country's largest federal savings bank to operate exclusively through the Internet. For obvious reasons, the bank enjoys substantial overhead savings over its bricks-and-mortar

competitors — which it can translate into better interest rates and lower fees for its customers.

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Those financial incentives, combined with the convenience of 24-hour-a-day, seven-days-a-week point-and-click service, make Net.B@nk an attractive resource for the growing population of time-stingy Netizens.

Online Convenience

"I looked around for the best money market I could find in May of 1998, and Net.B@nk had it," recalls Net.B@nk customer Alicia Hanson, who works at an Atlanta-based high-tech consultancy. "Then I opened a checking account with them. By October, I had closed out my other bank account, and now I use Net.B@nk for everything."

Hanson is a big fan of the convenience that online banking offers. Her paycheck is directly deposited into her account, and she can pay her bills even if she is away from home. "I can access my bank account from any browser any time I want to," she says. "And I don't have to go out and buy stamps anymore."

"Net.B@nk has set the standard for Internet banking by providing customers with a complete line of Web-based products and services."

D.R. Grimes, CEO, Net.B@nk



She is also using Net.B@nk's other services, which include online brokerage. "When you use their brokerage services, you can pull your money right out of your money market or checking, so you don't have to do any separate transfers," she explains. "That makes it really simple."

In addition to high-interest checking accounts, money market accounts, and brokerage services, Net.B@nk — which is an FDIC member and now has assets of over half a billion dollars — also provides mortgage loans, debit and credit cards, equipment leasing, and other banking services. The bank recently joined the Armed Forces Financial Network, which means that U.S. military personnel around the world can now enjoy the benefits of having an account they can access anywhere, any time.

Net.B@nk's appeal is reflected in its rapid growth, with the number of accounts doubling to over 35,000 in the first six months of 1999. The bank has also consistently turned a profit over the last five quarters.

According to International Data Corp. there were about 6.6 million households banking online in 1998 — a number that they project will increase five-fold by 2003.

With its big head start, Net.B@nk is well positioned to capture a good share of that lucrative market. "Net.B@nk has set the standard for Internet banking by providing customers with a complete line of Web-based products and services," declares Net.B@nk CEO D.R. Grimes. "It's the ultimate one-stop banking and financial services site." ➤

THE DIFFERENCE BETWEEN OTHER BANKS AND US?




THE DREADED ASTERISK.

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So, why aren't you NetBanking?SM

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Fortunes can be won or lost in a New York minute—which is why Z&I Consulting Services Ltd. had to act fast when the New York-based stock brokerage was opening its new midtown trading floor. “Our employees buy and sell stocks for profit and they do not like to experience downtime or any slowness in service,” says Paul Lerner, information systems officer at Z&I.

Z&I had to squeeze at least three monitors onto each trader’s desk (trading applications are notorious screen hogs). So the company made the obvious choice to conserve precious desk space by purchasing flat panel LCD displays. But Z&I encountered short supplies and high prices when it shopped for the monitors online.

“Prices had gone berserk and most of the retailers were offering monitors over \$200 above MSRP [manufacturer’s suggested retail price],” Lerner says. “What’s more, none of them had more than a dozen monitors in stock. Only Solutions4SURE.com was able to deliver 90 monitors on time, and with extremely competitive pricing.”

Solutions4SURE.com, based in Norwalk, Conn., sells over 40,000 brand name products—at industry-leading prices—to small and mid-size businesses. The company has a distinctive “buy with confidence” guaran-

tee: Solutions4SURE.com secures transactions through SSL encryption; it never shares your personal information with other companies; it never surprises you with hidden charges; and it accepts returns and exchanges with no questions asked (and no restocking fees).

“We switched to Solutions4SURE.com from another online store because the prices were much lower, and we didn’t have to use a credit card every time,” says Brian Mulford, systems network analyst at Charter Financial Inc., a New York-based capital equipment leasing provider.

Charter Financial set up a free E-Account at Solutions4SURE.com to purchase thousands of dollars worth of equipment monthly. Businesses, government agencies, and schools that use purchase orders can apply for an open line of credit. And Solutions4SURE.com lets




customers lease equipment for one, two, or three years with no money down.

A Personal Touch

Customers rave about the service they enjoy at Solutions4SURE.com. The online store is open 24 hours, seven days a week, and helpful, knowledgeable Customer Care Representatives can assist shoppers Monday through Friday, 8 a.m. to 8 p.m., EST.

“The customer service at Solutions4SURE.com is top notch,” according to Tim Johnston, head of IT at Candlewick Press Inc., a Cambridge, Mass.-based children’s book publisher. “They are friendly, courteous, and willing to help. Most other e-tailers are very inhuman, concerned with the one-off deal rather than building a relationship with a client.”

Mulford is similarly impressed by the sales and service at Solutions4SURE.com. A Solutions4SURE.com sales representative recently visited Charter Financial in New York. “I was very impressed that he took the time to follow up with us,” Mulford says. “Now I have two account reps I can call at any time. And they always get back to me right away.”

Solutions4SURE.com provides a “really, truly personal touch,” Z&I’s Lerner says. “They are ready to work on our terms and fulfill our needs. I’ve experienced more highly professional service with them than I ever expected.” 

“The customer service at Solutions4SURE.com is top notch.”
Tim Johnston,
Head of IT,
Candlewick Press Inc.



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Athlon PC Sprints Past Pills

*Edited by Alan Stafford
and Andrew Brandt*



QUANTEX'S SM600 SE (left) and Dell's Dimension XPS T600 (right) flank the Athlon-powered Sys Performance 600A.

FOR THIS MONTH'S *Top 10 Power PCs*, we tested two desktops fueled by Intel's latest screamer, the Pentium III-600. Both systems earned record PC WorldBench 98 scores for PCs running their respective operating systems. But these impressive scores look almost anemic compared to the numbers posted by one AMD Athlon-injected machine.

With a PC WorldBench score of 345, the Athlon-600-based Sys Technology Performance 600A, running on Windows NT, rips the speed crown away from Intel's reigning PIII system. It's more than 6 percent faster than the NT-based Dell Dimension XPS T600, which turned in a PC WorldBench score of 323. The Quantex SM-600 SE also packs a PIII-600, but our test unit came with Windows 98, so we can't compare its PC WorldBench score of 260 head-to-head with the Sys's score. (A PC running Windows NT will score about 17 percent higher on PC WorldBench 98 than the same system operating on Windows 98.) The Dell, Quantex, and Sys machines all nab places on our *Top 10 Power PCs* chart.

CHIPS AND CLIPS

A NEARLY FORGOTTEN chip makes a comeback via our *Top 10 Home PCs*. IDot.com slides in at number five in the budget division with a Cyrix M II-333-powered system. Though it's slower than all the other PCs on the chart, at \$633, the 333M2 V costs nearly \$300 less than the next-cheapest desktop. Meanwhile, the aging Pentium II lives on in the notebook market. Dell's Inspiron A400LT muscles onto the top of the power chart with a PII-400 CPU and a 15-inch screen.

Beyond the processor, PC vendors are racing to be the next to ship an all-in-one box wrapped in transparent blue plastic—and Apple Computer is slapping each of them in turn with a lawsuit accusing each of copying the iMac. Thus far, Apple has sued Future Power and Daewoo, seeking

to block sales of their E-Power PC; EMachines, with its EOne; and Sotec, which is also dubbing its iMac look-alike the E-one.

The move toward higher-style systems has not gone unnoticed in the PC World Test Center. Polywell's monolithic matte-

silver Poly 500AG400 had us glancing over our shoulder expecting to see Darth Vader. At the other end of the massiveness scale sits Gateway's svelte Profile, which looks like a standard LCD monitor with a keyboard attached. Neither system had the juice to crack our Top 10 charts, but we suspect that before long we'll be raving about systems' style as well as

about their substance. Until then, you can read what we think about the Polywell and Gateway at www.pcworld.com/t10pcs.

Another trend you can expect to see in the new millennium is the prevalence of USB, and scanner manufacturers like



POINT YOUR browser to www.pcworld.com/top400 for late-breaking reviews on desktop computers. In PC World Online's Top 400 section, you'll find comprehensive reviews and ratings for products in 16 categories. You'll also find reviews that are not available in print.

Hewlett-Packard and Umax are hedging their customers' bets with dual-interface models. Instead of the traditional single port (parallel, SCSI, or USB), HP's ScanJet 5200Cse, ranked fourth in this month's *Top 10 Scanners* SOHO category, includes both parallel and USB ports. The ScanJet 6350C, which debuts in second place on the corporate chart, also has both USB and SCSI ports. Likewise, Umax's brand-new 2200 ships with USB and SCSI on the same flatbed. We'll test the 2200 for the December issue. —Cameron Crotty

Cameron Crotty is a freelance writer based in San Francisco. Alan Stafford is a senior editor and Andrew Brandt is an associate editor for PC World. Senior Editor Karen Silver; Senior Associate Editors Cameron Heffernan and Aoife McEvoy; Associate Editors Grace Aquino and Michelle Campanale-Surkan; Staff Editor Mick Lockey; and Assistant Editor Kalai Murugesan contributed to the Top 100 this month. Testing was performed by Ulrike Diehlmann, Robert James, Elliott Kirschling, Jeff Kuta, and Nancy Miller of the PC World Test Center. See page 14 for contact information. ▶



IN YOUR FACE: Dell's Inspiron A400LT has a huge 15-inch screen.

YOUR GUIDE TO THE TOP 100

QUESTIONS ABOUT OUR CHARTS? The following information should answer most of them.

How do the charts work? Each month we test a large number of PCs, printers, scanners, monitors, graphics boards, and modems, and compare them with previously reviewed products. Only the best products land on the Top 10 charts, which are refreshed monthly. System configurations are shown as tested. Vendors may have since changed components.

What does the overall rating mean? This 100-point scale reflects results from our hands-on evaluations and performance tests. A score in the 90s is exceptional, while one in the 70s is above average.

What does the PC WorldBench 98 score mean? It's a measure of how fast a PC can run a mix of common business applications as compared to our baseline machine, a Gateway PMMX-200 configured with 32MB of RAM, a 2GB hard drive, and 512KB of secondary cache. A PC that scores 200, for instance, is twice as fast as the baseline system.

Where do the scores for reliability, support quality, and support policies come from? Reliability and support quality scores are based on surveys of *PC World* readers and anonymous support calls made by *PC World* staff. The policies score is based on vendor support policies.

TOP 10 POWER PCs

	SYSTEM: \$2000 AND OVER	Month tested	★ Overall rating	Street price (as of 8/26/99)	PC WorldBench 98 performance score ¹	Base configuration ²
1	 Dell Dimension XPS T600 800/388-8542 www.dell.com	NEW	91	Average: \$2384	Outstanding 323	Very good: Pentium III-600, 128MB of RAM, 512KB L2 cache, 20.4GB hard drive, midsize tower case, Windows NT 4.0
2	 Compaq Prosignia Desktop 330 800/345-1518 www.compaq.com	Sept 99	90	Inexpensive: \$2267	Outstanding 246	Very good: Pentium III-550, 128MB of RAM, 512KB L2 cache, 25.5GB hard drive, midsize tower case, Windows 98
3	Micron Millennia Max 500 800/642-7667 www.micronpc.com	Apr 99	89	Inexpensive: \$2223	Very good 237	Very good: Pentium III-500, 128MB of RAM, 512KB L2 cache, 22.6GB hard drive, midsize tower case, Windows 98
4	Quantex SM600 SE 800/896-4898 www.quantex.com	NEW	87	Average: \$2399	Outstanding 260	Very good: Pentium III-600, 128MB of RAM, 512KB L2 cache, 18GB hard drive, midsize tower case, Windows 98
5	Dell OptiPlex GX1p 550 800/388-8542 www.dell.com	NEW	87	Average: \$2385	Very good 305	Very good: Pentium III-550, 128MB of RAM, 512KB L2 cache, 20GB hard drive, midsize tower case, Windows NT 4.0
6	Sys Performance 600A 800/613-9963 www.sys.com	NEW	87	Average: \$2399	Outstanding 345	Very good: AMD Athlon-600, 128MB of RAM, 512KB L2 cache, two 9.1GB hard drives, midsize tower case, Windows NT 4.0
7	Gateway E-4200 550 800/315-2536 www.gateway.com	NEW	86	Inexpensive: \$2234	Good 290	Very good: Pentium III-550, 128MB of RAM, 512KB L2 cache, 17GB hard drive, midsize tower case, Windows NT 4.0
8	IBM PC 300PL 800/426-7255 www.ibm.com/ibmpc	Aug 99	83	Inexpensive: \$2359	Very good 232	Very good: Pentium III-500, 128MB of RAM, 512KB L2 cache, 20.4GB hard drive, midsize tower case, Windows 98
9	Quantex SM500 800/896-4898 www.quantex.com	Sept 99	82	Very inexpensive: \$2099	Good 226	Very good: Pentium III-500, 256MB of RAM, 512KB L2 cache, 17GB hard drive, midsize tower case, Windows 98
10	Compaq Deskpro EN 6450+ 800/345-1518 www.compaq.com	Aug 99	81	Inexpensive: \$2358	Good 268	Very good: Pentium III-450, 128MB of RAM, 512KB L2 cache, 22.7GB hard drive, midsize tower case, Windows NT 4.0
 Best Buy		Percent of overall rating ▶		Price 15 percent	Performance 20 percent	Base configuration 10 percent

¹ A system's performance word score is relative to the scores earned by other PCs running the same operating system. For more details, see "Your Guide to the Top 100" on page 221.


² We define vertical cases as towers (taller than 20 inches), midsize towers (15.5 to 20 inches), or minitowers (shorter than 15.5 inches); and horizontal cases as desktops (5 inches or taller) or compacts (shorter than 5 inches).

³ For more information about all of the products listed in this table, select number 905 on the product information card or visit www.pcworld.com/productinfo.



OH, FOR THE LOVE OF MEGAHERTZ. Nine of the ten systems on this month's *Top 10 Power PCs* chart sport processors humming away at 500 MHz or faster. Two new machines based on Intel's Pentium III-600 chip muscle onto the chart in first and fourth places, but Sys Technology steals some of their thunder with its Performance 600A, the fastest system we've seen and the first we've evaluated that's based on AMD's buff Athlon-600 processor.

1 DELL DIMENSION XPS T600

 **WHAT'S HOT:** The 600-MHz sibling of last month's Best Buy—the Dimension XPS T550—earns a **NEW** PC WorldBench 98 score of 323, making it one of the fastest Windows NT boxes to pass through the PC World Test Center. However, it bests the T550 by only about 5 percent. The T600 offers both a CD-Rewritable drive and an Iomega Zip drive, and it comes network-ready with a 3Com network interface card. The ex-


tremely flat Dell UltraScan P780 Trinitron screen displays sharp text and images.

WHAT'S NOT: Case design and interior layout could be better: The case's side panel, secured by thumbscrews and squeeze latches, requires fiddling to remove or replace correctly. Inside, some of the cables seem a bit long, and they partially block access to the RAM and expansion slots. The sound quality of the Altec Lansing ACS340 subwoofer-and-satellite system is merely adequate.

WHAT ELSE: Dell provides thorough documentation, including a well-organized user manual and excellent online help. Color-coded ports and matching cables make setup a breeze. Dell's QuietKey keyboard and the Microsoft IntelliMouse are quiet and easy to work with. Dell bundles Microsoft Office 2000 Small Business Edition with this system.

BEST USE: The Dimension XPS T600 makes a solid, powerful centerpiece for any small office.

2 COMPAQ PROSIGNIA DESKTOP 330

 **WHAT'S HOT:** A score of 246 on our PC WorldBench 98 tests is above average for a PIII-550 system running Windows 98. The system includes great multimedia extras: an Iomega Zip drive, a Diamond NVidia Vanta graphics board, and a Sound Blaster Live card. The 19-inch Compaq

Extra features	Design and expandability	Vendor's system reliability	Tech support quality/policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)	Product info number ¹
Very good: Diamond Viper V330 graphics board with 32MB of SDRAM, 17-inch monitor, 2X CD-RW drive, V.90 modem, network card, Iomega Zip 100 drive	Good: network ready, flat-screen monitor; 3 open drive bays, 3 open slots	Outstanding	Good/Good	24/7, toll-free	3/1	—
Very good: Diamond NVidia Vanta graphics board with 16MB of SDRAM, 19-inch monitor, 12X-52X CD-ROM drive, V.90 modem, Iomega Zip 250 drive	Very good: easy-on-the-eyes monitor; 1 open drive bay, 3 open slots	Fair	Fair/Good	24/7, toll-free	3/1	660
Very good: Diamond Viper V770 graphics board with 16MB of SDRAM, 19-inch monitor, 8X DVD-ROM drive, V.90 modem, Iomega Zip 100 drive	Very good: sturdy case, lots of interior room; 3 open drive bays, 3 open slots	Good	Fair/Outstanding	24/7, toll-free	Varies ² /3	661
Good: NVidia RIVA TNT2 Ultra graphics board with 32MB of SDRAM, 19-inch monitor, 6X DVD-ROM drive, V.90 modem, network card	Good: spacious, well laid out interior; 6 open drive bays, 4 open slots	Good³	Good³/Good	24/7, toll-free	3/1	662
Good: STB NVidia TNT graphics board with 16MB of SDRAM, 17-inch monitor, 17X-40X CD-ROM drive, network card	Good: can detect chassis intrusion; 2 open drive bays, 6 open slots	Outstanding	Good/Outstanding	24/7, toll-free	3/3	—
Outstanding: Matrox Millennium G400 DH graphics board with 32MB of SGRAM, 17-inch monitor, 17X-40X CD-ROM drive, network card, UltraDMA RAID card	Good: impressive fit and finish; 4 open drive bays, 3 open slots	—	Fair³/Good	9/5 ⁴ , toll-free	Varies ² /5	663
Good: ATI Rage 128 graphics board with 16MB of SDRAM, 19-inch monitor, 17X-40X CD-ROM drive, network card	Good: large but cluttered interior; 5 open drive bays, 2 open slots	Good	Good/Outstanding	24/7, toll-free	3/3	664
Outstanding: STB Velocity 4400 graphics board with 16MB of SDRAM, 19-inch monitor, 17X-40X CD-ROM drive, network card, Iomega Zip 100 drive	Satisfactory: network ready; 2 open drive bays, 5 open slots	Good	Good/Fair	24/7, toll-free	3/1	—
Good: NVidia RIVA TNT2 graphics board with 32MB of SDRAM, 19-inch monitor, 2X CD-RW and 6X DVD-ROM drives, V.90 modem, network card	Very good: tool-less case, spacious interior; 5 open drive bays, 4 open slots	Good³	Good³/Good	24/7, toll-free	3/1	665
Very good: Matrox Millennium G200 graphics board with 16MB of SGRAM, 19-inch monitor, 12X-52X CD-ROM drive, network card	Very good: sturdy case, integrated speakers; 2 open drive bays, 5 open slots	Fair	Fair/Good	24/7, toll-free	3/3	666
Extra features 10 percent	Design and expandability 15 percent	Reliability 15 percent	Support and warranty 15 percent			

¹ Five years on CPU and main RAM, three years on other parts.

² 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.

³ 24/7 support for the first year only.

⁴ Six years on CPU and main RAM, three years on other parts.

S900 monitor offers impressive display quality: Text and images remain crisp even at 1600 by 1200 resolution.

WHAT'S NOT: Some front bezel pieces—the floppy drive faceplate and the eject button, in particular—were loose on the unit we looked at. The system comes with limited expandability: Along with one open drive bay, you'll find only one free ISA, one open PCI, and one open combination slot inside.

WHAT ELSE: The Prosignia Desktop 330 ships with Microsoft Office 97 Small Business Edition and Norton AntiVirus Deluxe software and a vast 25.5GB hard drive that will hold them—and just about anything else you want to install. The system's solidly constructed keyboard is a pleasure to use.

BEST USE: Compaq's Prosignia line hits the target for the small-business user who won't settle for inferior, integrated multimedia components.

3 MICRON MILLENNIA MAX 500

WHAT'S HOT: The top performer among Pentium III-500s we've seen running Windows 98, the Millennia Max 500 features an abundance of interior room. The great-sounding Monsoon MM-1000 speaker set includes four satellites and a giant subwoofer.

WHAT'S NOT: In the latest Reliability and Service survey, our readers rated Micron's telephone support quality as only Fair.

WHAT ELSE: Micron includes a blazing 8X DVD-ROM drive and an Iomega Zip drive with the Millennia Max 500. You also get a terrific graphics board (the top-quality Diamond Viper V770) and a bundled V.90 modem for easy connection to the Internet.

BEST USE: As a multipurpose system with impressive multimedia capabilities, the Millennia Max 500

should have little trouble inspiring people to work hard during the day and entertaining them at night.

4 QUANTEX SM600 SE

NEW **WHAT'S HOT:** Achieving a PC WorldBench 98 score of 260, the Quantex whizzed through our benchmark ▶



MINDING THE STORAGE: Dell's Dimension XPS T600 sports both CD-RW and Iomega Zip drives.

tests as the fastest Pentium III system we've tested running Windows 98. It comes fully loaded at a fair price, with plenty of RAM and hard disk space, a DVD-ROM drive, and a RIVA TNT2 video card that can handle MPEG decoding. The Altec Lansing ADA 305W satellite-and-subwoofer system supports Dolby ProLogic Surround Sound controlled via a USB cable, and the combo makes both music and movies sound great. The case



A PIII FOR ME, PLEASE: Quantex's SM600 SE is the fastest PC we've seen yet running Windows 98. The interior is so huge, Quantex should list the number of bedrooms and square footage.

interior is spacious and well laid out—all cables are tucked out of the way, and components are easy to access.

WHAT'S NOT: Technically, you don't need tools to open the case, but three thumb-screws plus an old-school, all-metal wrap-around enclosure don't facilitate entry. Labels for the rear ports are inconveniently located on a separate diagram pad. **WHAT ELSE:** The clear documentation includes a helpful setup poster, but no hard-copy software manuals. Although the DiamondTron monitor yielded razor-sharp text in our tests, colors looked slightly faded and we noticed a dark patch in the lower left corner. The system offers abundant mass-storage upgradability, with three internal and three external open drive bays. However, it has few options for additional adapter cards, with only one free PCI slot and three open ISA slots (three PCI slots are filled with a modem, a network card, and a sound card).

BEST USE: The SM600 SE would make a solid addition to just about any office.

5 DELL OPTIPLEX GX1P 550

NEW WHAT'S HOT: Dell must have an entire department for case design. A button on the front of the system releases the side panel, which swings up and off. A removable daughterboard chassis at the bottom of the tower contains the system's expansion slots, and the power supply rotates up and out of the way to provide easy access to RAM slots. The GX1p 550's PC WorldBench 98 score of 305 is above average for a PIII-550 system running Windows NT. Likewise, the STB NVidia TNT graphics card packs loads of power, and images on the Dell M770MM monitor look sharp and clear at all resolutions.



WHAT'S NOT: Unlike the online help, the hard-copy manual is skimpy, containing only basic system information. The speakers, mounted on the monitor, sound thin and brassy, though you can control volume with a wheel built into the monitor's side.

WHAT ELSE: A button under the side panel detects chassis intrusion; the button is wired to the motherboard, which prompts the system to notify a network administrator if someone removes the panel. The Microsoft ergonomic keyboard allows you to type smoothly, once you get used to the design. There's no removable

storage beyond the floppy drive, but the interior has lots of expansion room.

BEST USE: The OptiPlex is an ideal corporate workstation for power users, especially if easy access to the interior is crucial.

6 SYS PERFORMANCE 600A

NEW WHAT'S HOT: The Performance 600A uses a 600-MHz AMD Athlon processor to rack up a record-breaking PC WorldBench 98 score of 345, easily surpassing comparable Pentium III systems running Windows NT. Two 9.1GB hard drives connect to a Promise UltraDMA 66 PCI card in a RAID configuration to speed up certain disk-intensive operations. Plug two monitors into the Matrox Millennium G400 DH (dual head) video card and you can view your desktop across both displays. Creative Labs' Sound Blaster sound card generates premium audio. Sys Technology's warranty is one of the longest in the business.

WHAT'S NOT: Faded colors and fuzzy text from the Sys Technology SPM17 MS display sandbag the system's graphics potential. A single, laser-printed setup sheet and component manuals for the CD-ROM drive and monitor make up the minimal hardware documentation. Sys cuts its tech support from 24 hours daily to 9 hours on weekdays after the first year.

WHAT ELSE: You need a screwdriver to get inside the all-metal case, but the side panel detaches quickly and slides back on easily—the fit and finish are impres- ▶

Tech Trends: RAM Prices May Head Back Up

PRICES FOR MEMORY SEEM to have finally leveled off after a long slide. Inexpensive RAM has meant that typical midrange systems—and many budget systems as well—ship with a minimum of 64MB of memory these days. Among high-end computers, machines with less than 128MB of RAM are few and far between, and even systems with 256MB occasionally appear.

However, vendors may become less generous with RAM provisions once they start rolling out systems based on Rambus DRAM. RDRAM is an expensive new type of high-performance RAM that sits on a new memory bus running as fast as 800 MHz (compared to the typical 100-MHz speed of memory buses today). Systems that take advantage of the faster bus will begin arriving late this year and may cost hundreds of dollars more than those using the slower bus. Because of that premium, expect to see RDRAM, at least initially, only in expensive, top-of-the-line PCs such as those that make our power chart.




ILLUSTRATION: DOUG ROSS



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sive. The soft-touch keyboard comes with a removable wrist rest. **BEST USE:** With a better monitor (or two), the Performance 600A would make a killer 2D graphics workstation—you can keep your work on one monitor and your tools on the other.

7 GATEWAY E-4200 550

NEW WHAT'S HOT: The 19-inch Gateway VX900 monitor provides crisp and clear text and images at all resolutions. The system ships with excellent manuals, including a separate guide for maintaining and troubleshooting this specific model. A solid keyboard enables smooth typing. **WHAT'S NOT:** Its score of 290 on our PC WorldBench 98 tests, though impressive, falls below those of the other Windows NT-based, PIII-550 systems we've tested. A bar that adds rigidity to the case hinders access to the expansion cards and the rest of the large but cluttered interior. **WHAT ELSE:** The sleek, three-piece Boston Acoustics BA635 speakers-and-subwoofer set looks sharp and pumps out great sound, despite the mediocre Ensoniq sound card. Twisting two large thumbscrews gets you inside the case, but the side panel must be lined up precisely for replacement. An internal plastic fan duct directs air to the CPU for better cooling. **BEST USE:** With Windows NT, a good monitor, and a network card, the E-4200 550 serves well as a corporate workstation.



OUT OF THE PARK: The Sys Technology Performance 600A whacks a record PC WorldBench 98 score of 345.

8 IBM PC 300PL

WHAT'S HOT: A 20.4GB hard drive and Iomega Zip drive give the PC 300PL a huge amount of storage space. The system's PC WorldBench 98 score of 232 is better than average for a PIII-500 machine running Windows 98. IBM bundles its own ViaVoice dictation software and Lotus SmartSuite with the system. **WHAT'S NOT:** We had varying degrees of success reaching reps during our anonymous calls to tech support. When we did get through, the techs were knowledgeable but sometimes impatient. **WHAT ELSE:** The PC 300PL includes a built-in ethernet connection. It offers two open bays and five open expansion slots. **BEST USE:** The PC 300PL would work well as a presentation PC or multimedia development system for business users in a networked office.

