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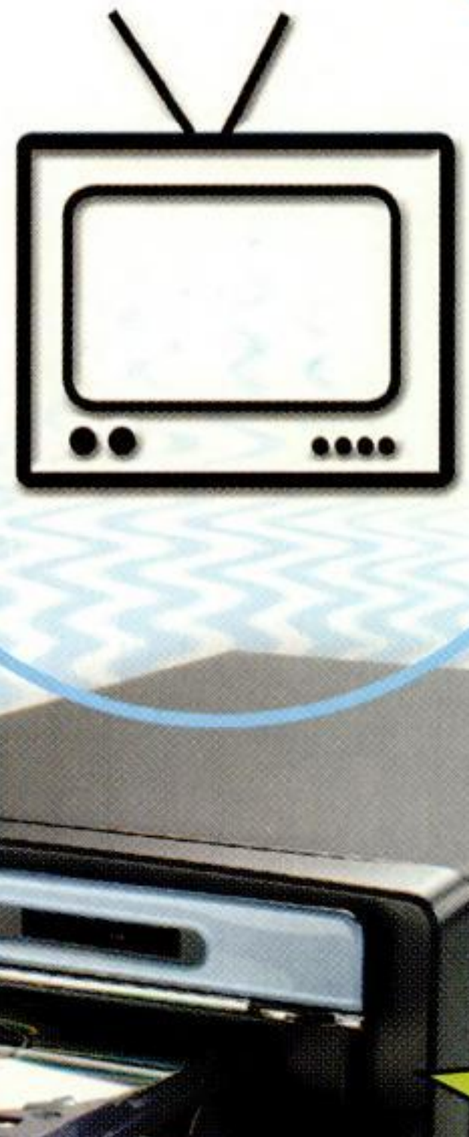
First benchmarks, page 51!



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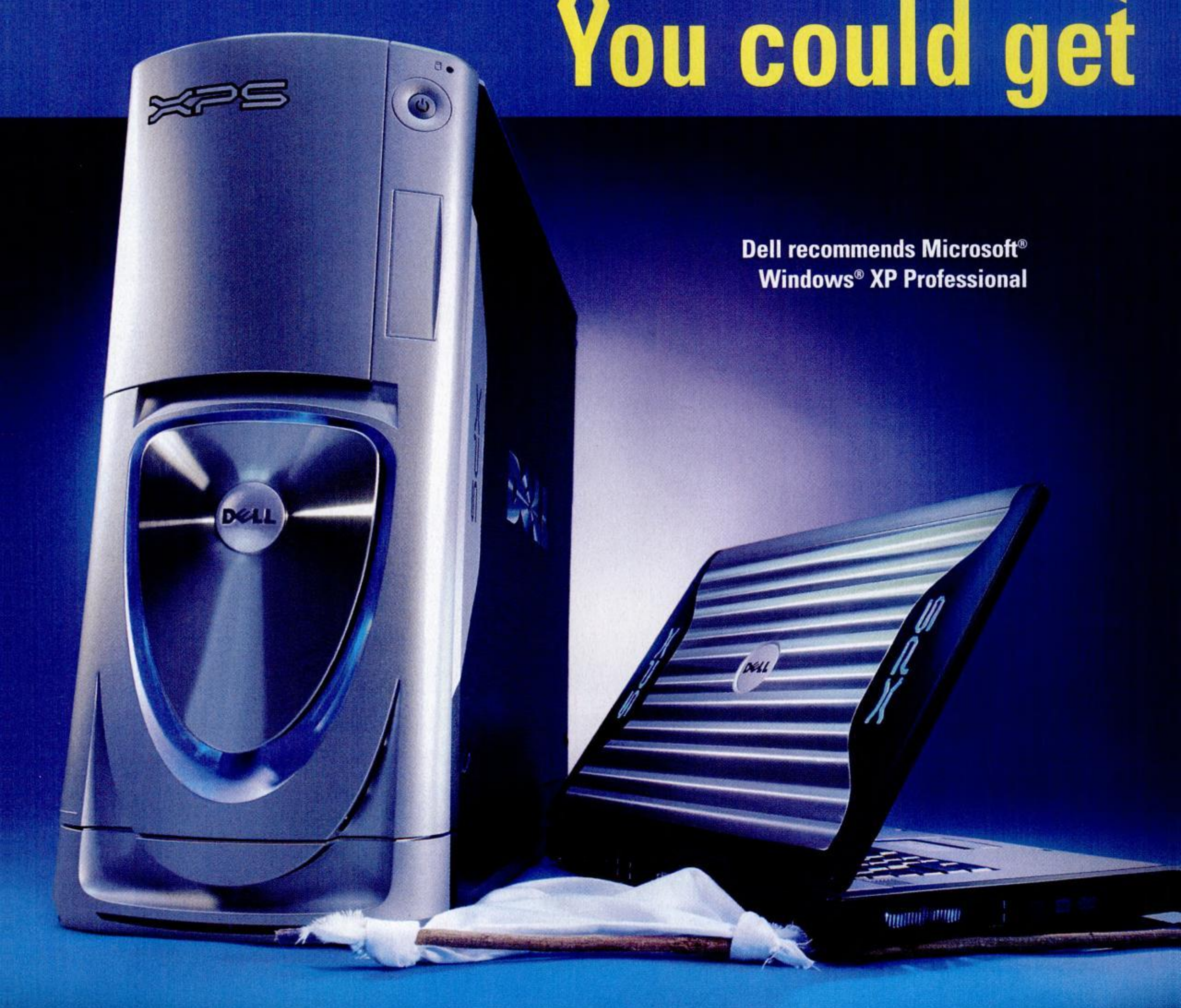

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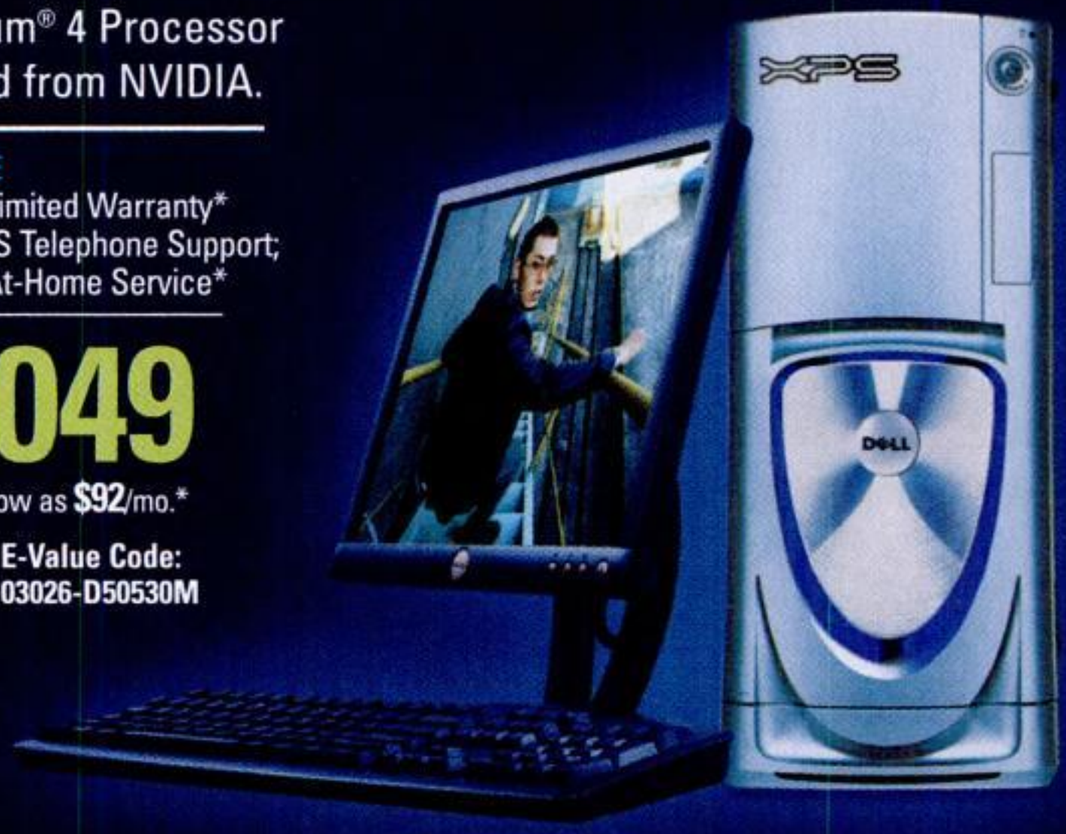

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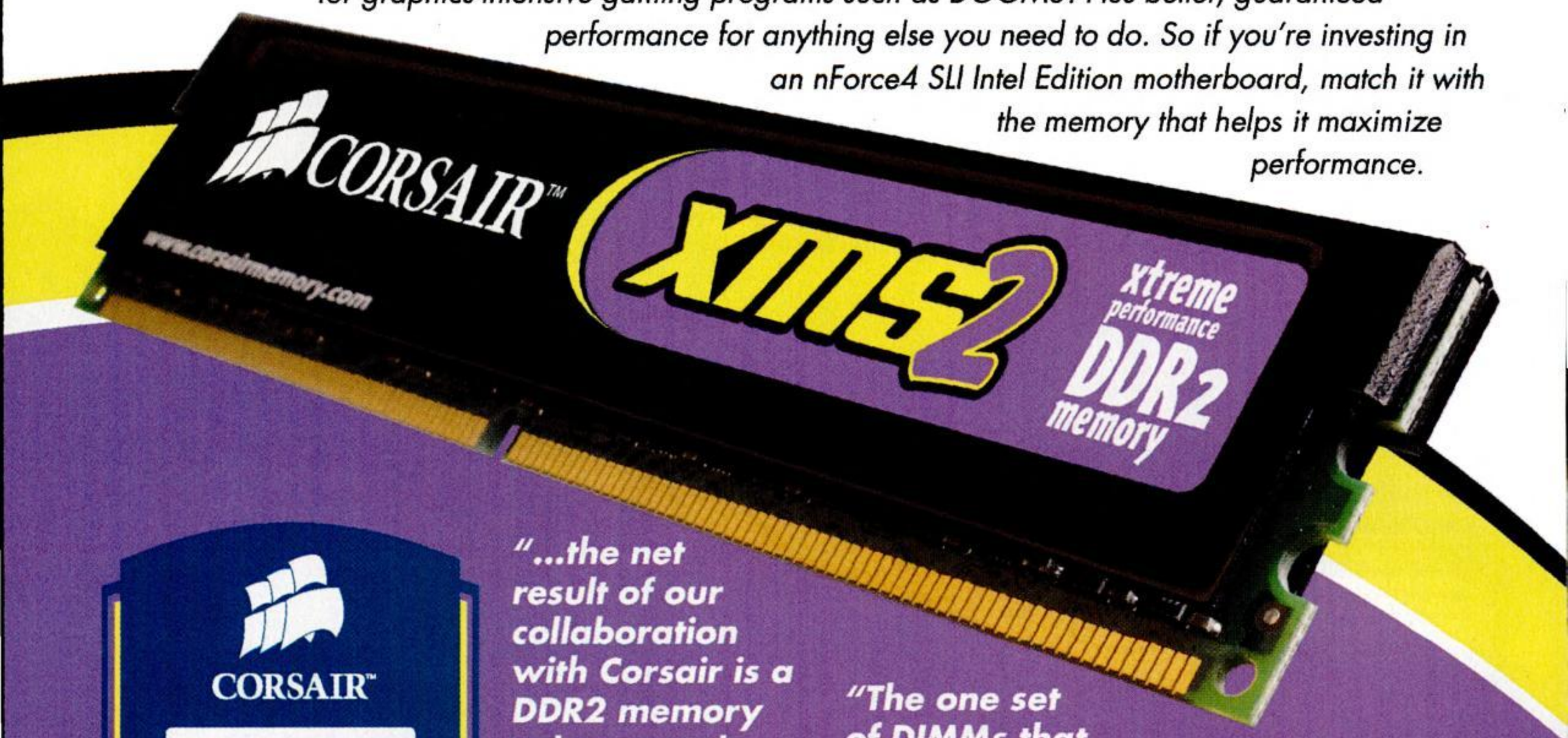

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Release Notes

Enraging Your Art Director

The first home I networked was my own. I bought what the realtor called a "fixer-upper," and like any hardware hacker steeped in the DIY work ethic, I did most of the remodeling myself. In addition to refinishing the floors, installing new carpet, and adding a bathroom, I spent an afternoon running Cat5 Ethernet to each room. It was an easy job, and the mess was minor compared with the crown-molding mess, the insulation mess, and the "I think I just drilled into a water line" mess. But as I discovered this month while working on our streaming media cover story, installing network wiring in a perfectly *finished* home is a whole 'nother story.

Natalie, our brave art director, was kind enough to volunteer her 110-year-old San Francisco Victorian for the networking portion of the feature. The job seemed pretty straightforward: Drill through the floor into the basement, and run Cat5 to each room. Easy enough, right?

Drilling through the floor of your own home isn't for the faint of heart. Doing the same in a *friend's* home—especially a beautifully preserved Victorian—is downright terrifying. When Mike Brown drilled the first pilot hole in the baseboard trim, Natalie seemed a tad nervous, but I was first-day-of-junior-high-school scared.

I had no idea how *dense* Victorian floors are. After about 20 minutes of drilling, I realized that Natalie's floor was significantly thicker than the flimsy plywood sheeting in my first home. After 40 minutes, the hole was actually smoking. At 50 minutes, the drill bit broke, and I knew we were screwed. (Natalie was the one with the jacked-up floor, but I was the one catching the frightened looks.)

The broken end of the bit was wedged more than a foot into the hole, well beyond reach. I had decided to hire a professional to repair the hole, when I noticed a tiny metal tip poking out of the basement ceiling. The hole was perfect! Five minutes of work freed the bit, and we were back in business. We finished wiring Natalie's network, and were on our way.

The moral of this tawdry tale? Every how-to article you'll ever read in *Maximum PC* is bound to present some unforeseen problems. Even the most innocent-sounding project can blow up in your face. But just remember, everything's fixable—with enough replacement parts, licensed contractor visits, insurance settlement checks, conflict-resolution therapists....

—WILL SMITH

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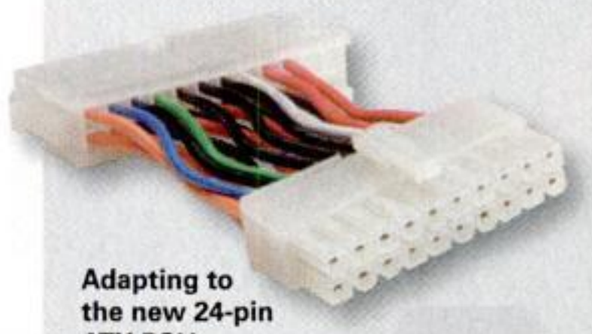

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JUNE FEATURES

In/Out

You write, we respond

SCRABBLE ROW

In the review of *Scrabble Online* in your April issue, the screenshot shows the word "given" across, with the word "ewe" below it, spelling "ve," "hew," and "zone" (in the lower right-hand corner). According to my *Merriam-Webster's Collegiate Dictionary*, 10th Edition, there is no such word as "Ve." Just letting you know.

—STEVE NICHOLS

ASSOCIATE EDITOR JOSH NOREM RESPONDS: We hear ya, Steve; but try telling Skynet—or whatever computer system *Scrabble Online* uses to acquire its words—that it's cheating. It doesn't listen. All it cares about is winning, rules be damned. The computer comes up with words like "ha" and "eh," and as you can see in the screenshot, even non-words like "ve." The game allows abbreviations, too. But as soon as you learn "the rules," so to speak, you can have a lot of fun. In one game, for instance, the computer used the word "ag" as an abbreviation for agriculture. So a few days later, when I was playing against Logan Decker and Will Smith on the office LAN, I threw down "ag." Sure enough, EIC Will Smith challenged it (sucker!), losing the challenge and his next turn as a result. Will's foolish maneuver allowed me to take another turn, which I used to slap down the word "owned."

THE DVD-RAM EVANGELIST SPEAKS

In your review of LG's 16x Super Multi DVD Burner [May 2005], you mention that 5x DVD-RAM media was not available at press time. I'm not sure how far ahead of publication you write these articles, but I've been using Panasonic 5x media here in Chicago since late February. It's currently priced at less than $6 per disc, and I've had no trouble finding it. Second, while I would have agreed that DVD-RAM was a dead format just a few months ago, a number of major drive manufacturers have recently announced new Super-Multi drives. HP, NEC, and LG are all making drives that will be available later this year. I believe HP has stated that all its new drives will be Super-Multi. NEC has an upcoming third-quarter release of the 4550A, which supports RAM at 16x. And this summer, 16x DVD-RAM media will become available.

—SAM CHASE

FEATURES EDITOR LOGAN DECKER RESPONDS: Your sleuthing for media obviously paid off, but at the time we received the drive, neither NEC nor Verbatim had any 5x DVD-RAM media in stock. Yes, we know it's odd that a manufacturer would deliver a drive to reviewers without the means to test its full potential, but it happens. As for DVD-RAM being a "dead format," we wouldn't mind being proven wrong—after all, with built-in data verification, DVD-RAM is certainly more reliable than DVD+R or DVD-R for data backups. But with Toshiba's HD-DVD just around the corner, and Blu-ray scheduled to arrive early next year, even inexpensive 16x DVD-RAM is too little, too late. We'll see.

INVOLUNTARY DOWNLOADS

I enjoy your magazine, and look forward to each issue (except those with the darn quizzes—how the hell am I supposed to know that stuff?).

I'm having a problem with *Ad-Aware* that perhaps you might also have encountered. Whenever I use the program to scan my PC for adware, and it finds something, I soil my underwear when that godawful WRRRNT! WRRRNT! WRRNT! sound blasts through my 5.1-channel surround-sound system. I know I should expect it by now, after running the program six times—and thus ruining six pairs of underwear—but every time, when my back is turned, there it is out of nowhere, WRRRNT! WRRRNT! WRRNT! Is there a freeware program that will prevent my inadvertent "downloading" whenever *Ad-Aware* goes off?

—MATTHEW GUY

EXECUTIVE EDITOR MICHAEL BROWN RESPONDS: Here's a simple BVD-saving solution, Matthew: Open *Ad-Aware*, open the Configuration window (click the gear-shaped icon), and then click the Tweak button. Scroll down to the bottom of this window until you see the item labeled "Misc Settings." Click the plus sign to expand the menu item, and then click the check-mark next to "Play sound at scan completion" and change it to an X. That will turn off the sound at the end of the scan. That's even more convenient than wearing Depends.

DON'T DO THAT OR YOU'LL GO BLIND

I work within an organization that provides kids with computer instruction. Many times the persons escorting the kids (nannies, brothers, you name it) search for sites containing sexual and/or violent content. I need a program that will filter that content. Which program do you suggest I use?

—JESUS O. BERISTAIN

EXECUTIVE EDITOR MICHAEL BROWN RESPONDS: We haven't reviewed these types of programs, in large measure because we feel they promote censorship, but also because we believe that parents who rely on them are substituting the value systems of third parties for their own. The Internet is a freewheeling—bordering on chaotic—medium, but that's part of its appeal. On the other hand, we understand your desire to shield your charges from the sordid side of the web. To that end, we've heard good things about Solid Oak Software's *Cybersitter* for single PCs, and Logisense's *EngageIP* for enterprise networks.

SUITE SOLUTION

I've been meaning to ask this question for several months. In this year's Softy Awards [February 2005], you didn't mention any system-utility suites, such as those from Norton or McAfee. In fact, you didn't mention any stand-alone utilities, such as a disk defragmenters, Registry utilities, or other types of PC problem fixers. So my question is: Which would you recommend, a suite (e.g., *Norton System Suite*) or separate programs (such as *Diskeeper*, *Registry Mechanic*, et al)?

—LAWRENCE KIM

EDITOR IN CHIEF WILL SMITH RESPONDS: Traditional system suites bundle a couple of apps you desperately need—antivirus apps, defragmenters, and firewalls—with a whole lot of apps that fall squarely in the placebo category. Sure, Registry cleaners and Windows tune-up apps give you a warm, fuzzy feeling when you run them, but we've never actually seen any performance benefits from using a third-party

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If you pass up this issue, you're not getting the most out of your PC; in fact, you might as well be using a Mac!

GAMING NOTEBOOK ROUNDUP

We asked the biggest names in notebook computers to heave their biggest, baddest, and brawniest game rigs in our direction. Can these top-shelf portables chew through top-shelf games like *Half-Life 2* as easily as they can crunch numbers? Come back next month for the benchmarks and the official verdicts.

64-BIT WINDOWS FAQ

Guess who's got the answers to your questions about the mighty era of 64-bit computing? You betcha—we do, and we're spilling the beans on the hardware, the software, the privileges, and the pitfalls of the desktop revolution that's almost upon us.

FOOLIN' WITH WATER COOLIN'

Your water-cooling feature in the May issue ("Chill Out with Water Cooling") raised two questions for me: First, the distilled-water additives used in many of the kits sound a lot like the coolant that's used in automobiles. I have a Zalman Thermal 1, which is manufactured from aluminum, copper, brass, and who knows what else. I was thinking of replacing my distilled water with a mixture of H2O and Prestone. What do you think? Second, I'm in the process of installing water blocks for both the north and south bridge chipsets. Which direction should the water flow? Downhill is always a safe bet, but should it flow to the CPU first, and then to the north and south bridges, or should I pump it in the other direction?

—CHRIS KAUFMAN

ASSOCIATE EDITOR JOSH NOREM RESPONDS: Yes, the additive used in water-cooling kits is very similar to automotive coolant—it's anti-corrosive and might also improve the heat-exchange properties of distilled water. Although we haven't tested any kits with Prestone, per say, based on the information presented on the Prestone website, its 50/50 product sounds like just the ticket: It consists of 50 percent anti-corrosion coolant and 50 percent distilled water. Never, ever use regular tap water, because it contains minerals and chemicals that will leave deposits in the water-cooling circuit, limiting the kit's performance and overall lifespan. Always use distilled water (also called de-mineralized water).

As for your second question, you should send the coolest water to the hottest component first, and then have it flow to the next-hottest component, preferably in a downhill fashion to aid in water flow. If you're going to cool both your CPU and your core logic (although we don't think the chipset generates enough heat to warrant the time, money, and effort), you should route the coolant directly from the radiator to the CPU, from the CPU to the north bridge, from the north bridge to the south bridge, and from the south bridge back to the pump.

app to compact our Registry. For that reason, we usually recommend that readers purchase stand-alone versions of the utilities they need.

SLOW DOWN, WILL YA?

With regard to your Quick Start story "nVidia Opts out of Incremental Upgrade Cycle" [April 2005], I think that's a long-awaited happening. Nothing aggravates me more than going out and buying a new product that's rated to be the best performer available, and returning home from the store to discover that its replacement was just released, and the product I just bought is no longer the best available. With Intel introducing a whole new crop of CPUs that aren't compatible with the motherboard chipsets it only just recently shipped, the tech industry is rendering the entire notion of upgradeability a myth.

—JOE ZINSKIE

OVERCLOCKING AIN'T ALWAYS COOL

In the "Chill Out with Water Cooling" article in the May issue, you compared four internal water-cooling solutions based on their cooling performance, ease of installation, overclocking potential, and noise level. Corsair's COOL water-cooling kit scored the highest in cooling performance, was the second-easiest to install, and gave reasonable noise output. Being the most efficient water-cooling solution in this roundup, we are disappointed that the overclocking potential was not fully unleashed. The degree of CPU overclocking is directly proportional to the degree of cooling achieved. The overclocking results should perhaps be re-evaluated. It is hard to understand how the coolest solution can be the least-impressive overclocker.

—VIVIAN CHEN
PARTNER DEVELOPMENT MANAGER
CORSAIR MEMORY

ASSOCIATE EDITOR JOSH NOREM RESPONDS: We were surprised enough by the results during our testing that we double-checked them on the spot. In theory, the temperatures afforded by the water-cooling kits should have a direct correlation with overclocking potential, but in the real world this isn't always the case. Because the correlation between CPU temperatures and overclocking success fluctuated quite a bit, we decided to weigh other factors more heavily than the overclocking success when rendering our final overall verdicts. ■

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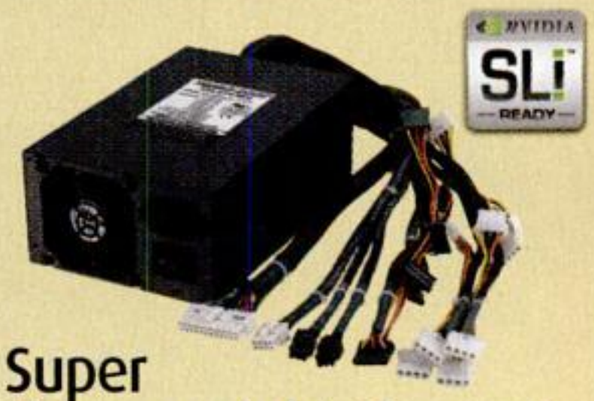

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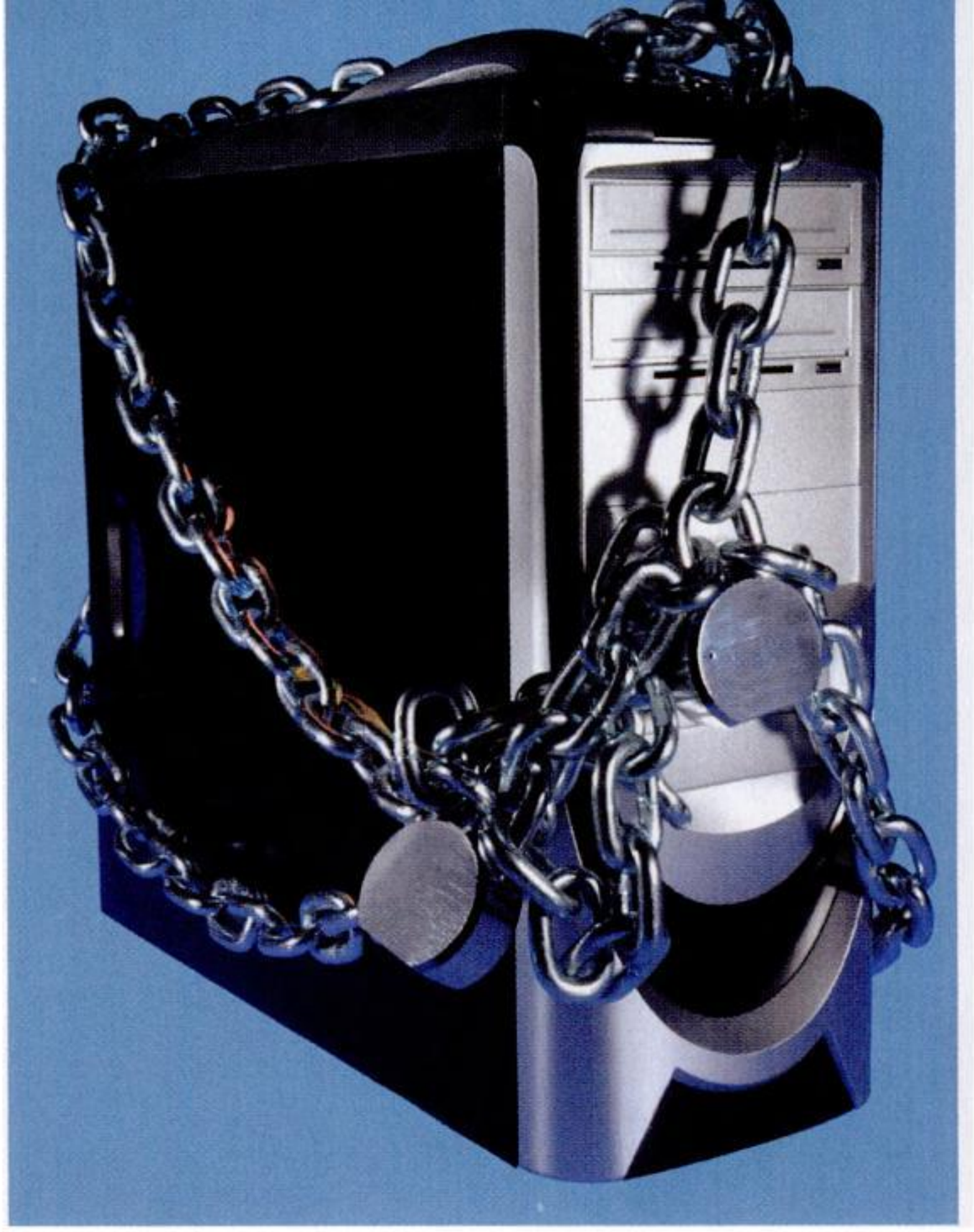
The beginning of the magazine, where articles are small

The Truth about Trusted Computing—REVEALED!

The big question is, "Can we trust trusted computing?"



When you log onto your bank's website to check your account balance, does the bank's website know it's really *you* who's logging on? Or when you're IMing a 19-year-old coed from Wichita, are you sure it's Jenny you're chatting with, and not Billy Bob? In both situations, the answer is no.

Today's networks already require a high level of trust between PCs to even connect to each other over the Internet, but a consortium of manufacturers known as the Trusted Computing Group (member companies include AMD, Intel, Microsoft, and Sony) is introducing new technology that can make absolutely sure you are who you say you are. Or at least, that's what the consortium wants you to believe.

A new microcontroller known as the Trusted Platform Module (TPM) is at the heart of this security scheme, and the module is already being integrated into next-gen motherboards—including the new dual-core mobo we just received from Intel (see page 42). According to computer-industry analyst and TCG board member Rob Enderle, the TPM is currently shipping in IBM notebooks, and both Dell and HP are integrating it in a cross-section of corporate desktops.

In its current implementation, the TPM provides hardware encryption to create a secure space on a PC's hard drive. It's meant to serve as a secure lockbox for passwords, usernames, financial information, and so forth. Because the TPM provides hardware-based encryption, it should be very difficult to crack. The upshot? If your laptop is ever stolen, there's little chance that crucial data stored in the encrypted lockbox will be compromised.

The long-term goals of the trusted-computing platform (TCP), however, seem more questionable. Eventually, an overarching software component will allow user-authentication between TPM-equipped systems—such as when you log into your online bank account—and it will even allow you to tie certain files to a particular PC. Put these two features together, and it begins to look like the ultimate digital rights-management scheme.

The dual-core system we received from Intel this month includes a Trusted Platform Module. Without software support, it's a useless feature—for now.

Although we welcome enhanced data security, we're troubled by the possible ramifications. For example, vendors could use the TCP to bind purchased media files to a single PC in a much more secure manner than the FairPlay scheme that Apple uses for files purchased from *iTunes*.

But that probably won't happen, claims Enderle. "We'd love to say 'it won't be used for DRM,'" Enderle adds, "but there's no way to enforce it." Seth Schoen, staff technologist for the Electronic Frontier Foundation, has a different take: "Back in 2000, [the TCG] listed DRM as an example of trusted computing," he says. "It's a technology that can be used for both good and bad purposes."

Trusted computing is still in its infancy, but it will become much more important when Microsoft unveils its next OS, code-named Longhorn. Longhorn will have built-in support for the TPM, using Microsoft's proprietary trusted-computing platform, known as *Next-Generation Secure Computing Base* software (formerly code-named Palladium). Microsoft has yet to release details about the *NGSCB's* actual function, saying only that it is actively working on implementing the software in its future OS.

Anyone Want a 1TB Disk Drive? Holla!

New tech paves the way for massive increases in storage capacity

Since the dawn of time, bits representing data have been stored on horizontally aligned magnetic particles—arranged end to end in a concentric circle—around a hard drive platter. Manufacturers have succeeded in storing more and more bits on each platter by increasing areal density: shrinking the particles and packing them closer together.

But when the particles become too small, a phenomenon known as the superparamagnetic effect occurs: The magnetic particles interfere with each other and lose their ability to maintain a magnetic orientation. Their north and south poles spontaneously reverse, and the data on the platter becomes corrupted.

Hitachi and Toshiba recently found a relatively simple way around this problem: By arranging the magnetic particles on the platter in a perpendicular, rather than horizontal, orientation, they can substantially increase areal density without worrying about the superparamagnetic effect corrupting the bits.

According to Hitachi, this perpendicular recording technology will pave the way for 3.5-inch disk drives capable of storing as much as one terabyte of data by 2007, as well as microdrives that boast 20GB capacities. Its first implementation of the technology, however, will be in notebook drives. The company says it's already testing a 2.5-inch 100GB drive.

Toshiba, for its part, plans to incorporate the technology in the 1.8-inch drives it sells to Apple for use in the iPod by this summer. This could result in a slimmer 40GB iPod, because the drives would use only one platter (current 40GB iPods use two-platter drives). Toshiba also plans to introduce a dual-platter 80GB drive.

Perpendicular recording technology isn't as simple as it sounds, though; and it presents a whole new batch of engineering problems for the propeller-heads to work out. The primary challenge is in fine-tuning the read/write drive heads to accommodate the particles' increased density. Hitachi says it has achieved this by positioning the read/write head to within 10 nanometers of the platter. To put this in perspective, 10nm is roughly 1/10,000th the width of a human hair.

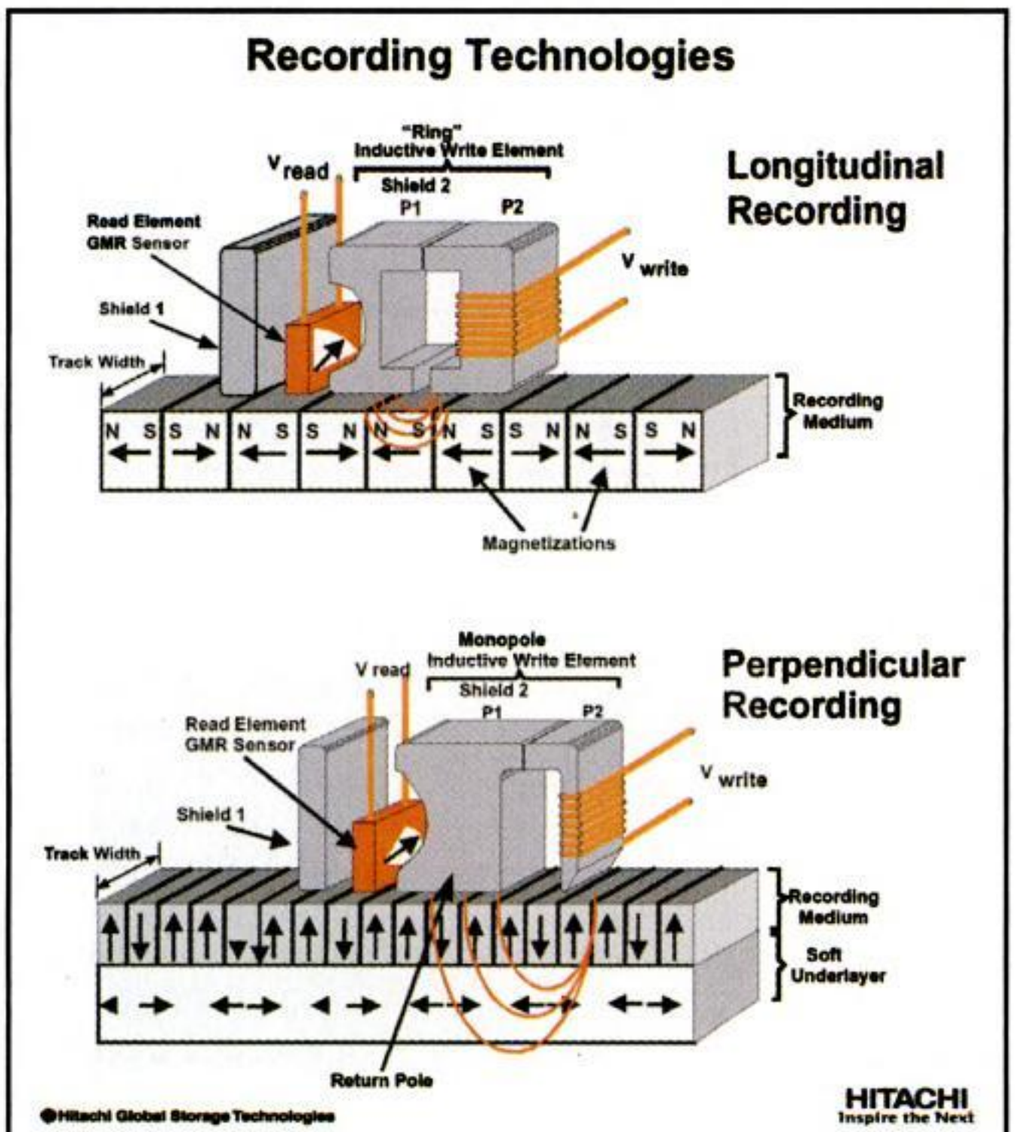


Image provided by Hitachi Global Storage

Today's hard drives store data on magnetic particles that are arranged horizontal to their platter surfaces. On next-gen drives, these particles will be arranged perpendicular to the platter, a trick that will dramatically increase areal density and lead to tremendous gains in storage capacity.

FAST FORWARD BY TOM R. HALFHILL

Why Transmeta Failed

Another one bites the dust. Well, almost. Transmeta isn't completely out of business, but it has been forced to downsize and radically change course in order to slow the arterial bleeding still threatening to kill the wounded company. What went wrong?

Almost everything went wrong. The worst effect of Transmeta's downfall, however, isn't the millions of dollars bled from stockholders or the retreat of Transmeta's processors from the market. (Transmeta's last-ditch strategy is to gradually stop selling chips in favor of licensing its technology and engineering services to other companies.) No, the worst fallout is the impact on the investment community. It will be years—if ever—before another startup gets the massive funding needed to challenge Intel's supremacy in PC processors. For the foreseeable future, only AMD will offer any significant competition against the mighty empire. (VIA still makes PC processors, but it's a bit player.)

When Transmeta was founded in 1995, it began with big ambitions and a big disadvantage. Intel is a huge company with vast financial resources, world-class engineering, and its own chip-fabrication plants. By contrast, Transmeta is a small, fabless semiconductor company that subcontracts its chip manufacturing to independent foundries. After years of design effort, Transmeta realized it couldn't beat the performance of Intel's desktop processors.

Part of the problem was Transmeta's radical new approach to microprocessor design. By themselves, Transmeta processors can't run x86 software. They rely on emulation—the company prefers to call it "code-morphing software"—to achieve x86 compatibility. Despite using the best emulation technology available, Transmeta couldn't match Intel's desktop performance. But by moving some complexity from the chips into the emulation software and inventing its LongRun voltage/frequency-scaling technology, Transmeta slashed power consumption. So the company decided to focus on notebook and embedded processors.

Five years ago, when Transmeta introduced its first Crusoe chips, company officials objected to my opinion that emulation overhead would cripple Crusoe. "Overhead" was obsolete, they insisted—code morphing wasn't a handicap. Now we know better.

When Intel, AMD, VIA, and other companies imitated LongRun, Crusoe was in stormy seas. When Intel did as I predicted and created its own low-power design (Pentium M/Centrino), Crusoe was shipwrecked. Transmeta was overwhelmed by Intel's superior resources. Although I salute Transmeta for having the gumption to try, and for creating some innovative technology, I marvel at the investors who bet so much money on such a long shot.

Tom Halfhill was formerly a senior editor for Byte *magazine and is now an analyst for* Microprocessor Report.

FUN-SIZE NEWS

BUH-BYE COMDEX

As much as we love visiting Las Vegas for its enchanting nightlife, we were excited to hear that Comdex has been cancelled once again. The foot-punishing industry trade show has suffered waning attendance numbers for several years, and was cancelled in 2004 for the first time in 25 years. With the "vertical enhancing" show cancelled again in 2005, we can only hope it will never return.

DELL MOVES TO BTX

Believe it or not, only some forms of exotic Persian land snails actually move slower than the rollout of the new BTX formfactor. But the BTX movement is expected to pick up some serious steam in late 2005 when Dell embraces the next-gen formfactor with its desktop line. Developed by Intel, BTX relocates the motherboard and case components for improved cooling and efficiency. Dell won't be the first to ship BTX, though; Gateway already offers BTX desktops.

RFID REFRESH

When people hear the term "RFID chips" they think of Big Brother, *Minority Report*, and John Ashcroft, so the Department of Homeland Security and Philips have done what any sensible doublespeak-loving organization would: change the term to something less scary. From now on, please refer to radio frequency identification chips as "contactless chips." Thank you very much. Your cooperation is noted, good citizen. P.S. No, we're not making this up.

802.11n Promises Wi-Fi at Wired Speeds

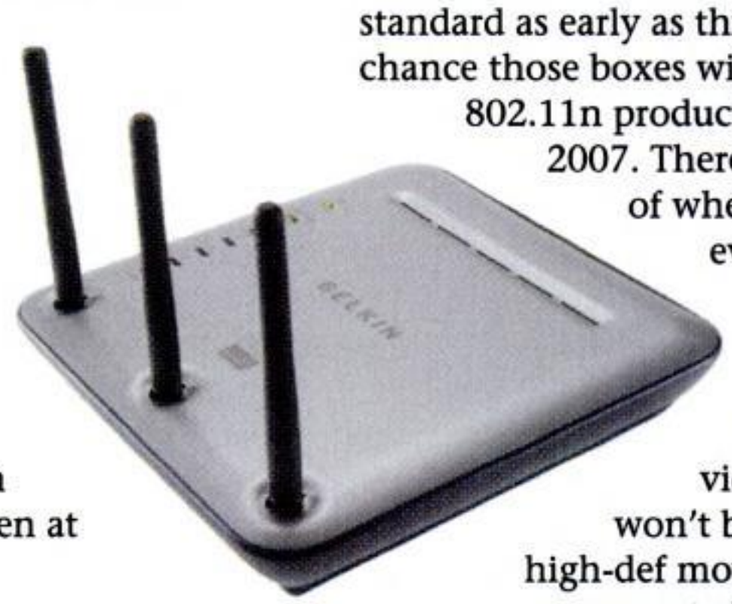
But don't hold your breath—the spec's still a long way off

The successor to 802.11g Wi-Fi is coming, but don't toss out your G router just yet. The IEEE committee is poised to ratify the new 802.11n wireless standard, but technology based on it is unlikely to appear in your home until some time in 2007.

The N protocol promises radical performance improvements over existing 802.11g Wi-Fi networks, with actual speeds expected to top that of 100Mb Ethernet—that's comparable to speeds obtained by today's hard-wired networks. It sounds even better compared with today's G standard, which rarely exceeds 23Mb/s. What's more, it will retain that performance level even at range.

The IEEE voted on a first draft of the 802.11n specification in April. And while the industry is ecstatic over the buzz, even the president and CEO of one of the standard's biggest proponents had a lukewarm reaction: "There's so much hype and noise about all this, but the draft is not an outcome in any sense of the word," said Airgo Networks' Greg Raleigh. Airgo is a key member of the consortium that proposed this particular technology back in August 2004.

Although some companies might build routers based on the 1.0 draft of the standard as early as this fall, there's little chance those boxes will work with genuine 802.11n products when they arrive in 2007. There's also the problem of whether N speeds will even be relevant in two years' time. While 100Mb/s is fine for streaming MP3s and low-grade video, it certainly won't be able to stream high-def movies to our wall-mounted holodeck displays. As much as we look forward to the rollout of 802.11n, it could very well end up being too little, too late when it finally arrives.



This Pre-N router from Belkin is a bit ahead of its time; the actual 802.11n protocol won't appear until 2007.

HDTV under Fire!

The broadcast flag will enforce DRM for HD video, but you can avoid problems by upgrading today

If you're like us, you enjoy recording TV shows and ripping them to Divx to watch on a laptop or to stream to another PC on your home network. Using today's technology, this is totally legal and fairly easy to do with the right hardware. All that is going to change, though, on July 1, 2005, when the FCC's "broadcast flag" for digital video streams and HDTV recorders makes its debut.

Broadcast-flag technology uses a signal embedded in the digital television stream that tells the recorder what it can and cannot do with the stream once it's been captured. The flag might dictate that the content can't be copied to another device, it might not permit archiving to DVD, or it could allow free distribution—the latter scenario being the least likely.

If you think this will be a gradual rollout, think again. The FCC has mandated that every TV tuner, HDTV recorder, and digital television stream be broadcast flag-enabled as of July 1, 2005. Of course, it's possible vendors will release flag-enabled product ahead of schedule; and it's our understanding that non-enabled product on store shelves prior to the deadline can remain there until sold.

Our advice? Don't mess around—go shopping now. Visit EFF.org for a list of currently available hardware that is not broadcast-flag enabled.

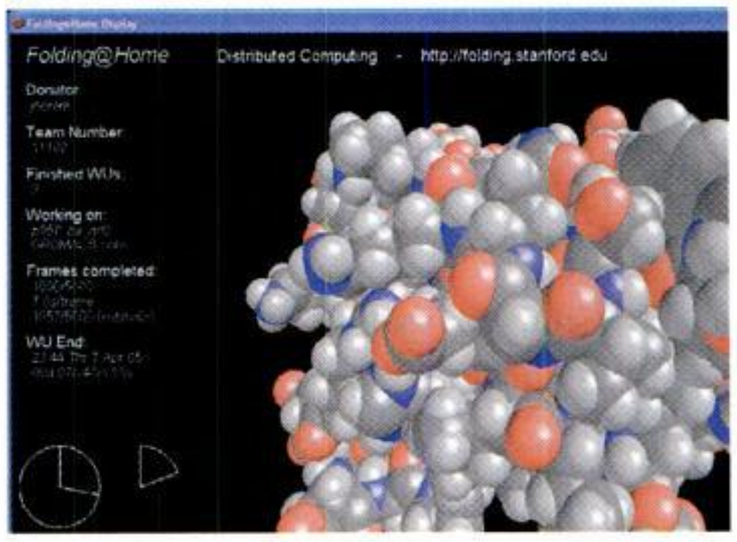
Come July 2005, this TV tuner sans broadcast-flag technology will be worth a fortune on eBay!

Cure Diseases in Your PC's Spare Time

Join Maximum PC's folding team today!

Maximum PC has assembled a global array of computer users who donate their spare CPU cycles to a distributed-computing project known as Folding@home, and we want you to join our team. The project is the brainchild of some Stanford University whiz kids who figured out a way to harness the combined power of millions of computers around the world in order to unlock the secrets of protein folding.

Many of the miracles of biology are the result of protein's amazing ability to perform biomechanical functions—everything from extracting energy from a sugar molecule to removing waste from a cell—by reassembling itself, or "folding." The complex nature of protein molecules makes this process difficult to study. A single error in the protein can prevent it from folding correctly, and these errors can cause an array of serious diseases.



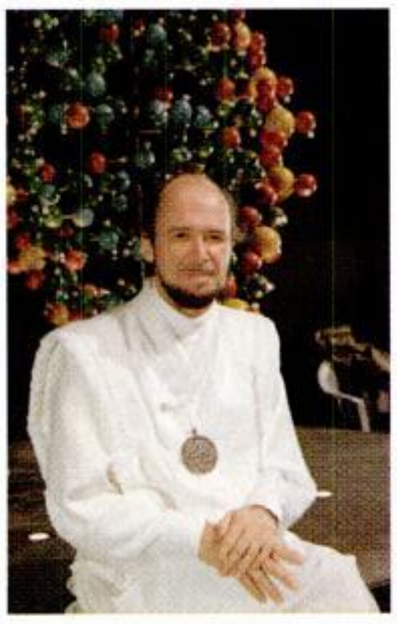
The Folding@home client keeps tabs on how many work units your PC has completed. This newbie recently joined the team.

Humongous computing power is required to accurately simulate protein folding—more power than any single university can afford. The answer to this dilemma is distributed computing. Download and run a simple screensaver, and you can add your CPU's power to the global Folding@home network.

Maximum PC's folding effort is already strong: Our team has thousands of members and we're ranked 10th in the world. But we can do better, with *your* help! All you need to do is grab the client from **http://folding.standford.edu**, install it on as many machines as you can, and let it run in the background. When it asks for your team number, input **11108**.

How Often Do You Beat Your PC?

Users inclined to be unknowing, vengeful



The typical AOL user (left) doesn't know the meaning of common terms such as "spam" and "phishing." He probably knows what "A/S/L" means, however.

Two studies released this month turned a cold scientific eye toward two things long suspected but never tested. One: Most people don't handle computer crashes well, which means they express their frustration by physically attacking their computers. Two: AOL users don't know much about computers—it's shocking, we know.

A study by Ontrack Data Recovery found that the most popular response to data loss is to yell at the PC or to strike it. Thirteen percent reported that they try to sweet talk the PC, and if necessary, disrobe in front of it while saying "Come on baby, you know you want to give SS105-34x.xls back." OK, we made up that second response. A full one-third of respondents admit to throwing in the towel and accepting their fate without asking for help.

Another study commissioned by AOL UK found that the lingo used by computer magazines and PC geeks confuses most users. The study found that one in 10 AOL users thought "spyware" was a program that monitors unfaithful partners for extra-marital online activity. Also, a shocking 84 percent didn't know that the word "phishing" refers to e-mail scams. Even more shocking is that 16 percent of respondents didn't know what the term "spam" meant.

GAME THEORY BY THOMAS L. McDONALD

Empires Past and Present

Sometimes the most passionate love affairs flame out the fastest. As I bellied up to *Empire Earth II* and set my wee minions about their endless tasks of building and fighting, I remembered my first few moments with the beta of the original *Age of Empires* way back in the dark mists of 1997. Those first few moments were especially sweet because everything that followed was a quick skid down the muddy slope of wrecked expectations, leaving only the hollow echo of tortured metaphors to remember it by. I wound up loathing the game more than I should have and my feelings were out of all proportion to the game's relative merits and deficiencies

The problem wasn't what *AoE* was, but what it *wasn't*, and what it wasn't was *Empire Earth/ Empire Earth II*. (Sometimes the influence of "Fuzzy Wuzzy Wasn't Fuzzy" weighs heavily on my writing.) I went in expecting Rick Goodman and company to give me an RTS *Civilization* with complex research trees, deep strategic possibilities, and killer graphics, but they were going for something else entirely. When the time came to write the review, I broke one of my cardinal rules: Review the game at hand, not the game you wish it was.

***Empire Earth II* took me back to that first kiss with *AoE*, because it actually *is* the game I wished *Age of Empires* had been. If *Age of Empires* were the lovechild of *Warcraft* (mom) and *Civilization* (dad), it had dad's looks and mom's personality. With *Empire Earth*, the child definitely takes after its father. Rick Goodman's original *Empire Earth* was superb, with multiple resources and races, an elaborate web of technologies and epochs, and plentiful units offering a more complete conquest experience. It was as though Goodman himself had wanted *AoE* to be and do more.**

A lot of creative people return to the same themes and work them out in different ways over a number of years, whether it's Andrew Wyeth with Helga Testorf or George A. Romero. It's as though they always want to try the same thing from a different angle. Goodman was not on hand for *Empire Earth II*, but his shadow falls heavily on the whole project, as a new team of developers continue to work out and refine those ideas and obsessions first given form in *Age of Empires*.

Tom McDonald has been covering games for countless magazines and newspapers for 11 years. He lives in the New Jersey Pine Barrens.

Head2Head

A showdown among natural PC competitors

THIS MONTH: Mini Flash MP3 Players

Apple arrived fashionably late to the MP3 party, but blew away the competition with its easy-to-use, elegant iPod. Can Jobs & Co. work the same magic with a flash memory-based player? We compare two 1GB MP3 players—the iPod Shuffle and its closest competitor, Creative's MuVo Micro N200, in order to, as Apple puts it, "give chance a chance."

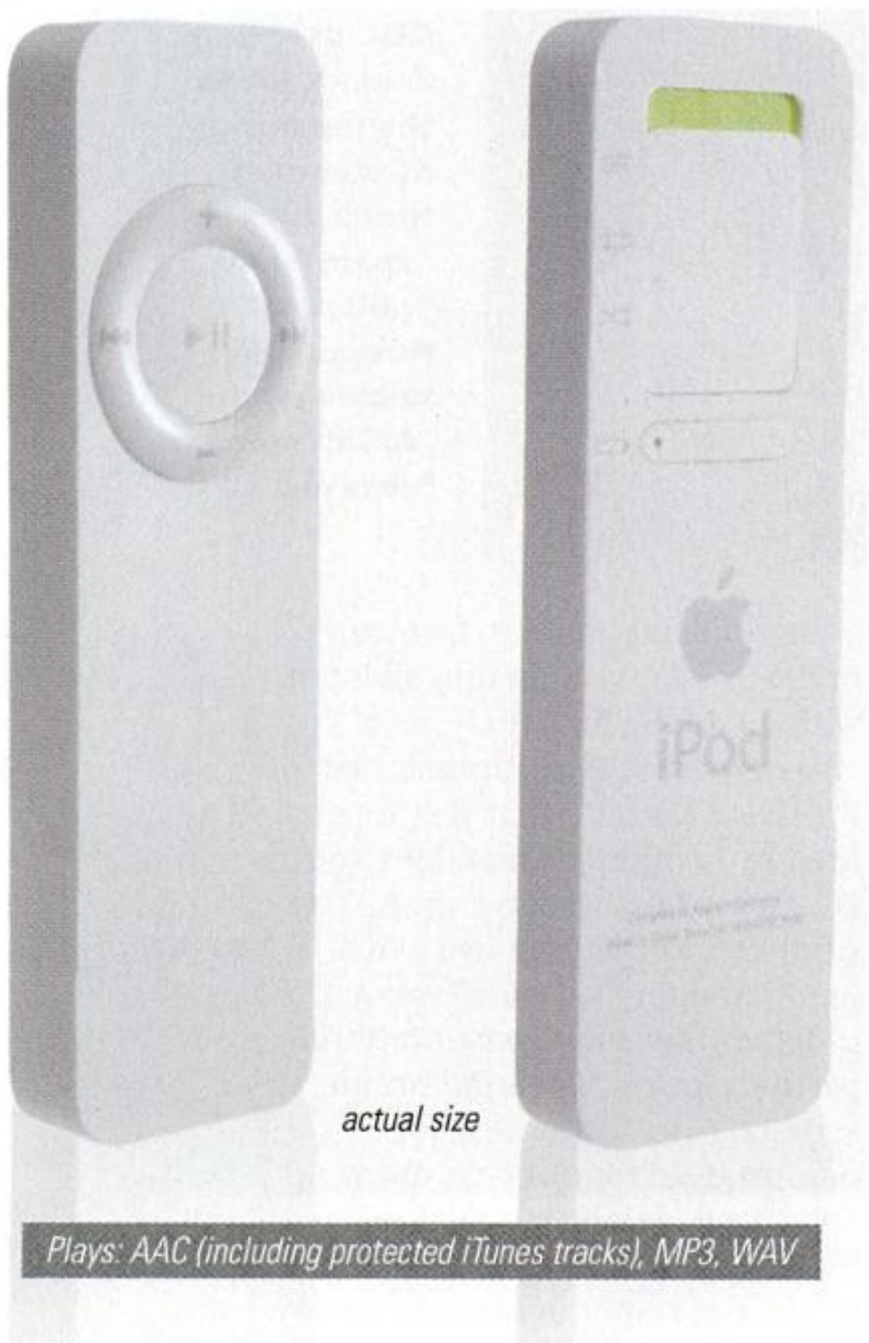
—LOGAN DECKER

iPOD SHUFFLE

Sound quality
In our tests, both players delivered equally good sound without clipping either end of our tracks, but the Shuffle gets much louder than the MuVo (one editor described the maximum volume as "terrifying"), and the headphones are the best you'll get bundled with a flash memory-based player (although we still recommend springing for a better set to improve overall sound quality). Sadly, however, the screen-less Shuffle has no facility for equalization. **Winner: Shuffle**

Features
Other than its ability to act as a removable hard drive through Windows Explorer, the iPod Shuffle is—either by default or by design—pretty much feature-free. No playlists. No EQ. No FM tuner. No voice recording. Surprisingly, the Shuffle also omits support for tracks encoded with the Apple Lossless Encoder. But damn if it doesn't *look* good. **Winner: MuVo—by a mile**

Ease of use
The Shuffle's lack of an LCD screen forced Apple into design compromises that no amount of marketing spin can make up for. The only source of feedback comes from two LEDs, one on the front, and one on back, and Apple seems to admit defeat by including a wallet card to help you decode the light signals. And, of course, you can't see what track you're listening to or visually scroll through your music. Too spartan for our tastes. **Winner: MuVo**



actual size

Plays: AAC (including protected iTunes tracks), MP3, WAV

Battery life
Apple seems to have been a little modest with the rated battery life of 12 hours—we got more than 15 hours of continuous play from the Shuffle at 75 percent volume. But that's still not as good as the MuVo. Sorry, Charlie. **Winner: MuVo**

Software
Well, no contest here. *iTunes* is the best MP3 playback software available for Windows, and it can be configured to fill your iPod Shuffle either randomly or from specific playlists, and you can even give preference to tracks that you rate higher than others. **Winner: Shuffle—by a mile**

MAXIMUM PC VERDICT 7

+ SHUFFLEBOARD
Lightweight, dashing, nicely designed control ring, and loud as hell.

– SHUFFLE PLAY
No screen. So-so battery life. No screen. No playlist support. No screen.

$150, www.apple.com

CREATIVE MUVO MICRO N200

Sound quality
The MuVo's EQ options—including a five-band custom setting—should have propelled it over the Shuffle in this category, but we were disappointed by its timid volume (tolerable even at maximum). And the bundled headphones are the usual crap—you'll be much happier pairing the device with bass-boosting earbuds or Shure's E2c or E3c sound-isolating earbuds ($99/$180, **www.shure.com**). **Winner: Shuffle**

Features
Despite its diminutive size, the MuVo packs an orgy of features, especially when compared with the Shuffle's masochistic minimalism. You get no-brainers like data- and music-file transfer through Windows Explorer, voice recording, an FM tuner, and EQ. Although the MuVo doesn't support playlists, you can create quick-and-dirty ones by dropping tracks into folders you create in Windows Explorer—a boon for those who can't be bothered with maintaining good ID3-tag hygiene. No help for those who prefer lossless codecs like FLAC, though—what a pity.
Winner: MuVo—by a mile

actual size

Plays: MP3, WMA, (including protected WMA files), WAV

Ease of use
Unless you're determined to "Enjoy Uncertainty," an LCD screen is a must on any player with a capacity greater than 512MB. Otherwise, you'll end up fast-forwarding through miles of tracks to get to the one you want. The LCD screen on the MuVo (which can be oriented to read left-to-right or right-to-left) allows us to set EQ, select a folder for playback, and find out the name of the Led Zep song that just played ("Bonzos Montreux").
Winner: MuVo

Battery life
The MuVo would have taken this category even if it didn't beat the Shuffle in the endurance test, because it runs on a single AAA battery that can be easily swapped out when the juice is drained. It further sweetens the deal that a single Energizer battery afforded us almost 18 hours of play.
Winner: MuVo

Software
Creative's *PlayCenter* was never a pretty lass, but it's a decrepit old hag now. Fortunately, you can load the MuVo with music through Windows Explorer and never have to look at *PlayCenter* ever again.
Winner: Shuffle—by a mile

MAXIMUM PC VERDICT 9

+ EARBUDS
Tons of features, good battery life, great sound, integration with Explorer.

– EARWIGS
Should have higher volume ceiling, no support for OGG or lossless codecs.

$170, www.creative.com

THE UPSHOT

We can already hear the Apple psychos moaning: *You guys don't get it! The whole idea is that it doesn't have a screen—it's like a personal radio station!* Oh, we get it—we're just not wild about it. Ultimately, the Shuffle promotes a passive listening experience that isn't really like radio at all; instead of introducing you to *new* music, it just rearranges your stuff like a bad housekeeper. It's a nice bauble and a great complement to the hard drive-based iPod, but it's no match for the **MuVo Micro N200** in the flash memory-based MP3 player division.

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WatchDog

Say hello to **Murphy**, WatchDog of the Month

Maximum PC takes a bite out of bad gear

THIS MONTH: The WatchDog goes after...

>Creative Labs >Toshiba >America Online >Freeipods.com

Settlements

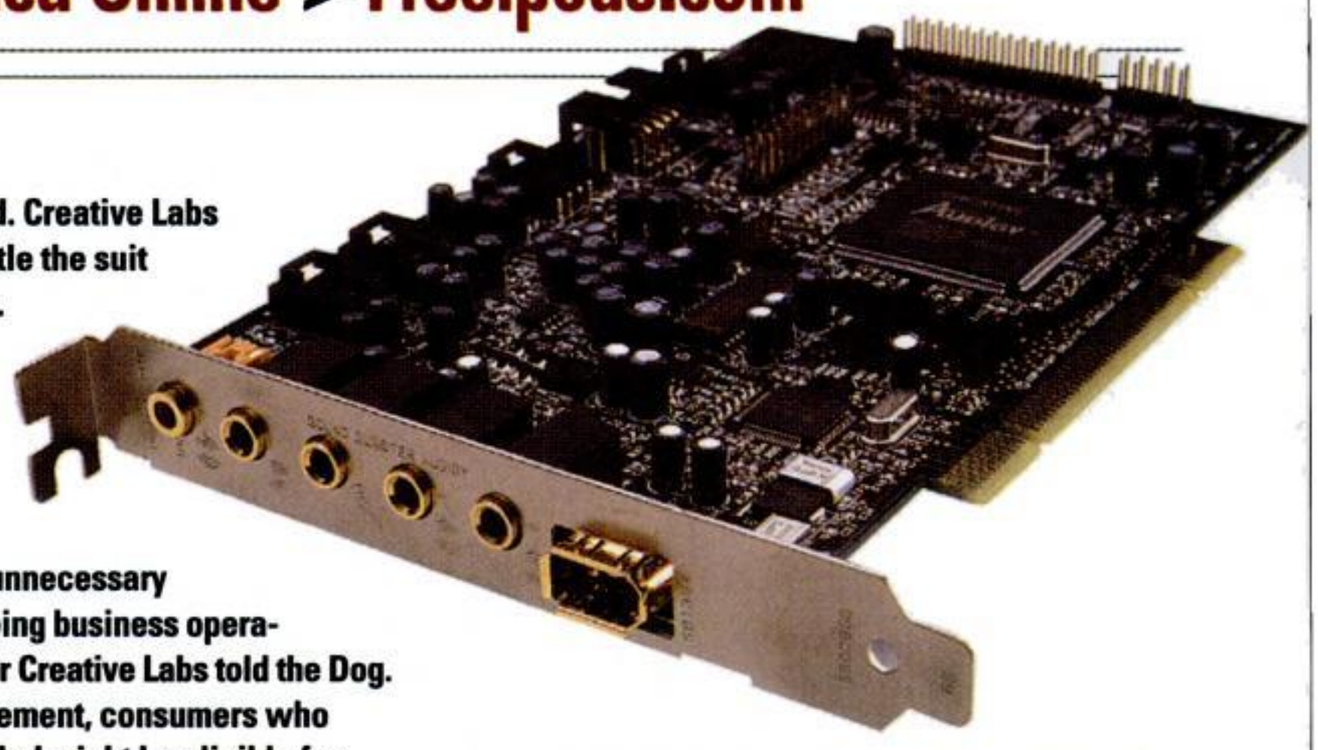
It looks like the Dog got some bad info on the tentative settlement in the 75GXP Deskstar class-action suit. The correct URL is: www.ibmdeskstar75gxplitigation.com. To summarize, consumers who found themselves saddled with a failed IBM 75GXP Deskstar HD could qualify for a $100 claim. A settlement hearing will be held in Texas on July 1, and consumers have until June 17 to opt out of the settlement.

◆

Creative Labs' first Audigy card was marketed as a 24-bit soundcard capable of 96KHz sample rates, but as those who follow PC soundcards know, while the Audigy could play back audio at 24-bit, it's recording ability was limited to 16-bit. A lawsuit filed by Paul Holt on March 28, 2003 in a San Francisco Superior Court claimed Creative intentionally misled consumers by advertising the Audigy as a 24-bit card. Creative Labs has now agreed to settle the suit without admiting guilt.

"We find the plaintiff's claim to have absolutely no merit whatsoever. We agreed to settle the claim to minimize unnecessary interference with ongoing business operations," a spokesman for Creative Labs told the Dog.

As part of the settlement, consumers who believe they were misled might be eligible for a 25 percent discount certificate toward—you got it—another Creative Labs' product. The discounted amount is not to exceed $62.50. To qualify for the discount, consumers must file a claim including the serial number of the soundcard and a sworn statement that they are unhappy with the card's audio-processing capabilities. Only the Audigy ES, Audigy Platinum, Audigy Platinum EX, Audigy Gamer, Audigy MP3+, and Extigy soundcards qualify. The discount certificates are restricted to purchases made at Creative's U.S. web store. For more information, point your browser to www.audiocardsettlement.com.



Creative Labs was sued over the original Audigy's inability to record audio at 24-bit.

◆

In other settlement news, Toshiba is making amends to owners of its Satellite 5005-S504 and S507 notebooks. After Toshiba's Pentium III-based notebooks were introduced, consumers began reporting problems with the units overheating, crashing, or slowing down. Consumers suspected the problem was directly related to the fact that the notebooks housed desktop Pentium III CPUs rather than Intel's mobile P-III proc, which cost about a third more at the time.

Consumers also complained that the BIOS updates "fixed the problem by lowering the clock speeds of the chip to make it run cooler." Toshiba didn't help the situation when it implied fault on the part of the benchmark programs which indicated slowdowns.

Several suits were filed alleging that the Satellite 5005-S504 and S507 contained a design defect, and that Toshiba knowingly tried to conceal it from consumers. At the time, *Maximum PC* reader Mike Wallace was among those who complained.

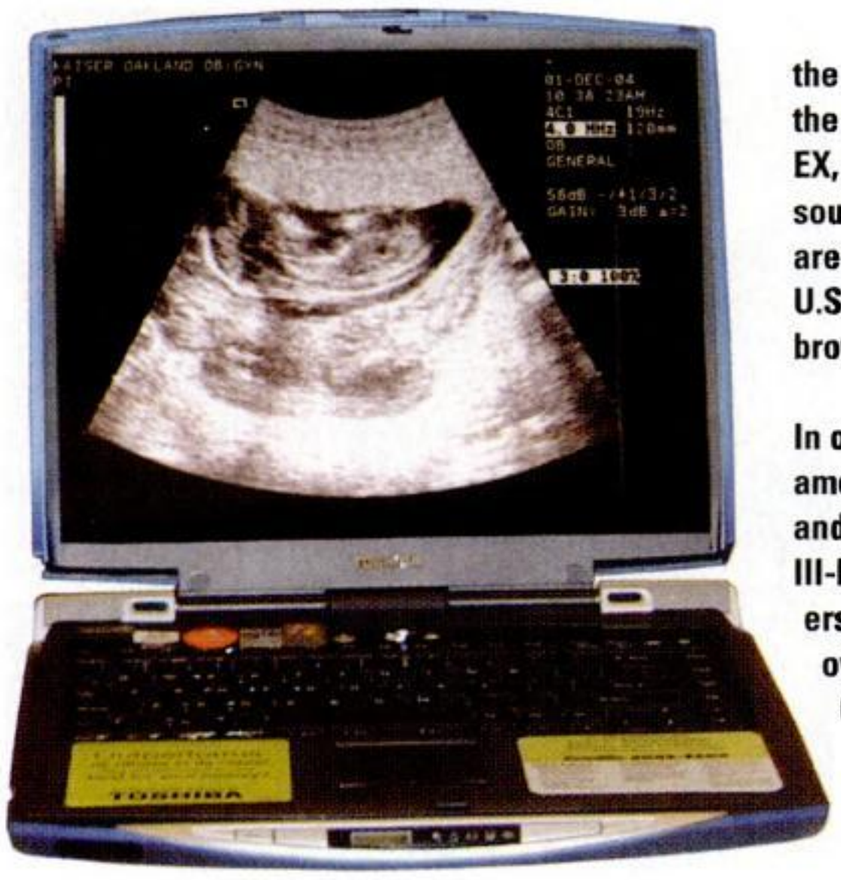
"I have always believed that Toshiba made quality laptops. I realize there will be problems from time to time, and I can get beyond that," Wallace said in the October 2002 issue of Maximum PC. "However, Toshiba's lackadaisical customer-service approach has me doubting I will ever buy another one of its products."

This winter, without admitting fault, Toshiba settled the lawsuit. Details are as follows:

➤ Consumers who had their S504 or S507 notebook serviced more than once before November 2, 2004 can take either a $1,000 cash payment or a $1,500 credit voucher to be used at Toshiba's web site if they return the notebook to the company.

➤ Consumers who had their S504 or S507 ser-

> *"AFTER THE PENTIUM III-BASED NOTEBOOKS WERE INTRODUCED, SOME CONSUMERS BEGAN REPORTING PROBLEMS WITH THE UNITS OVERHEATING, CRASHING, OR SLOWING DOWN."*



Toshiba has settled a lawsuit over the Satellite 5005-S504's and S507's overheating problems.

A FEW GOOD DOGS...

Think your favorite pooch has what it takes to be "WatchDog of the Month"? Send a high-resolution image of your canine to Watchdog@maximumpc.com.

viced only once prior to November 2, 2004, are eligible for a $1,000 cash payment if they return the notebook to Toshiba, or a $500 cash payout if they keep the notebook.

➤ Consumers who are willing to sign a sworn statement that their S504 or S507 had problems but was never serviced by Toshiba are eligible for a $500 payout and can keep the notebook. For more information and a copy of the claim form, visit www.satellite5005settlement.com. Forms must be completed and filed by June 27, 2005.

AOL on the Up and Up?

DEAR DOG: I read on several blogs that agreeing to America Online's new terms of service means you waive any rights to privacy and that the company can monitor your instant-message communications and keep copies of them. So Sad.

—BRIAN G.

THE DOG RESPONDS: America Online monitoring instant-message chats? Sounds insidious, so the Dog questioned AOL about the "new" change. Spokesman Andrew Weinstein says it's all a tempest in a Porta-Potty. "It's not accurate. It was a misinterpretation of the privacy policy that was not related to person-to-person communications," Weinstein told the Dog. Weinstein said the TOS refers to messages posted by users in public forms or boards. It informs AOL members that anything they post to public forums is public. Weinstein reiterated that AOL doesn't monitor IM conversation, which is stated in the company's official privacy policy. Even the news that the TOS was recently updated is bogus, Weinstein said. The TOS has been in place since February 2004 and wasn't changed until after the recent confusion broke out. The difference? According to AOL, the only change to the TOS is clearer wording that the company does not monitor IM chatter. Woof.

Not So Free iPod

DEAR DOG: I've got a bone to pick with you over your March 2005 column [regarding Freeipods.com]! I personally hate pyramid schemes and thus have vehemently warned my friends against this latest insidious venture. In your complete endorsement of this diabolical scam, you forgot to mention the most important part. You make it seem as if you sign up for your trial service you get a free iPod! That's not how it works. You forgot to mention that while it may be easy for you to justify $30-$50 worth of trial memberships for one month (which then you have to remember to cancel), you must also convince several of your friends to do the same—only they don't get anything in return.

That is, unless they want to harass more of their friends and so on. Obviously the majority of people who sign up for this type of scam can't find enough other people to follow them in the allotted time and therefore spend at bare minimum $30-$50 and get nothing!

You have to realize that no company is going to spend $200 to entice you to use a $15/month service that probably has a slim profit anyway. It is apparent (to me at least) that for every iPod Freeipods.com gives away, there would have to be 20–40 people who signed up but couldn't get it together enough to get an iPod for the company to stay in business.

> ***"IT'S NOT ACCURATE. IT WAS A MISINTERPRETATION OF THE PRIVACY POLICY THAT WAS NOT RELATED TO PERSON-TO-PERSON COMMUNICATIONS."***

I personally would feel evil and sleazy every time I turned on my "free" iPod, knowing that many people had to be scammed in order for me to own it! I encourage you to please run a retraction as I would hate for more people to fall for this.

—TY TOPPER

THE DOG RESPONDS: Actually, the Dog did not endorse Freeipods.com, but merely informed reader Aaron Gingrinch that Freeipods.com was not a scam operation. Typical pyramid schemes are designed so that only a very few people ever "win" at all. Freeipods.com is more in line with the towel hawker at a football game. You have to sign up for a credit card to get the free towel. But because the iPod is more costly than a towel, you have to have several others sign up as well. To quote the Dog's own column, "Freeipods.com asks you to sign up for one of several available services or products, such as a one-month trial of Blockbuster rentals, a subscription to *USA Today*, or one of several credit-card offers or online music services. Some of the services are free, but others aren't."

Freeipods.com and the company that runs it, Gratis, indeed hope you *can't* convince enough family and friends to sign up because that means they make more money—the company gets the referral pay from the service provider and doesn't have to send you an iPod. Even here at the *Maximum PC* offices the Dog was unable to get coworkers to sign up (and the company would have reimbursed the fees!) because no one wanted to deal with the hassle of canceling services. Anyway, the way the Dog sees it, the intention of Freeipods.com isn't to get everyone an iPod, it's to get a motivated individual an iPod.

To sum it all up, the Dog does not, nor has he ever, endorsed Freeipods.com, and he stands by what was written in the March 2005 issue: "That doesn't mean you should jump in with both feet, though. You should still read the fine print of any offer you sign up for online… Details like these can turn 'free' into *not* free very quickly." Woof. ■

Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic The Dog on them by writing **watchdog@maximumpc.com**. The Dog promises to get to as many letters as possible, but only has four paws to work with.

RECALL ALERT

Not that we're picking on Toshiba, but this BIOS update seems like an important one. Toshiba is recommending that people with Satellite A60 and A65 notebooks, including models: A60-S156, A60-S1561, A60-S166, A60-S1661, A65-S1064, A65-S1065, A65-S1062, A65-S1762, A65-S126, A65-S1261, A65-S136, A65-S1361, A65-S1063, A60-S1662, A60-S159, A60-S1591, A60-S1591ST, A60-S1592ST, A65-S109, A65-S1091, A65-S1066, A65-S1067, A65-S1070, A65-S1069, A65-S1068 immediately update their BIOS. The company says that in extremely rare instances, the Satellite A60/A65 can overheat and cause the plastic casing on the right-hand corner of the notebook to deform.

"The overheating and deformation occur only when the notebook is booting or resuming from standby or hibernation, and can be avoided by installing BIOS ver. 1.70, which was released on October 22, 2004, or a later version," the company says. Only A60/A65 notebooks with serial numbers in the 64xxxxxx, 74xxxxxx, 84xxxxxx, and 94xxxxxx range are at risk of overheating and melting.

Toshiba says certain A60 and A65 notebooks should be updated to the latest BIOS to avoid overheating and melting.

JEFFREY STEPHENSON: HUMIDOR CL SERVER PROJECT

Converting a humidor into a computer turned this hobbyist into a case mod icon. What's your vision? Go to Newegg.com to find everything the world's most artful modders are running.

System Specs:

- 40GB Toshiba 2.5" drive
- Twin Linksys® antennas
- ATX power control
- 256MB of DDR memory
- 40mm CPU fan
- 4-port wireless DSL router

BizRate

COMPUTER SHOPPER SHOPPERS' CHOICE 2004

www.newegg.com/jeffrey.html

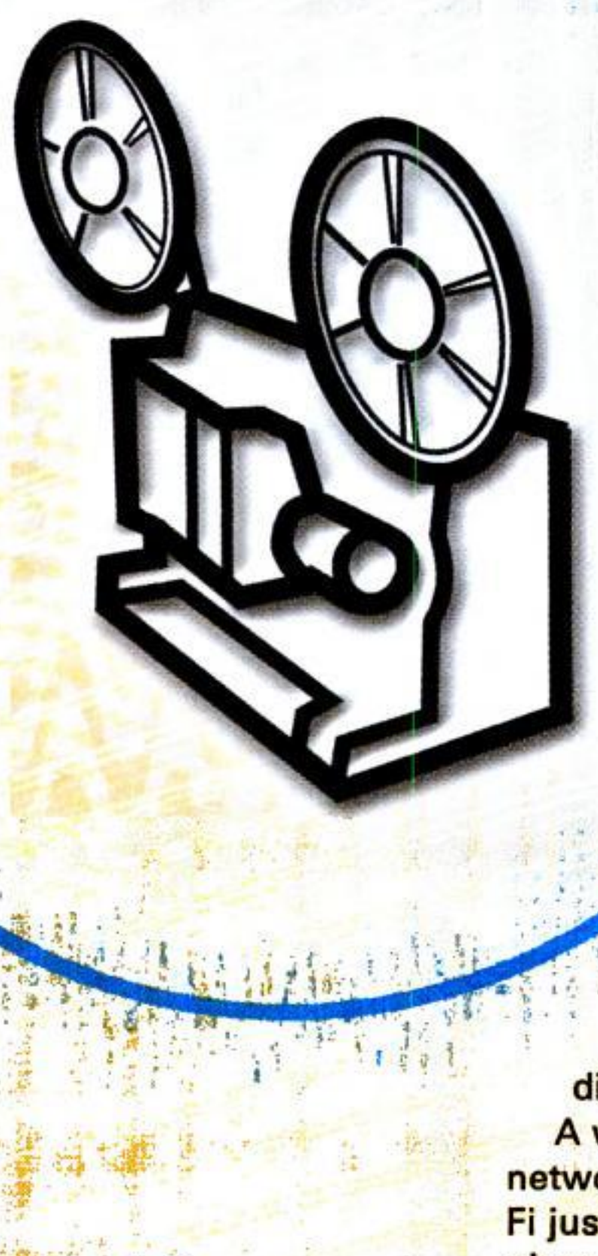
STREAM YOUR:

The Shuttle SB86i is a great media server case. It's cool, quiet, and includes decent onboard sound and graphics.

Music
TV
Movies

Everywhere In Your Home!

Wireless is convenient, but it doesn't provide enough bandwidth for video streaming. Luckily, it's easy to wire your home for seamless transmission of digital media of every stripe!



BY MICHAEL BROWN AND WILL SMITH

Sitting in your Barcalounger, you are the master of your digital domain. At your fingertips are 300 recently recorded TV programs, any of which is ready to roll at your command. And digital media privileges are not yours exclusively. In her bedroom, your daughter grooves to a catalog of 25,000 songs, while your wife, nestled cozily in the den, watches any movie from your vast collection. It's all made possible with some strategically placed Ethernet cable and a media server discretely humming away in a closet.

A powerful media server is the centerpiece of your digital home. Always on, it stores all of your media in one convenient location that you can access anytime from anywhere—your living room, bedroom, or even a laptop in the backyard. The server needn't be a powerful machine by gamer standards, but it must be configured with the right hardware and software, lest your digital dream home become a nightmare.

A wired network is the glue that holds everything together. Wireless networks are great for browsing the web and checking e-mail, but Wi-Fi just doesn't have the legs for streaming video. Wiring your home gives you reliable, lightning-fast connections to all the rooms in your home, and it's easy to do. If you have an easily accessible crawl space, basement, or attic, running Ethernet is a snap. All you need are the right tools and a free afternoon or two.

Before you do anything, read this feature. Make sure you know where you're going to put your server, which rooms you'll run your wired network to, and where you'll rely on wireless. If you plan carefully, and follow our instructions, you can start on Saturday morning and be streaming *Blade Runner* on Sunday night! It's time to make your digital dream home a reality!

INSIDE:

NETWORK YOUR HOME

PREPARATIONS

Planning is key to a successful network configuration.

In order to get your network cooking, you need to know where you're going to put your media server, in which rooms you'll want network access, and which rooms will require hard-wired—versus wireless—network access. (If you plan to stream only data and music to a particular room, a wireless access point will deliver plenty of bandwidth, but wireless will support only one or two video streams.) Wired networks are based on a star topology, with cables emerging from a central switch (also known as the home run) to serve all the devices connected to the network.

Because there will be a lot of cables emerging from this central switch, you'll want to keep it out of sight. Consider placing it in a closet or even in the garage. Keep in mind, however, that the switch requires electrical power. At the same time, you'll need to keep your data wiring a safe distance from electrical and magnetic fields, such as AC power lines (at least six inches), electric motors (at least three feet), florescent lamps (three feet), and transformers (three feet).

Once you've settled on a location for your home run, you'll need to decide where to place your network ports. Ideally, you'll place the network ports near the devices you want to connect, on an interior wall of your house. Perimeter walls can be difficult due to low overhead in the attic or crawl space.

Once you decide where to run your cables, you should measure the distance for each run—be sure to measure not only the horizontal distance from the home run to the outlet, but also the vertical distance required for the cable to travel up and down the walls. You shouldn't need to cut your cables until the run is complete, but it helps to know how much wire you'll need when you go shopping.

WHAT YOU'LL NEED

Here are the components you'll need to construct an eight-node network. If you can't find these materials at your local home-improvement store, you can order them online at Tigerdirect.com or Newegg.com.

Infrastructure:

■ An eight-port switch – We used Netgear's GS608, but any gigabit switch will provide maximum speed (**www.netgear.com**)

■ A wireless router – We selected Netgear's WGU624 because it stacks neatly on top of the eight-port switch, and includes four additional Ethernet ports (**www.netgear.com**)

■ Bulk Cat5e Ethernet cable – We chose Cat5e because it supports Gigabit Ethernet; buy more than you think you'll need from Home Depot or any electronics store

■ Cat5e Ethernet patch cables – You'll need two cables for each device you want to connect, available anywhere network gear is sold

■ 20 RJ-45 Ethernet ports – Leviton makes easy-to-install Ethernet ports that mount to any electrical box. We need just 16, but it's good to have extras (**www.leviton.com**)

■ 8 single-port wall plates – The Ethernet ports pop into these, then screw into electrical boxes (**www.leviton.com**)

■ 8 single-gang electrical boxes – We'll mount these in the wall of each room we want to wire. Available at Home Depot

■ 1 dual-gang electrical box – We'll run all the wires for the home run to this electrical box. Available at Home Depot

■ 1 eight-port, dual-gang wall plate – For the home run, we'll use a double-wide electrical box and eight connectors (**www.leviton.com**)

Tools:

You'll need several tools to properly install the network. We got all the networking gear from Leviton (**www.leviton.com**), and most everything else should be available from Home Depot.

■ UTP cable stripper – You could use wire snips to strip the Ethernet, but this is much easier and safer

■ Punch-down tool for connecting the Ethernet ports – A must-have for tidy networking

This network tool kit comes with cable stripper, crimper, and punch-down tool.

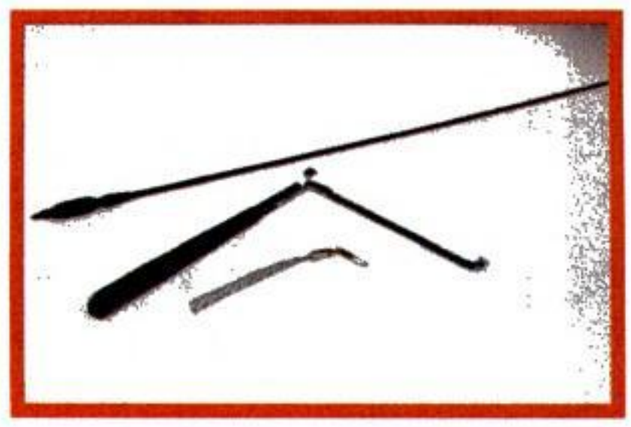
■ Cable pullers – We like to have both pull rods and fish tape to make pulling cables through the walls easier

■ Measuring tape

■ Drill – We recommend an actual corded drill. Cordless models might not have enough torque to bore large holes through stacked two-by-fours

■ Drill bits – One—either an auger or spade type—to drill holes large and deep enough to snake your cable bundles through, and a second, smaller bit to drill a pilot hole for the wallboard saw)

■ Wallboard saw – You'll need this to cut holes in your walls for the electrical boxes



Super-long drill bit with cable pullers

Pull rods

Fish tape

STEP 1: WALLBOARD SURGERY

You won't regret heeding the old carpenter's maxim, "measure twice, cut once"

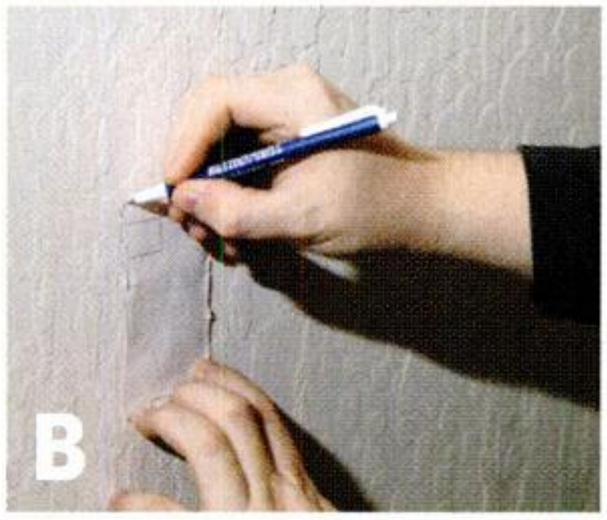
Once you've mapped out your network on paper, you should examine the locations you'll be routing cable to. Although you'll want to limit the number of times you enter your crawl space or attic, it's crucial that you conduct a scouting expedition in one or both places before you start cutting holes in your walls.

In many homes, the declining angle of the roof might make the top of an outside wall inaccessible from the attic. If you have a crawl space—or better yet, a basement—beneath the house, you might be able to run the cable up through the floor, instead. In other situations, a two-by-four brace or fireblock midway up the wall could render it impossible for you to snake cable down to an electrical box. You can use an electronic stud finder to quickly identify this potential problem. Insulation in outside walls can also make things difficult—particularly if it's the blown-in type.

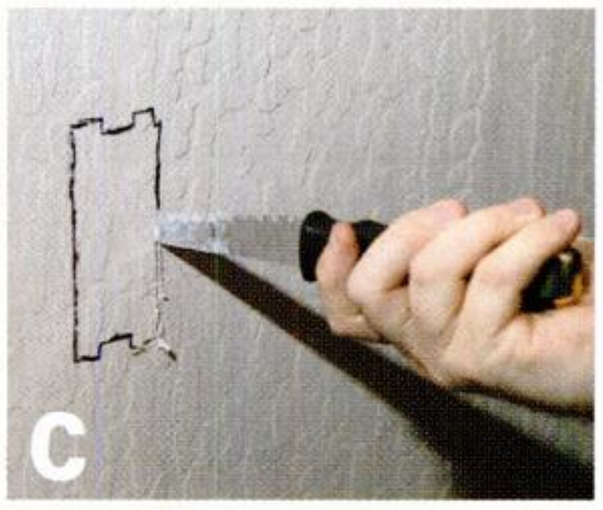
Make sure you have adequate clearance from electrical cables, and be aware of what's on the *other* side of the wall, too. You don't want to cut a hole in the wall only to discover a water pipe blocking your way—or worse, spouting water from a fresh wound.

Lastly, identify a landmark in your home—such as a chimney, a bathroom vent, a heat duct, etc.—that will help you orient your location from within your attic, basement, or crawl space. You'll use that landmark when deciding where to cut holes.

You can use an electronic stud finder (or the old two-knuckle tapping trick) to locate the two-by-four studs in the wall. The stud finder will beep when it detects the edge of the stud; keep dragging until the tone stops to identify the other edge of the stud. Place your Ethernet jack at the same floor height as your electrical outlets, but keep the cable a few inches from any electrical cable inside the wall.



When you buy your electrical boxes, pick up a few of these paper templates. Tack the template to the wall and trace an outline for the hole you're going to cut to accommodate the electrical box. (If you can't find the paper templates, you can trace an outline around the box itself.)



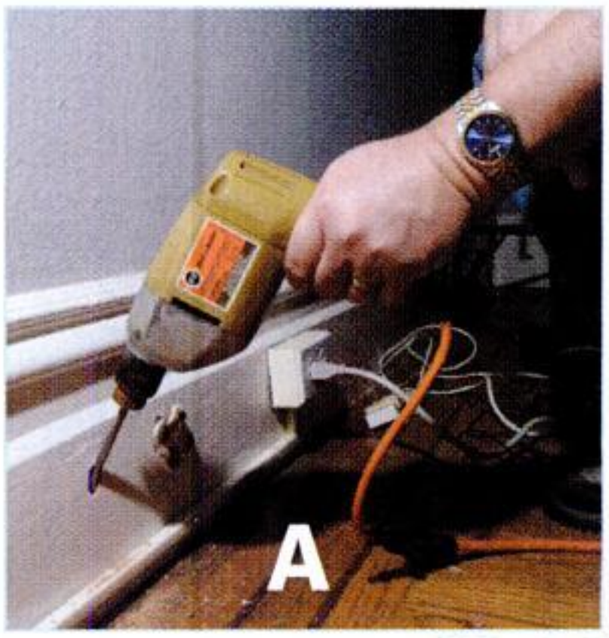
Drill a pilot hole in one of the lines that you've drawn. Insert the wallboard saw into the hole and slowly cut around the perimeter. Don't insert the electrical box until you've pulled your cable through the hole.

STEP 2: PULLING CABLES

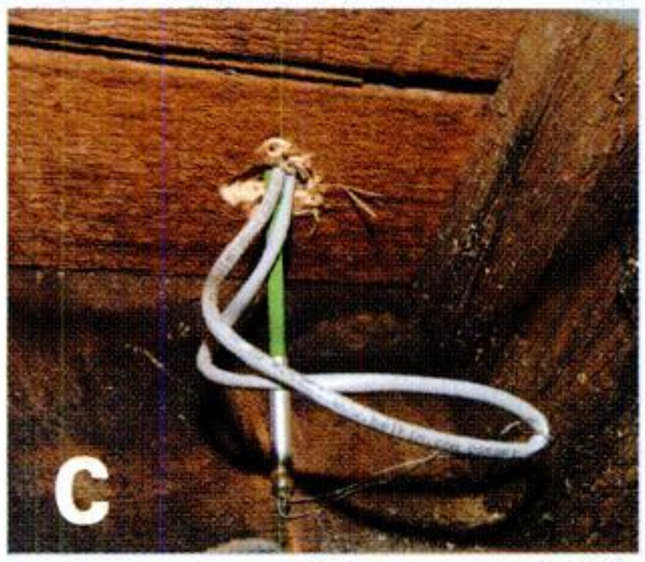
And now the real dirty work begins

If you're fortunate enough to have a basement or first-story garage beneath your living quarters, you won't need to enter your attic at all. Regardless, when you're running cable, start at one end, then run it to the other. Whatever you do, don't start in the basement or attic. Don't forget to bring your measuring tape, drill, drill bits, and your measurements. After you finish the first run, go ahead and pull wires to the rest of the rooms you want to connect.