9 QUANTEX SM500

WHAT'S HOT: The SM500 includes an excellent array of features for the price, including both DVD-ROM and CD-RW drives and twice the RAM of the average power PC. The Microsoft IntelliMouse and ergonomic keyboard are comfortable to use. The case requires no tools to open, and inside the spacious, tidy interior, cables are bundled out of the way. **WHAT'S NOT:** Despite the huge

amount of RAM, the system's performance rates below the average for similarly configured PCs running Windows 98, and even falls short of many systems with far less RAM. The 19-inch Quantex AT1097F monitor blurs at 1600 by 1200 resolution but remains sharp at every lower setting.

WHAT ELSE: One-touch, on-screen monitor controls offer powerful display manipulation, including a zoom feature. Software-decoded DVD movies play well even while other applications churn away in the background.

BEST USE: The SM500 is a solid small-office machine that can pull double duty as a multimedia station.

10 COMPAQ DESKPRO EN 6450+

WHAT'S HOT: The Deskpro's PC WorldBench 98 score of 268 makes it faster than any similarly configured PIII-450 system running Windows NT we've tested. Powered by a Matrox Millennium G200 graphics card, the 19-inch Compaq display delivers sharp, clear text and images, even at the maximum resolution of 1600 by 1200. The PC comes with room to grow: Inside are two open externally accessible drive bays and five open slots. Don't worry too much about the lack of internal drive bays—the Deskpro's 22.7-GB hard drive provides lots of space. **WHAT'S NOT:** Compaq integrates both the sound card and speakers into this system, compromising the audio's fidelity. Compaq's reliability and service scores rate only Fair in PC World's latest survey.

WHAT ELSE: The case is quite sturdy, and the interior is roomy, partly because most of the system's expansion cards plug directly into a daughterboard that attaches to the motherboard at a 90-degree angle.

BEST USE: The Deskpro EN 6450+ makes a solid small-office workstation. ▶



SPEAK TO ME: Gateway's E-4200 550 comes with Boston Acoustics BA635 speakers, which look cool and really belt out the tunes. Gateway's flat CRT monitor produces crisp images.

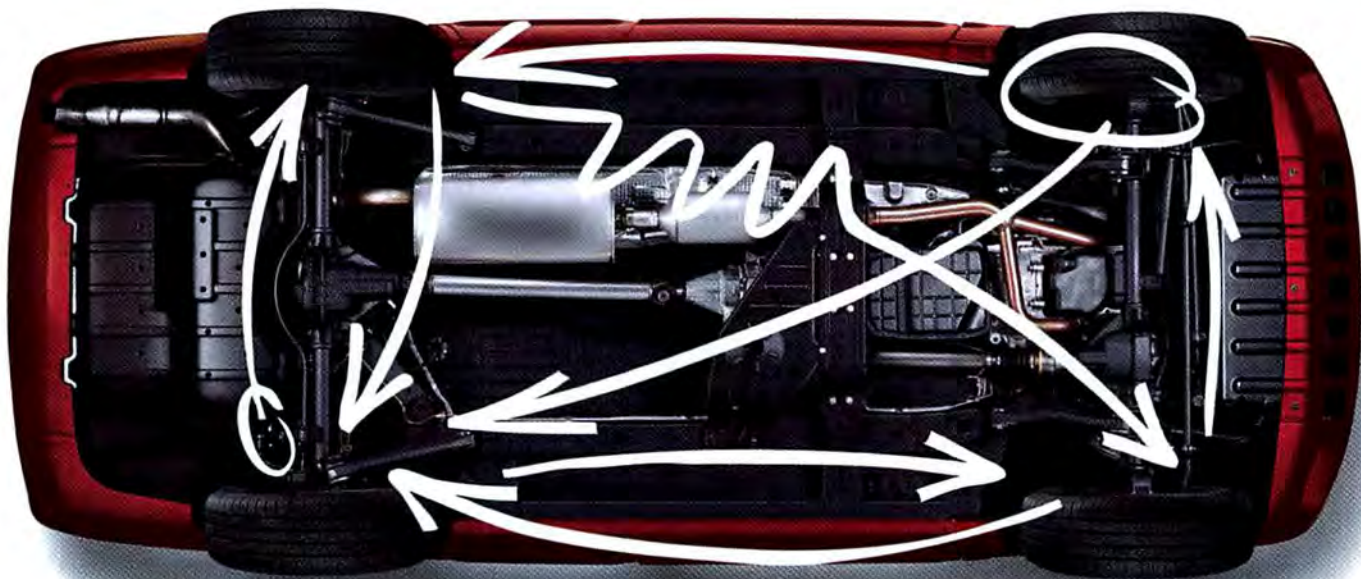
ALSO NEW THIS MONTH



WE EVALUATED the following systems along with the others, but they didn't score high enough to reach the Top 10 Power PCs chart. For write-ups, visit PC World Online (www.pcworld.com/t10pcs).

- ◆ NexTrend NexStar PIII-500
- ◆ Xi Computer 1100 MTower DP

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TOP 10 MIDRANGE PCs

	SYSTEM: \$1200 TO \$1999	Month tested	★ Overall rating	Street price (as of 8/26/99)	PC WorldBench 98 performance score ¹	Base configuration ²
1	 Dell Dimension XPS T450 800/388-8542 www.dell.com	June 99	91	Inexpensive: \$1419	Very good 218	Good: Pentium III-450, 64MB of RAM, 512KB L2 cache, 13.6GB hard drive, midsize tower case, Windows 98
2	 Micro Express MicroFlex-5B 800/989-9900 www.microexpress.net	Sept 99	89	Inexpensive: \$1499	Outstanding 234	Very good: Pentium III-500, 128MB of RAM, 512KB L2 cache, 18GB hard drive, midsize tower case, Windows 98
3	Gateway E-4200 500 800/315-2536 www.gateway.com	Apr 99	89	Average: \$1859	Outstanding 235	Very good: Pentium III-500, 128MB of RAM, 512KB L2 cache, 22GB hard drive, midsize tower case, Windows 98
4	Quantex M500 800/896-4898 www.quantex.com	Sept 99	87	Inexpensive: \$1499	Outstanding 230	Good: Pentium III-500, 128MB of RAM, 512KB L2 cache, 13GB hard drive, midsize tower case, Windows 98
5	Gateway GP6-466c 800/315-2536 www.gateway.com	Oct 99	87	Inexpensive: \$1329	Good 207	Good: Celeron-466, 64MB of RAM, 128KB L2 cache, 22GB hard drive, midsize tower case, Windows 98
6	CyberMax Enthusiast 500 800/437-4596 www.cybermaxpc.com	May 99	86	Inexpensive: \$1499	Outstanding 236	Good: Pentium III-500, 128MB of RAM, 512KB L2 cache, 13.6GB hard drive, midsize tower case, Windows 98
7	Dell Dimension L500c 800/388-8542 www.dell.com	NEW	84	Inexpensive: \$1420	Good 214	Satisfactory: Celeron-500, 64MB of RAM, 128KB L2 cache, 9GB hard drive, minitower case, Windows 98
8	Micron Millennia Max 450 800/642-7667 www.micronpc.com	July 99	83	Inexpensive: \$1480	Very good 216	Good: Pentium III-450, 64MB of RAM, 512KB L2 cache, 14.4GB hard drive, midsize tower case, Windows 98
9	NEC PowerMate VT 300 888/863-2669 www.nec-computers.com	Aug 99	82	Average: \$1818	Outstanding 231	Good: Pentium III-500, 128MB of RAM, 512KB L2 cache, 13GB hard drive, minitower case, Windows 98
10	Axis Systems Orion 100C DVD 800/378-9014 www.axisys.com	Oct 99	81	Inexpensive: \$1318	Good 210	Good: Pentium III-450, 128MB of RAM, 512KB L2 cache, 10.2GB hard drive, minitower case, Windows 98
 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 221.

² We define vertical cases as towers (taller than 20 inches), midsize towers (15.5 to 20 inches), or minitowers (shorter than 15.5 inches); and horizontal cases as desktops (5 inches or taller) or compacts (shorter than 5 inches).


³ For more information about all the products listed in this table, select number 906 on the product information card or visit www.pcworld.com/productinfo.



THIS MONTH WE TESTED THE first systems based on the Celeron-500 processor, but only one—the Dell Dimension L500c—made our *Top 10 Midrange PCs* chart.

Also moving in to midrange territory are systems too inexpensive to qualify as power PCs any longer. Both the Gateway E-4200 500 and the NEC PowerMate VT 300, for example, migrated from the power chart following price cuts of \$546 and \$295, respectively.

1 DELL DIMENSION XPS T450

 **WHAT'S HOT:** For an affordable Pentium III-450-based PC, the \$1419 XPS T450 packs a wallop. Dell includes such top-end components as a Diamond Viper Nvidia TNT graphics board with 16MB of SDRAM and a Yamaha audio board. And if you want to add more equipment, rest assured: The well-organized interior provides space for all manner of devices, thanks to four free expansion slots and four open drive bays.

Finally, the XPS T450's color-coded cables make connecting peripherals easy.


WHAT'S NOT: Images on the 17-inch Dell M780 monitor look a tad fuzzy. Belying its name, the Dell QuietKey keyboard that accompanied our test system clacked when we typed.

WHAT ELSE: The bundled Harman/Kardon HK195 speakers yield decent audio, though we've heard fuller and richer sound from a number of Altec Lansing models. The XPS T450's software bundle

includes Microsoft Office Small Business Edition and Microsoft Streets Plus. Well-written manuals carry many helpful illustrations, and if you need more assistance, Dell's technical help line offers good support. One nice touch inside: A ventilation hood over the CPU shunts excess heat from the processor directly out the computer's back panel.

BEST USE: The Dimension XPS T450 will thrive in small businesses, especially those without an IS staff (for such companies, service and support are critical).

2 MICRO EXPRESS MICROFLEX-5B

 **WHAT'S HOT:** With a score of 234 on our PC WorldBench 98 tests, this \$1499 MicroFlex performs as well as a Top 10 power system. Text and images on the excellent 17-inch Impression 7VX monitor remain crisp all the way up to the maximum 1600 by 1200 reso-

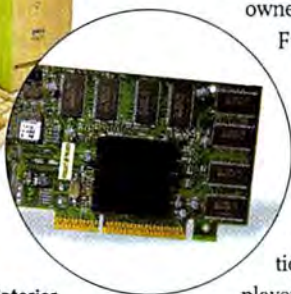
Extra features	Design and expandability	Vendor's system reliability	Tech support quality/policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)	Product info number ¹
Good: Diamond Viper NVIDIA TNT graphics board with 16MB of SDRAM, 17-inch monitor, 17X-40X CD-ROM drive, V.90 modem	Outstanding: tidy interior with plenty of space; 4 open drive bays, 4 open slots	Outstanding	Good/Good	24/7, toll-free	3/1	—
Good: ATI Rage 128GL graphics board with 16MB of SDRAM, 17-inch monitor, 5X DVD-ROM drive, V.90 modem	Satisfactory: side panel difficult to remove; 4 open drive bays, 6 open slots	+	Fair */ Outstanding	24/7, toll-free	4/4	667
Good: ATI Rage 128GL graphics board with 16MB of SDRAM, 19-inch monitor, 13X-32X CD-ROM drive, network card	Satisfactory: case suffers some flex; 5 open drive bays, 2 open slots	Good	Good/Outstanding	24/7, toll-free	3/3	668
Very good: S3 Savage 4 graphics board with 16MB of SDRAM, 19-inch monitor, 6X DVD-ROM drive, V.90 modem, Iomega Zip 100 drive	Satisfactory: only one open RAM slot; 5 open drive bays, 5 open slots	Good +	Good */ Good	24/7, toll-free	3/1	669
Very good: integrated ATI Rage 128VR graphics with 8MB of SDRAM, 17-inch monitor, 4X DVD-ROM drive, network card, Iomega Zip 100 drive	Good: motherboard too small for case; 4 open drive bays, 2 open slots	Good	Good/Outstanding	24/7, toll-free	3/3	670
Good: STB Velocity 4400 graphics board with 16MB of SDRAM, 19-inch monitor, 6X DVD-ROM drive, V.90 modem	Good: cover a bit tricky to remove; 6 open drive bays, 4 open slots	Fair +	Good */ Good	24/7, toll-free	3/1	671
Satisfactory: integrated Intel 810 graphics with 4MB of SDRAM, 17-inch monitor, 17X-40X CD-ROM drive, V.90 modem, network card	Satisfactory: small interior, but power supply swings out; 1 open drive bay, 3 open slots	Outstanding	Good/Good	24/7, toll-free	3/1	—
Good: Diamond Viper V550 graphics board with 16MB of SDRAM, 17-inch monitor, 6X DVD-ROM drive, V.90 modem	Very good: stylish box says no to beige; 4 open drive bays, 4 open slots	Good	Fair/Outstanding	24/7, toll-free	Varies ³ /3	672
Satisfactory: Diamond Viper V550 graphics board with 16MB of SDRAM, 17-inch monitor, 14X-40X CD-ROM drive, V.90 modem	Good: USB port on front of case; 2 open drive bays, 3 open slots	Good	Good */ Outstanding	24/7, toll-free	3/3	673
Good: integrated Intel 740 graphics with 8MB of SGRAM, 17-inch monitor, 6X DVD-ROM drive, V.90 modem	Satisfactory: case isn't tool-free; 4 open drive bays, 4 open slots	+	Good */ Outstanding	24/7, toll-free	3/3	674
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.

³ Five years on CPU and main RAM, three years on other parts.



EXPLOSIVE GRAPHICS: The Dell Dimension XPS T450's well-organized interior contains a Diamond Viper NVIDIA TNT graphics board with 16MB of SDRAM.



WHAT'S NOT: Though the corrugated side panel may have been intended to make the system easier to open, it has the opposite effect. Poorly labeled connectors on the rear of the machine may frustrate new owners during installation.

Furthermore, the system ships without a printed manual, although it does come with a quick-start setup guide and adequate documentation for the DVD-ROM player and the monitor.

WHAT ELSE: The large interior provides ample expansion room, including four open drive bays, six free card slots, and three open memory sockets.

BEST USE: Offices that make heavy use of multimedia for presentations, videoconferencing, or training will appreciate the system's great sound and video.

3 GATEWAY E-4200 500

WHAT'S HOT: The corporate-oriented E-4200 500 offers high-end performance and comes bundled with an ethernet card. The system's ATI Rage 128GL graphics card helps the 19-inch Gateway monitor display images vividly, and the Altec Lansing GCS100 speakers and subwoofer offer rich sound. A huge price drop makes it a contender on our midrange chart, rather than on our power chart.

WHAT'S NOT: Gateway includes no business applications with the E-4200 500 even at \$1859—the highest price on the midrange chart.

WHAT ELSE: The system's midsize tower case provides a lot of expansion room. A less costly CD-ROM drive stands in for the DVD-ROM drive you might expect at this price point. Gateway supplies excellent documentation, and the company's record for reliability and service in support of its work PCs is strong. ►

BEST USE: A good choice for offices seeking a power-packed, multimedia-equipped business workstation.

4 QUANTEX M500

WHAT'S HOT: You'd be hard-pressed to find a better-appointed multimedia powerhouse. The 6X DVD-ROM drive, Aureal Vortex2 sound card, and S3 Savage 4 graphics board make the M500 a capable authoring station. And after work it's a fine movie-watching machine, thanks to the accompanying 19-inch DiamondTron flat CRT monitor.

WHAT'S NOT: Quantex's warranty on the M500 covers labor for just one year. In our anonymous calls to Quantex's tech support line, representatives frequently gave incomplete answers.

WHAT ELSE: The M500's PC WorldBench 98 score of 230 is exactly average for a Pentium III-500 system running Windows 98. Quantex throws in an Iomega Zip 100 drive with the machine.

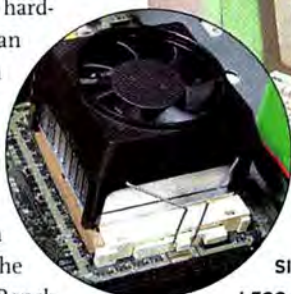
BEST USE: The M500 makes a fast presentation system or a choice executive workstation for the Big Cheese.

5 GATEWAY GP6-466C

WHAT'S HOT: The GP6-466c ships with many corporate accoutrements but sells for just \$1329, a remarkably low price for a business-oriented system. Gateway includes hardware goodies such as an Iomega Zip drive and a network card, too. The above-average software bundle consists of Microsoft Office 97 Small Business Edition and several utilities. The GP6-466c's PC WorldBench 98 score of 207 is better than average for a Celeron-466 computer.

WHAT'S NOT: Inside the system's monstrously large case, we found limited room for expansion. The motherboard Gateway uses is far too small for the surrounding case. As a result, the motherboard doesn't extend to the bottom of the case, and the lowest three expansion slot openings don't lead to any slots.

WHAT ELSE: Gateway's excellent documentation and setup guides offer solid



SIZZLIN' CELERON: The Dimension L500c, Dell's first system with the Celeron-500 CPU (shown at left, beneath the fan), is one of the fastest Celeron-based machines we've tested.

Tech Trends: Options in Optical Storage

FOR YEARS, PCs came with only one type of optical media drive as standard equipment: a CD-ROM drive. Nowadays, alternatives such as DVD-ROM and CD-RW (CD-Rewritable) drives read CD-ROMs and provide significant benefits in exchange for fairly modest premiums. This month, six PCs on our midrange chart (and three on our budget list) pack DVD-ROM drives.

Few applications require more space than the 650MB available on a single CD-ROM. For the titles that do, however, discs capable of holding 4.7GB or more are a boon: For example, DeLorme's Topo USA map collection fits on six CD-ROMs or a single DVD-ROM.

CD-RW and CD-R (CD-Recordable) drives let you record data—and even your own audio CDs—on recordable optical discs. Though data transfer rates often leave much to be desired, the stability of such optical media make CD-RW and CD-R drives

perfect for backing up and archiving critical data. Rewritable drives and their media cost more than their record-only counterparts, but you can reuse CD-RW discs (unlike CD-R discs). DVD-ROM drives, which allow you to write gigabytes worth of data to one disc, are another external storage option, but they're extremely expensive—the drives usually cost over \$500, and discs cost \$25 or more each.

While external DVD-ROM, CD-R, and CD-RW drives sell for at least \$300, often you can get a good deal on an internal drive if you buy it as part of a preconfigured computer system. For example, Micron charges only \$49 extra to include a DVD-ROM drive in place of a CD-ROM drive, and \$149 extra for a CD-RW drive in place of either.



6 CYBERMAX ENTHUSIAST 500

WHAT'S HOT: For the second month in a row, the Enthusiast posts the highest PC WorldBench 98 score on the midrange chart. Though it lacks a dedicated MPEG decoder board, this powerful system renders DVD movies smoothly and vibrantly—even with several applications running at once in the background. The Altec Lansing ADA305 Digital PowerCube speakers and subwoofer lend lifelike sound effects to games and DVD movies.

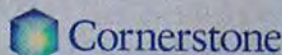
WHAT'S NOT: We waited and waited—up to 55 minutes—for tech support, and had to call three times before reaching a live technician. When we finally got through, the staffers, though courteous, tended to miss our tougher questions.

WHAT ELSE: The Enthusiast includes a large bundle of office and reference software, including Corel's WordPerfect Suite 8, Compton's World Atlas, and Compton's Encyclopedia. Its case cover is a bit tricky to remove and replace.

BEST USE: The Enthusiast is a great choice for budget-oriented small offices that frequently use multimedia applications. ▶

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7 DELL DIMENSION L500C

NEW WHAT'S HOT: The Dell L500c is one of the first 500-MHz Celeron systems we've seen, and its PC WorldBench 98 score of 214 is just three points shy of that of the fastest Celeron machine we've evaluated. We had no trouble getting inside this minitower's stiff plastic case, and ports on the rear are color-coded.

WHAT'S NOT: The L500c's space-saving integrated components limit the performance of its otherwise solid peripherals. For instance, the 17-inch Dell M780 monitor provides passable text and images, but the Intel 810 integrated video subsystem, which carries a mere 4MB of video RAM, restricts the monitor to 24-bit color and 1280 by 1024 resolution. If you want to upgrade, you'll be limited to PCI video cards.

WHAT ELSE: The L500c's extensive documentation lacks hardware information. The keyboard suffers from minor flexibility, though keystrokes are solid. The interior is small, but the power supply swings out so you can access motherboard components easily. The easy-to-configure Harman/Kardon HK195 speakers faithfully reproduce most sound, despite being limited by the integrated audio.

BEST USE: A good workstation for a small office on a budget, the \$1420 L500c is backed by Dell's excellent reputation for reliability and service.

8 MICRON MILLENNIA MAX 450

WHAT'S HOT: An appealing departure from the beige box syndrome, the stylish, light-gray Millennium Max 450 provides



DON'T CALL ME BEIGE: The Micron Millennium Max 450's light-gray case is a bit more stylish than most.

souped-up video with a Diamond Viper V550 graphics card. It also includes a 6X DVD-ROM drive, a nice extra.

WHAT'S NOT: When playing DVD movies, the screen appeared too dark, even after we boosted the brightness setting to the highest possible level. The integrated Crystal sound chip generates adequate audio for system beeps and boops, but it doesn't have the 3D audio features of most high-end audio cards. The sound from the Advent AV009 speakers (especially the subwoofer) was so muffled, we thought we were in a Midas shop.

WHAT ELSE: You get fewer free PCI slots in this system than in most midrange PCs, but you also have less reason to upgrade right away. In our most recent Reliability and Service survey, subscribers rated Micron's support quality as Fair.

BEST USE: This all-purpose system will work well in any small office, but audio-philes should consider replacing the integrated sound chip with a PCI sound card.

9 NEC POWERMATE VT 300

WHAT'S HOT: This PowerMate's PC WorldBench 98 score of 231 is a bit higher than that of most comparably equipped Pentium III-500 systems running Windows 98. The VT 300's minitower case features a front-mounted USB port, and the 17-inch NEC Vista Scan 7000 monitor provides USB controls and a USB port on its base. The monitor displays clear text and graphics at resolutions up to 1280 by 1024.

WHAT'S NOT: The monitor's USB connector occupies one of the system's USB ports; thus, while you gain the convenience of having a USB port within easy reach on the display, you don't increase the total number of free USB ports. The interior is cramped.

WHAT ELSE: NEC includes a V.90 PCI modem with this system. Highlighting the excellent documentation are an in-depth troubleshooting section and many illustrations and diagrams.

BEST USE: The PowerMate makes an excellent office PC for performance-hungry, multimedia-savvy users.

10 AXIS SYSTEMS ORION 100C DVD

WHAT'S HOT: Though the Orion comes without an MPEG decoder card, its 6X DVD-ROM player works well, automatically changing the monitor's resolution to the best setting for video or computer signals. The 17-inch ADI CM700 monitor displays crisp images. Excellent documentation includes detailed diagrams and a thorough troubleshooting section.

WHAT'S NOT: With a score of 210 on our PC WorldBench 98 tests, this system is considerably slower than many comparable PIII-450 PCs. Manipulating the case cover requires manual dexterity and the removal of four screws.

WHAT ELSE: At \$1318, the Orion might appeal to budget-conscious buyers searching for an expandable multimedia machine. But if you want audio, you'll have to spend more—the system doesn't include speakers at this price.

BEST USE: The Orion 100C DVD makes a solid presentation system.



PORTS FORWARD AND ASTERN: NEC's PowerMate VT 300 supplies a front and a rear USB port.

ALSO NEW THIS MONTH

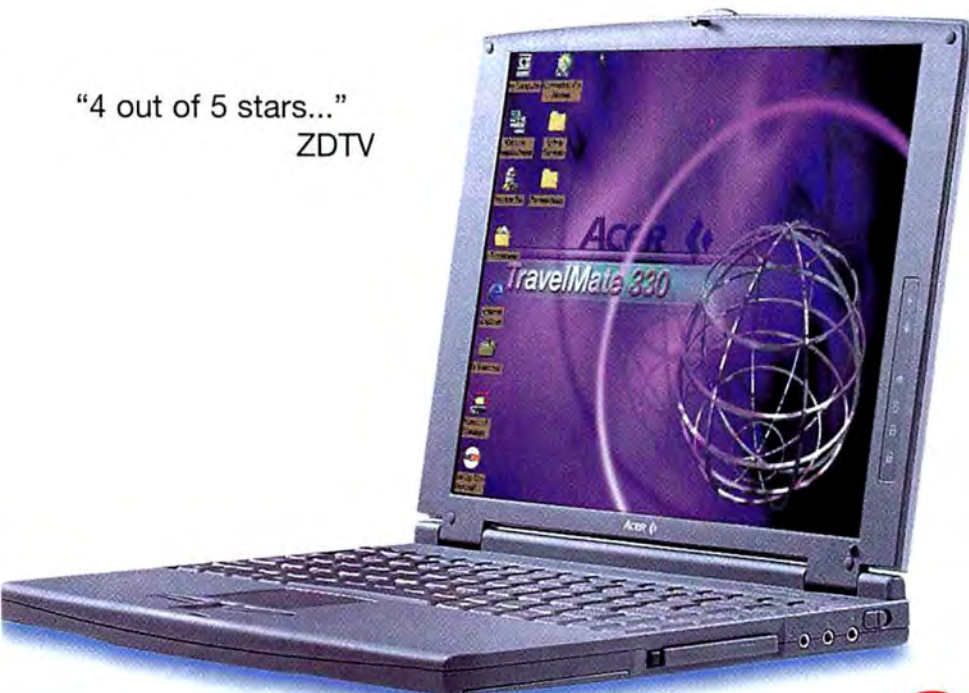


WE EVALUATED the following systems along with the others, but they didn't score high enough to make the *Top 100 Midrange PCs* chart. For write-ups, visit PC World Online (www.pcworld.com/t10pcs).

- ◆ ABS Value Workstation PIII-450
- ◆ CompUSA American Pro 466
- ◆ Gateway Profile
- ◆ Micron Millennium Celeron 500
- ◆ Midwest Micro Systemax Venture PVO-500c
- ◆ Polywell Poly 500A6400



"4 out of 5 stars..."
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TOP 10 BUDGET PCs

	SYSTEM: UNDER \$1200	Month tested	★ Overall rating	Street price (as of 8/26/99)	PC WorldBench 98 performance score ¹	Base configuration ²
1	 Micro Express MicroFlex-50C 800/989-9900 www.microexpress.net	Aug 99	84	Expensive: \$1199	Outstanding 222	Good: Pentium III-450, 64MB of RAM, 512KB L2 cache, 18GB hard drive, midsize tower case, Windows 98
2	 Gateway E-1200 433c 800/315-2536 www.gateway.com	NEW	79	Average: \$1049	Good 199	Satisfactory: Celeron-433, 64MB of RAM, 128KB L2 cache, 8.4GB hard drive, desktop case, Windows 95
3	Quantex M466-2c 800/896-4898 www.quantex.com	Sept 99	79	Expensive: \$1199	Very good 209	Good: Celeron-466, 64MB of RAM, 128KB L2 cache, 13GB hard drive, midsize tower case, Windows 98
4	Micro Express MicroFlex-40B 800/989-9900 www.microexpress.net	NEW	78	Average: \$999	Outstanding 215	Good: AMD K6-III-400, 128MB of RAM, 256KB L2 cache, 9.1GB hard drive, midsize tower case, Windows 98
5	Axis Systems Orion LX/CVE Celeron 400 800/378-9014 www.axisys.com	NEW	78	Inexpensive: \$898	Good 193	Satisfactory: Celeron-400, 64MB of RAM, 128KB L2 cache, 6.4GB hard drive, midsize tower case, Windows 98
6	Dell Dimension L466c 800/388-8542 www.dell.com	Oct 99	78	Expensive: \$1169	Very good 200	Good: Celeron-466, 64MB of RAM, 128KB L2 cache, 13GB hard drive, minitower case, Windows 98
7	MidWest Micro Office MWO-400C 800/728-8582 www.mwmicro.com	July 99	74	Inexpensive: \$863	Good 192	Satisfactory: Celeron-400, 64MB of RAM, 128KB L2 cache, 6.4GB hard drive, midsize tower case, Windows 98
8	Polywell Poly 810CW-433 800/999-1278 www.polywell.com	Oct 99	72	Average: \$950	Very good 204	Satisfactory: Celeron-433, 64MB of RAM, 128KB L2 cache, 9.1GB hard drive, minitower case, Windows 98
9	IDot.com 400K6-2 888/388-4368 www.idot.com	June 99	72	Average: \$1114	Good 184	Good: AMD K6-2-400, 64MB of RAM, 1024KB L2 cache, 10.1GB hard drive, midsize tower case, Windows 98
10	Crossline Endeavor BX 888/909-2767 www.crossline2000.com	NEW	70	Expensive: \$1188	Very good 208	Good: Celeron-466, 128MB of RAM, 128KB L2 cache, 10.2GB hard drive, minitower case, Windows 98SE
 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 221.