In this example, we pushed a fish rod down into the basement to help find the hole. Once we've located the hole, and made sure it's clear, we attached a cable to the fish rod using 20-ga metal wire, and pushed the looped end of the cable back down into the hole. If you're drilling down from an attic, you'll need to drop your fish tape down the hole between the insulation and the wall, then have a helper tie the end of the cable to that, and then pull the fish tape and cable back up.



If your home doesn't have modern gypsum boards to cut holes in, you can drill down at a very shallow diagonal angle, then mount a wall-mount Ethernet jack on the wall.



Once the cable is visible in your basement, you can begin pulling it from the hole toward your home run. Take care not to bend or crimp the cable. If you must staple the cable, use plastic nonmetallic staples and leave the cable loose within the staple. If you crimp or compress the cable, you'll seriously impair its ability to transmit data. Label or tag each end of the cable before you pull it up into the other hole, so you'll know where it's going to and coming from.

STEP 3: TERMINATE THE CABLES

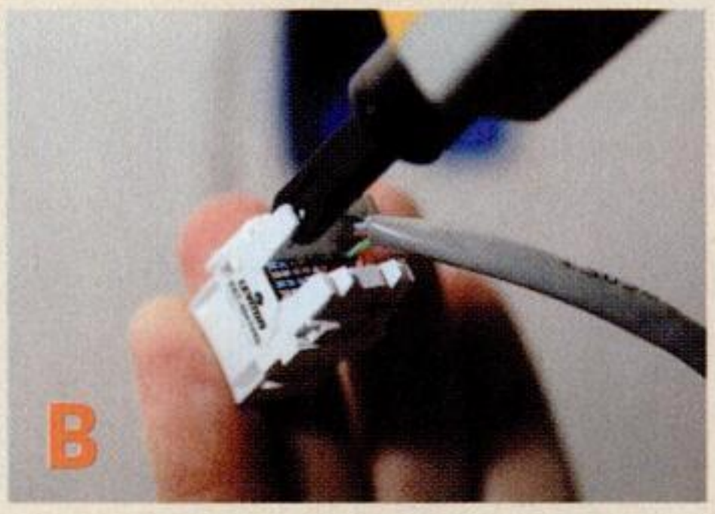
In other words, attach jacks to the ends of your cables

Once you've completed all your cable runs, you'll need to terminate the cables (wire them to Ethernet jacks). Take care to strip no more than one inch of the jacket away from the twisted pairs of wires inside. It's very important that the jacket covers the wires all the way up to the jack; otherwise, you could compromise the cable's ability to transmit data at maximum speed. You'll need a UTP stripper and a wire punch-down tool for this step.

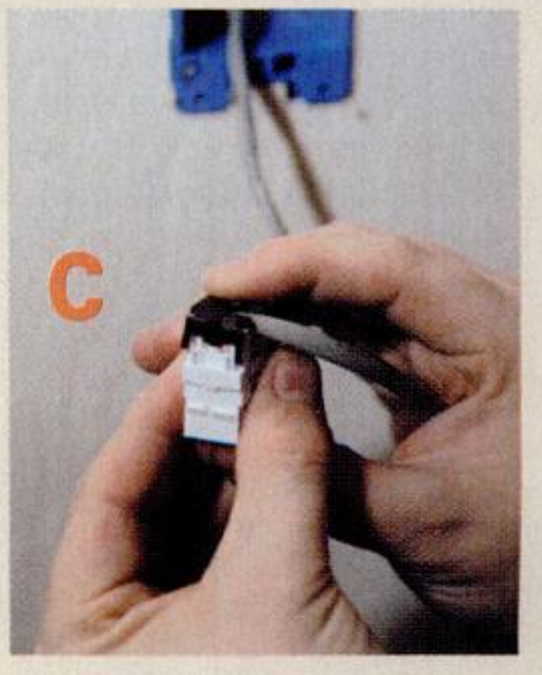
For esoteric reasons we won't go into here, there are two different wiring schemes for terminating Cat5e cables: T568A and T568B. Most jacks and patch panels have diagrams for both wiring schemes, and there's no significant performance difference between the two. The key is that the entire system must be terminated using the same scheme. We've chosen T568A for this example.

Terminate both ends of all of your cable runs and move on to the next step.

To begin, you'll need to strip the ends of the wire using your wire stripper. Most strippers help align the end of the wires so you trim just the right amount. Trim any excess wire using your wire snips.



Following the T568A wiring diagram on the jack, untwist each pair of color-coded wires and drape them into the matching channels. Using the spring-loaded push-down tool, push each of the wires down into the appropriate channel. When the push-down tool clicks, it snips off the excess wire.



Once you've placed and trimmed each of the wire pairs, run the wire through the channel and lock it in place with the included black cover.

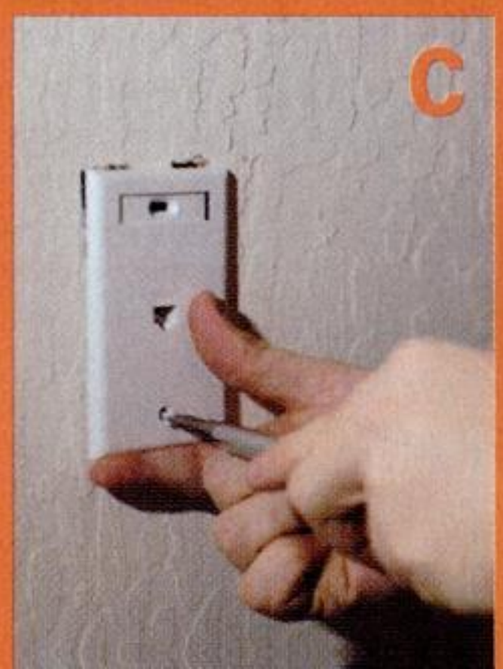
STEP 4: CLOSE YOUR ELECTRICAL BOXES

Tidy up your mess, or face the consequences

You're just about finished with the cabling part of your project. Now all you need to do is arrange all those cables inside your electrical boxes and screw on the faceplates.

To deal with excess cable, coil it loosely inside the electrical box. If you have more excess wire than comfortably fits inside the box, you can push it back inside the wall. Be sure to leave four to six inches of excess wire at each outlet in case you need to reattach a recalcitrant jack.

Push each of the Ethernet jacks into the holes in the backs of the wall plates. They should snap firmly in place. Note that they only go in one way, make sure that the UP label on the jack and the wallplate agree.

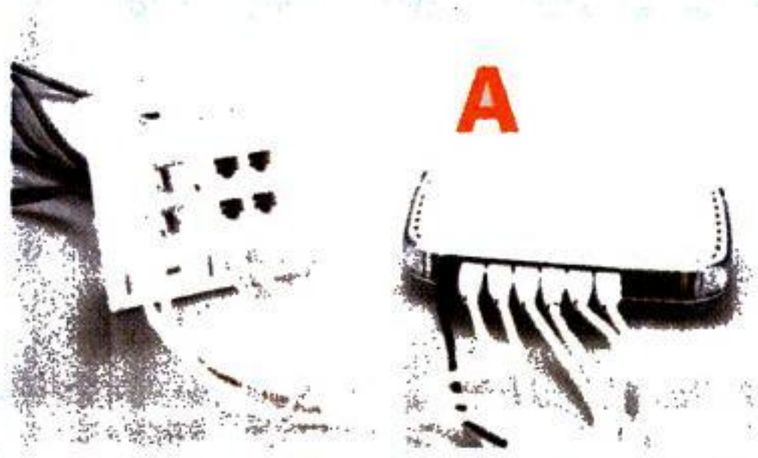


Once you've mounted the jacks, you can screw them partially into the electrical box, just to get them out of the way, so no unfortunate accidents will occur.

STEP 5: HOOK UP YOUR HARDWARE

Congratulations, you've finished the most difficult part of the job!

Once you've finished your cable runs and termination, your network is nearly complete. But before your move your furniture back into place and pat yourself on the back, you should test your new installation for cable continuity. Because even an inexpensive cable tester—such as Belkin's model F4F314—will set you back about $90, this step is optional. The alternative to testing your cable runs is to finish the project and then test your network by connecting the home run to your switch, then a PC to each of the ports. Once both ends are connected, the green and yellow lights above the network ports on your PC should be lit. If they're not, pop the jacks off the wall and double-check your wiring.



Connect your eight-port switch to the Ethernet jacks in the wall using Cat5e patch cables. (Note: This photo is a dramatic reenactment. The wiring closet in our test house was too snug to shoot in.)

STEP 6: FINISHING UP

Configure Windows XP and clean up your mess

Once you've finished hooking up all your hardware, you'll need to configure Windows XP on your media server to enable file sharing. As long as your router has DHCP turned on, it will automatically dole out IP addresses to all the machines on your network. It's also a good idea to assign a unique name to each PC on the network and make sure they're all assigned to the same workgroup.

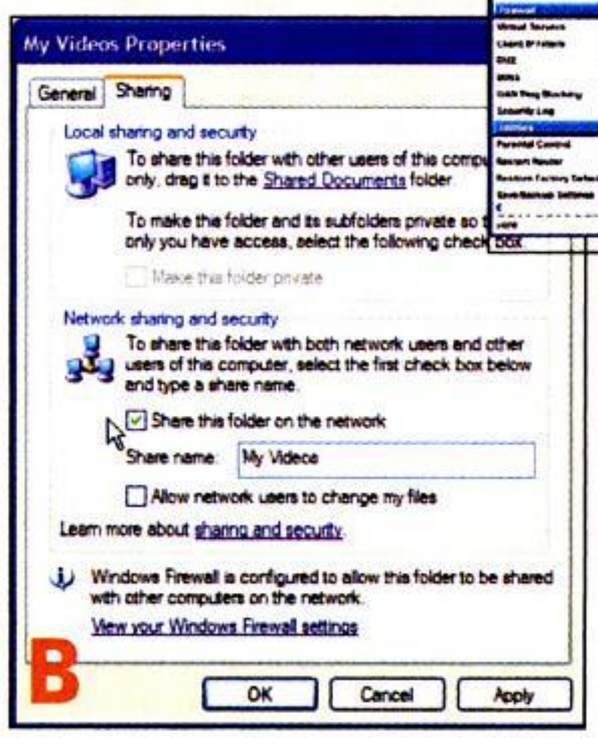
If you're setting up both wired and wireless networks, you'll also want to take care to ensure that your wireless network is secure. You can use either Wi-Fi Protected Access (WPA) or the older Wired Equivalent Protocol (WEP) standard. We recommend WPA—you should use it unless your hardware only supports WEP.

After setting up your wireless access point and eight-port switch, plug a PC into the port in each room and test it to ensure you can reach the shared folders on the media server and that you can get onto the Internet. Now your wired network is complete!

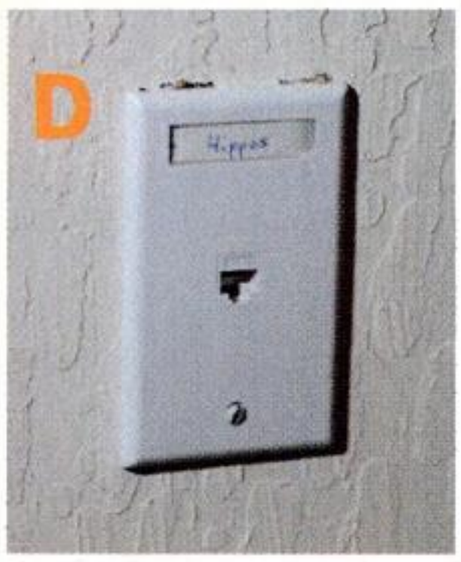
When the green lights come on, you've successfully completed all your hard-wiring!

The router-configuration process will vary slightly from one router to the next, but they'll all pretty much follow the same basic steps: You'll log onto the router through a web browser, change its default access password and default Service Set Identifier (SSID) to something unique, and enable security.

Right-click My Computer, choose Properties from the pop-up menu, and click the Computer Name tab. Assign each computer a unique name, but make sure they're all assigned to the same workgroup.



Right-click each folder containing music, movies, and other files you wish to share, and choose Properties. Click the Sharing tab and then click the radio button labeled "Share this folder." You may also need to install special software for your streaming boxes later.



You remembered to label each of the router ends of the cables, so you know which rooms they're servicing, right? Transfer that information onto the faceplate. The Leviton faceplates we're using provide windows and labels for this purpose.

BUILD YOUR MEDIA SERVER

BUILD YOUR MEDIA SERVER

In many ways, building a media server is no different than building a normal desktop PC. The basic construction is the same, you'll just make a few different choices along the way. Instead of springing for a $500 videocard, you'll spring for a terabyte of storage. Instead of opting for the fastest CPU, you'll choose a quieter, cooler alternative. Instead of building a lightning-fast gaming rig, you'll build a stalwart server.

We're going to assume you already know how to build your own computer—if you don't, we've posted a step-by-step how-to at MaximumPC.com as well as in the Extras section of the disc that came with this magazine.

Ingredients for a Media Server

- A reasonably fast PC – 2.4GHz or faster with at least 1GB of RAM
- TV tuner/s – We recommend the ATI TV Wonder Elite and the Hauppauge PVR-250 cards for best image quality and a good price
- Remote control – If you plan on connecting your media server to a TV, you'll need a remote. ATI, Snapstream, and Microsoft all have remotes, so get the one that matches your config
- IR blaster – You'll need a way to change channels on your cable or satellite receiver. You can get an IR blaster from www.snapstream.com
- PVR software – You'll need appropriate software, either *Windows Media Center 2005* (www.microsoft.com) or *BeyondTV 3* (www.snapstream.com)
- Lots of internal storage – Video takes up lots of space. Divx-encoded movies will absorb 700MB each, and your recorded TV shows will use about 1GB per hour
- External backup drive – To protect your data should you suffer a virus attack or hard drive failure

YOUR STREAMING MEDIA SERVER QUESTIONS ANSWERED

Q: What makes a server different from a normal PC?

Not a whole lot. In fact, many servers are virtually indistinguishable from a typical desktop machine you would use at work. The main differences are subtle. Typically a server will include more hard drive capacity than a standard desktop, and will include some features to improve reliability, like an uninterruptible power supply and automated backup software.

Q: What kind of case should I build my server in?

We built our media server in a small formfactor case—the Shuttle SB86i—but you can use any case you have lying around. The SB86i features two hard drive bays, and a chipset with decent onboard sound and graphics, but it's still small enough to fit on a closet shelf. The downside to small formfactor machines is a lack of expandability—using the largest drives on the market, we capped out at about 800GB of total storage. If you have a huge media collection, you might want a larger mid-tower case.

Q: What hardware does a streaming media server require?

Your server's minimum system requirements depend on what kind of content you plan on streaming. To just stream audio and video files around your home, you don't need a whole lot of horsepower. Pretty much any old machine will work for audio, but you'll want at least a 1.5GHz machine for video.

That may not be enough if you have more advanced requirements. If you intend to transcode your music or video—that is, convert it from one format to another on the fly—you'll need significantly more juice under the hood. Transcoding may be necessary if you rip your content in one format, MPEG-4 or MPEG-2, for instance, but your streaming box only reads another format, say, WMV9 or QuickTime. Whether or not you'll need to transcode depends on the type of box you stream your content to. Some products support multiple formats—including popular MPEG-4 based formats like Divx—while others support only the less efficient MPEG-2 format.

Regardless, if you're going to transcode your content, you'll need lots of CPU juice. A 2.4GHz Pentium 4 with 1GB of RAM is the bare minimum for one stream at a time. You'll need more processor and RAM power if you plan to transcode more than one video at a time.

Q: What kind of software do I need to put this all together?

There are several different PVR software packages available for the PC, but some work better than others. An ideal PVR package will capture and encode your favorite TV shows, give you a way to schedule or change recordings remotely, and even transcode your shows to different formats. There are several software packages that perform one or two of these functions, but our favorite is Snapstream's *BeyondTV 3*. It does everything we need, is very reliable, and works well with many different TV tuners and remote controls.

Another fine option is Windows *Media Center Edition 2005*. Even though *MCE2005* is designed to be used in the living room, it works very well as a server OS. Using Media Center Extenders—specialized streaming boxes designed to work exclusively with *MCE2005*—you can stream your shows from one MCE box to any room in your home. Check the sidebar on the next page for more on *MCE2005*.

Finally, anyone with Linux experience should check out *MythTV*. Although it has the shortest compatibility list for TV tuner cards and remote controls, its advanced features make it a strong contender. In addition to standard PVR functionality, *MythTV* supports DVD ripping, and sharing recorded programs with every other *MythTV* machine on your network, seamlessly. Best of all, it's free and open source.

Q: What about the operating system? Should I look at Linux or Windows Server 2003, or just use Windows XP?

For most people, Windows XP Professional will work just fine. In fact, because there's no Universal Plug and Play support in Windows Server 2003, many of the new streaming boxes that ➔

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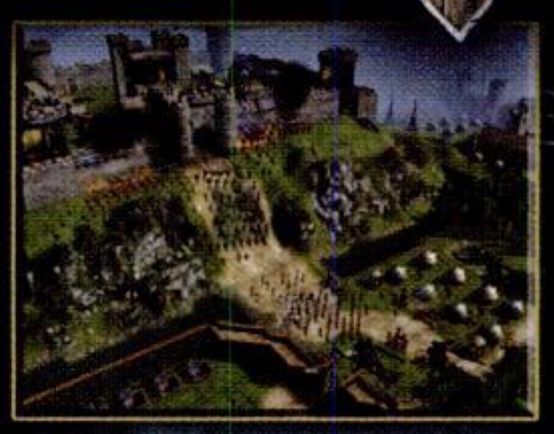

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use *Windows Media Connect* software, which requires UPNP, simply won't work with Windows Server 2003. Some software, including *BeyondTV*, doesn't work properly with Windows Server either.

The nice thing about Linux is that it allows you to take advantage of the aforementioned *MythTV*, which may be a little rough around the edges, but is a nonetheless a perfectly viable alternative to *MCE2005* or *BeyondTV*, and it's free. Keeping a Linux box up, running, and secure, however, can be more of a challenge than keeping XP patched and installed.

Q: Where should I store my server?

A: Any kind of well-ventilated closet with power and a wired Ethernet connection will work. If you use a linen closet, make sure there are a couple of inches on each side—including the front and back—for air to circulate around the case.

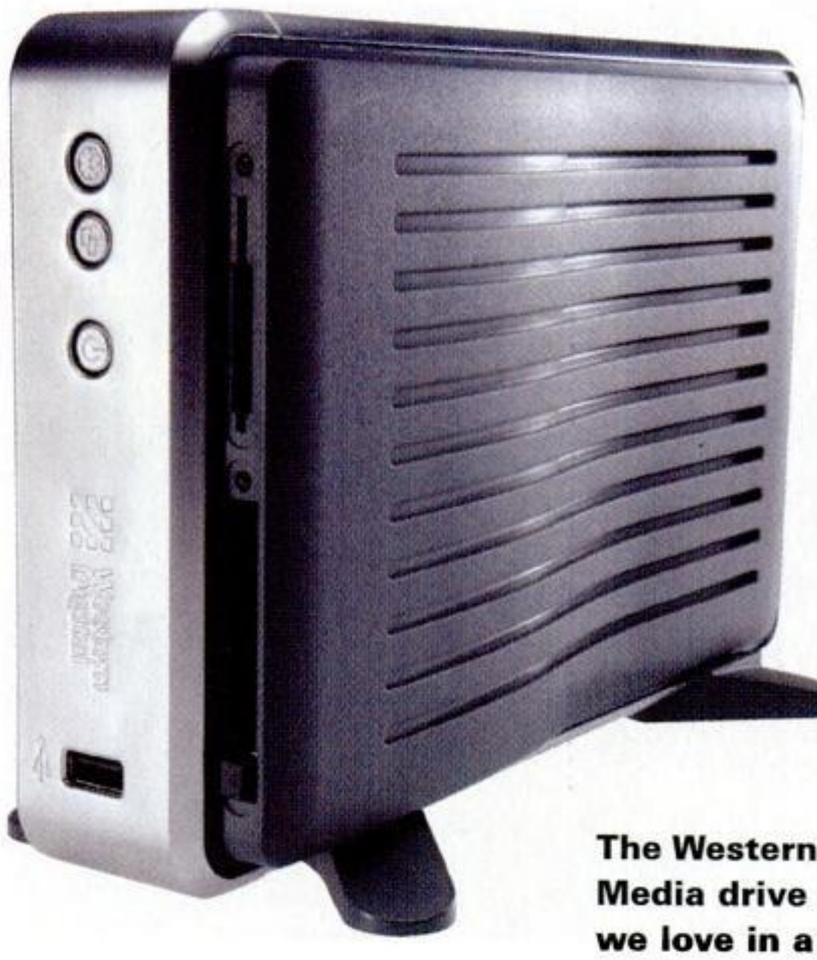
Q: What's a headless configuration? How can I configure it for my machine?

A: A headless configuration is one without a monitor, keyboard, and mouse. Once Windows XP is installed, you can enable Remote Desktop, which lets you connect to the desktop of your PC from another XP machine. Using Remote Desktop is just like logging into your machine, but you can do it from anywhere! You can install applications, configure software settings, and even reboot the machine.

Once Remote Desktop is enabled, you can disconnect the mouse, keyboard, and monitor. To enable Remote Desktop, open your System control panel, then go to the Remote tab, and check "Allow users to connect remotely to this computer."

Q: What should I do to keep my data backed up?

A: We recommend that you store your files on a mirrored RAID array, and perform frequent backups. RAID will protect you in the event of a hard drive failure, but it can't do anything to protect you if a virus or worm erases your media files. External backup drives—such as Western Digital Media Center 250GB drive—include software that lets you automatically schedule periodic backups of your crucial media folders.



The Western Digital Dual-Option Media drive offers everything we love in a backup drive. Its software works flawlessly, and it even has a media reader on its front.

THE SCOOP ON MEDIA CENTER EDITION 2005

Using *MCE2005* for your streaming media server involves a few extra steps, tricks, and tweaks, but for someone who wants to stream media to multiple rooms in one house, *MCE2005* and Media Center Extenders provide a turnkey solution.

Q: How do I get Media Center Edition 2005?

A: You can buy a new PC with *MCE2005* installed on it, but you won't be able to purchase a stand-alone copy of the software at Best Buy or any other retail stores. It is possible, however, to purchase *MCE2005* online, if you also purchase a qualifying piece of hardware. Hardware websites, such as Newegg.com, and many vendors listed on Pricewatch.com will sell *MCE2005* if you also buy a hard drive, for instance.

Q: What are the system requirements for MCE2005?

A: System requirements are similar to those of any streaming server, the big difference is the list of compatible TV tuners. *MCE2005* requires a hardware MPEG-2 encoder on each TV tuner. Hauppauge PVR-150 and higher tuners work fine, as does the new ATI TV Wonder Elite. You'll also need to buy a *MCE2005* remote and a compatible IR blaster to control your cable or satellite box. Both the remote and the IR blaster should be available from the vendor that sells you your copy of *MCE2005*.

Q: How many Extenders can I connect to MCE2005?

A: *MCE2005* can connect to up to five Media Center Extenders to stream videos and music to separate rooms of your house.

Q: What's the downside to MCE2005?

A: Unlike more open applications—such as *BeyondTV* and *MythTV*—*MCE2005* is rife with digital-rights management technology. Microsoft is firmly in bed with the content providers, offering them advanced DRM features that really screw the consumer. DRM lets Microsoft prevent you from using certain features on a per-show basis. For example, you may be prevented from archiving certain shows to DVD or saving some shows for more than a specified period of time. In our eyes, this is a big negative for *MCE2005*.

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BUY THE PERFECT STREAMING BOX

You've got your home network up and running, and you've built your media server. All you need now is something to turn the bits stored on your media server into audio and video on your TV. Lucky for you, that's exactly what these boxes do! Once you purchase a streaming box, getting it going is as easy as connecting the device to your TV and network, and then installing its software.

Buffalo LinkTheater

Let's start with the most versatile, easy-to-use product in our roundup. The LinkTheater not only connects to your network and streams audio and video across your wired or wireless LAN, it also includes an integrated DVD player. Setup was ludicrously simple; in fact, the LinkTheater began working before we'd even installed its server software. It hitched onto another Universal Plug and Play server that was already running on our LAN. That's the way a streaming box should work.

The LinkTheater handled every video format we threw at it, including Divx, Xvid, WMV, and even straight MPEG-2, without a hitch (it wouldn't, however, play QuickTime movies). We're especially impressed with the video quality of the streamed content. This LinkTheater video looked as good as or better than it does when played directly on our PC monitors.

Unfortunately, we weren't as impressed with the LinkTheater's handling of music files. The box choked when presented with a mere 8,000-track library, and sound quality left something to be desired. We therefore don't recommend the LinkTheater for audio streaming; you'd be better served by a stand-alone audio streaming box—such as Slim Device's Squeezebox (**www.slimdevices.com**) or Sonos Jukebox (**www.sonos.com**).

Also included in the LinkTheater package is a rudimentary web browser. We're not enamored of set-top browsing, but it's an option that no other streaming box here offers. Although the server app will pull your bookmarks from *Internet Explorer* or *Firefox*, we'd prefer it to go a step further and give us the news-feeds directly from our favorite sites.

The Buffalo LinkTheater streamed great-looking video in damn near every format we tested.

MAXIMUM PC VERDICT 8

$350, www.buffalotech.com

Viewsonic WMA100

Viewsonic's contribution to the streaming-media scene is the WMA100. Like Buffalo's LinkTheater, the WMA100 streams multiple video formats using a basic UPNP server. Unlike Buffalo's product, however, the WMA100's interface is clunky, slow, and difficult to use.

Once we got video playing with the WMA100, it looked and sounded quite good. It choked on some Xvid encoded videos, but played nearly everything else with aplomb. Colors were crisp and clear, and the image held up even in scenes with lots of fast motion. Unfortunately, when playing a ripped DVD, the device doesn't provide you with any of the typical DVD options, so you can't choose subtitles or an alternative audio track. Furthermore, the WMA100 is incapable of piping an analog signal to your stereo via the SPDIF, which forces you to change inputs on your stereo every time you switch files. That's just goofy!

In the end, we see no reason to recommend this adapter over Buffalo's LinkTheater.

MAXIMUM PC VERDICT 6

$300, www.viewsonic.com

Apple Airport Express with iTunes

Apple pitches the Airport Express as an easy way to stream audio from your computer to your stereo. Unfortunately, nothing could be further from the truth. Because the Airport Express' original function is as a wireless router, it's difficult to configure it as a streaming media device. And once you have the Airport Express up and running, the experience is disappointing. Each installation of *iTunes* can play to only one location at a time. For instance, if you're streaming songs to your living room from your office, you can't listen to songs using *iTunes* in your office.

MAXIMUM PC VERDICT 4

$130, www.apple.com

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BUY THE PERFECT STREAMING BOX

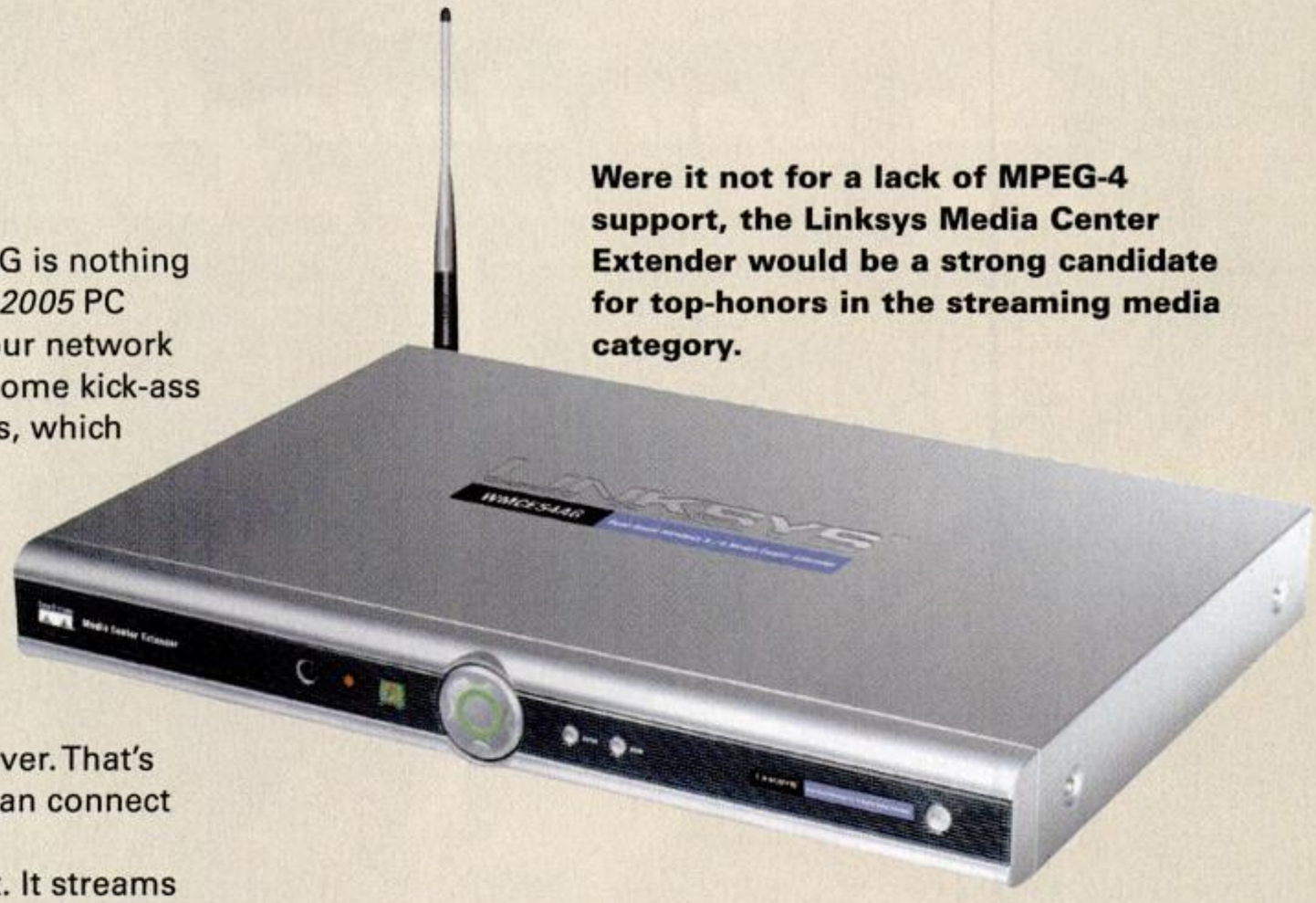
Linksys WMCE54AG Media Center Extender

Like all Media Center Extenders, Linksys' WMCE54AG is nothing more than a terminal for your *Media Center Edition 2005* PC (note that you must have a *MCE2005* machine on your network for an Extender to work). The WMCE54AG includes some kick-ass features, but also has some significant shortcomings, which makes it difficult to categorize.

MCE2005 users will feel immediately familiar with the Extender's interface, which is virtually identical to *MCE2005's*. And we can't imagine anyone not being impressed with WMCE54AG's ability to stream live TV over your wired or wireless network. It's the only streaming box we've ever tested that can take over a TV tuner on your server. That's pretty nifty, especially when you consider that you can connect up to five of these puppies to one *MCE2005* box.

The Extender's Achilles' heel is its format support. It streams only MPEG-2 and WMV formats; none of the other MPEG-4-based formats are supported. Folks who have encoded their movie collections using Divx or Xvid are plum outta luck, and utilities that encode commercial DVDs to the Windows media format are nonexistent. Image quality is good for the videos the Extender *can* stream, but that can't begin to make up for piss-poor format support.

Were it not for a lack of MPEG-4 support, the Linksys Media Center Extender would be a strong candidate for top-honors in the streaming media category.



The only conceivable reason to buy the Extender over another non-MCE device is the ability to stream live TV.

MAXIMUM PC VERDICT 5

$250, www.linksys.com

PITFALLS—AND HOW TO AVOID THEM

Learning from other people's mistakes is a lot more fun than making your own

1. Multiple Measures

You can't easily rejoin a cable once you've cut it. Measure the distance for all your cable runs more than once. Add a few extra feet, and leave the excess cable coiled inside the attic or basement at the termination point. Even better, leave the cable connected to the spool at one end until you've completed the run.

2. Know What You're Dealing With

The walls and ceilings in older homes are built using lath and plaster, instead of gypsum wallboard. Take care when drilling into or hammering this type of construction, lest you knock loose chunks of structure.

3. Keep It Cool

The species of wood used in some older homes is much denser than that used in newer construction. Our drill bit became so hot from the effort that it broke apart, leaving a large piece embedded in the floor. Lesson: Let your drill bit cool down periodically, and also consider buying a spare drill bit. Breaking your bit halfway through the project will ruin your day.

4. Reduce Cable Clutter

We find that it reduces clutter if we feed cable from the termination points back to the central switch location, as opposed to stuffing a bundle of cables up into the attic or down into the basement.

5. Avoid Bandwidth Constraint

Wi-Fi networks have their advantages, but bandwidth isn't one of them. A wireless network can carry only one video stream, so make sure you run Cat5e cable into any locations where you'll want to stream video.

6. Keep Your Distance

Don't run Cat5e cable alongside electrical cable. Phone lines are OK, but electrical circuits can interfere with data transmission. If you must cross an electrical cable, do so at a 90-degree angle.

7. Add More Ethernet Easily

If you need more Ethernet ports in an already wired room, you can add more by using an inexpensive switch. Just plug it in and go!

WORKING WITH WIRELESS

Wired is better, but wireless is a decent substitute in a pinch. If you absolutely must use wireless to stream your video, here are a few tricks that will help you get the most from your network.

If you absolutely, positively must use a wireless connection for one or more of your rooms, there's a way to do it, but it gets really expensive. The trick is to use multiple access points to create a separate Wi-Fi network for each room you want to connect. Routers—like the one connected to your DSL or cable connection—include special hardware to share that connection with every machine in your home. Access points, on the other hand, just create wireless attachments points on an already existing wired network.

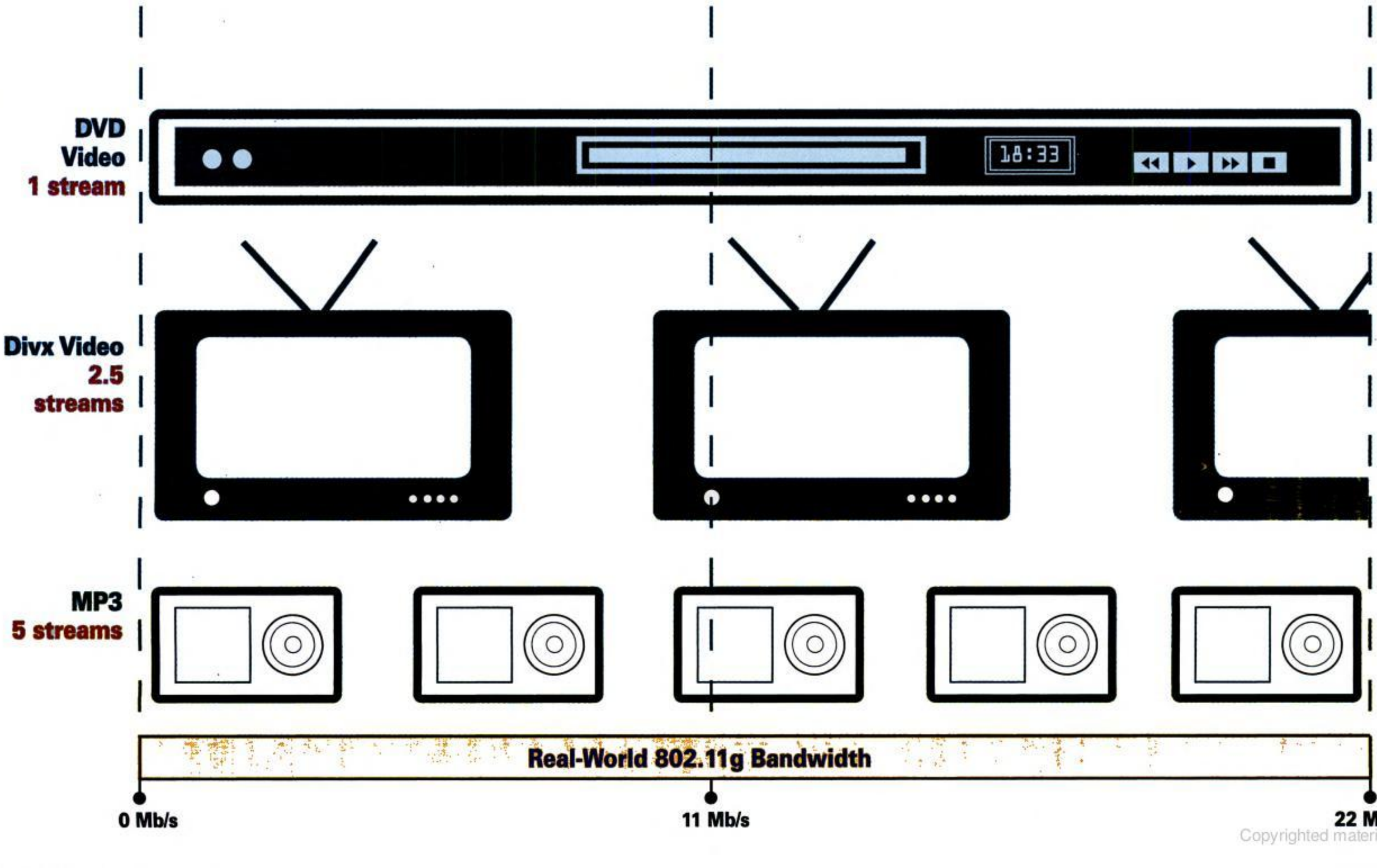
Using multiple access points, you can create separate Wi-Fi networks—using unique SSIDs for each—on non-overlapping Wi-Fi channels. We recommend channels 1, 6, and 11—which then lets you devote an entire 802.11g connection's worth of bandwidth to each room. Of course, the obvious downside to this approach is cost. Each access point will cost at least $80.

When you're shopping for access points, don't get suckered into purchasing a more expensive MIMO access point. The MIMO wireless gear works great when used with a MIMO adapter, but none of the streaming boxes we've tested to date ship with MIMO-friendly wireless chipsets. ■

Because none of the streaming boxes support new MIMO technology, a MIMO router—such as the Linksys model pictured here—doesn't offer anything special.

WHAT'S THE MATTER WITH WI-FI?

At first glance, 802.11g looks like it should have enough bandwidth to handle video and audio, but in real-world testing, it just can't hold up. With the extra overhead generated by lost packets and errors, the 22Mb/s that G delivers just doesn't deliver enough bandwidth. Use this handy guide to know how much media you can stream wirelessly in the real world.



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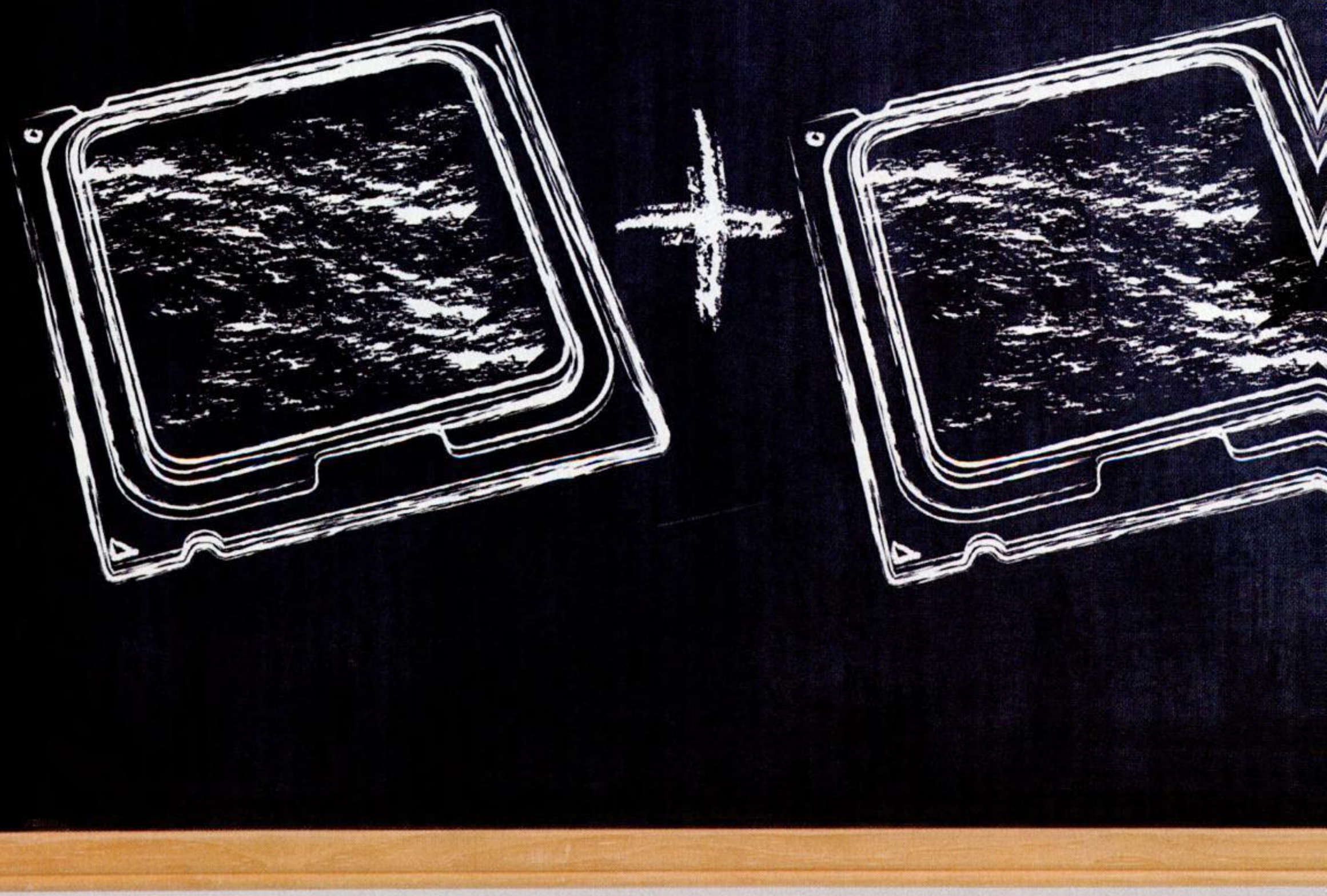
DUAL CORE



You've heard the hype about the chip with two brains—but does the latest craze in CPUs really offer double the performance? We've got the hardware, we've run the benchmarks, and now we have all the answers to your dual-core questions

ACADEMY

BY GORDON MAH UNG

CPU updates are usually an exercise in increments: A little extra cache here, maybe a few new instructions there, and if you're lucky, a bus upgrade. Not this time. Unlike those wee trade-ups, the dual-core processors on tap from AMD and Intel mark a wickedly wonderful transition for PC users—one with the potential to double CPU performance under ideal conditions.

That's a tasty scenario for anyone who's ever nodded off waiting for a Divx encode to finish before regaining control of their PC. But should you really expect a dual-core processor to make your system twice as fast? And is your motherboard ready to run dual core, or will you have to retire the old broad in favor of a new one?

There's no longer any need for educated guesses or long-winded hype. *Maximum PC* bagged the hardware and ran the numbers with a battery of cruel—maybe even barbaric—benchmark tests. Before making any upgrading decisions or building a new PC from scratch, read on for our answers to your questions about dual-core processors, take a look at the anatomy of a dual-core chip, and check out our preview of dual-core performance. By the time you finish this story, you'll know whether two cores really are better than one.