² We define vertical cases as towers (taller than 20 inches), midsize towers (15.5 to 20 inches), or minitowers (shorter than 15.5 inches); and horizontal cases as desktops (5 inches or taller) or compacts (shorter than 5 inches).

³ For more information about all the products in this table, select number 907 on the product information card or visit www.pcworld.com/productinfo.



CELERON-BASED SYSTEMS continue to dominate the budget chart, but two AMD K6 systems make strong showings. A well-equipped PIII-450 system, the Micro Express MicroFlex-50C, defies the trend and holds on to the top spot. Even on less-expensive systems, 17-inch monitors are becoming standard equipment, but Crossline's Endeavor BX debuts here with a 19-inch model, a hot graphics card, and a DVD-ROM drive, all for \$1188.

1 MICRO EXPRESS MICROFLEX-50C



WHAT'S HOT: Just barely sliding in at our budget chart's \$1199 price cap, the MicroFlex-50C did well enough on our PC WorldBench 98 tests to beat half the systems on the midrange chart. Pair that performance with a good 17-inch monitor and great Altec Lansing ACS44 speakers, and the MicroFlex-50C comes ready to rock. The system offers plenty of space for expansion and a

rugged, tool-free case that's easy to slide open. Micro Express covers parts and labor for four years.

WHAT'S NOT: Most of the internal components sit within plain view, but the hard drive bays could be easier to access. In our anonymous calls to Micro Express's support line, we found the representatives' manner abrupt and standoffish.

WHAT ELSE: The ATI Rage 128GL graphics board can send the video from a DVD movie out to a television using the in-

cluded S-Video or RCA cables—without the need for a separate decoder card.

BEST USE: The MicroFlex-50C is a solid presentation system for budget users.

2 GATEWAY E-1200 433C



WHAT'S HOT: The E-1200 comes with lavish, extensively illustrated manuals. As if you'd need them—**NEW** color-coded ports and matching cables make setup a snap. The compact, pizza box shaped case opens easily without tools and is surprisingly roomy.

WHAT'S NOT: A minimal software package means small offices will have to spend extra for applications, though the included Intel LANdesk Client Manager 3.31 will please corporate types. The extended keyboard is noisier than Matthew Broderick's terminal in the movie *War Games*.

WHAT ELSE: The E-1200's PC WorldBench 98 score of 199 is middle of the pack among 433-MHz Celerons. Integrat-

Extra features	Design and expandability	Vendor's system reliability	Tech support quality/policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)	Product info number ¹
Good: ATI Rage 128GL graphics board with 32MB of SDRAM, 17-inch monitor, 5X DVD-ROM drive, V.90 modem	Good: rugged, tool-free case; 4 open drive bays, 6 open slots	*	Fair */ Outstanding	24/7, toll-free	4/4	675
Satisfactory: integrated ATI Rage IIC graphics with 4MB of SGRAM, 17-inch monitor, 17X-40X CD-ROM drive, network card	Satisfactory: pizza-box case is surprisingly roomy; 2 open drive bays, 2 open slots	Good	Good/ Outstanding	24/7, toll-free	3/3	676
Good: 3dfx Voodoo3 2000 graphics board with 16MB of SGRAM, 17-inch monitor, 4.8X DVD-ROM drive, V.90 modem	Good: loads of expansion room; 6 open drive bays, 6 open slots	Good *	Good */ Good	24/7, toll-free	3/1	677
Satisfactory: Diamond Monster Fusion graphics board with 16MB of SGRAM, 15-inch monitor, 12X-40X CD-ROM drive, V.90 modem	Good: spacious interior, puzzling case; 4 open drive bays, 4 open slots	*	Fair */ Outstanding	24/7, toll-free	4/4	678
Satisfactory: integrated Intel 740 graphics with 8MB of SGRAM, 17-inch monitor, 17X-40X CD-ROM drive, V.90 modem	Good: unwieldy case; 3 open drive bays, 4 open slots	*	Good */ Outstanding	24/7, toll-free	3/3	679
Satisfactory: integrated Intel 810 graphics with 4MB of SDRAM, 15-inch monitor, 17X-40X CD-ROM drive, V.90 modem, network card	Good: easy-open case; 1 open drive bay, no open slots	Outstanding	Good/ Good	24/7, toll-free	3/1	-
Satisfactory: integrated ATI Rage Pro Turbo graphics with 8MB of SDRAM, 15-inch monitor, 16X-40X CD-ROM drive, network card	Satisfactory: hidden power switch; 4 open drive bays, 2 open slots	*	Fair */ Outstanding	24/7, toll-free	Varies */ 3	680
Satisfactory: integrated Intel 810 graphics with 4MB of SDRAM, 17-inch monitor, 17X-40X CD-ROM drive, V.90 modem	Satisfactory: case doesn't cooperate; 1 open drive bay, 2 open slots	*	Fair */ Fair	24/7, toll-free	3/5	681
Good: integrated Card Expert Intel 740 graphics with 8MB of SDRAM, 17-inch monitor, 17X-40X CD-ROM drive, V.90 modem	Very good: sturdy, tool-free case; 3 open drive bays, 4 open slots	*	Fair */ Good	24/7, toll-free	Varies */ 3	682
Good: Diamond Viper V550 graphics board with 16MB of SDRAM, 19-inch monitor, 6X DVD-ROM drive, V.90 modem	Satisfactory: cables block interior access; 2 open drive bays, 3 open slots	*	Poor */ Fair	11/6 *, toll-free	Varies */ 3	683
Extra features 10 percent	Design and expandability 15 percent	Reliability 15 percent	Support and warranty 15 percent			

* 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.

¹ Five years on CPU and main RAM, three years on other parts.

² 24/7 support for the first year only.

³ One year on RAM and hard drive, three years on other parts.

ed ATI Rage graphics and Crystal Audio sound chips are adequate for most tasks, but don't test them with 3D apps. Windows 95 is included by default, but you can specify Windows 98 as an option. Our test system included no external speakers, but they too are available as an option.

BEST USE: This machine fills the bill as an inexpensive corporate workstation, especially where small cubicles abound.

3 QUANTEX M466-2C

WHAT'S HOT: This Celeron-466 Quantex earned a 209 on our PC WorldBench 98 tests, the third-highest performance score on our budget chart. The interior offers opportunities for expansion—you get a whopping six open slots and six open drive bays—and the cables are bundled together and pulled out of the way.

WHAT'S NOT: In our evaluation, the 17-inch Quantex AT897C monitor suffered from badly blurred text at its 1600 by

1200 setting and looked somewhat fuzzy even at a more standard 1024 by 768 resolution.

WHAT ELSE: The 4.8X DVD-ROM drive that comes with the system provides smooth, uninterrupted video playback, even with several apps running in the background.

BEST USE: A small office with budget constraints could do much worse than this quick, multipurpose system.

4 MICRO EXPRESS MICROFLEX-40B

NEW WHAT'S HOT: Powered by an AMD K6-III-400 processor, the MicroFlex-40B posted a PC WorldBench 98 score of 215, one of the fastest finishes we've seen from a system using that chip. The spacious, easy-to-navigate midsize tower chassis houses 128MB of RAM (most PCs at this price level have half that



TURNING THIS WAY AND THAT:

Gateway's E-1200 433c comes with removable feet that allow you to install the compact system in either horizontal or vertical orientations.

amount). The Impression 5VX monitor displays sharp images at all resolutions.

WHAT'S NOT: While you don't need a screwdriver to crack the case, it's still ▶

puzzling to open. And the included documentation offers users little help—it provides a setup poster; an adequate, though somewhat generic, system manual; and a CD-ROM version of the manual. The reset button looks confusingly similar to the wake-up button.

WHAT ELSE: Only Norton AntiVirus comes bundled with the system; all other applications are sold à la carte. For gaming, you'll get acceptable sound and video from the Altec Lansing ACS44 speakers and Diamond Monster Fusion video card, though the latter amounts to overkill for the 15-inch monitor.

BEST USE: This Micro Express system offers small offices lots of power. Consider it if you're looking to replace an older, slower machine and you already have all the software you need.

5 AXIS SYSTEMS ORION LX/CVE CELERON 400

NEW WHAT'S HOT: For the terrific price of \$898, you get a Celeron-400 system that outperformed most similarly configured PCs on our PC WorldBench 98 tests. This budget system also leaves you plenty of room to grow, with three open drive bays and four free slots. The Altec Lansing ACS43W speakers pump out respectable sound.

WHAT'S NOT: The 17-inch ADI VD-697 monitor displays adequate pictures at resolutions up to 800 by 600, but at 1024 by 768 text fuzziness causes discomfort. Our test unit didn't come with much in the



THE K6-III-POWERED Micro Express MicroFlex-40B is faster than most Celeron 500-based systems.

way of hard-copy manuals (Axis plans to include a system manual soon). Documentation is available on the PC's hard drive, but you're out of luck if the drive fails (unless you've printed everything).

WHAT ELSE: The Orion's interior is spacious, but you need a screwdriver to get there, and you have to manhandle the all-metal housing to remove and replace the case. Stamped icons identify rear ports. The Keytronic keyboard flexes more than we'd like, and the keys rattle a bit but allow smooth typing.

BEST USE: The Orion LX/CVE is a little rough around the edges but would make a competent small office system.

6 DELL DIMENSION L466C

WHAT'S HOT: This Celeron-equipped Dimension L466c was the lowest-priced system on last month's midrange chart. Now a \$90 price cut to \$1169 shifts it to the budget division. The case that Dell designed for this machine proved one of the simplest to open of the many easy-open cases we've seen. Dell's extremely thorough documentation includes a large reference and troubleshooting manual, as well as quick-start and setup guides.

WHAT'S NOT: With a score of 200 on our PC WorldBench tests, the Dimension L466c runs slightly slower than similarly equipped Celeron-466 PCs. Because the system ships with an integrated Intel 810 AGP graphics chip (with 4MB of video memory), no AGP slot is available to accept a new card. You

could, however, add a PCI board. The tiny Dell 828FI 15-inch monitor performed poorly, displaying fuzzy text at 1024 by 768 resolution. Replacing it with Dell's 17-inch M780 would raise the system's price to a still-affordable \$1349.

WHAT ELSE: The computer comes with a 17X-40X CD-ROM drive, a 13GB hard drive, and a controllerless V.90 modem in addition to an integrated ethernet card. PC World readers categorize Dell's systems as among the most reliable computers available.

BEST USE: With its integrated networking capabilities and business-oriented software, this Dell is well suited to networked offices that don't require a high-performance workstation.

7 MIDWEST MICRO OFFICE MWO-400C

WHAT'S HOT: A peppy performer in our PC WorldBench 98 tests, this \$863 Midwest Micro system is among the fastest Celeron-400 machines we've seen and the cheapest PC on the budget chart. The MWO-400C is exceptionally easy to set up; its box includes a color foldout installation poster complete with technical support information.

WHAT'S NOT: While the setup guide offers good information, documentation overall is sparse. The system uses two redundant power switches, one in front and one on the back of the power supply, which could confuse new users.

WHAT ELSE: The system is light on multimedia, but it does include a Cyber Acoustics CA-50 speakers-and-subwoofer set and a crisp 15-inch KDS monitor.

BEST USE: This bargain shines as a superb workstation, though you might want to pay \$79 more to upgrade to a 17-inch monitor.

8 POLYWELL POLY 810CW-433

WHAT'S HOT: This very affordable system (\$950) garnered a 204 on our PC WorldBench 98 tests, making it one of the fastest Celeron-433 machines we've evaluated. It ships with an excellent bound manual full of in-depth computing data, plus decent online help.

WHAT'S NOT: Accessing the interior of ►



THE PRICE IS RIGHT: Axis's Orion LX/CVE Celeron 400 vaults onto the chart by virtue of its featherweight cost.

1. Start image editing software
2. Choose "file acquire"
3. Pre-scan page
4. Set scan area
5. Set resolution
6. Set scan mode
7. Scan page
8. Close TWAIN
9. Save file
10. Close image editing application
11. Start e-mail package
12. Start new message
13. Choose "attach file"
14. Locate saved file on hard disk

**How to scan and e-mail
a photo from their scanner.**

**How to do it
from ours.**

One small step for scanners. 13 fewer steps for you.

Let's face it, most scanners are not as simple
as they are supposed to be.

Drag and drop, plug and play,
billions of colors, and all the other
terms and specs don't make a bit of
difference when all you want to do is
e-mail a photo, scan a page of text into
your word-processor or any of the other
tasks you do countless times a day.

Visioneer OneTouch offers a simpler, more elegant
solution. It does most of the work for you, thanks to its
tight integration with the PaperPort software.

Drop in your original. Push a button. It's that easy.
Hold down a button, change a few settings, and your
scanner is practically a whole new machine.

Sure, we have all the specs
and features you expect in a
quality scanner, but we think
you'll be much more impressed
with those five friendly buttons
up front.

Visioneer OneTouch.
All scanners should be this simple.



- Available in USB and Printer Port models • Printer Port models feature pass-through design • Lift-off lid
- Includes PaperPort software • Windows 95/98/NT 4.0 compatible



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the tiny case can be a pain: You have to remove three screws and fiddle with the cover to get it on and off. The small keyboard seemed flimsy, and the keys felt cramped when we typed. Polywell used nonupgradable integrated video and sound to achieve the compact size.

WHAT ELSE: The Poly leaves two slots open for future upgrades, but it has no free internal drive bays and only one available external bay.

BEST USE: If space and money are constraints, this system fits nicely into a budget office environment.

9 IDOT.COM 400K6-2

WHAT'S HOT: The 17-inch Momena Technology DRMON17 monitor stands out with bright, crisp colors and text; and small images such as icons on a Windows taskbar look sharp even at 1024 by 768 resolution. We also found the on-screen controls easy to use. Future upgrades should be painless: Simply squeeze two latches and slide off the system's sturdy case to access inner components.

WHAT'S NOT: The IDot.com doesn't ship with any software other than the operating system. Hold times when calling tech support can be long.

WHAT ELSE: The system's PC World-Bench 98 score of 184 is about average for AMD K6-2-400 systems running Windows 98. Support reps gave us accurate but brief answers and seemed reluctant to troubleshoot our problems. The Microsoft Natural keyboard offers crisp keystrokes

Tech Trends: Why Free PCs Don't Make the Charts

WITH PCs ADVERTISED for well under \$500 and scores of companies giving them away for "free," you could be excused for wondering why none of the systems in *PC World's* budget chart costs less than \$800. The answer lies in how we calculate overall system value.

A quick glance at our charts will tell you what we look at when we evaluate a system, including performance, price, hardware extras, and vendor support policies. We don't take special service contracts into account—such as extended for-free warranties and Internet access contracts. That's because assigning a reliable value for these services is next to impossible. Most companies offering free or low-cost PCs require you to sign up for a multiyear Internet service contract so they can recoup the money they lose on system hardware.

The other reason you don't see any ultralow-cost systems on the *Top 10 Budget PCs* is much simpler: We haven't yet seen one that could make our price/performance cut. Although systems that sell for \$800 to \$1000 also minimize costs in a number of ways, savvy manufacturers can still create systems in that price range that you'd want to use every day. They incorporate processors that are a little slower than cutting edge; they reduce hard drive size and available RAM; and they use less-expensive peripherals, from keyboard to mouse to monitor. But on most tasks, inexpensive systems like the \$863 MidWest Micro Office MWO-400C that make our budget chart do a fine job.



once you get used to its curvaceous design.

BEST USE: The IDot.com 400K6-2 would make a capable small office system, especially if you're looking for an easily upgradable machine.

10 CROSSLINE ENDEAVOR BX

NEW **WHAT'S HOT:** Crossline bundles the Endeavor with Diamond's hot Viper V550 graphics board and a respectable Vortex audio card. The KDS VS195 19-inch monitor has a handy front-mounted wheel for adjusting the picture. Both sides of the case lift off and go back on smoothly. The solid extended keyboard includes power, sleep, and wake-up keys.

WHAT'S NOT: Crossline includes a minimal user manual and no setup documentation. The system's interior is a ganglia of cables, and the power supply blocks access to the processor and partially obstructs memory slots.

The Dynapoint Designer 600 speaker system produces only midrange sound well. Tech support hours drop from all day/every day during the first year to 11 hours/six days a week thereafter.

WHAT ELSE: The Endeavor BX's PC WorldBench 98 score of 208 is average for a 466-MHz Celeron. Text on the included monitor could be sharper and colors richer. While the software-decoded DVD playback is adequate, we occasionally encountered hesitations and artifacts. The ports on the back of the unit are labeled but not color-coded. The system's 128MB of RAM is a generous allotment for the price, and Crossline bundles Corel WordPerfect Office 2000.

BEST USE: The Endeavor could make a worthy presentation system. ▶

ALSO NEW THIS MONTH



WE EVALUATED the following system along with the others, but it didn't score high enough to reach the *Top 10 Budget PCs* chart. For a write-up, visit PC World Online (www.pcworld.com/t10pcs).

◆ Premio Telesto2



CROSSLINE DOESN'T skimp on components: Its new Endeavor BX comes with, among other things, a Celeron-466 processor, a 19-inch monitor, and a 6X DVD-ROM drive.



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TOP 10 NOTEBOOK PCs

POWER NOTEBOOK: \$2300 AND OVER		Month tested	★ Overall rating	Street price (as of 8/20/99)	PC WorldBench 98 performance score <small>Faster</small>	Base configuration
1	 Dell Inspiron A400LT 800/388-8542 www.dell.com	NEW	91	Average: \$3098	Outstanding 200	Very good: Pentium II-400, 15-inch active screen, touchpad, 64MB of RAM, 14GB hard drive
2	Quantex I-1410 800/896-4898 www.quantex.com	May 99	90	Very inexpensive: \$2397	Very good 191	Very good: Pentium II-366, 14.1-inch active screen, touchpad, 128MB of RAM, 8GB hard drive
3	Dell Latitude CPI A366XT 800/388-8542 www.dell.com	May 99	87	Average: \$2898	Good 184	Good: Pentium II-366, 13.3-inch active screen, touchpad, 64MB of RAM, 6.4GB hard drive
4	Micron TransPort NX PII-400 800/642-7667 www.micronpc.com	Oct 99	83	Expensive: \$3599	Outstanding 202	Outstanding: Pentium II-400, 15.1-inch active screen, touchpad and eraserhead, 128MB of RAM, 14GB hard drive
5	HP OmniBook 4150 800/322-4772 www.hp.com	Oct 99	82	Very expensive: \$3899	Outstanding 200	Very good: Pentium II-400, 14.1-inch active screen, touchpad and eraserhead, 64MB of RAM, 10GB hard drive
BUDGET NOTEBOOK: UNDER \$2300		Percent of overall rating ▶		Price 14 percent	Performance 20 percent	Base configuration 5 percent
1	 Micron TransPort Trek2 800/642-7667 www.micronpc.com	Sept 99	82	Expensive: \$2299	Outstanding 184	Good: Celeron-400, 14.1-inch active screen, touchpad and eraserhead, 64MB of RAM, 4.3GB hard drive
2	Compaq Armada 3500 800/345-1518 www.compaq.com	June 99	79	Average: \$2199	Very good 166	Satisfactory: Pentium II-333, 12.1-inch active screen, eraserhead, 32MB of RAM, 1GB hard drive
3	Fujitsu LifeBook E Series PII-333 888/466-8434 www.fujitsu-pc.com	Aug 99	78	Average: \$2199	Very good 176	Good: Pentium II-333, 13.3-inch active screen, ErgoTrac pointing device, 64MB of RAM, 6.4GB hard drive
4	Acer TravelMate 722ITX 800/733-2237 www.acer.com/asac	NEW	77	Expensive: \$2229	Very good 176	Very good: Pentium II-333, 14.1-inch active screen, touchpad, 64MB of RAM, 6.4GB hard drive
5	Acer TravelMate 330T 800/733-2237 www.acer.com/asac	Sept 99	76	Average: \$1999	Good 150	Satisfactory: Pentium II-333, 12.1-inch active screen, touchpad, 32MB of RAM, 4.8GB hard drive
 Best Buy		Percent of overall rating ▶		Price 20 percent	Performance 14 percent	Base configuration 5 percent

* Includes computer; adapter; power cord; and floppy, DVD-ROM, or CD-ROM drive.

* For more information about the products listed in this table, select number 903 on the product information card or visit www.pcworld.com/productinfo.

* Insufficient data to give a rating.

* Due to insufficient data from survey, score is based on responses to anonymous calls for tech support.



NOTEBOOK COMPANIES DON'T MIND giving consumers the impression that they design and manufacture their own portable computers. But in fact, most vendors, even big ones like Dell, have handed over those functions to third-party companies, many of which are based in Asia. That's why you often find different vendors selling very similar notebooks.

So when you have two identical-looking, comparably priced laptops like Dell's \$3098 Inspiron A400LT and Quantex's \$3099 I-1511—new Pentium II-400 notebooks we reviewed this month—how do you choose between them? Look closely at what each vendor adds to the deal, especially bundled software and support policies. Quantex outshines Dell in the applications department with its inclusion of Microsoft's Office Small Business Edition. But Dell's support plan is better. Its

three-year parts and labor warranty covers all hardware, whereas Quantex's warranty covers only the CPU and main RAM for three years (one year for other parts). Dell also provides nicer manuals and, judging from our monthly anonymous calls to its tech support line, better help.

Dell's superior support quality and policies made all the difference when it came time for us to rank the notebooks. The Inspiron A400LT takes our power Best Buy this month, while the Quantex I-1511

lands just outside Top 10 territory. (For more on third-party notebook makers, see "Who Made Your Notebook?," www.pcworld.com/may99/notemakers.)

MAKE WAY FOR PII-400

OF THE SIX NEW systems we tested this month, only two scored high enough to earn spots on our Top 10. Dell's \$3098 Inspiron A400LT debuts in first place on the power chart. If your pocketbook isn't that elastic, Acer's TravelMate 722ITX, a heavy Pentium II-333 notebook in fourth place on the budget chart, offers one of the few 14.1-inch screens you'll find on a more affordable laptop.

Processor phaseouts and model discontinuations helped flush out almost all the other notebooks that made the October Top 10; only Dell's Latitude CPI A366XT remains this month. Notebook vendors

Extra features	Design and ease of use	Battery life (hours:min)	Traveling weight (pounds) ¹	Vendor's system reliability	Tech support quality/policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)	Product info number ²
Good: 4X DVD-ROM drive, V.90 modem, lithium ion battery, multipurpose bay takes second battery	Average: comfy keyboard, overhanging screen	Outstanding: 3:49	Very heavy: 10.4	Outstanding	Good/Good	24/7, toll-free	3/3	-
Very good: 4X DVD-ROM drive, V.90 modem, lithium ion battery, multipurpose bay takes second battery	Average: good audio	Very good: 3:15	Heavy: 9.7	3	Good */Fair	24/7, toll-free	Varies */1	643
Good: 10X-24X CD-ROM drive, lithium ion battery, multipurpose bay takes second battery	Very good: easy to upgrade	Satisfactory: 2:15	Average: 7	Outstanding	Good/Good	24/7, toll-free	3/3	-
Very good: 4X DVD-ROM drive, V.90 PC Card modem, lithium ion battery, multipurpose bay takes second battery	Average: accepts many add-ins, tilt feet too stiff	Satisfactory: 2:26	Heavy: 9.9	Good	Good/Fair	24/7, toll-free	Varies */1	644
Good: 4X DVD-ROM drive, lithium ion battery, multipurpose bay takes second battery	Very good: thin, versatile, comfy to type on	Good: 2:45	Average: 8.3	Good	Good */Fair	24/7, toll call ⁷	3/3	645
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: 12X-24X CD-ROM drive, V.90 modem, lithium ion battery, multipurpose bay takes second hard drive	Very good: versatile desk-top replacement	Good: 2:38	Average: 8.7	Good	Good/Fair	24/7, toll-free	Varies */1	646
Satisfactory: 12X-24X CD-ROM drive, lithium ion battery, multipurpose bay	Average: flexible add-on base	Satisfactory: 1:59	Light: 6.1	Fair	Good/Good	24/7, toll-free	3/3	647
Excellent: 20X-24X CD-ROM drive, V.90 modem, lithium ion battery, two shared bays (one holds second battery)	Very good: two versatile bays	Satisfactory: 2:25	Average: 8.2	3	Good */Fair	24/7, toll call ⁸	1/1	648
Good: 12X-24X CD-ROM drive, V.90 modem, lithium ion battery, one shared bay	Average: firm but slightly awkward keyboard	Very good: 3:02	Heavy: 8.9	Fair	Good */Poor	24/7, toll call ⁸	1/1	649
Satisfactory: 10X-24X CD-ROM drive, V.90 modem, lithium ion battery	Average: thin and light, no docking station	Good: 2:53	Light: 6.8	Fair	Good */Poor	24/7, toll call ⁸	1/1	650
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 Three years on CPU and main memory, one year on other parts.

² Five years on CPU and main memory, one year on other parts.

⁷ Free tech support ends after three years.

⁸ Free tech support ends after one year.

HANGING AROUND:
The 15-inch screen on the Dell Inspiron A400LT protrudes about a half-inch over the side of the case when closed.



ducing October's number one budget machine, the Celeron-366-based Inspiron 3500 C366GT, too. Another chart veteran, Gateway's heavy Solo 9150, morphed into a new Solo 9300 line of svelter multimedia machines. We'll look at the Solo 9300 in December.

FUN-FILLED NOTEBOOKS

APPLE ISN'T THE only computer company making candy-colored portables with nifty consumer-targeted features such as

wireless networking. NEC, IBM, Sony, and even staid Dell plan to give the iBook a run for its money by rolling out their own multihued laptops. We'll evaluate the first of these in the January issue. In the meantime, check out "All Dressed Up

and Ready to Go" (in this month's *Top of the News*) for a preview of the fun consumer notebooks.

POWER NOTEBOOKS

1 DELL INSPIRON A400LT



WHAT'S HOT: Nearly 4 hours of battery life is impressive for a laptop with a 15-inch screen and a top-of-the-line processor. No other PII-400 notebook we've seen comes close. Dell sells the A400LT with a 14.1GB hard drive and nicely redesigned documentation, which includes an electronic manual. You get the A366LT's comfortable keyboard with big, bow-tie-shaped mouse buttons and an extra-large space bar. Dell notebooks consistently earn high reliability scores from *PC World* readers.