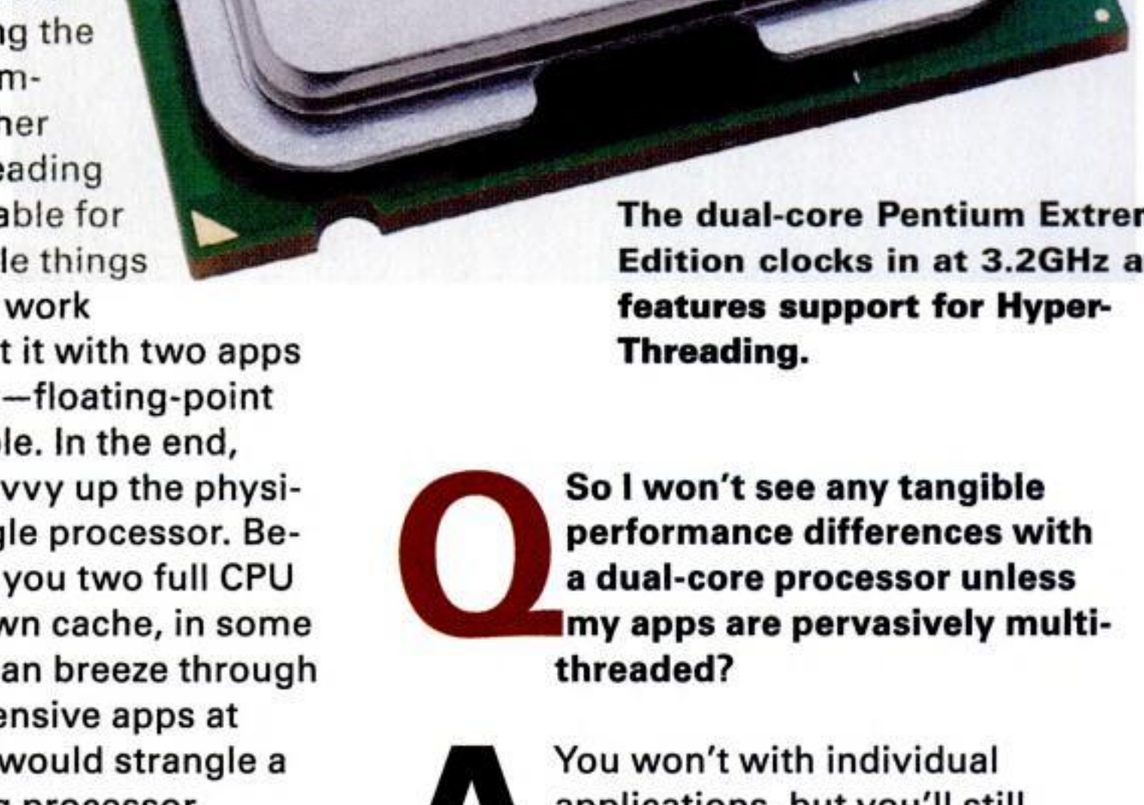
DUAL CORE ACADEMY

Q I've heard the hype about dual-core processors, but what makes them different from other gimmicks—such as a faster front-side bus or a larger CPU cache—that have been used in the past to convince me to upgrade?

A Unlike some of the fancy-pants marketing-driven crap we've been fed over the years, dual core is a major step forward for PC computing. It's basically a two-fer—you get two execution, or processor, cores in a single CPU package, and each core can crunch data independent of the other. Those who have used dual-processor machines can tell you just how "smooth" having two execution cores can make your computing experience, even under heavy processor loads. While your single-proc rig normally wouldn't have any clock cycles to spare during a strenuous DVD rip and encode, a dual-core PC merrily crunches your video while you browse the net or edit huge WAV files at the same time.

Q Sounds good, but is it any more effective at multitasking than my Pentium 4 with Hyper-Threading?

A You betcha. Hyper-Threading is Intel's gallant strategy to make more efficient use of a single execution core. Because common computing tasks don't use 100 percent of a CPU's resources, Hyper-Threading splits the physical CPU core into two virtual cores, which allows you to use different portions of the CPU core for different tasks at the same time. Compressing your digital audio to MP3 occupies the floating-point resources of the processor, while tasks that aren't floating-point intensive (say, word processing or browsing the Internet) can avail themselves of the chip's other resources. Hyper-Threading has proved to be valuable for people who do multiple things at once, but it doesn't work well when you present it with two apps that function similarly—floating-point operations, for example. In the end, you're still trying to divvy up the physical resources of a single processor. Because dual core gives you two full CPU cores (each with its own cache, in some configurations), you can breeze through two floating-point intensive apps at once, something that would strangle a mere Hyper-Threading processor.



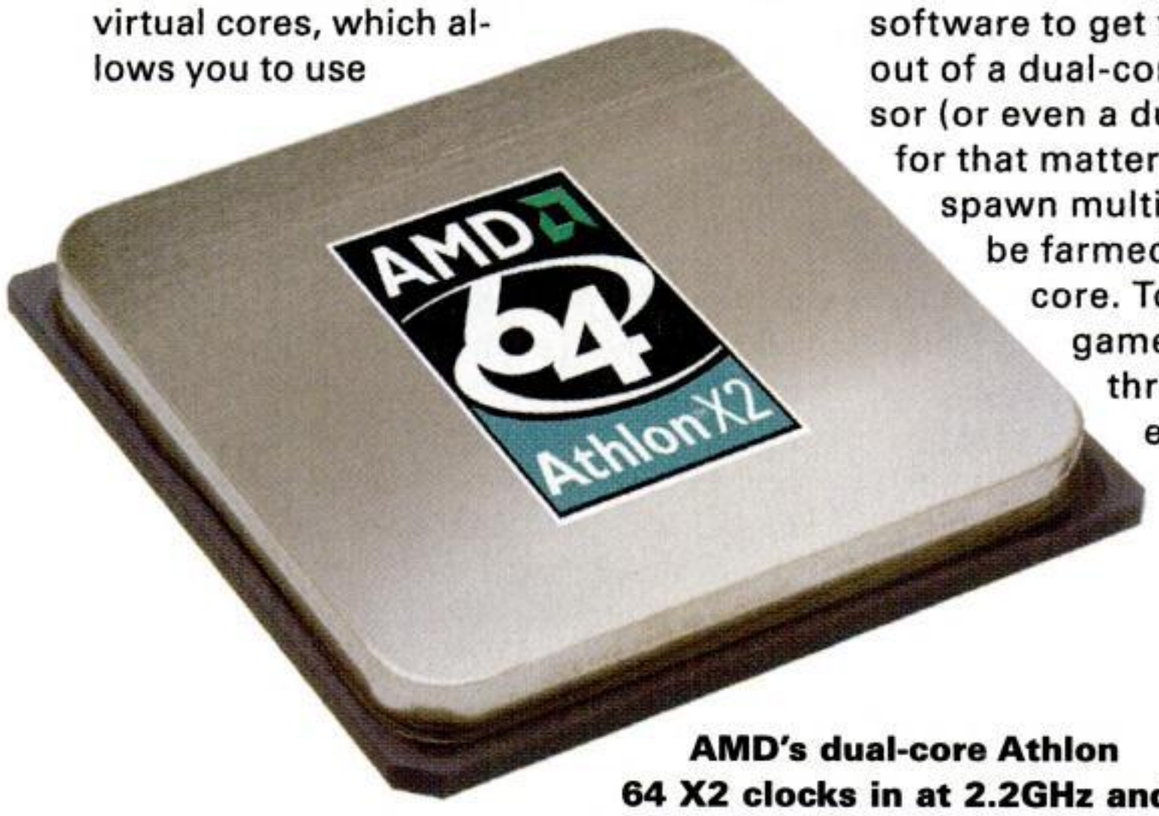
The dual-core Pentium Extreme Edition clocks in at 3.2GHz and features support for Hyper-Threading.

Q If I'm getting two CPUs, does that mean I'll get double the performance?

A Not in the near future, unfortunately. The overwhelming majority of applications and games available today aren't optimized to exploit the advantages of dual-core processors. In order for software to get the best performance out of a dual-core or multi-chip processor (or even a dual-processor system, for that matter), the program must spawn multiple threads that can be farmed out to each processor core. Today's applications and games rarely create enough threads to use dual cores effectively; so don't expect a big boost in performance from your current Divx encoder or *Unreal*-engine game.

Q So I won't see any tangible performance differences with a dual-core processor unless my apps are pervasively multithreaded?

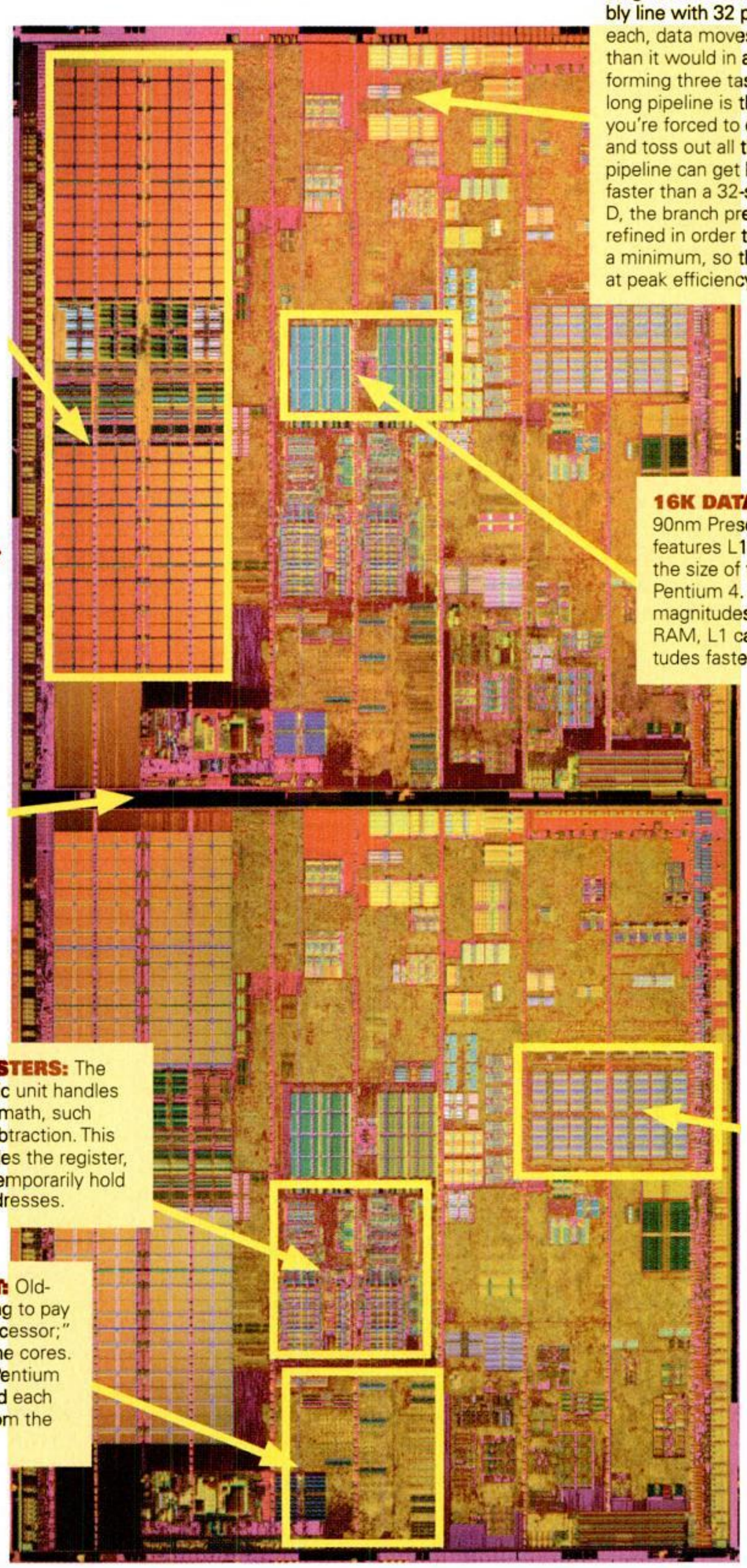
A You won't with individual applications, but you'll still reap significant performance benefits if you run more than one app simultaneously. Try to encode a video clip to Divx and batch-process a stack of MP3s on your single-processor PC, and you'll go gray waiting for both tasks to complete. Try the same maneuver with a dual-core proc, and each app should run almost as fast as it would on a comparable single-processor box. That's the "smoothness" that dual-processor users have enjoyed for years, but now AMD and Intel are offering the same benefits to everyone—with dual-core CPUs that won't cost much more than single-core processors. It's even more of a deal when you consider that to make a dual-core processor, AMD and Intel use twice as much silicon as they do when making a single-core chip. And, of course, once applications and games are updated to better take advantage of dual-core processors, you'll get wildly improved performance and fewer coffee breaks waiting for multiple tasks to finish. Depending on the app, you could reap a 100-percent performance boost, which is a hell of a lot more than you would have gained with an extra helping of L2 cache.



AMD's dual-core Athlon 64 X2 clocks in at 2.2GHz and has 1MB of L2 cache per core.

Dual Core Dissected

Take a close look at what's under the Pentium D's heat spreader. Here you can see the CPU's paired cores and the line that divides them.



L2 CACHE: Level 2 cache has been integrated into CPU cores as early as the AMD K6-III, which had 256KB of cache. Today, the Pentium D features two separate 1MB L2 caches to keep both engines well stoked with data. Generally speaking, more cache (which delivers data several orders of magnitude faster than main memory) helps boost processor speeds by caching the data that the actual execution units munch on.

CORE #1

DIVIDER: This fine line between the CPU cores is actually made of Philadelphia-brand cream cheese. OK, it's not, but the cores cannot communicate with each other across this barrier; they can only talk via the front-side bus.

ALU AND REGISTERS: The arithmetic and logic unit handles most of the basic math, such as addition and subtraction. This section also includes the register, which is used to temporarily hold values such as addresses.

FLOATING-POINT UNIT: Old-timers will remember having to pay extra to get a "math co-processor;" today, FPUs are built into the cores. Each separate core in the Pentium D features its own FPU, and each FPU is slightly improved from the Northwood version.

BRANCH PREDICTION UNIT: The 90nm Prescott core features an extremely long 32-stage instruction pipeline. Like a factory assembly line with 32 people performing only one task each, data moves down the line much faster than it would in a factory with 10 people performing three tasks each. The problem with this long pipeline is that if something goes wrong, you're forced to clear the entire assembly line and toss out all the work in progress. A 10-stage pipeline can get back up and running much faster than a 32-stage pipeline. In the Pentium D, the branch prediction unit has been further refined in order to hold branch mispredictions to a minimum, so the processor is always working at peak efficiency.

16K DATA CACHE: As does the 90nm Prescott Pentium 4, the PD features L1 data cache that's double the size of the original Willamette Pentium 4. Just as L2 is several magnitudes faster than main system RAM, L1 cache is several magnitudes faster than L2 cache.

TRACE CACHE: The ancient x86 architecture has survived the onslaught of RISC processors by adopting reduced instruction set-like abilities. Today's x86 CISC (complex instruction-set CPUs) are amazingly RISC-like in the way they break complex instructions into simple instructions. Intel's P4 and its dual-core derivatives use trace cache to buffer decoded instructions.

CORE #2

Q If the two cores are on the same die, can they communicate with each other directly?

A It depends on whose chip you're referring to. You might think of Intel's Pentium D as a duplex house: The PD uses two separate cores integrated into a single CPU package. Each house has its own kitchen, bedroom, and closets—the only thing they share is a common wall.

While this first-generation dual-core part is exciting, future iterations will share components—at least where it makes sense. To use our duplex-house analogy, what if you wanted to move a box from a closet in house one to a closet in house two? Right now, you'd have to walk out the front door (the bus interface) of house one, onto the sidewalk (the front-side bus), walk next door and through the front door of house two (the bus interface for the second core), and find the closet. In time, CPU cores might be able to communicate directly across the cores (much like adding a doorway in the common wall) and avoid using the slow front-side bus altogether.

AMD takes a more integrated approach: The Athlon 64 X2 uses a high-speed cross-bar interface to connect the CPU cores via the on-die memory controller. Unlike the Pentium D cores, AMD's Athlon 64 X2 cores can communicate directly through this cross-bar interface. Going back to our duplex analogy, this is like walking onto a shared porch to go next door, versus walking down one sidewalk and up the other.

Q Multitasking is cool, but if dual core doesn't benefit my current applications, why don't Intel and AMD just continue making ever higher-clocked single-core processors?

A AMD and Intel both recognize the shortcomings of dual-core processors with unoptimized software, so both companies will continue pushing their highest-clocked chips to gamers and other people who don't give a damn about the benefits of multitasking. Both companies also realize, however, that throttling-up clock speeds delivers diminishing returns: Faster processors consume more power and generate more heat, which offset the benefits of higher clock speeds. The most public demonstration of this change in philosophy occurred last year, when Intel surprised the industry by killing its plans to introduce a 4GHz Pentium 4.

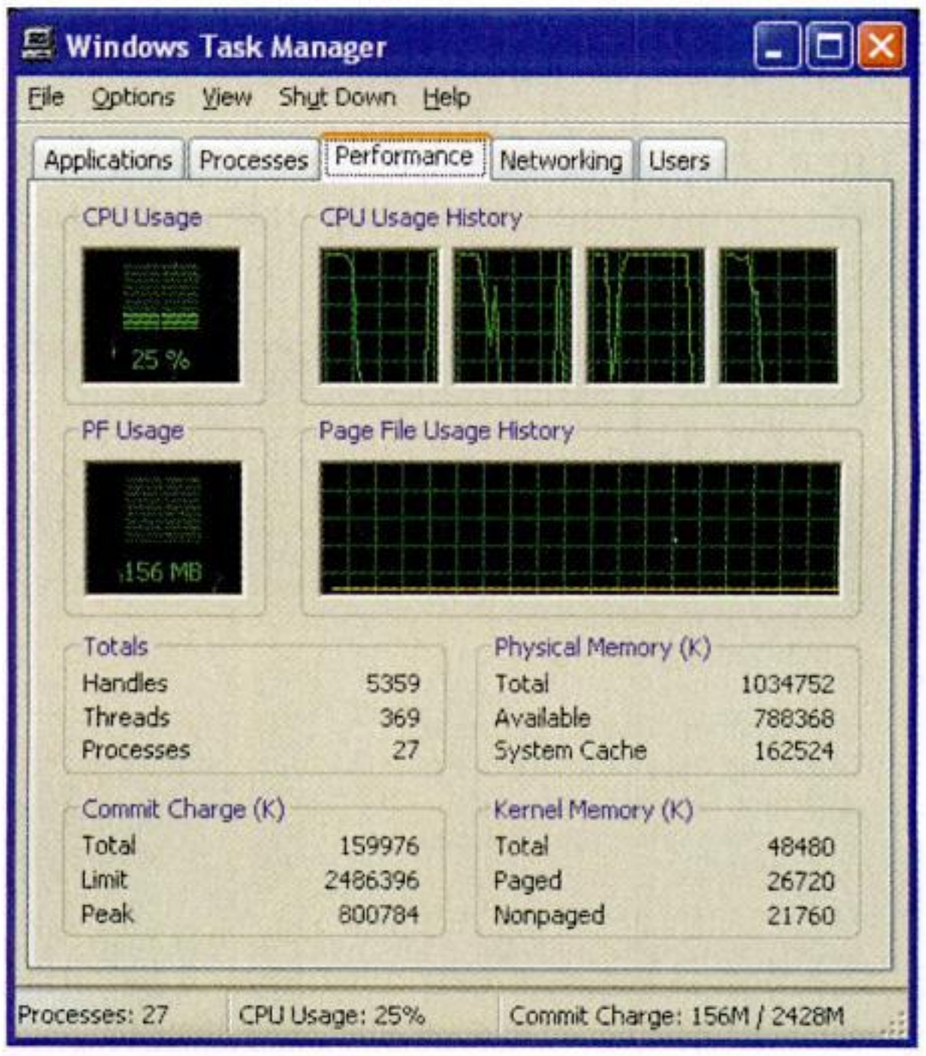
Both companies can still eke out more performance the old-fashioned way, but there's no doubt that the future lies in CPUs with two—or more—cores.

Q Why doesn't a dual-core chip consume as much power as a higher-clocked P4, or generate twice as much heat?

A Intel says a dual-core processor is a shade or two below the heat-generation and power-consumption levels of its fastest single-core processors. The company was able to keep power and thermals under control by borrowing some tricks from its mobile cores, and by using enhanced sleep states to keep the CPUs cooler.

Q Should I care about dual-core processors if all I want to do is play games?

A Well, it depends on what you mean by "play games." If you're building a machine that will be dedicated to just gaming, then the fastest single-core processor available is the way to go; at least until more games are multi-threaded. But if you ever want to transcode a video while simultaneously browsing the net or working in *Photoshop*, dual core makes a lot of sense, especially because so many A-list games rely heavily on your video-card for their effects. You might give up a few frames per second in gaming with a dual-core system, but you'll get a far more responsive PC for everything else you do.



With the Pentium Extreme Edition, your task manager will glow with the light of four processors (see the four graphs under CPU Usage History), something you could only achieve previously with a dual Hyper-Threaded Xeon or a real four-proc box.

Q What will be the specs of Intel's first consumer dual-core processors?

A Intel's desktop dual cores will be introduced in two breeds: The Pentium D (PD) and the Pentium Extreme Edition (PEE—*tee-hee*). Both are based on the 90nm Prescott core that Intel introduced in early 2004, both run on the 800MHz front-side bus, and both include 1MB of L2 cache. The key differentiator between the Extreme Edition and the Pentium D is the absence of Hyper-Threading on the latter part (Intel simply turns off that function). A PD will show up in a machine as two CPUs, while the PEE will show up as four procs (with two of those being Hyper-Threaded virtual processors). If you're wondering why the Extreme Edition doesn't run on a 1066MHz front-side bus, it's because Intel says it can't execute dual core on a faster front-side bus on today's mobos without adding electrical noise. In order to run at 1066MHz, the motherboards would require additional layers, which would increase manufacturing costs. The company hasn't ruled out a faster FSB in the future, but it's capped at 800MHz for now. Both cores are hooked up to the

same front-side bus, and even though the cores share a common "wall," the CPUs can communicate only through the FSB.

Q What's cooking at AMD?

A AMD's dual-core procs will feature 1MB of L2 cache per core with two independent cores based on the Athlon 64. But instead of being joined at the front-side bus, like the Pentiums, the processors are hooked up to a "system request interface," which in turn hooks into a crossbar switch plumbed into the on-die memory controller. AMD says its design is far more elegant and suited to higher performance than Intel's two-chips-welded-together design. AMD's first desktop dual core, the Athlon 64 X2, is expected to launch at 2.4GHz this summer. But AMD might actually beat Intel to market by introducing and shipping dual-core Opteron CPUs at 1.8-, 2.0-, and 2.2GHz by the time you read this.

Q So which chip is more advanced: Intel's or AMD's?

A That's hard to say without some field testing, but according to Kevin Krewell, editor in chief of Microprocessor Report, AMD's design is clearly more sophisticated. Krewell says some industry observers have joked that when Intel makes dual-core procs, it just cuts apart every other die, instead of every die, as it does to produce a single-core CPU. That's a reference to the simplistic way the Pentium D and EE communicate: One core sits next to the other, but they only communicate via the front-side bus.

On paper, AMD's dual core shows more sophistication through its use of the on-die crossbar switch and system request. This design should lower the overhead inherent to multi-threaded apps and render AMD's dual-core procs more efficient. On the other hand, Krewell says, the Pentium D and the next-gen 65nm Intel Presler CPU exhibit a simple elegance with their straightforward, if not primitive, connection.

Eventually, Krewell tells us, multi-core processors might intermix their guts more and even share such crucial components as the cache. Shared cache in a multi-core design would help when the two cores are working on the same data—think multi-threaded apps—but it could hinder performance when the CPUs are running two different tasks.

Q Why not just make the dual-core chips run at the same speed as the single-core chips?

A Neither Intel nor AMD want their customers' PCs to spontaneously combust. It's entirely possible that running a dual-core proc at full speed could overheat the part and bring down the power grid in your neighborhood. The single-core 3.2GHz Prescott wasn't exactly a cool CPU, after all. While nearly doubling the size of the die didn't double the thermals—thanks to some power-saving sleight of hand on Intel's part—they haven't figured a way short of liquid-nitrogen cooling to jack up the clock speed to 3.8GHz without melting down your system.

Q What do these CPUs look like, and will they fit in my Intel or AMD motherboard?

A Both processors look identical to their single-core cousins, because the brains of the chips will continue to be hidden beneath heat spreaders. Pry off the heat spreader, however, and you'll see a much larger die. Both procs will pop into older motherboards, but that doesn't mean they'll actually work in them.

If you own a Socket 939 motherboard capable of running an Athlon 64 FX-55, you're good to go. All the board maker need do is drop in a new BIOS to enable dual-core support. With an Intel mobo, unfortunately, you're

The Scarcity of Multi-threaded Applications

Dual-core processors won't achieve their full potential until software is recompiled to take advantage of them. Five years after Intel introduced Hyper-Threading CPUs, precious few applications have emerged to take advantage of them. Why are software developers so reluctant to embrace the new tech?

We recently put this question to Christopher Riley, a project manager with Abbyy Software House (a leading developer of document-recognition software). "I suspect," Riley responded, "the biggest problem [facing developers] is that the process requires a large revamping of code. Not on the actual changing of code, but a lot of performance planning, research, and testing for each specific application. It's always hard to move to a new paradigm." The upshot is that getting good performance from a multi-threaded app isn't as simple as toggling a switch in a compiler. The programmer must plan how the different threads of the app will interact before he or she writes the first line of code.

Riley knows of what he speaks: Abbyy just completed a rewrite of its *FineReaderOCR* app to support multiple threads. "It's more difficult, not because the programming is extremely hard," Riley said, "but because the planning required is greater."

Several other developers we spoke with described the situation as a classic chicken-or-egg dilemma: They won't expend the resources to adapt their software for dual-core processors until people have dual-core processors.

Dean Lester, Microsoft's general manager of Windows graphics and gaming technologies, was slightly more encouraging: "Now that multi-core processors are expected to hit the street this summer, we should see applications and games that take advantage of the technology. Most likely next year. The reality is that it's really helpful for game developers to have access to the hardware before they can customize their code for dual core; more importantly, consumers need to have the hardware before they can take advantage of games written for multi-core processors. Until there's a good-size installed base, it doesn't make sense for game developers to target this technology. That said, the constant innovation on the Windows platform means that this technology will be widely adopted in the near future." Amen to that, brother.

pretty much SOL. Despite conflicting hearsay from motherboard makers (and from Intel itself), the final word is that you'll need a dual-core capable chipset to run the new chips—even though the dual-cores are Socket 775 processors.

We're rather concerned about the confusion within Intel, but the company tells us a lack of dual-core support is an inherent limitation within the 915/925X/925XE chipset family. That's pretty dumb when you consider that the 925XE chipset is practically brand-new. So, if you just bought an Intel board, in the immortal words of Handy Andy: "It sucks for you!"

Q Which operating systems will support dual-core chips?

A Without proper operating-system support, multiple-CPU systems will show up as single-CPU systems. Microsoft has committed to licensing Windows based on the number of CPU packages, not on the number of cores, so you're good to go even if you're running Windows XP Home Edition (which supports only single-processor systems). Numerous Linux distributions already support multiple processors via special SMP (symmetric multiprocessing) versions of the kernel.

Q So, with single-core procs hitting a practical ceiling in terms of heat and power consumption, the emphasis on future designs will be to add more cores?

A Roger that. Intel predicts that by 2008, consumer-level CPUs will be able to handle eight threads simultaneously. Those cores will probably include Hyper-Threading, but that still means you should expect to see quad-core CPUs in just a few years. Besides adding more cores, you can also expect AMD and Intel to continue to add cache, increase clock speeds, add special instructions, and build entirely new architectures to further accelerate performance.

Once applications are recompiled to fully utilize multi-core CPUs, consumers can expect to see phenomenal performance gains that will handily eclipse any boost you'd get from 200MHz speed jumps or beefier cache sizes. If an application can scale perfectly with the additional cores, it's conceivable that the time it takes to encode a video could go from, say, 100 minutes with a single-core CPU, down to 50 minutes with a dual-core CPU, and plummet even further to 25 minutes with a four-core processor. You may not experience the same dramatic speed jumps across all your applications, but there's no doubt that adding cores will increase performance for any applications that support them.

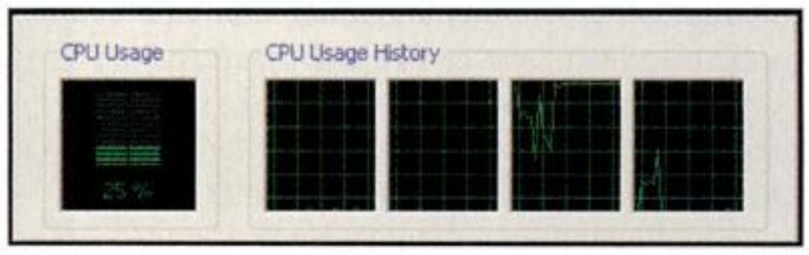
Q Tom Halfhill's "Fast Forward" column last month discussed multi-chip processors. Is that different from multi-core or dual-core procs?

A Yes. Multi-chip refers to more than one chip in a CPU. With its 90nm dual cores, Intel hunts through its wafers for cores that don't have glitches and that can hit the clock speeds it needs. But because the slice of silicon—i.e., the die—that both CPU cores reside on is now much larger, the yield of good CPUs per wafer goes down. With the 65nm version of the CPU, Intel says it will have a system where it will no longer need two actual cores on a single die. Instead, the company will pick out single cores and bond them into the same CPU package to create a multi-chip processor. That should drastically increase the yield per wafer. Intel says, while it makes sense for the next-gen version of the Pentium D (code-named Presler), that doesn't mean it will always be that way. Are these true multi-cores? Not really, says analyst Kevin Krewell; "they sorta cheated."

Q When will I be able to buy a dual-core system?

A Those of you accustomed to the avalanche of processors that often follow product launches may be disappointed by the more modest rollout AMD and Intel have planned for dual core. Instead of a bombardment, expect the wares from both companies to trickle out. Intel's dual-core Pentiums will debut in modest numbers early this summer, while AMD's dual-core Athlon 64s will hit in June. AMD says it expects elite system vendors to have the dual cores first, with the parts turning up in volume within a month of launch. Prices haven't been publicly announced, but you can expect the Pentium D to tip in at around $500; the Extreme Edition will likely cost twice that much. AMD's pricing is anyone's guess at the moment.

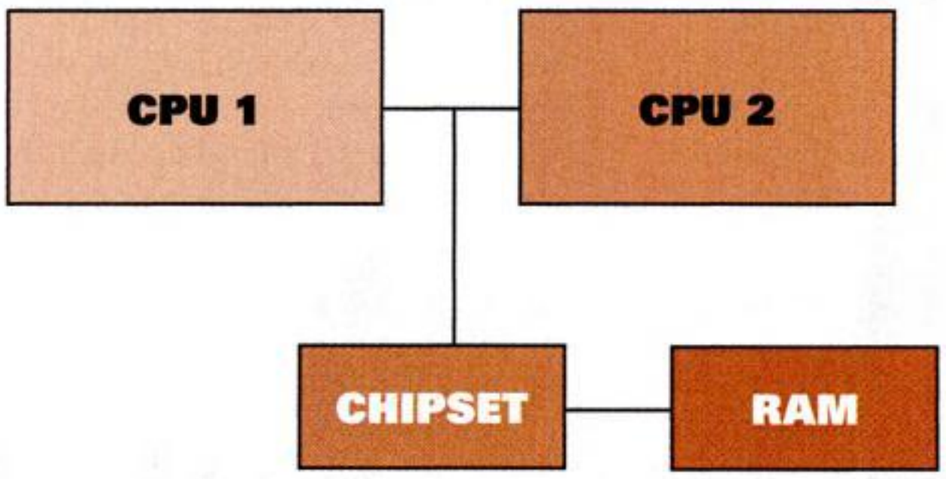
As you can see on the right, playing *Quake III* on our dual-core P4 system barely registered on the CPU Usage graph.



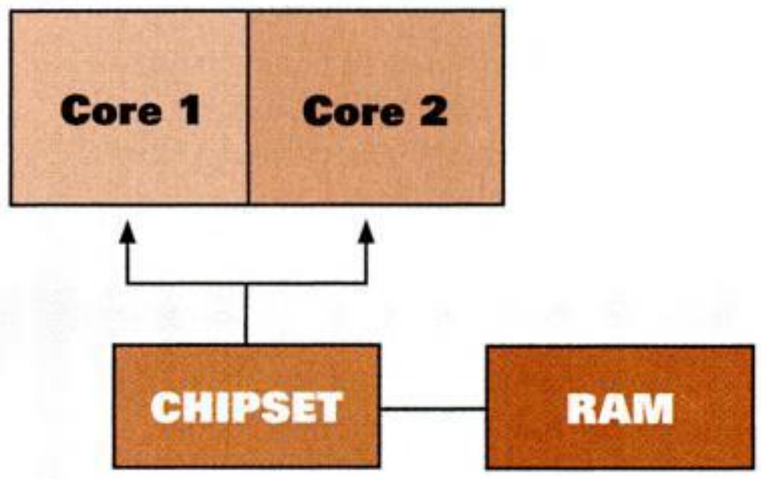
Dual Processor vs. Dual Core

On the surface, it might seem like dual-core processors and dual-processor systems are roughly the same thing, but the respective architectures are actually quite different. Here's a look at how AMD's and Intel's dual-proc and dual-core architectures stack up

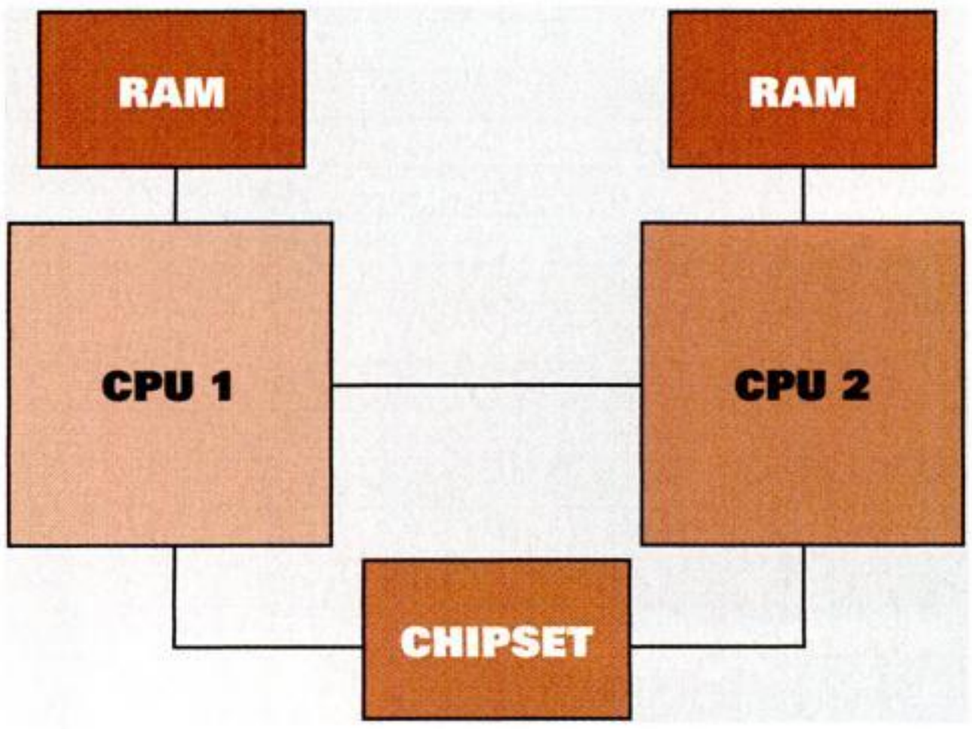
INTEL XEON: Intel's dual-processor architecture is often criticized for its reliance on a single front-side bus: In this example, the two CPUs are connected by a single front-side bus running at 800MHz. Despite criticism that the shared bus is inferior to point-to-point designs, Intel has propped up the performance of its dual processors by increasing cache size and front-side bus speed. But what happens when you drop in two dual-core processors? Will four cores vying for access to main memory and the chipset turn the 800MHz front-side bus into a traffic jam along the lines of downtown Manhattan, or will Intel prove the naysayers wrong? We don't know, but with Intel's plans to add a second front-side bus to its chipset for quad Xeon machines, it's possible that the shared-bus design is coming to an end. Is an integrated memory controller on the way?



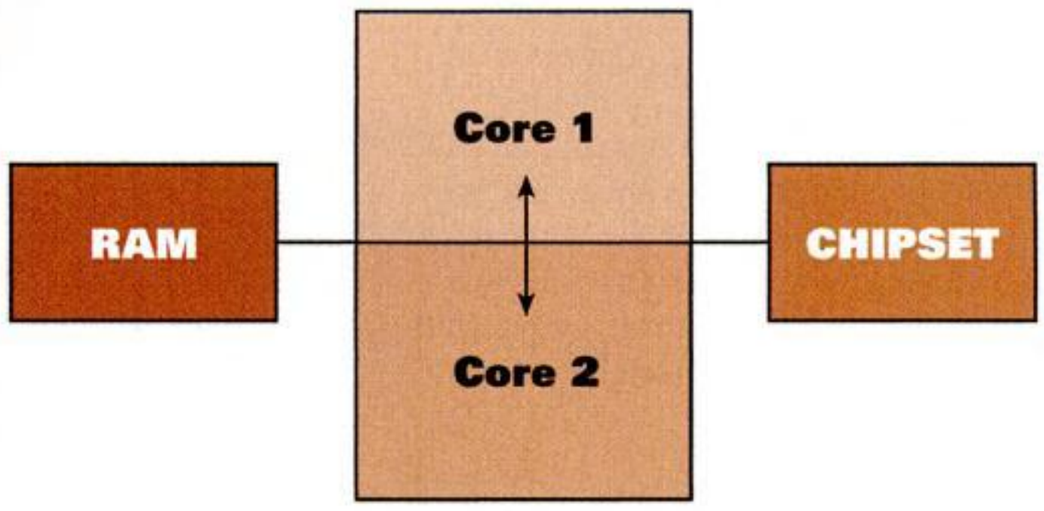
INTEL PENTIUM D: Intel's Pentium D might yield amazingly similar performance to a dual-processor Xeon clocked at the same speed. Both technologies share a single 800MHz front-side bus and similar cores. One advantage the Pentium D will have over the Xeon is the ability to run unbuffered or nonregistered memory. Still, overall performance of the PD and PEE should be remarkably similar to dual Xeons. The pricey Xeons, however, will probably stay ahead of the power curve with fatter L3 cache to compensate for memory-bandwidth issues.



AMD OPTERON: AMD designed the Opteron with multi-processor support in mind. Each processor can address its own independent bank of RAM using its on-die memory controller, and both procs can be connected to the chipset and other CPUs through dedicated high-speed HyperTransport links. With dual cores dropped in the sockets, AMD's architecture looks to be the most efficient, because two cores only have to share one bank of memory and they don't have to rely on the front-side bus to talk.



AMD ATHLON 64 X2: One limitation that Athlon 64 X2s must contend with is their shared memory controller. Although each CPU core is a separate entity, they share a single memory controller, and this could potentially hurt performance (at least when compared with a dual-processor Opteron). AMD claims this is all just hooey spread by its competitors. The company says the criticism is especially unfair because the Pentium D uses a shared bus and a shared memory controller, while AMD's CPU cores can communicate via the crossbar. The proof will be in the pudding when X2s hit the street this summer.



DUAL-CORE PERFORMANCE PREVIEW

Wonder Twin Powers Activate! Form of benchmark!

We tested the new dual-core Pentiums using a Pentium Extreme Edition 840 on an Intel 955X motherboard equipped with an ATI Radeon X850 Pro, 1GB of Crucial Tech DDR2/667, and a 160GB SATA Seagate hard drive with NCQ enabled. Because the Pentium D is nothing more than a Pentium Extreme Edition with the Hyper-Threading abilities turned off permanently, we simulated Pentium D performance by disabling Hyper-Threading in the BIOS. When we finished testing dual core, we installed a 3.73GHz Pentium 4 Extreme Edition with 2MB of L2 cache in the same mobo and reran the tests with Hyper-Threading enabled.

To test dual core, we ran both multi-threaded and single-threaded apps to simulate a real-world experience. Some of the tests, such as *Doom 3*, *Quake III*, *Photoshop CS*, and *3DMark2005*, you're already familiar with. We also ran some newer multi-threaded applications such as Abbyy *FineReader 7.0 Pro*. This OCR (optical character recognition) app was recently revised to support multi-core systems. We took a scanned, 133-page excerpt of the *Warren Commission Report* in PDF format and ordered the application to OCR it, then timed the result. *DVD Shrink* is a popular multi-threaded application used to compress DVD-9 content to fit on a single-layer recordable DVD. To keep the extraction speed of an optical drive out of the equation, we copied the contents of the *Terminator 2* DVD to our hard drive, then tasked *DVD Shrink* with recompressing the disc's contents to fit on a single 4.7GB disc. For additional multi-threading tests, we grabbed Newtek's *LightWave 7.5D* and used it to render a single frame of the built-in benchmark raytrace file using eight separate threads.

Because few of today's applications are multi-threaded, we also threw several multitasking tests at the dual-core system by simply running two benchmarks simultaneously, then reported the scores for each benchmark separately.

THE RESULTS

Scan the benchmark chart, and the first thing you'll notice is how much faster the dual-core CPUs are in multi-threaded applications when compared with the 3.73 P4 Extreme Edition. The latter's 533MHz clock-speed gap, 2MB of L2, and 1066MHz front-side bus just can't make up for an additional core when you run compute-intensive tasks. In our multi-threaded OCR test, for example, the PEE is 69 percent faster than the P4EE. The PEE also transcoded our DVD 33 percent faster than the P4EE with HT. The PEE completed the *LightWave* benchmark 60 percent faster than its higher-clocked sibling. The PEE blew away the P4EE in the majority of our homegrown multi-tasking tests.

As expected, the PEE doesn't fare well with non multi-threaded benchmarks such as *MusicMatch 10* and *Photoshop CS*. Multiple cores just can't compete with raw horsepower in single-threaded apps. We saw similar results in the gaming tests. This is why Intel isn't pushing the dual-core Pentium Extreme Edition or Pentium D as gaming procs. The superior bandwidth (from the larger L2 cache and 1066MHz front-side bus) and higher clock speeds of the Pentium 4 own gaming.

Oddly, we found that the performance of the PEE improved in some tests when Hyper-Threading was turned off. Why? Intel naturally blamed Microsoft, postulating that the scheduler in Windows XP doesn't differentiate between Hyper-Threaded virtual procs on the same core, and as a result, it throws all the work to one core only, instead of evenly spreading work between the two physical cores.

Our tests that mixed multi-threaded applications with single-threaded apps seem to support this theory. In such scenarios, the multi-threaded applications had enough work to keep both physical cores busy and generally the PEE with HT enabled did better than the same CPU with the HT disabled (in other words, the Pentium D).

THE VERDICT

Overall, we're impressed by the performance benefits of dual core, but only with the right workload. Multi-threaded applications and multitaskers should see massive boosts in performance over single-cored processors. Things you could never do before, such as ripping a DVD while playing an online game, are quite possible with a dual-core processor.

Gamers who demand the fastest frame rates and users of primarily non multi-threaded applications, however, should stick with the fastest single-core processor available. That said, if you're willing to sacrifice a few fps in games, you can pick up a huge performance boost when you use multi-threaded apps. And with modern games relying heavily on the GPU, you don't give up too many frames by opting for a dual core. Of course we won't know the full story until AMD releases its X2 series of dual-core procs in a month or two. Only then can we declare the real winner. ■

CPU	PENTIUM EE HT OFF	PENTIUM EE HT ON	PENTIUM 4 EE HT ON
Clock/FSB	3.2GHz/800	3.2GHz/800	3.73GHz/1066
3DMark03 overall	12,335	12,321	**13,020**
Doom III (fps)	86.5	85.0	**97.4**
Quake III (fps)	384.1	384.5	**484.5**
3DMark05	5,731	5,729	**5,867**
Abbyy FineReader 7 Pro (sec.)	210	**161**	272
DVD Shrink 3.2 (sec.)	477	**443**	587
LightWave 7.5D Raytrace (sec.)	61.2	**50.4**	80.1
MusicMatch 10 MPC 2004 (sec.)	276	280	**238**
Photoshop CS MPC Test (sec.)	363	356	**324**
3DMark05 CPU w/ DVD Shrink	**5,677**	4,369	5,175
DVD Shrink w/ 3DMark05 CPU (sec.)	767	**573**	879
3DMark2005: w/ MusicMatch 10	**4,528**	4,457	3,399
MusicMatch 10 w/ 3DMark2005 (sec.)	**283**	358	342

Best scores are bolded.

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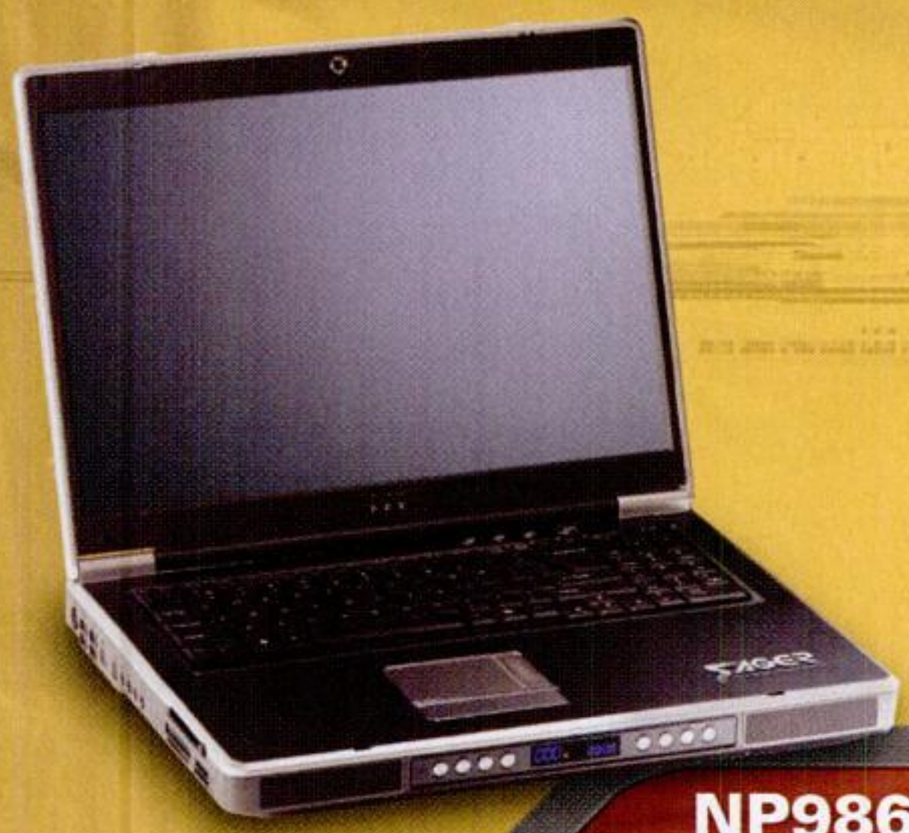

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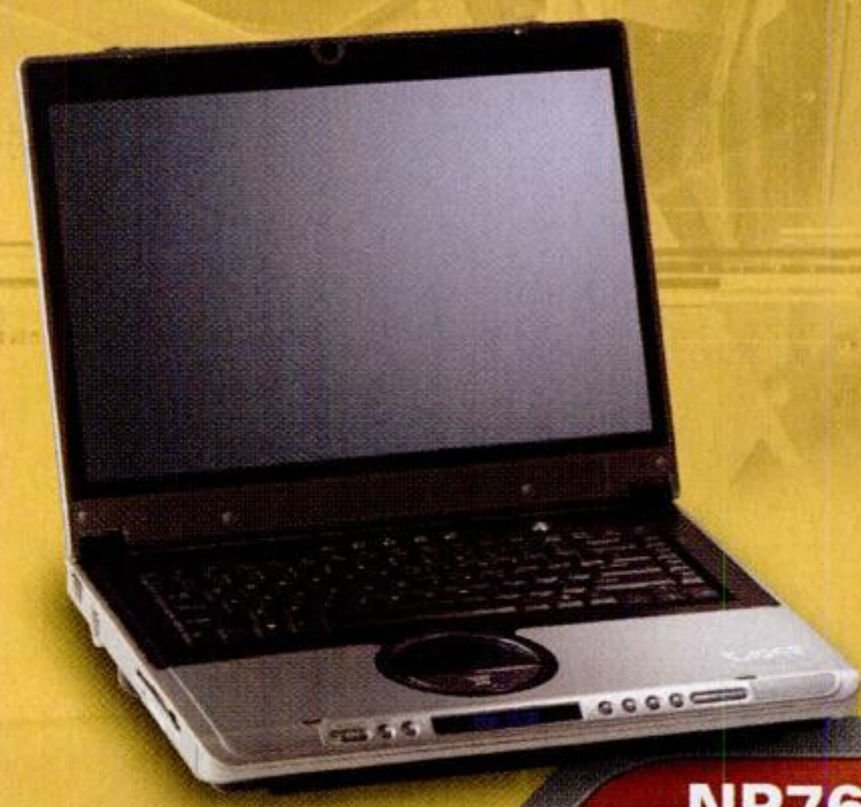

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- The front panel Audio DJ CD player control with separate power switch lets you play your favorite music CD or MP3 while on the go.
- Dual Optical Device bays and Dual Hard Disk Capability allow this system to be customized with 2 CD-ROM devices and 2 Hard Drives coexisting for maximum storage capacity.

OPTIONS

- 802.11g Wireless Module
- 802.11g and Bluetooth Combo Module
- TV Tuner with Remote

- 17.0" Wide Viewing Angles WSXGA+ Active Matrix Display with Super Clear Glare Type Screen
- Intel® Pentium®4 Processor 560 with HT Technology (1MB L2 Cache, 3.6GHz, 800MHz FSB)
- 256MB DDR3 nVIDIA® GeForce™ Go 6800 PCI-Express™ Graphics
- 1024MB Dual Channel DDR2 SDRAM
- 60.0GB 7200RPM Ultra ATA100 Hard Drive
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- Front Panel Audio DJ with Separate Power Switch
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- Built-In 7-in-1 Card Reader
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- Integrated Fax Modem[4] and 10/100/1000 Ethernet
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- Sager's Umbrella Protection Policy

NP7620C $1945

FEATURES

- ATI MOBILITY™ RADEON® X800 PCI-Express™ Graphics with 256MB DDR3 Memory delivers true-to-life graphics at blazing speeds.
- Dual Smart Bays (one fixed/ one versatile) allow this system to be customized just the way you want it. Pick from an optional second battery, secondary HDD, 7-in-1 Card Reader or an additional CD-ROM device.
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- TV Tuner with Remote

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- Built-In Digital Video Camera
- On-Board 56K V.90 Modem[4] and 10/1000 Ethernet
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- 6 Built-In Speakers
- Virtual 8 Channel External Speaker Output
- 3.5" Removable 1.44MB FDD Exchangeable with Optional 2nd Battery/CD-RW/DVD/ HDD Drive/7-in-1 Card Reader
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ENCYCLOPEDIA OF Removable Media

MAXIMUM PC'S VISUAL GUIDE TO FLASH MEMORY

During the last two years, the removable-memory landscape has changed dramatically. Since then, some formats have risen and others have sunk. Here's a quick field guide to all the formats you need to know about today.

—MARK NOACK AND LOGAN DECKER

ALL CARDS SHOWN AT ACTUAL SIZE

CompactFlash

USED IN: Digital cameras, PDAs

CURRENT MAXIMUM CAPACITY: 12GB ($9,500)

COST PER MEGABYTE (AT MAXIMUM CAPACITY): $0.80

DURABILITY: The sturdiest flash memory around.

THE GOOD: Can be used in the PC card slot of laptops with an inexpensive adapter; "professional" versions support transfer rates up to 12MB per second.

THE BAD: Extremely bulky by today's "World of Tomorrow" standards; faster CompactFlash cards are significantly more expensive (usually around 30 percent) than the standard variety.

THE INTERESTING: Type I refers to cards that are .14-inches thick. Type II refers to cards that are .20-inches thick.

PROGNOSIS: The huge number of CompactFlash-dependent devices still in use today virtually guarantees that this format will remain common.

MicroDrive

USED IN: Digital cameras, PDAs, and most devices with a Type II CompactFlash slot

CURRENT MAXIMUM CAPACITY: 6GB ($270)

COST PER MEGABYTE (AT MAXIMUM CAPACITY): $.05

DURABILITY: Don't drop it!

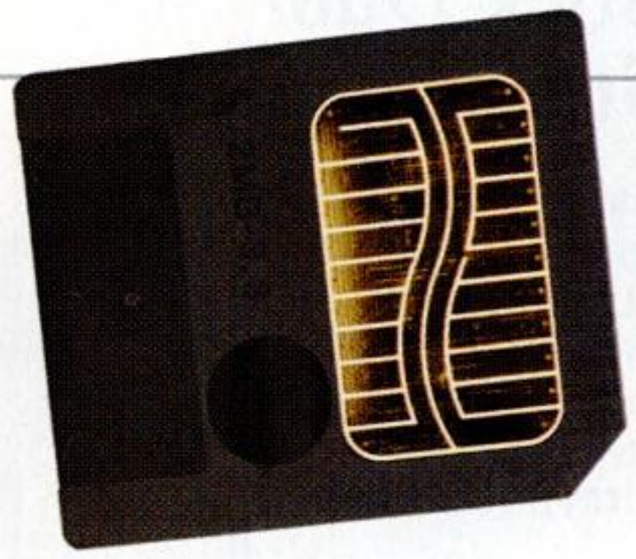
THE GOOD: A technological marvel; hard drive compatible with most CompactFlash Type II devices.

THE BAD: Literally a tiny hard drive, the MicroDrive consumes much more power than flash memory, and is still scary-slow compared with the pokiest flash media.

PROGNOSIS: Iffy—the MicroDrive may be eclipsed by smaller and less expensive miniature hard drives (such as Toshiba's .85-inch hard drive and the Cornice Storage Element) that aren't intended to be removed.

Prices, capacities, and cost per megabyte reflect those in effect at press time—hey, we're not psychics!

SmartMedia



USED IN: Vintage MP3 players and digital cameras

CURRENT MAXIMUM CAPACITY: 128MB ($20)

COST PER MEGABYTE: $0.16

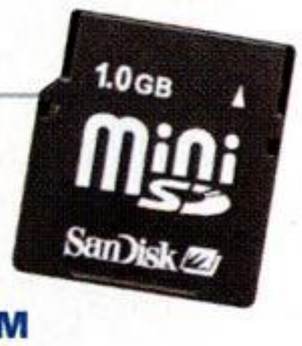
DURABILITY: Very thin and prone to breakage.

THE GOOD: Way back when, the slender SmartMedia cards allowed manufacturers to create smaller MP3 players and digital cameras.

THE BAD: Must be handled with care; low capacity.

PROGNOSIS: Moribund—consumer electronics moved on from this low-capacity, fragile format years ago.

miniSD



USED IN: Cameras, PDAs, cellphones

CURRENT MAXIMUM CAPACITY: 256MB ($60)

COST PER MEGABYTE (AT MAXIMUM CAPACITY): $0.23

DURABILITY: Rigid plastic is tough, but dangerously tiny size makes us nervous.

THE GOOD: miniSD brings oodles of storage to ultra-compact digital cameras and cellphones; can be used in SD slots with adapter.

THE BAD: Low adoption rate in consumer electronics.

THE INTERESTING: miniSD can be used in standard SD card slots with the appropriate adapter.

PROGNOSIS: Borderline—backwards compatibility with SD is a nice touch, but ultra-mini digital cameras and camera phones might opt for the even smaller microSD format.

MMC

USED IN: MP3 players, digital cameras, PDAs, cellphones

CURRENT MAXIMUM CAPACITY: 1GB ($75)

COST PER MEGABYTE (AT MAXIMUM CAPACITY): $0.08

DURABILITY: They look fragile, but even we klutzes have yet to break one.

THE GOOD: Very small size; works in today's ubiquitous SD card slots.

THE BAD: SD cards have edged out this format.

PROGNOSIS: Lacking the encryption facility built into SD cards, the compatibility with SD slots is the only thing keeping this format alive.

TransFlash/microSD

USED IN: Cellphones

CURRENT MAXIMUM CAPACITY: 256MB ($60)

COST PER MEGABYTE (AT MAXIMUM CAPACITY): $0.23

DURABILITY: Very fragile; not intended for frequent handling.

THE GOOD: The smallest flash memory formfactor available in consumer electronics.

THE BAD: Fragile; not intended for frequent handling and certainly not for roughhousing.

THE INTERESTING: TransFlash was ever so briefly known as "T-Flash," and now it is essentially being rebranded as microSD. Ugh.

PROGNOSIS: Excellent—who doesn't want more storage for his or her cellphone camera?

SmartMedia

USED IN: MP3 players, digital cameras, PDAs, cellphones

CURRENT MAXIMUM CAPACITY: 2GB ($200)

COST PER MEGABYTE (AT MAXIMUM CAPACITY): $0.10

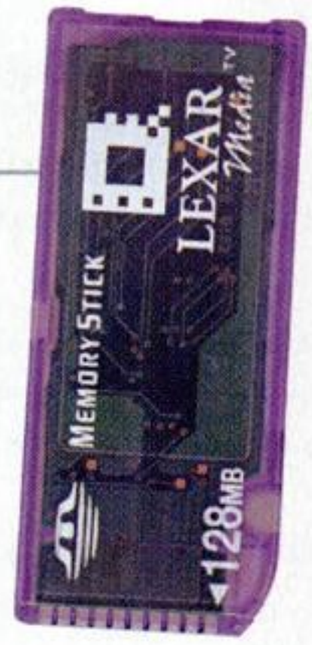
DURABILITY: Just like MMC cards, these babies are pretty tough.

THE GOOD: Improves on MMC with built-in encryption for read-only software distribution, faster transfer rate, and lower power consumption.

THE BAD: Still physically too large for today's cellphones.

PROGNOSIS: SD's balance of size, capacity, and features makes it an ideal format for all types of personal electronics; manufacturers agree, so expect to see SD slots around for a very long time.

MemoryStick/ MemoryStick Pro



USED IN: Sony products (digital cameras, vidcams, laptops, *et al*)

CURRENT MAXIMUM CAPACITY: 512MB ($100), 4GB High-Speed Pro ($700)

COST PER MEGABYTE (AT MAXIMUM CAPACITY): $0.20/$0.08 High-Speed Pro

DURABILITY: Very durable—rivals SD.

THE GOOD: Usable in the vast complement of Sony consumer electronics; features write protection.

THE BAD: Very few products outside the Sony stable use this format.

PROGNOSIS: Sony's a tenacious company, so like it or not, MemoryStick is here to stay.

MemoryStick Duo/ MemoryStick Pro Duo

USED IN: Sony products, including cell phones and the foxy new PSP!

CURRENT MAXIMUM CAPACITY: 512MB ($105)/2GB High Speed Pro Duo ($450)

COST PER MEGABYTE (AT MAXIMUM CAPACITY): $0.20/$0.23 High-Speed Pro

DURABILITY: Just as durable as the full-size MemoryStick.

THE GOOD: Can be used in MemoryStick slots with an adapter.

THE BAD: No significant advantages over more standard formats, such as SD.

PROGNOSIS: Sony won't let go of this one, so expect it to be around a long time.

xD

USED IN: Digital cameras—mainly Olympus and Fujifilm

CURRENT MAXIMUM CAPACITY: 1GB ($100)

COST PER MEGABYTE: $0.10

DURABILITY: Comparable to SD, but slightly smaller. Designed to be handled.

THE GOOD: Relatively swift transfer rates in an itty-bitty formfactor; can store "panoramic" photos on selected Olympus camera models.

THE BAD: Limited adoption among digital camera manufacturers.

PROGNOSIS: Fuji and Olympus wanted xD to become the "it" standard for digital cameras. Alas, other cam manufacturers shunned xD in favor of more open formats such as SD and miniSD, so its longevity is far from assured.

RS-MMC

USED IN: Cellphones

CURRENT MAXIMUM CAPACITY: 512MB ($70)

COST PER MEGABYTE (AT MAXIMUM CAPACITY): $0.14

DURABILITY: Fairly durable, but not designed for frequent handling.

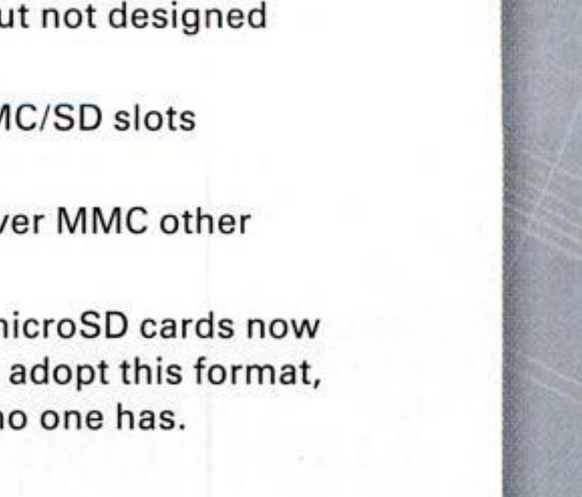
THE GOOD: Can be used in MMC/SD slots with an adapter.

THE BAD: No improvements over MMC other than its size.

PROGNOSIS: With mini- and microSD cards now available, there's little reason to adopt this format, so it comes as no surprise that no one has.

Reading, Writing, 'Rithmetic

Maximum PC sheds light on the mysteries of high-speed CompactFlash



Pulling 8GB of photos off your digital camera requires either patience or a high-speed CompactFlash card.

Several manufacturers have taken to describing the speed of their CompactFlash cards using the same rating system we're familiar with from our optical drives: 1x speed means the card can be written to at 150KB per second, 2x means 300KB per second, all the way up to 80x, which is 12MB per second. And these are write speeds, mind you; read speeds can exceed even these figures. That's downright dazzling for flash media, and a boon for photographers who can't afford to miss a shot while waiting for their images to be written to memory.

CompactFlash has been able to ratchet up the speeds beyond what most other types of flash memory can accommodate because each unit contains its own miniature IDE controller right on the card itself. As a result, it's possible to pack in faster memory cells and tweak the interface to wring out more performance without requiring a firmware update—or worse, a replacement—to the CompactFlash-enabled digital camera you already have.

Amazingly, you can achieve even faster transfer rates than these, but you'll have to match the right camera with the right card. For example, Lexar's Write Acceleration (WA) technology claims improved write speed performance up to 23 percent, but in order to bag the extra speed, you'll need a camera that supports WA (which includes models from big cheeses Kodak, Nikon, Pentax, and Olympus). ■

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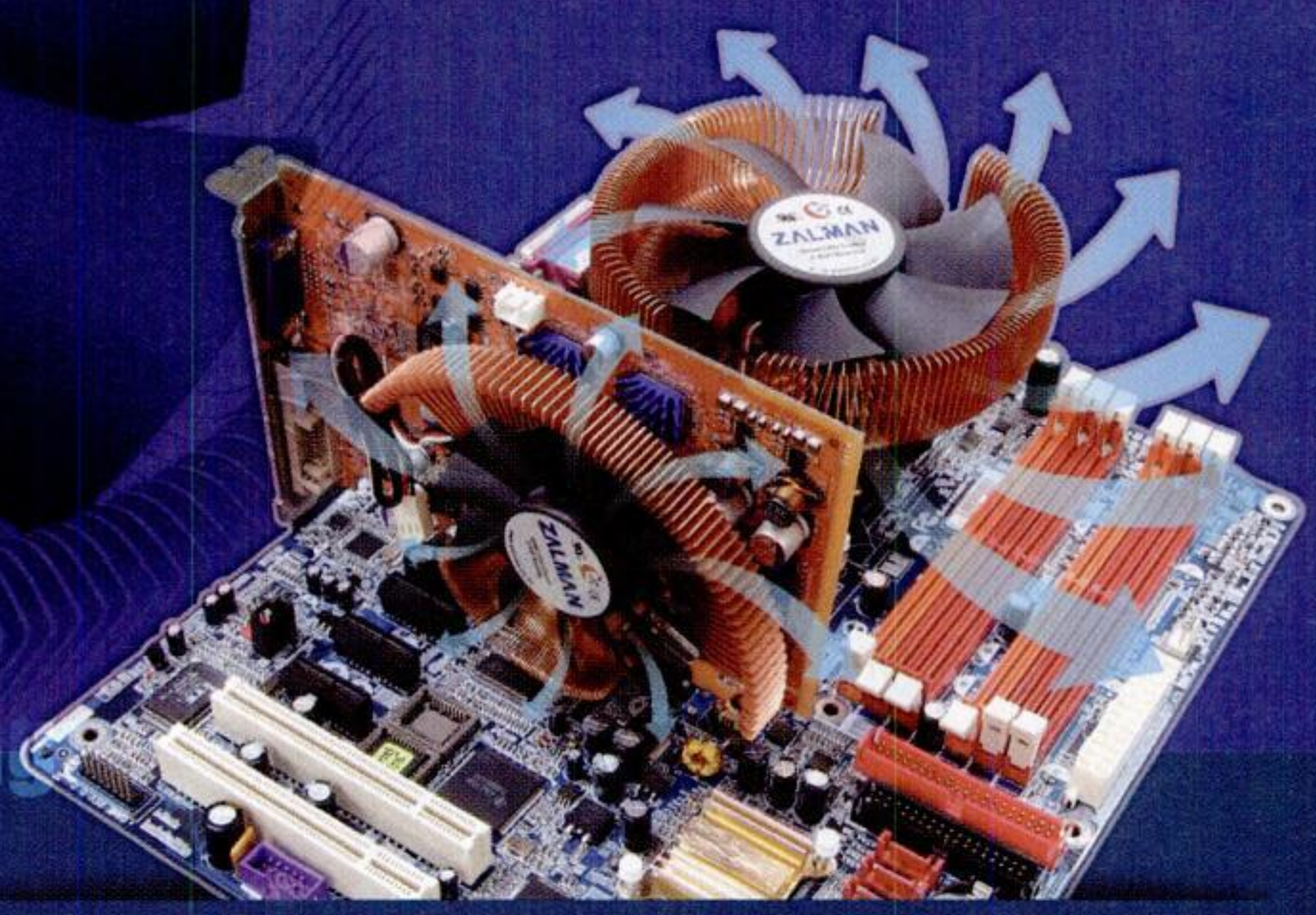

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How To... A step-by-step guide to tweaking your PC experience

MAXIMUM PC
TIME TO COMPLETION
00:46
HOURS MINUTES

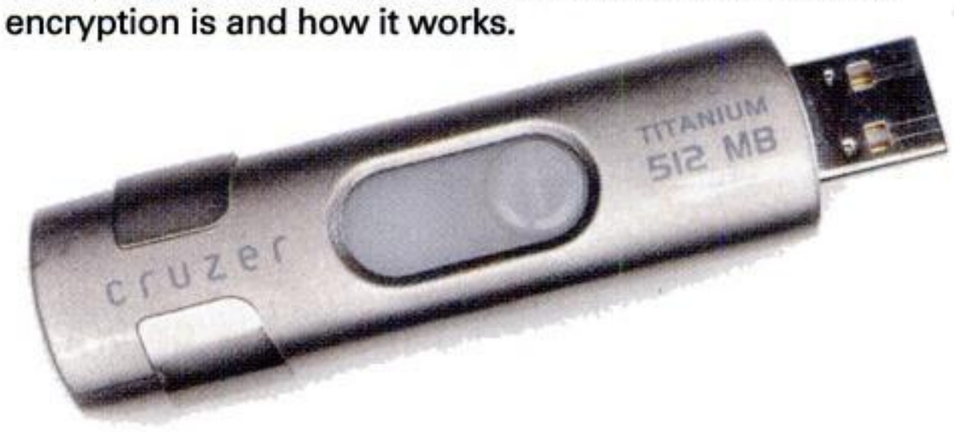
Protect Your Data FROM DIGITAL THIEVES

Use encryption technology to keep your private data out of the public domain

BY OMEED CHANDRA

Firewalls and antivirus programs are just dandy for protecting your PC itself, but what about the stuff that's *on* your PC? The thousands of MP3s you've amassed over the years; your income-tax returns dating back to the Reagan presidency; your infallible proposal for achieving peace in the Middle East—we're talking about your data, chief. Those precious bits and bytes might be safe enough on your hard drive, but they're dangerously exposed the moment they leave the shelter of your home. Send an e-mail, and it might pass through dozens of other computers on the Internet, where it could be easily intercepted and read before reaching its intended recipient. Indulge in the convenience of carrying your most important data in your pocket on a USB flash drive or a portable hard disk, and you'll be in a world of hurt if that pocket drive is lost or stolen.

Digital thieves are everywhere, so we'll show you some easy ways—using free and low-cost tools—to defend the data stored on your pocket drives. We'll show you how you can ensure the privacy of your e-mail, too. And for the uninitiated, we'll explain the basics of what encryption is and how it works.



WHAT IS THIS "ENCRYPTION" YOU SPEAK OF?

You probably use encryption all the time, whether you realize it or not. Encryption is what keeps shady characters from seeing your password when you log onto Hotmail, or stealing your credit-card number while shopping online. And in a much more potent form, it's what the government uses to keep enemies of the state from getting their hands on top-secret NSA communiqués.

Encryption is fundamentally about obscuring data, using a special code called a key. Here's a simple example: Say your best friend wants to know how much you *really* paid for your engagement ring. Suspecting that your girlfriend is monitoring your Internet connection, you e-mail your buddy saying the ring cost $8,000. Next, you call him on the telephone and inform him that you encoded the message by multiplying the true price by 800. Your friend then divides 8,000 by 800 to learn that the ring cost a mere $10; your girlfriend will be none the wiser. (Note: *Maximum PC* does not advocate buying your fiancé a $10 engagement ring, and we accept no responsibility for the consequences of such unwise actions.)

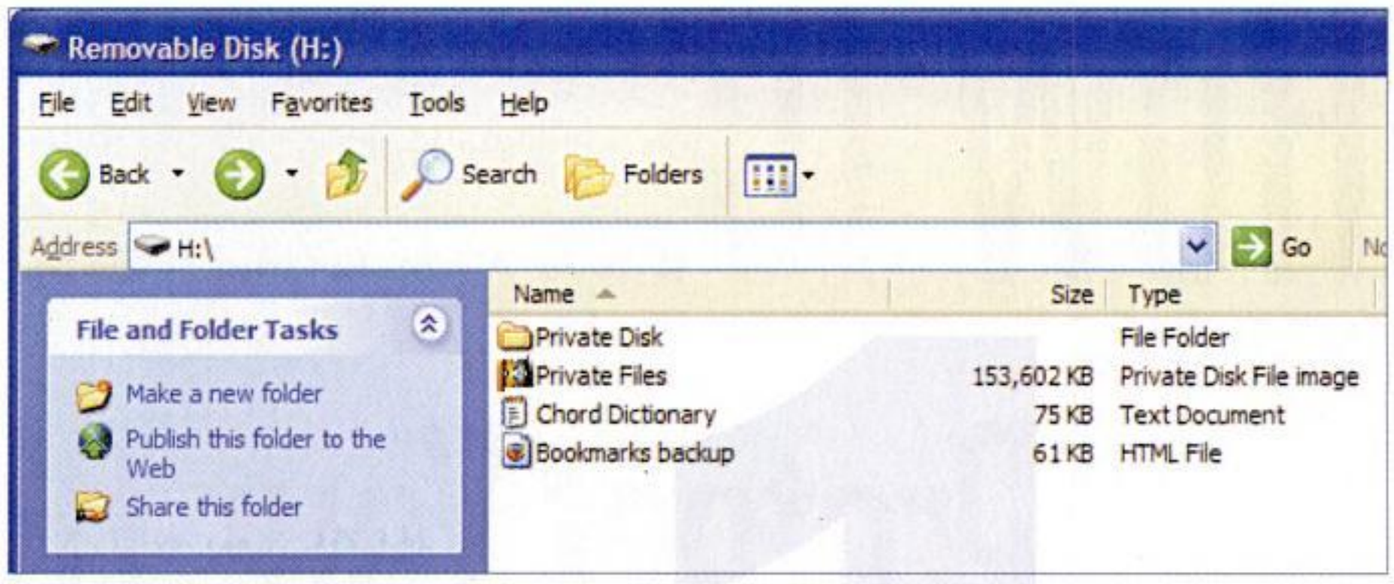
Real-world encryption procedures are much more complicated, of course, but the concept is basically the same. They differ mainly in terms of the number and types of keys used to scramble and unscramble data, as well as how those keys are computed. Good encryption algorithms generally use very large numbers (indicated by the bit strength, e.g., 128-bit) and complex formulas. In order to decrypt something, you'll need to either know or be able to compute the proper key. Assuming the key-generating algorithm is too complex to decipher, the only way a hacker can decrypt your data is by guessing the right key. That's why higher bit strength translates into better security—a 256-bit binary key (where the value of each bit can be either 0 or 1) has a whopping 2^{256} possible values! Few (if any) criminals will bother with the exorbitant amount of time needed to try out that many keys—they'll just move on to an easier target.

OK, that's simple enough; the more bits, the better. But how can you tell whether a particular encryption utility uses a secure algorithm? As a rule of thumb, opt for utilities that employ one of the widely used encryption algorithms that cryptography experts have deemed secure. There are too many to mention here, but some of the most popular include AES (Advanced Encryption Standard), RC4, Blowfish, and 3DES (Third Generation Data Encryption Standard). We'll stick with AES for this how-to; AES has yet to be cracked as of this writing.

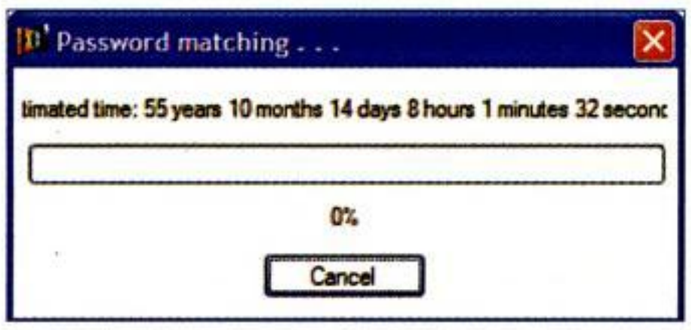
STEP 1: OBTAIN PRIVATE DISK

We tested several tools capable of encrypting the contents of a pocket drive. We wanted a secure, user-friendly program that could be run from the encrypted drive itself, so we wouldn't have to install it on every computer we take our files to. Our top choices were *Lockngo Professional* ($40, **www.keynesis.com**) and *Private Disk* ($45, **www.dekart.com**). Both apps consume a negligible amount of disk space, and each boasts 256-bit AES encryption for the entire contents of a drive (many utilities encrypt only the file system and not the data, leaving the latter vulnerable to cracking).

Although *Lockngo Professional* is easier to set up and use than *Private Disk*, we prefer the latter for several reasons. First, *Lockngo* won't let you leave a portion of your pocket drive unencrypted for storing unclassified data—it's all or nothing. Second, you can use the same copy of *Private Disk* on as many pocket drives as you wish, whereas you must purchase a separate copy of *Lockngo Professional* for each pocket drive you own. *Private Disk* can even be used to encrypt files on your computer's hard drive. And finally, unlike *Lockngo*, *Private Disk* encrypts data on the fly as you copy it to your pocket drive, making it considerably faster. Read on to learn how to set up *Private Disk* on a pocket drive.



Unlike some of its competitors, Dekart's *Private Disk* allows you to leave part of your pocket drive unencrypted. This means you can protect your vital data, but still have easy access to less critical files.



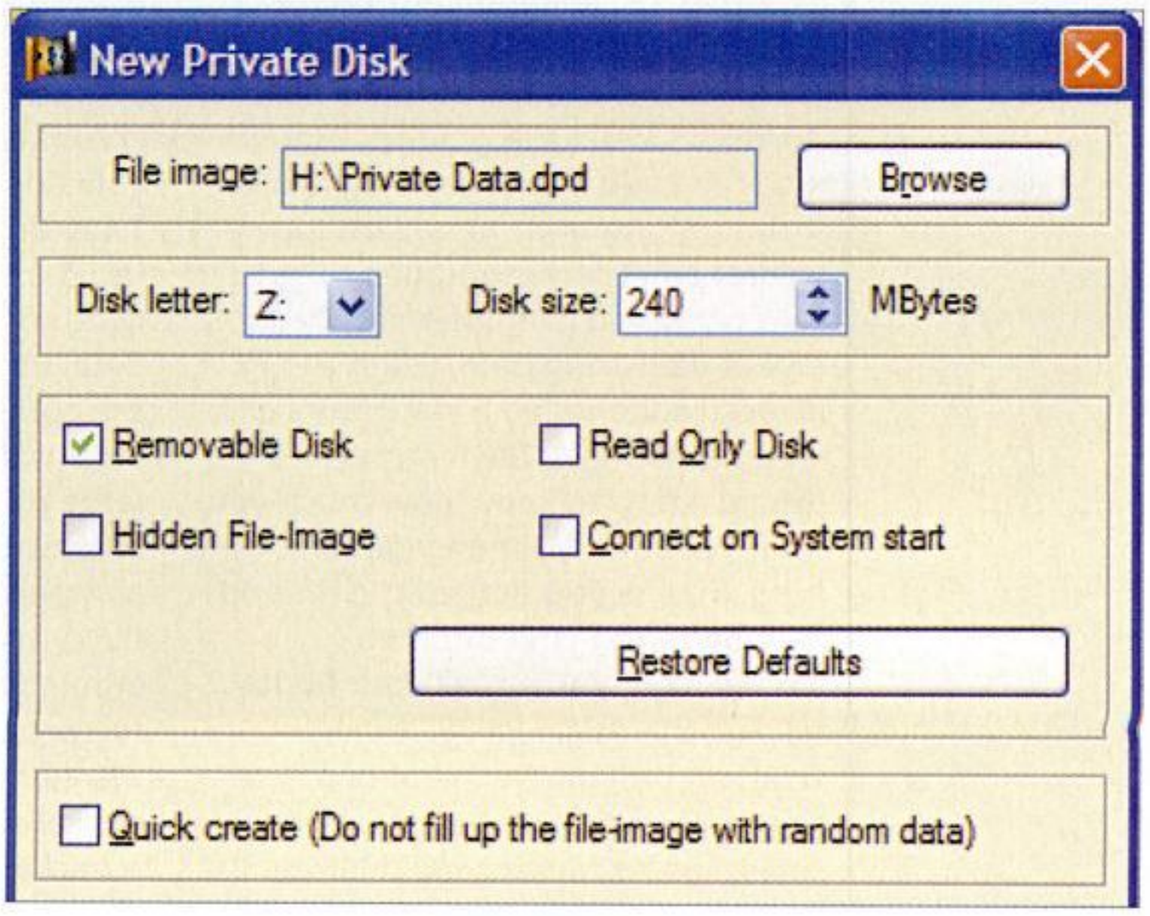
If you forget the password to your encrypted files, *Private Disk* can try to guess it using a brute-force attack. If you've chosen a good password, however, the guessing process could take years.

STEP 2: INSTALL PRIVATE DISK AND CREATE AN IMAGE FILE

The first thing you'll need to do is download and install *Private Disk* on your computer (every Windows OS since Windows 95 is supported). When you run the program for the first time, we recommend heading over to the Options tab and unchecking "Closing the window will minimize the program to System taskbar" and "Display icon on System taskbar." Then, return to the Disk tab and click the Create button. If you haven't connected your pocket drive to your computer yet, do so now, and then click the Browse button and navigate to your pocket drive. The encrypted data on your pocket drive will be represented by a .dpd file in Windows Explorer. Enter a name for this file and click Save.

You should now be back in the New Private Disk window. Feel free to experiment with the various options here later on; for now, let's just deal with the "Disk size" field. You can encrypt as little or as much of your pocket drive as you wish—just be sure to reserve about 2MB of unencrypted free space for storing the *Private Disk* program files. For instance, to encrypt a 256MB USB flash drive (which had an actual capacity of 242MB, according to Windows XP), we specified a 240MB image size.

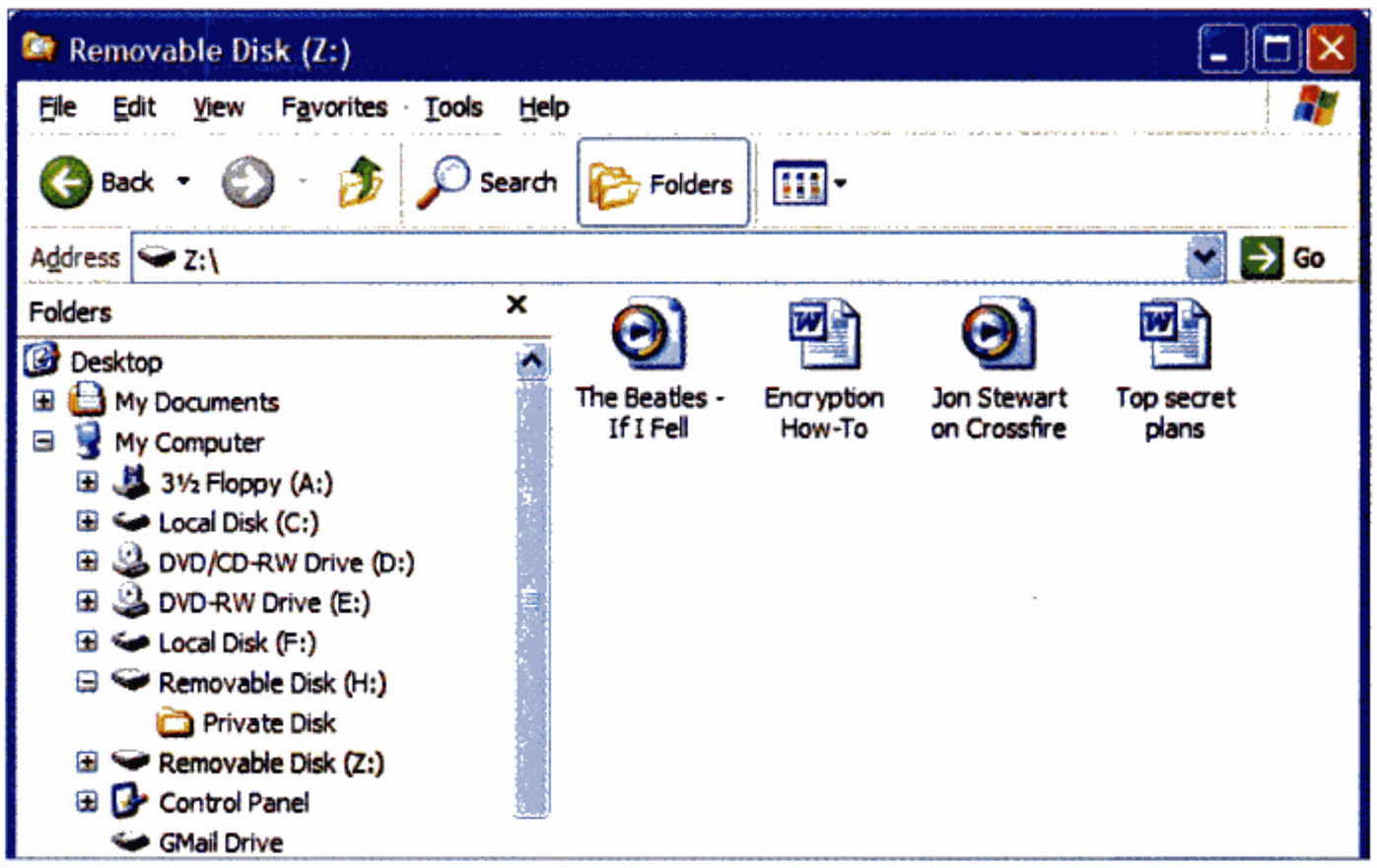
At this point, click the Create button and choose a password for your encrypted data. The usual common-sense advice applies here: Use a long password that isn't something ridiculously obvious (e.g., your name) and that incorporates a combination of upper- and lower-case letters, numbers, and symbols. You can even use an easy-to-remember sentence. Make sure it's something you won't forget though—if you do forget it, your encrypted files are as good as gone. Lastly, format the new virtual drive when prompted, using whatever settings you desire.



We chose to save our encrypted disk image to a USB flash drive, but you can also create an encrypted image file on your PC's hard drive and use it to protect important files stored there. This can be useful if, say, your hard drive gets stolen or you have snoopy coworkers or family members.

STEP 3: ADD A PINCH OF DATA AND A DASH OF SELF-SUFFICIENCY

You'll need to mount your encrypted image file before you can access and modify the data inside it. *Private Disk* does this automatically when you first create the image, but the next time you need to access your data, you'll need to start *Private Disk*, click the Connect button, and locate the image file you wish to mount—or just double-click the image file. Enter your password, and your encrypted data will appear as a virtual drive in Windows Explorer, where it can be read from and written to just like any other drive. Any data you add to this virtual drive is automatically encrypted. When you're done accessing your encrypted data (and before you unplug your pocket drive), dismount the virtual drive either by exiting *Private Disk* or by clicking the Disconnect button in the program's main window.



Once you mount an encrypted .dpd file using *Private Disk*, its contents will appear as a virtual disk drive in Windows Explorer, where it can be read from and written to.

Toting files around on a pocket drive isn't very convenient if you can't access them on computers that don't have *Private Disk* installed. However, it's easy to take *Private Disk* with you. First, copy the entire *Private Disk* folder from your hard drive onto your pocket drive (the default folder is C:\Program Files\Dekart\Private Disk). Next, open the Start menu, choose Run, type "%SystemRoot%\system32" and click OK. Locate versnum.dll and dkar.dll and copy these two files to the *Private Disk* folder on your pocket drive. Finally, edit prvdisk.ini (found in the *Private Disk* folder) and add the following line at the end: SerialNumber =xxxxx (where xxxxx is the serial number you obtained upon purchasing *Private Disk*).

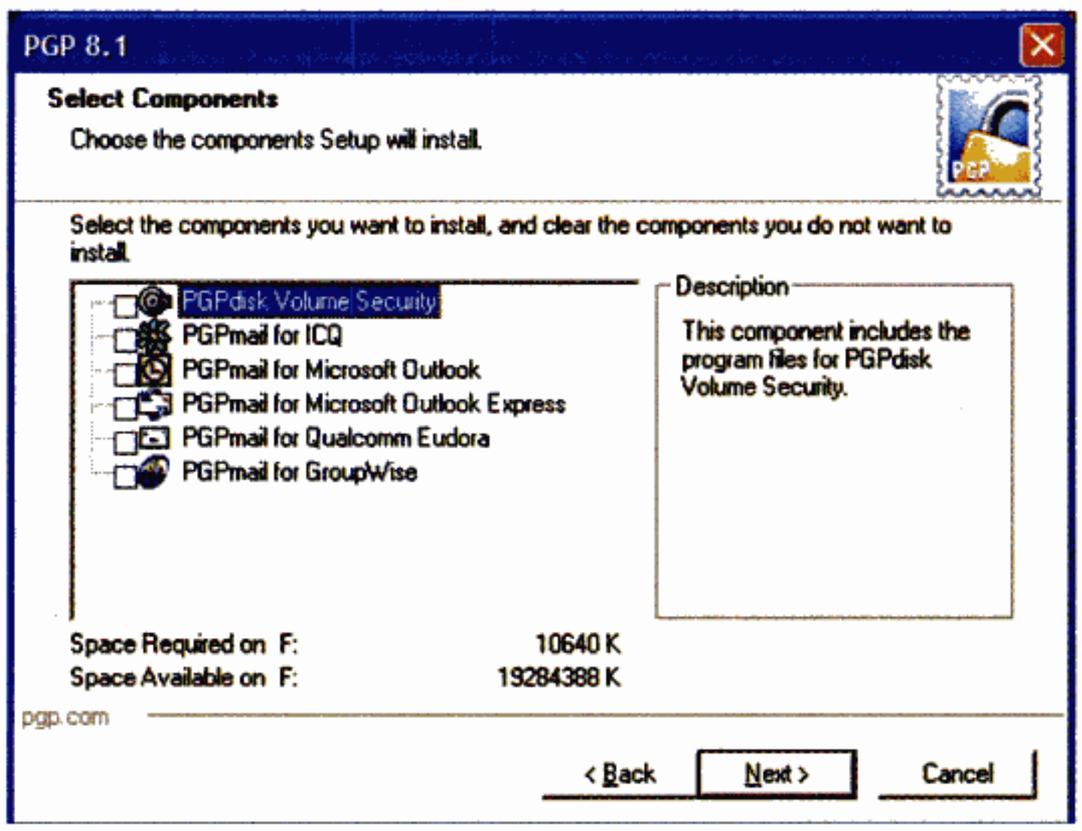
Your encrypted pocket drive is now entirely self-sufficient. To access your files on someone else's computer, simply run the PrvDisk.exe executable from your pocket drive and mount your encrypted image file.

Sending E-mails Securely and Confidentially

STEP 1: WHAT IS PRETTY GOOD PRIVACY?

Regular e-mail is perfectly fine for casual communications, but what if you need to send a private e-mail regarding an important matter? The solution is a tool called *PGP* (**www.pgp.com**), which is an acronym for "Pretty Good Privacy." *PGP* utilizes shared-key encryption, which means it uses two kinds of keys: public and private. You first generate public and private keys for yourself; and then you and your contacts add each others' public keys to your respective "key rings." Using these public and private keys, *PGP* encrypts and decrypts e-mails sent between you and the people on your key ring, thus ensuring that the sender and recipient are who they claim to be.

PGP has been around for many years and is the most popular method of e-mail encryption in use today. It exists in several flavors, including a freeware version for noncommercial use. To get started, download and install the latest release, minus all the optional plug-ins and features (none of which are free). When the installer asks if you already have keys you'd like to use, select "No, I'm a New User."