WHAT'S NOT: This big, square desktop ►

are beginning to replace their 366-MHz models with similarly performing 400-MHz models. Dell's Inspiron A400LT, a Pentium II-400 unit, takes over for the older 366-MHz version, number two on last month's power list. Dell stopped pro-



POINTER SISTERS: Micron's TransPort Trek2 doubles your pleasure by including dual pointing devices—a touchpad and an eraserhead. Unfortunately, the latter can't be set up for clicking.

alternative tips the scales at more than 9 pounds excluding the AC adapter. The built-in stereo speakers produce mediocre sound, somewhat undercutting the Inspiron's desirability as a multimedia PC. Also, the screen hangs over the side of the case (when it's closed) by about half an inch, making serious damage more likely if you drop the notebook on its front edge.

WHAT ELSE: The Inspiron will hold a second battery (\$119 extra), which you insert in place of the stacked floppy and 4X DVD-ROM drives. Although it performs only 5 percent better than its PII-366 predecessor, the A400LT outruns all other similarly configured Pentium II-400 laptops we've tested so far.

BEST USE: A good multimedia machine for anyone who needs marathon battery life, plenty of storage, and a big screen. Just add external speakers.

BUDGET NOTEBOOKS

1 MICRON TRANSPORT TREK2



WHAT'S HOT: Removing devices for safekeeping or upgrading components on the TransPort Trek2 is a snap. Memory, the CD-ROM drive, and the hard drive are all accessible without the aid of tools. You can connect multiple multimedia devices for recording and playing sound. The multipurpose bay supports a second hard drive.

WHAT'S NOT: Thin-sounding speakers don't do justice to the TransPort's impressive audio and video components.

WHAT ELSE: Upgrading the CD-ROM

drive (for \$199) to a DVD-ROM drive will allow you to take advantage of the S-Video port so you can watch movies on a television set. The Trek2 runs a shade faster than other Celeron-400 portables we've tested and offers decent battery life. It's one of the few laptops around with a touchpad and an eraserhead. But you can't configure the latter for tapping, so its use as a primary input device is limited. Also, you can't use the Trek2's single set of mouse buttons with the eraserhead because of the distance between the buttons and the eraserhead (the buttons are located in front of the touchpad).

BEST USE: Nice choice for small businesses looking for a reasonably priced desktop replacement with top-notch audio and video features.

4 ACER TRAVELMATE 722ITX



WHAT'S HOT: The TravelMate 722ITX is one of just two portables on the budget chart with a 14.1-inch screen. Other nice touches include a relatively spacious 6.4GB removable hard drive (held in place by one large thumbscrew) and a respectable battery life of 3 hours. You can swap out the CD-ROM drive for a 2X DVD-ROM drive (\$349 extra), an LS-120 drive (\$248), or a second hard drive (\$599 for 6GB).

WHAT'S NOT: After the first year of ownership, tech support will cost you—either \$99 for an additional year of support or \$25 to \$35 per incident.

WHAT ELSE: The \$2229 TravelMate 722ITX is ordinary in more ways than one: Its performance on our PC World-Bench 98 tests (compared to similarly configured portables), 8.9-pound weight, bundled sound system, and plain but thorough documentation are nothing to brag about. Aside from the position of the <Page Up> and <Page Down> keys, which are located horizontally instead of

vertically, we liked the firm keyboard.

BEST USE: Small businesses will appreciate the TravelMate 722ITX's ability to share add-in devices.

Near Misses

WE ALSO LOOKED at new notebooks from Asus, NEC, Quantex, and WinBook this month. Of these, Quantex's I-1511 came closest to making the power chart (just two places shy). It fell short because of its relatively low reliability and support scores. The I-1511's hardware is identical to the Inspiron A400LT's except for one minor difference: Instead of individual system status lights, the Quantex offers a status LCD panel at the top of the keyboard.

Of the other also-rans, we liked NEC's \$3708 Versa SX PII 400 the best. The latest model in NEC's two-year-old line of classy, thin and light corporate portables, this Pentium II-400 notebook can't be

JUST ADD IT: Acer TravelMate 722ITX's modular bay supports a variety of extras, from DVD-ROM to LS-120 drives.



beat for looks or add-in possibilities. Unfortunately, its high price helped keep it off our Top 10 list.

—Carla Thornton

Contributing Editor Carla Thornton regularly covers notebooks for PC World. ▶

ALSO NEW THIS MONTH



WE EVALUATED THE following systems along with the others, but they didn't score high enough to reach the Top 10 Notebook PCs chart. For write-ups, visit PC World Online (www.pcworld.com/top400).

- ◆ Asus PII 366
- ◆ WinBook XL2 Celeron

DVD for Under \$2000

Now you can enjoy a DVD-ROM drive, 400 MHz with 128K of integrated full speed L2 cache, 32 MB of SDRAM, a 6 GB Ultra DMA hard drive and a 3.5" floppy disk drive for under \$2000!

Our feature rich WinBook XL² also is equipped with cutting-edge features and slim, lightweight design. Industry-leading 2X AGP graphics using ATI's RagePro LT chipset drive a brilliant 14.1" XGA TFT display. Order yours today!

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400MHz

- 400 MHz
- Thin (1.5") and Lightweight (7.4 lbs.)
- 14.1" XGA Active Matrix Color Display
- 32 MB SDRAM, expandable to 256 MB
- ATI 3-D RagePro Graphics Accelerator w/4 MB SGRAM
- 6 GB Ultra DMA removable Hard Drive
- 45 Watt/hour Lithium Ion Smart Battery
- 128K Integrated L2 cache On chip
- 3.5" floppy disks drive and 4x DVD-ROM drive (reads CD-ROM, CD-R and CD-RW) both built-in, no need to swap
- Integrated Dual-Button Touchpad
- 3-D PCI Audio
- 2x AGP Graphics Port
- Two Type II PCMCIA slots, CardBus and Zoomed Video supported
- Parallel, Serial, PS/2, VGA, 2-way Infrared port, S-Video and TV out, USB
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- One-year Limited Extendable Warranty
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† 56k modems are capable of 56 kbps downloads. Due to FCC rules that restrict power output, however, correct download speeds are limited to 53 kbps. Upload speeds are limited to 33.6 kbps. Actual speeds may vary depending on line conditions.

‡ Monthly lease prices are based on a 36-month term. Monthly payments do not include taxes, fees or shipping charges, subject to credit approval and availability. Lease terms subject to change without notice. Prices and specifications valid in U.S. only and subject to change without notice. All purchases are subject to availability. For a complete copy of Corporate and Limited Warranties, contact WinBook Computer Corporation or our website at www.winbook.com/warranty.

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TOP 10 HOME PCs

POWER SYSTEM: \$1400 AND OVER		Month tested	★ Overall rating	Street price (as of 8/13/99)	PC WorldBench 98 performance score ¹	Base configuration ²
1	 Dell Dimension XPS T550 800/388-8542 www.dell.com	Aug 99	92	Expensive: \$2339	Outstanding 241	Pentium III-550, 128MB of SDRAM, 512KB L2 cache, 20GB hard drive, midsize tower case, 19-inch monitor, Windows 98
2	Micron Millennia Max 500 800/642-7667 www.micronpc.com	Aug 99	88	Inexpensive: \$1699	Outstanding 236	Pentium III-500, 128MB of SDRAM, 512KB L2 cache, 20GB hard drive, tower case, 17-inch monitor, Windows 98
3	Quantex SM550 SE 800/896-4898 www.quantex.com	Aug 99	88	Expensive: \$2099	Outstanding 239	Pentium III-550, 128MB of SDRAM, 512KB L2 cache, 17GB hard drive, midsize tower case, 19-inch monitor, Windows 98
4	Gateway Performance 500 800/315-2536 www.gateway.com	Apr 99	87	Average: \$1765	Very good 229	Pentium III-500, 64MB of RAM, 512KB L2 cache, 13.6GB hard drive, midsize tower case, 19-inch monitor, Windows 98
5	CyberMax Enthusiast 500N 800/345-8926 www.cybermaxpc.com	NEW	87	Inexpensive: \$1699	Very good 228	Pentium III-500, 128MB of SDRAM, 512KB L2 cache, 19GB hard drive, midsize tower case, 19-inch monitor, Windows 98
BUDGET SYSTEM: UNDER \$1400		Percent of overall rating ▶		Price 10 percent	Performance 20 percent	
1	 Quantex M466c 800/896-4898 www.quantex.com	Oct 99	85	Inexpensive: \$949	Outstanding 208	Celeron-466, 64MB of SDRAM, 128KB L2 cache, 6GB hard drive, midsize tower case, 15-inch monitor, Windows 98
2	Dell Dimension L400c 800/388-8542 www.dell.com	Oct 99	85	Inexpensive: \$916	Very good 185	Celeron-400, 64MB of SDRAM, 128KB L2 cache, 6.4GB hard drive, minitower case, 15-inch monitor, Windows 98
3	Micron Millennia C466 800/642-7667 www.micronpc.com	Sept 99	84	Average: \$1173	Outstanding 211	Celeron-466, 64MB of SDRAM, 128KB L2 cache, 15GB hard drive, minitower case, 17-inch monitor, Windows 98
4	CyberMax Enthusiast KIII-400 800/345-8926 www.cybermaxpc.com	Oct 99	80	Expensive: \$1249	Outstanding 206	K6-III-400, 128MB of SDRAM, 256KB L2 cache, 10GB hard drive, midsize tower case, 19-inch monitor, Windows 98
5	IDot.com 333M2 V 888/388-4368 www.idot.com	NEW	78	Very inexpensive: \$633	Fair 142	Cyrix MII-333, 64MB of SDRAM, 1024KB L2 cache, 3GB hard drive, minitower case, 15-inch monitor, Windows 98
Best Buy		Percent of overall rating ▶		Price 25 percent	Performance 15 percent	

¹ A system's performance word score is relative to the scores earned by other PCs running the same operating system. For more details, see "Your Guide to the Top 100" on page 221.


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).



IF YOU'RE LOOKING FOR something to be grateful for this Thanksgiving, our *Top 10 Home PCs* this month serves up bargains galore. The bounty includes two inexpensive new models brimming with goodies. To sweeten the mix, four previously tested power PCs and two repeat budget systems drop their prices. Among the new machines, IDot.com's \$633 333M2 V costs less than any other home PC we've seen. On our power chart, CyberMax's \$1699 Enthusiast 500N nabs fifth place, thanks to fast performance and upscale hardware (including a Zip drive) for a low price.

POWER HOME PCs

1 DELL DIMENSION XPS T550

 **WHAT'S HOT:** If speed is what you need, this PC runs like Secretariat. It's loaded with a Pentium III-550 CPU, 128MB of RAM, and a Diamond

Viper V770 graphics card with a whopping 32MB of video memory. The result: a scorching PC WorldBench 98 score of 241 (currently the highest of any home PC) and terrific graphics performance. The 19-inch monitor displays clean text—even at small font sizes—and good color.

Other pluses: a 20GB hard drive, a Zip drive, capacious room inside to add cards and drives, and Altec Lansing ACS340 speakers that produce rich, full tones.

WHAT'S NOT: Even after a \$140 price drop, the \$2339 price is on the high side. You won't find many bundled applications with the XPS Dimension T550—the only software of note is Microsoft's Works-Suite 99, which includes Word 97.

WHAT ELSE: Dell's computer cases are among the easiest to open and lift off. The T550's slide-on-and-off panel makes upgrading components less of a chore.

BEST USE: With its speed and advanced hardware, the T550 is a great hedge against premature obsolescence for the demanding home office user. Thanks to the huge amount of graphics memory, gamers and video fanatics also might want to give this system a try.

Extra features	Setup/ ease of use	Graphics	Reliability/ support	Comments	Product info number ¹
Outstanding: Diamond Viper V770 graphics board with 32MB of SDRAM, 4.8X DVD-ROM drive, V.90 modem, Zip drive	Outstanding/ Outstanding	Very good	Good/ Outstanding	PRO: \$140 price cut, fastest home PC so far, exceptionally good speakers, very expandable. CON: Short on bundled software.	-
Very good: Diamond Viper V550 graphics board with 16MB of SDRAM, 4X DVD-ROM drive, V.90 modem	Good/ Very good	Very good	Good/ Good	PRO: Hefty \$617 price drop, speedy performance, innovative case design. CON: Limited documentation for novices.	651
Outstanding: 3dfx Voodoo3 3000 graphics board with 16MB of SDRAM, 4X DVD-ROM drive, V.90 modem, Sony CD-RW drive, Zip drive	Good/ Good	Very good	Good/ Good	PRO: \$300 price cut, superfast, terrific speakers, Microsoft Natural Keyboard. CON: Monitor blurry on small text, poor setup manuals.	652
Very good: STB Velocity 4400 graphics board with 16MB of SDRAM, 4.8X DVD-ROM drive, V.90 modem	Outstanding/ Very good	Outstanding	Fair/ Good	PRO: \$164 cheaper this month, very fast, great sound. CON: Has half the memory of other power models here, mediocre software package.	653
Outstanding: 3dfx Voodoo3 3000 graphics board with 16MB of SDRAM, 6X DVD-ROM drive, V.90 modem, Zip drive	Very good/ Very good	Outstanding	Fair/ Good	PRO: Lowest-priced power home PC here, terrific overall performance. CON: Limited setup documentation, uneven brightness on monitor.	654
Extra features 15 percent	Setup/ease of use 5 percent	Graphics 10 percent	R & S 40 percent		
Very good: Intel 740 graphics board with 8MB of SDRAM, 6X DVD-ROM drive, K56flex modem	Very good/ Outstanding	Very good	Good/ Good	PRO: Speedy, plenty of software titles, very expandable. CON: Big mid-size tower takes up lots of room, no easy-off cover, small monitor.	655
Very good: integrated Intel 810 graphics with 4MB of SDRAM, 17X-40X CD-ROM drive, V.90 modem	Outstanding/ Outstanding	Very good	Good/ Outstanding	PRO: \$23 price drop, small but expandable case, built-in ethernet port. CON: Limited range of bundled applications, tiny monitor.	-
Good: integrated Nvidia RIVA 128ZX graphics with 8MB of SGRAM, 4.8X DVD-ROM drive, V.90 modem	Good/ Very good	Very good	Good/ Good	PRO: \$200 price cut, fastest budget home PC so far, one year of free classes from Micron's online training program. CON: Mediocre keyboard.	656
Outstanding: 3dfx Voodoo3 2000 graphics board with 16MB of SDRAM, 4.8X DVD-ROM drive, K56flex modem	Good/ Very good	Very good	Fair/ Good	PRO: Fast, lots of memory, top graphics scores for budget home machine. CON: Setup documentation unclear for novices.	657
Fair: integrated SIS 530 graphics with 8MB of SDRAM, 12X-24X CD-ROM drive, V.90 modem	Good/ Very good	Poor	1/1	PRO: Cheapest home PC we've tested, easy-off cover. CON: Very slow, subpar graphics, no extra apps, flimsy keyboard, dinky monitor.	658
Extra features 5 percent	Setup/ease of use 10 percent	Graphics 5 percent	R & S 40 percent		

¹ For more information about the products listed in this table, select number 904 on the product information card or visit www.pcworld.com/productinfo.

² Insufficient data to give a rating.

5 CYBERMAX ENTHUSIAST 500N

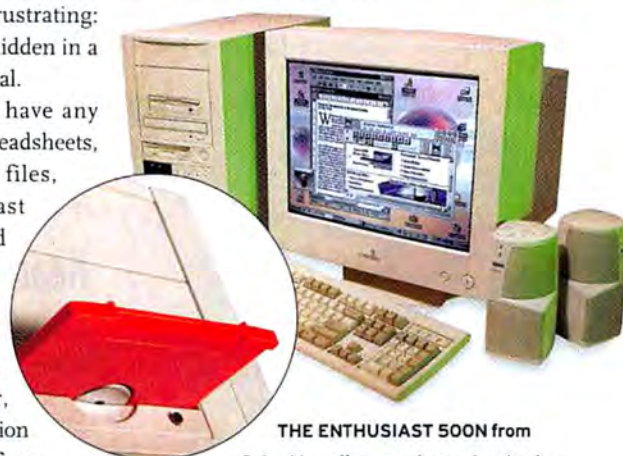
NEW WHAT'S HOT: The \$1699 Enthusiast 500N offers big-time speed for little outlay. On our PC WorldBench 98 tests, it ran a mere 5 percent slower than our fastest power system—Dell's Dimension XPS T550—but costs \$640 less. Thanks to its 3dfx Voodoo3 3000 graphics card, the Enthusiast 500N also delivers smooth AVI video playback and good-looking graphics in 3D games. Its Altec Lansing ADA305 speakers with subwoofer deliver rich and crisp sound, from bass notes through higher tones. Inside the PC, there's plenty of room for expansion, and slots and bays are easy to access.

WHAT'S NOT: Our test unit's 19-inch monitor was mildly disappointing. Deep reds on some images appeared slightly washed out, and brightness was uneven across the screen, with a pronounced dark patch in

one corner. The bundled keyboard is sturdy but lacks such common high-end features as volume controls and programmable buttons. Novices might find the 500N's documentation frustrating: Critical hardware info is hidden in a techie motherboard manual. **WHAT ELSE:** You won't have any problem storing large spreadsheets, databases, or graphics files, thanks to the Enthusiast 500N's hefty 19GB hard drive and bundled Zip drive. The system comes with Corel's WordPerfect Office 2000 suite, which includes word processor, spreadsheet, and presentation tools for home or small offices.

BEST USE: Experienced computer users looking for a fast PC at a rea-

sonable price will appreciate this system. Terrific graphics performance makes the CyberMax a good fit for gamers and multimedia hounds, too. ▶



THE ENTHUSIAST 500N from CyberMax offers great speed and extra features, such as a Zip drive (shown at left), making it a terrific value for small- and home-office users.

BUDGET HOME PCs

1 QUANTEX M466C

WHAT'S HOT: The Celeron-466-based M466c is very fast for a \$949 PC. And at that price you get a 6X DVD-ROM drive and a pair of clear-sounding MLI-190 3D Super speakers. The spacious midsize tower case offers more room to grow than just about any budget home PC we've seen, with three free externally accessible drive bays, two open PCI slots, and three free ISA slots.

WHAT'S NOT: Setting up the system may challenge inexperienced PC users. Documentation is limited—the user manual consists of a Windows guide that covers only the basics, and much of the hardware information is buried in a separate motherboard manual. Besides being small, the bundled 15-inch monitor didn't display small text as clearly as we'd like. Finally, despite a strong PC WorldBench 98 score of 208, the M466c fared worse than other budget home PCs in our 3D gaming tests.

WHAT ELSE: Quantex offers an array of software titles, which makes it unique in our current mix of Top 10 systems. The M466c comes standard with Corel's WordPerfect Suite 8, a series of Compton's Home Library reference CD-ROMs, and Amazon Trail (a nature game from the Learning Company), among other family-oriented programs. In short, it has something for everyone in the family.

BEST USE: Experienced PC users looking for an affordable home system that provides lots of speed and room for expansion will like the M466c. Upgrading to a

superior video card ought to improve the Quantex's graphics performance significantly and make this system an outstanding low-cost gaming or graphics workstation.

5 IDOT.COM 333M2 V

NEW **WHAT'S HOT:** At \$633, the 333M2 V is the cheapest home system we've tested. Its high-quality case and first-class set of peripherals

surpass those of many other bargain PCs. An easy-off cover allows quick access to the interior, which contains two open PCI slots and two free drive bays—lavish expansion room for the price.

WHAT'S NOT: Equipped with a Cyrix MII-333 chip, it posted a PC WorldBench 98 score of 142—barely faster than the average PII-233 PC. The 333M2 V also lagged in our 3D gaming tests and produced choppy AVI video playback. The keyboard felt flimsy and finally, the system came with no software extras, though IDot.com offers Microsoft Office 97 Small Business Edition for an additional \$189.

WHAT ELSE: Despite limited documentation, the 333M2 V includes a good setup guide that will help inexperienced users get up and running. Bundled Altec Lansing ACS43 speakers produce above-average sound given the lack of a subwoofer.

BEST USE: This low-cost system makes a fine choice for shoppers on a tight budget or for families looking for a second PC. Those who play the latest 3D games, work with high-resolution graphics, or run demanding software such as spreadsheets and databases will want a system with higher performance scores.

Near Misses

TWO NEW SYSTEMS from Quantex barely miss this month's chart. The speedy GX500's PC WorldBench 98 score of 227 placed it a notch below the systems on our power list. At just \$1699, this Quantex costs the same as the number-two Micron



THE QUANTEX GX500'S terrific graphics

performance should please graphics gurus and gaming fans. The heat sink (shown at left) attached to the 3dfx Voodoo3 video card keeps the board cool.



Millennia and the fifth-place CyberMax.

Avid gamers, videophiles, and graphics enthusiasts will welcome the GX500's fast graphics performance. In fact, its overall graphics scores beat those of any other system we've tested. Its 3dfx Voodoo3 3000 graphics card with 16MB of video memory helped it pull in the highest score on our 3D racing game.

The GX500's roomy interior includes two open PCI slots, two free ISA slots, and five free drive bays. A 12GB hard drive, a Zip drive, and a 6X DVD-ROM drive all come standard at this price. Despite the GX500's terrific hardware and performance, it still runs slower on business apps and has fewer features than the other power systems on the chart.

Quantex's M500c is virtually identical to the GX500 except that it's powered by a Celeron-500 instead of a PIII-500 and costs \$250 less. As a result of the CPU choice, the M500c runs slower than the GX500, posting a PC WorldBench 98 score of 213 and a lower (though still good) graphics score. Budget-conscious buyers will find the M500c adequate for day-to-day computing and occasional gaming.

Oakland, California, writer Kirk Steers is a contributing editor for PC World. ▶

ALSO NEW THIS MONTH



WE EVALUATED THE following systems along with the others, but they didn't score high enough to make the Top 10 Home PCs chart. For write-ups, visit PC World Online (www.pcworld.com/t10homepcs).

- ◆ Kingdom Pinnacle 466 Family System
- ◆ Kingdom Pinnacle 500 Home and Office Computer



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TOP 10 PRINTERS

	SMALL-BUSINESS/HOME COLOR	Street price (9/8/99)	Overall rating	Speed for plain text/full-page graphics (ppm)	Print quality for text/color graphics	Comments	Product info number
1	 HP DeskJet 812C 800/752-0900 www.hp.com	\$199	85	3.6/0.5	Good/ Good	 FEATURES: Ink jet, rated 4.6 ppm monochrome/3.1 ppm color. 600-by-600-dpi maximum resolution, 100 sheets input, 50 output. SUMMARY: Good print quality, especially at this price. Printer is nearly identical to the \$299 HP DeskJet 882C in fifth place, but is slower at both graphics and text.	742
2	 Lexmark Z51 Color Jetprinter 800/539-6275 www.lexmark.com	\$249	82	3.3/0.4	Good/ Very good	FEATURES: Ink jet, rated 10 ppm monochrome/5 ppm color. 1200-by-1200-dpi maximum resolution, 100 sheets input, 50 output. SUMMARY: A \$30 price drop boosts this model's rating. Extra features and useful paper-handling abilities outweigh underwhelming performance. Print quality is good, but beware of manufacturing problems that can cause striped gray-scales.	743
3	Lexmark 5700 Color Jetprinter 800/539-6275 www.lexmark.com	\$199	77	2.9/0.3	Good/ Good	 FEATURES: Ink jet, rated 8 ppm monochrome/4 ppm color. 1200-by-1200-dpi maximum resolution, 100 sheets input, 25 output. SUMMARY: Sturdy model delivers good output across the board. Text speed is adequate, but graphics are a bit slow. Cost-conscious users can save \$20 with the slower but otherwise comparable 3200 Color Jetprinter.	744
4	Epson Stylus Photo 700 800/463-7766 www.epson.com	\$249	75	1.3/0.4	Adequate/ Good	 FEATURES: Ink jet, speed unrated. 1440-by-720-dpi maximum resolution, 100 sheets input, 30 output. SUMMARY: Good graphics print quality on plain paper—and outstanding quality on specialty media—but text speed is the slowest on the chart, and text quality could be better. Includes a strong photo-oriented software bundle.	—
5	HP DeskJet 882C 800/752-0900 www.hp.com	\$299	74	4.3/0.8	Good/ Good	 FEATURES: Ink jet, rated 5 ppm monochrome/2 ppm color. 600-by-600-dpi resolution (maximum resolution unrated), 100 sheets input, 50 output. SUMMARY: Impressive print quality and speed on both text and graphics, but somewhat steep price keeps it from climbing the chart. HP's slower DeskJet 812C is a better deal overall.	745
6	Canon BJC-6000 800/652-2666 www.ccsi.canon.com	\$249	73	4.6/0.9	Very good/ Adequate	 FEATURES: Ink jet, rated 8 ppm monochrome/5 ppm color. 1440-by-720-dpi maximum resolution, 130 sheets input and output. SUMMARY: This quick unit produces both text and graphics faster than any other ink jet on the chart. It also features strong text print quality and optional networking. However, graphics could look better.	746
7	Lexmark Z11 Color Jetprinter 800/539-6275 www.lexmark.com	\$99	72	2.1/0.3	Good/ Adequate	 FEATURES: Ink jet, rated 4 ppm monochrome/2.5 ppm color. 1200-by-1200-dpi maximum resolution, 100 sheets input, 25 output. SUMMARY: A great price—now \$20 lower—and acceptable output make this the first single-cartridge printer to appear on the chart in years. Colors are adequate, if a bit oversaturated, and text is slightly shadowed.	747
CORPORATE COLOR							
1	 QMS Magicolor 2 DeskLaser 800/523-2696 www.qms.com	\$1299	86	8.8/1.0	Very good/ Very good	 FEATURES: Laser, rated 16 ppm monochrome/4 ppm color. Standard 8MB of RAM, 600-by-600-dpi maximum resolutions, 250 sheets input and output. SUMMARY: Not only is it the cheapest model on the corporate chart, this well-designed QMS is relatively quick at both text and graphics, with high overall print quality.	748
2	Tektronix Phaser 740/N 800/835-6100 www.tektronix.com	\$1850	85	8.9/0.5	Good/ Adequate	FEATURES: Laser, rated 16 ppm monochrome, 5 ppm color. Standard 32MB of RAM, 1200-by-1200-dpi maximum monochrome/600-by-600-dpi maximum color resolutions, 350 sheets input, 500 output. SUMMARY: You can upgrade this fast, affordable laser to add even more features. Strong text quality, but graphics output can be inconsistent.	749
3	Lexmark Optra SC 1275 800/539-6275 www.lexmark.com	\$1899	85	7.5/0.5	Good/ Good	 FEATURES: Laser, rated 12 ppm monochrome/3 ppm color. Standard 16MB of RAM, 600-by-600-dpi maximum resolutions, 400 sheets input, 250 output. SUMMARY: This great choice for busy offices features speedy printing, extensive paper-handling options, good all-around print quality, and a straightforward design.	750
 Best Buy		 Recommended for home		 Windows 95-certified Plug and Play		All products: 910	



HOW WE TEST The overall rating for both small-business/home and corporate 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 BEEN A *SOLID GOLD* flashback month in the printer world, and we don't mean that in a good way. All four new units we looked at hark back to the low-tech golden oldies of a few years

ago, when fuzzy gray text qualified as "black" and colors looked more fit for the Sunday funnies than for presentations. Apparently, in their frenzy to cut prices and hurry models to market, printer makers are trying to reinvent the past—and the result is

new ink jets that are as uninteresting as your local Top 40 radio station.