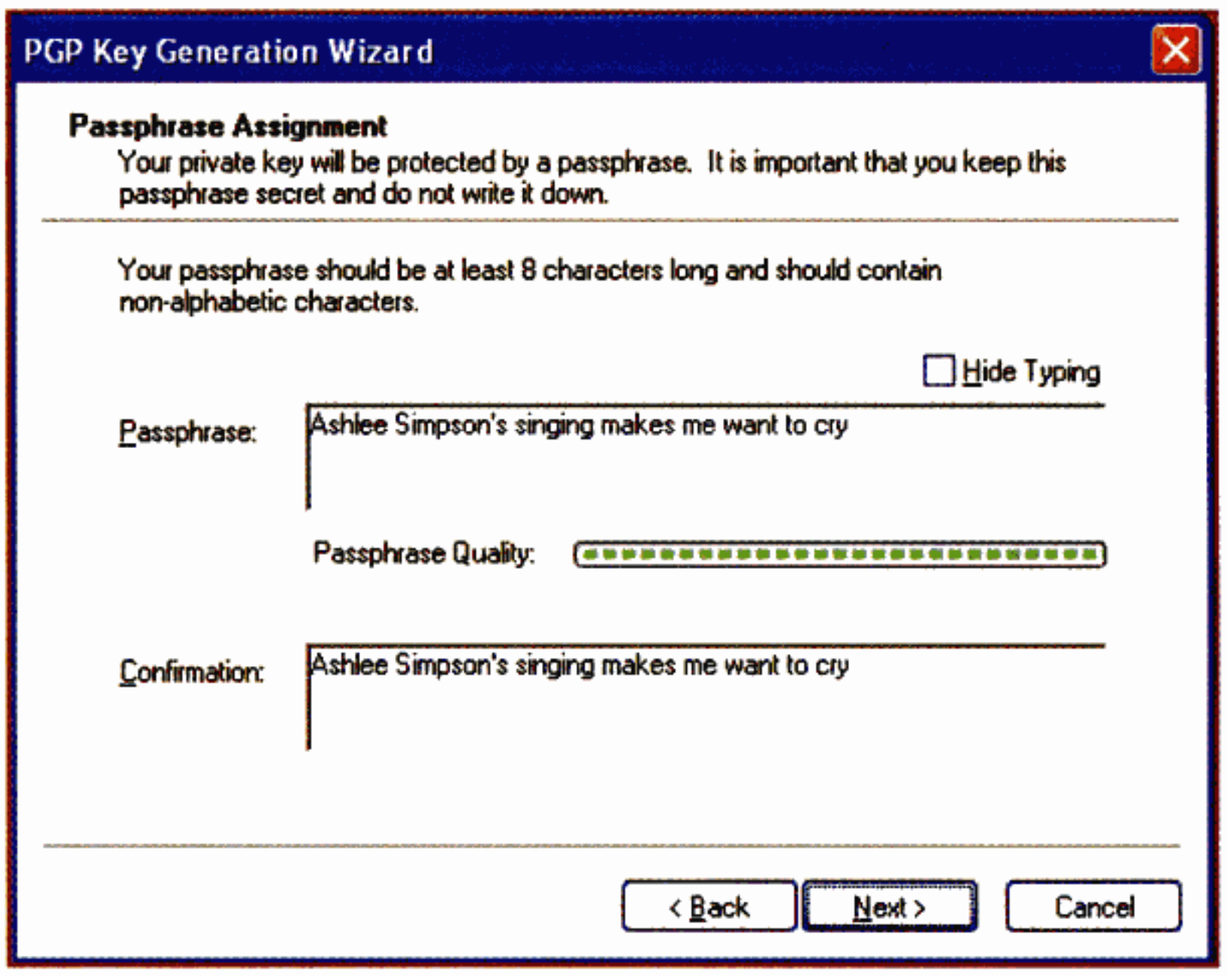


Shell out $60 for *PGP Personal Desktop* and you'll get *PGPdisk* (for encrypting files on your hard drive), as well as convenient plug-ins for ICQ and several popular e-mail clients. If you want to use the freeware version of *PGP* instead, uncheck all these optional components during installation.

STEP 2: CREATE YOUR PGP KEYS

The first time you reboot your computer after installing *PGP*, the License Authorization window will appear. Click the Later button to make it go away, and then look for the *PGP* padlock icon in the notification area of your taskbar (at the bottom-right of your screen). Right-click the padlock and choose PGPkeys to open the PGPkeys window. From the Keys menu, open the Key Generation Wizard by clicking New Key. Click Next, enter your name and e-mail address, and click Next again. This will bring you to the most critical part of the key-generation process—choosing a pass-phrase. Your pass-phrase should be long and complex, ideally encompassing a combination of spaces, symbols, numbers, and letters. When you're done, click Next, Next again, and then Finish.

Note that *PGP* offers a multitude of different encryption methods and strengths to choose from. These settings can be accessed by clicking the Expert button on the first screen of the Key Generation Wizard, but because the default encryption method (256-bit AES) is well-suited to our purposes, we won't mess with it.



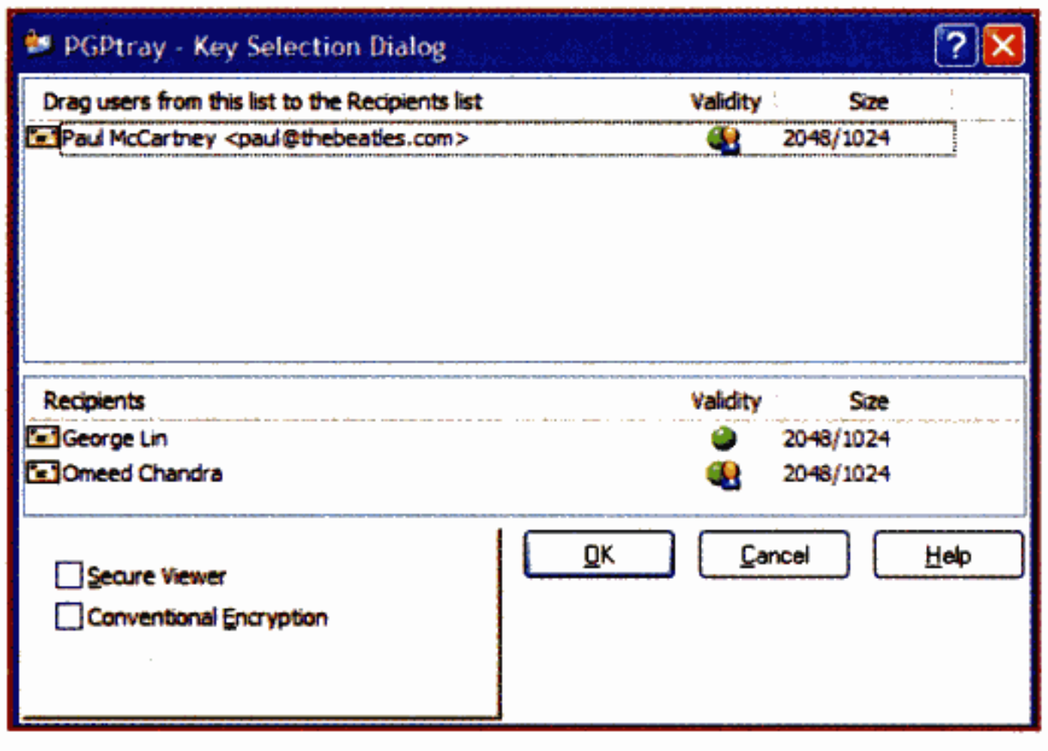
Your pass-phrase is the weakest link in the security of *PGP*, so it's imperative to pick one that's difficult to figure out, but that you'll still be able to remember. To assist in this process, *PGP* rates the quality of your pass-phrase as you type it in.

STEP 3: EXCHANGE KEYS AND E-MAILS WITH OTHER PGP USERS

In order to send and receive secure e-mails among other *PGP* users, you must first exchange keys with them. To do this, open the PGPkeys window by right-clicking the *PGP* padlock icon in the notification area and clicking PGPkeys. Select your name from the list of keys displayed, click Edit, and then choose Copy to send your public key to the clipboard. Now fire up your favorite e-mail client, create a blank message, and paste your public key into the message window. Sending this e-mail to fellow *PGP* users will allow them to add your public key to their key ring.

You'll also need to add your contacts' keys to your own key ring. Have them send you an e-mail with their public key using the procedure just described. When you receive the e-mail, open it in its own message window (to do this in Microsoft *Outlook*, go to your Inbox and double-click the desired message). Next, right-click the *PGP* icon in the notification area, choose Current Window, and then click Decrypt & Verify. *PGP* will look at the encrypted text in the window, and present you with several options. If the message sender isn't already on your key ring, you will be prompted to add him or her. (You might need to manually sign the sender's key to verify its authenticity. To do this, right-click the person's name in the PGPkeys window, click Sign, and then click OK.) Subsequently, right-click the person's name again, choose Key Properties, and move the Trust Model slider to Trusted and click Close.

After that, it's easy to exchange encrypted messages with other *PGP* users. To send an encrypted e-mail, type the e-mail using your favorite client, then (with the message window selected) right-click the *PGP* icon in the notification area, choose Current Window, and click Encrypt & Sign. When prompted, select the intended recipients of the message from your key-ring and click OK. You can now send the e-mail as you normally would. To read an encrypted e-mail sent by one of your contacts, open the message in its own window, right-click the *PGP* icon, choose Current Window, and then click Decrypt & Verify. *PGP* will verify that the sender is indeed who he or she claims to be, and then decrypt the e-mail so you can read it. ■



When sending an encrypted message using *PGP*, you'll be prompted to specify who is allowed to read the message by dragging people from your key ring to the Recipients list. If you forget to add the intended recipient(s) of an e-mail to this list, they won't be able to read it.

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MEMORY ADVICE FOR A NEWBIE

This is my first time building a computer and I was wondering if you could give me some advice. I plan on getting a GeForce 6800 Ultra and already have an Athlon 64 4000+ picked out. Is there any performance boost in gaming above 1GB in memory? The motherboard supports up to 4GB of RAM, but how much is really necessary?

—KEVIN ELLIS

Right now, the sweet spot for performance gaming is at the 1GB mark, but we are rapidly approaching the day when that won't be enough. You may see a slight performance increase with more memory in some MMORPG titles, but for the most part, 1GB is sufficient. Some might even argue that 1GB is optimum because most 512MB modules, which you'd use for a 1GB total, have better latencies than the denser chips used to make 1GB modules, which you'd need for 2GB of total RAM. The Doctor's advice: If you have cash to burn or you work with very large memory-intensive applications, buy 2GB. Otherwise stick with 1GB.

ONBOARD SOUND ANNOYANCE

My computer's onboard sound is getting feedback from everything. I can hear it when I type, when I move or click my mouse, when my hard drive does anything. I contacted ASRock but they never responded and it's been a month!

—ANDREW SCHMIDT

If what you mean by feedback is a high-pitched screech, you should mute or turn down the sensitivity for any mic or headset you have hooked up to your PC. You can do this by opening the mixer (double-click the speaker icon in your system tray) and adjusting the appropriate slider. If the mic or line-in slider is not visible, select Options, then Properties, and select those lines. Then click OK. Once the sliders are visible in the mixer, you can play with the sound output to cut out the interference.

If, on the other hand, what you mean by feedback is an audible ticking as you transfer HD or LAN data, that's usually a sign of poor speaker shielding or a poor motherboard design. You can try moving your speakers to see if that helps diminish the noise. Or try plugging in a set of headphones to see if the interference persists. If the interference goes away, you know it's your speakers. If the interference is still there, your motherboard is likely the culprit. Turning down the volume may solve the problem, or you can disable the onboard audio and buy a PCI soundcard.

OLD LOGIN TO NEW

The login screen on my Windows XP SP2 box is the old "hit the <Ctrl-Alt-Delete> key to login in" type. On my wife's computer, the screen comes up and shows the different users, and you only have to click the appropriate user. How can I change mine to look the same?

—DAVID MAURICE

You need to enable the Welcome Screen. To do that, open the Control Panel, go to User Accounts, then click "Change the way users log on to this computer." Click "Use the Welcome Screen," and press OK. There are some circumstances where you won't be able to use the Welcome Screen, though. If your computer is part of a Windows domain or you use certain VPN clients, the Welcome Screen option is, sadly, unavailable.

CPU THE CULPRIT?

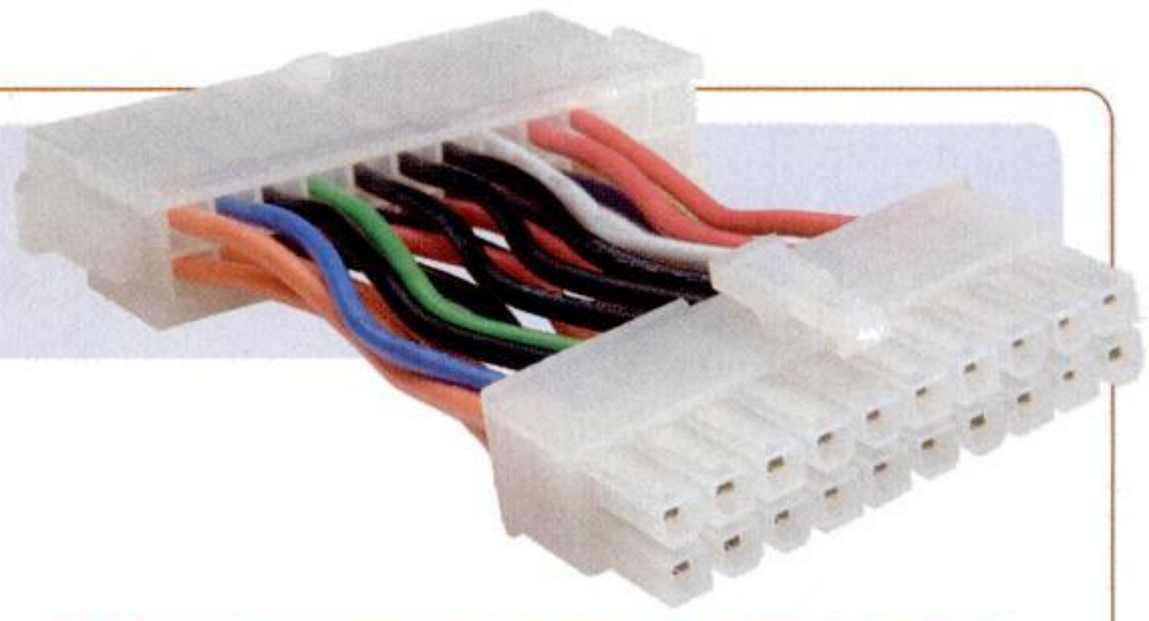
Ever since upgrading from an AMD XP 2400+ with a 266MHz FSB CPU to a 3200+ w/400MHz FSB, I've been unable to completely rip an entire episode of *Star Trek TNG* from DVD using *#1 DVD Ripper*. I am always stopped by an IRQ error, which frequently causes my computer to reboot as well. My machine has 1024MB of DDR400 Crucial RAM in dual-channel mode on a SOYO KT880 motherboard with an ATI All-In-Wonder 9000 graphics card and a RAID 0/1 array of four Western Digital 80GB 7,200rpm on a Promise FastTrak TX2/100 RAID card. The faster processor is the only thing that's changed lately in my system; previously I was able to rip all four episodes from a disc with a single mouse click. Which of these parts is most likely too slow for my CPU?

—REED YOUNG

You do own the DVD, don't you? If you don't, shame on you! Taking money from the pocket of Patrick Stewart is just wrong. The Doctor also enjoys ripping DVDs that he's purchased, and has found that video encoding (which is what you're doing) is a CPU-intensive task.

You mentioned that you upgraded to a new proc, but did you upgrade the heatsink? The 3200+ will generate more heat than the 2400+, so you're likely

PESKY POWER SUPPLY PROBLEM



The next time you upgrade your power supply, you'll be faced with the prospect of using an adapter to make the 24-pin ATX power connector work in a 20-pin motherboard.

I've been shopping for a power supply for my Intel 875P motherboard. The problem is that my mobo has apparently reached "legacy" status. It needs the 24-to-20-pin adapter for the main ATX power connector. The space inside my Antec Lanboy is very limited, and the adapter looks to be unnecessarily large for anything except a full tower case. Is there a way for me to use the ATX 12V 2.0 PSU with my standard ATX case without the use of the adapter? Can I hardwire the 20 pin connector directly and tie off the extra 4 wires safely? What do you suggest?

—ROBERT WILSON

While you could perform surgery on the 24-pin connector and trim out the lines, it's not a good idea. You'd be wrecking your power supply's ability to ever work with the 24-pin connector, which you'll definitely need for your next upgrade. If you look at the pin-outs of the 24-pin connector, the additional 4-points are all on one side of the connector. If a motherboard has clearance on that side of the power connector, it's possible the 24-pin connector could be plugged directly into the 20-pin port, although looking at our own D875PBZ mobo, this option appears unlikely. The best solution is to use the adapter, get a zip tie, ball up the excess wire, and tie it off somewhere.

POWER SUPPLY

I want to know what power supply you recommend for the Asus A8N-SLI Deluxe board. I want a power supply that will allow expandability and not require me to upgrade for a few years. I was looking at Antec's True550 EPS12V, which seems more than adequate for future upgrades, and is backward-compatible with most of today's mobos, but it doesn't have active PFC. What do you think?

—MARK PENNER

At press time, nVidia had certified only three power supplies to work with SLI rigs, including this PC Power & Cooling Turbo-Cool 510 SLI.

SLI PSUs are a thorny issue. The Doctor has heard chatter that some supplies sporting SLI badges have not actually been certified by nVidia to carry the SLI logo. At press time, only three PSUs were SLI-approved by nVidia: PC Power and Cooling's Turbo-Cool 510 SLI and Turbo-Cool 850 SLI, and the Silverstone ST65ZF. We've actually run several test SLI systems using the original Turbo-Cool 510 Express, and even though it hasn't been approved, it works just fine. For more up-to-date info on a PSU's certification visit: www.nzone.com/object/nzone_sli_powersupplies.html.

suffering a heat-related crash. If you're running the stock cooler for the 2400+, you should try a fatter heatsink rated for the hotter proc.

On the off chance that your case can't keep up with the extra heat the 3200+ generates, run the system with the case open and a fan blowing in it to see if the case is simply overheating. If it is, you'll need to add additional fans to increase internal airflow, or simply upgrade to a new case.

It's also possible your system BIOS has the memory CAS latency set too aggressively. Open the BIOS, and lower the CAS latency settings to CL2.5 or even CL3. If lowering the latency yields no improvement, try clocking the RAM back to DDR333 to make sure the problem is not with your memory.

Finally, you should also see if SOYO has issued an updated BIOS for the board. This is a long shot, though, as the KT880 was introduced long after the Athlon XP 3200+ was available, so it's unlikely there's a BIOS problem.

I MUST HAVE MY DOOM 3

I recently broke the bank and bought some upgrades for my computer hoping to maximize my *Doom 3*, *Half-Life 2*, and other gaming experiences. I have a problem, though. I have an Asus A7N8X-E motherboard, an AMD Athlon XP 3200+, 2GB of memory, and a GeForce 6800 Ultra videocard. The system works fine; however, my frame rates in *Doom 3* suck! Testing with *Fraps*, I hit a high of 32fps (1024x768 with Ultra Quality and 8x AA). I figured this was a fluke, so I loaded *Unreal Tournament 2004* and got 150-plus frames per second with everything cranked up and running at 1280x1024! Is there something wrong with my settings? I read your review, and you guys got more than 80fps with this card and *Doom 3*. Please help me on this! I'll renew my subscription for five years if I can hit at least 80fps with *Doom 3*!

—DAVE HACKETT

Unfortunately, your performance in *Doom 3* will be limited by your CPU's slow performance. The Athlon XP simply lacks the horsepower that *Doom 3's* next-gen graphics engine demands.

For the record, when we test *Doom 3*, we run it at 1600x1200, 4x antialiasing and 4x anisotropic filtering, using the High Quality setting. The Ultra Quality setting is for cards with more than 256MB of video memory. By using the Ultra setting on a 256MB card, your card has to expend mucho effort swapping high-resolution textures in and out of video memory. However, even if you drop to High Quality mode, it's unlikely you'll see 80fps on your current system.

I NEED MY 3D

I own an nVidia GeForce2 MX 400 videocard, and I recently noticed that when I try to load any games off the Maximum CD (bundled with this magazine), it says I don't have a videocard. I can install games, but when I go to play them, I have no such luck. Is there any way to fix this?

—NICOLAS BEDARD

You're singing the my-videocard-is-too-old-to-play-this-game blues, Nic. The GeForce2 MX chipset lacks the programmable-shader support that's crucial to many of today's games. The good news is that you can get a decent videocard for less than $200. We recommend the GeForce 6600 series of boards for gamers on a budget. ■

SECOND OPINION

CALL IT VIRTUAL VOMIT SYNDROME

I've suffered from game-induced motion sickness ever since I first played *Wolfenstein 3D*. The problem occurs when your brain receives movement signals from your eyes, while your inner ear tells your brain that you're standing still.

I've found that the higher the frame rate, the more intense the nausea. So the solution is to crank up the visual quality settings and resolution to get that frame rate down. You should also disable any weapon bob effects. The constant motion of the weapon only makes the problem worse.

There are several alternative cures. Ginger is a good one. You don't have to chew the root though. You can get ginger capsules at health food stores, and I've had lots of luck with the new ginger-flavored Altoids. Ginger ale is less potent, but also works for some people. Ginger beer packs a lot more kick.

If ginger doesn't work for you, suck a lemon. Seriously, a shot glass of lemon juice seems to help some people, especially for those folks who find ginger ineffective.

The best news is that, while it's uncomfortable, you can build up a tolerance, to the point that you're no longer affected. I used to get hit hard back in the days of the 386 and the original *Doom*, but after a while the nausea and dizziness simply went away. New games and new camera techniques bring it back, but once you're on the road to recovery, it's generally slightly less problematic each time you play.

—DAN AMRICH

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—doctor@maximumpc.com

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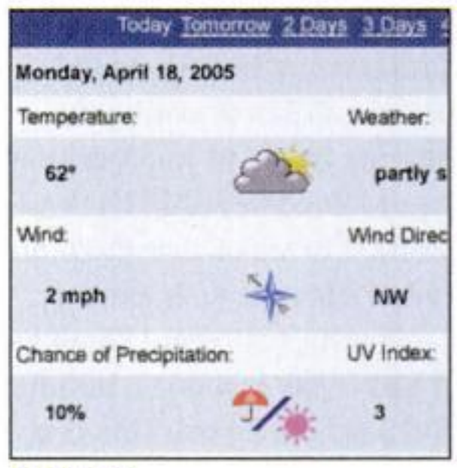

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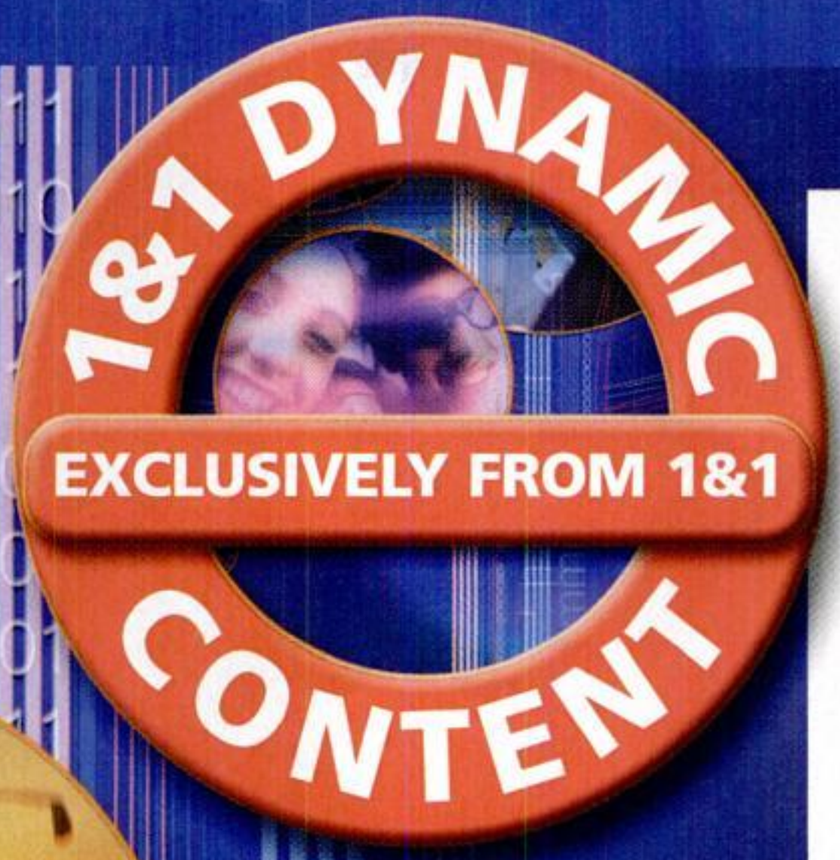

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MARKETING TOOLS		
Chat channels	1	1
1&1 WebStatistics	✓	✓
SITE-BUILDING TOOLS		
1&1 Dynamic Content Catalog	✓	✓
PDF2Web Converter	✓	✓
DynamicSiteCreator	✓	✓
Graphic archive	✓	✓
WebsiteCreator	12 pages	12 pages
Software suite worth $600	✓	✓
FrontPage extensions	✓	✓
CGI library	✓	✓
Active Server Pages	–	✓
DOMAIN NAMES		
Included Domains	1	1
Subdomains	10	10
Run multiple independent sites	✓	✓
Full DNS management	✓	✓
E-MAIL		
E-mail accounts w/ 1 GB space each	200	200
Aliases, auto-responders, forwarding	✓	✓
1&1 WebMail	✓	✓
Spam filtering for all accounts	✓	✓
Virus protection for all accounts	✓	✓
SECURITY FEATURES		
Protected by up-to-date firewall	✓	✓
Daily backups	✓	✓
Password protected directories	✓	✓
Dedicated SSL Certificate	optional	optional
SUPPORT		
24/7 phone support	✓	✓
24/7 e-mail support	✓	✓

– Linux packages – Microsoft packages

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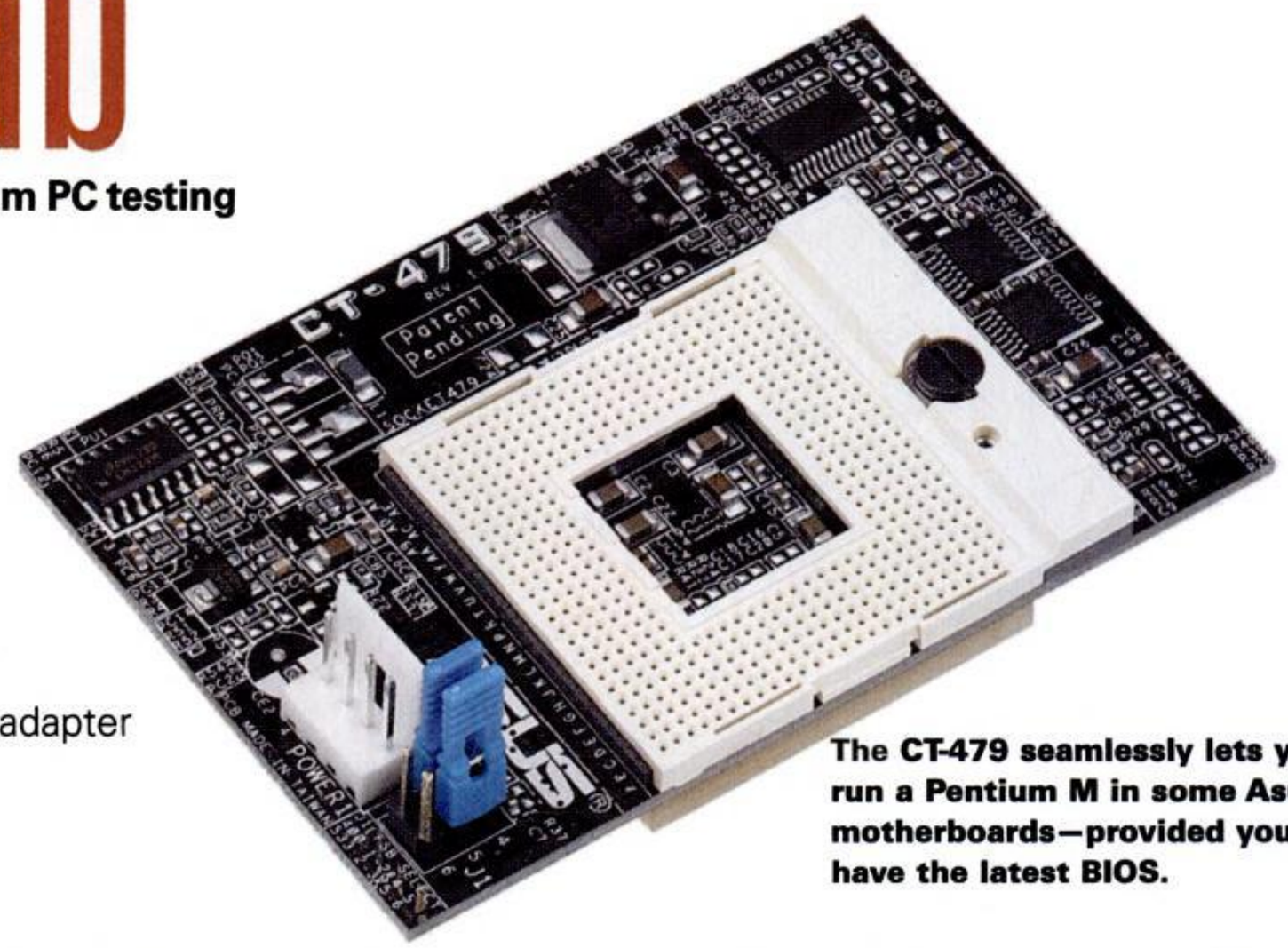
In the Lab

A behind-the-scenes look at Maximum PC testing

Teaching an Old Board New Tricks

Lab tested: Pentium M-to-Socket 478 adapter



The CT-479 seamlessly lets you run a Pentium M in some Asus motherboards—provided you have the latest BIOS.

Pentium M freaks who want to use Intel's mobile CPU in a desktop board have had a bitter pill to swallow: The only boards made to accommodate the mobile proc are micro-ATX. The micro-size version of ATX limits a user to a maximum of three PCI slots, and even worse, most of the Intel 855-based chipsets use the older ICH4M south bridge, which doesn't support SATA. Furthermore, Pentium M motherboards tend to be expensive because of the premium Intel charges for its mobile chipsets.

Well, Asus is aiming to change all that with its CT-479 adapter, which fits into Asus Socket 478 full-size motherboards and makes them Pentium M-compliant. Currently, only the Asus P4P800SE, P4P800-VM, P4C800-E, and P4P800-E Deluxe run with the adapter, but the company says future BIOS updates will enable all of its Socket 478 boards to support the CT-479.

The adapter is amazingly easy to use. Step one: Make sure your board is flashed with the latest BIOS to support the Pentium M. Step two: Plug your Pentium M processor into the adapter. Step three: Insert the whole package into your Socket 478 board. Because the adapter prevents you from using a standard Socket 478 heatsink, the CT-479 ships with a custom heatsink. It's not pretty, mind you, but the fan is more than you need for the low-wattage Pentium M.

We couldn't secure the newer 533MHz-bus version of the Dothan Pentium M, but we did get the adapter up and running in a P4C800-E board using Intel's 875P chipset and an older 2GHz Dothan Pentium M. We had to set the jumpers from 533MHz to 400MHz for our chip. Once that was done, we inserted the processor into the adapter and carefully plopped the package into our board. Unfortunately, our P4C800-E was a very early engineering sample board (No. 12, to be precise), which would only boot our 2GHz proc at 600MHz, even with the latest BIOS.

At 600MHz though, the adapter worked seamlessly as if we had any other Socket 478 CPU in place. Well, almost. The combination wouldn't let us change the CPU multiplier in the BIOS. This could either be a problem with the engineering sample board or a limitation of the adapter.

So why run the 875P chipset instead of 855? The 875P delivers the tech we demand from our mobos. While the 855 is stuck at 4x AGP, the 875P gives you 8x AGP. Whereas the 855 only runs DDR333, the 875P supports DDR400. The 875P also features Gigabit Ethernet direct from the north bridge for maximum performance. And the ICH5R south bridge offers both Matrix RAID and native SATA support .

Still, there is a weakness to using the adapter instead of an 855 motherboard: a lack of fan control. On the P4C800-E, for example, you have much less control over the system fans than you do with Aopen's i855GMEm-LFS. The Aopen board also gives you SpeedStep control over the clock speeds of the processor—something we couldn't touch on the P4C800-E. Nonetheless, the P4C800-E's overclocking abilities and other performance features far outstrip the 855 boards. All in all, it's not bad for $49.

Dual-Core Pentium on nForce4 SLI Intel Edition Update

Intel lovers face a serious dilemma if they want dual core and SLI on the same motherboard: Intel's 955 chipset doesn't do SLI, and it's been unclear whether nVidia's nForce4 will support dual core.

Well, we finally have dual-core info from nVidia. The company says dual-core support for the nForce4 SLI Intel Edition boards is an option that motherboard manufacturers can enable. nVidia says nForce4 SLI Intel Edition was designed to work with both single- and dual-core procs and should work fine, but final qualification is up to the motherboard maker. The only way to ensure that your mobo supports both dual core and SLI is to consult the manufacturer or check the product box. If the box has both the dual-core logo and the SLI logo, you should be set!

Intel, meanwhile, is "still examining dual-graphics capabilities for the 955X chipset."

Disc-It!

The days of having a desktop littered with piles of optical discs are finally over, thanks to an incredibly high-tech disc-retention device known as Disc-it! Here's how it works: Your optical discs slip onto a plastic pointy thing that holds them in place. It's ahead of it's time, we know, but at least it's compatible with traditional CD-R/RW, CD-ROM, DVD-R, and DVD+R media. And it of course supports modern dual-layer discs! It may even be compatible with next-gen formats—HD-DVD and Blu-ray discs, watch out! You can store up to eight discs per Disc-it, and the thingamajiggy is available in a wide variety of colors. It even has a non-skid bottom. But the best thing about the Disc-it is seeing people's expressions when you tell them it's one of your girlfriend's pasties. $5, **www.mydiscit.com**

Best of the Best

As of June 2005

This month, we switched from our long-time favorite case—the Silverstone Nimiz TJ03—to Thermal Take's Armor VA8000BWS case. The Armor doesn't have the sexy aluminum finish of the Nimiz, but it does feature liquid-cooling support, an optional BTX back plate, and a 120mm fan at the rear (the Nimiz sports dual 80mm). We're still in limbo on Pentium 4/Pentium D boards until we see more mobos with Intel's 955X chipset or nVidia's nForce4 Intel Edition. Finally, we have to point out that while the Radeon X850 PE is our top pick for a PCI-E card, that's just for systems that can't run SLI. Those with an eye toward dual videocards should consider nVidia's GeForce 6800 Ultras for top performance.

PCI Express videocard:
ATI Radeon X850 XT Platinum Edition

High-end AGP videocard:
nVidia GeForce 6800 Ultra

Budget videocard:
GeForce 6600 GT

Soundcard:
Sound Blaster Audigy 2 ZS Platinum

10,000rpm SATA:
Western Digital 740GD Raptor

7,200rpm SATA:
Maxtor DiamondMax 10 300GB

External backup drive:
Western Digital Dual-Option Media Center 250GB

Portable USB drive:
Seagate Portable External Hard Drive 100GB

DVD burner:
Plextor PX-716A

Widescreen LCD monitor:
Hewlett-Packard f2304

Desktop LCD monitor:
Dell 2001FP

Desktop CRT monitor:
NEC FE2111 SB

Socket 939 Athlon 64 mobo:
ASUS A8N-SLI Deluxe

Portable MP3 player:
Apple iPod 40GB

Photo printer:
Canon i9900

PDA:
Dell Axim X50v

5.1 speakers:
Logitech Z-5500 Digital

2.1 speakers:
Klipsch GMX A2.1

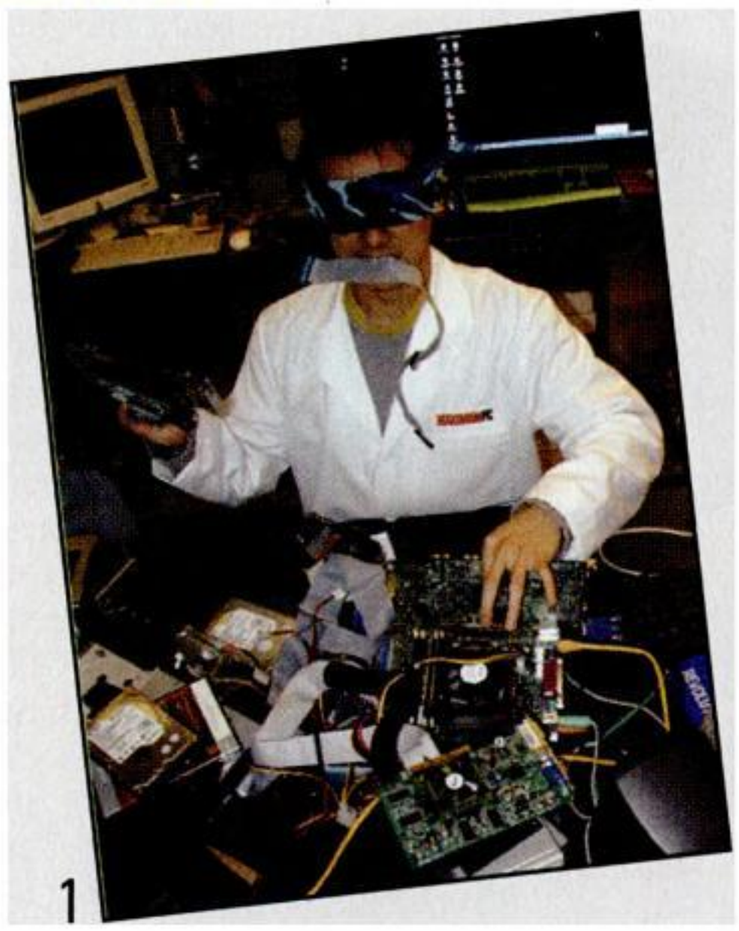
Mid-tower case:
Chenbro Gaming Bomb II

Full-size tower case:
Thermal Take Armor VA8000BWS

Our current gaming favorites: *Splinter Cell: Chaos Theory, Counter Strike Source, Psychonauts, World of Warcraft*

Benchmark Your Funny Bone!

Think you're funny, wiseguy? Do you have what it takes to challenge the formidable wit of Team Maximum PC? Now's your chance to find out! Here are three of the funniest panels from the Photo Funny archives. Add your own captions to each photo (make sure you keep them in order!) to tell a funny story, and e-mail your entry to input@maximumpc.com with "Photo Funny" in the subject line. The deadline is June 1. The best knee-slapper of them all will run in the August issue. Good luck!



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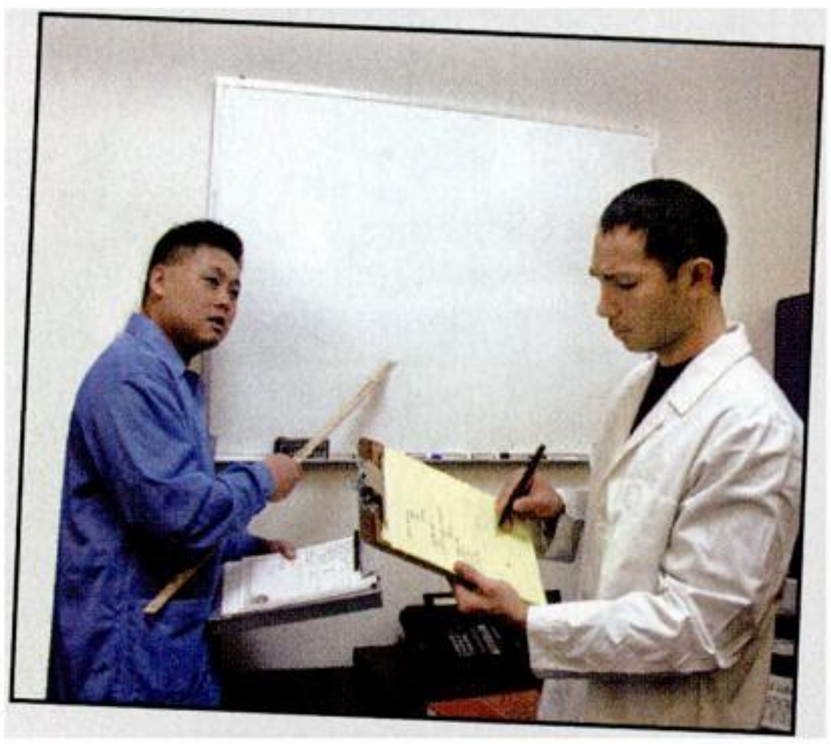

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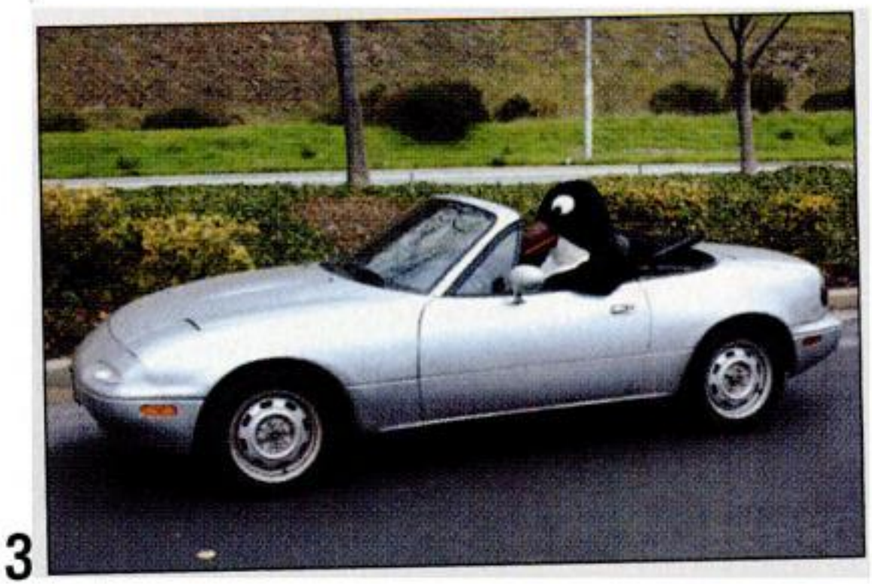


3

Polywell Poly 939N4-SLI

We'll take one gig of graphics memory, Alex

We're all for the 939N4-SLI's dual 512MB GeForce 6800 Ultra's in SLI mode, but this bargain PC needs a bit more pizzazz to garner a Kick Ass rating.

Polywell Computers specializes in reasonably priced custom PC configurations, so we requested the fastest PC the company could muster with the latest parts. The result: The Poly 939N4-SLI, which consists of some primo components stuffed into a decidedly generic case.

With new parts from AMD and Intel unavailable at the time of our request, Polywell built a system that's similar to our latest zero-point test beds, with a few exceptions. The most significant difference is that the nVidia GeForce 6800 Ultras in this SLI rig boast 512MB of memory *each*. Most everything else is *Maximum PC*-stock; CPU duties are handled by the familiar Athlon 64 FX-55 running at a stock 2.6GHz, plugged into an Asus A8N-SLI Deluxe motherboard (equipped with nVidia's nForce 4 SLI chipset). But while we splurged on our zero-points by packing them with 2GB of memory and an Audigy 2 ZS soundcard, the Poly is saddled with just 1GB of DDR400 (two sticks from Super Talent Memory) and the mobo's onboard RealTek ALC850 codec for audio duties.

We applaud Polywell's inclusion of dual 74GB Western Digital Raptors in a RAID 0 config. Unfortunately, a dearth of 3.5-inch drive bays in the mini-tower case—there are only four, with one occupied by a floppy—forced Polywell to stack these two hotty drives on top of each other. The two 50mm intake fans are insufficient for this storage sandwich—we measured ambient temperatures near the drives at 119 degrees Fahrenheit.

The 512MB per-videocard memory boost could give gamers a speed boost, but we're not convinced. Even the normally ebullient videocard vendors aren't promising performance gains from the 512MB cards. These cards' core clocks run at the same 425MHz as standard 256MB GeForce 6800 Ultras, but the memory clock is slower at 525MHz, compared with 550MHz on the 256MB boards.

Folks who want to augment the 138GB of storage—and we imagine there will be many—will have to buy adapters for the two open 5.25-inch drive bays. Curiously enough, Polywell's website shows a second dual 3.25-inch drive cage inside the case, but this was missing from the box we received. Of the two remaining 5.25-inch bays, one is occupied by a Sony drive that burns single-layer DVDs at 16x and double-layer media at 4x; the second bay holds a Sony CD-RW/DVD combo drive.

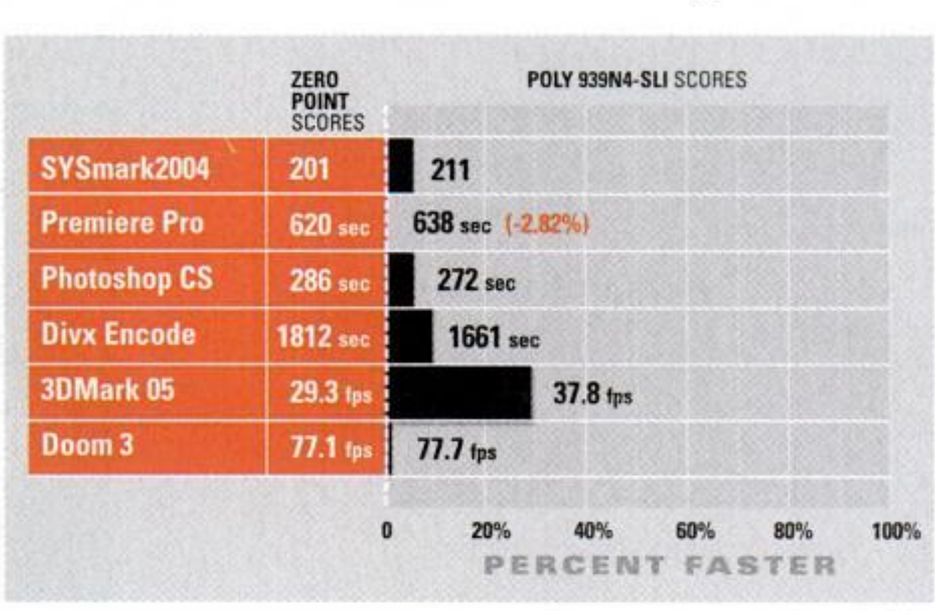
Performance-wise, the Polywell outran our zero-point system in every benchmark save one. It opened up just a small lead in *SYSmark2004* scores—211 compared with our zero-point's 201—but in *3DMark2005* Game 3, it trounced the zero-point by a whopping 29 percent.

Polywell's picks for motherboard, graphics, and mass storage leave us with little to complain about at this price point, and the decision to go with generic memory doesn't seem to adversely affect performance. But the absence of a dedicated soundcard, a shortage of 3.5-inch drive bays, and the EZ-Bake Oven hard-drive situation leave us a little cold.

—MARK BEHNKEN

UNDER THE HOOD

THE BRAINS	
CPU	AMD Athlon 64 FX-55 (2.6GHz 1MB L2)
Mobo	Asus A8N-SLI Deluxe (nForce4 SLI chipset)
RAM	1GB Super Talent DDR400 (two sticks)
I/O ports	6 USB (2 front, 4 rear), 2 FireWire A (front, rear), parallel port, PS/2 mouse and keyboard
LAN	Dual Gigabit LAN (nVidia and Marvell)
DISPLAY	
Videocard	Two nVidia GeForce 6800 Ultra 512MB cards in SLI (425MHz core, 525MHz DDR)
STORAGE	
Hard drives	Two 74GB Western Digital WD740GD (10,000rpm SATA) running in RAID 0 via nForce 4 south bridge
Optical drives	Sony DW-D26A DVD-RW, Sony CRX320E CD-RW/DVD-ROM combo
AUDIO	
Soundcard	Onboard RealTek ALC850 8-channel audio codec
Speakers	Creative Labs P7800 7.1 speaker w/subwoofer
FINE DETAILS	
Case	Polywell standard chassis, Sparkle Power 550W PSU
Fans/extras	120mm fan, 2 50mm fans, AMD reference CPU cooler, 3.5-inch floppy, Media Reader 7-in-1 internal drive
BUNDLE	
Windows XP Pro	
BOOT: 37 sec.	**DOWN: 22 sec.**



Our zero-point reference system uses a 2.6GHz Athlon 64 FX-55, 2GB of DDR400 Crucial Ballistix RAM, two nVidia GeForce 6800 Ultra cards in SLI, a Maxtor 250GB DiamondMax10, a Sound Blaster Audigy 2 ZS, a PC Power and Cooling TurboCool 510 Deluxe Express, and Windows XP Pro with SP2.

MAXIMUM PC VERDICT 7

HOT

Dual 512MB graphics boards in SLI; strong application performance.

NOT

Generic case, limited expansion, and hard drives that run way too hot.

$3,890, www.polywell.com

iBuyPower Gamer-X

The Gamer-X cuts through the price tags but can't dent the benchmarks

iBuyPower's Gamer-X can be had at a low price, but it'll cost you in performance.

After a few months of reviewing PCs equipped with bristling RAID arrays, SLI videocards, amazingly fast CPUs, and even the occasional luxurious 30-inch flat panel, iBuyPower's Gamer-X comes across as quaint.

You know how you feel after landing your F-22 Raptor only to learn that your ride home is a Sopwith Camel? That's how this rig makes us feel.

For instance, we were aghast that the Gamer-X sports just a single hard drive. It forgoes the standard RAID array, for a lone SATA Western Digital WD2500JD. Compared with eighth-gen Seagates and hecka-fast Maxtor drives, this garden-variety jumbo-buffer jobbie just doesn't turn our crank.

And after seeing so many SLI boxes recently, we were taken aback at the sight of a single videocard. We didn't realize they still make 'em like that! The videocard is a WinFast PX6800. With its core clocked at 325MHz and the RAM at 600MHz, we didn't expect it to set any speed records. At least it's of the PCI-E variety and not AGP.

The mobo is a questionable choice, as well. Asus' P5GDC uses Intel's 915P chipset and supports both DDR *and* DDR2 RAM in its six RAM slots. Four are dedicated to DDR while the remaining two are for DDR2. The budget-buyer's dream would be to run both types of RAM *simultaneously*, but the P5GDC rightly prevents you from trying this. (Any mobo running two types of RAM concurrently would suffer a severe performance hit.) The mobo supports RAID by way of the Intel ICH6R south bridge chip—but as we noted already, iBuyPower doesn't spring for the necessary second drive.

Fortunately, the P5GDC has enough features that you won't be wanting for hardware. It offers onboard FireWire, HD Audio-compliant sound, and gigabit Ethernet. And with the single-slot 6800 card, you get three PCI slots and two x1 PCI-E slots should you care to scratch any hardware itches. The board plays host to a new Intel Prescott Pentium 4 (with 2MB of L2 cache); it runs at 3.4GHz—two clicks off the top of the line. At least it supports 64-bit extensions and NX technology.

Performance-wise, the Gamer-X gave us what we expected: sub-par gaming *and* application performance. For instance, compared with our Athlon 64 FX-55 zero-point machine, the Gamer-X ran about six percent slower in *SYSmark2004's* application suite, 14 percent slower in Adobe *Photoshop CS,* and five percent slower in our Divx encode. But the Gamer-X was at its worst in our gaming tests, performing 57 percent slower than our SLI-equipped zero-point rig. The Gamer-X's only shining moment was in Adobe *Premiere Pro,* where it was 23 percent faster than our Athlon test bed, thanks to the program's Hyper-Threading optimization and P4-friendly code.

So what's good about the Gamer-X? Just one thing: the price. iBuyPower likely knows it can't take on the top-end boutique vendors—whose PCs cost as much as a car—so it has built a decent cheapo box. Unfortunately, we think iBuyPower missed the sweet spot, making too many sacrifices in the name of price.

—GORDON MAH UNG

UNDER THE HOOD

THE BRAINS	
CPU	Intel 3.40GHz Pentium 4 660 (2MB L2 Cache 800MHz FSB)
Mobo	Asus P5GDC
RAM	1GB Geil DDR400 (board supports DDR and DDR2)
I/O ports	6 USB (2 front, 4 rear), 1 optical SPDIF out, 1 coax SPDF out, 2 FireWire, parallel port, gaming port, serial port, 3 line out, mic-in, line-in
LAN	Gigabit Ethernet using Marvell Phy
DISPLAY	
Videocard	Leadtek Winfast PX6800 TDH
Monitor	Viewsonic VA712B 17-inch 8ms
STORAGE	
Hard drives	Western Digital WD2500JD (8MB cache)
Optical	Sony DW-D26A, 16x DVD-ROM
AUDIO	
Soundcard	Onboard HD Audio
Speakers	Logitech X-530
FINE DETAILS	
Case	NZXT tower with Orion XP400 PSU
Fans/extras	2 80mm fans, media reader
Mouse	Microsoft Intellimouse Explorer 4.0
Keyboard	Logitech Elite
BUNDLE	
Windows XP Home	
BOOT: 55 sec.	**DOWN: 13 sec.**

Our zero-point reference systems uses a 2.6GHz Athlon 64 FX-55, 2GB of DDR400 Crucial Ballistix RAM, two nVidia GeForce 6800 Ultra cards in SLI, a Maxtor 250GB DiamondMax10, a Sound Blaster Audigy 2 ZS, a PC Power and Cooling TurboCool 510 Deluxe Express, and Windows XP Pro with SP2.

MAXIMUM PC VERDICT 7

PIE

Super-low price.

PI

Second- and third-rate collection of components do not make a Maximum PC.

$1,595 ($1350 w/o display and speakers), www.ibuypower.com

Tascam VL-S21 2.1-Channel Speaker System

Budget speakers that can hang with the big boys

When Tascam contacted us about reviewing its $100 VL-S21 2.1-channel speaker system, we wondered if anyone at the company had read our reviews of cheap speakers lately. We stifled a chuckle and said, "Bring 'em on!" And, boy, are we glad we didn't dismiss these speakers out of hand.

The VL-S21s are marketed as inexpensive studio monitors, which means they're designed to be flat across the entire frequency spectrum. But Tascam claims the VL-S21s are also suitable for computers and MP3 players.

Tascam uses a flat-panel NXT transducer sandwiched in a 1-inch-thick steel panel for each satellite. A 5.25-inch subwoofer—housed in a standard medium-density fiberboard cabinet with three amps—handles bass duty. On paper, the amps look wimpy, sending a mere five watts RMS (0.06 percent THD) to each of the satellites and 15 watts RMS (0.3 percent THD) to the sub. In our tests, however, the sats got plenty loud, even with the puny amps. Apparently, the NXT transducers in each satellite don't require much power. The subwoofer moved a surprising amount of air, too.

We do have some minor gripes with the VL-S21s. The volume control is inconveniently located on the back of the subwoofer, and there is no headphone jack. Bummer. With our Audigy 2 set to its default output of 79 percent, we were able to turn up the amp to nearly max without experiencing any distortion. After setting the amp to about three-quarters volume, we used the soundcard's software volume control for further adjustments.

For music testing, we've been using the woofer-rattling bass drum track in Paul Thorn's "Fabio & Liberace" (from *Ain't Love Strange*) as something of an acid test for musical bass response. To our surprise, the lightly powered subwoofer delivered tight, clean bass. Next, we cued up Steely Dan's "Josie" (from *Aja*) to see how the satellites handle high frequencies—paying close attention to the crystalline chime. The speakers deliver a very wide sound field, with excellent stereo imaging.

The Tascam VL-S21 2.1-channel speaker system delivers more performance than we would ever have suspected from $100 speakers.

In our punishing games tests, the VL-S21s' bass response proved to be a little light in the loafers. The satellites gave us a tingly feeling in *Half-Life 2*, serving up everything from character dialog to machine-gun fire with crispy flair. The stomping footsteps of Striders and the reverberating thud of exploding grenades and heavier ordnance lacked just a little bottom. Cranking up the lower frequencies in Creative's software EQ helped some, but wasn't the whole answer. If we were evaluating these speakers solely on their musical performance, they'd rate a Kick Ass award, but they sit just shy of that when it comes to games.

—MICHAEL BROWN

MAXIMUM PC VERDICT 9

+ FLAT-PANEL
Vibrant speakers with an amazingly low price tag.

− FLAT-FOOTED
Just shy of Kick Ass bass response for games.

$100, www.tascam.com

Samsung Writemaster Double Layer DVD Burner

Can you hear it now?

With LightScribe disc-labeling drives showing up from BenQ and HP, it's understandable that you might overlook Samsung's 16x dual-format, double-layer Writemaster DVD burner. But that would be a shame, because if you don't feel the need to tart up your disc's label, the Writemaster's talents will be of particular interest to anyone building or upgrading a media center PC.

First, the basics. The Writemaster (we always sit up straight when we hear that name) was able to burn 8.3GB of data to a 2.4x double-layer DVD+R disc at 5x speed, for an impressive burn time of 23:03 (min:sec). That time is about five minutes shy of the Plextor's capabilities, but it's still well above average. Similarly, we burned 4.25GB of assorted files to a single-layer DVD+R disc in just 5:55 (min:sec)—spooky! Is that the number of the *other* beast?

We'd normally be beside ourselves with glee at this point, but the Writemaster let us down by refusing to overspeed any media other than 2.4x double-layer DVD+R, so we were limited to writing at 8x to 8x DVD+R media instead of 12x, and so on. DVD rewriting is a bit of a let-down as well; it's stuck at 4x even though 8x DVD+RW media is finally starting to appear. Finally, the Writemaster does not support bit setting, which some DVD+R/RW drives use to fool older set-top players into thinking the recordable discs are actually DVD-ROMs, to increase compatibility.

The Writemaster is bundled with the ever-reliable *Nero Express* from Ahead, but you don't get any fancy drive-tweaking software like you do from BenQ and Plextor. Nonetheless, this drive is one of the quietest on the market—even when writing at maximum speed to DVD! If you know how fast that disc is spinning in there—that would be stupid-fast, Wink—then you know this is no small feat.

Because optical drives should be seen and not heard, Samsung's super-hush Writemaster is a great fit for entertainment center PCs.

Quiet operation has been a welcome feature in Samsung drives for the last couple of years. And that's what really makes the Writemaster ideal for home-brew entertainment and media center PCs—unless you actually *enjoy* the sound of a gentle blow-dry during your movies.

—LOGAN DECKER

MAXIMUM PC VERDICT 7

+ S'MORES
Very fast double- and single-layer DVD+R writing; nearly silent operation.

− S'NORES
Cannot overspeed most disc formats; no power-user features.

$75, www.samsung.com

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~~$1,599~~ **$1,399**
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- **3-Year Limited Warranty**

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· 17" LCD Monitor (add $235)

~~$1,599~~ **$1,499**
Instant Saving *$100*

ZT PRO Gaming PC X6714

- **Intel® Pentium® 4 Processor 540 with HT Technology (3.20 GHz, 1MB L2 Cache, 800MHz FSB)**
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Small Formfactor Fisticuffs

Screw the Mac Mini! Build your own micro PC

Just when you thought small formfactor machines were getting boring, FIC and Aopen arrive to jazz up what's become a rather predictable category.

—GORDON "LEE HARVEY" UNG

FIC Piston

Neither boom box nor nuke, FIC's Piston is the wackiest small formfactor we've seen to date.

Built by the company that brought us the fabulous Condor SFF, FIC's Piston offers its own innovations in small-formfactor design. First, it's cylindrical, which makes it good for, umm, we don't really know what. Second, it features an integrated DVD decoder chip that lets you play DVDs or audio CDs without having to boot into the OS. This is a nifty feature, for sure, but on our unit, we had to manually select our video output mode every time—once set, the device should have remembered our selection. FIC said it was looking into the problem.

Building the Piston was easier than we expected, but that's only true if you buy a unit equipped with the optional optical drive. Wrestling the drive into these cramped quarters would be a bitch. As it is, we struggled to install the PCI Express videocard, thanks to a tight-fitting power cable. The Piston has only enough room to fit medium-powered single-slot PCI-E cards, so don't expect to jam a 6800 Ultra or x850 into the Intel 915G-based box.

The Piston's biggest downfall is its nonstandard shape. A cylindrical case just isn't convenient. You can't stack anything on the unit, and the plastic rod on the PC's underside that keeps the case from rolling off your desk and down the stairs is flimsy. Plus, the Piston runs extremely hot, trading cooling-solutions for quiet operation, and it is indeed quieter than other Pentium 4 SFF boxes we've seen recently.

Unfortunately, unlike FIC's Condor, the Piston's unique design doesn't appear to offer any real-world benefit.

Piston

MAXIMUM PC VERDICT 6

+ BEER

Integrated TV tuner, "instant-on" DVD, built-in speaker.

– BEER BELLY

Odd shape, tight fit for videocard, no additional add-in card slot.

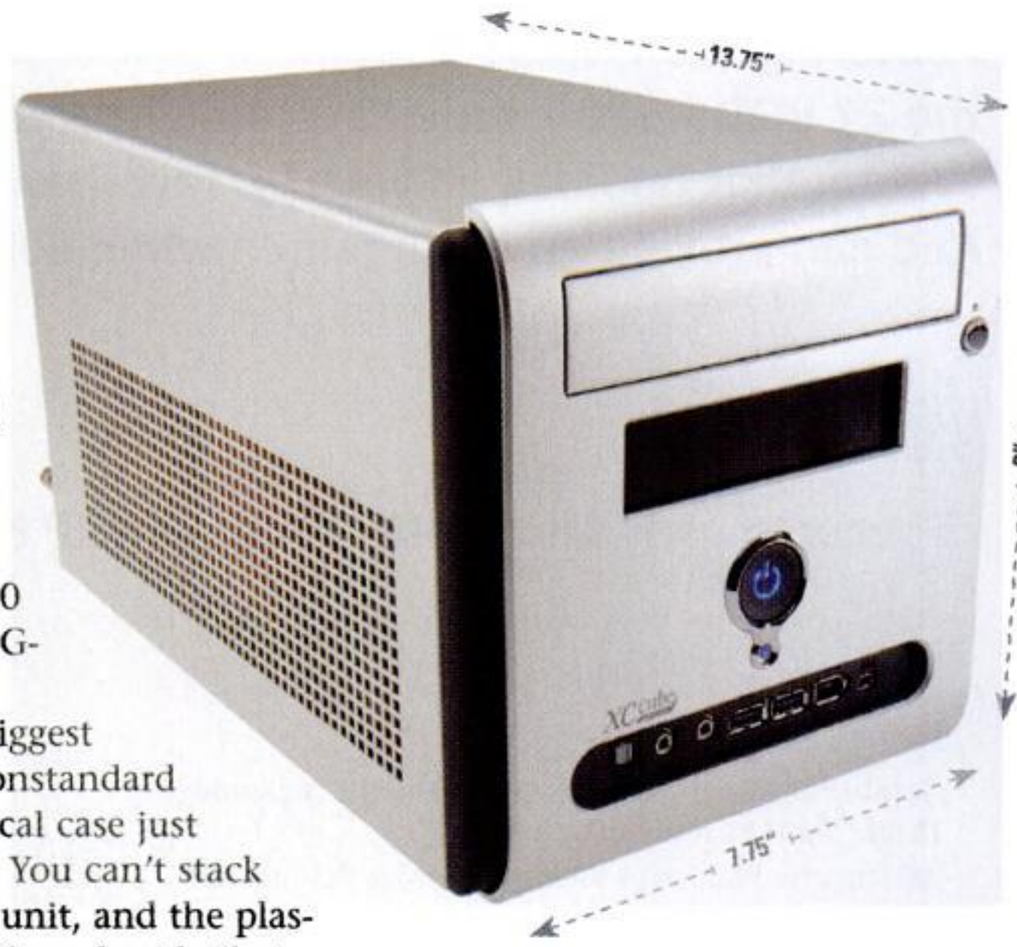
$500, www.fica.com

The FIC Piston looks like a bomb, but it doesn't make much of an impact.

Aopen EY 855-II XC Cube

In the last few months, small formfactor PC's have found themselves on a collision course with modern computing. Can SFF manufacturers manage the temperatures of today's hot components, while maintaining a reasonable quietude?

Up until now, we haven't seen small formfactor machines that offer truly silent operation. But leave it to Aopen—the first company to introduce a "hybrid" desktop mobo using the Pentium M CPU—to do the same with its EY 855-II XC Cube. Like the Aopen mobo we used in our February 2005 "Silent PC" howto, the XC Cube runs on an Intel 855 chipset with integrated graphics. Of course, you can ditch the onboard graphics for an AGP card.



***Shhh*, the Pentium M in the Aopen XC Cube lets you chew code without the processor din.**

If you're shocked at the prospect of using old-school AGP technology, stop reading here, because the XC Cube only offers a 4x AGP port. What's more, the board lacks support for SATA drives, and RAM is limited to DDR333.

The EY 855-II's strong suit is its silence. Though it's a tad loud when running a 7,200rpm drive, with a 5,400rpm drive the machine runs silent—even under a full load.

Should power users even consider Pentium M and an 855-based box? If you're more concerned with raw power than noise, you shouldn't. The XC Cube is better suited to filling the role of unobtrusive PC. With a 5,400rpm hard drive and onboard graphics or a fanless AGP card, the XC Cube is as quiet as an SFF gets.

Who knows? In time Aopen may integrate Intel's PCI-E Pentium M chipset with a SFF design.

EY 855-II XC Cube

MAXIMUM PC VERDICT 7

+ JELLO CUBES

Pentium M, baby!

– CUBICLES

No SATA, and limited to DDR333 and AGP.

$320, www.aopen.com

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ON NEWSSTANDS MAY 31, 2005!

Accordance ARAID 2000

A cagey device that protects your data

The ARAID is hot-swappable, so with Windows running you can slide a drive into the second bay and have a fully functional RAID 1 array.

The ARAID 2000 is a two-drive RAID enclosure for either SATA or PATA drives that occupies two 5.25-inch internal bays in your PC. Each drive is housed within a lockable, removable tray. With the drives screwed into the trays, you insert the trays into the enclosure and lock each shut with the turn of a key. You'll need the right type of trays for your drives—they're available in both parallel ATA and Serial ATA formats—and the entire enclosure connects to your PC using a single PATA or SATA cable. In operation, it functions like a hot-swappable RAID 1 array that's always ready for action.

Here's how it works: You put your bootable drive in the top bay, then connect the enclosure to your PC using either a PATA or SATA cable. Upon boot, the PC recognizes your hard drive as if it were directly connected to the mobo. Once the system is up and running, you simply insert the second drive into the bottom tray and it begins to copy everything from the first drive. Once the copying operation is complete (it transfers about 30GB an hour), you have a fully functioning mirrored RAID 1 array. This is really, really cool—using a typical RAID controller, you'd have to wipe both drives and start over from scratch to set up a RAID 1 array. Alternatively, you can run the unit in "single drive" mode, and Accordance tells us that RAID 0 support will also be offered via a firmware update by the time you read this.

The only major downside to the ARAID 2000 is noise. The internal 70mm fan is way too loud. It's louder than a CPU cooler, which is ridiculous. Also, the SATA host adapter degrades performance. In *HD Tach*, we saw average seek times on our test drive drop from 13.2ms to 18.4ms when run from the ARAID. Read times also dipped a smidge from a maximum average of 52.3MB/s to 49MB/s. Performance felt the same, but benchmarks showed otherwise.

Despite these two flaws, there's not much to really criticize here. The ARAID delivers on all its promises and is a slick and easy way to add data redundancy to your current rig, if you can stomach the price tag.

—JOSH NOREM

MAXIMUM PC VERDICT 8

+ RAID 1

Easy to use; best way to add RAID 1 to your system.

– POLICE RAID

Fan is too loud; slightly diminished performance.

$370, www.accordancesystems.com

Cooler Master Praetorian 730

The vaunted Wave Master gets a face-lift

MAXIMUM PC KICK ASS PRODUCT

The new Wave Master boasts subtle design changes geared towards improved airflow and cooling.

You know you're a hardcore geek when you begin reminiscing about the good-ole days you spent with an ATX enclosure, but it happened this month when the Praetorian 730, aka the Wave Master 2, arrived in the Lab. As successor to the beloved Wave Master, the silly-named Praetorian has big shoes to fill, but it largely succeeds in improving the formula.

Although the front bezel has undergone some cosmetic change, the interior of the case remains basically the same as the previous design. A thick aluminum door now spans the front of the case from top to bottom. Its winged design allows ample airflow, an improvement over the original Wave Master. Behind the door are four 5.25-inch bays, two external 3.25-inch bays, and a 120mm intake fan covered by an easily removable mesh grille with an air filter.

The Praetorian 730 also features a revamped exhaust scheme. Instead of relying on just a single 80mm exhaust fan, two of these suckers now blow hot air out the back of the case. Cooler Master also added a small plastic shroud over the CPU area, but if you're using a tall aftermarket heatsink/fan combo, the shroud might prohibit the case door from closing. Top-mounted USB, FireWire, and audio jacks are unchanged from the previous version, and the power, reset, and activity lights have fortunately been relocated to the top of the case as well, allowing easy access to all.

Sadly, Cooler Master didn't add a tool-less drive-mounting system to its newest offering. The Praetorian's internal drive bays require screws for mounting. Sure, screws provide the most secure mounting option for optical and hard drives, but we'd rather have the convenience that a tool-less mounting mechanism provides.

We dig the newly redesigned Wave Master. Its improved airflow scheme is a big plus, and while we'd prefer a more modern tool-less design for the drive bays, it's still a mid-tower any of us would be proud to own.

—JOSH NOREM

MAXIMUM PC VERDICT 9

+ BEZEL

All-aluminum construction, removable mobo tray, and superb cooling.

– BEELZEBUB

Screws required to mount drives, and interior can get a little cramped.

$160 ($150 for silver), www.coolermaster.com

Wi-Fi Router Rhumba

We would so hate to be a mere turbo G router now

Generally speaking, high-speed wireless has always been a contradiction in terms. And while the chipset muckety-mucks have long touted the promise of truly fast wireless networks, the results we've seen to date have been disappointing at best—and infuriating at worst. So-called 108Mb/s 802.11g routers almost never reach speeds above 30Mb/s in real-world use, and many don't even meet the speed claims of old-school 802.11b, at range.

That's why MIMO (multiple input, multiple output) routers are such a breath of fresh air.

—ROBERT STROHMEYER

Linksys WRT54GX

The WRT54GX is the second MIMO router we've tested at *Maximum PC*. It also represents a second-gen application of Airgo's MIMO wireless chipset, which has vastly improved since the technology's debut in Belkin's Pre-N router late last year.

MAXIMUM PC KICK ASS PRODUCT

MIMO routers get better range and speeds than conventional Wi-Fi by sending at least twice as much data—often three times as much—at once, using an unconventional multi-path technique. Rather than fighting line-of-sight interference through sheer power output alone, these routers use difficult terrain to their advantage, bouncing signals off of walls and other interfering objects in a way ordinary routers can't, without sacrificing throughput.

Unlike Belkin's Pre-N, Linksys' MIMO really delivers. It not only extends range beyond all the clutter and chaos of our signal-rich office environment, it does so at speeds approaching conventional wired networks. In our battery of file-transfer tests, the WRT54GX produced real-world speeds of up to 43.2Mb/s at point-blank range, dropping to 34.1Mb/s at 100 feet. Of course, to get numbers like these you'll have to use Linksys' accompanying PC Card adapter rather than your notebook's built-in Wi-Fi. But if performance is critical—and you know it is—it's worth the expense.

In addition to making the WRT54GX wicked-fast at longer ranges, MIMO easily overcomes the hassle of speed-throttling when slower devices join your network. Because MIMO uses multiple transceivers, it can handle two different standards at the same time without slowing down the whole network. The upshot is that your grandma's ancient 802.11b PowerBook won't drag your high-speed network down to b-speeds every time she logs on to check her e-mail.

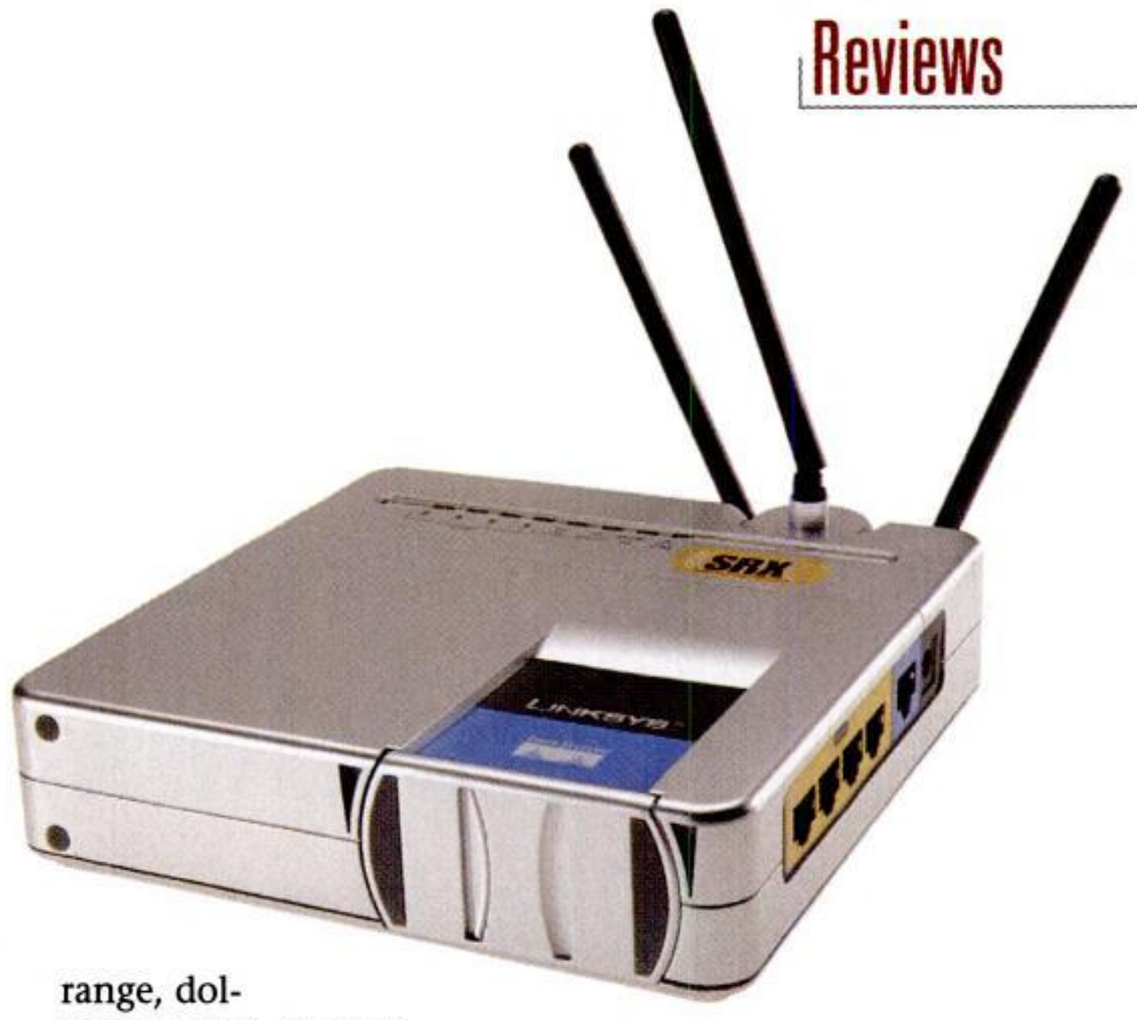
Our only real beef is that when the IEEE ratifies the final 802.11n spec next year, this router will be as obsolete as the 802.11g and b routers.

US Robotics USR 5461

Arriving late to the turbo-G party, the US Robotics USR5461 Wireless MAXg Router is a case study in mediocrity. Sure, it's pretty fast with point-blank speeds of up to 27.9Mb/s. But so what, really? Linksys, Netgear, and D-Link each offer a turbo router that does at least that, for about the same price.

A year ago, we'd have wet ourselves over the MAXg's performance. Its Broadcom BroadRange chipset even holds onto signal strength admirably at maximum range, doling out data at up to 22.6Mb/s from 100 feet away in our tests. But what this router really does best is illustrate the impending doom of turbo 802.11g. Incremental speed enhancements like these just don't cut it as we stand perched at the edge of a major wireless standards overhaul, and the MAXg presents no compelling case for an upgrade from your existing Wi-Fi hardware.

Don't get us wrong. If you're looking for a cheap, dependable workhorse router, the MAXg can do the job without sapping your wallet. But you deserve better, and we know it.



Like a pose-able action figure, the Linksys WRT54GX MIMO router bends to your will.

US Robotics USR 5461

MAXIMUM PC VERDICT 7

+ NEMO THE FISH

Holds onto its performance, even at range.

– NEMO THE CAPTAIN

If you're gonna upgrade your Wi-Fi, why not go MIMO?

$60, www.usr.com

Conventional wireless never looked so... well... conventional as it does in the US Robotics MAXg.

Linksys WRT54GX

MAXIMUM PC VERDICT 9

+ MIMO

Faster than some wired networks, even at long range.

– FUGU

Its MIMO mode isn't 802.11n compliant.

$160, www.linksys.com

DARE to COMPARE: Wi-Fi Routers

	0 FEET	100 FEET
Linksys	**43.2Mb/s**	**34.1Mb/s**
US Robotics	27.9Mb/s	22.6Mb/s

Best scores are bolded. Our wireless test is run by transferring a 707MB MPEG-4 video file from a PC hardwired to the router to a wireless machine.

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Xitel SoundAround

2 + 1 does not equal 5

Before we listened to Xitel's SoundAround, we thought any device or software that promised to deliver true surround sound from two speakers was digital hokum. The SoundAround has done little to change our opinion.

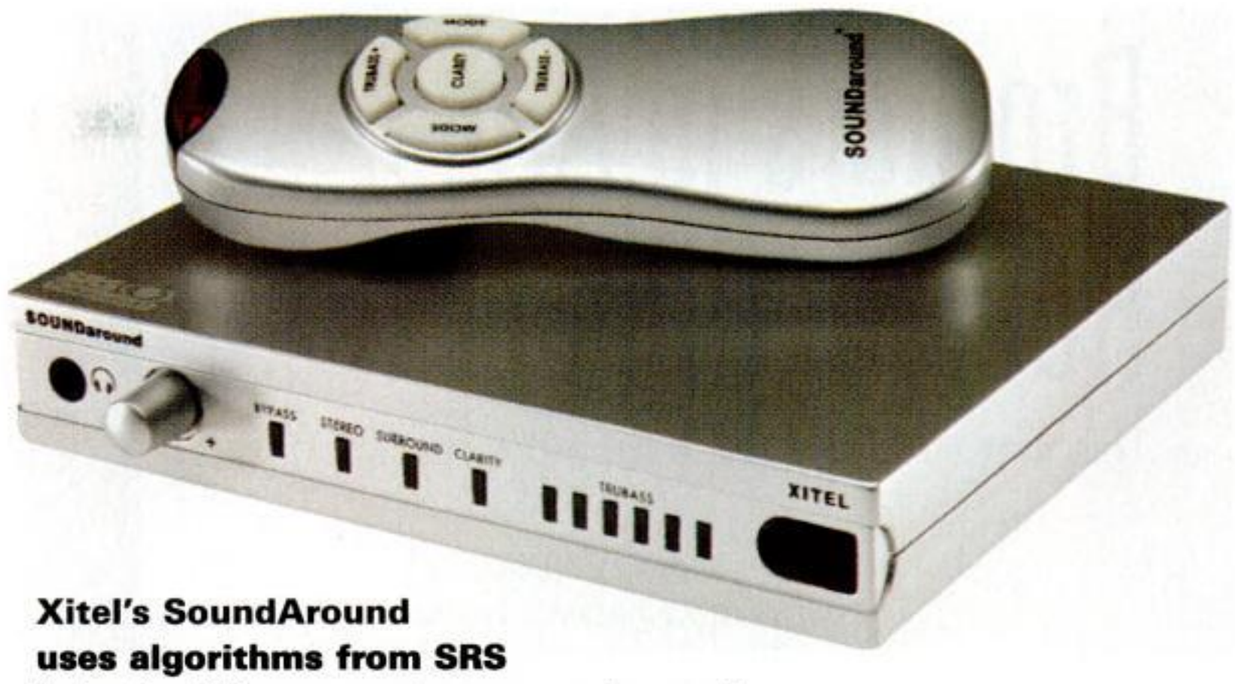
Xitel makes some big claims of its $100 device, plastering a logo on the box that reads "5.1 from 2." Although that's clearly overstating the device's capabilities, the SoundAround isn't total crap. It does make DVD movies and games sound a skosh better. Does it make even a 2.1-channel system sound like 5.1 channels? Not in the least.

Here's the lowdown: As an analog audio signal passes through the SoundAround to your powered speakers, it's processed by a suite of algorithms, collectively known as TruSurroundXT, from SRS Labs. (Incidentally, if you're using your PC to watch DVDs, you'll get the exact same algorithms with InterVideo's *WinDVD* software). We tested the SoundAround with our new favorite low-end speaker system: Tascam's VL-S21 (reviewed on page 70 of this issue).

There's a headphone jack with volume control on the front of the box, and a switch on the back allows you to customize the audio processing for small, medium, or large speakers. All other effects can be adjusted using a wireless remote control.

The SoundAround has three modes: Bypass, Stereo, and Surround. Bypass mode, as you've probably guessed, does nothing to the signal. Stereo mode engages SRS' TruBass algorithm to beef up lower frequencies. Used judiciously, TruBass does indeed enhance the bass; but in our tests, bumping it up more than two (out of six) notches just turned the subwoofer's bass into mush. The effect might be more useful with a 2.0-channel speaker system.

Surround mode activates TruBass and SRS' TruSurround algorithm, which delivers "virtual" surround sound over a two-channel audio system using any multichannel audio source. You can also toggle SRS' Dialog Clarity algorithm, which attenuates the frequency range occupied by human voice. In our tests with both movies (*The Matrix*) and games (*Half-Life 2*), "surround sound" proved to be much too big a promise for the SoundAround to deliver. The device considerably expanded the audio sweet spot, but it did absolutely nothing to position audio events in a 3D space. Activating Dialog Clarity, meanwhile, just made voices sound grating.



Xitel's SoundAround uses algorithms from SRS Labs to deliver pseudo-surround sound from 2.0- and 2.1-channel speaker systems.

If you're desperate to improve your PC audio experience, we'd recommend upgrading your speakers before investing in a device like this.

—MICHAEL BROWN

MAXIMUM PC VERDICT 5

GOOD VIBES
Expands audio sweet spot using just two speakers.

DR. PHIBES
Fails to deliver on its surround-sound promises.

$100, www.xitel.com

Logitech MX518

This variable-sensitivity gaming mouse will tickle your fancy

Using a hyper-sensitive gaming mouse can be both a blessing and a curse. Sure, having lightning-quick turn speed and pixel-perfect accuracy are great in a hot-'n'-heavy deathmatch, but when you're sniping, 1,600dpi is just too twitchy. For the best of both worlds, Logitech's new MX518 lets you change the resolution on the fly using two hard-wired buttons.

Here's how it works: The two buttons above and below the MX518's scroll wheel control the mouse resolution. Press the button above the wheel, and the sensitivity and mouse speed increase. Press the button below the wheel, and the sensitivity decreases, netting you finer control over mouse movements. The mouse ships with three presets—400dpi, 800dpi, and 1,600dpi—that work all the time, even if you haven't installed Logitech's mouse drivers. If you install the drivers, you can reconfigure the sensitivity settings to better suit your needs.

Getting this to work in games takes a little tweaking, but the benefit is huge, especially in games that include vehicles. We recommend setting your in-game mouse sensitivity with the mouse set at the highest resolution you plan on using. Then you can crank the resolution down for extremely accurate movement when you're sniping or flying an aircraft. In fact, the lower resolution provides more precision with the inaccurate weapons in games such as *Brothers in Arms* and *Battlefield: Vietnam*.

Logitech also improved the MX518's feet. Instead of the usual Teflon-footpads, this rodent sports new shoes that use an even slicker substance. The result? Silky smooth movement when paired with a gaming mousepad.

No, those aren't bullet holes; the Logitech MX518's surface decal is covered with nifty 3D-looking indentations.

Of course, you might be wondering why Logitech would go with a traditional optical design instead of the laser design they debuted in the MX1000. The answer is simple: Many gamers don't dig the "floaty" feel of the laser mouse. Because the only laser mouse released to date is the wireless MX1000, it's impossible to tell if the float we felt on that mouse is the result of the laser sensor or the wireless connection. Regardless, we're fond of the multitude of options that the MX518's selectable sensitivity gives us.

—WILL "TUF-E-NUF" SMITH

MAXIMUM PC VERDICT 9

DONUT HOLES
Adjustable sensitivity sans drivers rocks. Feet are super smooth.

BULLET HOLES
The sensitivity buttons are small and difficult to use.

$50, www.logitech.com

Brothers in Arms: Road to Hill 30

This war suddenly got a lot more realistic!

Those boys up ahead aren't lying down on the job, they took a few shots when they charged non-suppressed Germans.

Dear Mom and Dad,

Sorry I haven't written in a while, but the Germans have been fighting us tooth and nail, and I just haven't had a chance to sit down and write. Hopefully, I'll be able to write more often in the future, at least if my hand doesn't get blown off like old Jonesy's!

So, here's the latest update: Last week we were supposed to sky dive into this certain part of [redacted], but instead we landed in [redacted]. We've spent the last seven days trying to make it to [redacted] where we should be able to regroup with our platoon. Since we dropped in, the fighting has been nonstop. I don't know if I'm suffering from shell shock, but it's getting much harder to hit the Germans. I have to really take my time and aim to make each shot count. My squad mates tell me this is more "realistic" than the fighting I've done before, and I sure believe them! Apparently I'm doing something right, though—the lieutenant just promoted me to squad commander!

Now that I have two squads under my command, I have to take a more strategic look at the battlefield. I'm using one squad as a fire team—they pin down Gerry with suppressing fire. Once the soldiers are pinned down and unable to return fire, I can send my assault team around the enemies' flank, letting them pounce on the unsuspecting Deutsch-heads and obliterate them with grenades or small arms fire. It's a simple formula, really, but it applies to every single encounter we have here in the battlefield. It doesn't matter if I'm commanding soldiers, tanks, or a mix of both, I always have to pin them down and flank them. Even though the suppression/flanking maneuver is the smart thing to do, it's already become a bit repetitive. Sometimes I just want to send the assault team right up the middle of the battlefield!

Aiming and shooting is made extra difficult by the blood and dirt that splatters all over my glasses. If only there were some sort of laser surgery that would correct my poor vision!

My other gripe about command is that the boys in my squad are a little dim. I never noticed it before I took over, but they need to be told everything. When I give a simple order—for example, "Shoot at that [redacted]"—these guys can't even move to a spot where they'll have a clear shot. They just stand around with their hands in their pockets yelling, "I can't shoot there Sarge!" When that happens, I have to order them to move to a new spot so they will have a shot, even if it's only three feet! Luckily, my boys heal really fast. If a guy goes down during one mission, he's right back beside me at the start of the next.

While my boys are busy suppressing and flanking, I usually settle down behind some cover and try to take out a few Krauts myself. These Germans might be a bit misguided, and their leader is [redacted], but they're damn good soldiers. They're difficult to kill when not suppressed, and they use cover effectively. Although I hate them and want to kill them all, I'd go so far as to say they're the smartest battlefield opponents I've ever faced (just don't let my CO hear this!).

Maybe the Germans are so hard to kill because the only weapons we're equipped with are typical Army gear—government-issue crap! The only way to actually shoot a German is to steady my aim by crouching down, then drawing a bead on the guy using my gun's iron sights.

I'd better sign off. The first nine days of this war have been hell; hopefully it will get better in time. We're shipping out to [redacted] on [redacted]. Thanks for the care packages and tell Mary Jo I miss her! Tell her I can't wait to get back home so she can [redacted].

—MATT "JOSH NOREM" BAKER

MAXIMUM PC VERDICT 9

+ SUPPRESSING FIRE

Tense gameplay, very realistic, and commanding squads is fun.

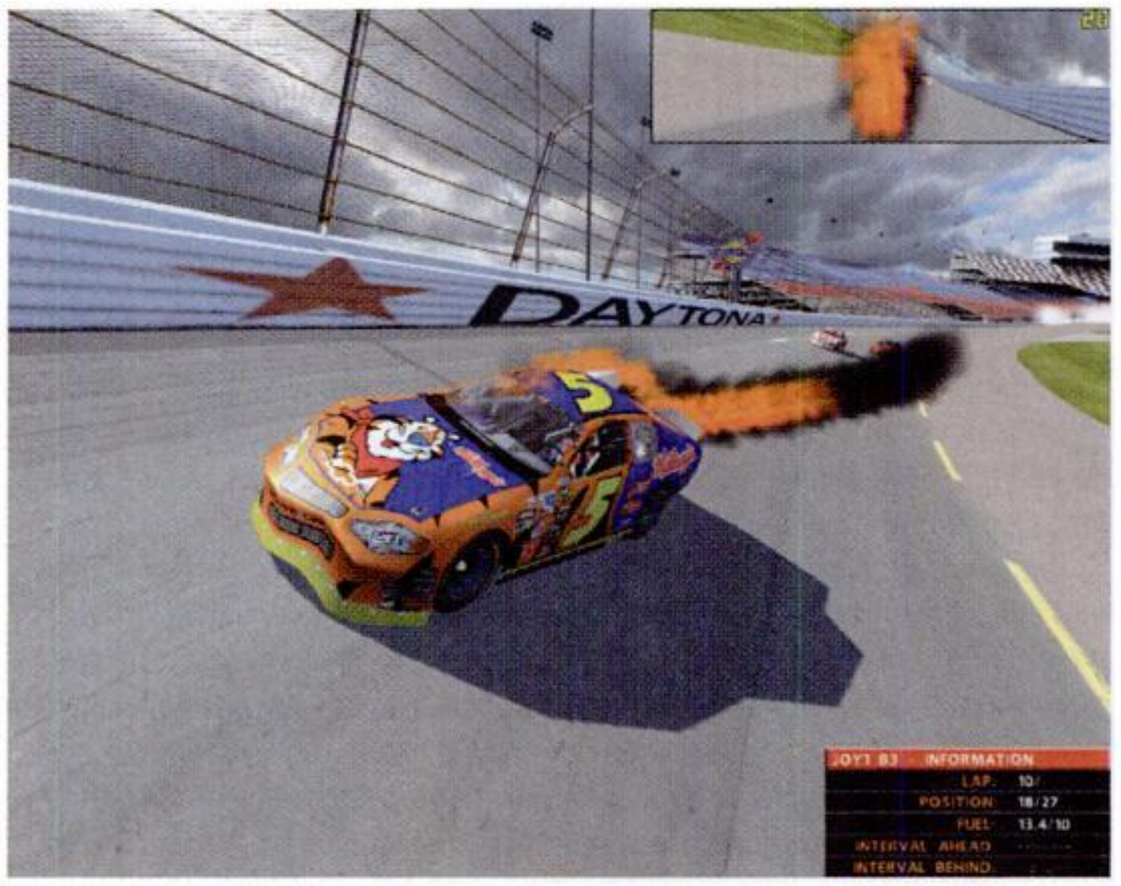
− ENGULFED IN FIRE

Almost too realistic, squads need micro-management, and dead squad mates come back to life.