Take Canon's new BJC-2000. At \$99, it's the only dual-cartridge printer we've seen for less than \$100. (Dual-cartridge models run with black and color ink installed at the same time. They are more convenient and usually produce finer prints than single-cartridge models, which require you to swap cartridges.) The BJC-2000 prints pretty quickly: Its text speed of 3.1 pages per minute is faster than that of some of its competition, and its 0.4 ppm color speed meets the average.

But the Canon's print quality leaves much to be desired. Its black ink is more gray than black, making text appear somewhat weak, and it prints large type with rough edges. The text output is not horrible, just unimpressive. The BJC-2000's graphics, unfortunately, do look awful. Close parallel lines overlap into uneven stripes, gray-scale images look like old newsprint, and color photos come out pale and fuzzy. Even good documentation and an attractive software bundle, including American Greetings' CreatoCard, Crayola PrintFactory, Micrografx's Snap-Shot photo editor, and Canon's color design software, don't redeem the package.

Compaq's IJ300 is equally cheap, but also falls well short of the chart. Though it's based on Lexmark's impressive Z11 (ranked number seven this month), the single-cartridge IJ300 has its ups and

downs. Like the Lexmark, which wowed us with much better print quality than we'd seen from a single-cartridge model, the Compaq's output rivals that of many inexpensive dual-cartridge units. The IJ300 produces some good-looking pages, with clean, dark text and surprisingly good detail and color range on graphics. But it grinds out just 0.9 ppm on text, hopelessly slow even compared to Lexmark's lazy 2.1 ppm. Why the difference? Despite using similar engines, the two have different firmware, drivers, and internal designs, all of which can affect speed. In the end, budget-conscious printer shoppers should stick with the Z11.

We also reviewed Xerox's new ink jet, the DocuPrint C8. Xerox, despite a well-deserved reputation for good monochrome and color lasers, has yet to succeed with an ink jet. The \$129 DocuPrint C8 prints text at just 1.2 ppm—slower than any other model in recent memory, save the hapless Compaq IJ300. And its print quality comes nowhere near the Compaq's—the C8's text output appears blurry and uneven, lines are randomly speckled, and color graphics look alternately washed out and oversaturated. On the plus side, the new model's three color ink tanks can be replaced individually, which spares you from having to discard every color when one tank runs dry, as you must do with most low-end ink jets.

But the Xerox also features an annoying



MISSING THE CORPORATE chart by a hair, NEC's SuperScript 4200 prints fast, produces handsome output, and costs just under \$2000.

defect. During our color tests, the printer started squealing like an aging fan belt. Turns out that an internal part—the pulley that enables a belt to move the print heads—were not properly greased. Xerox has since corrected the error, but not before some squeaky models made it into stores. The company says it will replace any unit that exhibits this problem.

NEC'S NEAR MISS

NEC's new color laser, the SuperScript 4200, is very similar to the SuperScript 4400 we tested last winter, but at \$1999 it costs \$300 less. It's hard to criticize the 4200, which just misses the chart. It churns out crisp text at more than 10 ppm, good enough for most offices. Color graphics print at a par-for-the-course 0.5 ppm and look detailed, if a bit dark. And if you pack the 4200 with 80MB of memory (it comes with 32MB standard), it can print at 1200-by-1200 dpi. (We didn't evaluate the high-resolution output.)

Unfortunately, to print on legal-size paper with the 4200 you must either hand-feed the pages or buy an extra \$129 paper drawer, since the printer's standard drawer, unlike those of almost all other lasers, doesn't stretch to accommodate legal. But that's a minor complaint. The SuperScript 4200's only serious flaw is its timing: Several similar printers now sell for hundreds less. QMS's Magicolor 2 DeskLaser, for example, does everything well for just \$1299.

—Dan Littman ■

PRINT QUALITY SAMPLES

NEC's Laser Shines, but Ink Jets Fade Away



CANON BJC-2000

Grayish black ink makes text appear soft, and gray-scale images look like newsprint. Large letters have jagged edges, and colors look washed out and fuzzy.

NEC SUPERScript 4200

Sharp type emerges from the 4200—even small letters look distinct. Details also stand out on color graphics, though shades run a bit darker than we'd prefer.

XEROX DOCUPRINT C8

Indistinct and uneven, the C8's text is difficult to read. Meanwhile, its gray and color images appear either wan or oversaturated, depending on the image.

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TOP 10 SCANNERS

	SOHO SCANNER	Street price (8/17/99)	Overall rating	Scan quality	Scan speed—B&W at 300 dpi/color at 600 dpi (seconds per page)	Comments	Product info number	
1	 Epson Perfection 636U 800/463-7766 www.epson.com		\$229	97	Very good	12/74	FEATURES: USB, 600 by 2400 dpi, 11.3-by-16.8-by-3.5-inch unit, ¹ 9.9 pounds, 8.5-by-11.7-inch scanning area, optional transparency adapter. SUMMARY: This USB unit delivers the same great features as its SCSI twin, the Epson Perfection 636, for \$70 less. Easy installation and lifetime support win it the SOHO Best Buy.	—
2	Microtek SlimScan C6 800/654-4160 www.microtekusa.com	\$90	89	Very good	36/81	FEATURES: USB, 600 by 1200 dpi, 10.4-by-16.4-by-1.7-inch unit, ¹ 7.7 pounds, 8.5-by-11.7-inch scanning area, no transparency adapter. SUMMARY: This low-cost, lightweight unit is the only CIS (non-CCD) scanner on the chart. Impressive scan quality, choice software, and good support keep it high on the list.	634	
3	Microtek ScanMaker X6 800/654-4160 www.microtekusa.com	\$120	88	Good	34/50	FEATURES: USB, 600 by 1200 dpi, 11.5-by-17.3-by-3.2-inch unit, ¹ 11 pounds, 8.5-by-11.7-inch scanning area, optional transparency adapter. SUMMARY: Solid scan quality and overall performance make this model a contender. A strong software bundle and features not found on competing models sweeten the deal.	635	
4	HP ScanJet 5200Cse 800/722-6538 www.scanjet.com	\$299	87	Very good	24/80	FEATURES: Parallel and USB, 600 by 1200 dpi, 12-by-19.1-by-4.9-inch unit, ¹ 12.5 pounds, 8.5-by-11.7-inch scanning area, optional 35mm slide adapter. SUMMARY: Versatile but pricey scanner delivers admirable scan quality, includes useful software, and has an easy-to-use design.	636	
5	Acer AcerScan Prisa 620UT 800/733-2237 www.acerperipherals.com	\$149	86	Good	27/112	FEATURES: USB, 600 by 1200 dpi, 12-by-18-by-4-inch unit, ¹ 9.5 pounds, 8.5-by-11.7-inch scanning area, includes transparency adapter. SUMMARY: Beyond good scan quality, this all-purpose unit scans transparent and reflective materials. Without transparency adapter, \$99 AcerScan Prisa 620U is also a good value.	637	
6	Plustek OpticPro 9636T 800/685-8088 www.plustekusa.com	\$129	85	Good	25/201	FEATURES: USB, 600 by 1200 dpi, 11.7-by-16.7-by-3-inch unit, ¹ 7.2 pounds, 8.5-by-11.7-inch scanning area, includes transparency adapter. SUMMARY: Reasonable price, respectable performance, and solid support make this a fine entry-level scanner, despite slow color scans and mediocre software.	638	
7	 Pacific Image ScanAce 1236U 310/618-8100 www.scanace.com		\$100	84	Good	32/92	FEATURES: USB, 600 by 1200 dpi, 12-by-17.8-by-3.8-inch unit, ¹ 6.9 pounds, 8.5-by-11.7-inch scanning area, no transparency adapter. SUMMARY: Inexpensive model delivers good quality and performance at a bargain price. The \$90 ScanAce 1236P, though slower in color and gray-scale scans, is also a good value.	639
CORPORATE SCANNER								
1	 UMAX Astra 2400S 800/562-0311 www.umax.com	\$299	95	Good	12/67	FEATURES: SCSI, 600 by 2400 dpi, 13.2-by-23.3-by-5.9-inch unit, ¹ 14.6 pounds, 8.5-by-14-inch scanning area, optional transparency adapter. SUMMARY: Fast performance and outstanding support earn this legal document-capable unit a Best Buy. Scan quality, software, and price are other strong points.	640	
2	HP ScanJet 6350C 800/722-6538 www.scanjet.com		\$499	94	Very good	13/76	FEATURES: SCSI and USB, 1200 by 2400 dpi, 12.3-by-19.6-by-7.6-inch unit, ¹ 15.8 pounds, 8.5-by-11.7-inch scanning area, includes transparency adapter and ADF. SUMMARY: A great choice for OCR, this speedy newcomer includes an automatic document feeder, scans 35mm slides, and delivers top-quality scans.	641
3	Canon CanoScan FB 1200S 800/652-2666 www.ccsi.canon.com		\$499	90	Very good	20/74	FEATURES: SCSI, 1200 by 1200 dpi, 11.5-by-18.1-by-3-inch unit, ¹ 8.8 pounds, 8.5-by-11.7-inch scanning area, optional transparency adapter and ADF. SUMMARY: High-resolution corporate model boasts great color and detail, but it's a tad slow and its driver can be tricky to configure.	642
 For expanded reviews of this month's scanners, visit www.pcworld.com/nov99/scanners . All products: 911								



Best Buy

For expanded reviews of this month's scanners, visit www.pcworld.com/nov99/scanners.

All products: 911

HOW WE TEST All scanners are tested with default settings under Windows 98 on a Dell Dimension V333 (Pentium II-333) PC with 64MB of RAM, using each scanner's bundled software. Overall score is based on scanned image quality (28 percent), scanning speed (25 percent), ease of use (17 percent), features (15 percent), support (10 percent), and price (5 percent). Speed tests are timed from the start of scanning until cursor control is regained. Data based on tests designed and conducted by the PC World Test Center.

¹Dimensions are listed in the following order: width, depth, and height.



THIS MONTH'S small- and home-office chart is nearly an all-USB club. Epson's new Perfection 636U replaces its SCSI sibling as a Best Buy, while the new \$100 Pacific Image ScanAce 1236U

brings up the rear with slightly faster color and gray-scale scans than its \$90 parallel predecessor. SCSI still dominates on the corporate side, with newcomers HP ScanJet 6350C and Canon CanoScan FB 1200S offering fantastic quality for \$499 each. ■

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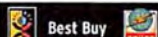
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TOP 10 GRAPHICS BOARDS

	AGP BOARD	Month tested	Street price (9/5/99)	Overall rating	Mixed-media business rating	3D rating	Features rating	Comments	Product info number
1	 Creative Labs Graphics Blaster RIVA TNT 800/998-1000 www.creative.com	Feb 99	\$100	91	Good	Excellent	Good	FEATURES: 16MB of SDRAM, 250-MHz RAMDAC, NVIDIA RIVA TNT chip, no bundled applications. SUMMARY: Excellent 3D performance and a top-notch color-calibration utility make this card a great value for business users and gamers alike.	732
2	Matrox Millennium G400 32MB 800/361-1408 www.matrox.com/mga	Sept 99	\$199	90	Excellent	Excellent	Excellent	FEATURES: 32MB of SGRAM, 300-MHz RAMDAC, Matrox G400 chip, bundled image editor, 3D modeling tool, and 3D game. SUMMARY: Speedy card lets you run apps simultaneously on two displays. A slightly slower 16MB version costs \$50 less.	733
3	3dfx Voodoo3 3500 TV 888/234-4334 www.3dfx.com	NEW	\$249	89	Excellent	Excellent	Excellent	FEATURES: 16MB of SDRAM, 350-MHz RAMDAC, 3dfx Voodoo3 chip, bundled video editing tool and 3D games. SUMMARY: Extremely fast in 3D and produced good-looking graphics in our 3D-gaming tests. It also lets you view and capture video files.	734
4	ATI Xpert 128 905/882-2600 www.atl.com	Aug 99	\$89	89	Good	Good	Excellent	FEATURES: 16MB of SDRAM, 250-MHz RAMDAC, ATI Rage 128GL chip, bundled graphics plug-in and 3D games. SUMMARY: Lowest-priced board here now costs \$10 less. An affordable choice for those who use standard office apps and play games.	735
5	Matrox Millennium G400 Max 800/361-1408 www.matrox.com/mga	Sept 99	\$249	88	Excellent	Excellent	Excellent	FEATURES: 32MB of SGRAM, 300-MHz RAMDAC, Matrox G400 Max chip, bundled image editor, 3D modeling tool, and 3D game. SUMMARY: Fastest at mixed-media business graphics, but ranks below G400 32MB sibling due to high price.	736
6	ATI Rage Fury 905/882-2600 www.atl.com	Aug 99	\$143	88	Good	Good	Excellent	FEATURES: 32MB of SDRAM, 250-MHz RAMDAC, ATI Rage 128GL chip, bundled 3D games. SUMMARY: Affordable, speedy card—suitable for basic graphics and gaming—costs \$16 less this month, but ATI is still revising drivers to mend Director bug.	737
7	Creative Labs 3D Blaster RIVA TNT2 Ultra 800/998-1000 www.creative.com	Sept 99	\$200	88	Good	Good	Good	FEATURES: 32MB of SDRAM, 300-MHz RAMDAC, NVIDIA RIVA TNT2 Ultra chip, no bundled applications. SUMMARY: Costs \$30 less this month and delivers solid performance in office apps and games, but it's slower than some competitors.	738
PCI BOARD									
1	 3dfx Voodoo3 2000 888/234-4334 www.3dfx.com	Oct 99	\$130	94	Good	Excellent	Good	FEATURES: 16MB of SDRAM, 300-MHz RAMDAC, 3dfx Voodoo3 chip, no bundled applications. SUMMARY: Top upgrade choice for avid gamers is affordably priced and has the fastest 3D performance among the PCI cards we've tested.	739
2	Matrox Millennium G200 SD PCI 800/361-1408 www.matrox.com/mga	Feb 99	\$119	86	Good	Good	Good	FEATURES: 8MB of SGRAM, 250-MHz RAMDAC, MGA-G200 chip, bundled 3D modeling tool, image editing application, and 3D game. SUMMARY: Performs well in both business graphics and 3D games and offers useful software extras.	740
3	Creative Labs Graphics Blaster RIVA TNT 800/998-1000 www.creative.com	Apr 99	\$100	86	Good	Average	Good	FEATURES: 16MB of SDRAM, 250-MHz RAMDAC, NVIDIA RIVA TNT chip, no bundled applications. SUMMARY: A good, inexpensive pick for standard graphics needs, but it delivered lackluster images in our 3D-gaming tests.	741



For reviews of other new graphics cards that we tested this month, visit www.pcworld.com/t10graphics.

All products: 909

TEST CENTER **HOW WE TEST** We test boards under Windows 95. Business tests include PC WorldBench 98, a PowerPoint test, and a Macromedia Director script. Our 3D score is based on four games, each evaluated on frame rate and image quality. For AGP cards we add a texturing test using Caligari's TrueSpace3. We tested AGP boards in an NEC Direction 333 with a PII-333 and 64MB of RAM. We tested PCI boards in a Micron Millennia Mme PC with a Pentium MMX-233 and 32MB of RAM. Overall rating is based on performance (AGP 55 percent, PCI 50 percent), features (25 percent), price (AGP 10 percent, PCI 15 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.



TWO AGP BOARDS break into chart territory. The 3dfx Voodoo3 3500 TV lands at number three despite its high \$249 price, thanks to great speed plus TV-tuning, video-capture, and video-out capabilities.

In fifth place, Matrox's fast Millennium G400 Max lets you run apps on two monitors (or a monitor and a TV) at once. On the PCI front, Creative Labs' Graphics Blaster RIVA TNT returns, with its sibling, the 3D Blaster Banshee, discontinued. ■

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TOP 10 MODEMS

	INTERNAL V.90 MODEM	Month tested	Street price (9/1/99)	Overall rating	56-kbps downloads/ 33.6-kbps transfers (min:sec per MB)	Comments	Product info number
1	 Viking 56K Windows ISA Modem 800/338-2361 www.vikingcomponents.com	NEW	\$60	83	3:37/6:16	FEATURES: Supports x2, ISA card, Lucent chip set, V.80 videoconferencing, MNP-10 error control, MNP-10EC, distinctive ring, voice mail, QuickLink Message Center III software. SUMMARY: Controllerless modem does well with 56-kbps downloads but is slow on 33.6-kbps transfers. Five-year warranty and 24-hour toll-free tech support.	723
2	Zoom FaxModem 56K ISA Dualmode 800/631-3116 www.zoom.com	Sept 99	\$69	82	3:38/5:54	FEATURES: Supports K56flex, ISA card, Lucent chip set, V.80 videoconferencing, distinctive ring, voice mail, Caller ID, Communicate software. SUMMARY: Quality, performance, and a reasonable price keep this modem near the top of the chart. Backed by a seven-year parts and labor warranty, with 15 hours of phone support daily.	724
3	3Com U.S. Robotics Winmodem PCI 800/638-3266 www.3com.com	Sept 99	\$60	81	3:37/5:55	FEATURES: Supports x2, PCI card, USB/TI chip set, V.80 videoconferencing, distinctive ring, Caller ID, RapidComm software. SUMMARY: \$20 price drop this month adds value to solid performer with slim voice features. 3Com offers a lifetime warranty on its modems, but only 10 hours of tech support per weekday—and the call will cost you.	725
4	MaxTech XPVS56P/RS NetPacer Pro Internal PCI Data/Voice/Fax Speakerphone Modem 800/936-7629 www.maxtech.com	Oct 99	\$35	81	3:12/5:58	FEATURES: Supports K56flex, PCI Card, Rockwell chip set, V.80 videoconferencing, voice mail, speakerphone, VoiceView, Caller ID, SuperVoice software. SUMMARY: Fast and low-priced but short on features. Has five year warranty and 10-hour daily support. MaxTech's nonspeakerphone model, the XPV56P, made fourth place last month.	726
5	Digicom Systems Modem Blaster 56K Internal Data Fax Modem w/Voice 408/719-5180 www.digicomsys.com	NEW	\$40	81	3:26/6:05	FEATURES: Supports K56flex, PCI card, Creative chip set, V.80 videoconferencing, distinctive ring, voice mail, speakerphone, Caller ID, QuickLink Message Center III software. SUMMARY: Affordable modem delivers good performance on 56-kbps downloads, consistent connections on different line types, and an array of basic voice features.	727
6	Zoom FaxModem 56K PCI Dualmode 800/631-3116 www.zoom.com	Jan 99	\$60	79	4:16/5:40	FEATURES: Supports K56flex, PCI card, Rockwell chip set, MNP-10EC, V.80 videoconferencing, distinctive ring, voice mail, Communicate software. SUMMARY: Average price. Offers good voice features and comes backed by long support hours. Runs slowest on the chart for 56-kbps downloads but does fine with 33.6-kbps.	728
7	Boca 56K WinStorm Modem M56H1 561/997-6227 www.bocaresearch.com	Aug 99	\$39	79	4:11/5:43	FEATURES: Supports K56flex, PCI card, Rockwell chip set, V.80 videoconferencing, MNP-10EC, distinctive ring, voice mail, speakerphone, Caller ID, QuickLink Message Center III software. SUMMARY: \$31 price drop puts this controllerless PCI modem back on the chart. Backed by a five-year warranty, but lacks toll-free support.	729
PC CARD V.90 MODEM							
1	 3Com MegaHertz 56K Global GSM & Cellular Modem PC Card w/ Xjack 800/638-3266 www.3com.com/mobile	NEW	\$229	85	3:30/6:02	FEATURES: Supports x2, 3Com/TI chip set, direct cellular connection, voice mail, speakerphone, Caller ID, digital line voltage protection and alert, Xjack pop-out phone jack, BVRP Phone Tools software. SUMMARY: Loaded but expensive. Linux and Windows compatible; includes exclusive line probing hardware. Offers lifetime warranty.	730
2	IBM 56K PC Card Modem 800/426-2968 www.ibm.com/options	Mar 99	\$160	83	4:01/6:06	FEATURES: Supports x2, USB/TI chip set, direct cellular connection, Caller ID, digital line voltage protection and alert, Xjack pop-out phone jack, QuickLink III software. SUMMARY: A little poky on 56-kbps downloads, but reasonably priced and comes with built-in phone jack, digital voltage protection, and 24-hour tech support.	-
3	Pision Dacom Gold Card Global 56K PC Card Modem + Fax 800/997-7466 www.psiondacom.com	July 99	\$165	78	4:10/5:39	FEATURES: Supports K56flex, Rockwell chip set, MNP-10 error control, callback, manual volume control, direct cellular connection, EasySwitch country-switching software. SUMMARY: You can use it abroad and with some GSM cell phones, so it's suitable for travel. Slower on 56-kbps downloads than other PC Card modems here.	731



Best Buy

For reviews of products that didn't make the chart, visit www.pcworld.com/t10modems.

All products: 908

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NEW MODELS TAKE THE LEAD on both internal and PC Card charts this month. Viking's ISA model offers great performance at a competitive price. Meanwhile, 3Com's new Global GSM &

Cellular Modem PC Card replaces its 56K Cellular Modem PC Card, adding overseas and cell phone capability plus circuitry for more reliable connections. Digicom's Modem Blaster debuts in the internal chart with competitive pricing and performance. ■



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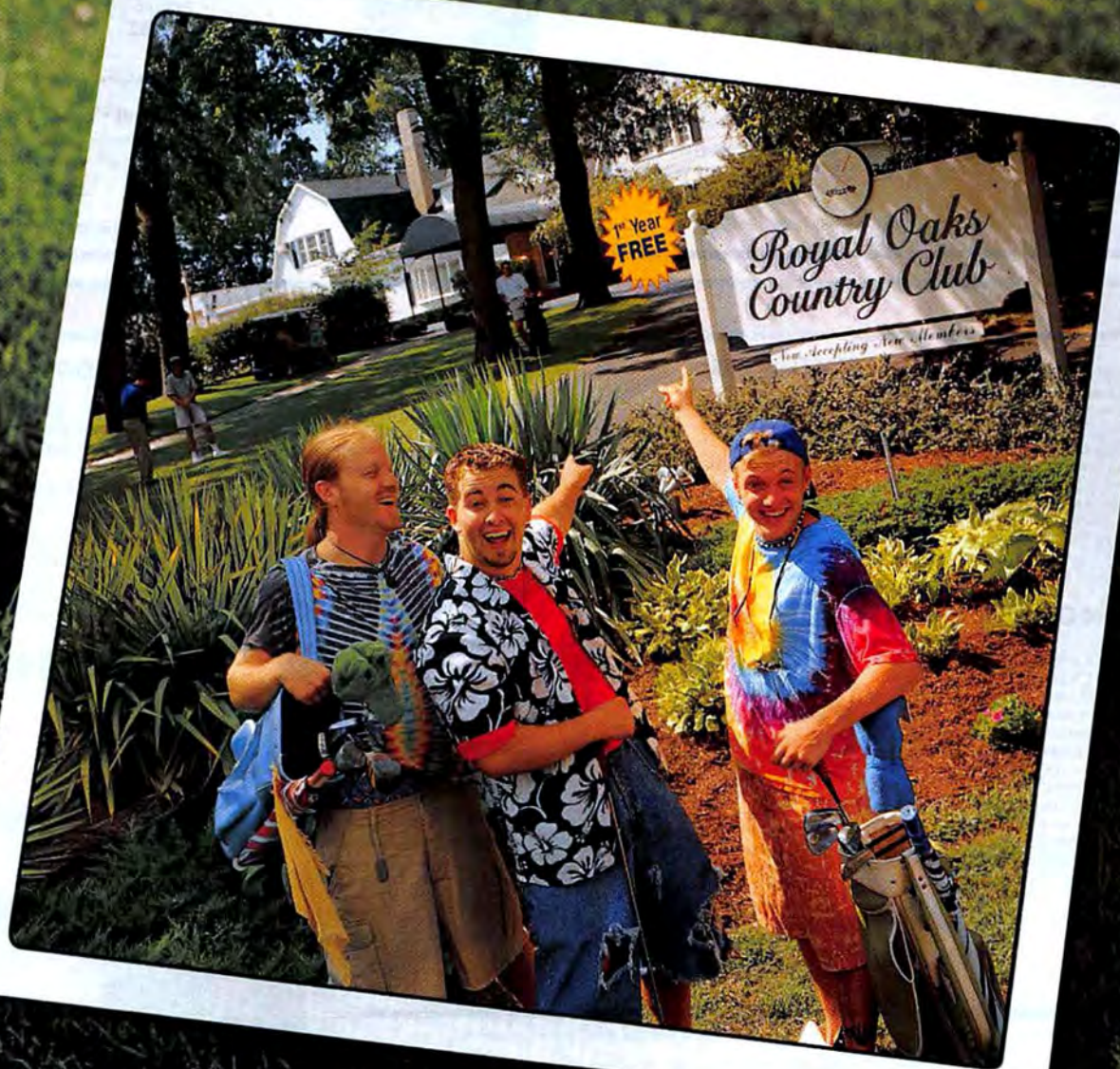
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³ CD-ROM speeds are variable. Maximum speed shown.

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HERE'S HOW



WINDOWS TIPS

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Deactivate Upstart Start-Up Apps

98

SOME OF THE NEW features in Windows 98 do considerably more harm than good by preventing you from using your computer. Probably the best example of this is the Windows Critical Update Notification feature, which forces Task Scheduler to start each time you boot your system, even if you turn off Task Scheduler.

I've suggested uninstalling Critical Update (see "Taming Task Scheduler," www.pcworld.com/jun99/windowstips_tame) as a solution. But reader Glen McLemore points out a way to disable both Task Scheduler and Critical Update Notification without uninstalling either—in case you want to run them again someday.

Choose **Start•Run**, type **msconfig**, and

press **<Enter>** to start the System Configuration Utility. Click the **Startup** tab and uncheck the box next to **Critical Update** (see **FIGURE 1**). If you see a check in the box next to the Scheduling Agent entry, uncheck that, too. Click **OK** and follow the prompts to restart your PC. If you later decide that you want to activate these items, just run the System Configuration

Utility again and restore the check marks.

As you might suppose, this utility prevents a start-up application from launching when Windows starts—a useful restraint in many cases. In Windows 95, the only way to obtain the same result is to tinker with various Windows launchpads, some of which are hard to find. Required steps include cutting icons from the Start Menu\Programs\Startup folder in the Windows folder, using a text editor to edit the 'load=' or 'run=' line of the Windows folder's win.ini file, or revising recondite Registry settings with the System Policy Editor. Luckily, System Configuration's Startup tab lets you control all these areas with a convenient one-stop checklist.

If you find yourself using System Configuration Utility frequently, you may prefer to launch it from a menu icon. To do that, open the folder of your choice in the Start Menu folder, right-click an empty area, and choose **New•Shortcut**. In the Command line, type "**c:\windows\system\msconfig.exe**" (your path may differ), and click **Next**. Type a name like **System Configuration Utility**, and click **Finish**.

Alternatively, you can access the msconfig utility—somewhat more circuitously—

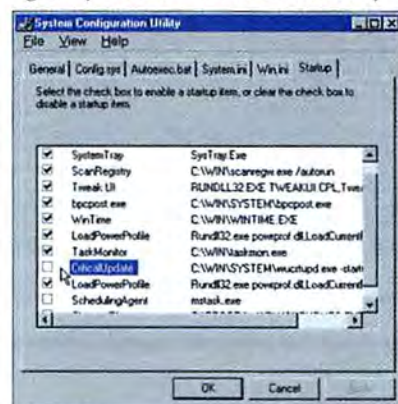


FIGURE 1: DISABLE CRITICAL Update to stop Task Scheduler from starting up each day.

by selecting **Start•Programs•Accessories•System Tools•System Information**. Then from the System Information menu, select **Tools•System Configuration Utility**.