$50, www.ubi.com, ESRB rating: M

NASCAR SimRacing

EA makes a right turn into the realism pit, but doesn't leave out the fun!



You probably should have listened to your pit boss and not tried—again—for "just one more lap."

If you think about it, it's absolutely astounding that a motor sport in which drivers pretty much only turn left can be as popular as NASCAR is today. It's even more impressive that a game that simulates the sport on the PC can be as engrossing as *NASCAR SimRacing* is.

SimRacing is big and brash, and it brings a new level of realism to the track that gear heads will relish. The game boasts 25 official NASCAR circuit tracks (plus three fictional tracks) and some five dozen rides and drivers spanning the three prominent NASCAR series: Craftsman Truck, Nextel, and National. The tracks look resplendent, with real-time weather effects and grandstands brimming with enthusiastic fans. Add stellar sound—particularly if you have a decent 5.1 speaker system—and it's like you've got a driver's eye view of the Daytona 500.

The cars look and behave realistically as well, with believable handling characteristics and even some damage modeling, although we would have preferred the latter to be more developed, and we would have liked more realistic driver AI. As it is, the AI drivers are eerily precise, and crashes among the computer-controlled cars are infrequent. Maybe next year....

The strong career mode starts you off in the Truck series and lets you work your way up, one race at a time, to the big show—the Nextel series. Good performance will conjure sponsorship opportunities, and more sponsorship money equals faster cars to play with. Grease monkeys will savor the garage mode, which lets you tinker with every conceivable facet of your car.

While the AI is good, live opponents are much more challenging. You can race against up to 42 human drivers online via EA.com or LAN. In test races with more than 20 other drivers, plus a few AI-controlled cars, the game played well, with minimal warping. Of course, you'll need a broadband connection.

Overall, *SimRacing* might not be as deep as Papyrus' NASCAR games, but it bridges the gap between arcade and hardcore simulation better than any game we've played before.

—STEVE KLETT

MAXIMUM PC VERDICT 8

+ CORVETTE

Stellar visuals and sound, solid physics, good use of NASCAR license.

− PINTO

AI quirks, minor graphic bugs, and a cumbersome interface.

$40, www.easports.com, ESRB rating: E

TrackIR 3 Pro

Look, Ma—no hands! Better view-control for sims has arrived!

It may not be fashionable, but the TrackIR 3 with Vector Expansion will help improve your game.

Turn your head, turn your field of view. That's the promise of the TrackIR 3 Pro. It connects to your PC via USB and sits atop your monitor. From there it uses infrared sensors to track the movement of a reflector that you clip onto your hat, then translates your movements into data your games can parse. The games can use the movement data to control your field of vision in games—just like you'd use your mouse to "look around" in an FPS.

The benefits of hands-free view controls are obvious to flight simmers: Just move your head to look wherever you want from the cockpit. It's a much more immersive and intuitive method than using a hat switch. The system is equally useful in racing sims, such as *NASCAR SimRacing*, and it's even applicable to some FPS games (such as *WWII Online*).

The catch is that developers must include support for the TrackIR in their games so you can use the device, and said support is spotty—particularly for the full six degrees of freedom (6DOF) the TrackIR 3 Pro can support when used with the Vector Expansion upgrade ($50).

Most "TrackIR Enhanced" titles support only two degrees of freedom, which means up/down and left/right field of view. This is fine for tracking a bogey, but full 6DOF support lets you also lean forward for a close-up look at the cockpit (or dashboard) dials, and lean to the left or right to peer out of the cockpit while taxiing (or lean into a turn in *SimRacing*). While only a handful of games—including *SimRacing*—currently support 6DOF, more are reportedly on the way (see **www.naturalpoint.com/trackir/games** for an up-to-date list).

It can take a few hours of training to get the hang of the TrackIR 3 Pro. You've got to keep your head steady and move it only when you want to change your view. And it can take some time to find the ideal positioning and software settings (the control software interface is cumbersome, and there's no printed manual).

If you're a sim-head, the reward is well worth the effort. Heck, even the TrackIR 3 Pro's limited 2DOF mode is worth its price of admission—if your favorite sim is on the list of supported titles, that is.

—STEVE "GOOSE" KLETT

MAXIMUM PC VERDICT 8

+ TALLY-HO!

Much more intuitive and immersive than traditional view-control methods.

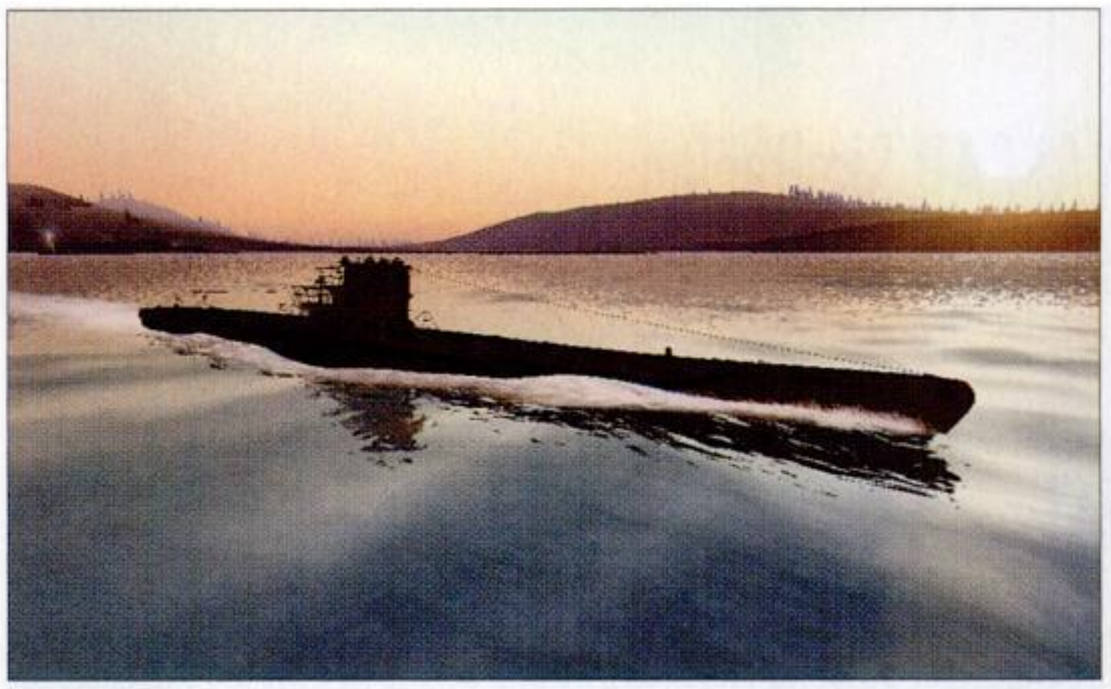
− CHECK SIX!

Tricky to set up properly, and support in games is spotty.

$130, www.naturalpoint.com

Silent Hunter III

UbiSoft rules the deep with one of the best simulations of 2005



***Silent Hunter III's* lush water effects caught our eye, but the incredible sim gameplay is what held our attention.**

Immersive, atmospheric, enthralling—pick an affirmative adjective and it'll likely stick to UbiSoft's *Silent Hunter III* like a magnet to steel. In fact, this WWII U-boat simulation is *so* good it could single-handedly rescue the long-floundering simulation genre.

Delayed for six months so the UbiSoft Romania development team could add a full dynamic campaign, the refit was well worth the wait. *SH3* maps the entire Atlantic theater, and this massive oceanic environment teems with *hundreds* of independently generated merchant and naval vessels. As the war progresses, North American supply convoys will entice you into opportunistic torpedo attacks while their shepherding destroyers employ intelligent and cunning tactics to locate and destroy you. Individual career patrols can last weeks—time acceleration eliminates the boring bits—and nothing drives home the tension of U-boat command like the rapid-fire sonar pings from a hovering Flower-class Corvette (who's still pissed about the two tankers you torpedoed) as you nervously flee to hull-popping depths.

The gameplay in *SH3* is full-to-overflowing with *Das Boot*-esque moments. The sim's eight distinct U-boat hulls (43 counting variants) boast down-to-the-rivet authenticity. Each features fully animated 3D crews, working deck/flak guns, and an historically accurate torpedo targeting system. The game is scalable for any skill level, so novices can let the Weapons Officer resolve target solutions automatically while hardcore submariners can enter their own range, speed, bearing, and distance calculations at *SH3's* challenging TDC (torpedo data "computer") station. Sadly, cooperative Wolfpack engagements are only available in the eight-person multiplayer game, but that's a forgivable omission considering the depth and quality of the single-player campaign.

The cinematic visuals—curiously locked at 1024x768—are another huge selling point. Destroyed ships blow apart with Spielberg-ian aplomb and the lush water effects—from moonlit Mediterranean swells to full-on North Atlantic gales—are the best we've seen in *any* PC game. (There are graphic anomalies with certain videocards, but a recent patch addressed many issues).

You don't have to be a simulation fan to appreciate this remarkable new "Game of the Year" contender. One dive, and *Silent Hunter III* will pull you in hook, line, and sinker.

—ANDY MAHOOD

MAXIMUM PC VERDICT 9

DIRECT HIT

Exquisite graphics and pyrotechnics; immersive dynamic campaign; savvy AI.

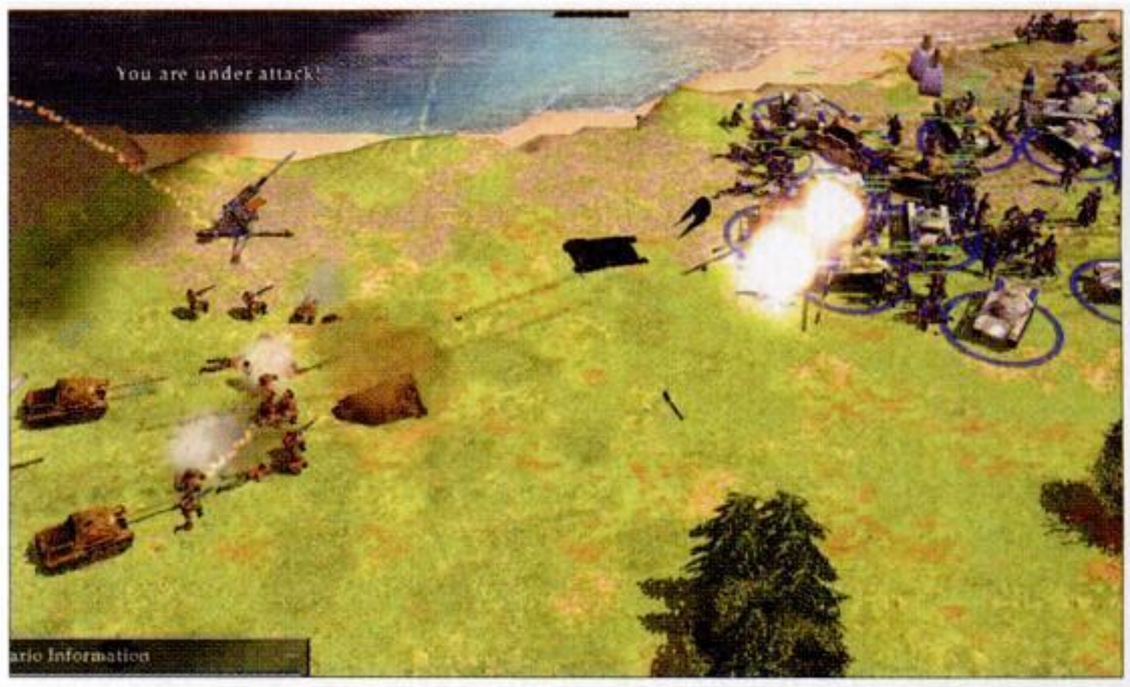
HULL BREACH

Graphics glitches; fixed 1024x768 resolution; no Wolfpacks in single-player game.

$40, www.ubi.com, ESRB rating: T

Empire Earth II

Finally, a game that lets you skip your history classes



Liberating France is a test of tactical efficiency as you race against the clock.

History is a hot subject these days. Historical TV shows about wars are more popular than ever before. But really, where's the fun in watching file footage when you could be reenacting key milestones in the rise of some of the world's most interesting empires? *Empire Earth II* let's you do that, and the action is accompanied by a wealth of background info to establish the context of your missions.

This time around, your conquest for global supremacy is split into three distinct single-player campaigns. You'll wage war or make nice with 15 real-world civilizations—while representing the Korean, German, and American empires. The campaigns are divided among three time periods, so you won't play the same epochs with each civilization. Each level of the history-driven campaigns plays out key moments in a nation's complex development.

Three key improvements to the first game help you micromanage economics and battle strategies. First is the citizen-manager feature, which lets you easily distribute your peons to resource locations and keep a close eye on the slackers. The picture-in-picture feature is useful for observing battles and choke points while you build up your nation's infrastructure. It gives you control over two different regions of the map at once. But our favorite new tool is the War Planner. It let's you and your multiplayer teammates sketch complex battle tactics directly on the map. This works much better for strategic planning than the typical "attack now!" chat command you'd otherwise send.

Combat follows the staple rock-paper-scissors formula, with certain special leader units that enhance the overall abilities of your troops. Nothing about the actual combat stands out. Most of the time, strength in numbers and adequately upgraded technologies compensate for a lack of mid-battle micromanagement. The newly added territory feature makes capturing map regions and reinforcing borders a key strategic element, but we'd be more impressed with dynamically shifting nation boundaries (a la *Rise of Nations*).

The single-player campaigns are easily completed, but you'll spend most of you time in online skirmishes anyway. With up to 10 players per game and a great diplomacy scheme, there's plenty here for you to create some very memorable RTS battles.

—NORMAN CHAN

MAXIMUM PC VERDICT 8

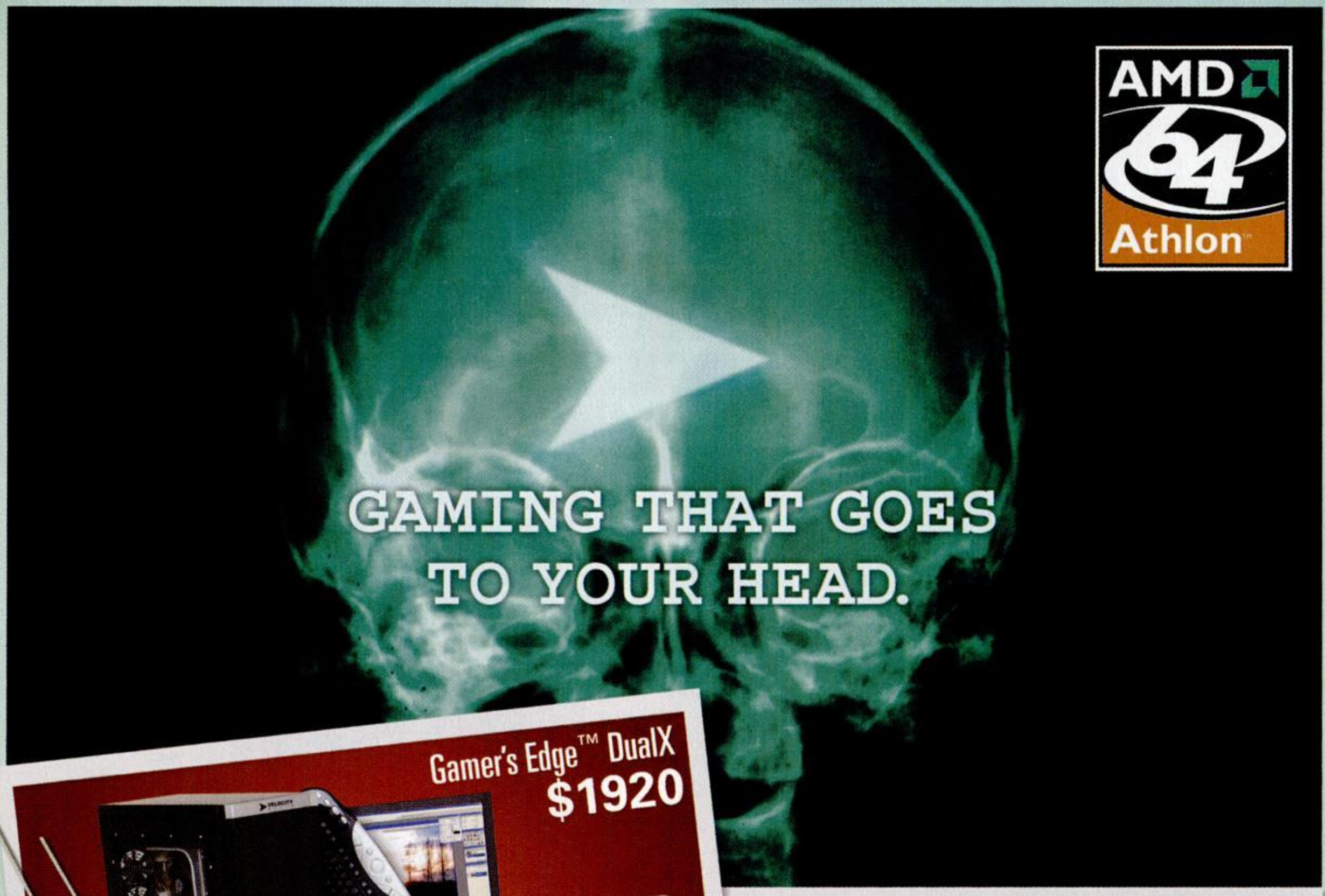
HISTORY CHANNEL

War-planning feature and intense historical detail are a winning combination for strategy.

HISTORY TEXTBOOK

Cut-and-dry unit balancing; still plenty of economic micromanagement.

$50, www.empireearth.com, ESRB rating: T



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Monarch 1150 USB 2.0 Tower Case w/300W Power Supply
DFI K8M800-MLV K8M800 Onboard Audio, Video, SATA, LAN, USB, and IEEE
AMD Sempron™ 2600+ 256K (754) - includes AMD Certified heatsink
256 MB DDR (266) PC-2100 Corsair (VS256MB266)
Western Digital 40 GB 2 MB Cache 7200 RPM (WD400BB)
Lite On LTN-527 52X CD-ROM
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Part #: 90999
SELECTED COMPONENTS:
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Asus K8V-SE Deluxe K8T800 Audio, GB-LAN, USB, IEEE, SATA w/RAID, DDR, ATX
AMD Sempron™ 3100+ 256K (754) - includes CoolJag JVC258A heatsink
512 MB DDR (400) PC-3200 Corsair
Western Digital 120GB, 8MB Cache, 7200 RPM, SATA (WD1200JD)
Samsung TS-H552B/WRCH 16x Dual Layer DVD±RW (Black)
Mitsumi Floppy 7-in-1 USB Card Reader
ATI (Asus) 9600SE Radeon 128MB DDR
Industry Standard Upgradable
1 or 3 year warranties available
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COMPUTER SHOPPER REVIEW RATING NOVEMBER '04: 8.0 out of 10

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Monarch Furia™ Custom Desktop

Part #: 80302
SELECTED COMPONENTS:
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Abit AV8 K8T800 Audio, GB-LAN, IEEE, USB, & SATA
AMD AthlonTM 64 3500+ 512K (939) - includes heatsink and fan
512 MB DDR PC-3200 Corsair
Western Digital 160GB 8MB Cache 7200 RPM SATA (WD1600JD)
Lite-On SOHW-1633S DVD-RW / CD-RW
ATI (Asus) 9600SE Radeon 128 MB DDR 8X AGP, TV-Out, and DVI
Industry Standard Upgradable
USB Ports on front of case
1 or 3 year warranties available
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AMD Athlon™ 64 3800+ Processor	$ 1109	CAG603
AMD Athlon™ 64 3500+ Processor	$ 975	CAG605
AMD Athlon™ 64 3200+ Processor	$ 889	CAG607
AMD Athlon™ 64 3000+ Processor	$ 845	CAG608

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AMD Athlon™ 64 3500+ Processor	$ 1315	CSE604
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- LG 16X DVD-ROM
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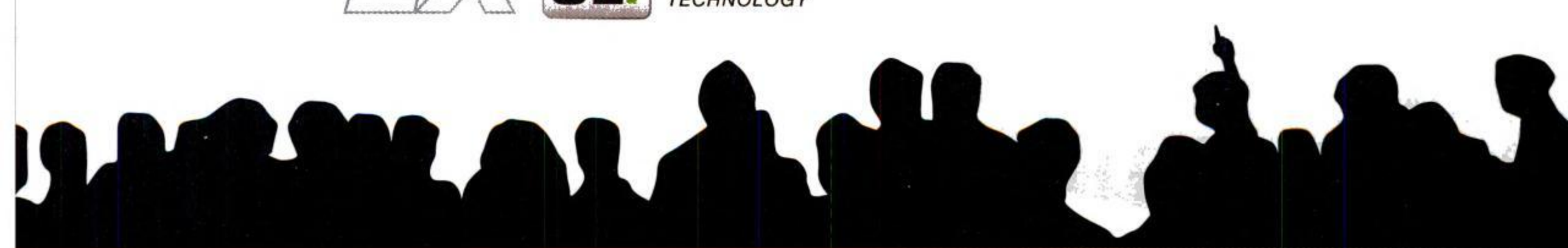

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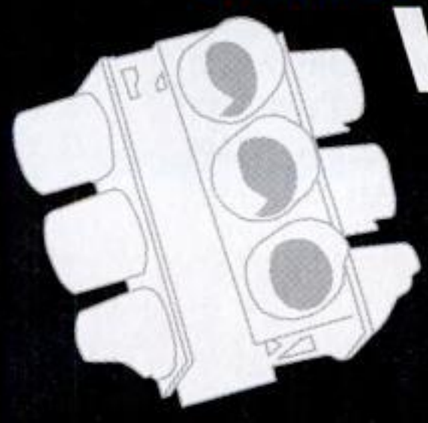

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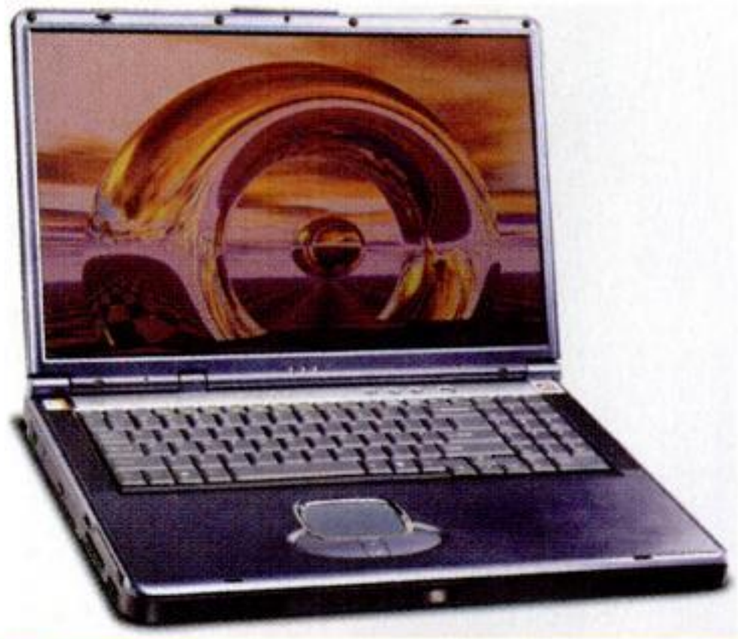

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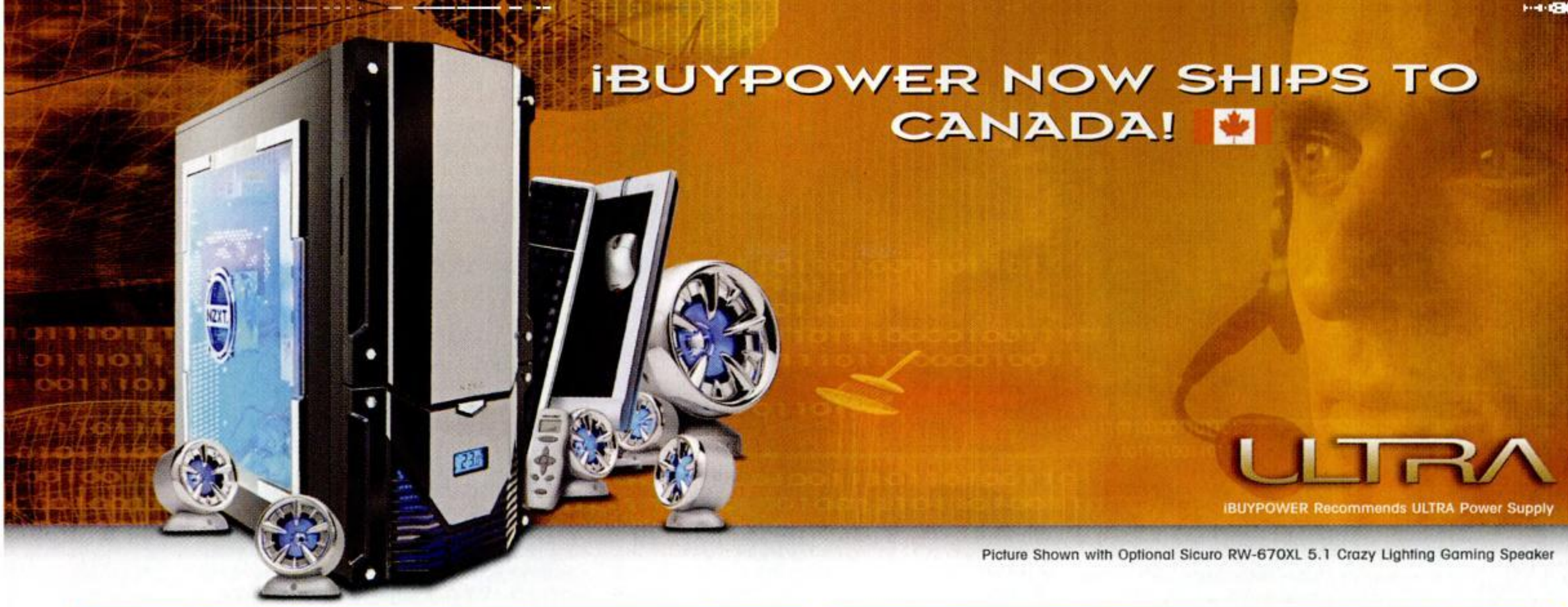

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AMD Athlon™ 64 3500+ Processor	$ 889
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- Geil 1024MB **DDR400** Memory
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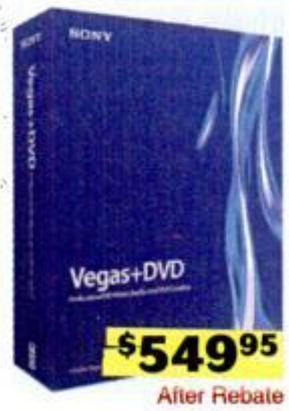

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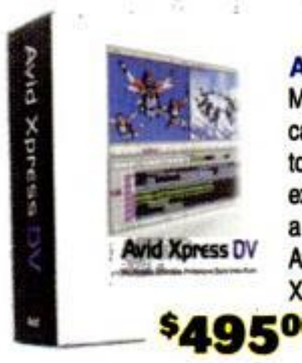

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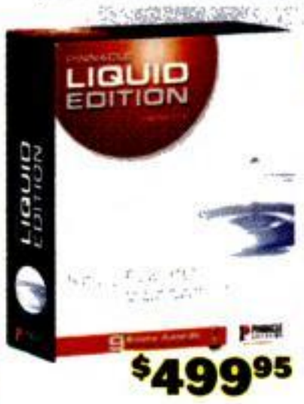

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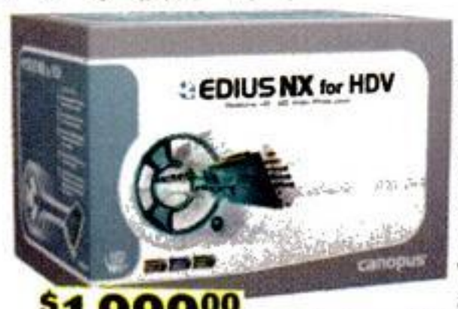

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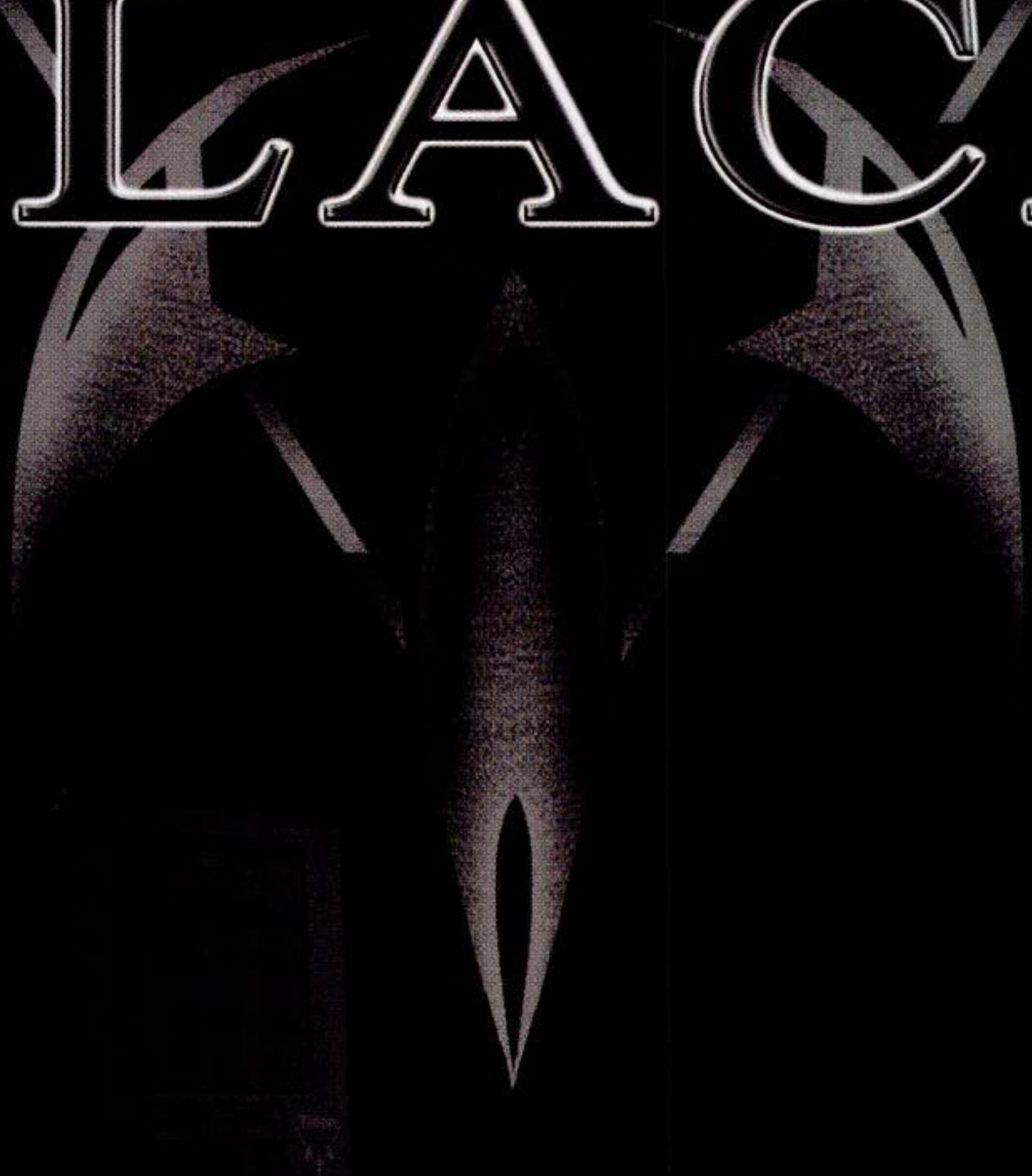

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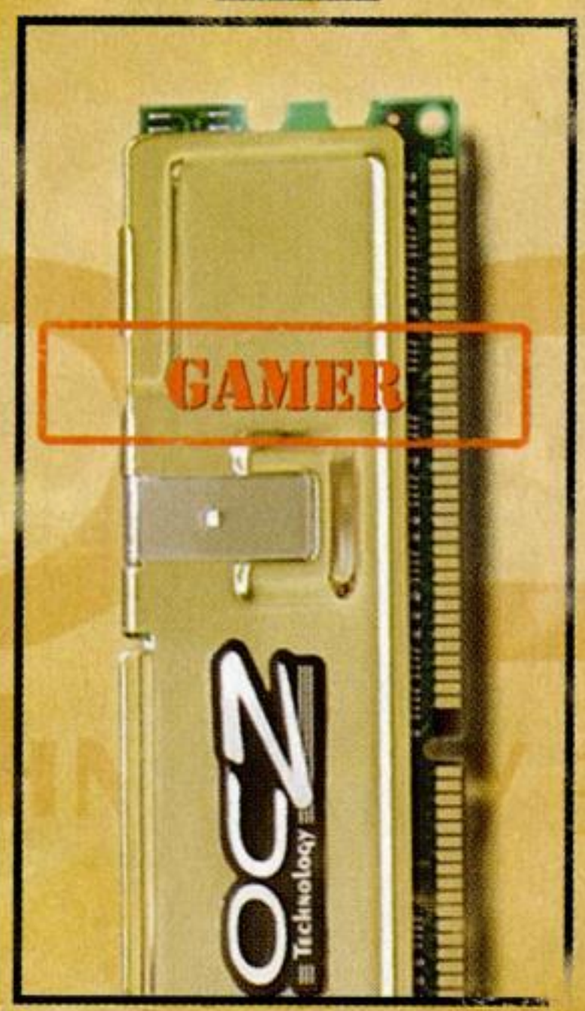

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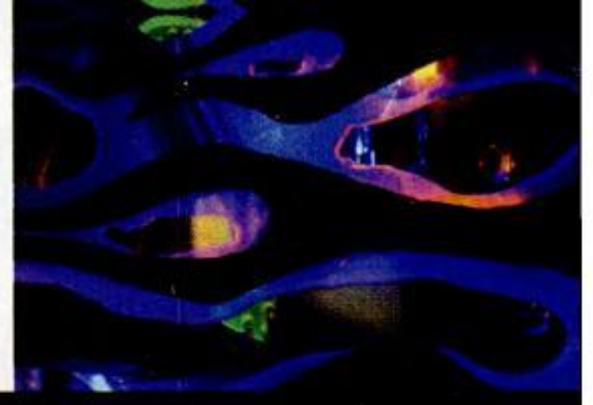
Rig of the Month



THIS MONTH: Craig Tate's blingGreen

Prior to its present incarnation, this month's Rig was a homely, hand-me-down, beige steel box of dubious origins. But Craig Tate saw beyond its bland facade, past the machine-punch pockmarks that riddled its surface, to the beauty that would be blingGreen.

He rolled up his sleeves, Bondoed, sanded, and drilled away at the blah beast until his joints were stiff and his fingers bleeding. Then he primed and MetalCast every nook and cranny, and bedecked the interior with lights. It was a mother of a makeover, to be sure, and yet despite the radical measures, the result is tasteful and artfully balanced.

By far, blingGreen's most striking attribute are the hand-cut harlequin flames adorning it. On the side, a piece of 1/8-inch UV-reflective blue acrylic resides between the cutouts in the case and the window, for added dimension.

At some points, these flames are just 2-3mm wide. And they were cut with a Dremel! Tate's biggest challenge was maintining the structural integrity of the steel while giving the flames a delicate, organic feel.

In what may be a modding first, crushed velvet makes an appearance, doing double duty as a cable cover/sound dampener. Is it just us, or does it make you want to curl up inside the PC with a martini?

More than 20 LEDs of different colors are attached to a circuit board inside the case. Half are triggered by hard drive activity, and the other half are triggered at idle. It all serves to create a dramatic flickering effect behind the flame cutouts.

If you have a contender for Rig of the Month, e-mail **input@maximumpc.com** with high-res digital pics and a 300-word write-up.

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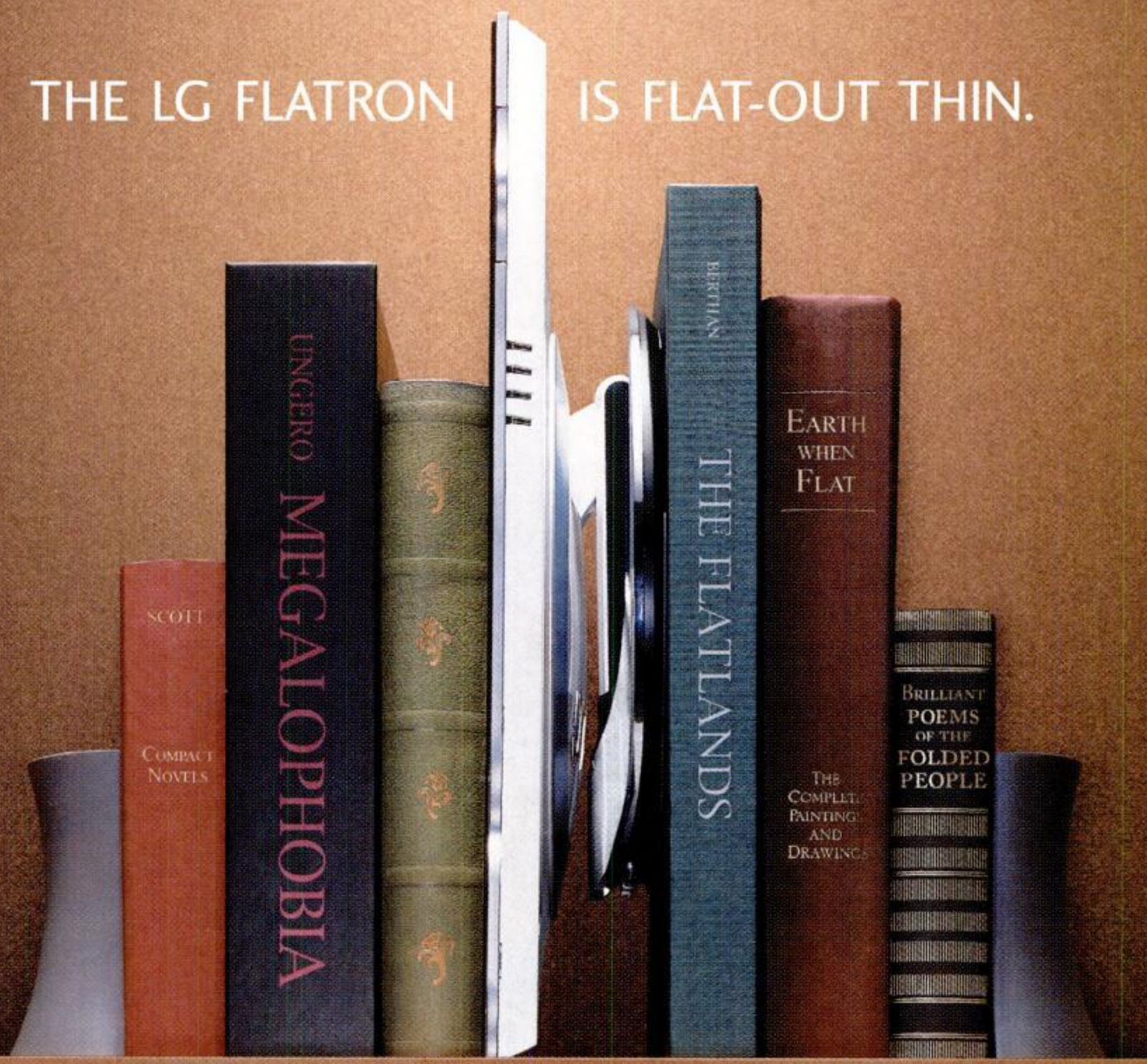

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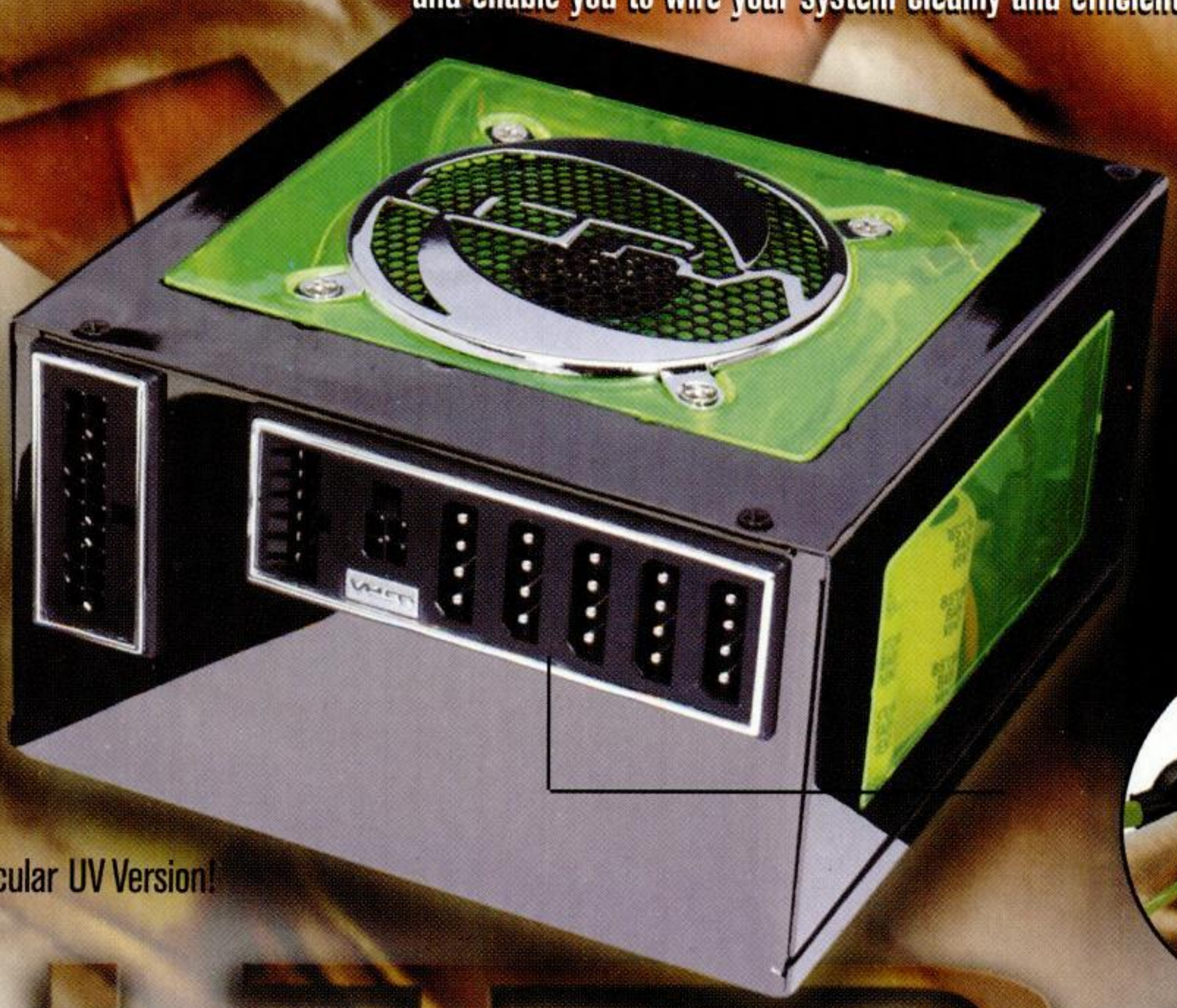

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