MORE FUN WITH CASCADING MENUS



IF YOU READ May's *Windows Tips*, you know how to move your My Documents folder—or any other folder—to the Start menu to get a cascading menu of all the files and folders nested inside (see “Quickly Get to Previously Accessed Files or Sites,” www.pcworld.com/may99/windowstips). It's certainly handy, but this technique does have some limitations. For example, it forces you to keep your work documents on the same drive as Windows—not always possible on a crowded drive. But reader Leo Manzer knows how to turn any folder or drive—or the Network Neighborhood—into a cascading menu. You can even do some basic file management from your new menus.

Check prerequisites. You need to have one of the following configurations: Windows 98 Second Edition, Windows 98 with Internet Explorer 5, or Windows 95 with Internet Explorer 4's Desktop Update (and Internet Explorer 5 installed thereafter). Make sure that you have the latest version of IE 5; this tip may not work with beta versions. If your system doesn't meet these threshold requirements, skip to “Seek alternatives,” on the next page.

Build it. Right-click an empty area of your taskbar and choose **Toolbars•New Toolbar**. Navigate through the tree diagram of your disks, select a drive or folder, and click **OK**. Windows creates a toolbar on your taskbar. (If the toolbar's icons seem too big, right-click the new toolbar and choose **View•Small**.) Position the pointer over the title of the toolbar, and drag it to the right until all items on the

toolbar except its title disappear. (Drag down if your taskbar is along a vertical edge of your screen.) You'll see a double arrowhead (>>) next to the title, indicating that some of the toolbar is out of view. Anytime you want to access this folder or drive as a menu, click the >> symbol. The menu shows files as menu choices and subfolders as submenus.

Customize it. Add as many taskbar document menus as you want. If you like these menus, consider dragging the taskbar dividers to turn the Desktop or Quick Launch toolbars into menus as well. To rearrange the menus on the taskbar, drag a toolbar title to a different location on the taskbar. To rearrange the order of icons within the menu, just drag and drop them where you like. To sort menu items by name, display and right-click the menu, and choose **Sort by Name**.

Make a megamenu. If you like this menu, you can reduce clutter by making one big menu that includes all your desktop items, Control Panel, the Printers folder, all hard disks on your system, and even Network Neighborhood. Just right-click the taskbar and choose **Toolbars•New Toolbar**, as before. Scroll to the top of the folder list, select **Desktop**, and click **OK**. Then drag the toolbar title as described above until you see the >> symbol for your new supermenu. At this point you can close the default Desktop menu (which doesn't show My Computer and Network Neighborhood) and eliminate the menus for individual drives or folders.

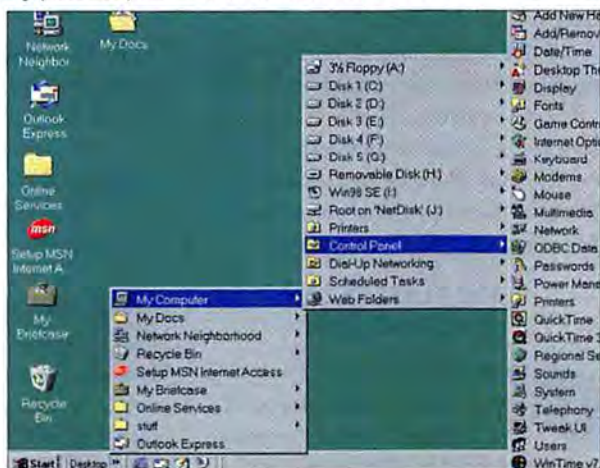


FIGURE 2: CREATE THE ULTIMATE cascading menu of all your system's drives, folders, documents, and control panels with IE 5.

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DON'T MISS ADDITIONAL HERE'S HOW information at www.pcworld.com/heres_how.

Use the keyboard. It takes a few keystrokes, but you can get to your new menu without using the mouse. To display and then close the Start menu, press **<Ctrl>-<Esc>**, **<Esc>**; next press **<Tab>** repeatedly until you highlight the menu you want. (If you inadvertently select a menu you don't want, press **<Esc>** and continue tabbing.) To navigate through the menu and submenus, press the first letter of a menu item or use the arrow keys. When you've selected the file you want, hit **<Enter>**. To minimize the number of keys needed, drag the title of the toolbar you use most often and drop it next to the Start button (see **FIGURE 2**). That way you can display its menu with a simple **<Ctrl>-<Esc>**, **<Esc>**, **<Tab>**.

Try a floater. If you want to launch your menu from a tiny floating toolbar, position the pointer over the toolbar title and drag it to the desktop. To make it less

conspicuous, right-click in an empty area of the toolbar and choose *Show Text* to remove the menu check mark and hide the toolbar labels. Make any other custom changes you want (I prefer to right-click, choose *View•Large icons*, and uncheck *Show Text*). Then drag an edge of the toolbar, and resize it to its smallest size (at least one icon will remain visible). As before, you access your menu from the >> symbol. To keep the menu visible at all times, right-click the toolbar's title bar and choose *Always on Top*.

Manage files. You can even do some basic file management from these magic menus. For example, you can right-click menu items and choose *Delete* or *Rename*. To copy or move files in menus, you can right-click and use the *Cut*, *Copy*, and *Paste* commands—or you can drag and drop items between the submenus. One quirk to watch out for: When dragging and dropping between drives, Windows usually copies files rather than moving them; but when you drag from a menu, Windows always moves the file (regardless of the destination) unless you right-drag and choose *Copy Here*.

Seek alternatives. Okay, so what should you do if your system doesn't satisfy the minimum requirements mentioned earlier (under "Check prerequisites")? In that case, I highly recommend using Scrollworks Cascader. Though it won't let you make a menu out of any folder, it can instantly generate menu versions of the Control Panel, the Printers folder, desk-

top items, the My Documents folder, My Computer, Network Neighborhood, and more. Unfortunately, however, the drives in the My Computer and Network Neighborhood menus will not appear as submenus. Scrollworks Cascader is easy to use, and it doesn't require any memory-resident program to operate once you've set up your menus. You can register for only \$10. The program is available from PC World Online's FileWorld or from its creators at www.scrollworks.com.

GET MORE ZOOM FOR YOUR BUCK

98 IF YOU FEEL nervous about using Microsoft PowerToys' QuickRes (which was designed for Win 95, not 98) to change screen resolution in Windows 98, stop worrying: You don't need this utility because Microsoft has built the same feature into Windows 98, though it's a little tricky to find. Fortunately, reader Bill J. Brodnick of Cleveland has clued us in. Right-click the desktop and choose *Properties*. Click the *Settings* tab and then the *Advanced* button. Check the box for *Show settings icon on task bar* (see **FIGURE 3**). Then click OK twice. The QuickRes icon will appear in the tray area of the taskbar (near the clock).

Bill also passed along another zooming tip. If you use the Microsoft Mouse with its infamous scrolling wheel, you can zoom screen size in and out in Internet Explorer, Microsoft Word, or (to a lesser extent) Microsoft Excel by holding down the <Ctrl> key as you rotate the mouse wheel.

CDDB PLAYERS CAN NAME THAT TUNE

? HOW CAN I VIEW the album title and artist name while playing a CD in CD Player? I used to be able to see that information all the time, but now I can't, following a recent hard disk crash.

Riaz Fancy, via the Internet

WINDOWS TOOLBOX

Let the Music Play With CD Valet

IF YOU'RE LOOKING for a cheap CD-player program that saves you the trouble of typing in artist and track info and takes up a minimum of screen real estate, consider CD Valet, a small but powerful utility from GHL Software.



Besides getting CD info from CDDB, an Internet CD database (see "CDDB Players Can Name That Tune" below), this \$10 shareware application has lots of customization

options, such as programming which tracks will play and in what order, playing audio CDs across multiple drives, and customizing the information displayed. You can control the entire application from a tiny icon in the system tray (the area near the clock). Download CD Valet from FileWorld, or from its maker at www.ghlsoftware.com.

FIRST, TRY CHOOSING *View•Disk/Track Info*. If your disk crash also destroyed the *cdplayer.ini* file in your Windows folder, you may find that you've lost the list of titles and artists you had hoped to see. Instead of retyping all that information, why not switch to a CD player that supplies it to you via the Internet? With many of these utilities, you simply connect to the Internet, pop in a CD, and wait a bit while the player retrieves the artist name, album title, and track information of your CD from a vast database of audio CDs called the CDDB. If your musical tastes aren't too esoteric, you may never again have to enter the names of titles and artists. You can find shareware and freeware CDDB players at www.cddb.com/cdplayer.html, and you can read more about CDDB at www.cddb.com. Interested in test-driving a program that offers lots of customization options? Then try CD Valet, featured in this month's "Windows Toolbox."



You'll find files mentioned in this article at www.fileworld.com/magazine. Send your questions and tips to scott_dunn@pcworld.com. We pay \$50 for published items. Scott Dunn is a contributing editor for PC World and a principal author of The PC Bible, 2nd Edition (Peachpit Press, 1995).



FIGURE 3: ADDING THE QUICKRES menu icon to your taskbar is easy—once you know where to look.

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Share Internet Connections Easily and Affordably

WINDOWS 98 SECOND EDITION comes with one great new feature that many NT Workstation users would willingly kill (okay, pay) for. Internet Connection Sharing (ICS) allows computers on a LAN to share a Windows 98 SE system's analog, ISDN, cable, or ADSL modem connection. If you think the all-powerful Windows NT Workstation offers something similar, think again.

Installing ICS on the server system is quick and easy. ICS uses the Dynamic Host Control Protocol (DHCP), a standard TCP/IP networking service that allows a computer to dynamically assign valid IP addresses to other computers on the local network, thereby enabling a shared Internet connection. The DHCP server then acts as a traffic controller, routing data between the local computers and the Internet. Client systems require only a quick setting change to establish their LAN connection. And since DHCP is a standard protocol, the client computers on your network don't have to run Windows to link through ICS. I routinely use a Windows SE system's dial-up ISDN connection to get Net access for a second computer running Linux.

Unlike NT Workstation, the NT Server package comes with a full-fledged DHCP

service that you install and configure with the Control Panel's network applet. But at \$275 or so for the five-user upgrade version, it's a fairly expensive option for NT Workstation users.

Fortunately, several third-party products offer cheaper solutions. Sybergen Networks' SyGate 3 (see **FIGURE 1**) has even more features than Microsoft's ICS. Like ICS, SyGate uses DHCP to give IP addresses to computers on the network, works with any PC that has the TCP/IP network protocol installed, and requires no other software or configuration on the client side. Beyond that, SyGate provides

firewall software to protect both client and host computers, and its filtering feature lets you limit where client computers surf. If you need to share your network connection with only one or two other computers, SyGate's three-user version is a bargain at \$40. You can buy the software online or download a demo (fully functional for the first 100MB of data downloaded) from www.sygate.com/download.htm or from PC World Online's FileWorld.

If you're a complete tightwad (like me), you may be able to share that NT Workstation connection for free. As we went to press, a Swedish company called Weird Solutions was offering a free beta of its forthcoming DHCP Turbo NT utility. This package runs as a service, meaning it loads automatically, regardless of who is logged on. For the current status of the product, see www.weird-solutions.com.



Get the Latest Hotfix

IF YOUR NT SYSTEM is vulnerable to attack from within your organization or from the outside, check out the latest post-Service Pack 5 "hotfixes"; three of these prevent miscreants from exploiting flaws that could bring your system to its knees. To get them, visit www.microsoft.com/security/bulletins/current.asp. You can also find post-SP5 fixes, installation instructions, and related Knowledgebase articles at ftp.microsoft.com/bussys/winnt/winnt-public/fixes/usa/nt40/Hotfixes-PostSP5.

DHCP isn't the only way to share a Net connection. Proxy servers can fill the bill, though they won't dole out IP addresses dynamically. For users who don't mind popping NT's TCP/IP hood to do a little network configuring, the free AnalogX Proxy is attractively lean (a mere 200KB download) and mean. To make setup easier, the program's accompanying readme file explains the installation steps in plain English. The current version of Proxy supports Web and mail connections, and AnalogX promises FTP, chat, and other

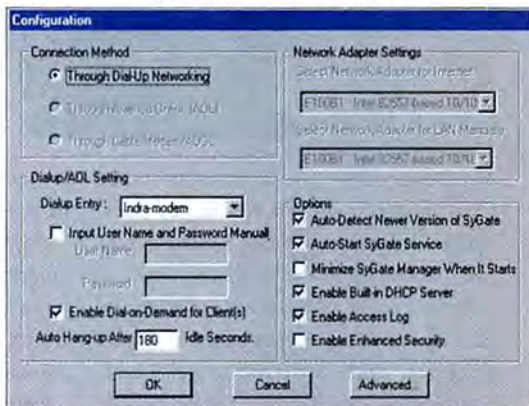


FIGURE 1: SHARE YOUR NET CONNECTION with other PCs and keep hackers out with Sybergen Networks' SyGate 3.

SyGate 3

Price: \$40 for 3 users, \$70 for 6 users, \$120 for 10 users, \$200 for 25 users, \$300 for unlimited number of users; Sybergen Networks; 877/923-7436; www.sygate.com

PRODUCT INFO NO. 633

support in a later version. Hey, what do you expect for free? Find the utility online at www.analogx.com or FileWorld.



You'll find files mentioned in this article at www.fileworld.com/ magazine. Scott Spanbauer is a contributing editor for PC World. Send questions and tips to nttips@spanbauer.com. We pay \$50 for published items. ■

YOUR QUESTIONS ON: How to get Tweak UI ♦ Putting your PC on standby

Crashes Happen: Here's How to Protect Yourself



COULD YOU GIVE me a checklist of steps I should take now to be ready if my hard drive ever fails to boot?

Donna Witvig, Irvine, California

TO BE FULLY prepared for that miserable day when your hard disk grinds to a halt or doesn't start up at all, you've got to start taking notes now. First, you need to know your CMOS settings for the hard drive. How you get to your CMOS settings screen differs from PC to PC, but it usually involves pressing a key noted in a screen prompt when your computer boots.

On a nonworking hard drive, the CMOS information might be blanked out. So checking it before you have problems and writing down the hard disk settings becomes extremely useful if you ever need to fill in the blanks.

Next, create a Windows emergency start-up floppy, if you haven't already done so. Select *Start>Settings>Control Panel*. Double-click *Add/Remove Programs*. Click the *Startup Disk* tab. Pop a floppy into your A: drive, click *Create Disk*, and follow the prompts from there. Label the disk "Start-up" or "Emergency Bootup" and before storing it away in a safe place, check to see that it works properly. If you use Windows 95, see www.pcworld.com/apr99/hardwaretips for more details.

When you boot from the start-up floppy, you'll get an A:\> prompt. Type *dir c:* and press <Enter>. A list of files will scroll by quickly. Next, see if you can boot your CD-ROM drive. Place a data CD-ROM in

the drive and type *dir x:*, where *x* is the drive letter of your CD-ROM drive. A list should scroll by. If you get an

error message saying the drive was not ready, you will need to manually load your CD-ROM drivers onto the floppy. These drivers can reside in a folder of their own, in the root directory, or in the \windows\command folder.

You might also want to download Ontrack Systems' Data Advisor (www.ontrack.com), a freebie that analyzes your hard drive and often tells you what's wrong. Alternatively, Data Advisor can also call Ontrack and let a technician examine your system via your modem, at a cost of \$100. If the technician is able to fix the problem online, that operation costs extra.

In data recovery as in life, there are no guarantees. Sometimes the files you lose on a failed hard drive are gone for good. Two floppy-based recovery programs to consider, aside from Data Advisor, are Ontrack's EasyRecover and PowerQuest's Lost & Found. Both do an excellent job of lifting files off your drive. Each saves the data to another drive rather than restoring it on the bad one. Both EasyRecover and Lost & Found are available in free demo versions that identify which files can be saved and in commercial versions that actually save the files.

You can also send your dead drive to Ontrack and possibly get your recovered data back on CD-ROMs. Ontrack charges \$100 to diagnose your drive and \$1200 to \$1400 to recover as much data as possi-



How Slow Is Your Site?

IF YOU HAVE A Web site, you should be concerned about how long it takes visitors to download a page. There are too many variables on the Internet—from the quality of the phone or network connection to how busy the server is—to gauge download times precisely, but if you use FrontPage 2000, you can get estimates for different types of Internet connections. Just click the estimate bar on the lower right-hand status bar, and select any option from a 1400-bps modem to a T3 connection.

ble. If nothing else, those prices will make you more religious about backing up.

I WANT MY TWEAK UI



YOUR COLUMN often recommends installing Tweak UI from the Windows 98 CD-ROM. But the program isn't on the Windows 98 Second Edition CD-ROM. I've found Tweak UI useful in Windows 95; where can I get the Windows 98 version?

Richard Chandler

Raleigh, North Carolina

MICROSOFT HAS DONE an about-face on Tweak UI, a great freebie that lets you easily customize how Windows behaves and looks. The program is no longer included on the Windows 98 CD-ROM, and the version that was included is no longer available on disc or online.




FIGURE 1: TWEAK UI'S Windows 95 version is the only version currently available.

Microsoft has never officially supported Tweak UI, or any other of the PowerToys the company made available for download shortly after Windows 95 premiered. The version that came on the first Windows 98 CD-ROM—which Microsoft insists wasn't developed specifically for Windows 98—differed from the original Windows 95 version (see **FIGURE 1**). The later Tweak UI had more options and two tabs—IE4 and Control Panel—that were not included in the original version.

Microsoft didn't include Tweak UI with the latest CD-ROM because it thought that it made Windows unstable in certain situations. How often does that happen? With all of the reader questions I research for *Answer Line*, I've found only one problem related to Tweak UI and Win 98, and it was nothing that could crash your system (for details, see my June column at www.pcworld.com/jun99/answers).

I've used both versions of Tweak UI with Windows 98 without serious problems. So if you have Win 98 SE and want Tweak UI, go ahead and download the original version from www.microsoft.com/windows95/downloads/contents/wutoys/w95pwrttoysset. Just keep in mind that if your system does become unstable, a Tweak UI setting might be the cause.

WHOSE DEFAULT IS IT?

 WHEN I DOUBLE-CLICK a file that isn't associated with an application, Windows brings up its Open With dialog box so I can choose a program to launch it with. But by default Windows checks the 'Always use this program to open this type of file' option, which makes accidentally associating a file type with the wrong application all too easy. Is there a way, once I've made this mistake, to get back to the Open With dialog box?


Stan Grant, Lodi, Ohio

IT'S EASY TO bring up that dialog for an already-associated file. Select the file, hold down **<Shift>** while right-clicking it, and select *Open With*. In this situation, the Always box will be unchecked (see **FIGURE 2**).

If you want that option to come up unchecked at all times, you're going to have to edit the Registry, which you should never do until you've backed it up. To back up the Registry, go to the Windows directory and copy the following Registry files to another folder: *system.dat*, *system.da0*, *user.dat*, and *user.da0*. Windows 98 users won't see the 'da0' files. Since the Registry files are hidden, type **attrib -s -h -r *.da*** and press **<Enter>**. The files will then appear in the directory for copying.

Once you've backed up your Registry, select *Start>Run*. Type **regedit** and press **<Enter>**. Next, navigate the Registry Editor's left pane to *HKEY_CLASSES_ROOT\Unknown\shell\OpenAs\command*. In the right pane, double-click (*Default*). In the resulting Edit String dialog box, add a space and **%2** to the existing text string, so that it reads 'C:\WINDOWS\rundll32.exe shell32.dll,OpenAs_RunDLL %1 %2'. Press **<Enter>**, and exit the Registry Editor.

EASY STANDBY

 IS THERE ANY WAY for me to create a shortcut I can use to put my desktop system into Standby mode, like I do with my notebook?

Ted Langlet, Volcano, California
MOST NOTEBOOK computers are configured with the power-saving Suspend (in Windows 95) or Standby (in Windows 98) mode enabled. But the only desktop systems that support these features (located on the Shut Down part of the Start menu) are those that offer power management. If you don't see the Standby option in your PC's Shut Down Windows dialog box, yours doesn't offer it. And if power management is not configured to be on, Windows won't provide Suspend or Standby as a menu choice.

Manually putting Windows 98 into Standby mode is much harder than it should be—most people certainly won't want to walk through the required steps every time they get up to take a break.



FIGURE 2: CHECK the bottom box in the Open With dialog to associate files permanently.

For better power management controls, I recommend *Exits95/98*, a free utility produced by Dutch Blue Rose Software (peterw.club.tip.nl). The program creates a system tray icon you can click to exit or reboot Windows quickly—or to put your computer into Standby. But because every system tray icon represents a program that's open and running in the background, you may be best advised to use *Exits95/98* without actually installing it.

Once you have uncompressed the utility's files, copy them to a newly created folder—say, *C:\Program Files\Exits95*. Next, create a shortcut by dragging *Exits95.exe* to your desktop. Right-click the shortcut, select *Properties*, add **/s /n** to the end of what's in the Target field, and add quotes to both ends of the field—thereby turning, for instance, *C:\Program Files\exits95\Exits95.exe* into "*C:\Program Files\exits95\Exits95.exe /s /n*". Then click OK. The switches tell the program to set the computer to Standby mode without further prompts.

Now it's a simple matter of renaming the shortcut **Stand By**, and moving it somewhere convenient. I keep mine on the QuickLaunch toolbar just to the right of the Start button.



Download files mentioned in this article from www.fileworld.com. Send your questions to answer@pcworld.com. We pay \$50 for published items. PC World Contributing Editor Lincoln Spector writes the syndicated computer column *Gigglebytes*. ■

EasyRecover

Price: Limited version \$49, full version \$195;
Ontrack Data; 800/872-2599; www.ontrack.com

PRODUCT INFO NO. 634

Lost & Found

Price: \$70; PowerQuest; 800/379-2566;

www.powerquest.com

PRODUCT INFO NO. 635

Trim AOL files ♦ Find radio stations on the Web ♦ Troubleshoot audio problems

The Web Is Alive With the Sound of Music

EASY LISTENING get on your nerves? Too much hip-hop for your baby-boomer taste? Thanks to the Web, your radio station options these days are almost limitless. Regardless of where you live and how many AM and FM stations your old antenna-wearing box receives, the Web can turn your PC into a megaradio. Thousands of radio stations from Helsinki to Antarctica broadcast on the Web—in many cases live. And you aren't restricted to music alone.

You can listen to daily news broadcasts from NPR or Bloomberg, or tune into a beloved hometown station. To do that, you must have a 486 or faster computer, a sound card, speakers, a fairly good connection to the Net (28.8 to 56 kbps will do, but faster is better), and two free browser plug-ins: RealPlayer from RealNetworks (www.real.com) and Windows Media Player from Microsoft. The latter comes bundled when you buy Internet Explorer 5 or Windows 98, so if you have either of these, you needn't download it separately.

You can bookmark Web broadcast URLs just as you would any other Web page. Just be sure to bookmark the URL that lets you listen to music, not the one that takes you to the radio station's Web page. You can then place shortcuts to radio broadcasts on your desktop or on the Quick Launch toolbar. Whether listening to Web radio will slow down access to other Web sites depends on the speed of your ISP and on whether Internet traffic is heavy at that moment.

But tuning in to Web radio is not as

simple as turning a boombox dial to zero in on your favorite station. In addition, pops and static hiss can distort sound, and you may encounter bizarre error messages that audio plug-ins seem to be particularly susceptible to. With those perils in mind, here are some tips for, er, easy listening.

Find radio stations. To find radio stations on the Web, start with directories like the Jumbo Internet Radio List (www.internetradiolist.com), which offers links to thousands of stations. Multicast sites like Broadcast.com (www.broadcast.com) and Spinner (www.spinner.com) offer searchable directories of radio

stations, as well as TV programs and other audio and video broadcasts on the Web. Click the *Web Events* button in Windows Media Player (that button is labeled *Showcase* in some versions) to get to Microsoft's radio station guide, or go to windowsmedia.microsoft.com. In IE 5, activate the Radio toolbar (*View•Toolbars•Radio*); then click the *Radio Stations* button and select *Radio Station Guide* to browse through dozens of offerings. My favorite way to find radio stations is with the \$23 EarthTuner, which includes a database of 1400 Web stations, including a large selection of

Don't Uninstall IE 5, Repair It
ERRATIC IE 5 BEHAVIOR may tempt you to uninstall the browser. But before you do that, try to fix it: Open the Add/Remove applet from Control Panel, and select *MS IE 5*. A dialog box will prompt you to repair it instead. The repair tool (available in all versions of Windows 9x prior to 98 SE) checks the program's files to confirm that they're up-to-date and properly configured in the Registry. If problems persist, your best option is to download the latest version of the browser from www.microsoft.com/ie.

news and business stations that you can search and tune into (see **FIGURE 1**). When you find stations you like, you can program them into jukebox-like buttons. EarthTuner plays video as well as sound. You can download the program for a 15-day trial period from www.earthtuner.com or from PC World Online's FileWorld.

Activate the Radio toolbar. If your IE 5 toolbar lacks the Radio toolbar, you may not be running an up-to-date version of Windows Media Player. You can download the latest from Microsoft's Web site (www.microsoft.com/windows/mediaplayer/download). You also need to enable IE 5 to show the Radio toolbar: Select *Tools•Internet Options•Advanced*, scroll down to Multimedia, and place a check mark in the box beside *Always Show Internet Explorer Radio Bar* and another in the box beside *Play Sounds*. Click OK.



FIGURE 1: CLICK A PART of the globe, and EarthTuner will find radio stations from the selected region that broadcast online.

Remove radio stations. To remove radio stations from IE's drop-down list, you'll have to edit the Registry. (The drop-down list holds only six stations, so it might be easier to add new stations and let the old ones scroll out.) As always, before you do anything to the Registry, back it up: Select *Start•Programs•Accessories•System Tools•System Information*. From the *Tools* menu choose *Registry Checker*. This tool will check the Registry, then ask you whether you wish to back it up. Click *Yes*. Select *Start•Run*, type *regedit*, and press *<Enter>*. Next, head to the *HKEY_CURRENT_USER\Software\Microsoft\MediaPlayer\Radio\MRUList* key. Systematically delete each *Radio_Station_n* value you want to get rid of by highlighting each one and then selecting *Edit•Delete*. Finally, change the *Radio_Station_Count* value to 0.

Avoid the traffic. If music sounds choppy and you get frequent "network congestion" errors, you're probably listening during Internet rush hours. Listening to Web radio is usually easiest in the late evening hours. If you can't connect to the audio server, many other surfers may be listening to the same station; only a finite number of people can tune in at once. The solution: Try connecting later. If you get time-out errors, that could mean the audio server is busy or your ISP is ill prepared to handle all the traffic.

Clear your cache. You can nip many audio problems in the bud by clearing out your browser's disk and memory caches. For instance, if your audio player reports an "error 14," a loaded cache is usually to blame. You might also increase the size of caches to handle large audio files; you'll have to experiment with this. In Navigator, head to *Edit•Preferences* and click the



FIGURE 2: IMPROVE REALPLAYER audio quality by checking one of these options.

plus symbol next to *Advanced* (or double-click *Advanced*). Select *Cache*. In the menu on the right pane, first click *Clear Memory Cache* and *OK*, and then *Clear Disk Cache* and *OK*. Click *OK* again to close the Preferences dialog; then close and reload your browser. In Internet Explorer, select *Tools•Internet Options* and select the *General* tab. Under Temporary Internet Files, click the *Delete Files* button and *OK*. Close and reload your browser.

Update your sound card driver. Outmoded drivers often have difficulty handling Web radio's compressed audio streams. Since the sounds you normally play on your PC aren't compressed, you might not realize that your driver is old until you try to tap into Web radio. Visit the Web site of your sound card or PC manufacturer to obtain the latest driver and installation instructions.

Optimize RealPlayer. Does your music distort or play too fast or too slow? If you use RealPlayer, you can tweak how it works with your sound card by selecting *Options•Preferences* and clicking the *Performance* tab. Next, click the *Settings* button under Sound Card Compatibility, select either *Disable 16-bit sound (use 8-bit only)* or *Disable custom sampling rates* (see FIGURE 2), and click *OK*. If the sound quality doesn't improve, disable the other setting. Also, make sure the Bandwidth setting listed under the Connection tab is set to your modem's speed. **Don't miss a beat.** Catch up with the state of MP3 and other hot Web music technologies by reading our special report, "You Say You Want a Revolution: Music on the Web," on page 199.

SPEED UP AMERICA ONLINE

JOSEPH J. LAZAR JR. OF Lansdale, Pennsylvania, writes that he can't figure out how to delete a file in his AOL directory called *main.idx*, which seems to grow with each hour spent online.

AOL's software stores artwork in a cache file called *main.idx*, and as this cache balloons it slows down your access to the service. To shrink it, click the *My AOL* icon and select *Preferences•Graphics*. Next, set 'Maximum disk space to use for online art' to 1. Then close and reload

AOL's software. That will delete the bloated cache. Now repeat the above steps but this time reset 'Maximum disk space to use for online art' to 6 (see FIGURE 3). This will prevent the cache from expanding to more than 6MB. You should occasionally repeat these sets of steps.

Many people have noticed that 32-bit versions of AOL 4.0 indulge in a lot of

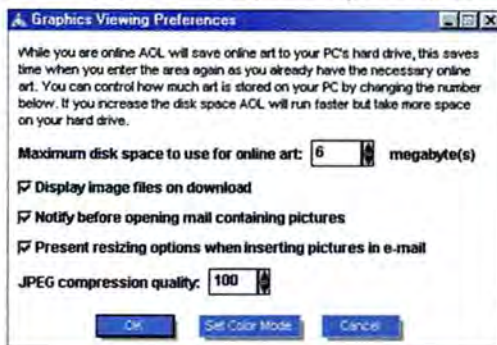


FIGURE 3: REDUCING AOL'S CACHE file often produces a faster connection and improved overall performance.

disk grinding. Inefficient memory buffering causes the software to write to *main.idx* and other cache files almost incessantly as the computer receives data from the Net or from AOL. AOLSPEED, a free patch from Jordan Russell and Steve Anders (www.digicron.com/aolspeed and www.aolspeed.dhs.org/#download), curbs AOL's disk grinding and speeds up the software in the process. It works with only certain versions of AOL 4.0, however, so visit either of those Web sites to find out whether yours is among them.

You can speed up AOL's software even more by cleaning up other cache files and by tidying up your mailbox:

- If you're using AOL's browser, clear out its cache: Click *My AOL*, select *Preferences*, and click *WWW*. Under the *General* tab, click *Delete Files* beneath the Temporary Internet Files entry; and under the *History* tab, click the *Clear History* button.
- Straighten up the Personal File Cabinet: Select *My Files•Personal Filing Cabinet*, and highlight and delete unneeded messages.



You'll find files from this article at www.fileworld.com/magazine. Judy Heim is coauthor of *The Quilter's Computer Companion* (No Starch Press, 1997).

E-mail formatting macro ♦ Step-saving keyboard shortcuts ♦ Protect Word styles

Liven Up Your Documents With Watermarks

FEW DESIGNS CAN add as dramatic an effect to a document as a watermark. This dim background image that sits "under" your text is an excellent way to add pizzazz to text documents. A watermark may be text, like the word *Draft* or *Copy* in large letters, or an image (say, a logo) that does not diminish the legibility of the document (see **FIGURE 1**). In most cases, adding a watermark isn't an obvious process; here's how to create your own:

Word 97 and 2000: Select **View**•**Page Layout**. To display the whole page at once, click the arrow to the right of the Zoom percentage box on Word's Standard toolbar, then select **Whole Page** from the list. Next, select **View**•**Header and Footer**. If your document already contains text or graphics, click the **Show/Hide Document** text icon to hide the text from view. To use a graphic as a watermark, select **Insert**•**Picture**, and choose an image, just as you would normally. Now drag the picture to where you want it to go, and use the sizing handles to resize it to suit.

If you want to create a text-based watermark, choose **Insert**•**Text Box**, then drag a text box of the size you want onto the

page. Type the text, positioning it in the box by using the alignment icons on the formatting toolbar, and then

select **Format**•**Font** and choose a type size.

Select a pale color from the Color palette in the Font dialog box. Right-click the graphic image or the border of the text box, then select **Format Picture** or **Format Text Box** from the pop-up list. If you're formatting a picture, drop down the Color list in the Format Picture dialog box, and select **Watermark** to automatically lighten the image, or adjust the brightness and contrast of the image with the scroll arrows (see **FIGURE 2**).

In Word 97, click the **Wrapping** tab of the Format Picture or Format Text Box dialog box, and select **None** as the wrapping style, then click **OK**. In Word 2000, click the **Layout** tab of the Format Picture or Format Text Box dialog box, select **Behind text** as the wrapping style, and click **OK**. Click

Close on the Header and Footer toolbar, or select **View**•**Header and Footer** to return to the normal editing screen. Finish up by changing the Zoom size back to your usual setting.

If you need to make changes in your watermarks later, select **View**•**Headers and Footers** again to allow you to select the watermark for formatting or editing. **Note:** Because Word stores watermarks in Headers and Footers, your watermark will appear on all pages of the document.



Quick Pasting in Word

BY DEFAULT, WORD in all versions from 6 through 2000 uses the <Insert> key to switch from the default insert mode to overtype mode. Since most of us rarely use overtype mode but often paste material into our documents, why not assign the paste command to the <Insert> key? Here's how to set it up: Select **Tools**•**Options**, then click the **Edit** tab in the Options dialog box. Select **Use the INS key for paste** option to mark it, and click **OK**. Word will insert the contents of the clipboard when you press <Insert>.

WordPerfect 8: Place the cursor on the part of the page where you want the watermark to appear. Select **Insert**•**Watermark**. In the Watermark dialog box, click **Watermark A** or **Watermark B**, then click **Create**.



FIGURE 2: MAKE YOUR (WATER)MARK by selecting **Watermark** in the Format Picture dialog box.

WordPerfect will display the Property toolbar and show the entire page in the window. If the Property toolbar does not appear, select **View**•**Toolbars**•**Property Bar**, then click **OK**.

Click the **Pages** icon on the Property Bar, then select one of the options in the Pages dialog box and click **OK**. To use your own text as a watermark, click on the page where you want the text to appear, then type the text. Select it and choose a font size. WordPerfect will automatically make the text a light gray.

For a graphic watermark, click the **Insert File** icon in the Property Bar, then choose the desired graphic file in the Insert File dialog box and click **Insert**. WordPerfect will automatically lighten the image and size it to fit between the page margins. ▶

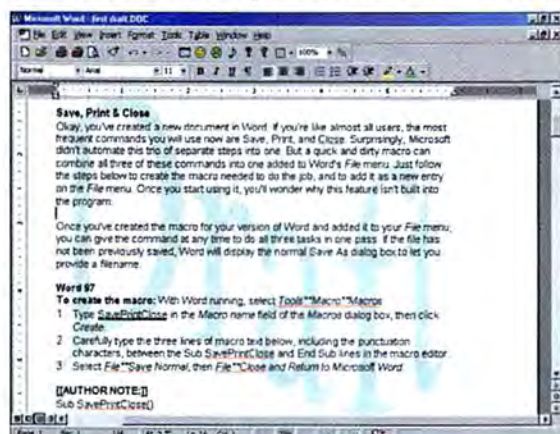
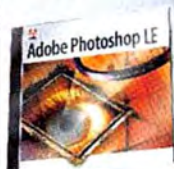
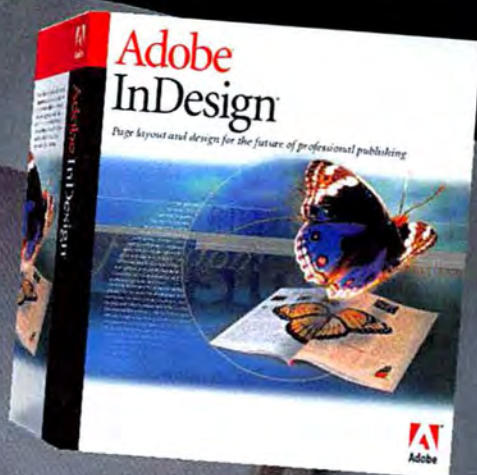


FIGURE 1: WATERMARKS CAN ADD drama to your documents without making them more difficult to read.

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Emulsion Direct Imaging Technology™ for scanning directly from the surface of film originals without glass interference. — U.S. Patent No. 5,574,274

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Click in the top margin of the document, then click the *Close* icon in the Property bar to return to your document.

To edit your watermark later, select *Insert*•*Watermark*, choose *Watermark A* or *Watermark B*, and click *Edit*.

CLEAN UP MAIL IN WORDPERFECT 8

WHEN YOU PASTE text from an e-mail message into a WordPerfect 8 document, you often find short lines of text, caused by hard returns at the end of each line of type. Fixing such text is time-consuming if you do it manually. In the March 1999 issue, we presented a macro that handles this job for Word users, and many readers

notes). Be sure to type all punctuation, capitalization, and spacing as shown.

Note 1: Wherever you see '[HRT]' in the macro, click *Codes* on the Macro Toolbar, then choose *HRT* from the list in the Macro Codes dialog box and click *Insert*. Do not type the brackets. The macro will not work if you type this code in.

Note 2: Where you see '{{space}}' in the macro code, simply press <Space>. Do not type the brackets.

4. Click *Save & Compile* on the Macro Toolbar. When prompted, type a name, such as *fixmail*, in the Macro Save As dialog box, and click *Save*. If WordPerfect reports any errors during this process, check your typing carefully and make any necessary corrections.

Use the Macro: Paste the text from the e-mail into your document. Click and drag to highlight *only* the pasted text. If you do not select any text, the macro will exit without doing anything. Select *Tools*•*Macro*•*Play*, choose the *fixmail* macro in the Play Macro dialog box, and then click *Play*.

Note: This macro works best on text in which a blank line separates the paragraphs (the usual e-mail format). If there are no blank lines, you will have to edit the text manually, either before or after running the macro.

WordPerfect Macro for E-Mail Text

```
Application (WordPerfect; "WordPerfect"; Default!; "EN")
OnError (GETOUT)
PosBlockTop ()
SearchFindWholeWordsOnly (State: No!)
SearchString (StrgToLookFor: "[HRT]")
ReplaceString (RplcStrg: "@@")
ReplaceForward (SearchMode: Extended!)
ReselectLastSelection ()
PosBlockTop ()
SearchString (StrgToLookFor: "@@@@")
ReplaceString (RplcStrg: "[HRT][HRT]")
ReplaceForward (SearchMode: Extended!)
ReselectLastSelection ()
PosBlockTop ()
SearchString (StrgToLookFor: "@@")
ReplaceString (RplcStrg: "{{space}}")
ReplaceForward (SearchMode: Extended!)
ReselectLastSelection ()
PosBlockTop ()
SearchString (StrgToLookFor: "{{space}}{{space}}")
ReplaceString (RplcStrg: "{{space}}")
ReplaceForward (SearchMode: Extended!)
Label (GETOUT)
```

FIGURE 3: THIS MACRO FIXES short lines that appear when e-mail is copied into a WordPerfect 8 document.

have asked for a WordPerfect equivalent. It's in **FIGURE 3**. To create it, just follow the steps below, or download the macro at www.pcworld.com/nov99/wptips:

Create the Macro:

1. Select *File*•*New*, then *WordPerfect Document* in the New dialog box; click *Create*.
2. Select *Tools*•*Macro*•*Macro Toolbar*.
3. In the document window, carefully type the macro commands listed in Figure 3 (see the instructions in the following two

CREATE KEYBOARD SHORTCUTS

BUILT-IN KEYBOARD shortcuts abound in Word 97 and 2000, but most of us have a few ideas for shortcuts of our own. Here's how to add these handy keystrokes to almost any part of Word, including (but not limited to) commands you can't find on your Word menus.

Select *Tools*•*Customize* and click *Keyboard* in the Customize dialog box. In the Customize Keyboard dialog box, make a selection from the Categories list, then choose a command from the list for that category (see **FIGURE 4**). The Categories list includes entries for each Main menu command, as well as the categories shown in Figure 4.



FIGURE 4: KEYBOARD SHORTCUTS for most functions in Word are assigned in this dialog box.

When you've selected an item to shortcut, click inside the 'Press new shortcut key' box, and then type the desired key-stroke combination. Look just below to see if the combination is available. If it's assigned to another command, press <Backspace> and try again. If you use a key-stroke already assigned to another command, your new assignment will take precedence. **Hint:** Try <Alt>•<Ctrl> combos—they will likely have the most letters available. Click *Assign* to store your shortcut, and make a note of it. Click *Close* twice when you're finished.

Note: At any time, you can restore Word's keyboard to its default assignments by clicking *Reset All* in the Customize Keyboard dialog box.

PROTECT YOUR WORD STYLES

WHEN YOU EXIT Word 97 or 2000, the program automatically saves changes you've made in formatting styles, storing them in the normal.dot template. This saves time, but can be very inconvenient if you've modified certain styles for a particular document—those styles may be reset for all documents. However, you can force Word to prompt you before it saves normal.dot. Select *Tools*•*Options* and click the *Save* tab. Select *Prompt to save Normal template* and click *OK*.



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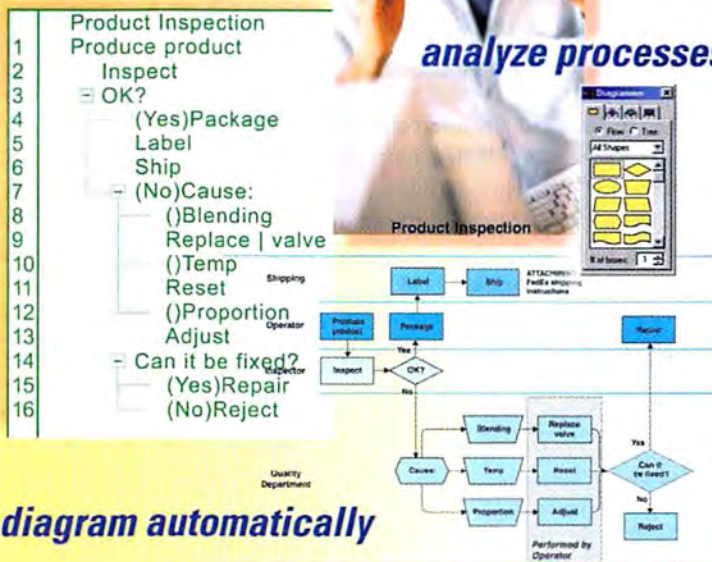


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www.spss.com/software/allclear

'Fill' Empty Cells in Excel Line Charts

WHEN YOU CREATE a line chart in Excel, missing data points (blank cells) won't be plotted, and the line will contain gaps. Excel provides two other ways of handling missing data: Treat blanks as zeros, or interpolate the data by connecting the line between the nonmissing data points (see **FIGURE 1**). In our example, interpolating missing data seems the better choice in view of the data's time-based nature.

To set how Excel deals with missing data, select your chart and choose **Tools>Options**. In the Options dialog box, click the **Chart** tab and then select the appro-

as your browser. Outlook Express is a good choice (it comes with Internet Explorer). Alternatively, Netscape Communicator provides access to newsgroups.

For general spreadsheet questions, visit the comp.apps.spreadsheets newsgroup. For questions about Excel, Microsoft provides more than a dozen forums. If your ISP doesn't provide access to the Excel groups (named microsoft.public.excel.*, in which * represents a particular topic such as programming), go to msnews.microsoft.com to access Microsoft's public news server. Quattro Pro-specific newsgroups are available as well, and Corel has a public news server at cnews.corel.ca.

You may be amazed by the depth of the knowledge available from these forums. Most questions posted to a newsgroup get a reply within a few hours. Response quality depends largely on how well the question is asked, so identify the spreadsheet (and version) that you use, and make your question as specific as possible.

SUM THE HIGHEST VALUES IN A RANGE



I USE EXCEL, and I need to calculate the sum of the three largest values in a range of 100 cells. The range isn't sorted, so I can't use a SUM function. Do you have any suggestions about how I could handle this problem?

Richard Spikey, Madison, Wisconsin
EXCEL's LARGE function returns the *n*th-largest value in a range, in which *n* is the function's second argument. You need a formula that calls the LARGE function



Reduce the Size of 1-2-3 Imports

WHEN YOU IMPORT a 1-2-3 file into an Excel workbook, the file may become extremely large, making it slow to open and save. If this happens to a file you import, it most likely contains preformatted rows or columns. When Excel imports such a file, it converts all formatted cells, even if they're empty. The solution is to select all blank rows and columns beyond the last used cell in your worksheet, delete these, and resave the workbook. The resulting file should be of a more manageable size.

three times and then sums the results. The following formula, which assumes the numbers are located in the range A1:A100, will do the job:

=LARGE(A1:A100,1)+LARGE(A1:A100,2)+LARGE(A1:A100,3)

Another approach is to use an array formula like this one:

=SUM(LARGE(A1:A100,{1,2,3}))

The formula first passes an array of three values to the LARGE function, and then uses the SUM function to add the values returned by the LARGE function. Notice that the values 1 through 3 are enclosed in brackets rather than parentheses. As always, after typing an array formula, press **<Ctrl>-<Shift>-<Enter>** instead of **<Enter>**.

Formulas of this type can become unwieldy as *n* gets larger. For example, to sum the top 30 values in a range, a formula must contain a list of integers from 1 to 30. Here is a more general version of the array formula:

=SUM(LARGE(A1:A100,ROW(INDIRECT("1:30"))))

This formula uses the ROW function to generate a series of integers between 1 and 30, and uses this array as the second argument for the LARGE function. To sum a different quantity of numbers, just change the 30 to the desired number.

Send your questions and tips to john@j-walk.com. We pay \$50 for published items. Contributing Editor John Walkenbach is the author of *Excel 2000 Bible* (IDG Books, 1999) and maintains The Spreadsheet Page (www.j-walk.com).

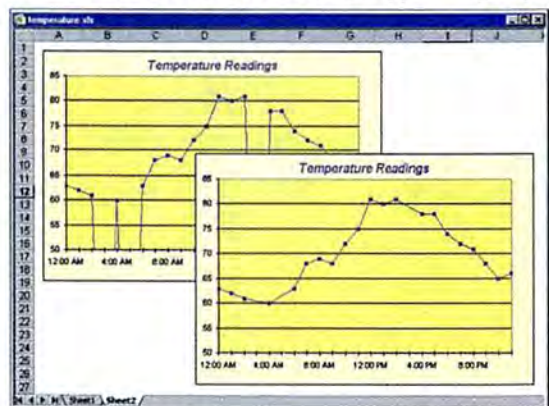


FIGURE 1: YOU CAN INSTRUCT Excel to treat empty cells as zero-values (left), or interpolate across missing data points.

appropriate option. Your choice will apply to all data series in the selected chart. You can also represent data with the formula **=NA()** instead of leaving a cell blank. The chart will use interpolation for data cells that contain this formula, regardless of the setting in the Options dialog box.

FREE SUPPORT ON THE NET

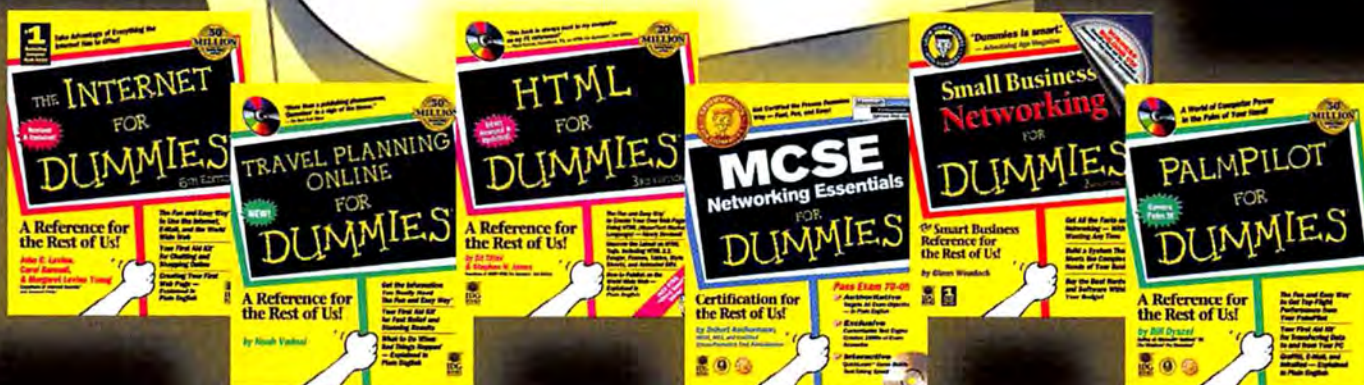
THE INTERNET has changed the nature of product support for the better. Instead of gambling on hit-or-miss support from vendors, you can now obtain peer-to-peer assistance from newsgroups. To access these newsgroups, however, you need a newsreader. If you use Internet Explorer

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- ☐ PLAN DREAM VACATION (W/IN BUDGET)
- ☐ CODE FOR E-COMMERCE
- ☐ PASS MCSE CERTIFICATION EXAMS
- ☐ NETWORK NEW OR USED PCs
- ☐ PLAN YOUR DAY ON YOUR PALM
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Adding RAM vs. adding L2 cache ♦ Printing on different paper sizes

Avoid IRQ-some Installation Problems

BACK IN THE Jurassic days of Windows 3.x, the process of installing a new modem, network interface, or other expansion card was at best hit-or-miss. You plugged your card into an expansion slot and waited to see if its IRQ, or interrupt request line, would happily coexist with the ones for all the other hardware in your PC. If it didn't, readjusting the settings was a nightmare.

Nowadays, adding a new card is much easier thanks to Windows 9x's Plug and Play technology. But in a way, today's PCs are victims of their own success. Many currently available systems come with so many internal devices (each preconfigured with its own IRQ) that you may actually run out of free IRQs before you install a new card or device. If you find yourself without a free resource when installing a new card or device, here's what you need to know.

Many of your PC's hardware components communicate with your system through an IRQ. Whenever a device has a task for the CPU, it sends a signal to the CPU via an IRQ. When the CPU sees this signal, it interrupts its current task and gives its attention to the device. For example, each time you type a letter on your keyboard, the keyboard sends a request on its IRQ line alerting the CPU that a character needs to be processed.

No room for add-ons. Before you buy a new card or peripheral, find out whether it needs an IRQ. Most cards that plug into expansion slots, whether PCI or ISA, require an IRQ. Significant exceptions include most video cards, USB devices, and

EIDE or SCSI devices like CD-ROM drives or hard disks. (The IRQs that these devices use are automatically assigned to the USB, EIDE, or SCSI bus rather than to the device itself.)

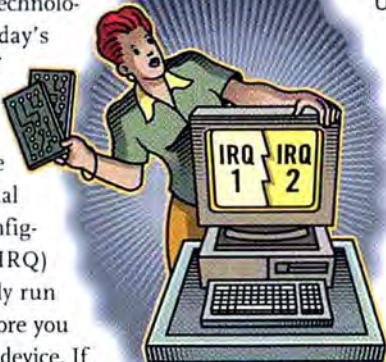
If your new hardware does need an IRQ, figure out how many free IRQs your computer has.

Unfortunately, most systems come from the factory with only a few unused IRQs. A typical PC has a total of 16 IRQs, numbered 0 through 15. To see how many IRQs are free on your PC, go to the Windows 98's System Information utility at *Start>Programs>Accessories>System Tools>System Information*, click *Hardware Resources*, and then *IRQs* (see **FIGURE 1**).

Windows 95 users can obtain a list of IRQ designations by right-clicking the *My Computer* icon on the desktop, selecting *Properties* and then the *Device Manager* tab, and double-clicking the *Computer* icon at the top of the hardware tree.

If you have one or more unused IRQs, your PC and Windows should automatically match any new hardware with a free IRQ during installation. But even if all your system's IRQs appear to be in use, you may be able to work around the deficiency.

Fix faulty steering. If you're installing a PCI card (check the box it came in if you're not sure), then it might not



Automate Modem Log-Offs

DO YOU EVER leave your computer for a long period of time, forgetting to disconnect from your ISP? Doing so can result in missed phone calls or huge phone bills. A solution is to set Windows 98 to automatically disconnect your modem after a specified duration of idling. Open the *Modems* icon in *Control Panel*, click the *Properties* button, and select the *Connection* tab. Now in the 'Disconnect a call if idle' box, set the amount of time (in minutes) your PC can remain idle before Windows hangs up.

need its own IRQ. PCI slots were designed to share IRQs, and if you're lucky, your card will install without requiring a new one. But if that's not the case, try the following tweaks.

First, enter your PC's CMOS setup program and find the PCI setup screen. What you see there will vary depending on your BIOS's make and version, but the choices and labels should generally be the same. Look for a setting that controls IRQ sharing and make sure it's enabled. If you're given a choice of ISA/Legacy, PCI, or Automatic setting for each IRQ, specify Automatic (usually the default) for each. If that doesn't help, try selecting PCI.

If you're using Windows 98 or the OSR2 version of Windows 95 (version 4.00.950B or 4.00.950C as listed in the System Properties dialog box in *My* ▶

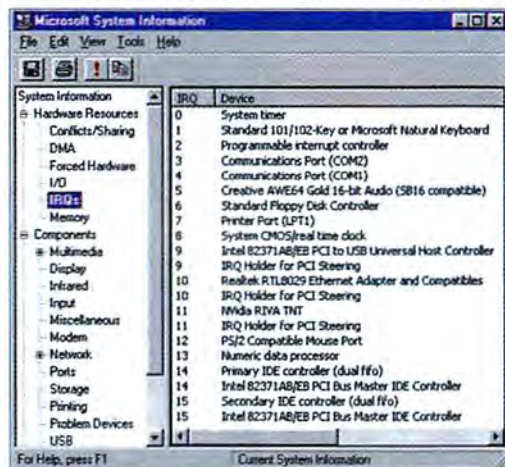


FIGURE 1: GET THE LOWDOWN on your system's IRQ usage with Windows 98's System Information utility.

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FIGURE 2: BY ENABLING IRQ Steering in Device Manager, you can let PCI cards share an IRQ.

Computer), you can enable its PCI steering feature, which also facilitates the sharing of IRQs on the PCI bus.

In Device Manager, double-click *System devices*, then *PCI bus*. Under the *IRQ Steering* tab, make sure the *Use IRQ Steering* box is checked (see **FIGURE 2**). Also make sure that all the boxes below the *Use IRQ Steering* box are checked except for 'Get IRQ table from Protected Mode PCIBIOS 2.1 call'. If you still can't get your PCI card to install properly, try enabling that box as well.

An IRQ for an IRQ. Another way to free up an IRQ is to take it from another device. Start by looking through your CMOS setup program for settings that let you disable devices. For example, many CMOS programs will let you disable your mouse port and clear its IRQ—usually IRQ 12—for use by another device. That's an option if you're using a serial mouse, not one attached to the dedicated mouse port.

Most CMOS programs will also allow

you to free up an IRQ by disabling your unused USB, serial, or parallel ports. And if you're really desperate, you can try disabling one of the two EIDE channels on your motherboard, assuming that they're not being used by a hard disk, CD-ROM drive, or other device. Check your CMOS setup program to be sure.

NEED EXTRA CACHE?



I JUST UPGRADED from Windows 95 to Windows 98 on a Pentium-200 system with 16MB of RAM and 256KB of level 2 cache. I want to upgrade my memory. Should I increase my RAM, my L2 cache, or both?

Victor Berd, Tustin, California

FIRST OF ALL, get yourself more RAM—32MB is the bare minimum required to run Windows 98. And if you increase your total RAM to 64MB, you'll see a huge improvement in performance when using Windows 98—especially when you're working with several applications open at the same time.

Adding extra L2 cache on your system is not as important. L2 cache is high-speed memory that's used to store frequently accessed data, which the CPU can retrieve more quickly from this location than from system RAM.

While systems with no L2 cache—such as the first Celeron-300 PCs—suffer greatly in performance, a little L2 cache goes a long way. For a system equipped with up to 64MB of RAM, 256KB is plenty; additional L2 cache produces only marginal performance gains. If you want more than 64MB of RAM, however, you

will want more cache—at least 512KB.

Then again, if your old Pentium uses the 430VX or 430TX chip set—consult your PC's manual to find out—you definitely don't want more than 64MB of RAM. Those common chip sets cache data only from the first 64MB, so adding more RAM could actually slow down your system. This limitation was corrected in all Pentium II and later chip sets.

FASTER FORMATTING



I HAVE AN HP LaserJet 4 printer and need to frequently switch between 8.5-by-11-inch, legal, and nonstandard paper sizes. Changing paper trays is okay, but reconfiguring my printer's Windows 98 settings for paper size, orientation (portrait versus landscape), and other settings is driving me crazy. I'm actually considering buying one or two more printers just to save time. Is there a cheaper solution?

Trevor Salamat

Newport, Rhode Island

ABSOLUTELY. Just install your printer in Windows more than once. Double-click the *Add Printer* icon in your Printer folder and run through the installation process. Windows may ask you for the Windows CD-ROM so it can load the printer driver. So before you get to this point, you should check your printer maker's Web site for a more current version of the driver.

Windows will create a separate icon each time it installs your printer. Rename each icon with an appropriate moniker—like HP LaserJet 4 Legal-Landscape, HP LaserJet 4 Legal-Portrait, and so on (see **FIGURE 3**). Then right-click each icon and select *Properties* to choose your paper size and orientation. This is also a handy way to quickly print envelopes or print in a fast, low-resolution draft mode.

Each of the icons will appear on the printer list in any Windows application. Alternatively, you can drag each icon from the printer folder to your desktop and then drag any document onto the appropriate icon to print.



FIGURE 3: PRINT ON different paper sizes by creating several iterations of your printer.

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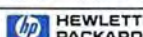
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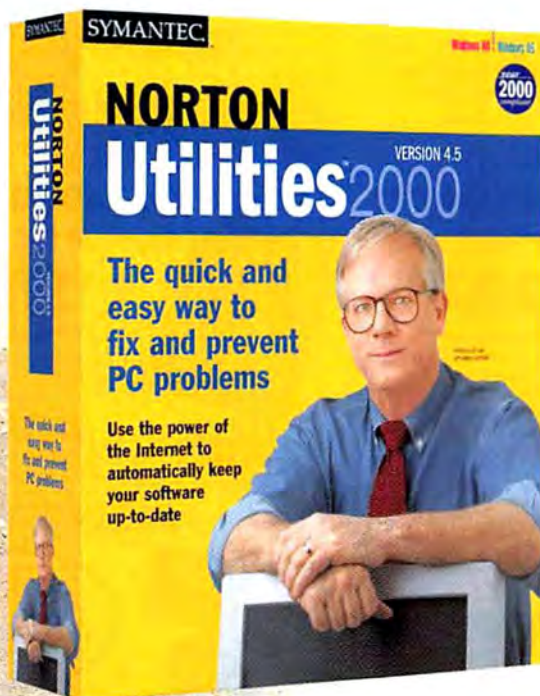
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Max. per domain cost @ \$2.00/domain/mo	N/A	N/A	\$50.00	\$50.00	\$150.00	\$500.00	\$2,000.00
Max. possible cost to you/month	\$14.95	\$19.95	\$109.95	\$139.95	\$199.95	\$859.95	\$3,999.95
Your monthly gross profit @ \$19.95 domain	N/A	N/A	\$498.75	\$498.75	\$1,496.25	\$4,987.50	\$19,950.00
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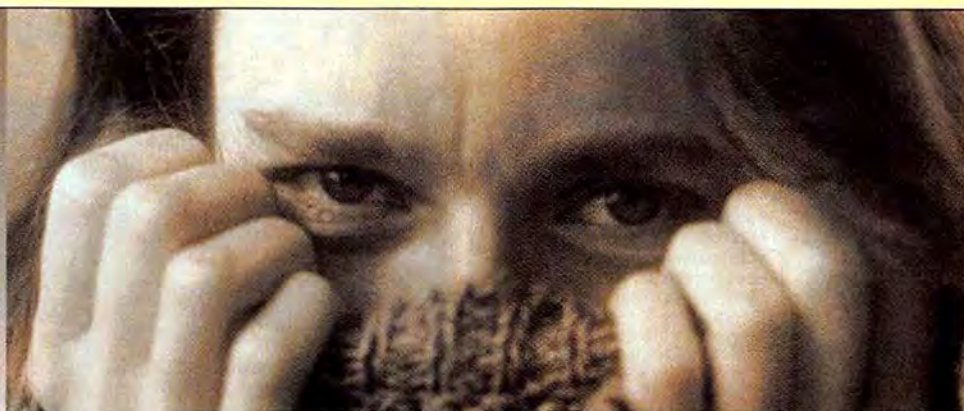
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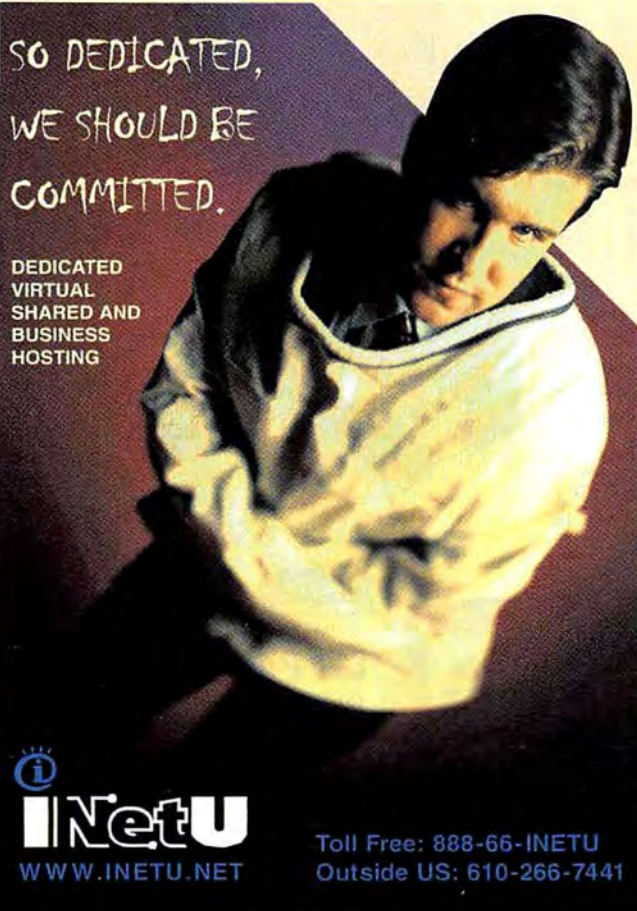
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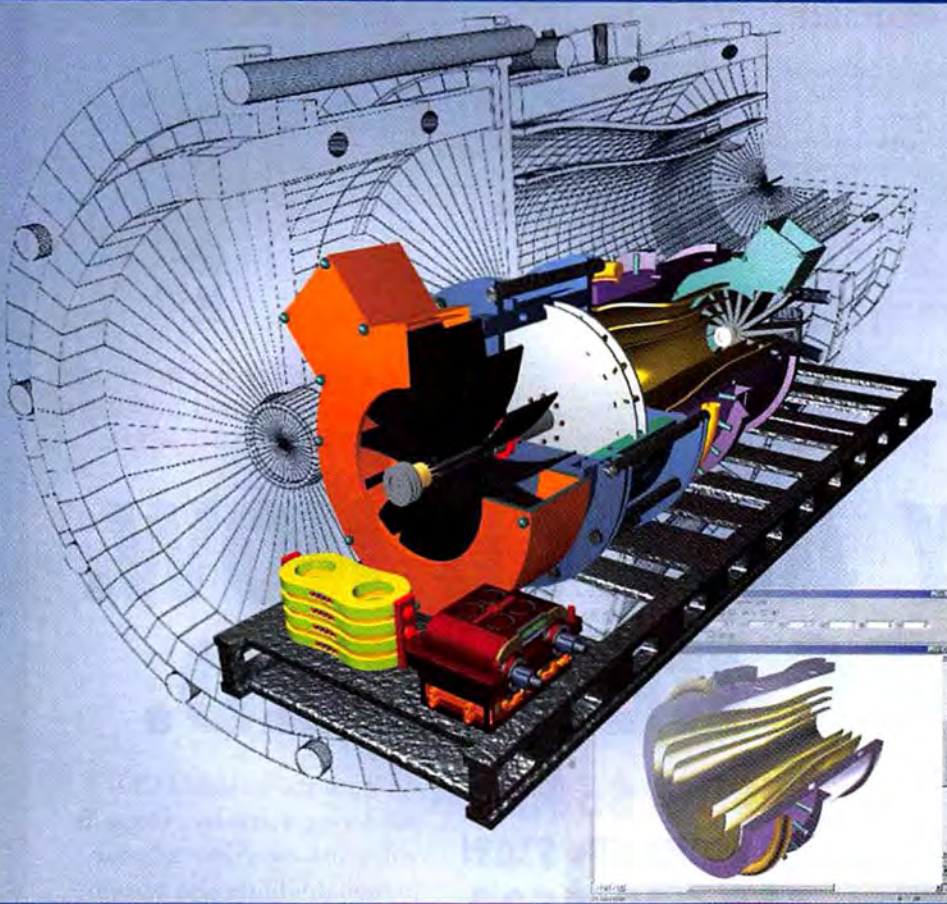
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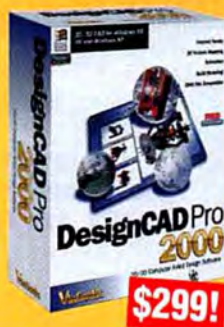
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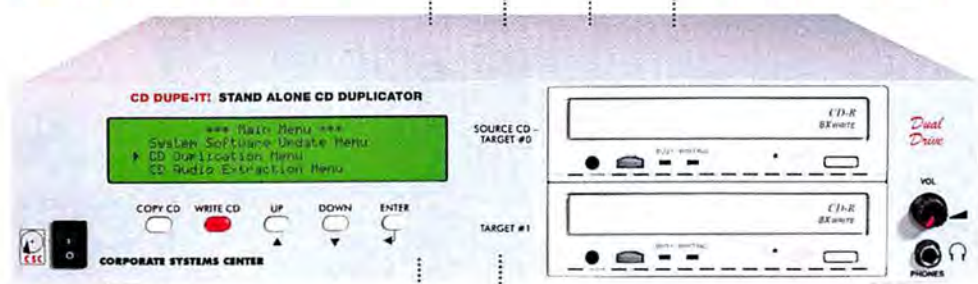
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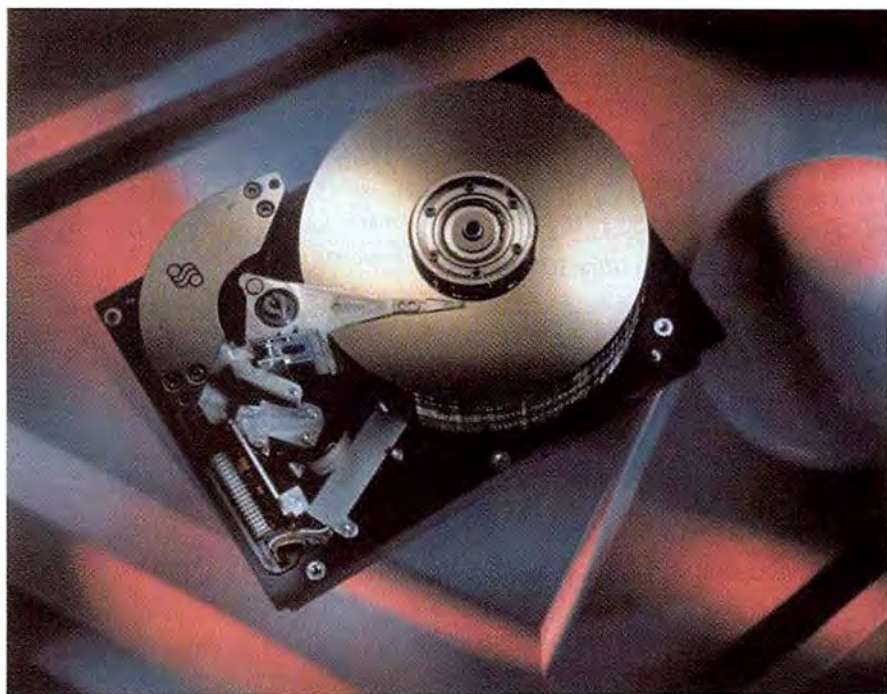


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Gold Diagnostic Adapters

- Styles:** Gender Changers
- Both 50 pin and 68 pin (all combinations)



Styles: 68 Pin Drive to 50 Bus
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Styles: For Adaptec Ultra Wide Cards
Adapters with partial termination built in for 68 to 50 converters (converts Host Adapter)

Gender Changer
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Styles: Converts the 68 pin connector on a 68 pin cable to a 50 IDC female connector so that a 50 pin drive can be used on the 68 cable.

Styles: Converts the 80 pin SCA type drives to be used with either 50 or 68 pin SCSI Buses. Three models available.

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Drive Bracket Kits- 3.5" to 5.25"
From: \$10

We carry a variety of Brackets that allow you to mount a 3.5" drive into a 5.25" bay. They include all screw and hardware necessary. Face panels are also available. Also see our Bay Cooler Fan and Bracket Kits.

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Now you can safely remove any SCSI device from a SCSI chain by simply clicking a switch. The Hot Swap Powered Terminator also has an optional Power Supply so that it can supply termination power to portable setups or when termination power is not being supplied.

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- Benefits:**
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Features:

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 - Test Cable Integrity
 - No Loss Of Important Data

Features:

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From: \$999

14 & 29 Bay - The Ultimate Large SCSI Storage Solutions
Shown with optional Bay Coolers and Dual Redundant Power Supply. Multiple SCSI Channel Support and Modular Designed Expansion.

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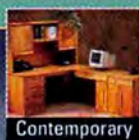
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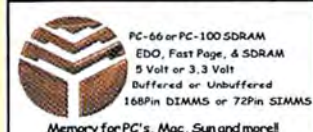
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AT-A-GLANCE

Item #	CPU	Monitor	RAM	Hard Drive	CD-ROM †	Video	Motherboard	Case	Tiger Credit Card	Tiger Price	After Rebate
CTVTM49A	Cyrix MII 300	15"	32MB PC 100	6.4GB UDMA	24X	PCI/4MB	AT	Mid-Tower	\$17/Month	\$559.99	\$159.99
CTVTM44B	AMD K6-300MHz	15"	32MB PC 100	4.3GB UDMA	24X	PCI/2MB	AT	Mid-Tower	\$17/Month	\$559.99	\$159.99
CTVTM55A	AMD K6-2/400 3DNow!	15"	64MB PC 100	6.4GB UDMA	32X	AGP/8MB	ATX	Micro-ATX	\$25/Month	\$629.99	\$229.99
CTVTM56A	AMD K6-2/475 3DNow!	15"	64MB PC 100	8GB UDMA	40X	AGP/8MB	ATX	Micro-ATX	\$23/Month	\$699.99	\$299.99
CTVTM50A	Celeron 400MHz	15"	64MB PC 100	8GB UDMA	32X	AGP/8MB	ATX	Mid-Tower	\$23/Month	\$699.99	\$299.99
CTVTM57A	AMD K6-2/400 3DNow!	15"	128MB PC 100	13GB UDMA	40X	AGP/8MB	ATX	Micro-ATX	\$23/Month	\$779.99	\$379.99
CTVTM51A	Celeron 500MHz	15"	96MB PC 100	8GB UDMA	32X	AGP/8MB	ATX	Mid-Tower	\$26/Month	\$829.99	\$429.99
CTVTM29D	Pentium III 450	17"	96MB PC 100	8GB UDMA	40X	AGP/8MB	ATX	Mid-Tower	\$39/Month	\$959.99	\$559.99
CTVTM39	AMD K6-III/400 3DNow!	17"	128MB PC 100	13GB UDMA	40X	AGP/8MB	ATX	Mid-Tower	\$30/Month	\$999.99	\$599.99
CTVTM42B	Pentium III 450	17"	128MB PC 100	13GB UDMA	40X	AGP/8MB	ATX	Mid-Tower	\$39/Month	\$1069.99	\$669.99
CTVTM47	AMD K6-III/450 3DNow!	17"	128MB PC 100	20GB UDMA	40X	AGP/8MB	ATX	Mid-Tower	\$34/Month	\$1139.99	\$739.99
CTVTM43B	Pentium III 500	17"	128MB PC 100	13GB UDMA	40X	AGP/8MB	ATX	Mid-Tower	\$39/Month	\$1149.99	\$749.99
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CTVTM46A	Pentium III 600	17"	128MB PC 100	20GB UDMA	40X	Voodoo 3 AGP/16MB	ATX	Mid-Tower	\$50/Month	\$1679.99	\$1279.99

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Seven Great Things to Be Thankful For

IN SOME JETSONIAN FUTURE, robot-assisted home networks may grab recipes for Thanksgiving dinner from gourmet Web sites and do everything from stuffing the bird to stirring the gravy. These days, we're delighted if the computer and the connection keep working long enough to bring up the football scores. But worthy products, services, and concepts do come our way. This year's list:

Relentless price cuts. Thanks once more to Moore's Law and the miracle of competition, virtually every piece of hardware you can buy today is significantly cheaper than last year's model, more powerful, or both. This year's growth spurts were particularly noteworthy: No matter how little you pay now, you can't buy a desktop PC remotely as crappy as the 266-MHz unit I paid a then-rock-bottom \$800 for in September 1998. I give thanks for the price/performance ratio of the next machine I buy.

Faster connections. There are plenty of problems with both DSL and cable modems, including service that's sometimes erratic (and often totally unavailable), overblown speed claims, and installation backlogs. The systems can't surmount Internet congestion or slow sites, and video still stinks. But when I listen to streaming MP3 audio clips, or watch my machine Hoover up messages or download the latest security patches in seconds instead of minutes, I give thanks that I can actually get cable modem service in my area.

Ink jet improvements. Even cheap printers, particularly those from Hewlett-Packard, keep getting better and faster. Photo-quality output is now so good it shows up the shortcomings of most digital cameras. If they could just apply these improvements to ink and paper prices, we'd give not just thanks but hosannas.

CD-R redux. Recordable CDs always seemed like a good idea, but the media and the drives stayed pricey for way too long. Now discs are finally cheap and devices are reasonably priced. CD-R machines can still be tricky to install, and they're not as easy to



Many companies are willing to lose money to gain market share, and that often translates to great deals.

use as one might hope, but the ability to play CD-Rs in the vast majority of existing CD and DVD devices makes them the closest thing to a universal storage medium this side of the floppy. And today's drives also include the ability to read and write CD-RW discs—giving us yet another reason to be thankful.

Digital camcorders with IEEE 1394 ports. MiniDV and Digital8 cameras let you shoot a video, blow the bits across an IEEE 1394 cable to your PC, edit your masterpiece, and bring it back out to tape without any loss of image quality. If you have any serious interest in editing video on the cheap, digital is clearly the way to go, and computers that can handle it without busting your budget are now available.

Personal video recorders. The TiVo and Replay boxes are essentially VCRs that record digitally on hard drives instead of videotape. This allows all sorts of nifty options, including the ability to pause a "live" show when the phone rings and pick up viewing where you left off when you're done talking. The Replay device even lets you press a little button to skip past commercials and reclaim some of your life. The first models lack enough high-quality capacity to be truly useful VCR replacements, but that will inevitably change. Give thanks for the concept now while it's fresh and relatively pure; the two companies' business alliances hint strongly that the devices' interfaces will quickly become cluttered with advertisements.

Profitless e-businesses. Most of the people I know who have used Internet grocery stores love them for their extra service at regular store prices. Personally, I've been happy shopping online for books, CDs, and computer equipment, all at discount prices that sometimes border on the ridiculous. Now an online outfit in

my area promises to deliver and pick up video rentals more or less on demand for less than what the neighborhood video shop charges, which sounds like a business plan for high-speed ruin.

But at least for now, many of these companies are willing to lose money to gain market share or mind share, and that willingness often translates to great deals. Thank you, dot-coms, for making this possible—for however long the party can last.

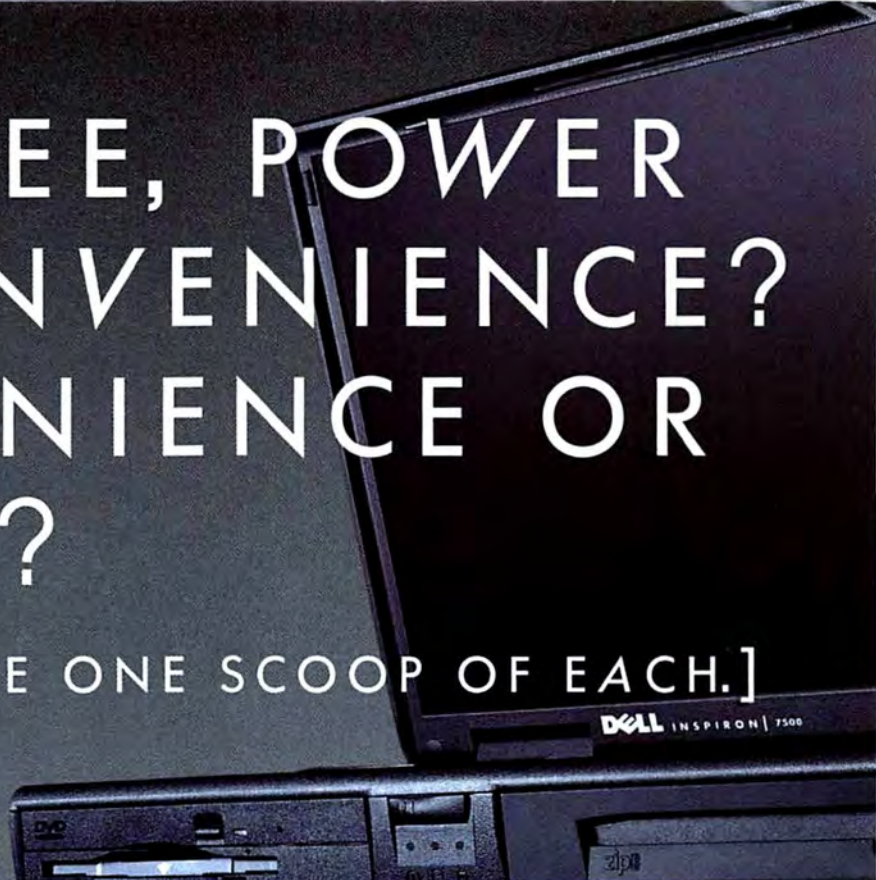
PC World Contributing Editor Stephen Manes is the cohost of Digital Duo, a series appearing on public television stations nationwide. For program information, see www.digitalduo.com.



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[OH HECK, TAKE ONE SCOOP OF EACH.]



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NEW DELL® INSPIRON™ 7500 Notebook

Mobile Desktop

- Intel® Celeron™ Processor at 433MHz (up to 400MHz Pentium II)
- 15" XGA Active Matrix Display
- 64MB SDRAM (up to 512MB)
- 4.8GB* Ultra ATA Hard Drive (up to 25GB*)
- Removable Combo 24X* Max Variable CD-ROM and Floppy Drive
- 2X AGP 4MB ATI Rage Mobility™ P-3D Video (up to 9MB)
- 3D Surround Sound with Wavetable, Lithium Ion Battery
- Microsoft® Windows® 98 Second Edition
- Microsoft® Works Suite 99 with Money 99 Basic
- 3-Year Limited Warranty*

\$2199 Business Lease*: \$74/Mo., 36 Mos.
E-VALUE CODE: 03690-091021

Dell Recommended Upgrade:

- Upgrade to 128MB SDRAM, add \$199
- 3-Year Next-Business-Day On-site* Service, add \$99



*48-Mo. Purchase Plan offered through Dell Financial Services L.P., 14050 Summit Dr., Austin, TX 78728, to qualified consumers. Only available in the 50 U.S. states and District of Columbia, except AR & MN. Availability may be limited or offer may vary in some states. Advertised payments are based on sales prices depicted for 48-mo. term at 18.99% APR, with approved credit. Excludes taxes & shipping charges which vary (For example, based on sales price of \$2199 for a desktop system, the total of sales taxes and shipping charges via 3- to 5-day ground to Hartford City, IN would be \$204.95 [includes sales taxes of \$109.95 and shipping charges of \$95.00]). Taxes and shipping charges due with 1st payment unless included in the amount financed, in which case your monthly payment will be higher.



IT'S LIKE GETTING YOUR PLANE TICKET UPGRADED TO AIR FORCE ONE.



USING SOME PCS IS LIKE FLYING FIRST CLASS. THEN THERE IS THE SENSATION OF FLYING IN ONE OF THE MOST ADVANCED, LOADED, HIGH-TECH PLANES ON THE PLANET. THAT'S KIND OF WHAT IT'S LIKE USING A DELL® SYSTEM FEATURING THE LATEST PENTIUM® III PROCESSOR WITH 133MHZ SYSTEM BUS, AND THE NEWLY DEVELOPED RDRAM TECHNOLOGY THAT DELIVERS UP TO 166% IMPROVED MEMORY PERFORMANCE OVER SDRAM. ALL THAT MEANS FAST OVERALL PERFORMANCE AND VASTLY IMPROVED MULTI-TASKING. BUT TO REALLY UNDERSTAND, YOU'LL HAVE TO FLY IT YOURSELF. PLEASE FASTEN YOUR SEATBELTS, AND PUT YOUR TRAY IN THE UPRIGHT POSITION.

NEW DELL® DIMENSION® XPS B Series

Cutting-Edge Performance

- Intel® Pentium® III Processor at 533MHz (up to 600MHz)
- 64MB PC700 RDRAM at 356MHz (up to 384MB RDRAM)
- 13.6GB* Ultra ATA HD (up to 37.5GB*)
- 17", 16.0" vs M780 Monitor (upgrade to 15" Flat Panel as shown, \$739)
- 32MB 4X AGP Graphics Card, Network Interface
- 48X* CD-ROM, 128V Sound & Speakers (upgrade to ACS-340 speakers as shown, \$39), Zip Drive
- MS® Windows® 98 & Office 2000 Small Business
- 3-Year Ltd. Warranty*, 1-Year Next-Business-Day On-site* Service

\$1699 Business Lease*: \$57/Mo., 36 Mos.
E-VALUE CODE: 03689-591016

Please contact your sales representative for more information as estimated ship dates will exceed 30 days.

Phone Hours: M-F 7a-9p • Sat 10a-6p • Sun 12p-5p CT
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